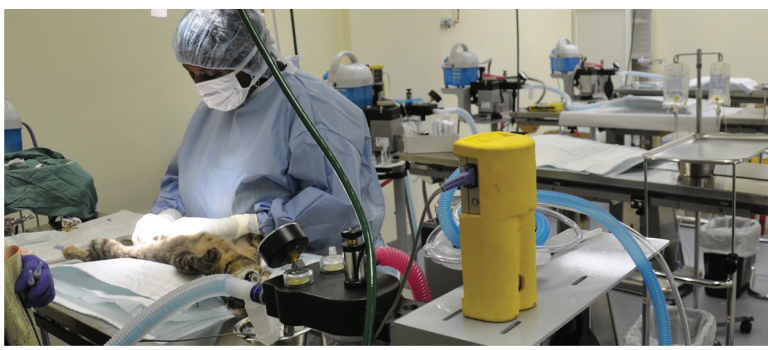
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Second Edition

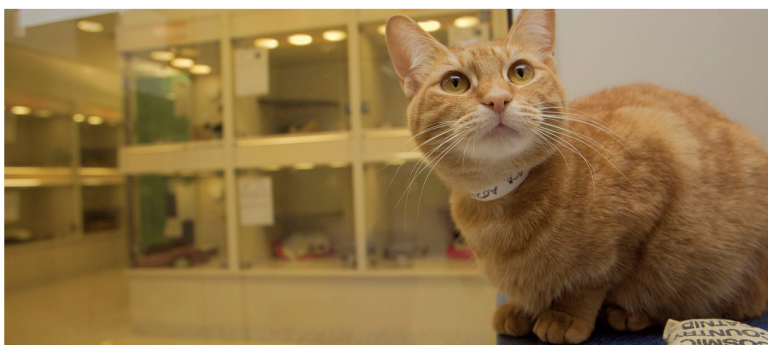
Edited by Lila Miller and Stephen Zawistowski











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Second Edition

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Dedication

We dedicated the first edition of *Shelter Medicine for Veterinarians and Staff* to Dr. Lloyd Tait because he kindled the flame that became shelter medicine at the ASPCA. We dedicate this second edition to the Association of Shelter Veterinarians and all those who provide care for animals in shelters. They have fanned the flames and ignited a revolution in how we think about the work we do.

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In the first edition, we began by thanking the ASPCA and our many colleagues here for their invaluable help and support in the effort to complete that text. In the years since, our debt has greatly increased. Once again, they have provided us with significant content for the book, as well as a wide range of professional, personal, and administrative support. Drs. Kathy Makolinski, Miranda Spindel, and Stephanie Janeczko from the ASPCA Veterinary Outreach Department provided skills, information, and perspectives on shelter medicine not available to us while developing the first edition. We are also pleased to acknowledge the continued support of ASPCA President and CEO Edwin Sayres and his commitment to evidence-based animal welfare.

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Once again, special thanks go to our families, who were supportive and tolerant of books and files strewn about living spaces and our sometimes absence from family activities as we wrestled with writing, editing, and fretting.

Thank you all.

Lila Miller
Stephen Zawistowski

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Introduction

Lila Miller and Stephen Zawistowski

Shelter medicine was truly in its infancy when work began in 2002 on the first edition of *Shelter Medicine for Veterinarians and Staff*. The first formal veterinary class in shelter medicine was taught in 1999 at Cornell University using informal handouts and materials gleaned from a variety of sources and adapted for application in a shelter setting. The Association of Shelter Veterinarians (ASV) had just been formed in 2001. The shelter medicine residency program at the veterinary college at UC Davis was a pioneer program. While it seemed that the seeds had been firmly planted for shelter medicine to become an established specialty within veterinary medicine, it was still largely unknown just how much interest or support would be generated at the university level or among general practitioners. Regardless of the direction that formal studies of shelter medicine would take, within a year after the first edition of *Shelter Medicine for Veterinarians and Staff* was published in 2004, it was clear from favorable peer reviews and the demand from shelters and veterinarians that a second edition was needed. There have been several other important developments in the field of shelter medicine, including the publication of the textbook *Infectious Disease Management in Animal Shelters* by Miller and Hurley in 2009 and the release of the ASV's *Veterinary Medical Care Guidelines for Spay–Neuter Programs* (Looney *et al*., 2008) and *Guidelines for Standards of Care in Animal Shelters* (ASV, 2010). The two documents produced by this highly regarded and experienced group of veterinarians are referenced throughout this textbook. Of particular note for animal sheltering is that the ASV guidelines are based upon the Five Freedoms that were developed for the welfare of farm animals in the United Kingdom in 1965. (The Five Freedoms can be found in Table 9.1 in the chapter on canine care.) These thoroughly referenced guidelines have the potential to improve the welfare and quality of care for shelter animals by being based on the needs of all animals, which do not change based on their situation, and should be used for that purpose.

Other key developments in shelter medicine are the growth of the ASV and increased interest in shelter medicine at veterinary colleges and in other countries. ASV now has more than seven hundred members in several countries. It is an important resource for veterinary professionals interested in working for and with shelters. It provides and sponsors a listserve for its members, veterinary college chapters, continuing education programs, scholarships, and position statements on key issues and is working to create a shelter medicine board-certified specialty. The association's website is www.sheltervet.org

Shelter medicine continuing education programs are being presented routinely at national veterinary and animal welfare conferences (North American Veterinary Conference, Western Veterinary Conference, Midwest Conference, Humane Society of the US Expo) and have been topics at international veterinary conferences in Canada, South Africa, Turkey, Australia, the Netherlands, and Spain, demonstrating an interest that is broad based in scope and growing. At the time of this writing, many veterinary colleges have either informal or formal shelter medicine programs and/or residencies, including Cornell University, UC Davis, University of Florida, University of Pennsylvania, Purdue, Iowa State, Colorado State, University of Wisconsin, Oregon, and so on. The Veterinary Information Network (VIN) on the Internet teaches courses in shelter medicine and animal welfare and has a shelter medicine folder that allows

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VIN members to exchange information. While much of the material in this new edition of *Shelter Medicine* will apply to shelters anywhere in the world, the contributors live and work in the United States, and that will be evident in their examples and focus.

The challenge of this second edition was to try to sort through, organize, and present sensibly the enormous amount of information pertaining to this rapidly developing field. In some ways, the first edition was easy; it was a new field with just a few people working on a handful of topics, and we could cover much of it. The first edition had 30 chapters with 37 authors; this second edition has 42 chapters and 51 authors. A careful assessment was made of what additional information would be included while retaining much of the original information that was still current and applicable. Content was determined through consultation with shelter medicine experts both in the field and academia and via surveillance of the ASV sheltervet listserve. The listserve yielded valuable information about topics of concern to veterinary and shelter professionals. Some authors were invited to update their contributions to the first edition, while new authors were recruited for some chapters because of their special expertise in the field or because of new developments they were instrumental in uncovering.

Shelter medicine, like other medical fields, undergoes many changes in theory, fact, and practice. Sydney Burwell, the late dean of the Harvard Medical School, cautioned that "half of what you are taught as medical students will in ten years have been shown to be wrong. And the trouble is none of your teachers know which half" (Guise, 2008). Some of the recommendations found in the first edition may have been eliminated or modified in the second edition because of new knowledge that Dean Burwell predicted we should be prepared to receive.

One major change in the second edition is the expansion of information from one to several chapters. Dog and cat husbandry are now covered in several separate chapters instead of combined in one. Likewise, spay/neuter and animal behavior information that was relegated to one or two chapters is now covered in multiple chapters. To make space for new topics and more information on existing topics, the chapters on nutrition and vaccination were eliminated and that information incorporated in the individual species chapters. Readers of this edition will find they are referred to numerous other chapters for additional information on a particular topic. For example, rather than include detailed and often duplicate information about behavioral enrichment in both the dog and cat chapters, the reader is referred to the separate chapter devoted to behavioral enrichment.

SECTION 1: MANAGEMENT TOPICS

The first six chapters in the first section of the textbook could be described as covering management topics. Chapter 1 on the history of animal sheltering returns with updates, a discussion of recent developments, and new information, including microchipping and software management programs. Chapter 2 on statistics is a new chapter that reflects current trends in modern animal sheltering that value data collection and its impact on program design and measurement of progress in saving animal lives. With an emphasis on providing for animal welfare in all aspects of animal sheltering, Chapter 3 on shelter design provides new concepts about housing animals that stresses allowing them to express their normal behaviors. It also offers "cutting-edge" design ideas that are practical and inviting for staff, animals, and the public, as well as environmentally friendly and sustainable. The value of good sanitation practices to maintain a healthy shelter population cannot be overestimated, and although there are many other resources available with this information, it is an integral part of shelter medicine. Chapter 4 on sanitation provides an overview of procedures, protocols, and principles, with guidelines, specific information, and references to some of the newer disinfectant products on the market. Chapters 5 and 6 on administrative and legal issues, respectively, contain updated information about topics that might ordinarily be viewed as ancillary to shelter medicine but are key to the successful operation of a shelter.

SECTION 2: ANIMAL HUSBANDRY

The second section of this textbook is devoted to species-specific animal husbandry. It begins with two new and exciting additions to this edition, Chapters 7 and 8 on quality of life and population management. These two topics are intertwined. Quality of

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life is a complex subject that is difficult to define, particularly for populations of animals, but must be addressed if appropriate and humane animal care is to be provided. But a good quality of life for shelter animals is difficult, if not impossible, to provide and sustain if attention is not paid to actively managing the population and remaining within the shelter's capacity to provide that care. Chapters 9 on canines, 12 on reptiles, 13 on avians, 14 on wildlife, and 15 on equines return with new and updated basic husbandry guidelines, welfare, and medical information. Chapter 11 on small mammals now includes information on rabbits (instead of a separate chapter) and ferrets. Feline welfare has not received the same attention as canine welfare until recently. An attempt has been made to remedy this by providing extensive coverage of feline care in Chapter 10.

SECTION 3: INFECTIOUS DISEASE

The information about disease management has been expanded to six chapters from four. Chapter 16 begins with a brief, general overview of disease management. Chapter 17 is a new chapter on epidemiology that explores disease as it occurs in populations of animals rather than individuals, looking at ways to understand and thus help prevent its spread. Similar to the previous edition, Chapter 18 provides an overview of the most common diseases found in shelters, while Chapter 19 reviews and updates the most appropriate disease-testing protocols. Chapter 20 on treatment is a new chapter that describes how treatment options differ from those in private practice and what criteria should be used to guide appropriate treatment and care decisions in shelters. Chapter 21, another new chapter, focuses on management of disease outbreaks, a challenge that almost every shelter must face at some point no matter how well designed their facility or disease management program may be. This chapter helps bring together many of the concepts about disease presented throughout this section to aid in the development of effective, rational management strategies.

SECTION 4: ANIMAL CRUELTY

Chapter 22 opens the fourth section by providing an overview of animal cruelty laws that not only affect animals and shelters but veterinarians as well. Chapters 23 and 24 delve into veterinary forensics by providing basic guidelines for examining the living and deceased animal cruelty victim, respectively. Since the first shelter medicine textbook was published, at least four textbooks on veterinary forensics have appeared. (See appendix 24.1 for their titles.) Successful prosecution of animal cruelty cases requires scrupulous attention to collecting, preserving, and documenting evidence and testifying; the reader is encouraged to use the information in these chapters as a springboard for obtaining more advanced training in veterinary forensics and handling animal cruelty cases. Chapter 25, a new chapter on forensic toxicology, provides guidelines and valuable new and expanded information for handling suspected cases of poisoning, which unfortunately happens all too frequently, both deliberately and accidentally. Rather than have animal hoarding treated as a subset of another chapter on animal cruelty, Chapter 26 is devoted entirely to this phenomenon that was formerly called animal collecting. Information is provided regarding research and current theories about this behavior as well as specific guidelines for shelters and staff faced with managing these tragic situations. Chapter 27 on animal fighting is updated with additional information about this form of animal cruelty and will be helpful for veterinarians and staff who are directly involved in the investigation of this crime. Chapter 28 rounds out the animal cruelty section by providing information about equine cruelty. Horses occupy a unique niche in the United States by often being classified as both companion animals and livestock, and some of the care and legal concerns regarding horses are very different from what is encountered in cruelty to small companion animals. This chapter helps provide the information necessary to prosecute equine cruelty whether it is neglect or active cruelty, and offers basic guidelines for refeeding starved horses.

SECTION 5: SHELTER PROGRAMS

The fifth section of this textbook contains four chapters that deal with special programs. Chapter 29 on emergency care helps shelters define emergencies, create a basic emergency care kit, and develop guidelines for providing appropriate care when emergencies occur. Regardless of a shelter's mission and

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resources, the question of euthanasia will eventually arise. Chapter 30 provides technical information and guidelines for the humane euthanasia of the various species of animals most commonly encountered in shelters. The chapter is not a substitute for euthanasia training or certification, but does discuss the pros and cons of methods such as carbon monoxide as well as some of the main medical and scientific issues associated with euthanasia. Chapter 31 provides an extensive discussion of foster care programs that more and more shelters are discovering are necessary, lifesaving adjuncts for their organizations and communities. These programs place adoptable and non-adoptable animals who are at risk for euthanasia due to mild infectious disease or other treatable conditions into less-stressful home environments where recovery is more likely to occur with individualized care and comfort being provided. The last chapter in this section deals with disaster management. Shelters are increasingly called upon to help deal with disasters that involve collaborative efforts between local, state, and federal authorities and agencies. Chapter 32 is an extensive source of information that also provides links to resources that shelters will need in order to understand and handle their roles in disaster and emergency relief efforts.

SECTION 6: BEHAVIOR

The progress that has been made regarding behavior issues for shelters is reflected in the four chapters that comprise Section 6. Extensive new research into animal cognition, behavior, and welfare offers fresh insights and raises the importance of providing for the behavioral health of shelter animals. Chapter 33 provides an overview of adoption programs and current behavioral evaluations. Chapter 34 is a new chapter devoted to the importance of providing enrichment to sheltered animals to enhance their physical, behavioral, and psychological well-being. The chapter provides many examples of ways to enhance the animal's environment and experiences and discusses the importance of positive social engagements with both conspecifics and humans for normal behavioral health. Chapter 35 introduces the relatively new field of behavior forensics, which evaluates the behavior of dogs who are presented to shelters as a result of legal cases, are victims of cruelty, or are considered to be dangerous. It discusses the components of a behavior evaluation and explains how to best use them to make recommendations regarding the disposition of these animals. Chapter 36 provides an update on the use of drugs to manage behavior problems and facilitate rehabilitation.

SECTION 7: SPAY/NEUTER

Section 7 may surprise some readers because two of the six chapters provide a fairly in-depth treatment of spay/neuter and anesthesia procedures. Spay/neuter is an integral part of a comprehensive shelter and community approach to reducing animal shelter intake. Chapter 37 looks at a variety of traditional and nontraditional spay/neuter programs and provides information and examples that can help shelters and communities decide which approach will be most effective for them in reducing the number of unwanted animals being born and relinquished to shelters. The impetus for the development of pediatric neutering techniques and high-volume, high-quality spay/neuter programs originated with shelters, and many of the protocols and standards of care reside within the animal sheltering community. Because some of these procedures have not penetrated into the mainstream of veterinary medicine, some practitioners believe the procedures are unproven, unsafe, unnecessary, and thus unacceptable. Inclusion of specific anesthetic and surgical guidelines, protocols, and procedures as can be found in Chapter 38 on anesthesia, Chapter 39 on surgical techniques, and Chapter 40 on pediatric neutering not only provide information to shelter veterinarians and staff but also help lay the foundation for their full acceptance by all veterinarians as standard operating procedures. These chapters are not designed to substitute for professional instruction in surgery and anesthesia or for the use of textbooks devoted entirely to these subjects.

Chapter 41 provides the results of new studies as it tackles the management of stray and community cats, a topic that remains as controversial now as it was when it was presented in the first shelter medicine textbook 8 years ago. Chapter 42 ends the section on a high note by providing information about the research on nonsurgical sterilants. The continued development of alternatives to surgical sterilization of dogs and cats has the potential to

revolutionize veterinary medicine as well as the animal sheltering world.

CONCLUSION

It would be nearly impossible to provide in-depth coverage of all the topics pertinent to shelter medicine in one volume. The purpose of this second edition is to introduce newcomers to the field to the vast array of knowledge necessary to provide appropriate and humane care for shelter animals, to provide new research and update the information provided in the first edition, and to serve as a resource to guide shelters in need of additional information to operate modern, efficient, and humane shelters. Please refer to the two appendices at the end of this book for a list of veterinary and shelter medicine resources and a description of the oft referred to ASV Guidelines for Standards of Care in Animal Shelters.

REFERENCES

Association of Shelter Veterinarians [ASV] (2010) Guidelines for standards of care in animal shelters. Accessed at http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29

Guise, N.B. (2008) Riding the waves of change together: Are we all paying attention? *Journal of the Medical Library Association*, **96**, 85–87.

Looney, A.L., Bohling, M.W., Bushby, P.A. *et al.* (2008) The Association of Shelter Veterinarians' veterinary medical care guidelines for spay–neuter programs. *Journal of the American Veterinary Medical Association*, **233**(1), 74–86.

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Section 1
Introduction

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1
Introduction to Animal Sheltering

Stephen Zawistowski and Julie Morris

HISTORY

Animal shelters in America evolved from the livestock impounds that were found in colonial towns and villages. At that time, it was common for people living in a town or village to keep chickens for eggs, a goat or cow for milk, and a feeder pig to be fattened on kitchen scraps and then slaughtered to provide hams and bacon for the family. Animals who escaped their confinement near the family's home, or were found wandering on public property, would be rounded up by the community's poundmaster and taken to the impound. The impound would be fenced in and might have a shed. People searching for their missing beasts would come to the impound, and if they could identify their animal, they could pay an impoundment fine or fee and take their property home. The poundmasters kept any unclaimed animals for their personal use. They might keep the animals to feed their own family, or sell them to someone else. The poundmaster's income was based on the impound fees, and the money earned from the sale of these livestock, supplemented by the animals they kept for their own use (Zawistowski and Morris, 2004; Zawistowski, 2008). Companion animals, while present in many homes, occupied an awkward place in the culture (Grier, 2006). Wealthy families might have high-quality hunting dogs, or cherished lap dogs. Portraits from the era frequently show individuals and families posing with their prized companions. Grier's research also showed that families of lesser means also shared their lives with animal companions. However, companion animals did not enjoy the same protection afforded to livestock. The earliest laws to protect animals in America were meant to protect animals with value as property (Favre, 2003). This included livestock, but not dogs and cats. Just as they do today, dogs would stray from their homes. From time to time, the poundmaster would catch them and take them to the impound. If no one came to claim them and pay the required impoundment fee, the poundmaster faced a conundrum. Unlike the horses, cattle, pigs, or other livestock that came to the impound, it was unlikely that the poundmaster would be able to sell unclaimed dogs. And of course they were not likely candidates for the poundmaster's table. As a result, most of these stray dogs were killed. Depending on the skill and sensitivity of the poundmaster this could be a quick death or a prolonged and painful death. Clubbing, strangling, and drowning were common methods (Zawistowski, 2008).

As villages became towns, and towns became cities, it became less likely for people to keep their own livestock for meat, milk, and eggs. Stray dogs flourished in these cities, surviving on scraps, trash, and handouts. Reproduction was unfettered, and the poundmaster now found that stray dogs became their primary quarry. By now, the impound was known as the dog pound. Few dogs were claimed by owners or bought by people interested in having a pet. As a result, the poundmaster now had a substantial job finding an efficient way to kill dozens, if not hundreds, of dogs at a time. By 1870s, the pound in New York City resorted to drowning the unwanted

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animals in a large iron cage lowered into the East River. A century before the birth of the no-kill movement in America, strolling down to the river to watch stray dogs being drowned was an afternoon's diversion.

Dogcatchers of the era were despised, and not because they killed stray dogs. The men were still not paid a steady wage and continued to depend on redemption fees from people reclaiming their dogs at the shelter (Crossen, 2007). Their income depended on catching owned dogs and having people reclaim them. In time, the pound system evolved into a corrupted practice of kidnaping owned dogs and ransoming them back to their owners, while at the same time ignoring the many strays that plagued the city.

Slow change came to animal sheltering with the initiation of the American animal welfare movement (Lane and Zawistowski, 2008). Henry Bergh, a philanthropist and former diplomat learned of the Royal Society for the Prevention of Cruelty to Animals (RSPCA) in England, while returning from an assignment in St. Petersburg, Russia. He stopped in London and met with the Lord of Harrowby, the president of the RSPCA. When Bergh arrived back in New York City in 1865, he quickly set to work gathering support to establish a similar society in America. On April 10, 1866 his efforts were rewarded with a special charter from the State of New York for The American Society for the Prevention of Cruelty to Animals (ASPCA). Bergh's initial efforts were directed toward protecting the many horses who worked in the streets of the city. However, the early records of the ASPCA offer numerous examples of Bergh's interventions on behalf of dogs and cats. These included pursuit of dogfighters, ragpickers who used dogs to pull their carts, and frequent criticism of the city dog pound. City officials called upon Bergh and the ASPCA to take over the management of the city pound several times over the years. Each time, however, Bergh declined. He was well acquainted with the politicians of his era, and he feared that they would fail to provide him with the resources required to run the pound in a successful and humane fashion, and at the same time imperiling the broader work of his fledgling society.

Bergh's influence rapidly expanded outside of his native New York City. Just 1 year after the founding of the ASPCA, a society for the prevention of cruelty to animals (SPCA) was formed in Erie County/Buffalo, NY, with former president Millard Fillmore chairing the meeting. Philadelphia and Boston followed in 1868. Bergh was in communication with founders of these organizations. He provided information on the ASPCA charter, an understanding of the mission and organization, and encouraged them to adopt the SPCA name. Dozens of additional SPCAs were created in the next decade. Bergh's society remained a model for these other organizations to emulate, but there was no formal relationship between the ASPCA and the many local and regional societies for the prevention of cruelty to animals that followed. As a result, early in the history of the American animal welfare movement the seeds were planted for a problem that persists to this time, the misconception that SPCAs are somehow organized under or linked to the ASPCA.[1]

Caroline Earle White was the founder of the Pennsylvania SPCA in 1868. Social convention of the era denied her a position on the board of directors for the PSPCA because she was a woman. She then formed a Woman's Auxiliary of the PSPCA. It was in this role that she led the Woman's Auxiliary in the development of the first *humane* animal shelter. They conceived and built the City Refuge for Lost and Suffering Animals. This facility accepted stray animals, provided food and medical care, and promoted the placement of these as pets into new homes. They confronted the question of what to do with animals that could not be placed by commissioning the development of a humane euthanasia chamber that used gas to asphyxiate the animals—a dramatic improvement over the practice of clubbing and drowning.

The next major development in animal sheltering followed Henry Bergh's death in 1888. While Bergh had not taken up New York City's offer to operate the city's public animal shelters, his successors at the ASPCA took up the task in 1894. As part of this arrangement, the city approved the requirement

1. This was further complicated when the term "humane society" became another common organization name. It is important to recognize that "society for the prevention of cruelty to animals (SPCA)" and "humane society" are generic terms that refer to groups that provide animal sheltering and other services to their communities. They may be loosely organized in state or regional groups, but in the end are independent entities.

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that dogs in New York City be licensed, and authorized the ASPCA to collect the $1.00 license fee, and use the funds to provide animal control services. The license income permitted the ASPCA to hire salaried workers and convert a warehouse into a holding kennel. Workers on salary no longer needed to depend on reclaim fees for their income. They were then able to concentrate on picking up stray dogs and cats from the city streets. In just 1 year, the ASPCA was praised for the performance of the transformed animal shelter system. This included the fact that the ASPCA-operated shelter captured and euthanized more dogs than the shelters had done in the previous years. It was indeed considered an important service to remove these nuisance dogs from the streets. The city fathers of Brooklyn, NY—Brooklyn was still an independent city at the time—were so impressed with what they observed happening across the East River that they prevailed upon the ASPCA to step in and manage their animal shelter as well.

Many SPCAs around the country followed the example of both the Woman's SPCA and the ASPCA. Some would open charitable animal shelters that would take unwanted animals from the public, provide medical care, and make them available for adoption, or euthanize them if they were not adopted. Other societies would enter into relationships with city and town governments to provide animal-sheltering services. In still other communities, the local government owned and operated the animal shelter and provided the associated services. The current state of affairs in animal sheltering across the country remains a mix of these various models. In some places, SPCAs and humane societies continue to provide animal-sheltering services as charitable organizations. In other places, they may have service contracts with one or more city or town governments to provide some or all animal-sheltering services. These arrangements may include capturing stray animals, handling enforcement of animal-related regulations such as licensing and aggressive or dangerous dogs, cruelty investigations, sheltering animals, providing lost and found and animal adoption programs, public health functions such as holding animals for rabies observation, and euthanizing sick, injured, or unwanted animals. They may even provide spay/neuter services for shelter and privately owned pets. In some cases, the humane group may provide only part of these services. For example, the local government may cover the salaries of animal control officers who capture strays and handle regulatory enforcement, but may contract with a humane society to provide sheltering services. It is not uncommon to find that a community has both a government-operated animal shelter and one or more shelters operated by humane groups. All in all, it is a complicated state of affairs, and those interested in working with an animal shelter should take the time to understand the nature of its management, scope of services, and areas of responsibility.

In the years since Caroline Earle White pioneered the first humane animal shelter, there have been many advances in both methods and scope of services and programs, as evidenced by the breadth of topics covered in this text. The rest of this chapter will be a short introduction to some of the services and programs not covered elsewhere in the text, as well as some of the important issues that animal-sheltering organizations currently face.

SHELTER ORGANIZATIONS

As noted above, animal sheltering across the country evolved as an odd mix of organizations and circumstances. Many of the early humane groups developed in major urban areas such as New York City, Buffalo, Boston, Philadelphia, San Francisco, and others. Each of these organizations was founded by local community leaders and focused on the specific needs of their regions. In 1877, some of these leaders felt the need to coordinate their efforts in a more effective fashion. John G. Shortall of the Illinois Humane Society was the impetus behind a meeting of humane leaders that eventually lead to the formation of the American Humane Association (AHA). The early focus of AHA was the cross-country transport of livestock. Eventually, it would also address animal-sheltering issues. While originally conceived to be an umbrella organization for humane groups in the United States, this goal was never fully realized. Instead, AHA has established itself as a resource on animal welfare issues, including animal sheltering. Through publications, conferences, and educational outreach to the field, it provides a range of support services.

In the 1950s, a small group within AHA felt that the organization was becoming too focused on animal-sheltering issues and was not providing active leadership on other humane issues such as

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vivisection and hunting (Unti, 2004). In 1954, a small group led by Fred Myers formed the Humane Society of the United States (HSUS). An early animal-sheltering focus for HSUS was the effort to combat "pound seizure," where animal shelters were required to provide unclaimed dogs and cats to research laboratories. HSUS currently sponsors the largest annual conference for animal shelter professionals, Animal Care Expo, and publishes *Animal Sheltering* magazine; it also provides a variety of other educational and consulting services for local animal shelters.

The National Animal Control Association (NACA) represents professionals working in the animal control field, and the Society of Animal Welfare Administrators (SAWA) is composed of shelter professionals who work at a range of both nonprofit and government-run animal shelters. As evidence of the continued evolution of the animal-sheltering field and its development as a viable professional career, SAWA has developed the credential of Certified Animal Welfare Administrator (CAWA). Certification is earned through management and animal welfare experience as well as successful performance on a certification examination. Elements of that program include:

- Administration and management, including strategic planning, accounting, budgeting and financial policies, contract negotiation, and rules related to nonprofit status
- Personnel supervision and leadership, including recruitment, selection, training and performance evaluation, labor relations, compensation and benefits
- Public relations and fund-raising, including media and presentation skills, customer service policies, fund-raising and development
- Animal care and treatment, including humane animal treatment, animal care and control laws, animal health and welfare, and shelter design
- Reasoning related to problem solving, information analysis and synthesis, and discretion.

While NACA and SAWA are composed of individual professionals working in the field, the National Federation of Humane Societies (NFHS) membership is composed of organizations. The NFHS works to foster collaboration and cooperation among the many shelter, animal rescue, and animal control organizations in the field.

In 1994, the ASPCA ended its contract to provide animal control services to New York City. Since then it has developed a Community Outreach department that provides grants, training, and assistance for animal shelters across the United States.

SHELTER SERVICES

Shelter services have evolved over the years, and have changed substantially from the original mission of rounding up strays, returning a handful to owners, placing a few in new homes, and euthanizing the rest. Perhaps, most significant has been the general acceptance that cats should also be a part of a community's animal-sheltering programs. Early shelter programs concentrated on dogs, and indeed, more often than not, the shelters—called dog pounds—were funded at least in part by dog license fees. In general, the essential elements of a well-organized animal-sheltering program include the following (Handy, 2001):

- Uniformly enforce laws related to public health and safety
- Respond to nuisance complaints in a timely manner
- Investigate complaints of animal cruelty, abuse, and neglect
- Rescue mistreated and injured animals
- Shelter stray and homeless animals
- Work to reunite lost pets with their families
- Place healthy, behaviorally sound animals in responsible homes
- Euthanize suffering animals as well as those who are neither reclaimed nor adopted
- Promote mandatory identification of both dogs and cats
- Create incentives for the public to have pets sterilized
- Deter future problems through education programs.

While the above elements constitute what are frequently considered the core of primary services that should be available in a community, often one or more are omitted in various locations. A critical development in animal sheltering is the acknowledgment by some animal welfare organizations that

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in order to increase their effectiveness, communities should form collaborative coalitions among groups that provide animal care and sheltering services. This coalition would include both municipal and nonprofit animal shelters as well as various rescue groups that may operate through foster care programs. Again, while coalitions are becoming more common, they are by no means pervasive in the field. But when an effective coalition is formed, there is the recognition that the welfare of companion animals in that community is the responsibility of the entire community. Through collaboration and pooling of resources of the coalition members, more positive outcomes can be achieved for all the animals. Hosting joint adoption events, sharing vehicles to transport animals between shelters for adoptions or for foster care, and co-funding a community spay/neuter clinic are just a few ways through which coalitions increase their efficiency and outreach to the community. While individual shelters and rescue groups continue to maintain their own statistical data to track program performance, the true measure of success is the combined community data. The critical statistical measure of performance is the live release rate (LRR). Stated simply, it is the percentage of animals that enter the community shelter system and leave that system alive either through return to owners (RTO), adoption into new homes, transfer to other groups that guarantee an adoption placement, or rarely, transfer to an appropriate sanctuary.

Key Programs

There is much greater public scrutiny of animal shelter performance today than a generation ago. The no-kill movement, which had its birth with the publication of an influential essay by Ed Duvin (Duvin, 1989), has galvanized a diverse constituency to support, and indeed demand the end of euthanizing healthy dogs and cats as a means of population control. This increased pressure on animal shelters has caused some of them to reimagine their roles in their communities. Among other things shelter professionals have seen is the need to upgrade the skills of their managers and staff.

Shelters have hired more staff with training in animal behavior to evaluate and rehabilitate dogs and cats in the shelter, assist with appropriate adoption placements, and with adoption follow-up and support programs. Shelter medicine has been another part of the evolution of animal sheltering, leading to the first and current edition of this text, the formation of the Association of Shelter Veterinarians, and the creation of several formal shelter medicine programs at veterinary colleges, on the Internet, and at major veterinary conferences.

Reducing Animal Intake

In many cases, the best case scenario for animals in a community is to not enter the shelter system at all. Animals are best served when they are able to remain with their families in safe and secure homes. Shelters may employ a range of outreach and intervention programs that serve as safety nets that help keep animals with their current guardians. Research on relinquishment indicates that animal behavior problems, along with cost of care, moving, and other human household issues are strongly associated with a risk of relinquishment (Patronek *et al*., 1996a, 1996b; Salman *et al*., 1998). As a result, shelters and others have begun to offer animal behavior helplines (Lawson, 2000), food pantries (Hettinger, 2010), and lists of rental properties that will accept pets (People With Pets, n.d.).

A cornerstone program to reduce animal shelter intake is the sterilization of dogs and cats through aggressive spay/neuter programs. Anecdotal evidence and research (New *et al*., 2004) suggest that a significant proportion of the puppies and kittens born each year are the result of unplanned litters. Some of these puppies and kittens will be relinquished to shelters while still young; others may be taken into homes for some period of time before they too are relinquished to an animal shelter. Several chapters in this text address both the logistical and medical aspects of these programs. Expanded access to and affordability of spay/neuter services for the public has led to a dramatic decrease in the number of animals impounded at shelters each year, and the number subsequently euthanized (Marsh, 2010). Suffice to say, an ounce of prevention is worth a pound of cure.

Two significant advances to reduce the intake of cats at animal shelters are Trap-Neuter-Return (TNR) and Feral Freedom. TNR is described in detail in the chapter on management of stray and feral community cats. The Feral Freedom concept was initially developed in Jacksonville, FL (Weiss, 2011). The program targets free roaming cats that may not be well socialized when they enter the shelter and are

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not part of a managed colony or formal TNR effort. If they have been doing well in the environment where they were found and are not under any type of threat, they will be spayed or neutered, and returned. Otherwise, they have little chance of being adopted and would likely be euthanized. Local residents and businesses are provided with information regarding the program. The reality is that in many shelters, the prospects of a successful adoption for any adult cat may be quite poor, with euthanasia being the far-too common end result. Feral Freedom offers these cats a chance for a reasonable quality of life, and reduces the population of cats that a shelter may need to manage within its facility.

Release Programs

Release programs refer to efforts a shelter makes to ensure animals are either returned to their original homes, or are placed in new homes. The goal is "live release."

Lost and Found

A major focus of animal control programs is to capture stray dogs and cats and bring them to the shelter, where they are typically held for a mandated period of time that will vary from one community to another, providing an opportunity for owners to reclaim them. In addition, other shelters in a community may also accept strays brought into the shelter by members of the public. Lord *et al*. (2007a, 2007b, 2007c) studied the recovery of lost dogs and cats in one community in Ohio. They generated their survey sample data by contacting people who had called an animal agency searching for a lost pet, or had placed an advertisement in a newspaper regarding their lost pet. Cat owners reported a recovery rate of 53% and dog owners recovered 71% of their lost pets. Just 7% of the cat owners recovered their cat through an animal agency, while 34.8% of dogs were recovered through an animal agency. It is important to note that just 19% of cats and only 48% of dogs had some type of identification when they were lost. It does seem obvious that significant efforts will be needed to encourage owners to provide their pets with identification to help recover lost pets. There is evidence that a concerted effort can provide positive results (Lord *et al*., 2010). A study in four different communities showed that when cat owners were provided with collars and tags, more than 70% of cats were still wearing their collars 6 months later.

Adoption

Adoption programs have seen substantial change in the past two decades. Adoption programs in the mid-twentieth century had few standards, often placing animals for no fee and without an application process. By the early 1970s, greater concern was placed on the quality of an animal placement, and it became more common to require some sort of adoption application and interview. Some of these applications were quite long and complicated, and some generated complaints about the difficulty in adopting an animal. In New York City in 1973, the ASPCA became the first major shelter system to require that adopters agree to have their new pet spayed or neutered (Lane and Zawistowski, 2008). Although now a standard practice in the field, this was such a novel and controversial idea at the time that ASPCA staff and directors were called upon to explain this decision in major media outlets.

In 1999, prompted by two prominent instances of long-time, well-qualified animal welfare professionals being denied adoption by their local shelters, AHA hosted Adoption Forum I, a meeting of a group of shelter directors from around the country to develop recommendations for less rigid but perhaps more valid (or relevant) adoption criteria. As a result, a new concept of "open adoptions" began to emerge whereby the adoption process is conducted less like an interrogation with pass/fail criteria and more like a conversation focused on matchmaking and animal care. Four years later, PetSmart Charities hosted Adoption Forum II, with some of the same and some new directors at the table. Results of this forum, aimed at defining "successful" adoptions, are widely used by shelters wishing to update their adoption policies to be more customer-friendly and relevant to the desired outcome—a lasting animal placement (Moulton, 2003).

As adoption programs expanded to make animals more accessible to the public through evening and weekend hours, adoptions fairs, special promotions and events, revamped and reduced fees, and mobile adoption units, some have questioned whether the "ease" of these adoptions might preclude a significant commitment to the animal by the new guardian. For example, as shelters began to offer adoption access at off-site locations, or as part of large "adoption fairs," the question arose whether these easy-access opportunities encouraged low-quality adoption placements with the pets at risk

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of relinquishment shortly thereafter. Neidhart and Boyd (2002) addressed this question and found that adoption retention was comparable among those who adopted from an off-site adoption location, a large-scale adoption event, or at an animal shelter. Another study addressed the success of fee-waived adoptions for cats (Weiss and Gramann, 2009). Critics have argued that a required adoption fee ensured the adopter was ready and able to make a commitment to the cat's care and placed a value on the animal. Results of the research, however, indicated that when people were later contacted, those who did not pay an adoption fee were as committed and bonded to their new companions as those people who did pay a fee.

Animal Transport

As the number of puppies entering and being euthanized in shelters began to decrease in the 1980s, shelters began to rethink adoption supply and demand in their local communities, and a number of innovative programs began to emerge. Breed rescue was one of the earliest forms of relocation for adoption; organizations that could understand and best find homes for specific dog breeds would remove those animals from shelters and market to adopters, who not only got to "rescue" an at-risk animal, but also acquired a purebred animal for less cost than buying one.

At the same time, North Shore Animal League in New York was finding it harder to supply desirable animals for their high-volume adoption program. They began transporting small dogs, purebreds and puppies from local and then regional animal control facilities to their shelter in Long Island. This trend expanded to organizations across the Northeast and beyond, with many animals journeying thousands of miles from a shelter where they may have been at risk of euthanasia to a new home. And websites like PetFinder made it possible for adopters to look beyond the local shelter to find their desired new pet.

Transport programs vary in their complexity and structure. In some cases volunteers relay pets from one location to another. They will arrange to meet at highway rest stops or parking lots to transfer animals from one vehicle to another and then carry them along the next leg of their journey. A more formal effort is the PetSmart Charities Rescue Waggin' program which facilitates safe and humane transport for 50 dogs at a time, also helping the "source" shelters address overpopulation issues in their community. Dogs are being moved in large numbers by commercial haulers, from region to region by vans and trucks, and across the country by plane.

There are concerns that adoption transport programs may facilitate the spread of infectious diseases (Newbury *et al*., 2010; O'Shea, 2010). The NFHS recommends a best-practice approach that includes a veterinary examination and a valid health certificate for each animal being shipped (National Federation of Humane Societies, 2010). The Association of Shelter Veterinarian's Guidelines for Standards of Care in Animal Shelters devotes a section to animal transport as well (ASV, 2010).

Relocation programs have helped weave a more effective network of shelters within a community and beyond; many shelters are now communicating with their "shelter neighbors," sharing animals for adoption events and transferring dogs and cats as needed to increase adoptions. Shelters with better resources are working with less-well-equipped shelters to help save the lives of at-risk animals by providing them with the care needed to improve their medical and behavioral conditions and render them adoptable. The future will see further improvements in solving the logistics of matching supply with demand for shelter animals, attention to the public and animal health and safety issues, and improving the odds that animals entering shelters find positive outcomes.

TECHNOLOGY

Technology is playing an important role in developing many of the programs described above. This includes animal identification, data management, and other areas of shelter management. An expanding role for social media has provided new platforms for sheltering organizations to communicate with their communities and individual stakeholders and supporters.

Shelter Management Software

There is a wide range of shelter software available,[2] and every animal shelter should have the capability

2. Available shelter software (*not* an exhaustive list . . .)

- ShelterBuddy: http://shelterbuddy.com/
- Chameleon: http://www.chameleonbeach.com/
- PetPoint: http://www.petpoint.com/
- Multiple Options Inc.: http://www.multiop.com/home.htm
- Adopt-A-Friend: http://www.adoptafriend.us/

of finding and utilizing software to manage their day-to-day operations. Software programs can also provide a wealth of data that can assist with guiding strategic and operational plans, as well as providing information that can be shared with a shelter's board of directors and community at large.

Things to consider:

- The size and scope of the shelter operation. Software providers vary in their ability to meet the needs of the wide range of animal welfare organizations. Make sure the company has experience with all aspects of the shelter's operations.
- The quality of customer service. Timely responses to requests for assistance, after-hours availability, and staff who understand the animal welfare field should all be considered before signing on the dotted line. Speak with shelters who are currently using the software programs being considered and be sure to connect with shelters other than the ones the company has provided as references; it is important to know how the software and the customer service work for a variety of agencies, and not just for one or two.
- Related to customer service, what level of training is provided, initially and on an on-going basis? How will training needs be met throughout the course of the shelter's relationship with the software provider? With turnover in shelters being fairly regular, ensuring new staff can be trained is of utmost importance.
- How does the software provider handle upgrades to the system? Are they included in the initial purchase price? Is additional training provided to ensure staff is able to use the improvements correctly? Are shelters involved in decisions affecting improvements and/or changes to the system?
- More and more software applications are web-based, and this is an important consideration for animal welfare organizations. Web-based applications allow for real-time access to the software for staff and volunteers, 24 hours a day, from anywhere as long as they have Internet access and login information. Web-based systems also ensure that a local disaster does not impact the shelter's ability to access their data—a vital factor when managing crises.
- Does the software allow for varying levels of access depending on the user's status? This can be especially helpful when senior staff want to have access to, for example, certain financial reports, but do not want part-time staff and/or volunteers to have that same level of access.
- Determine who "owns" the shelter's data and how to get it back if a decision is made to change providers. Also, how quickly will the data be returned at the end of the relationship, and will there be a cost?
- Ask questions about how the software provider might be using the shelter's data, even in an aggregated form.
- Are there other strings attached? If so, how difficult is it to comply with the additional requirements?

Microchips

The United States does not have a nationally integrated microchip and database registration program for companion animals. There are currently three types of microchips distributed in the United States, based on the frequency at which they function: 125 kHz (encrypted and unencrypted), 134.2 kHz, and 128 kHz. The 134.2 kHz microchip is compliant with the International Standards Organization (ISO) standard used by most countries for companion animal identification, while the 125 kHz microchip has been most commonly used in the United States for the past two decades.

The availability of microchips that operate at different frequencies has been a problem in the past and has resulted in some microchipped animals not being identified. Some shelters resorted to scanning animals multiple times with different scanners able to read the different microchip frequencies. This resulted in the need for the development of "universal" scanners capable of reading microchips of all frequencies. By 2008, universal scanners able to detect and read microchips of all three frequencies were commercially available in the United States. A comparison of these scanners in both in vitro and in vivo applications showed that none of the available scanners was 100% sensitive for all microchips (Lord *et al*., 2008a, 2008b). Sensitivity, in general, was highest for the 134.2 kHz microchips. Sensitivity was increased by following appropriate protocols, including making multiple passes over a pet, in different directions. The in vivo study included microchipping and scanning animals at six different animal shelters. The authors concluded that the odds of missing an implanted microchip increased with an

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animal's weight (Lord *et al*., 2008b) and suggested that extra care be taken when scanning heavier animals. They also found that the metal in collars and tags could interfere with the reading and advised they be removed during scanning. This study also found that in rare cases (<2%) the implantation procedure failed, and a microchip could not be scanned for that pet, nor found via a radiograph. The authors advocate scanning a pet immediately following implantation to ensure that a functioning microchip was properly implanted, and performing multiple scans during the animal's stay and just before leaving the shelter. They also strongly advocate following the manufacturer's protocol for equipment maintenance and usage (e.g., battery changes), scanning, and microchipping in order to achieve the best results.

The value of an effective microchipping identification system is borne out by research showing that RTO rates for strays with microchips was much higher than the overall rate of return (Lord *et al*., 2009). For the shelters in this study, the median RTO for stray dogs was 21.9% (range: 0–97.5%) whereas the median for microchipped pets was 52.2% (range: 0–100%). The improvement for cats was more dramatic, with a median of 1.8% (range: 0.1–86.2%) overall compared to a median RTO for microchipped stray cats of 38.5% (range: 0–100%). A critical variable in finding the owner of a microchipped pet was whether the owner was registered with either a database maintained by the animal shelter or with one of the available national microchip database registries. The authors point out that an effective microchip identification program for the recovery of lost pets relies on three integrated elements. The first two are associated with the technology of the microchips and the scanners. Successful detection and reading of an implanted microchip requires proper scanning procedure with a scanner capable of reading the currently used microchip frequencies. The third element is registration of the microchip in an accessible database, along with current and accurate contact information for the pet's owner. The American Animal Hospital Association (AAHA) offers a free microchip database service that can be accessed at http://www.petmicrochiplookup.org/.

CONCLUSIONS

As the number of surplus animals decline in some communities and regions, shelters are expanding services to meet other pet-related needs such as behavior training, boarding and day care, wellness and veterinary services, and emergency preparedness and response. Increasing pressure for professionalization from within and outside the field coupled with consistently strong rates of companion animal ownership will likely mean that animal shelters will play an increasingly prominent role in the social fabric of communities. Indeed, many organizations already operate state-of-the-art buildings and/or programs that make them destinations and favorite charities for local residents.

REFERENCES

Association of Shelter Veterinarians (ASV) (2010) *Guidelines to Standards of Care in Animal Shelters*, http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 Accessed August 26, 2012.

Crossen, C. (2007) Dogs' role in society evolved: Their catcher never won our hearts. *The Wall Street Journal*, B1.

Duvin, E. (1989) *In the Name of Mercy*, Best Friends, http://www.BestFriends.org/nomorehomelesspets/pdf/mercy.pdf (accessed August 2007).

Favre, D. (2003) *Animals: Welfare, Interests and Rights*, Detroit College of Law, Michigan State University, East Lansing, MI.

Grier, K.C. (2006) *Pets in America: A History*, University of North Carolina Press, Chapel Hill, NC.

Handy, G. (2001) *Animal Control Management: A Guide for Local Governments*, International City/County Management Association, Washington, DC.

Hettinger, J. (2010) Banking on generosity to feed animals. *Animal Sheltering*, March–April, 7–8.

Lane, M.S. and Zawistowski, S. (2008) *Heritage of Care*, Greenwood Publishing Group, Westport, CT.

Lawson, N. (2000) Teaching people and their pets, Part 2. *Animal Sheltering*, March–April, 7–17.

Lord, L.K., Griffin, B., Slater, M.R. *et al*. (2010) Evaluation of collars and microchips for visual and permanent identification of pet cats. *Journal of the American Veterinary Medical Association*, **237**, 387–394.

Lord, L.K., Ingwersen, W., Gray, J.L. *et al*. (2009) Characterization of animals with microchips entering animal shelters. *Journal of the American Veterinary Medical Association*, **235**, 160–167.

Lord, L.K., Pennell, M.L., Ingwersen, W. *et al*. (2008a) In vitro sensitivity of commercial scanners to microchips of various frequencies. *Journal of the American Veterinary Medical Association*, **233**, 1723–1728.

Lord, L.K., Pennell, M., Ingwersen, W. *et al*. (2008b) Sensitivity of commercial scanners to microchips of various frequencies implanted in dogs and cats. *Journal of the American Veterinary Medical Association*, **233**, 1729–1735.

Lord, L.K., Wittum, T.E., Ferketich, A.K. *et al*. (2007a) Search and identification methods that owners use to find a lost dog. *Journal of the American Veterinary Medical Association*, **230**, 211–216.

Lord, L.K., Wittum, T.E., Ferketich, A.K. *et al*. (2007b) Search and identification methods that owners use to find lost cats. *Journal of the American Veterinary Medical Association*, **230**, 217–220.

Lord, L.K., Wittum, T.E., Ferketich, A.K. *et al*. (2007c) Search methods that people use to find owners of lost pets. *Journal of the American Veterinary Medical Association*, **230**, 1835–1840.

Marsh, P. (2010) *Replacing Myth with Math: Using Evidence-Based Programs to Eradicate Shelter Overpopulation*, Town and Country Reprographics, Inc., Concord, NH.

Moulton, C. (2003) *Report on Adoption Forum II*, ASPCAPro, www.aspcapro.org/mydocuments/adoption-forum.pdf (accessed May 23, 2007).

National Federation of Humane Societies. (2010) *Companion Animal Transport Programs – Best Practices*, http://www.humanefederation.org/TransferBestPractice.cfm (accessed December 8, 2010).

Neidhart, L. and Boyd, R. (2002) Companion animal adoption study. *Journal of Applied Animal Welfare Science*, **5**, 175–192.

New, J.C., Kelch, W.J., Hutchinson, J.M. *et al*. (2004) Birth and death rate estimates of cats and dogs in U.S. households and related factors. *Journal of Applied Animal Welfare Science*, **7**, 229–241.

O'Shea, P.L. (2010) *Shelter–Animal Relocation Raises Infectious Disease Concerns*, DVM360, http://veterinarynews.dvm360.com/dvm/ArticleStandard/Article/detail/694080 (accessed May 17, 2011).

Patronek, G.J., Glickman, L.T., Beck, A.M. *et al*. (1996a) Risk factors for relinquishment of cats to an animal shelter. *Journal of the American Veterinary Medical Association*, **209**, 582–588.

Patronek, G.J., Glickman, L.T., Beck, A.M. *et al*. (1996b) Risk factors for relinquishment of dogs to an animal shelter. *Journal of the American Veterinary Medical Association*, **209**, 572–581.

People With Pets. (n.d.) *Pet Friendly Apartments*, www.peoplewithpets.com: http://www.peoplewithpets.com/petfriendlyapartments.asp (accessed May 17, 2011).

Salman, M., New, J.G., Scarlett, J.M. *et al*. (1998) Human and animal factors related to relinquishment of dogs and cats in 12 selected animal shelters in the United States. *Journal of Applied Animal Welfare Science*, **3**, 207–226.

Unti, B. (2004) *Protecting All Animals: A Fifty-Year History of the Humane Society of the United States*, Humane Society Press, Washington, DC.

Weiss, E. (2011) *God Help the Ones that Purr*, ASPCA Professional, http://www.aspcapro.org/blog/2011/02/god-help-the-ones-that-purr/ (accessed December 14, 2011).

Weiss, E. and Gramann, S. (2009) A comparison of attachment levels of adopters of cats: Fee-based adoptions versus free adoptions. *Journal of Applied Animal Welfare Science*, **12**, 360–370.

Zawistowski, S. (2008) *Companion Animals in Society*, Thomson Delmar Learning, Clifton Park, NY.

Zawistowski, S. and Morris, J. (2004) The evolving animal shelter, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski), Blackwell, Ames, Iowa, pp. 3–9.

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2
Population Statistics

Janet Scarlett

INTRODUCTION

Homeless animals in American communities are not confined to dogs and cats alone, but for purposes of this chapter the use of the term "animals" will pertain only to these species. Most animal shelters, with the exception of sanctuaries, are temporary holding facilities for lost or homeless animals until new owners (or current owners) can be identified. Shelters receive animals, hold them, and then employ strategies to move them through and out of the shelter (Figure 2.1). While most of this chapter addresses movement of animals out of shelters into the community, it is important to remember that this movement represents only a small part of animal trafficking in communities as a whole (Patronek and Glickman, 1994).

Efforts to reduce the numbers of animals entering shelters include reducing populations through spay/neuter, reducing owner relinquishments, implementing widespread animal identification, and promoting responsible pet ownership (e.g., use of leashes and confining pets). In recent years, with the recognition that shelters in some areas have shortages of adoptable animals, particularly puppies, and others have a surplus, redistribution programs for homeless pets between different geographic areas or types of shelters have become popular. Thus, some shelters purposefully augment their intake with animals from areas (or shelters) where the number of animals exceeds the adoption demand in those areas (or shelters). A chapter in the previous edition of this book focused on statistics relating to the reasons that animals enter shelters (Scarlett, 2004).

Efforts to move animals out of shelters include transfer relationships with other shelters and rescue groups, state-of-the-art medical programs, effective adoption and transfer programs, and promotion of pet identification that enhances return of lost pets to their owners. This chapter reviews statistics relating to shelter adoptions, return of lost animals to owners, and transfer programs. The management of the flow of animals within shelters also influences the success of adoption and return-to-owner programs by affecting the health of the animals and their time within the shelter. The flow-through of animals within shelters is discussed in the chapter on population management. Studies relating to adoption, returns-to-owner, and transfers are limited, both in quantity and their geographic applicability. Comparisons of results across studies should be made cautiously as the studies differ in methodology (e.g., use nonrandom sampling, small numbers of animals or facilities, and type of shelters), location, and other factors that undoubtedly influence their results. Too often, sweeping generalizations are made on the basis of the results of a small number of studies that may or may not be valid or have wide applicability outside the area studied.

COLLECTION OF SHELTER DATA

Since publication of the last edition of this book, at least two events have encouraged collection of intake

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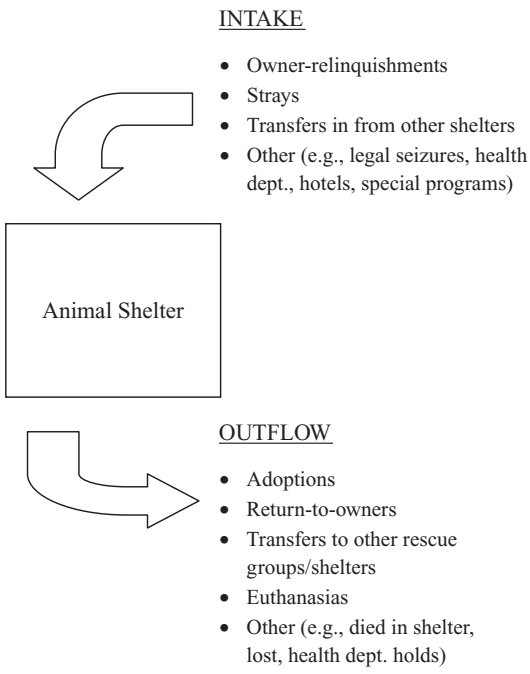


Figure 2.1. Intake and outflow of animals in animal shelters.

and outcome data by animal shelters. In August 2004, representatives from approximately 20 shelters and animal welfare groups met at the Asilomar Conference Center in Pacific Grove, California. The meeting was designed to increase cohesiveness among groups with disparate animal welfare philosophies and facilitate progress toward ending the euthanasia of healthy and treatable dogs and cats in the United States. Members of this group created and encouraged the use of the Asilomar Accords, with the goals of promoting transparency among organizations, adoption of standard definitions and sharing of data relating to categories of shelter intake and outcomes, subdivided by animal health (treatable or not) and adoption (adoptable or not) status. (For more information relating to these categories, see www.asilomaraccords.org.) The Maddie's Fund (a private pet welfare organization that supports shelter medicine programs) has encouraged collection of Asilomar data across the country by providing shelters with grants to do so, and plans to make these data available for searching in the near future.

The widespread distribution of "free" shelter software, PetPoint®, by Pethealth Inc. (in exchange for marketing their pet insurance and microchips) has also facilitated the collection of intake/outcome and other data by shelters and probably increased the numbers of shelters doing so. First introduced in 2005, Pethealth Inc. now acts as the repository for intake, outcome, and other data from over 1600 shelters in the United States and Canada. These events coupled with other changes in the shelter community (such as increased professionalization of staff, demonstrations of the usefulness of data) have all encouraged shelters to collect and utilize data.

LEAVING SHELTERS ALIVE

Shelters seek to increase the numbers and proportion of all animals impounded who leave their facilities alive. Animals leave shelters alive principally through adoptions, transfers to other adoption guarantee groups, or through reunification with their owners. The overall "success" of shelter programs to release animals alive has been measured most frequently using the live release rate (LRR). At least two measures of the LRR have been used. The Asilomar Accords defines the LRR in terms of the proportion of animals leaving the shelter alive in a given period (e.g., month and year) among those that experience an outcome (e.g., transfer, adoption, and euthanasia) during that same period (excluding those that died or were lost in the shelter's care). The LRR has also been defined as the proportion of animals released alive in a given period among those that entered the shelter during that period. Similarly, a metric sometimes called the "save rate" has also been used. It is defined as the proportion of animals released alive among all those available for an outcome (including all those in the shelter's care). Animals who are dead on arrival at the shelter or euthanized at an owner's request are not included in any of these calculations. Each approach has advantages and disadvantages, and which is selected for use depends on the question that is of most interest to the shelter.

All of these metrics are best used for monitoring the progress of an individual shelter. Comparisons across shelters are fraught with difficulties such as the proportion of animals seized or euthanized to protect public safety or shelter capacity. Monitoring the progress of an individual shelter also may not reflect the progress of the community, that is, how the

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community is doing as a whole (all shelters included) in their life-saving efforts.

ADOPTIONS

Shelters seek to increase their adoptions in relation to their intake and in relation to pet acquisitions overall in their communities. That is, they want to successfully place a large proportion of the animals presented to them, and ideally, they strive to capture an increasing proportion of the market share of newly acquired pets in their communities.

Adoption Metrics

Numerous metrics have been used to assess the effectiveness of an individual shelter's adoption program or to make comparisons across shelters. Counting the number of adoptions, calculating the percentage of adoptions among all dispositions or among all impoundments, or evaluating the number of adoptions per human population served by the shelter are the statistics most often reported. Each of these approaches has strengths and weaknesses, and the onus is on the consumer of such information to interpret the data in light of these characteristics.

Counts of the number of adoptions alone are probably the most problematic, especially when making comparisons between shelters or over more than a few years within the same shelter. Differences in intake, human population size, shelter policies, and many other factors confound such comparisons. In an attempt to mitigate the effects of these factors, adoption "rates" are often calculated instead. The number of animals adopted is used in the numerator regardless of the denominator, but when interpreting or comparing these rates, the consumer must carefully consider the denominators used in the rate calculations. For example, assessing the adoption rate (in a particular time frame) as a proportion of all dispositions accounts for the number of animals that received a disposition in the same time frame. What individual shelters put into the disposition denominator varies, however. For example, some shelters exclude animals that were lost or died from the denominator, while others do not. Excluding lost or deceased animals potentially inflates the adoption percentage compared to shelters that include those dispositions.

Similarly, animals remaining in the shelter (who lack a definitive disposition yet) are commonly excluded from the denominator of this statistic. Excluding these animals can mask an increase in the number of resident animals in the shelter as the adoption rate remains the same or even increases. Changes in the frequency of other dispositions (e.g., increases in transfers) can reduce adoption rates using this metric, but the number of lives saved may have increased or remained unchanged. Evaluating adoptions as a function of the total number of impoundments during the same period helps account for the animals still in shelter (except for those in residence at the beginning of the interval), but the definition of impoundments must be explicit. For example, ideally the animals entering as cruelty cases or held for other legal reasons (bite holds, contested ownership, etc.) should be excluded, but only until such time as they might become the property of the shelter. Adoption rates calculated as a function of animal care-days (that include length of stay and the number of animals in the denominator) are true rates in the epidemiologic sense, but are difficult for staff to understand and are most useful in research. They can mask the total number of actual animals adopted or impounded by the shelter if viewed as the only adoption metric.

Choosing to report adoptions in relation to the human population served by the shelter addresses the limitations of several of the metrics mentioned earlier in this section and facilitates comparisons among shelters when the human population served by the shelter can be relatively precisely estimated. Unfortunately, that is often not the case for shelters in areas served by many other shelters or rescue groups, or where the numbers of other groups with adoption programs is changing quickly. Similarly, the adoption capacity of a community can be affected by many community characteristics including the amount of pet-restricted housing, nature of the housing (e.g., apartments and single-family dwellings), degree of industrialization, income level, and many other factors that similarly complicate fair comparisons among shelters.

Trends in Adoption "Rates"

Many shelters have data on their websites relating to their adoptions as a proportion of dispositions as defined in the Asilomar Accords, and some data are published. Bartlett *et al.* (2005) found that among all Michigan shelters reporting statistics for 2003,

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approximately 32% of dogs impounded were adopted and 28% of cats. Earlier among the sample of shelters reporting in the National Council on Pet Population Study and Policy-funded Shelter Statistics Survey between 1994 and 1997, approximately 23–25% of dogs impounded and 22–24% of cats impounded were adopted (Zawistowski *et al*., 1998; National Council of Pet Population Study and Policy, 2000). These estimates were similar to those reported by Wenstrup and Dowidchuk (1999) for 1998 based on a sample of 180 shelters throughout the United States. Lord *et al*. (2006) published data from 165 of 223 animal care and control shelters in Ohio for the years 1996 and 2004 and demonstrated a significant increase (between the two dates spanning 8 years) in the adoption rates calculated both as a percentage of dispositions and of intake during this time frame (Table 2.1).

Recently, data for the period 2000–2007 from 104 animal shelters in Colorado (representing 81% of the state's human urban population and 89% of its human rural population) documented a 14.8% drop in dog adoptions per 1,000 human population (Morris, Wolf, and Gies, 2011). This drop in the adoption rate was offset by a 57.5% increase in dogs transferred out of shelters alive per 1,000 human population. The LRR (calculated as a proportion of dog intake) remained constant, suggesting that despite a decline in the adoption rate, the rate of lives saved overall remained the same (assuming that transfers did not result in euthanasia). The overall picture for cats was more gloomy. Cat intakes per 1,000 people increased 19.9% over the same period, and despite a 140% increase in transfers per 1,000 people, there was still an 11.6% decline in the LRR as a function of total intake. Another interpretation of these data could be that the public now values cats similarly to dogs and is surrendering more cats to shelters rather than releasing or leaving them on the streets. Which interpretation is closer to the truth is unknown.

Table 2.1. Adoption rates of dogs and cats between 1996 and 2004 for 165 animal care and control agencies in Ohio, United States.

	1996	2004
Dogs		
% of dispositions	24.4	37.5
% of intake	24.1	35.7
Cats		
% of dispositions	26.3	29.7
% of intake	25.7	30.9

Source: Data reprinted with permission from the American Veterinary Medical Association.

Marsh (2010) reported that number of adoptions from a California animal control agency from 1970 through 1995 were stable while intake numbers dropped sharply. These data suggest that the proportion of adoptions by intake was rising during this period (depending on transfer and return-to-owner rates). Comparing adoption rates per 1,000 human population from each of five states that have collected complete data regarding shelter intakes for various years (depending on the state from 2003 to 2007), Marsh reported that the estimates were remarkably similar (approximately 9 adoptions per 1,000 population).

In summary, adoption rates vary widely across regions and among shelters. Comparisons among shelters are fraught with questions about the comparability of the data and, therefore, the possibility of drawing inappropriate conclusions is high. Overall, the greatest utility of calculation of these rates is to assist in monitoring the success of individual shelters in meeting their goals to increase their LRRs. Combining data from all shelters in a community would enhance efforts to evaluate progress of an entire community as discussed earlier.

Market Share of Dog and Cat Acquisitions in a Community

Studies using different methodologies have reported information regarding the proportion of pets in communities acquired from shelters over time. Study methodology affects the estimates obtained and should be considered when attempting to make comparisons. If the number of pet-owning households grows in a community, or the average number of pets per household grows, demand for pets will increase. If either of these increases occurs in a community, and the proportion of new pets acquired from shelters (out of all other sources) remains unchanged, the absolute numbers of adoptions from shelters should increase.

So, what is happening to pet ownership within the United States? Using data from the American

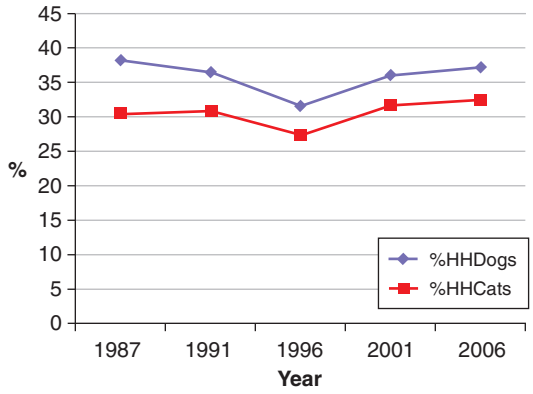


Figure 2.2. Trends in percentage of American households (HH) owning pets 1987–2006.

Veterinary Medical Association's periodic pet ownership surveys, the percentage of American households owning dogs since 1991 has remained relatively stable. The percentage of American households owning cats has increased slightly (~1–2%) over the past 20 years, but not dramatically (Figure 2.2) (AVMA, 1997, 2002, 2007).

Similarly, the average number of these species per household has remained relatively stable since 1987. If the proportion of households with pets or the average number of pets per household remains constant, then another strategy for increasing shelter adoptions is to increase the proportion of newly acquired animals originating from shelters (as opposed to pet stores, breeders, etc.).

The available studies regarding the market share of newly acquired pets coming from shelters are few in number and the estimates are often based on many assumptions. Probably the best, most recent study available was funded by PetSmart Charities (employing a professional survey company) and collected data regarding shelter market share in 2009 (PetSmart Charities, 2009). Approximately 1,000 people who had acquired a dog or cat within the previous 12 months were sampled from a national panel of households that are representative of the US population. Among those responding, 24% had acquired their new dog or cat from an animal shelter. Unfortunately, the percentages were not reported by species. This is probably an increase over previous years. Cross-sectional data from the American Pet Products Association support this increase. These data demonstrated that the percentage of animals acquired from shelters increased from 15% to 22% between 2005 and 2009. After reviewing the studies published from 1976 to 1991, Patronek and Glickman (1994) estimated that an average of 12% (range: 6.3–22%) of owned dogs had been acquired from shelters in this period. In 1994, in a county in Indiana, Patronek, Beck, and Glickman (1997) reported that 8.3% and 8.2% of dogs and cats, respectively, had been acquired from animal shelters. Pet owners from a sample of American households in 1995–1996 reported estimates of approximately 11% of their pets originating in animal shelters (New *et al*., 2000). Data collected cross-sectionally like these represent summary statistics over several years that may mask trends, and they include information only on animals surviving until the time of the study. For these reasons, they are probably not directly comparable to those collected in the PETsMART® Charities study. Given the magnitude of the difference between the estimates in the 1990s and that in 2009, however, it seems likely that shelters' market share of newly acquired pets has increased over time, at least in some parts of the country. An increase would be consistent with changes made over the past 15 years by many shelters to attract more adopters to their facilities. These changes include replacing dark, dingy facilities with modern adopter-friendly buildings, offsite or website adoption options, and improved customer service. It is amazing that with all of this investment, however, more data are not readily available to document the outcome of these efforts.

Factors Influencing Adopters' Choices

Several published studies (Wells and Hepper, 1992; Posage, Bartlett, and Thomas, 1998; Lepper, Kars, and Hart, 2002; Clevenger and Kass, 2003; Diesel, Smith, and Pfeiffer, 2007; Fantuzzi, Miller, and Weiss, 2010; Weiss *et al*., 2012) have identified factors associated with the probability of adoption from shelters. Age, size, temperament, breed, neuter status, appearance (e.g., coat color), and activity level were common factors influencing pet adoption. The preferences, however, for each of these characteristics varied among studies, probably related to the methods of data collection, geographic location, human population characteristics (e.g., income), and other factors. These studies strongly support that

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adoption preferences exist, but that they vary widely. Shelters seeking to understand better what attracts adopters to their shelters are advised to evaluate their own data relating to adoptions. Both the proportion adopted and time-to-adoption of animals (once on the adoption floor) with various characteristics are metrics that shelters with computerized software should examine.

Interventions Influencing Adoption

Several studies evaluated steps that shelters could take to enhance interest on the part of adopters. These included interventions for dogs such as providing social stimulation, toys, placement of beds, temporary placement in prospective homes before adoption, and various types of training (e.g., to wear a head halter, coming to the front of a kennel, and formal obedience training), as well as various alterations to the adoption environment (e.g., colored cage cards vs. white ones and artificial plants above pens) (Wells and Hepper, 2000; Normando *et al*., 2006; Luescher and Medlock, 2009; Perry, Scarlett, and Houpt, 2011).

Strategies potentially enhancing cat adoptions include the provision of toys, displaying cats at eye level, low stress cat handling, and communal housing (Gourkow and Frazer, 2006; Fantuzzi, Miller, and Weiss, 2010). These studies suggest that various interventions can enhance adoptability, but good studies are few in number. Also, the effectiveness of any one strategy in a particular shelter is unknown. Numerous other factors influence adoptions in a shelter such as shelter policies (e.g., acceptable adopter criteria intake and adoption fees), location (e.g., human attitudes toward animals or animal-associated ordinances), characteristics of impounded animals (e.g., age, neuter status, training, and breed) and resources. Comparisons of the "success" of adoption programs are best made within a shelter over time to facilitate monitoring that shelter's progress. Comparisons among shelters and among studies are difficult because shelter policies vary widely, as well as their resources, location, animal and human demographics, as discussed earlier in this section.

RETURNS TO OWNERS

Statistics tracking the proportion of dogs successfully returned to their owners (RTO or redemption rate) by shelters are best calculated by dividing the number of dogs returned to their owners by the number of stray dogs impounded. Since stray puppies and kittens are unlikely to be reclaimed, RTO rates should also be tracked by age.

Bartlett *et al*. (2005) found that dogs younger than 6 months had a rate of return of only about 6%, whereas the RTO for those 6 months and older was approximately four times higher (at 29%).

In the author's experience, RTO rates are most often calculated as a percentage of total impoundments (rather than just among strays), and almost never by age. Not tracking RTO rates as the proportion of strays or by age will usually underestimate the success of a shelter's efforts to reunite lost animals with their owners.

Regardless of the method used to estimate the RTO rates, discouragingly low rates of animals are successfully returned to their owners. This is particularly true for cats, where reported estimates range from under 1% to approximately 12% (Zawistowski *et al*., 1998; National Council of Pet Population Study and Policy, 2000; Bartlett *et al*., 2005; Lord *et al*., 2007; Scarlett, 2010; Morris, Wolf, and Gies, 2011). The success shelters have in reuniting stray dogs with their owners (~15–50%) is considerably better than for cats, but leaves plenty of room for improvement (Patronek and Glickman, 1994; National Council of Pet Population Study and Policy, 2000; Bartlett *et al*., 2005; Scarlett, unpublished data).

Numerous reasons undoubtedly account for these relatively low rates, including lack of pet identification, failure to register placed microchips, failure of owners to know how (when and where) to search for a lost pet, lack of desire to find the pet, lack of mandatory licensure of cats or lack of licensure of pets (even when required by law), and failure of community members to capture lost pets and take them to shelters (Lord *et al*., 2007). In some areas, shelters themselves do not use effective strategies to reunite lost pets with their owners. Enhancing the proportion of strays successfully reunited with their owners is an underused means to decrease the numbers of animals euthanatized in many shelters.

TRANSFERS TO OTHER SHELTERS OR RESCUE GROUPS

With the growing awareness of regional discrepancies in availability of dogs (and less frequently cats), shelters in areas with excess adoptable animals have

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created partnerships with shelters in areas with shortages in order to save lives. Often these partnerships have been between shelters in other parts of the country, but they have also arisen between intrastate shelters. Other local partnerships between nearby shelters or groups (e.g., animal control and private shelters or between shelters and rescue groups) have increased LRRs and adoptions. The number of these partnerships, their growth rate, and the number of animals transferred and saved are not available.

Carefully designed and implemented transfer programs have saved lives and benefitted shelters and animals in many parts of the country. Poorly run programs have put some receiving shelters in untenable positions (e.g., having to euthanize or treat transported animals for illness or inappropriate behaviors), and jeopardized both animal and human health in receiving communities (Armstrong, 2003; Levy *et al*., 2011). Similarly, transfers between shelters can introduce infectious diseases from one shelter to another if stringent protocols are not utilized. In light of the many transport programs in the United States, statistics relating to these programs are needed not only to document their successes but also to evaluate risks associated with moving large numbers of animals from one part of the country to another. The Association of Shelter Veterinarians (ASV) and the National Federation of Humane Societies have published best practices for transport programs (ASV, 2010, National Federation of Humane Societies, 2010).

CONCLUSION

Once animals enter shelters, the goal is to save the lives of as many as possible without inducing unnecessary suffering or jeopardizing human safety. Animals (other than those entering for legal reasons) leave the shelter by three primary means: adoptions, transfers to other shelters or rescue groups, or by being reunited with their owners. While the adoption, transfer and return-to-owner rates are each important, the overall proportion of animals leaving alive is more important for monitoring shelter progress. No one particular shelter statistic (including the LRR) should be viewed in isolation, however. Not all euthanasias that occur in shelters are unacceptable (Kass *et al*., 2001). Animals who pose a risk to human health and safety, those who are suffering and cannot be cared for in the shelter properly (after all alternatives have been explored), or those who are dying with no hope of recovery are examples of reasons for euthanasia that are consistent with the mission of humane organizations. Similarly, statistics relating to length of residence in the shelter, to the development of preventable illness or behavioral deterioration should be monitored to set goals for improvement and monitor progress toward those goals.

Collection, appropriate calculation and interpretation of meaningful statistics, and regular monitoring and discussion of these statistics should be a part of all shelters' operations and reports to their constituents.

REFERENCES

American Veterinary Medical Association (1997, 2002, 2007) *US Pet Ownership and Demographics Sourcebooks*. Center for Information Management, American Veterinary Medical Association, Schaumburg, Illinois.

Armstrong, S. (2003) All over the map: The pros and cons of animal transfer programs. *Animal Sheltering*, **May–June**, 1–22.

ASV 2010, Association of Shelter Veterinarian Guidelines for Standards of Care in Animal Shelters, http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 (accessed August 26, 2012).

Bartlett, P.C., Bartlett, A., Walshaw, S. *et al*. (2005) Rates of euthanasia and adoption for dogs and cats in Michigan animal shelters. *Journal of Applied Animal Welfare Science*, **8**, 97–104.

Clevenger, J. and Kass, P.H. (2003) Determinants of adoption and euthanasia of shelter dogs spayed or neutered in the University of California veterinary student surgery program compared to other shelter dogs. *Journal of Veterinary Medical Education*, **30**, 372–378.

Diesel, G., Smith, H., and Pfeiffer, D.U. (2007) Factors affecting time to adoption of dogs re-homed by a charity in the U.K. *Animal Welfare*, **16**, 353–360.

Fantuzzi, J.M., Miller, K.A., and Weiss, E. (2010) Factors relevant to adoption of cats in an animal shelter. *Journal of Applied Animal Welfare Science*, **13**, 174–179.

Gourkow, N. and Fraser, D. (2006) The effect of housing and handling practices on the welfare, behavior and selection of domestic cats (*Felis sylvestris catus*) by adopters in an animal shelter. *Animal Welfare*, **15**, 371–377.

Kass, P.H., New, J.C., Jr., Scarlett, J.M. *et al*. (2001) Understanding animal companion surplus in the United States: Relinquishment of non-adoptables to animal shelters for euthanasia. *Journal of Applied Animal Welfare Science*, **4**, 237–248.

Lepper, M., Kars, P.H., and Hart, L.A. (2002) Prediction of adoption versus euthanasia among dogs and cats in a California animal shelter. *Journal of Applied Animal Welfare Science*, **5**, 29–42.

Levy, J.K., Lappin, M.R., Glaser, A.L. *et al*. (2011) Prevalence of infectious diseases in cats and dogs rescued following Hurricane Katrina. *Journal of the American Veterinary Medical Association*, **238**, 311–317.

Lord, L.K., Wittum, T.E., Ferketich, A.K. *et al*. (2007) Search and identification methods that owners use to find a lost cat. *Journal of the American Veterinary Medical Association*, **230**, 217–220.

Lord, L.K., Wittum, T.E., Ferketich, A.K. *et al*. (2006) Demographic trends for animal care and control agencies in Ohio from 1996 to 2004. *Journal of the American Veterinary Medical Association*, **229**, 48–54.

Luescher, A.U. and Medlock, R.T. (2009) The effects of training and environmental alterations on adoption success of shelter dogs. *Applied Animal Behaviour Science*, **117**, 63–68.

Marsh, P. (2010) *Replacing Myth with Math: Using Evidence-Based Programs to Eradicate Shelter Overpopulation*, Town and Country Reprographics, Inc., New Hampshire, pp. 7–8.

Morris, K.N., Wolf, J.L., and Gies, D.L. (2011) Trends in intake and outcome data for animal shelters in Colorado, 2000 to 2007. *Journal of the American Veterinary Medical Association* **238**, 329–336.

National Council of Pet Population Study and Policy (2000) *The Shelter Statistics Survey, 1994–1997*, www.petpopulation.org/statsurvey.html (accessed June 21, 2012).

National Federation of Humane Societies (2010) *Companion Animal Transport Programs—Best Practices*. www.humanefederation.org/TransferBestPractice.cfm (accessed May 19, 2011).

New, J.C., Salman, M.D., King, M.D. *et al*. (2000) Characteristics of shelter-relinquished animals and their owners compared with animals and their owners in US pet-owning households. *Journal of Applied Animal Welfare Science*, **3**, 179–201.

Normando, S., Stefanini, C., Meers, L. *et al*. (2006) Some factors influencing adoption of sheltered dogs. *Anthrozoos*, **19,** 211–224.

Patronek, G.J., Beck, A.M., and Glickman, L.T. (1997) Dynamics of dog and cat populations in a community. *Journal of American Veterinary Medical Association*, **210**, 637–642.

Patronek, G.J. and Glickman, L.T. (1994) Development of a model for estimating the size and dynamics of the pet dog population. *Anthrozoos*, **7**, 25–41.

Perry, P., Scarlett, J.M., and Houpt, K.A. (2011) Evaluation of the effectiveness of animal shelter enrichment protocols for dogs. PhD thesis, Cornell University.

PetSmart Charities (2009) *PetSmart Charities A&U Barriers*, www.petsmartcharities.org/resources/resources-documents/PetSmartCharities_Research_AUBarriers.pdf (accessed February 20, 2011).

Posage, J.M., Bartlett, P.C., and Thomas, D.K. (1998) Determining factors for successful adoption of dogs from an animal shelter. *Journal of the American Veterinary Medical Association*, **213**, 478–482.

Scarlett, J.M. (2004) Pet population dynamics and animal shelter issues, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski), Blackwell Publishing Ltd, Ames, Iowa, pp. 11–23.

Scarlett, J.M. (unpublished data). Analysis of admissions data for the SPCA of Tompkins County, NY, 1997–2010.

Weiss, E., Miller, K., Mohan-Gibbons, H. *et al*. (2012) Why Did You Choose This Pet?: Adopters and Pet Selection Preferences in Five Animal Shelters in the United States, Animals 2012, 2(2), 144–159, also accessible online at http://www.aspcapro.org/aspca-research-what-draws-adopters-to-pa.php (accessed August 26, 2012).

Wells, D.L. and Hepper, P.G. (1992) The behaviour of dogs in a rescue shelter. *Animal Welfare*, **1**, 171–186.

Wells, D.L. and Hepper, P.G. (2000) The influence of environmental change on the behavior of sheltered dogs. *Applied Animal Behaviour Science*, **68**, 151–162.

Wenstrup, J. and Dowidchuk, S. (1999) Pet overpopulation: Data and measurement issues in shelters. *Journal of Applied Animal Welfare Science*, **2**, 303–319.

Zawistowski, S., Morris, J., Salman, M.D. *et al*. (1998) Population dynamics, overpopulation, and the welfare of companion animals: New insights on old and new data. *Journal of Applied Animal Welfare Science*, **1**, 193–206.

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3
Shelter Design

Lucinda Schlaffer and Paul Bonacci

INTRODUCTION: OVERVIEW OF CURRENT TRENDS/CHALLENGES

This chapter presents an overview of shelter design with particular attention to the health and welfare of shelter animals and the importance of sustainability in building construction and operation. For animals in the shelter environment, this approach centers on maintaining their health (both mental and physical) throughout the duration of their stay, from intake through disposition. Envision the shelter as a path that animals follow from their admission (whether owner-surrendered, lost, or rescued), through triage and medical treatment (as required), to intake and holding, and leading ultimately to adoption or other form of successful placement outside the facility. Daily operations require successful coordination of many moving parts: the work of veterinarians and technicians, the needs of animals, the efforts of volunteers, and the contributions of administrators and other staff members. The best buildings support the successful function of all these parts at a minimum of effort and cost.

Sustainability has become a guiding principle that permeates the contemporary building design, construction, and operation industry as a whole. Energy costs are rising, natural resources are declining, and building codes are reacting by incorporating sustainable construction practices as required standards.[1]

Whether planning a new shelter or renovating an existing shelter, soon the choice will not be whether sustainability is incorporated, but how.

This chapter addresses a variety of topics in shelter design, dividing them into the following sections:

- Planning and Needs Assessment Strategies
- Retrofitting an Existing Building
- Space Planning and Relationships
- The Shelter Environment:
  Space, Sound, Light, and Air
- Materials in the Shelter
- In Conclusion: The Shelter and the Community

PLANNING AND NEEDS ASSESSMENT STRATEGIES

Building projects should not be undertaken without first completing a planning and needs assessment. The following six steps are recommended before undertaking even a minor renovation project to avoid unnecessary or short-sighted projects that could prove a waste of precious organizational resources.

STEP 1: Develop a *case history* for your shelter. How old is the building? What do you like and dislike about it? Document current conditions with photos and any existing plans (e.g., floor, architectural, engineering).

STEP 2: Develop a *mission statement* as to changes or improvements that are needed. Make an outline of the challenges, such as inadequate space for animals or an outdated, inefficient building. Enumerate goals, such as increasing adoption

1. CALGreen—2009 California Building Code, ASHRAE Standard 189.1.

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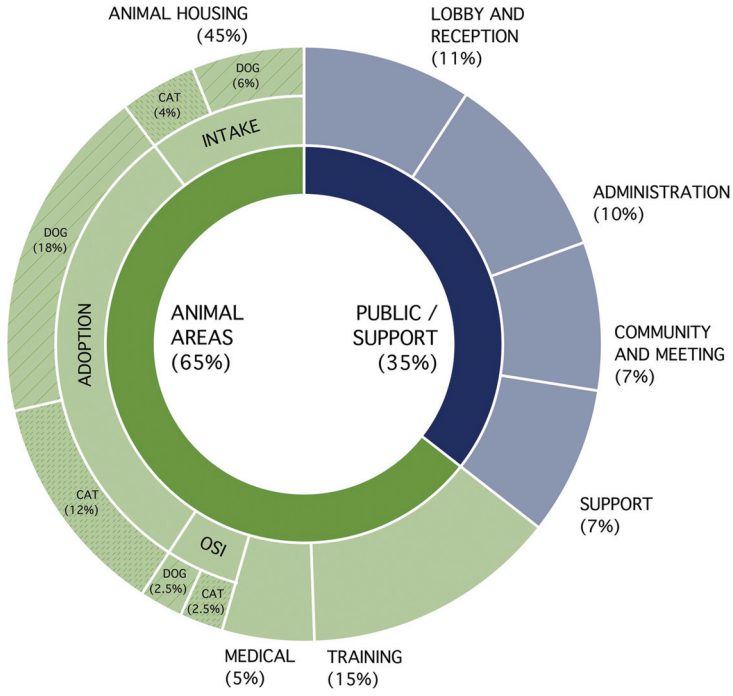


Figure 3.1. Shelter space usage diagram.

numbers or adding services such as spay/neuter or training.

STEP 3: Develop the *animal intake profile* of the shelter. Designate intake by mode of entry (owner surrender, animal control, rescue transfer) and by animal type on a monthly basis for a minimum of 2 years. Define the community being served by population and geographic area. What is the shelter's live release rate? Could it be improved?[2] Animal capacity drives shelter size. Scrutinize your numbers to avoid either overcrowding or overbuilding.

STEP 4: Document the *size of the facility*. Determine the gross building square footage, including all outside walls. Break this number down by use area, including at a minimum the following:

- adoption (cat/dog)
- intake/hold (cat/dog)
- medical hold/quarantine/isolation (for infectious disease) (cat/dog)
- administration (lobby, reception, offices)
- medical (exam/triage, surgical, including storage, preparation, and recovery areas, treatment)
- behavior (evaluation/training)
- service (cleaning, storage, mechanical)
- other (special uses, such as education/community room/get-acquainted, "real life room")

Add up the total areas and review the percentage of space each use occupies. See Figure 3.1 for comparison to an optimum space-use distribution.

STEP 5: Develop a *people profile*. How many full-time and part-time employees are there currently? How many volunteers are in the building on a typical day? What other people needs do you currently have (e.g., meeting rooms, education programs)? Are you missing any people or staffing components of a modern shelter, such as behavior assessment, separate cat and dog areas, a welcoming adoption area, or spay/neuter medical suite?

STEP 6: *Create a plan* to address your needs. In the plan, consider your optimum shelter capacity, operational costs, and mission. Try to design the

2. Asilomar Accord statistics. www.asilomaraccords.org

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shelter to meet median high capacity rather than for the absolute peak population, and implement strategies to meet peak numbers such as flex space and foster programs. In order to size your shelter, take the data collected on intake and your list of auxiliary spaces (medical, training, people, and community education areas) and put them on a chart. Assuming the shelter is efficient and follows modern disease management, quality of life, and cleaning protocols, the authors suggest 4–6 square feet (sq ft) per animal without in-house medical or training space to 6–9 sq ft per animal with medical, training, and community education components.

Plans should include consideration for the future and for your particular community. Is your community growing or shrinking? If the human population in your community is rapidly growing, then your animal population will likely also rise. In the author's experience, the number of intake animals per one thousand human population ranges between 5–20 (urban) and 20–40 (rural). Consider your neighbors: are there other organizations with whom you can partner? Remember that other groups operating in your geographic area will absorb some of the animal population, so adjust capacity estimates accordingly. While national trends show that dog populations are reaching a steady state, cat overpopulation remains a national issue. Consider that while dog numbers may decline, cat numbers will probably remain steady. Essential support spaces should be sized to meet the projected animal numbers. Consider other spaces (like meeting or education rooms) as "nice to have," but unless they can be converted to animal space, they are not essential to your core mission and perhaps should be eliminated if you are on a very tight budget.

What does it cost to operate the building in maintenance costs and utilities? Collect and chart electrical, fuel (gas/oil), water, and sewer charges for the past 2 years. Sustainably designed shelters should achieve 35–40% savings in water use and utilities. What are the cleaning and medical expenses? Good design equates to saved operational expense: less space and fewer drugs needed for housing and treatment of sick animals, less time required for cleaning, etc. Subsequent sections in this chapter deal with interior building environments, operations, and materials critical to successful, healthy shelter design.

Working with professionals knowledgeable in animal care will save money in the long run. You may have offers for in-kind design or construction services. Some may be reasonable, but there are no quick fixes. It is best to develop a master plan with professional help, and then tackle projects one at a time. Once a plan is in place, there can be a hierarchy for work tasks, with some projects suited for good will or in-kind donations and others that must be completed by skilled design and construction professionals. If the work cannot be done well, it should be delayed until sufficient funds can be raised to do it properly; otherwise you will be throwing good money after bad on short-term "solutions."

RETROFITTING AN EXISTING BUILDING

Although many shelters do not have the capital to undertake a major renovation or new construction project, thoughtful retrofit decisions can go a long way to improving an existing facility. This section consists of a list of "Dos" and "Don'ts" for retrofitting on a budget.

Dos

Do things that will create a welcoming appearance, make the facility easier to clean, highlight adoptions, increase volunteerism, increase efficiency, increase animal enrichment opportunities, and improve staff morale. To begin, here are five low-cost retrofit ideas:

1. *Hold a clean-up day*. Dispose of clutter. Clutter makes it difficult to clean and makes the shelter operation look inefficient. Remove awkward add-ons such as file cabinets or storage lockers from aisles and hallways. Rent an outdoor storage unit for bulk items that can be kept in a space that is not air-conditioned. Keep only current files on the premises; store other legal papers offsite. Hang nicely framed adoption photos on the walls, and confine other notices to areas where they belong: cleaning instructions in cleaning areas, employee notices in staff areas, etc. Store dog and cat toys in a bin or cubby near each room. Add quick connects on your hose connections, and store long hoses on wheeled carts.
2. *Make hallways more durable and presentable*. Consider adding a four-foot wainscot over

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dilapidated walls using large (2′ × 2′) porcelain tiles. A special event at a local pottery studio could provide children with an opportunity to custom paint ceramic tiles with their favorite pet and then sponsor a professional to install the tiles on a feature wall in the lobby or adoption corridor. Tiles can be placed over gypsum wallboard with tile-backer board and a top bumper rail, or installed over concrete block with proper surface preparation. Repaint walls above the wainscot with a water-based, washable, low volatile organic compounds (VOC)[3] latex paint. Consider replacing existing drop-in ceiling tiles with a moisture-resistant product.

3. *Make the operation leaner and cleaner.* Replace incandescent lamps with fluorescent lamps. Consider wireless photosensors to control lights within 15 ft of windows when there is enough sunlight. Add occupancy sensors in infrequently used rooms. Replace heating, ventilation, and air conditioning (HVAC) unit filters regularly; a pleated filter of MERV 6 or 8 is sufficient. Replace old carpet with removable carpet tiles. (Carpet should not be used in animal areas and if already in place should be removed because it is virtually impossible to effectively disinfect.) Contact commercial carpet tile manufacturers about discount "remainders" programs. Install tiles with adhesive strips rather than floor adhesive.
4. *Make a better first impression*. Replace the front door with energy-efficient, double-pane glazing styled to complement the building. Repair or replace poorly functioning door hardware. Add an entry vestibule if none exists, or add a new canopy or overhang to make the entry more welcoming. Install professionally maintained walk-off mats or entry grates to keep tracked-in dirt to a minimum. Create a new or refurbish an existing plant bed using native, animal-friendly plants. Recruit your local garden club for help and nurseries for donations of time and materials. Replace worn or outdated lobby seating with new washable chairs or benches. Replace a decrepit reception desk counter top. Keep retail areas orderly and focus on displaying a few items well. If you cannot see any adoptable animals from the lobby area, install a window into a room with a few cats, or a single dog; reserve this space for animals who are difficult to adopt.
5. *Invite a friend to visit*. Invite someone who is not an animal lover or frequent visitor to the shelter, and have them walk through and say what they think looks the worst to them. What jumps out? Rust at the bottom of doors, a bad odor, fur balls, dirty ceiling tiles? A neutral observer can spot things that the shelter staff overlooks. By addressing the worst offenders, the shelter will show significant improvement.

Don'ts

- Do not try to put inappropriate material finishes on a heavy-duty surface (animal areas).
- Do not buy any equipment that is not energy star or better.
- Do not accept donated equipment that has worse energy performance than what you already have.
- Do not start a project without some idea of a master plan.

SPACE PLANNING AND RELATIONSHIPS

In addition to completing a planning and needs assessment, shelters should evaluate their current daily operations prior to starting to build. Successful building projects should support the basic functions of the shelter and ease the flow and movements of people and animals through the facility. The goal of space planning is right-sizing and planning for the future. Be "lean and mean" but do not skimp on the animal areas. Prioritize as follows:

1. Ensure adequate (but not overbuilt) animal housing space.
2. Optimize efficient cleaning and feeding protocols.
3. Provide enough medical space to care for shelter animals.
4. Provide training and exercise space for animals,
5. Minimize dedicated "people only" spaces.

3. SCAQMD—South Coast Air Quality Management District http://www.aqmd.gov/prdas/coatings/VOCs/vocsMainPage.htm

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Space planning also deals with the major work/movement patterns (flows) in the shelter. This section describes six of these in detail.

1. *Animal flow*. The movement of animals through the shelter begins with intake and continues through adoption. Whether animals arrive at the shelter healthy, sick, or injured, they may regress further physically and mentally due to several factors, including shelter design issues. The area for cats should be separate from that for dogs. Provide convenient cleaning stations and food preparation kitchens near each group served. Subdividing animal spaces into smaller units or "pods" will provide the greater flexibility that is needed to manage disease outbreaks. If animal intake declines, it will allow the conversion of excess housing in the future to meet other needs such as training or community programs. The authors recommend four to six individual dog rooms per "pod," organized around one shared hallway or play space. A dog room (aka primary enclosure) typically is for one dog. A pod is a grouping of dog rooms that has a public side and a back side. Traditional shelter design would label these areas "kennels" and "wards." However, a primary enclosure with room-like proportions and good acoustics is better labeled a room. Consider installing a back door from dog rooms that leads to a dog-walking path. Provide easy organization for storing dog leashes and toys adjacent to each group of dog rooms.
2. *Visitor flow.* The visitor's walking pattern begins at the front entrance and progresses through the lobby to the adoption rooms. Primary movement from the lobby should proceed in one direction for adoptable cats and in another direction for adoptable dogs. Within cat adoption areas, provide some sitting space, a porch, or vestibules that allow for getting acquainted but that will not permit animals to escape. Within dog adoptions, provide some larger play spaces that can double as get-acquainted areas and one-on-one dog training spaces adjacent to the dog rooms. Review the owner surrender process and stray-animal viewing path. It may be a good idea to provide a separate entrance for owner surrender or to have a private counseling room adjacent to the main entrance lobby for adoptions. If space and staff for adoptions and owner surrender operations must be shared, consider limiting intake times to non-adoption hours.
3. *Staff cleaning and service flow.* The cleaning sequence should begin in the areas housing the healthiest animals and proceed to the least healthy; i.e., from adoption areas first to isolation areas housing diseased animals last. Provide larger central storage areas for animal food, bulk items, laundry, grooming, and cleaning supplies. Stock smaller, conveniently located cleaning stations weekly from the central storage. There should be separate, dedicated janitor closets for restroom/general use and for animal use. An enclosed service yard near the intake area can offer a place for hosing down cages, storing trash enclosures and refrigerated storage, and vehicle parking. Provide a sally port (secure entry way) and small office for animal control drop-off and record keeping, if applicable. Temporary holding space, separated by species, should be available for nighttime officers to place animals.
4. *Medical and evaluation flow*. Entry evaluation and examination functions can occur in one room in small shelter operations or in separate dog and cat examination rooms in larger facilities. Locating a behavior evaluation space near intake is desirable but not always feasible. A medical area (suite), including treatment, surgery, laboratory support, digital imaging, medical holding, and isolation rooms, can be located remotely from the entry evaluation area. Surgery and recovery areas should be located at a distance away from isolation areas that house sick and injured animals. Minimally, provide a cat medical isolation room for two to four cats and a separate medical isolation dog area with two individual dog enclosures. Although this number may seem low, in the authors' experience, the biggest breakthrough in sustainable design for shelters is the ability to virtually eliminate upper respiratory infections through proper shelter design and air systems coupled with appropriate management policies. It is also helpful to evaluate 1–2 years of shelter records to determine the specific treatment needs a shelter will require for each species and plan accordingly with either appropriate dedicated

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isolation space, or flexible areas that can be converted to isolate animals as needed.

Each enclosure for dogs should be a distinct room, located off a vestibule. A larger shelter should ideally include three separate cat isolation/quarantine rooms for dermatology, respiratory, and gastro/intestinal cases. Three dog areas, one for each illness category above, should be provided as well. Depending on the number of animals of other species in the shelter, provide one additional flexible isolation room for use as needed.

The medical suite should include its own food kitchen and cleaning area to serve this population of sick or diseased animals. If the medical clinic also serves the public, consider providing a separate entrance with a small reception/waiting room. A training space, if one is included, or the treatment room can also be converted to accommodate infrequent medical procedures for the public as needed. For an in-house spay/neuter clinic, consider its proximity to animal housing to minimize patient movement from housing to the clinic. A spay/neuter suite should have an animal preparation area that is separate from the surgery and an animal recovery area located where animals can be readily observed by staff until they are fully awake.

5. *Administrative flow*. Plan to include one office near the reception area to manage adoption activities. It is also a good idea to include a small counseling office close to the entrance. Other office needs can be grouped together away from the main activity of the lobby. Provide at least one meeting area (large enough to accommodate six to eight people) for in-house use and a separate staff lunch/kitchen/locker area. A separate staff bathroom with shower is also ideal. In a larger shelter, provide a medium-size meeting room (large enough for 15–20 people). Consider which tasks require privacy and which do not. Use open work areas, where feasible, to promote discussion, interaction, and sharing. Good volunteers provide a valuable resource for shelters; include an area for them for secure lockers, volunteer meetings, and work space.
6. *Dog training flow.* If the facility includes a dog training area for privately owned animals, a separate entrance for the public is ideal. When no scheduled training is taking place, staff can use the space for dog evaluations, one-on-one training, or small playgroups. Placing a behavior office adjacent to the training room and providing a one-way mirror helps with behavior evaluations.

THE SHELTER ENVIRONMENT

The quality of the interior environment is another critical element in the success of a shelter building. The design of the shelter building directly affects the physical and psychological health of animal occupants. The size and shape of housing, access to fresh air, daylight, and interaction (both human and animal), comfort in eating, sleeping, and eliminating, and exposure to stressors all impact animal well-being. This section discusses four major factors in building design that impact animal health (space, sound, light, and air) and describes different design strategies for addressing each of these issues.

Space

Think quality, not quantity. The size and shape of spaces impact animal well-being. Most premanufactured housing systems offer inappropriately shaped units for sale. The Guidelines for Standards of Care in Animal Shelters, developed by The Association of Shelter Veterinarians (ASV, 2010), recommend that primary enclosures provide sufficient space for animals to "make normal postural adjustments, e.g., to turn freely and to easily stand, sit, stretch, move their head without touching the top of the enclosure, lie in a comfortable position with limbs extended, move about and assume a comfortable posture for feeding, drinking, urinating and defecating." These guidelines are purposely written in a general manner to allow shelters to meet the needs of varying sized animals. Where possible, moving away from the traditional "kennels" and "cages" in animal housing will enable shelters to meet the needs of animals as described in these guidelines.

Cats

Manufactured cat housing comes in stacked banks of small cages made from fiberboard, fiberglass, or stainless steel. Some models offer "condo style"

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living, with vertical climbing options, connecting portals, and separate areas for litter boxes. Others have simplified ventilation systems. Few are ideal for cat housing. (See the chapter on feline care for additional cat housing considerations and recommendations.) Cats need more space than most systems allow: 8–11 sq ft for an individual unit (roughly a minimum of $2.5' \times 2.5' \times 2.5'$ volume per cat) stacked no more than two high, and 16–18 sq ft per cat for group rooms (a minimum $4' \times 4'$ area per cat). In the author's experience, it is best to have six to eight cats maximum per group room (see Figure 3.2).

In individual units, cats should have space to stretch out without stepping in a litter box or food tray. Having a perch is desirable within the unit as well as a hiding spot (a high-sided cozy or shelf with a partial screen).

Staff should move cats as infrequently as possible to reduce stress and minimize fomite transfer of disease. If cats are taken out of the unit when it is cleaned and disinfected, they should be placed in a dedicated carrier and then put back in the same unit, particularly cats in the holding/intake areas. Double units that allow animals to freely move or be moved side-to-side can eliminate the need to physically remove cats for cleaning. This approach may make sense in the intake/holding area, but once cats are in the adoption area a bigger, single unit is preferable. Individual units within adoption areas are especially appropriate for shy or older cats. Portals between adoption units can offer staff options in working with asocial cats to try to improve their chances of adoption. In a healthy shelter environment when disease transmission is of minimal concern, cats can be let out of individual housing into a vestibule to stretch, explore, and move about. However, simply allowing cats to roam while cleaning is not a substitute for planned exercise.

Group housing is attractive and shows the cats in a pleasant home-like setting interacting with other cats. Since most cats cannot be walked like dogs, a shared room gives them an opportunity to jump, climb, and run. Volunteers love to socialize and play with cats in group rooms. Provide several feeding bowls and litter boxes in a group room; one recommendation is for one food and water bowl and one litter box per two to three cats (see the chapter on feline care in the shelter). If a room is open to a window with a view and sunlight, you have created cat heaven (see Figure 3.3).

It may be tempting to try to justify decreasing the amount of square footage for cats, but cuts should be made elsewhere. Providing the appropriate space necessary for care, housing, enrichment, and stress



Figure 3.2. Cat housing, ASPCA NYC. *Source:* Dennis Connors Photography © 2008.



Figure 3.3. Cat room with a view. *Source:* ARQ Architects © 2009.

reduction to support feline physical and behavioral health represents one of the greatest challenges for modern shelter design.

Dogs

The authors recommend providing between 35 and 64 sq ft of space per dog. Most pre-fabricated kennel systems for dogs still utilize runs with long, thin proportions and open tops and sides that stimulate barking, jumping, and other stress behaviors. If your shelter has this type of unit, try to get the dogs out to play and walk as often as possible. When purchasing units, try to find ones wider than 4 ft to minimize a dog's nose and tail simultaneously hitting the side walls when turning, as this has been shown to be stressful to some dogs. Traditional runs in shelters are often 4 ft wide by 16 ft long for a total of 64 sq ft per animal. An 8 ft wide by 8 ft long room also provides 64 sq ft but is much better proportioned to meet a dog's needs. Boxier shaped rooms are easier to build, clean, and slope to drain. The shape is also conducive to get acquainted and work with dogs one on one.

Narrow indoor/outdoor or double-sided runs remain popular because they allow staff to shift a dog from one side to the other for cleaning and disinfecting. Before turning to double-sided, indoor/outdoor dog runs in new buildings, determine if any other cleaning protocols are feasible. For example, timing dog walking to occur simultaneously with cleaning allows sufficient time to clean the dog room, while providing true exercise, positive stimulation, and reinforcing outdoor elimination during walks. Dog walking should be made as easy as possible for walkers by providing convenient leash cubbies and "back door" access to outdoor areas. If dog walking is not a viable solution, single-room cleaning is possible. Provide a dog tie-out in the hall adjacent to each dog room to allow dogs to be safely leashed to the tie-out one at a time. If one tie-out is available for each dog, dogs do not share the same space in the hall, limiting spread of contagions from wall or floor surfaces. Use of alternate cleaning protocols also allows rooms to back up to a shared play space (see Figure 3.4).

In adoption areas, two or three healthy, friendly dogs could stay in the play space for supervised playtime when weather may discourage outdoor activities. During a peak intake emergency, the play spaces can serve as temporary overflow housing areas.

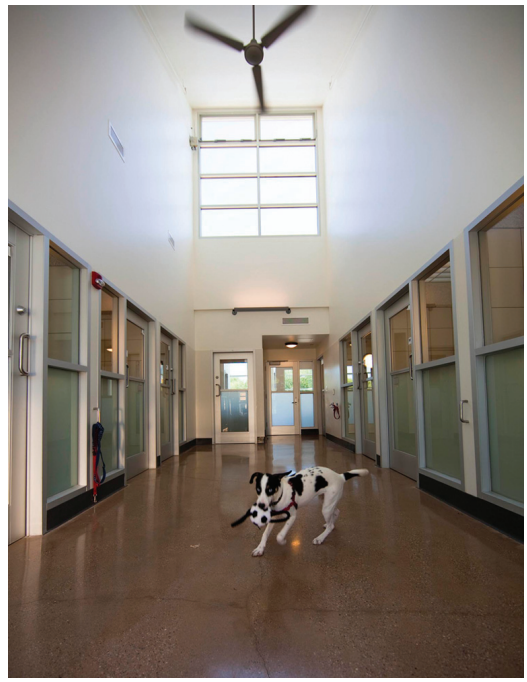


Figure 3.4. Dog play space.
Source: Sean Hennessy Productions © 2009.

House dogs individually in intake areas and throughout mandatory hold periods. Walls separating rooms from rooms and rooms from halls should not have any gaps or openings. Isolating the dog rooms individually in this way accomplishes many things at once. With 100% outside air and separate supply and exhaust (see the section on air for more information), each room becomes a virtual isolation chamber. Staff and public passing to and from the dog rooms must observe certain protocols so that human feet do not track pathogens from one dog to the next. To enhance cleaning efforts, individual drains in dog rooms are recommended. There should be no gaps between dog units that can inadvertently facilitate the spread of pathogens from one room to the next. If drains are placed off center, there is always a dry space for a dog to rest while waiting for cleaning to be completed. (Remember, cages should never be hosed down while animals are in

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them.) Combining cleaning and disinfecting with a good dog-walking program encourages efficient, thorough cleaning.

Some group units are desirable in adoption areas so dogs who enter the shelter together can stay together, and for cohousing healthy dogs who are behaviorally compatible. Vary the sizes of the rooms to provide efficient housing to handle large and small dogs. Dogs who show aggression should be housed in double units with guillotine doors to maximize efficient safe cleaning and handler safety.

Indoor/outdoor units are very costly to build and, in the author's opinion, although they are useful for staff, they are not the ideal solution for dogs. They waste energy, and in very cold climates, the guillotine doors often get locked or frozen shut; in very hot humid areas, the constant introduction of humidity can slow down how quickly rooms dry after cleaning and create condensation on walls, or worse, mold within walls. In general, if installing indoor/outdoor runs, use guillotine-type panels or dog doors to separate the indoor and outdoor zones. Insulated and gasketed doors and panels minimize heat loss.

Small Animals

For small animals, provide a room that has its own separate temperature control, as some animals may need added warmth. A flexible shelving system is a good idea to accommodate a range of housing enclosure types. Provide some protected outlets mid-way up the wall to plug in warming lights or other aids for small animals.

Sound

Think prevention rather than cure. Although mitigating noise is important, it is better to try to prevent it in the first place. The primary source of shelter noise is dog barking. Dogs bark for a variety of reasons, including when over-stimulated, frustrated, or irritated. Dog barking in turn stresses cats, other small animals, and some dogs. Dog barking can exceed levels known to cause hearing loss over time (Achutan, 2007). Several dog housing design and management strategies can reduce the stress and over-stimulation that result in barking.

Rooms should be proportioned so that a dog can turn around without touching his or her nose and tail simultaneously. Encourage frequent dog walking. Once a dog is walked and enjoys an outdoor playtime, the dog should be tired, happy, and quieter. Minimize noise transmission with completely enclosed individual rooms with walls that are continuous to the ceiling and doors with laminated glass panels. Minimize face-to-face orientation of dog rooms to reduce barking. Since some face-to-face rooms may be desirable for dog socialization, using individual, enclosed rooms will limit the spread of noise. Installing a "sniff hole" in the window or door of a dog room allows a dog to familiarize him or herself with visitors before the room door is opened. Combined with well-proportioned, comfortable rooms, "sniff holes" can further discourage jumping. A calmer dog is less likely to jump and bark (see Figure 3.5).



Figure 3.5. Dog room.
Source: Sean Hennessy Productions © 2009.

Light

Think sunlight, not light bulbs. Maximize the use of natural light, and minimize the use of artificial

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light. As in humans, exposure to unvarying artificial light only induces stress in animals, interferes with circadian rhythms, and compromises health. Attempt to provide access or exposure to daylight to all animals. Even in more budget-constrained retrofits, consider adding windows or skylights rather than additional light fixtures. If a building is oriented and proportioned to take advantage of sunlight, daylighting can be a highly successful lighting strategy. Windows and skylights offer visual stimulus along with daylight. Using light sensors to dim or turn off artificial lighting when daylight is sufficient saves energy without loss of function. Sensors can be added as retrofit for many shelters.

During low-light or nighttime hours as well as for visually demanding activities, like cleaning and veterinary procedures, artificial lighting is necessary. Fluorescent lamps with electronic ballasts are now widely available and cost-efficient, offering between 10,000 and 30,000 hours of lamp life. Light-emitting diodes (LED) fixtures are cost-effective for exit lighting and parking areas. Consider providing compact fluorescent task lights for anyone sitting at a desk, and turning off overhead ambient lighting. Aim to limit lighting loads to less than 1 watt per square foot. Occupancy switches can reduce energy consumption in rooms that are used intermittently, such as restrooms, copy rooms, storage, kitchens, and laundry areas, but are not feasible in animal spaces.

Air (Ventilation)

Think natural ventilation for people, and mechanical for animals. Although an oversimplification, this statement highlights the fact that animal and human needs are different. Animals require higher air-change levels (10–14 air changes per hour) with 100% outdoor air (no recirculation) for good disease and odor control. Humans do not have such stringent air-change requirements but value comfort and prefer fresh, outdoor air. Since air-change rates and temperature control drive equipment and operational costs up, it is important to tailor building systems to meet different occupant needs as efficiently as possible.

Animal spaces consume as much as one-half to two-thirds of the total area of the shelter. Constantly supplying large quantities of fresh, conditioned air to that much space can be costly. It is vital not to compromise on air quality; look instead for ways to minimize the quantity of air supplied. In general, the building should be divided into independently managed zones as much as is reasonably possible. Use solar orientation to determine exterior area zones, and these should be independent of interior space zones. In addition, animal areas can be broken up into separate zones so that unoccupied zones can be taken "offline," allowing greater temperature control and reducing air exchange rates when not in use. If individual animal rooms are fully enclosed, then only the air in the actual room needs to be introduced at a high air-change rate. It is acceptable to have lower air-change rates in halls, play spaces, and service areas. Locate exhaust vents low and near drains in dog rooms to remove lingering odors. Locate exhaust vents at the rear of individual cat units to help prevent cross-contamination of air between animals.

The use of radiant heating has become increasingly popular in shelters, especially for dogs since they are often on or close to the floor. However, high air-change levels can render radiant systems redundant in animal rooms. Nonetheless, solar thermal systems can bring hot water to a radiant floor system, and with adequate economic supports in rebates or incentives, may be a good solution for added comfort for dogs. When using radiant heating, vary the density of the tubing to create warm and cool areas, so each dog can find their perfect spot.

Employing energy recovery units is a great conservation strategy that can reclaim up to 90% of heating/cooling energy that otherwise would be lost in the exhaust air stream. Often this type of equipment qualifies for state or federal cash rebates.[4] To maintain system performance, replace any filters in the system regularly. In new systems, employ a minimum of MERV 8 level filtration. The higher MERV number reflects a finer level of particulate filtration. HEPA filters provide a very high level of filtration and can be used in a shelter surgery room but not elsewhere because they are very expensive to buy and maintain, reduce air flow requiring higher-volume

4. DSIRE—Database of State Incentives for Renewable Energy.

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fans to operate, and become clogged in animal areas. Exhaust ductwork from animal rooms can incorporate filters to stop fur, dander, and dust from clogging the ductwork.

If areas primarily occupied by humans (offices, lobby, meeting rooms, and related spaces) are designed to take advantage of natural ventilation, mechanical costs can also be reduced. New trends to reduce HVAC energy costs involve separating heating and cooling from ventilation. A central fan unit can supply and exhaust fresh air with a radiant system for space heating and cooling, reducing the size and complexity of ductwork. This simple arrangement can be inexpensive in new projects but is probably not feasible in retrofits. In milder climates and in fair weather, use insect screens and open windows and doors in public spaces. Using a central exhaust fan to pull outdoor air through the building can be a cost-efficient way to remove odors and provide fresh air.

Humidity, another important factor in mechanical system design, varies significantly by region. In dry areas, air-handling units can cool buildings with water-chilled air, eliminating the need for refrigerant-based condensers. Night ventilation can be used in hot climates when temperatures drop, pre-cooling the space for daytime occupancy. In other climates, humidity may be the main factor that makes spaces feel uncomfortable. Separate central humidity control may make it possible to cool less and still maintain comfort levels.

Appropriate system controls are critical to comfort and energy efficiency. Establish temperature setpoints that are reasonable. Is it acceptable that indoor temperature may exceed 85° Fahrenheit (F) 2 days out of the year? Is it acceptable that indoor temperatures may drop below 65°F 2 days out of the year? The animals can accept these rare events. It is mostly human perception that drives the design criteria that engineers use. Permitting a few days outside the design limit can result in significant savings in equipment and energy costs. Proceed with caution, however, on the control side of the system. Shelters often do not have facilities staff or expertise in system management. Keep the controls simple, understandable, and if possible, exclusively under the shelter manager's control. Lock thermostats to prevent tampering.

Since the demands placed on mechanical systems vary by climate, one size does not fit all. Building technologies are complex. Equipment costs money to buy, run, and maintain. Spend money wisely: More efficient equipment often comes with rebate programs to mitigate initial costs. Do not make any changes to your ventilation system without consulting a well-qualified mechanical engineer trained in energy conservation. Odor, humidity, temperature, and fresh air control are all very important to have a successful, healthy shelter.

MATERIALS IN THE SHELTER

Appropriate material finishes in shelters are critical to maintaining animal and staff health. All materials used in the shelter should be heavy duty, easy to clean, zero or low VOC emitting, and attractive. Surfaces, especially in animal and medical rooms, must be able to withstand continual applications of heated water, disinfectants, degreasers, and detergents. The goal is to provide a smooth, seamless (or at least to minimize joints), durable, and scratch-resistant surface. Material recommendations in this section are arranged by surface (floors, walls, ceilings) and listed in order of preference (best, better, good, acceptable, and unacceptable).

Floors: The Most Difficult Surface to Conquer

Best: concrete, terrazzo, welded rubber flooring
Better: recycled rubber, linoleum, cork/rubber, coatings
Good: porcelain tiles
Acceptable: carpet tiles
Unacceptable: paint, epoxy paint, wood, vinyl

Concrete (Suitable Locations: Throughout Shelter)

Concrete is relatively inexpensive, durable, and easy to clean when finished properly. Add fiberglass fibers to the concrete mix and provide control joints (located under walls or thresholds, where possible) during installation to minimize cracking. Antimicrobial additives are also available for concrete. Concrete stains and integral pigments add color to the concrete. Concrete should be sloped to drains and

troweled smooth. If building a new facility, request a sample dog room floor be poured and finished to establish the quality of workmanship throughout the building.

Improvements in finishing equipment allow concrete to be densified (hardened/less porosity) and polished to resemble stone, yet remain slip-resistant when wet. Ideally, concrete polishing occurs before any interior walls or finishes are installed to allow the heavy grinding equipment to reach the entire surface of the floor. Sealers that have no VOCs are then applied and reapplied annually for upkeep. The polisher can be brought back to buff up every couple of years. A professional concrete finisher must complete the initial work, but the sealer can subsequently be reapplied by staff or maintenance people without special training.

Polished, densified concrete is a possibility for retrofit applications, too. However, the staging can be involved, so it is necessary to complete large areas all at one time. When there is an existing coating, such as paint, epoxy paint, epoxy resin or urethane, it must be blasted or ground off prior to application.

Terrazzo (Suitable Locations: Throughout Shelter)

Terrazzo has been used in high-traffic governmental buildings and transportation centers for decades. Once completed it can be re-polished and is very hard and attractive. It is expensive, and it can be difficult to find an applicator in smaller cities.

Welded Rubber Flooring (Suitable Locations: Throughout Shelter Except Dog Housing)

Rubber flooring is a renewable nontoxic system requiring very minimal maintenance. If installed with integral coves and welded seams, it can withstand hosing. Some products have cushioning for areas where staff members are on their feet for long periods, such as spay/neuter clinics, medical suites, or kitchens or laundry rooms. Rubber is very durable and attractive, and can be installed in retrofit applications. The use of rubber in dog housing in shelters should be avoided due to dog damage to the seams. However, some boarding kennels have successfully used rubber, and there are some newer products emerging that make the floor seams tight enough to withstand a dog digging.

Recycled Rubber, Rubber/Cork, and Linoleum Flooring (Suitable Locations: Training and Meeting Rooms, Offices)

There are many options available for use of these materials that come in varying thicknesses and densities. Some can be installed in outdoor areas. Floors and seams need to be sealed or welded for cleaning. They are suited for animal housing areas. Some products may be too porous and therefore harder to disinfect and clean thoroughly. These flooring materials are relatively inexpensive, are comfortable underfoot, and can be installed in retrofit applications.

Coatings (Fluid or Trowel-Applied) (Suitable Locations: Throughout Shelter)

Coatings, such as resin-based epoxies or urethane mixes, are suitable for shelter installation, even in dog rooms. However, they must be applied and maintained by trained installers. Some are malodorous during installation, but the odor dissipates after curing is complete. They have a uniform appearance, are seamless, and come with different finish options (including quartz aggregates) to aid in slip resistance. However, the coatings are only as good as the underlying substrate. If the substrate is mortar-based, then a dog can break through and make a hole. Once through the top layer, a dog can ruin the surface quickly, requiring repair work.

Porcelain Tile (Suitable Locations: Throughout Shelter)

Larger porcelain tiles are a suitable flooring material; they are relatively inexpensive, and come in many colors. Some have recycled content. Porcelain tiles are virtually impermeable. Most are slip-resistant and easily cleaned. The grout joint is the weak link in the installation, but using larger tiles minimizes the number of joints. Pitching to drains in small rooms requires a good installer but is similar to a shower installation. Many tiles have coved base options, so tiles can be run up the walls in an integral installation.

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Carpet Tiles (Suitable Locations: Only Offices with Limited Animal Exposure)

Carpet tiles are an option for office areas with little or no animal exposure. Carpet tiles are available in antimicrobial, solution-dyed fibers strong enough to be cleaned with bleach solutions. Carpet tiles backed with rubber can add comfort to the office environment as well as acoustic control.

Paint, epoxy paint, wood, vinyl, or any permeable materials are NOT ACCEPTABLE for floors in shelters.

Walls: The Second Most Challenging Surface

Best: solid surface, glass, hard-troweled cement plaster
Better: wall coating systems
Good: concrete block with polished face, porcelain tiles
Acceptable: fiberglass-reinforced panels (FRP)
Unacceptable: wood, painted wallboard, vinyl wall coverings, standard concrete block

Solid Surface (Suitable Locations: Throughout Shelter)

Thin solid surface sheets can be applied to walls to create a seamless, durable, and attractive finish. Panels can be used in dog rooms above the coved base. Solid surface materials are very expensive but very long-lasting.

Glass (Suitable Locations: Throughout Shelter)

Laminated glass is very strong, and the inner lamination can be translucent, tinted, patterned, or clear. Glass shows dirt and grime more quickly than other materials, but a smooth surface with no joints makes cleaning easy.

Hard-Troweled Cement Plaster (Suitable Location: Throughout Shelter Except Dog Rooms)

Plaster walls are very hard and durable. Using integral color (color pigment that is mixed into the plaster) expands the range of decorative options. Plaster can be effectively sealed with clear, water-based sealers that can be reapplied without any special training. Veneer plaster applications can be relatively inexpensive depending on availability of skilled plasterers. Look for dense applications that are not porous or textured.

Wall Coating Systems (Suitable Locations: Throughout Shelter, Though Less Effective in Dog Rooms)

Epoxy-coated fiberglass-reinforced surfaces applied over tile-backer board are very durable. Color availability is limited, however, and the coating is not dog-proof to a frustrated dog. The finish must be maintained by a trained applicator.

Concrete Block with Polished Face (Suitable Locations: Throughout Shelter)

The blocks themselves are durable, but the mortar joints are a challenge. Fill mortar joints with an epoxy grout coat, then inspect the joints regularly and repair any signs of damage.

Porcelain Wall Tiles (Large as Possible) (Suitable Locations: Throughout Shelter)

See Floors, above, for more information.

Fiberglass-Reinforced Panels (Suitable Locations: Throughout Shelter Except Animal Rooms)

FRP are inexpensive but not as recommended as other materials for shelters. Their weakness is in the seams and corners. If moisture penetrates the joints, the panels may buckle or pop off. These panels can be used in some areas of the shelter, such as kitchens or treatment rooms, but not inside the animal rooms.

Painted Gypsum Wallboard, Wood, Vinyl Wall Coverings, Standard Concrete Block

With the exception of rooms with little animal traffic and low-maintenance or cleaning requirements (e.g., painted wallboard or sealed wood can be used in offices and meeting or conference rooms), these materials and any other porous or rough, textured surfaces should be avoided.

Ceilings: Last but not Least

Best: sprayed cementitious acoustical plaster, plaster (cats), wood slats
Better: painted gypsum wallboard, acoustical tile (cats)
Acceptable: acoustical tile (dogs)

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Sprayed Cementitious Acoustical Plaster (Suitable Locations: Throughout Shelter but Most Desirable in Dog Housing and Play Areas)

There are few products that have good acoustical properties and can withstand hosing. Certain varieties of sprayed acoustical plaster can withstand use in the tough dog areas while reducing noise levels. The authors highly recommended using this product in dog rooms. It can also be applied as a retrofit installation. Trained installers are required.

Aluminum, Plastic Grid, Ceiling Drop-in Tiles or Clouds (Suitable Locations: Acceptable for Dog Rooms, Better for Cat Rooms)

Many products are now available for use in a drop-in ceiling system that are antimicrobial, washable, scrubbable, and control odor. However, none are designed for a direct hose spray. Although moisture-resistant, ceiling tiles cannot sustain high humidity for long periods. In general, they are less expensive than sprayed acoustical plaster. Some manufacturers have similar tiles in a "cloud" configuration that can be installed between structural members in prefab buildings or with exposed ceiling structures. This approach improves the acoustical performance of a space, but dirt, dust, and fur can accumulate above the suspended systems. Hanging baffles are another option for noise control, but they are not as effective.

Cement Plaster (Suitable Locations: Best for Cats and Suitable Other Spaces Except for Dogs)

See Wall section for more information on cement plaster.

Wood Slats (Suitable Locations: Spaces Other Than Animal Housing, Especially Larger Rooms Such as Training/Behavior and Meeting)

Wood slats can be an attractive, low-maintenance finish with good acoustical performance when installed with gaps between boards and sound-absorbing mineral wool batts behind.

Painted Gypsum Wallboard (Suitable Locations: Spaces Other Than Animal Housing)

Use a moisture-resistant product, where needed, with low VOC, and washable paint.

CONCLUSION: THE SHELTER AND THE COMMUNITY

Shelters are one of the most difficult types of facilities to build well. The shelter needs to function like a hospital with strict disease-control measures. The shelter needs to be as durable as a prison, and resistant to water, disinfectants, and detergents. The shelter needs to be welcoming and aesthetically pleasing like a fine hotel. Incorporating sustainable building technologies enhances shelter design. Energy from the sun does not entail a monthly bill, thus saving money. Sunlight is welcoming and helps reduce disease. Smart air systems contribute to animal health and keep the shelter attractive to the community. Prioritizing space for animals allows all other work to be done in a healthy and efficient way.

Even the best-designed shelter cannot succeed in fulfilling the mission alone. A strong relationship between a responsive shelter and supportive community is necessary to ensure success. Proper shelter design can enhance this relationship, however, by tapping into the resources available in the community, helping with strengthening ties, and offering something back. The contemporary shelter reaches out to the community in many ways: by being accessible (longer hours, better locations); offering programs for teens, seniors, volunteers and other groups; encouraging animal-related events; and being a good neighbor to local business and people. This philosophy of reciprocity between the community and shelter is the cornerstone of a successful building campaign of any scale. Shelters must know the communities they serve, because, in the end, it is only

the community that can offer the one thing shelter animals need most: a permanent home.

REFERENCES

Achutan, C. (2007) *Noise Exposures and Hearing Loss Assessments among Animal Shelter Workers*, Department of Health and Human Services, Centers for Disease Control and Prevention, http://www.cdc.gov/niosh/hhe/reports/pdfs/2007-0068-3042.pdf (accessed November 22, 2011).

ASV (Association of Shelter Veterinarians) (2010) *Guidelines for Standards of Care in Animal Shelters*, http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 (accessed August 28, 2012).

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4
Sanitation

Kay Steneroden

INTRODUCTION

Sanitation is the process of cleaning and disinfecting and is a critical job in animal shelters. Animal shelters house animals with unknown medical and behavioral backgrounds together in close proximity in often overcrowded, always stressful living conditions. There are often limited resources to diagnose and treat animals with infectious disease. Maintaining a clean environment helps to prevent disease spread both to other animals as well as to humans (zoonotic disease) and creates an environment that is comfortable and healthy for animals and people.

Planning, practice, and training are required for animal shelters to implement effective sanitation protocols. A number of excellent articles, book chapters, manuals, and websites have been written and maintained on shelter sanitation in recent years (Griffith *et al*., 2000; Miller and Zawistowski, 2004; Petersen, Dvorak and Spickler, 2008; www.sheltermedicine.com; Miller and Hurley, 2009). The goal of this chapter is to highlight essential concepts and best practices in order to help those working in animal shelters develop and enhance their own shelter sanitation plan. (See Table 4.1 for some common definitions related to shelter sanitation.)

SANITATION PROCESS

Cleaning and disinfecting should always be thought of as a three-step process:

1. Mechanical removal of visible organic matter: This is the first and most important step in the sanitation process. Most detergents and disinfectants are either completely or to some degree inactivated by the presence of organic material such as food, feces, urine, or soil, so removal of visible contamination before cleaning with soap or detergent is essential (Russell and Hugo, 1987).
2. Cleaning with soap or detergent and warm-to-hot water: Removal of visible waste in step 1, along with thorough cleaning with soap or detergent and hot water in step 2 will remove 90% of environmental pathogens (Morgan-Jones, 1987) and are the most important factors in determining the outcome of disinfection activities (Kahrs, 1995). All surfaces should be rinsed thoroughly after cleaning with soap or detergent.
3. Disinfecting: As noted above, disinfectants must be applied to clean surfaces as many of them are inactivated by the presence of organic matter (food, urine, feces, blood, saliva, etc.). Disinfectants can also be inactivated by the presence of detergent or soap left on a surface through inadequate rinsing during step 2. Disinfectants must be used in the appropriate concentrations and left on a surface for a specified length of time. Disinfectants are labeled for use against particular pathogens based on the concentration and contact time. Mistakes in appropriately diluting disinfectants or minimizing contact time are common downfalls of shelter sanitation programs.

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Table 4.1. Sanitation terms.[a]

Sanitation term	Definition
Detergent	A cleansing agent; any of the numerous synthetic water-soluble or liquid organic preparations that are chemically different from soaps but are able to emulsify oils, hold dirt in suspension, and act as wetting agents
Degreaser	Powerful soap/detergent specially formulated to penetrate layers of dried-on body oils and other greasy debris
Disinfectant	An agent that frees from infection; especially a chemical that destroys vegetative forms of harmful microorganisms (as bacteria and fungi) especially on inanimate objects
Fomite	Any object or substance that is able to carry infectious organisms (bacteria, virus, fungi, parasites) and transfer them from one individual to another
Pathogen	A specific causative agent (as a bacterium, virus, fungus, parasite) of disease
Sanitation	The promotion of hygiene and prevention of disease by maintenance of sanitary conditions
Sterilization	To free from living microorganisms (as by the use of physical or chemical agents)
Soap	A cleansing and emulsifying agent made usually by action of alkali on fat or fatty acids and consisting essentially of sodium or potassium salts of such acids

[a]Defined by Medline Plus.

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These three steps should be considered separately; each is imperative for shelter sanitation to be successful. The three steps are not performed simultaneously and should be followed even when using the same product to clean and disinfect.

The disinfectant label and manufacturer's instructions should be consulted carefully for information regarding preparation, shelf life after preparation, storage, application, safety and post-application rinsing instructions. Some disinfectants can cause harm to animals if left in the environment where they may contact an animal's skin or mucous membranes; some disinfectants can be toxic when licked off an animal's coat or feet (Kore and Kiesche-Nesselrodt, 1990).

SANITATION PLAN

Effective sanitation requires knowledge, a plan of action, and evaluation (Grow, 1995; Kahrs, 1995). Having a written protocol for cleaning and disinfection is a great tool for learning and training new employees and volunteers, and provides a reference for evaluation of the effectiveness of the plan. A clearly written and well-understood sanitation plan is the cornerstone of a shelter's infection-control plan. The following are important considerations when developing any shelter sanitation plan.

Avoiding Disease Spread

Cleaning is one of the busiest times of the day in most shelters. The goal of cleaning and disinfection activities is to improve the cleanliness of the environment and thereby lessen infectious disease spread. However, without proper safeguards, the potential exists for the spread of disease by those performing sanitation activities through use of contaminated equipment or contaminated clothing or hands. Separate supplies should be provided for each section of the shelter so that disease is not spread between areas on cleaning equipment such as mops, rags, and buckets. Spreading or aerosolizing disease particles during cleaning should be avoided by using damp mops, electrostatic mops, or dust mops rather than vigorous cleaning with brooms and high-pressure hoses where animals are present. Staff should change outer clothing and gloves and wash hands before going to different areas and after cleaning. Wearing designated clothing for cleaning that can be changed before handling animals will help to reduce the possibility of disease spread.

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Order of Cleaning

In order to further decrease the risk of spreading disease while cleaning, staff should be instructed to proceed from areas housing animals who are vulnerable to infection but least likely to be infectious, to those housing animals who are most likely to be shedding infectious disease. It is important to avoid revisiting areas with healthy animals after cleaning an area with unhealthy ones. Cleaning should be performed first in areas with young animals, then healthy adoptable animals, healthy stray animals and animals in quarantine, and sick animals in isolation last. It is also important to evaluate the health of animals in a particular room or area prior to cleaning. If any animals housed in the same area with healthy animals have clinical signs of infectious disease, they should be moved to isolation or handled after the healthy animals. When cleaning a particular area or room, start with the highest point and work downward to avoid dripping dirty water onto a just-cleaned surface (Kahrs, 1995).

Minimizing Animal Stress

The cleaning process can be very disruptive and stressful to shelter animals; efforts to minimize noise, animal handling, and animal movement can help reduce that stress. Animals should be confined while cage cleaning is occurring and not allowed to run loose, which may agitate other caged animals as well as spread disease. Performing sanitation chores at the same time of day with the same staff can also help reduce stress.

Cages should be sanitized in the least stressful, yet most efficient way possible. This may mean minimizing handling, or leaving the animal in the cage while cleaning is taking place. A method such as spot cleaning (where a cage is spot cleaned on a daily basis but disinfected less often) is useful in cat areas. A guillotine door system is ideal for cleaning dog kennels; dogs can move freely to the adjacent clean cage while their cage is being cleaned. Cages should never be hosed with animals still in them and care should be taken to dry kennels prior to returning the animals. It is also important to maintain good ventilation while cleaning to decrease the possibility of irritating the mucous membranes of humans and animals.

WHAT, WHEN, AND HOW TO SANITIZE

A written shelter sanitation plan should list the item or area to be cleaned and disinfected, the frequency of sanitation, and the staff member who will be responsible for completion of the tasks. Products and supplies used for sanitizing a particular area or item should be listed along with application instructions. Some areas and items, such as kennels and visitation rooms, will require daily or twice daily cleaning with occasional deep cleaning. Other areas, including offices, especially those that do not see animals on a regular basis (if they exist), may require less frequent cleaning such as every other day or weekly. A step-by-step guide to carrying out the cleaning and disinfection procedures should walk the employee or volunteer through the expected process, and they should be made aware of potential hazards to themselves, the animals and the environment with regard to the use of specific chemicals and products (Grow, 1995). It is also important to include information on the use of personal protection equipment for those who are involved in cleaning and disinfection, i.e., the appropriate use of gloves, masks, or goggles when mixing and using chemicals (Grow, 1995; Kahrs, 1995).

Items and areas a sanitation plan should address include kennels, cages, dog runs, aisles and hallways, animal carriers, food and water dishes, litter pans, toys, bedding, offices including door knobs, computers and computer keyboards, telephones and office equipment, other indoor animal areas such as grooming rooms, treatment rooms, intake, visiting rooms, exercise yards, animal transport vehicles, work clothing (uniforms, boots), tools such as mops, squeegees and pooper scoopers, ventilation and heating ducts, and storage areas.

Cage or Kennel Sanitation

How animal cages or kennels are cleaned and disinfected will depend on the type of housing that exists in a particular shelter. Two-sided or guillotine caging is the best option for both cats and dogs in terms of optimizing the capability to be cleaned and disinfected. Two-sided cages allow animals to move from one side to the other during cleaning and disinfecting with minimal handling, thus decreasing the potential for disease spread as well as lessening animal stress.

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One of the least desirable methods of cage cleaning results from having only single cages available and using one holding run, holding cage, or tie-out for animals while their cage is being cleaned, then returning them to the just-cleaned cage. Unless the holding cage/area can be thoroughly cleaned and disinfected between each animal's use, every animal is potentially exposed to all the animals who previously occupied that space. The following sanitation methods are adapted from the UC Davis Shelter Medicine website. See the website for more detailed explanations (UC Davis Koret Shelter Medicine Program, 2011).

Double-Sided or Guillotine Cages

Sample protocol for double-sided cat cages:

- Don clean smock or scrub top and gloves.
- Assess the health of animals in the room or kennel and begin with healthy animals. (Move or make plans to move diseased animals to isolation as soon as possible.)
- Open doors between cages and allow animals to move to the cage that is clean. Bedding and toys that are not soiled can also be moved. Rinse and replace water dishes or provide clean water to each cat.
- Remove all visible signs of debris. Remove and discard all soiled paper, litter pans and used food dishes and sweep debris out of any heavily soiled cages using paper towels or hand broom and dust pan.
- Clean/scrub cage with soap or detergent and water to remove any remaining dirt or organic debris.
- Rinse soap/detergent from cage surfaces.
- Apply disinfectant to all surfaces and doors and leave on for appropriate contact time, usually 10 minutes.
- Rinse if needed.
- Dry cages and kennels.
- Sweep and disinfect the floor.
- Spray any surfaces that have been touched during cleaning, including door knobs, with disinfectant. Allow to remain for an appropriate contact time and wipe with a paper towel.
- Change smock or scrub top and gloves before moving on to another room.

Two-Cage Cleaning

With this protocol, two adjacent cages are assigned to each animal for the duration of their stay. The procedure for cleaning is the same as for the double-sided cage cleaning method, only the animal is physically moved from one cage to the other rather than moving on his or her own.

One Empty Cage per Bank, Ward, or Kennel

This method can be used if double cages are not available or there is not enough cage space to devote two cages per animal per stay. This method involves having at least one clean unoccupied cage in a cage bank or kennel. An animal is moved into the clean unoccupied cage, his or her cage is cleaned and disinfected and the next animal in line is moved into the just-cleaned cage and the process continues one cage at a time. It is critical when this method is used that the appropriate contact time is maintained for disinfection (usually 10 minutes).

A Carrier for Every Cat

If two cages are not available for every cat, a transport carrier can be assigned to each cat for the duration of their stay to be used to house them during cage cleaning. Cardboard carriers can be assigned on arrival and sent home with cats when they are adopted. Carriers should be identified with the cat's name and identification number. Metal or plastic carriers may also be used but must be cleaned and disinfected thoroughly after use by each cat. Metal or plastic carriers are best disinfected by removing any visible debris and then dunking them in a large barrel of disinfectant (10 minutes of soaking is optimal), rinsing if appropriate, and allowing them to dry thoroughly. An alternate cleaning method uses a high-pressure wash system that is dedicated to disinfecting equipment.

Spot Cleaning for Cats

Spot cleaning refers to a method where cages are gently cleaned during a cat's stay and deep-cleaned and disinfected between occupants or when a cage is heavily soiled. The cat remains in his or her cage while it is being cleaned, reducing handling and stress, and leaving the cat's familiar scents intact. Performed correctly, "spot cleaning" also saves time, reduces chemical use, and reduces the potential for fomite disease transmission. Spot cleaning is most

appropriate for healthy cats and cats with noninfectious disease.

Sample Spot-Cleaning Protocol

1. Have a carrier or hiding box in the cage for the cat to use during the spot cleaning.
2. Clean gently around the cat, wiping soiled or dirty areas and walls with a mild disinfectant or detergent on a rag or towel and brushing out spilled litter. Avoid spraying chemical cleaning solution around the cat.
3. Clean the litter box. Scoop feces and urine-soaked, clumped litter out; if soiled, replace with a clean box.
4. Examine food and water bowls; replace with clean bowls if soiled.
5. Leave in bedding unless soiled.
6. Carriers should be available for temporary holding of any cats who have to be removed from heavily soiled cages that require thorough sanitizing or for litters of kittens.
7. A detailed guide to spot cleaning cages is available on the website of *Animal Sheltering* magazine (Lawson and Pullen, 2005).

Group-Housed Animal Cleaning

When two to three animals are housed together, cleaning and disinfecting may be performed through the usual shelter cleaning protocols. If the group gets larger it will make more sense to perform spot cleaning with periodic deep cleaning. This will depend on the characteristics of the group-housed population—its size, ages and types of animals, vaccination status, quarantine and length of stay. It is generally recommended that community rooms be kept relatively stable with all animals being adopted out before new animals come in. Spot cleaning is appropriate for this type of group housing, with deep cleaning and disinfection occurring when the room is vacated and before the next group comes in. In the event of disease outbreaks or excessive hair, dirt, or smell, the animals should be removed and a thorough cleaning and disinfection performed.

Other Species

Many shelters care for species other than cats and dogs including small mammals, reptiles, avian species, amphibians, livestock, horses, and wildlife. Each of these species will have their own unique housing and sanitation requirements as well as specialized husbandry needs and concerns. Shelters accepting and keeping these species must become familiar with their unique requirements. Shelters should consider sending these species to specialized shelters or rescue organizations where their requirements may be better met and their likelihood of adoption increased through species-specific networking. Special attention should be paid to housing, cleaning, handling, and public access to reptile species as they can often be infected with and shed salmonella (Chiodini and Sundberg, 1981). See the individual chapters in this textbook on small mammals, wildlife, and avian, reptile, and equine species for more information on appropriate sanitation for these animals.

Cleaning Dishes, Toys, and Litter Boxes

A commercial dishwasher is the most effective method of sanitizing food and water dishes. If this is not an option and dishes, toys, and litter boxes must be washed by hand, the "three-step rule" still applies: (1) remove visible debris, (2) clean with hot water and soap or detergent, and (3) disinfect. In order to be effective, disinfectants must be allowed adequate surface contact time. Litter boxes should be sanitized in a separate location from food and water bowls, or after food and water dishes have been cleaned to limit fecal-oral disease spread. Stainless steel dishes are most easily cleaned and disinfected. Use of disposable litter pans will greatly decrease cleaning efforts and reduce potential for disease spread via fomites.

Laundry

Large food particles, feces, heavy hair contamination, and other organic debris should be removed from laundry (uniforms, blankets, towels, bedding, etc.) before placing it in the washing machine. A cycle of hot water, soap, and bleach at one-half to one cup per standard washer is recommended. For best sanitation, avoid overloading washers and dryers. Laundry should be allowed to cycle dry completely. Alternatively, wet laundry can be hung out in direct sunlight to dry completely. Laundry that is contaminated with canine and feline parvovirus, and ringworm should be discarded. A clear separation

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between clean and dirty laundry will help avoid cross-contamination (Griffith *et al*., 2000).

DISINFECTANT PRODUCTS

Sanitation can be achieved by chemical means (soaps, detergents, or disinfectants) or physical means (heat including steam, ultraviolet (UV) light, radiation, desiccation). In shelters, for the most part, chemicals are relied upon to clean and disinfect. In some circumstances, UV light and desiccation may be utilized as an aid to sanitation (e.g., in dry, sunny parts of the country laundry may be hung outside or cages cleaned and put in the sun to dry). This section will provide more information on proper selection of products for sanitation.

The choice of products to use for cleaning and disinfection will depend on the particular shelter and the infectious diseases of concern, but will include soap or detergent for cleaning, disinfectant to kill hazardous microorganisms, and a degreaser to use periodically to penetrate layers of dried-on greasy debris.

Cleaning and disinfection products must always be used at their proper concentrations. If the same product is being used to both clean and disinfect, it is important to follow the manufacturer's directions for product preparation for each function. A disinfectant's efficacy claim against a particular pathogen is determined by testing it under specific concentrations and contact times. If these concentrations and contact times are not followed in practice, product efficacy is unknown. Accurate measurement with measuring devices is necessary to ensure proper concentrations are obtained. Measuring cups and other devices should be available and charts with products and their proper dilutions posted where products are prepared and stored (see Table 4.2). Some products are labeled for use at different concentrations, but in general a stronger concentration will not necessarily kill more organisms and may actually harm animals and the humans performing the cleaning (Coppock, Mostrom and Lillie, 1988; Bello *et al*., 2009).

Products should never be mixed together unless specifically approved by the manufacturer. For instance, quaternary ammonium compounds are inactivated by soaps and detergents (Jeffrey, 1995), and mixing bleach with ammonia can result in toxic vapors. Cleaning products should be stored away from food and under appropriate heat and light conditions in order to remain effective. Training on the safe use of cleaning products must be an integral part of shelter staff and volunteer training.

Table 4.2. Approximate equivalent measurements.

1 ml (milliliter) = 1 cc (cubic centimeter)
1 teaspoon = 5 ml
1 tablespoon = 3 teaspoons
1 US gallon = 3.785 liters
1 fl oz = 2 tablespoons
1 gram = 15 grains
1 grain = 65 mg (milligrams)
1 fl oz = 28 ml (milliliters)
1 pint = 2 cups = 480 ml = 16 fl oz
1 cup = 240 ml = 8 fl oz
$^1/_2$ cup = 120 ml = 4 fl oz
1 liter = 1.06 qt = 33.82 fl oz
1 kg (kilogram) = 2.2 pounds
1 mcg (microgram) = 0.001 mg
1 mg = 1000 mcg
1 pound = 454 grams
1% means 1 gram in 100 ml

Certain cleaning products should be used with caution or not at all in animal shelters. Phenolic compounds such as Lysol® and Pine-Sol® should be avoided in shelters that house cats as cats are highly sensitive to these products (Petersen, Dvorak and Spickler, 2008). Aldehydes can be carcinogenic to humans and should be avoided. Biguanides such as chlorhexidine, nolvasan and virosan are toxic to fish and should be avoided due to environmental concerns.

Quaternary Ammonium Compounds ("Qacs" or "Quats")

Quaternary ammonium compounds are commonly used in shelters because they are very effective at disinfecting against a wide variety of disease pathogens. They are usually non-irritating to the skin when properly diluted and rinsed. Quats, however, are not effective against some of the most serious shelter pathogens including canine and feline parvovirus, calicivirus (Kennedy *et al*., 1995), and ringworm. Quats are also inactivated by the presence of soaps and detergents (Jeffrey, 1995) so surfaces must be

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rinsed thoroughly to eliminate all traces of detergents before Quats are applied.

Quaternary ammonium compound products have detergent as well as disinfectant properties and may on occasion be used for cleaning as well as disinfecting. Under these circumstances, sanitation should still be considered a three-step process where the quaternary ammonium compound is used for steps 2 and 3. Quats also may be used for step 2, followed by bleach for step 3, especially when dangerous pathogens are present.

Sodium Hypochlorite (Bleach)

Bleach is a very effective and inexpensive disinfectant to use in animal shelters. When mixed and applied correctly, bleach completely inactivates pathogens of particular concern to shelters including canine and feline parvovirus, calicivirus, and ringworm. Bleach also retains its effectiveness in hard water. On the negative side, bleach is significantly inactivated by the presence of organic matter and has no effect as a detergent. In order to be effective, surfaces must be clean of organic debris before bleach is applied. Bleach also loses its effectiveness when exposed to light or when left out for extended periods of time; fresh solutions must be prepared daily or whenever organic matter contaminates a solution. Bleach fumes can be irritating to animals and human mucous membranes and tissues, and bleach is corrosive to metal and creates a toxic gas when combined with ammonia or acids (Jeffrey, 1995). Typically, a 1:32 dilution of bleach to water is used for disinfecting to inactivate common shelter pathogens. At this dilution, fumes should not be noticeable or are minimal, and corrosion of metal and irritation to mucus membranes are minimized. When ringworm is a concern, a 1:10 dilution must be used. At this dilution, animals must be removed from the area during cleaning and disinfection and returned only when the area has been well ventilated and is free of fumes. There are many concentrations and formulations of bleach available in the market, and attention must be paid to the particular product chosen for use to be sure appropriate dilutions are calculated for shelter use.

Potassium Peroxymonosulfate

Oxidizing agents such as Virkon® or Trifectant® have a broad spectrum of action against a wide variety of pathogens. They are effective against pathogens of particular concern to shelters including canine and feline parvovirus, and calicivirus, but not ringworm. They have some detergent activity and relatively good activity on organic matter. They have low tissue toxicity and are less corrosive to metal than bleach but are more expensive.

Calcium Hypochlorite

Calcium hypochlorite disinfectants, such as Wysiwash®, are effective against canine and feline parvovirus, and calicivirus when used correctly. Like bleach, they have no detergent activity and are inactivated by organic matter, but they are less corrosive to metal than bleach. Calcium hypochlorite comes in a dry tablet form and can be used in hose-end applicator systems.

Sodium Dichloroisocyanurate (NaDCC)

Newer products such as Bruclean® are effective against canine and feline parvovirus, and calicivirus if used correctly. Like bleach they have no detergent activity and are inactivated by organic matter. They are also less corrosive to metal than bleach. An all-in-one applicator system dispenses detergent and disinfectant.

Accelerated Hydrogen Peroxide

The new generation of accelerated hydrogen peroxides, such as Accel® TB, are also effective against canine and feline parvovirus, and calicivirus if used correctly, and claim effectiveness against dermatophytes that can cause ringworm. They have good detergent activity, relatively good activity in the presence of organic matter, and have a short contact time, from 1–5 minutes (compared to 10–15 minutes for most disinfectants). Accel TB comes in liquid form, so can be used with several different types of applications such as centralized systems, hose-end applicators, and foaming brushes (Omidbakhsh and Sattar, 2005).

MATERIAL SAFETY DATA SHEETS

Material Safety Data Sheets (MSDS) sheets provide information on chemicals that are used in the workplace. They are required by law to be provided by the manufacturers of the chemicals and must be maintained by all employers (including animal shelters) for every chemical used in the workplace (Miller and Zawistowski, 2004; United States Department

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of Labor, 2011). These sheets provide information on the physical and health hazards of a chemical or product and must be available to all personnel. A system should be in place to catalog MSDS sheets when they are received. The format of MSDS sheets varies but should contain all of the following information: product identification including name, synonyms, chemical family and formula; hazardous ingredients including permissible exposure limit; physical properties of the chemical including boiling point, melting point, etc.; fire and explosion hazard data; health hazard data that define the medical signs and symptoms with exposure and emergency and first-aid procedures; reactivity data and spill, leak, and disposal procedures that include personal protection information such as eye protection, skin protection, respiratory protection, and ventilation. A notebook containing all current MSDS sheets should be kept in a location that is known and always accessible to all shelter personnel, including volunteers.

PERSONAL SANITATION

Hand Washing

No discussion of shelter sanitation would be complete without mention of the importance of personal hygiene for staff and volunteers, especially while cleaning.

Hands can act as carriers of disease from animal to animal and from animals to humans. In human healthcare settings, hand washing is stressed as one of the most important things that can be done to prevent disease transmission. The hand-washing message should similarly be reinforced in animal shelters through training, signage, by example, and by providing easy access to hand-washing stations. Shelters should strive to place sinks in high-use areas, and ensure that plenty of soap, towels, and hand sanitizers are available in all animal contact areas.

Frequent hand washing is recommended, especially after handling animals or their waste, before handling food, after handling garbage, blowing one's nose, sneezing, or using the toilet.

For best hand-washing results, hands should be wet with warm water, soap applied, and hands rubbed together for at least 20 seconds, creating a lather over the entire surface of the hands, between fingers and under nails, rinsed thoroughly under running water, and dried on a clean towel or air-dried (Centers for Disease Control and Prevention (CDC), 2011). The CDC has posters on proper hand-washing techniques that may be useful to display for staff and visitors.

Hand Sanitizers

Hand sanitizers serve a useful purpose, but do not take the place of thorough hand washing with running water and soap. Using hand sanitizers is inadequate when hands are contaminated with visible dirt or organic debris or in the presence of pathogens such as canine and feline parvovirus, and calicivirus. Hand sanitizers should contain at least 60% alcohol to be effective.

Uniforms or Separate Clothing for Cleaning

Shelters should provide separate uniforms or clothing for staff to wear when cleaning and disinfecting or encourage employees to bring separate clothing to perform sanitation chores. In order to prevent the transmission of disease from the shelter to the employee's own pets, clothing and shoes that are worn in the shelter should not be worn home.

Foot Baths

Foot baths and foot mats can be used to decrease spread of infectious organisms in animal environments (Colorado State University, 2011). However, they can also be, and often are, misused and over relied upon to the point where they are useless and may even contribute to disease spread. Pathogens are frequently found on floors in environments around infected animals (Steneroden, Hill and Salman, 2010). The goal of a foot bath or foot mat is to stop the spread of disease on shoes and other footwear beyond the foot bath. For foot baths or foot mats to be effective, the following must be kept in mind:

Bleach, quaternary ammonium compounds and 1% Virkon® (Trifectant) solutions are common choices for foot baths and foot mats. Bleach and Virkon® will be more reliably effective in outbreak situations of canine and feline parvovirus than quaternary ammonium compounds. Foot bath or foot mat solutions must be changed daily and/or whenever they appear to contain excessive amounts of debris. Frequency of changing the disinfectant will depend on the qualities of the disinfectant being used, amount of foot traffic, and location. For example,

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bleach should be changed more often because it is quickly inactivated by organic matter; high traffic and isolation areas should be changed more often, and foot baths used outdoors may need more frequent replacement from dilution due to rain/snow or inactivation through the presence of light. The foot bath must be stepped in, not stepped over or around with the sole of the shoe or boot in full contact or submerged in disinfectant. This requires that all people working in areas with foot baths or foot mats are wearing appropriate water-impervious footwear. In areas with heavy fecal or organic matter contamination, the soles of shoes or boots must be scrubbed prior to stepping in the foot bath. Brushes for scrubbing must be available. Having boots available for wear only in isolation areas, and leaving boots in the disinfectant for at least 10 minutes would be optimum. Under some circumstances disposable shoe covers may be a better choice than foot baths to prevent the spread of disease.

ENVIRONMENTAL CONTAMINATION

Some pathogens cause widespread and persistent environmental contamination in animal shelters. Surface type plays an important role in the ability to effectively clean any surface. Nonporous surfaces such as stainless steel are much easier to clean and disinfect than unsealed wood, for instance. A facility's type, its age, and building materials can contribute to disease persistence in the environment.

The potential for disease transmission from surfaces depends on the concentration of the pathogen in the environment, the specific conditions in the environment that affect a pathogen's multiplication or decay (Kahrs, 1995), as well as the ability to remove them from the environment through cleaning and disinfection. Certain pathogens common in animal shelters require focused and specific intervention in order to remove them from the environment. Canine and feline parvovirus, calicivirus, salmonella, parasite eggs, and ringworm spores can be especially troublesome; rigorous attention to cleaning and disinfection is required to remove and inactivate these pathogens. Products used for normal disinfection, such as quaternary ammonium compounds, will not likely be effective against them; bleach or Trifectant are more effective for disinfection. Rigorous cleaning; the use of appropriate, targeted disinfectants; and careful attention to the removal or disinfection of fomites are pivotal to ensuring that these serious pathogens do not persist in the environment.

ENVIRONMENTAL SAMPLING

To delve deeper into the effectiveness of a shelter sanitation program, or in the event of outbreaks of disease that cause widespread environmental contamination, environmental sampling can be a useful tool to target cleaning efforts and verify whether decontamination efforts have been successful.

Environmental sampling has been used with success in veterinary teaching hospitals for salmonella surveillance (Burgess, Morley and Hyatt, 2005; Colorado State University, 2011). Ringworm is a classic example of a disease causing widespread and persistent environmental contamination that can be managed in part with environmental sampling (Moriello and Newbury, 2009). For example, electrostatic wipes such as Swiffer® cloths can be wiped over objects (cages, floors, carriers, etc.) in a room suspected of ringworm contamination and cultured to determine if the pathogen is present or if decontamination has been successful. (See Moriello and Newbury, 2009 for a more detailed explanation.)

TRAINING ON SANITATION

The cornerstone of all shelter infection control strategies is education and training. This is especially true with shelter sanitation. Staff input from those who will actually be performing the procedures should be solicited during the development of the sanitation plan to ensure it is realistic for staff to meet the expectations. The plan must be communicated effectively to all staff and volunteers once it has been developed. Whenever possible, those performing sanitation chores should be encouraged to suggest improvements (Petersen, Dvorak and Spickler, 2008).

Sanitation protocols may appear cumbersome and time-consuming to staff, particularly if they do not have input into the process and do not understand the importance of the specific procedures. Shelters have high turnover rates in staff and/or volunteers, so training must be continual. In addition to discussing the established sanitation plan—its importance and potential hazards—essential training points include

the recognition of signs of infectious diseases, their routes of transmission, and the hazards of zoonotic diseases. The sanitation plan should be reevaluated periodically to ensure that it remains effective. Regular evaluation of the shelter sanitation plan allows for updates and reinforces that the shelter's mission, goals, and management value a clean environment. Staff should be observed periodically while cleaning to ensure their adherence to protocols, and offered opportunities for retraining whenever problems are anticipated or observed.

CONCLUSION

Written protocols covering all aspects and areas of the shelter should form the foundation of a shelter's sanitation program. Efforts to minimize animal stress, to limit the transmission of disease, and to clearly and in a stepwise manner train and inform staff are key to maintaining shelter sanitation. Instituting, evaluating, and maintaining a thorough and effective shelter sanitation plan is an investment in animal and human health and welfare.

REFERENCES

Bello, A., Quinn, M., Perry, M. *et al*. (2009) Characterization of occupational exposures to cleaning products used for common cleaning tasks: A pilot study of hospital cleaners. *Environmental Health*, **8**, 11.

Burgess, B., Morley, P. and Hyatt, D. (2005) Environmental surveillance for *Salmonella enterica* in a veterinary teaching hospital. *JAVMA*, **225**, 1344–1348.

Centers for Disease Control and Prevention (CDC) (2011) *Handwashing: Clean Hands Save Lives*, www.cdc.gov/handwashing/ (accessed June 5, 2012).

Chiodini, R.J. and Sundberg, J.P. (1981) Salmonellosis in reptiles: A review. *American Journal of Epidemiology*, **113**, 494–499.

Colorado State University, James L. Voss Veterinary Teaching Hospital (2011) *Biosecurity Standard Operating Procedures*, http://csuvets.colostate.edu/biosecurity/biosecurity_sop.pdf (accessed September 20, 2011).

Coppock, R.W., Mostrom, M.S., and Lillie, L.E. (1988) The toxicology of detergents, bleaches, antiseptics and disinfectants in small animals. *Veterinary and Human Toxicology*, **30**(1), 463–473.

Griffith, C.J., Cooper, R.A., Gilmore, J. *et al*. (2000) An evaluation of hospital cleaning regimes and standards. *Journal of Hospital Infection*, **45**, 19–28.

Grow, A.G. (1995) Writing guidelines to require disinfection. *Revue Scientifique Et Technique*, **14**(2), 469–477.

Jeffrey, D.J. (1995) Chemicals used as disinfectants: Active ingredients and enhancing additives. *Revue Scientifique Et Technique*, **14**(1), 57–74.

Kahrs, R.F. (1995) General disinfection guidelines. *Revue Scientifique Et Technique*, **14**(1), 105–122.

Kennedy, M.A., Mellon, V.S., Caldwell, G. *et al*. (1995) Virucidal efficacy of the newer quaternary ammonium compounds. *Journal of the American Animal Hospital Association*, **31**(3), 254–258.

Kore, A. and Kiesche-Nesselrodt, A. (1990) Toxicology of household cleaning products and disinfectants. *Veterinary Clinics of North America Small Animal Practice*, **20**(2), 525–537.

Lawson, N. and Pullen, K. (2005) Spot-cleaning a cat cage. *Animal Sheltering*, May/June 2005, http://www.animalsheltering.org/resources/magazine/may_jun_2005/spot_cleaning_a_cat_cage.html (accessed June 5, 2012).

Miller, L. and Hurley, K. (eds) (2009) *Infectious Disease Management in Animal Shelters*, Wiley-Blackwell, Ames, IA.

Miller, L. and Zawistowski, S. (eds) (2004) *Shelter Medicine for Veterinarians and Staff*, Blackwell Publishing, Ames, IA.

Morgan-Jones, S. (1987) Practical aspects of disinfection and infection control, in *Disinfection in Veterinary and Farm Animal Practice* (eds A.H. Linton, W.B. Hugo, and A.D. Russell), Blackwell Scientific Publications, Oxford, pp. 144–167.

Moriello, K. and Newbury, S. (2009) Dermatophytosis, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K. Hurley), Wiley-Blackwell, Ames, IA.

Omidbakhsh, N. and Sattar, S. (2005) Broad-spectrum microbicidal activity, toxicologic assessment, and materials compatibility of a new generation of accelerated hydrogen peroxide-based environmental surface disinfectant. *American Journal of Infection Control*, **34**(5), 251–257.

Petersen, C., Dvorak, G., and Spickler, A. (eds) (2008) *Maddie's Infection Control Manual for Animal Shelters*, Center for Food Security and Public Health, Ames, IA.

Russell, A.D. and Hugo, W.B. (1987) Chemical disinfectants, in *Disinfection in Veterinary and Farm*

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Animal Practice (eds A.H. Linton, W.B. Hugo, and A.D. Russell), Blackwell Scientific Publications, Oxford, pp. 12–42.

Steneroden, K., Hill, A., and Salman, M. (2010) Environmental sampling for *Salmonella* spp. in Colorado animal shelters (unpublished).

UC Davis Koret Shelter Medicine Program (2011) *Sanitation in Animal Shelters*, www.sheltermedicine.com/shelter-health-portal/information-sheets/sanitation-in-animal-shelters (accessed September 19, 2011).

United States Department of Labor, Occupational Safety and Health Administration, *Regulations (Standards 29 CFR) Guidelines for Employer Compliance (Advisory)—1910.1200 App E*, http://www.osha.gov/ (accessed September 21, 2011).

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5
Administrative Issues

Bonnie Yoffe-Sharp

INTRODUCTION

Shelter medicine is both an art and a science and can be an exceptionally fulfilling career. Caring for animals who have no one else to care for them, and having the freedom to make decisions about their health and medical care without having to rely on an owner's consent can be liberating. Many shelter veterinarians agree that not having to deal with the daily idiosyncrasies of clients is a welcome change from private practice.

That is not to say, however, that veterinarians working at or with animal shelters do not have other sources of stress and frustration. Whether working in a nonprofit humane society, municipal animal control facility, open-door or limited-admission shelter, most shelter veterinarians have nonmedical, often administrative, hurdles to clear. These hurdles, or challenges, vary from facility to facility and from person to person. Although monetary constraints may be the major obstacle that keeps shelters from accomplishing their goals, it is often the interpersonal conflicts that lead to the high stress levels encountered by shelter veterinarians.

What are the primary sources of these nonmedical challenges? The list can be long, but the most common include the following:

- Staff conflicts
- Employee management
- Boards of directors
- Government bureaucracy
- The media
- Relationships with local private practitioners

This chapter will examine each of these challenges, as well as possible approaches to resolving them.

STAFF CONFLICT AND EMPLOYEE MANAGEMENT

Often staff conflict boils down to miscommunication, lack of adequate communication, perception of unfair treatment, and basic personality differences. Open, honest, and clear communication sounds trite and simplistic; however, the reality is that this type of communication dramatically improves the quality of life—both at work and at home.

Effective Communication and Active Listening

Communication styles should be customized based on who is listening. Just because instructions have been heard does not mean that they have been understood. For example, one staff member may listen to instructions to perform a specific task or animal treatment and then either execute the task as instructed or ask for clarification if unsure of what is wanted. This provides an opportunity to give clearer instructions and ensures that the correct action is taken. On the other hand, another staff member may appear to be listening to the instructions yet do something totally different. Or, he or she may not perform the task at all, acting as if the instructions had never been given. This latter scenario can be extremely frustrating. It can be remedied by an adjustment in communication style. When giving instructions, it is important to not only try to be as clear as possible, but also to say the same thing at least twice, in two different

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ways. Asking for acknowledgment that the instructions have been understood, perhaps by having the staff member explain back to you what needs to be done, removes any doubt that the message is clear (Haddock, 2002; Williams, 2002). This can be done in a respectful, nonpatronizing way. The reasons for the employee's poor past performance of tasks are moot. Whether it is a passive-aggressive behavior pattern or a failure to pay attention really does not matter.

Active listening is critical for effective two-way communication. An enhanced listening ability translates into improved employee relationships that will dramatically improve job performance. Heavy workloads can make the thought of slowing down to really listen to a staff member's questions or concerns seem to be a poor use of time. But in the long run, the staff's respect and trust are necessary for effective functioning. Staff members need to trust that they, and the animals, are cared about enough that what they have to say is heard and understood. The same technique of asking for clarification of what the other person is saying, and then repeating it back and asking for confirmation should be employed. It is important not to prejudge the message being received. Labeling a person as stupid, crazy, unqualified, and so on, makes it easy to ignore what they have to say. It is important to be open to hearing the thoughts and feelings of other people. This is easier said than done; it is hard to believe that an unsympathetic person has said something worth thinking about (Haddock, 2000a).

Working Together

One common area of staff conflict in open-door animal shelters revolves around the important job of "dispositioning" for euthanasia. Choosing which animal is going to live and which one is going to die is tremendously stressful. (See the chapter on euthanasia.) Similarly, in limited-admission shelters, deciding which animals to admit and which to turn away can cause much internal conflict and stress. Every organization will have guidelines, protocols, and certain criteria that they use to help make these often-difficult decisions. It is those cases in the "gray zone" that cause the conflict and bad feelings:

- "Just how old *are* those kittens, and are they really weaned?"
- "That dog didn't really growl at the kid, he was just vocalizing to get attention. You just don't like Rottweilers."
- "Last year we put a cat up for adoption who had the exact same medical condition."

The list of such cases is endless. It is critical that there are specific and written criteria specifying what constitutes an adoptable versus an unadoptable animal. It is also critical to be consistent in the application of such criteria. This does not mean that there are not multiple factors that contribute to the final decision for any particular animal, including how crowded the shelter is at a particular point in time.

It is difficult for a shelter veterinarian to be second-guessed on a medical diagnosis he or she has made, because it may lead to an animal being determined to be unadoptable. The staff needs to understand and respect the veterinarian's areas of expertise, responsibility, and authority. The flip side, of course, is that the veterinarian must not make a habit of questioning the dispositioning decisions made outside of his or her realm of expertise and authority. The model of having two people, from different departments, making the disposition decisions on any given day seems to work well. For one thing, it takes some of the pressure and stress off each individual by "sharing the (emotional) load," and it instills more trust, and therefore less resistance, from those who would question a particular decision. It also provides a check and balance system. One model that the author has seen work fairly well is to include one person from the medical team and one person from the shelter department in such decision-making.

Positive Reinforcement

When managing employees it is imperative to give positive reinforcement. Training a new puppy by using only punishment does nothing but instill a fear response. Humans, too, need positive reinforcement. Staff must be made aware of their mistakes, and how to correct them, but they also need to know when they do things correctly. Compliments for a job well done make a person's day. A literal, or figurative, pat on the back lets staff know that what they do is not only known but appreciated. Nothing improves working relationships more. Nondepartmental employees need compliments too. Anyone who goes above and beyond their duties should be acknowledged and thanked. Letting the managers

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of such employees know how well they performed will help develop better interdepartmental relations. When a conflict does arise, or it becomes necessary to lodge a concern about someone else's employee, the pill will be a little less bitter to swallow because a level of trust and respect will already exist, hopefully allowing concerns to be heard less defensively.

Fair Play

Last but not least, it is crucial to be fair. It is normal to like some fellow employees more than others and for some relationships to extend beyond the workplace. At work, however, everyone must be treated equally. Even the appearance of favoritism must be avoided. This will enhance difficult relationships as well as keep friendly relationships more professional. It is easy to start to take advantage of a friendship if it is not clear that all staff members have the same standards of performance.

Hiring and Firing

Depending upon a shelter's organizational structure, a shelter veterinarian may be in charge of, or at least give input into, the hiring and firing of the veterinary support staff. The importance of these decisions cannot be overemphasized. It is critical to be aware of state and federal laws regarding what can and cannot be asked during an interview, as well as the organization's internal policies. No one enjoys having to terminate another person's employment and livelihood. Firing someone is probably one of the most difficult administrative responsibilities of a manager. However, if the proper time and care go into the front-end of the process—the hiring—then ideally there should be no need for the firing.

Admittedly it is very difficult to work short-staffed, and the motivation to fill an open position is great. But the pressure to fill the slot quickly can lead to short-sighted decisions that later may be regretted, sometimes for years to come. Here are some pointers to keep in mind:

1. Time spent being thorough is time well spent. It is worth working short-staffed for a longer period of time if it means finding the right person. Checking references, including past employers, is important. Even though prior employers would not usually disclose poor past performance, they are often eager and happy to expound upon the virtues of excellent performance. So confirmation of past employment and not much else probably should be taken as a warning sign. A lot of information can be gleaned from tone of voice, and often a past employer may drop hints about poor past performance. A good question to ask is, "If given the chance, would you hire this person again?" An uneasy silence or "no comment" says a lot.
2. The interview should include a tour of the shelter. Subjects to discuss might include the shelter's policies on euthanasia and adoption, and how animals with infectious diseases are treated. The astute tour guide will observe how the person interacts with the animals and the types of questions the tour generates for him or her.
3. If possible, the person should be hired on a trial or probationary basis. And, if things are not feeling right, the employee should be terminated promptly, even if the probationary period is not over.
4. "Gut feelings" are worth listening to. If the potential new hire has all the right answers and says all the right things, but something just does not feel right, that feeling should not be overridden immediately. Give it time. The person can be asked to come in for a second and even third interview. Other employees can be invited to sit in on the interview or spend time alone chatting with the candidate. Everyone's thoughts and opinions should be gathered before a decision is made. A new staff member needs more than the necessary skills to make a good fit; the personal vibe is just as important.
5. Common sense cannot be overrated. Obviously the individual hired will need specific required skills dependent upon their job tasks. Whereas many technical skills can be taught or improved upon with training and practice, common sense is one of those assets that a person either has or does not have. It cannot be taught. Managers with many years of experience with many different types of employees often place common sense near the very top of the list of qualities a potential hire must possess.
6. Team players are invaluable. Again, skills can be honed with proper training; personality cannot. In a shelter environment multiple departments need to communicate and work well with each other, and coworkers need to rely upon each other.

Cooperation improves the quality of life for both employees and the animals. An individual who is not a team player can increase the stress for everyone.

7. Allow adequate time for training. Trial by fire is to be avoided; nobody should get burned. Provide written training guidelines and protocols as available, and assign the best person to do the training. The new hire should have the optimum chance for success by starting off with the right work habits.
8. Quality evaluations must be standard practice. Although writing evaluations seems like a chore with a low priority, good evaluations are worth their weight in gold. "Good" employees need to realize that they are appreciated for what they do for the organization and the animals. Evaluations are a way of highlighting the qualities that are valuable as well as pointing out areas for improvement. For a "bad" employee, the evaluation is a way of discussing specifically where there is room for improvement and more specifically what is expected in the future (Haddock, 2001). The phrase "I expect . . ." followed by specifically what needs to be done is a good approach.
9. The case for termination must be carefully built. If an employee must be terminated, it is imperative that it be done professionally. All needed documentation of poor performance must be in order, in the stepwise protocols most organizations require. The pattern of poor performance previously documented in the evaluations will greatly reduce the likelihood of a lawsuit or union intervention upon termination. If things do escalate to legal proceedings, all the ammunition needed to verify the need for termination will be at hand.

BOARDS OF DIRECTORS

One veterinarian who worked for a nonprofit humane society animal shelter for 14 years and subsequently joined the shelter's board of directors, wearing the hat of a board member for the past 10 years, is an example of a person who has "seen it from both sides." The reasons she gives for joining the board are "love for the organization and wanting to make positive change."

The Big Picture

From an employee's perspective, it may be hard to understand why boards of directors head nonprofit humane organizations. They may seem to be a group of people who often have no clue about the day-to-day operations of an animal shelter, and who seem to have no knowledge of, nor interest in, animal issues. Some of their decisions may seem totally uninformed. However, it is important to understand the true function of a board. The main role of the board is to look at the big picture, to develop the direction and mission of the organization, and to work with the executive director (ED) to ensure that the organization's general policies and programs reflect that mission. It is not the board's role to be involved in the shelter's day-to-day operations. The board is legally responsible for governance of the organization, which includes overseeing finances and ensuring adequate resources for the organization, planning long range, and reviewing and approving the annual operating budgets.

Big problems can develop if the board and the ED do not have a strong and cooperative relationship. In most cases, staff veterinarians probably have few, if any, direct interactions with the board. The ED is the staff's interface with the board. If a staff veterinarian has a problem with a board decision that affects the veterinarian's department and ability to provide medical care for the animals, it is the ED who will need to help him or her make their case. It is never a good idea to go over the head of the ED to the board of directors. (The exception to this rule, of course, is in the case of egregious and/or unlawful behavior on the part of the ED, such as sexual harassment, animal cruelty, and so on.)

Here is an example of a board of directors keeping the big picture in mind:

Many years ago, while working at a nonprofit humane organization, the shelter veterinarian started a blood donor program, making canine and feline blood available to local practitioners. (This was before animal blood banks were available.) The shelter only charged the amount it cost for staff time and the materials to collect the blood. It was a great program, and the local veterinarians loved it. Animal lives were saved, and no shelter animals suffered due to the program. About one and a half years after the start of the program, the board of directors became aware of the program, and an uproar ensued.

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The board was concerned that the public would think the shelter was conducting animal research or that animals were being euthanized for their blood. They worried that community residents would be reluctant to surrender animals to the shelter. The ED understood that no animals were suffering, and in fact many animals were benefiting from the program. But, in the end, she agreed with the board that the possible loss of public support and confidence in the organization outweighed the life-saving benefits of the program. And in the end, the veterinarian understood that the community's trust in and support of the animal shelter were more essential and would have a larger impact on animal lives than the individual animals who were helped by the blood donor program. Perhaps the board and ED were practicing population medicine better than the shelter veterinarian was able to do. They had assessed the risk-to-benefit ratio and come to the conclusion that more animals ultimately would be served without the program.

Politics

Political issues can be a major problem with a board of directors. Board members may have hidden or not so hidden agendas. This can tear a board and ultimately an organization apart. If a board is too busy fighting among themselves, there is no time to help build the finances of the organization. This can ultimately affect the bottom line for some of the shelter's medical programs. Unfortunately, a staff veterinarian can have very little control over these types of problems. It is important to stay out of it as much as possible and try not to burn any bridges. It is impossible to know when the support of the board, or of individual board members, will be needed.

GOVERNMENT BUREAUCRACY

Working for government has its own set of challenges—the most prominent being the bureaucracy of government. A humane organization background can be an asset in helping to run a municipal shelter. This is not always the case for many municipal shelters. Some animal control facilities are under the auspices of a police department. That is, the people in authority are not necessarily "animal people."

The main problems in this arena concern money (lack of it), bureaucracy (lots of it), and ignorance of animal welfare and sheltering issues. It can be hit or miss as to what priorities are valued. For example, if the chief of police is passionate about animals, staff are in better shape than if he/she feels "stuck" with having to oversee "the pound." In either case, it behooves the shelter veterinarian to get to know the people who make the decisions that affect his or her ability to practice shelter medicine effectively. Those in authority at the shelter need to know and respect the professional staff and the job they do, not only for the animals, but also for the animal-owning and animal-loving members of the community. Those in a position of authority over the shelter need to be educated on important animal issues, and what is in it for them.

For example, at one municipal shelter the shelter veterinarian approached the police chief about her interest in hosting a day-long course on the link between animal abuse and interpersonal violence. The workshop was aimed at law enforcement personnel, animal control officers, veterinarians, social workers, educators, and so on. The veterinarian did not know at the time that the chief was a member of the county's domestic violence task force. The chief became very excited and brought the idea up to the task force that puts on a very large conference annually. The outcome was a 90-minute presentation on the link at the conference that included the shelter veterinarian as a speaker, and a day-long post-institute conference following the main conference, focusing exclusively on the cycle of violence to people and animals.

It was lucky that everything fell into place. The shelter veterinarian gained value in the eyes of the chief, improved her ability to approach him with other concerns that would come up in the future, and addressed a much larger audience than originally anticipated. Also, the police chief became more sensitized to the issues of animal abuse and their link to interpersonal violence; he is likely to expect more action on the part of his officers when they are presented with cases of possible animal abuse.

THE MEDIA

Shelter veterinarians are most likely to be approached by the media in relation to an animal cruelty or animal hoarder case or when something goes wrong, like a mistaken or contested euthanasia. These types of cases are big news and spark a lot of public interest. Although such cases provide an opportunity to educate the public about issues of

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animal cruelty and neglect or the importance of affixing proper identification to a pet, caution is advised. People are misquoted, or quoted out of context, all the time. In cruelty or other sensitive cases, there should be one designated media point person for the agency, and all inquiries should be referred to this person. The shelter veterinarian should only make statements if authorized. Even then, he or she should stick to a prearranged script. It is easy to get nervous and forget the main message. It is also important not to speculate or reveal specific details of an ongoing investigation.

If dealing with the media for less-stressful reasons, such as being interviewed about being a shelter veterinarian or doing an educational piece about geriatric pet care, the veterinarian should be able to relax and enjoy the experience. The message should be clear and delivered in short sound bites. It should be as simple and nontechnical as possible in order to hold the audience's attention and be easily understood. Here are some tips to remember when preparing for a media interview:

1. Most reporters want to present accurate information. Unless proven otherwise, assume that he or she is trying to do the best job to write a balanced and honest report.
2. The media can serve as a conduit to the community. The interview is an opportunity to present accurate information. Truthfulness enhances credibility. Problems should be addressed, but then the positive message put forward. There is no shame in not knowing the answer to a question. If this happens, try to find the answer and get back to the reporter before his or her deadline.
3. A confident and upbeat attitude is important. A shelter veterinarian is an expert with more influence than he or she may think.
4. It is critical to never walk into an interview cold, upset, or unknowledgeable. The shelter veterinarian should find out exactly what is to be discussed or, if possible, obtain the actual questions ahead of time. If need be, promise to call back within a specified time and use that time to prepare and hone the message. Remember, reporters are always on deadline. Keeping this in mind and promptly returning their phone calls will be appreciated.
5. Whether the interview is by phone or in person, it is best to assume that it is being taped. Always remember: When dealing with the media, there is no such thing as "off the record."
6. Consistency counts. The most important things should be said first. Two or three main statements should be woven into the interview no matter what. A bridging technique can be useful to get back to the main message. For example, a transitional phrase such as "What's most important for you to know is . . . " works well. Also, anticipating questions and giving a direct answer to a direct question is good advice.
7. The phrase "No comment" is to be avoided. If certain information cannot be discussed, it is okay to say so, and if possible, why.
8. Just as in court testimony, it is wise to say no more than necessary, and stop. A reporter's pause may be a trap for the veterinarian who may feel compelled to fill the void—and inadvertently put his or her foot in their mouth.
9. Do not repeat an interviewer's negative words. For example, a reporter may ask, "Don't you feel it was irresponsible of you to euthanize all twenty of the impounded rabbits?" By responding, "I was not irresponsible," the next day's headline might read, "Dr. Smith denies she was irresponsible." What readers will recall is a connection between "Dr. Smith" and "irresponsible."
10. The reporter always has the last word. Becoming annoyed or sarcastic won't help the cause.

Another important concept to remember when dealing with the media is that it is always preferable to act rather than wait and then have to react. The objective should always be to hit the papers first with positive spin, rather than play defense and react to someone else's negative spin. Referring again to the blood donor program discussed earlier, the shelter veterinarian could have handled it differently. At the time there were only a couple of small articles—totally untrue—insinuating that animals were being euthanized in order to obtain blood. Today the veterinarian and shelter might work together to release a press statement preemptively, explaining how the program worked and the wonderful life-saving benefits of having fresh whole blood

on hand for emergency transfusions. Another point to emphasize would be that shelter animals as well as owned pets in the community would benefit from this program.

RELATIONSHIP WITH LOCAL PRIVATE PRACTITIONERS

Many shelter veterinarians feel as if they are walking a tightrope between their shelters' policies and the opinions of their local private practice colleagues. Some sheltering organizations actually have a predominantly adversarial relationship with their local veterinary community. It is imperative that a healthy and strong relationship be developed and maintained between these two groups for the optimum health of a community's animals. Differences aside, both groups have many common goals. The optimum strategies for forming, or strengthening, positive relationships are unique to each community. Some things that have worked in the past are discussed in this chapter; however, it never hurts to capitalize on personal and organizational strengths and talents to develop unique and creative approaches to nurture this important relationship. The following are a couple of guiding principles for shelter veterinarians to keep in mind when establishing or maintaining a healthy and productive relationship with local veterinary practitioners:

1. One investment leads to another: The more time that individuals donate, the more invested and loyal they are to the organization (or the person) they are developing a relationship with. This is true for both time and money invested. Once someone has done something for or given something to either an individual or an organization, they are more invested in the relationship and are therefore more likely to help or defend it in the future.
2. WIIFM or "What's in it For Me?" (Haddock, 2000b): Every decision a person makes and every action he or she takes is based on the answer to that underlying question. What this means is that all people have personal motivators. These motivators run the gamut from personal gain or the need to feel superior all the way to altruism or the need to feel important and needed.

Shelter veterinarians should keep these guiding principles in mind when developing relationships with local practitioners. Working together on some small project or coming to a consensus on an issue marks the beginning of affinity and rapport. Joining the local veterinary medical association (VMA) and attending the meetings is one way to accomplish this. Volunteering for office or committee work could be the next step. This can provide an opportunity to get to know some of the other veterinarians in the community in ways unrelated to the shelter. Beyond that, it is easier to ask somebody for something if a relationship or at least an acquaintanceship already exists. Tactically, it makes sense to begin by asking for something small. For example, can the shelter leave some pet loss support group brochures in their waiting rooms? In this case, the "what's in it for me" is a new service for their clients. Local veterinarians can easily say yes to this because it benefits both the shelter (outreach to people in need of pet loss support) and the practice. Every small "yes" makes future yeses more likely. This is a tried and true technique for sales people. Shelter veterinarians are sales people, too. They are selling themselves and the organizations they work for.

The Printed Word: Newsletters

1. Local veterinarians should be on every shelter's mailing list. It may be possible to leave extra newsletters in their waiting rooms.
2. A shelter veterinarian can offer to write a "Shelter Notes" column for the local VMA newsletter. Sample topics include the shelter's vaccination protocols, rabies quarantine policies, early-age spay and neuter information, or interesting recent case histories or cruelty cases. The list is endless.
3. Asking local colleagues to write a column for the shelter newsletter, on either a one-time, rotating or regular basis, can enhance the relationship. Sample topics include timely animal health issues (summertime hazards for pets), or an "Ask the Vet" question-and-answer column.

Face-to-Face Interactions

People work together more comfortably when they know each other. Face-to-face interactions provide opportunities to improve communication, build

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mutual respect, and develop rapport. They also provide a forum to sound out ideas and work on cooperative programs or projects.

One way to foster face-to-face interactions is to invite local colleagues to special events hosted by the shelter. These colleagues should be on the organization's mailing list, and a personal follow-up call, as appropriate, can be considered. For example, if the shelter hosts an annual awards event that honors those who have gone above and beyond in helping animals in the community, local veterinarians can be invited. Perhaps one of their clients or patients is receiving an award. If the shelter offers classes to the public that may be of interest to their clients or staff, send copies of the flyers or invitations to the local clinics.

Speaking at a local VMA meeting can yield big benefits. A formal lecture on a topic about which the shelter veterinarian has experience or expertise is one idea to consider. Sample topics could include the veterinarian's role in recognizing and reporting animal abuse, temperament testing of shelter dogs, the role of stress on the incidence of upper respiratory infections in animal shelters, shelter medicine as herd health, and so on. The veterinarian who is not comfortable doing a formal presentation can report informally to the group on the services offered by his or her shelter, or lead a discussion on a community-related animal issue. Local practitioners may be completely unaware of the various services provided and functions performed by the community animal shelter.

Liaison Committees

A liaison committee consisting of a few local VMA members and relevant shelter staff can facilitate ongoing interactions. The shelter and local veterinary community will dictate the particulars of the program. Experiences with such a committee can be very positive and provide multiple benefits to both organizations. Here is one shelter veterinarian's experience as an example of how such a committee can work:

The committee consisted of four local, and relatively shelter-friendly, small animal practitioners. They all happened to be practice owners. The shelter staff members included the veterinarian, the ED, and the director of operations. When necessary, other staff members would come to a meeting. For example, the manager of the spay/neuter clinic came to meetings to discuss a cooperative spay/neuter program. Meetings were held every other month from 6:30 p.m. to 8:00 p.m. at the shelter. Soft drinks and a snack were sometimes provided. The liaison committee meetings were used to open up and improve communication with the local veterinary community, to sound out ideas, and to launch new cooperative programs. The first few meetings were somewhat formal and stiff. In time, they evolved to the point that everyone freely engaged in discussions and heated debates with mutual respect and humor. The two groups became allies, enabling the shelter to obtain generous donations of time and expertise from the practitioners for such projects as community outreach vaccination clinics and a spay/neuter referral program.

Topics for discussion included the shelter's routine deworming protocols, contents of medical information handouts that went home with adopters, vaccination policies for wolf hybrids, pet overpopulation legislation, feral cat program protocols, cooperative programs, and very heated debates about declawing cats. Often the group digressed into consulting with one another on interesting and unusual cases which helped to build professional camaraderie.

At the bimonthly VMA meetings, one of the local practitioners on the liaison committee would give a brief report to the membership. The direct benefit of the report included increased exposure to and knowledge of the shelter and especially its medical programs. Rather than being criticized by a local veterinarian because a recently adopted kitten developed an upper respiratory infection, the shelter was more likely to receive a friendly call of concern. The shelter veterinarian always used the opportunity to not only thank her colleague for the call but also to solicit ideas on how to decrease this type of problem in a shelter population. This created a "win win win" situation: the shelter veterinarian gained new insight on an old problem, mutual esteem was built among professionals, and the shelter veterinarian was able to convey all the precautions that were already being taken to prevent the spread of infectious disease within the shelter. Often local practitioners underestimate the level of care that shelter patients routinely receive.

Veterinarians in areas with several animal shelters may also consider forming a liaison committee of

representatives from each of these organizations to meet on a regular or informal basis.

Visits to the Shelter

An evening or weekend "behind the scenes" tour of the shelter facilities may have surprising benefits. This can be restricted to just veterinarians, or extended to their family members and staff. Providing food will usually increase attendance, especially if people are being asked to come after work. Many people have a negative, preconceived notion of an animal shelter or "pound."

Local veterinarians can be invited to give a speech or teach a class at the shelter for the public and/or shelter staff. Topics could include geriatric pet care, emergency first aid for pets, how to choose the right companion animal for a family, the importance of vaccinations and routine veterinary care, and so on.

Some shelter veterinarians may ask why a private practitioner would want to take time out of his or her busy schedule to prepare and teach a class for the animal shelter. The answers are many and vary from individual to individual. They can include feeling a sense of importance for being asked, the possibility of drawing new potential clients from community members in the audience, and a sense of satisfaction and altruism in giving back to the community.

Professional Input

Asking colleagues for professional advice and help, when indicated, makes good sense. People generally love to be asked; it is a compliment to them as individuals and to their expertise. For example, asking for input on shelter health practices such as disinfection, vaccination, or deworming protocols does not imply ignorance on such topics. The fact is that "new and improved" products come out all the time, and before changing a shelter's procedures and products, it is wise to solicit the opinions of colleagues who may have experience with other products. Care should be exercised in deciding whom to ask certain questions, and if veterinarians are going to be asked for their input, their comments should actually be considered. If not acted upon, there should be clear communication about the reasons. Understandably, veterinarians may be resentful if their advice is asked and then seemingly ignored. Critical evaluation of any information gathered will aid in making informed decisions.

Practical help or advice on selected medical cases can be requested from local associates or specialists. But whenever a colleague will provide a service for a shelter case, fees to be paid must be discussed up front as well as whether services will be reimbursed at full price, a reduced fee, "at cost," or pro bono. People feel good about helping, and again, local practitioners will have a chance to observe the level of care that patients receive at their local shelter.

Often it will be possible to elicit generous aid via phone consults and during actual office visits and procedures. Specialists may agree to see shelter animals for free or reduced fees; generous actions like this may help to foster cooperative relationships, and shelter animal patients emerge as the big winners.

Of course, no good deed should go without appreciation. It is vital to ensure these generous donations of time and expertise are recognized. A thank-you note signed by the shelter staff or veterinary department staff does not seem like much but is highly valued by the recipients. Recognition in the shelter newsletter or on a plaque in the shelter lobby likewise are appropriate ways to recognize others' contributions. Cookies or flowers also work nicely. A framed photograph of the patient with his or her new adoptive family will usually end up on the wall in the private practitioner's waiting room or office. Everyone wants to be appreciated, and people are much more likely to help again in the future if appropriately appreciated in the past.

Mutual respect and good relationships among shelter veterinarians and their colleagues in private practice are vital. Working together will not only improve the quality of the shelter veterinarian's life (the adverse effects of stress are well known), it will also improve the quality of life for the animals in their care. Veterinarians share many common goals, and even if there are philosophical differences on certain issues, shelter veterinarians and private practitioners can certainly work together on those goals that they share. The time and energy invested in developing a strong, cooperative relationship with community veterinarians will bring many rewards. Kirkwood (1999) provides additional advice on how to improve relations with local veterinarians.

CONCLUSION

The practice of veterinary medicine in an animal shelter has its own unique rewards and challenges.

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The profession as a whole is recognizing the expertise necessary to provide appropriate medical care for the populations of animals cared for in shelters. The vital services animal shelters provide to both the animals and people in our communities also have been increasingly recognized. Shelter veterinarians can be very proud of the role they play in helping to provide those services. Just as important as their medical knowledge and skills, however, is their ability to successfully negotiate the administrative and human sides of shelter medicine. The rewards for achieving both are priceless.

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REFERENCES

Haddock, P. (2000a) Creating positive outcomes by aligning perceptual positions. Interpersonal Skills. Workshop presented by Foothill-De Anza Community College, Business and Industry Institute, Cupertino, CA, p. 17.

Haddock, P. (2000b) What's in it for me (WIIFM). The Art of Persuasion. Workshop presented by Foothill-De Anza Community College, Business and Industry Institute, Cupertino, CA.

Haddock, P. (2001) Discussing unsatisfactory performance. Creating an Environment Where People Can Do Their Best Work. Workshop presented by Foothill-De Anza Colleges Business and Industry Institute, Cupertino, CA, p. 26A.

Haddock, P. (2002) Active listening. Win Win Negotiations. Workshop presented by Foothill-De Anza Colleges Business and Industry Institute, Cupertino, CA, p. 10.

Kirkwood, S. (1999) A prescription for better veterinary relations, in *Animal Sheltering*, Humane Society of the United States (HSUS), (November–December).

Williams, A. (2002) Paraphrasing. Listening for Success. Workshop presented by Foothill-De Anza Colleges Business and Industry Institute, Cupertino, CA, p. 29.

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6
Legal Issues for Shelters

Jane McBride

INTRODUCTION

The law as it pertains to animal shelters and animal welfare work is blossoming, or mushrooming, or exploding—whatever metaphor works best for you. This chapter provides a general overview of some common issues of concern for shelters and is also meant to discuss some of the many ways the law interfaces with shelter medicine. The information and any views or opinions presented in this chapter are solely the work of the author and are not attributable to the Illinois Attorney General's Office.

PUBLIC TRUST, NONPROFIT STATUS

It is helpful to understand the basics when approaching a particular line of employment. Whether the intention is to make a career of shelter medicine, or just to help at the local shelter or animal control facility as needed, it is best to understand the underpinnings of the organization.

Most if not all private animal shelters are organized as nonprofit corporations via articles of incorporation accepted and on file with the secretary of state's office. As such, they are governed by a board of directors that is in turn guided by a set of bylaws. If the organization is a municipal, or publicly funded animal control facility, the shelter most likely is operated under the auspices of a health department, police or sanitation department and is set up as a division of local government.

The private nonprofit generally acquired its tax-exempt status with the U.S. Treasury by declaring its mission to be the prevention of cruelty to animals, including education and community outreach. This is standard language, suggested and generally used for the Internal Revenue Service's Section 501(c) (3) application.

Once a private nonprofit animal sheltering organization achieves its Section 501(c) (3) status, its next stop is with the state agency that licenses shelters, and the state's attorney general's office of charitable trusts. In most states where animal shelters are regulated, the state department of agriculture licenses, inspects, and writes the regulations for both private and government shelters. According to a compilation of "State Law Impacting Shelters," generated by the Humane Society of the United States, dated July 2010, only 17 states in the nation had licensing requirements for animal shelters.

An example of a statute that regulates shelters is Illinois' Animal Welfare Act, 225 ILCS 605/1, found under the "Professions and Occupations" title. It regulates boarding kennels, pet shops, catteries, dog breeders, guard and sentry dog services, animal shelters, animal control facilities and foster homes associated with animal shelters. Under the authority of the act, the Illinois Department of Agriculture licenses the entities, conducts annual inspections, and inspections in response to complaints. Requirements of the act include record keeping, restriction on selling or transferring animals prior to the age of 8 weeks, information disclosure at the point of sale or adoption, sterilization and microchipping of all animals prior to adoption from animal control facilities and shelters, transfers between rescues, annual renewal of licenses, grounds for revocation,

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required standards of care, special provisions regarding sale or adoption of reptiles, and administrative fines for violation of provisions of the act. Requirements concerning standards of care may address minimal sanitary conditions, proper ventilation, adequate nutrition, and humane care and treatment while in the custody of the facility.

Administrative rules may be promulgated by the agency that has primary jurisdiction for administration and enforcement of the statute. In Illinois, the Illinois Department of Agriculture has promulgated rules pursuant to its authority to do so under the Illinois Animal Welfare Act that are specific regulations developed for the purpose of the administration and enforcement of the statute. For instance, the statute gives the Department of Agriculture general authority to license and regulate foster homes but also allows the department to develop administrative rules setting forth specific regulations pertinent to foster homes. The administrative rules include a limit on the number of foster animals a shelter may maintain in any one home, and it includes requirements that each home must meet to maintain animals in isolation from the foster home's own animals.

The introduction and enactment of what have come to be known as "puppy mill bills" may impact not only commercial retailers and breeders but animal shelters and animal control facilities. For instance, the enactment of 2009 Wisconsin Act 90 is the first instance in which animal shelters have been required to be licensed and brought under regulation in Wisconsin. Illinois' PA 96-1470, which came into effect in January 1, 2011, requires shelters to adhere to more extensive disclosure requirements when displaying animals available for adoption, and requires certification of disclosure when an adoption is finalized. Missouri's Canine Cruelty Prevention Act (SB 161, the Proposition B compromise brokered by Governor Jay Nixon) eliminated the animal shelter exemption from license fees. The bill amends Missouri's Animal Care Facilities Act (ACFA), Missouri Revised Statutes (MoRS) 273.325 to 273.357. The new law eliminated the shelter license fee exemption that has been in place since ACFA came into existence in 1992. This was deliberately done in the bill that was a predecessor to SB 161 and carried forward in SB 161, ultimately signed into law in April 2011. At the time of this writing, the Humane Society of the United States had initiated a lawsuit to restore the shelter exemption. The lawsuit is a challenge to the underlying bill on procedural grounds. It is very important that shelters be aware of the new licensing, standards of care, and disclosure requirements included in such legislation that may apply to them.

Besides becoming licensed, where a license is required, the private nonprofit animal sheltering organization must register with the attorney general's office of charitable trusts which oversees the organization's adherence to its responsibilities as a public trust.

When a shelter veterinarian is looking for personal guidance in his or her role, beyond that provided by his or her state's veterinary practice act and any edicts or direction handed down by the board of directors or executive director, the bottom line is they should meet the standard of care expected by the licensing agency. The "standard of care" is the level of care described in the licensing statute and underlying rules, and the interpretation of that language by the agency with primary jurisdiction. For example, if the state statute indicates that a shelter must provide "adequate nutrition," which is the language contained in the Illinois statute, the shelter veterinarian must in his or her own professional judgment determine within the constraints of the shelter's budget, what constitutes adequate nutrition. The means by which the shelter veterinarian can gauge their own judgment is to ask the agency inspector assigned to the facility what the agency's interpretation of "adequate nutrition" might be. If the shelter's budget is not able to provide adequate nutrition per the shelter veterinarian's judgment and the regulating agency's judgment, then the shelter needs to downsize its operations to the point where it can afford to provide adequate nutrition to the animals in its care.

In addition, the delivery of care must be appropriate for an entity existing as a public trust.

Board of Directors

The roles of a nonprofit organization's board of directors, the executive director, and any principal employee of an animal shelter—a category the veterinarian often falls into—are that of stewards of the public trust: a trust that has been granted to the organization via its nonprofit charter and the ensuing grant of lucrative concessions and immunities bestowed by the federal and state government once the organization is deemed tax-exempt (Wolf, 1999).

Table 6.1. Responsibilities of the board of directors.

A board of directors' six principal areas of responsibility
Determine the organization's mission and set policies for its operation, ensuring that the provisions of the organization's charter and the law are being followed
Set the organization's overall program from year to year and engage in longer-range planning to establish its general course for the future
Establish fiscal policy and boundaries, with budgets and financial controls
Provide adequate resources for the activities of the organization through direct financial contributions and a commitment to fund-raising
Select, evaluate, and if necessary, terminate the appointment of the chief executive
Develop and maintain a communication link to the community, promoting the work of the organization
A board of directors' duties do not include
Engaging in the day-to-day operations of the organization
Hiring staff other than the chief executive
Making detailed programmatic decisions without consulting staff

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When the public donates to support the organization's mission, they are doing so with the understanding that the principals in charge of the organization are operating the entity in a manner accountable to its public trust status.

Wolf (1999) articulates a succinct list of what a board of directors' responsibilities are, and what are not. It is important for a veterinarian to be familiar with this nonprofit wisdom when evaluating potential employment or volunteer involvement. Well-run organizations abide by these lines of responsibility. An individual will best be able to thrive as a shelter veterinarian when the board is functioning properly, the veterinarian's areas of responsibility have been clearly defined and are accepted by both the board and staff, and there is no conflict with the veterinarian's oath, ethics, or the state veterinary practice act. (See Table 6.1 for a description of the responsibilities of a board of directors.)

Tax-Exempt Status, the IRS and Form 990

Another important question is what is required to maintain an organization's tax-exempt status. It must be organized and operated exclusively for the exempt purpose; it must not have any earnings that improperly benefit private individuals; it must not carry on substantial activities to influence legislation (guidance on what is considered "substantial" is available from the IRS), and it is absolutely prohibited from participation in any political campaign. There are limitations on unrelated business activities and unrelated business income. The American Bar Association publishes an excellent resource regarding nonprofit board responsibilities (American Bar Association, 2002). This guidebook is updated on a regular basis; look for the most recent edition.

Potential conflicts of interest on the part of any director, principal officer, or member of a committee with board-delegated powers have recently come under heightened scrutiny by the IRS, and organizations are now encouraged to establish conflict-of-interest policy statements in conjunction with their bylaws (Nonprofit Risk Management Center, 2012c). The heightened concern with the management of nonprofits took further form in the 2008 redesign of Form 990, Tax Return of Organization Exempt from Income Tax. According to the IRS, the Form 990 had not been significantly revised since 1979, and it was universally regarded as needing major revision due to changes in the law and the increasing size, diversity, and complexity of the exempt sector.

According to the IRS' FAQ statement, major changes include a front page summary that provides a snapshot of key financial and operating information, a governance section, and revised compensation and related organization reporting. The new form replaces existing unstructured attachments with formal schedules.

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The new form requires each filing organization to provide certain information regarding the composition of its board or governing body, certain of its governance policies and practices, and the means by which it is held accountable to the public by making governance and financial information publicly available. The FAQ statement goes on to state that "many of the questions on the form request information on practices or policies that are not required by federal tax law. However, good governance and accountability practices provide safeguards to help ensure that the organization's assets will be used consistently with its exempt purposes. This is a critical tax compliance consideration, especially for organizations that are subject to private benefit, excess benefit, and private inurement prohibitions. "'Private inurement' means that an asset or funds, acquired under the auspices of a public trust organization, are used or diverted to benefit a private individual. In addition, well-governed and well-managed organizations are more likely to be transparent with regard to their operations, finances, fund-raising practices and use of assets for exempt and unrelated purposes."

The FAQ statement also includes the following in response to the question "How does the new form enhance transparency of an organization's mission, financial information, and operations?" Response: "The new form's summary page provides a snapshot of key financial governance, and operating information, including a comparison of the current and prior years' revenues, expenses, assets, and liabilities. The reordered core form provides a description of the organization's program service accomplishments immediately after the summary page to provide context before the user proceeds to sections on tax compliance, governance, compensation, and financial statements. The Checklist of Required Schedules also provides a quick review of whether the filing organization is conducting activities that raise tax compliance concerns, such as lobbying or political campaign activities, transactions with interested persons, and major dispositions of assets, and indicates which schedules the organization is required to file with the form" (IRS, 2008–2011).

This is important to the shelter veterinarian because the organization's Form 990, by law, must be on display and available to the public at all times. This enhanced form creates a much more elaborate and exact reporting obligation. The sort of information sought by Form 990 is also collected and compiled by (municipal) shelters and made available to the public. In addition, state licensing agencies generally have intake, adoption, and euthanasia reporting requirements. Information regarding whether or not there are state reporting requirements should be obtained from the state agency that licenses or otherwise regulates the shelter. It is important that the shelter veterinarian is aware of and understands these requirements and anticipates his or her own role in complying with reporting and transparency requirements.

INSURANCE AND RISK MANAGEMENT

There cannot be a discussion about law and shelter medicine without talking about liability. Risk management is the term used for efforts that reduce the chance something will go wrong or a "harm" will occur. It is a shelter veterinarian's best friend. It provides inspiration to develop appropriate protocols and procedures and make sure they are adhered to, continually reviewed and updated. It is important to embrace risk management. The Association of Shelter Veterinarians (ASV) released a "Guidelines for Standards of Care in Animal Shelters" document in 2010 that can be accessed on the association's website (ASV, 2010). Any sort of professionally developed, peer-reviewed operating standards are an excellent resource for a shelter's risk management committee. According to the Nonprofit Risk Management Center, risk management is a discipline for dealing with the possibility that some future event will cause harm. It provides strategies, techniques, and an approach to recognizing and confronting any threat faced by an organization in fulfilling its mission. Risk management may be as uncomplicated as asking and answering three basic questions: What can go wrong? What will we do both to prevent the harm from occurring, and anticipating the aftermath of an "incident"? If something happens, how will we pay for it? (Nonprofit Risk Management Center, 2012).

The last question is often addressed by the purchase of insurance. Shelters most commonly purchase a general liability policy as well as directors' and officers' (D&O) insurance, and of course workers' compensation coverage. If the shelter veterinarian is considered an officer, or is in any sort of executive management role, he or she may be

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covered or a candidate to be covered by D&O insurance. The American Bar Association's Committee on Nonprofit Corporations has an in-depth discussion of D&O insurance in Chapter V of the *Guidebook for Directors of Nonprofit Corporations* (American Bar Association, 2002). The shelter veterinarian should also be covered by a veterinary malpractice and license defense insurance policy. If the shelter operates a mobile unit clinic, the shelter must provide adequate vehicle insurance so that the staff may not have to use personal insurance in the event of an accident. The shelter's umbrella liability policy should be written so that it covers claims not covered by the veterinary malpractice policy. The shelter should also be willing to indemnify for claims not covered by the veterinary malpractice policy.

A shelter veterinarian will be asked to evaluate and/or treat owned animals not in the custody of or considered the property of the shelter in his or her role as the shelter veterinarian. The shelter veterinarian will potentially be asked to perform spay/neuter surgeries on owned animals, take part in low-cost health clinics for the public, and evaluate and even treat animals who are the victims of neglect or cruelty. For each and every service extended to the public, the shelter must require the patron to sign a waiver and release form. Unfortunately, not even a waiver and release clause is an absolute shield against liability. See Appendix 6.1 for a sample of a waiver and release for a microchip clinic. It is important that all identifying information for the pet be included on the form, hence the request for the owner and pet information above the actual waiver and release. The permission regarding the use of the patron's name and photo in connection with the event is for the purpose of publicity for the organization. Any time that photos are utilized by the organization for their newsletter or promotional materials, the organization should obtain a signed release.

As stated in "Risk Management Basics" in the *Resource Library* of the Nonprofit Center for Risk Management, for most nonprofits, insurance is a valuable risk-financing tool. Purchasing insurance, however, is not synonymous with risk management. In the nonprofit sector, practicing risk management is living the commitment to prevent harm. In addition, risk management addresses many risks that are not insurable, such as the potential loss of tax-exempt status, public good will, and continuing donor support.

Harm to a shelter's reputation, be it due to an accident with an animal, a disease outbreak, or a mishap with a controlled substance is absolutely devastating, especially if it is a private entity that is wholly dependent on donations.

So what is "liability"? It is generally the result of a tort, which is a private or civil wrong or injury, for which the law provides for damages. It could be the result of negligence. Or, the subject matter could be something to which strict liability is applied, such as workers' compensation. A shelter could be held liable for the actions of its volunteer or employee under the concept of vicarious liability known as *respondeat superior.* A complete discussion of this topic can be found in "Myths About Nonprofit Liability and Risk Management" and "Liability Basics for Nonprofit Organizations" (Nonprofit Risk Management Center, 2012a; 2012b).

OWNERSHIP STATUS

The ownership status of an animal will dictate the level of medical services that may be administered. An animal who comes to the shelter as a stray is of unsettled ownership status, and will remain so until the shelter takes certain steps.

Generally, for a government-run shelter that is under the auspices of the public entity charged with the management of "at large" or stray animals, there is a holding time, designated by state law or local ordinance, during which the shelter must maintain the animal while the owner is notified or during which an owner may come in and identify the animal and claim him or her. If the animal comes in with some sort of identifying information, be it an identification (ID) tag or a microchip, the shelter, generally, by law, must make every effort to contact the owner and hold the animal for a given number of days to allow the owner an opportunity to reclaim the animal. If the animal carries no identification, oftentimes there is a statutorily designated number of days the animal is to be maintained before ownership transfers to the shelter and the shelter has full discretion as to the disposition of the animal.

Private shelters that do not serve an animal control function must establish, with the local municipality or the state regulatory agency, a procedure by which they will hold an animal for possible reclaim. Once the designated time has lapsed, the shelter is then allowed to claim ownership of the animal and have

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sole discretion as to the care and disposition of the animal.

In many jurisdictions, there is no such established procedure for private shelters, and thus they operate totally at their own risk handling strays. In many jurisdictions, it is recommended that all strays be processed through either a government shelter or a shelter with a government contract so that the proper procedure is implemented to either establish ownership, or have the ownership revert to the public shelter. Once ownership is established in the public shelter, the public shelter has the legal right to transfer ownership to a private shelter.

During the time that the shelter is holding the animal awaiting owner identification and reclaim, what care and medical services may be administered to the animal? In most states, there is a statute on the books that establishes "owner's duties" to a companion animal. In Illinois, "basic care" provisions are found in the Illinois Humane Care for Animals Act, Section 3.0, Owner's Duties, 510 ILCS 70/3.0. The definition of owner in such provisions generally includes any and all keepers or caretakers of the animal, so any entity or individual harboring an animal, must, by law, provide such basic care.

Basic care generally includes shelter to protect animals from exposure to adverse weather, good-quality food and water, veterinary care to prevent suffering, and humane treatment. Beyond providing medical care to prevent suffering, shelters may administer vaccinations and treatments that will protect the existing population in the shelter from the addition of this new animal, as well as administer vaccinations and preventatives to the new animal that will provide protection from diseases while being held in a kennel or shelter in such close proximity to a large number of other animals. Thus, core vaccinations are advisable and permissible. The ASV (www.sheltervet.org), American Association of Feline Practitioners (www.aafponline.org), and American Animal Hospital Association (www.aaha.net) all have on their respective websites recommendations for vaccinating shelter animals. Vaccination recommendations for shelter animals often vary from those of private practitioners, so veterinarians using shelter protocols should know where to find them to prove adherence to the recommended standard of care for shelters. Deworming the animal to prevent the spread of parasites is permissible and strongly recommended to prevent roundworm and hookworm infections that can also cause disease in humans. Flea treatment is certainly advisable and permissible. However, the responsibility of treating the animal is accompanied by the responsibility of addressing any adverse effects that may occur due to treatment, including keeping records of such events.

During the time that ownership of the animal remains unsettled, a shelter may not spay or neuter the animal. Surgery may only be performed if it is necessary to save the animal's life or if it is absolutely necessary to prevent suffering. The specific time period a shelter must hold an animal before ownership of the animal reverts to the shelter is generally established in either the state's animal control statute, or by local ordinance. For instance, the Illinois Animal Control Act dictates that an animal who carries some indication of ownership, such as a microchip or rabies tag, must be held at least 7 days to allow for the owner to reclaim the animal (Illinois Animal Control Act, Section 10, 510 ILCS 5/10). During this period, no elective surgeries should be performed. Only those interventions necessary to save the animal's life and prevent suffering (alleviate pain) should be performed.

In the event of an owner relinquishment, the shelter should make every effort to obtain the owner's permission for the shelter to obtain the animal's medical records from the animal's former veterinarian. There should be language on the shelter's relinquishment form that the relinquishing owner can sign that allows the shelter to obtain the animal's records. Further, there should be a checklist on the form for the owner to relay any and all available information about the pet, both medical and behavioral, at the time of the relinquishment. Once the relinquishment form is signed and the animal is in the custody of the shelter, the shelter may spay or neuter the animal and perform and administer any and all medical services deemed necessary.

Services for an owned animal, be it at a spay/neuter clinic, vaccination clinic, microchip clinic, emergency veterinary care in an emergency or disaster situation, veterinary care extended to a member of the public's animal to avert crisis, or veterinary care for the personal animals of shelter staff or volunteers must be provided either by a licensed veterinarian or under the direct supervision of a licensed veterinarian. Every state's veterinary practice act stipulates

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that care can only be provided, and drugs prescribed, within the context of a veterinarian–client–patient relationship (VCPR). Thus, the elements of a VCPR must be present when any veterinary procedure is provided by a shelter to an owned animal.

The American Veterinary Medical Association (AVMA) provides the following definition of the VCPR: The VCPR is the basis for interaction among veterinarians, their clients, and their patients. A VCPR exists when all of the following conditions have been met:[1]

- The veterinarian has assumed responsibility for making clinical judgments regarding the health of the animal(s) and the need for medical treatment, and the client has agreed to follow the veterinarian's instructions.
- The veterinarian has sufficient knowledge of the animal(s) to initiate at least a general or preliminary diagnosis of the medical condition of the animal(s). This means that the veterinarian has recently seen and is personally acquainted with the keeping and care of the animal(s) by virtue of an examination of the animal(s), or by medically appropriate and timely visits to the premises where the animal(s) is(are) kept.
- The veterinarian is readily available, or has arranged for emergency coverage, for follow-up evaluation in the event of adverse reactions or the failure of the treatment regimen.

Medical records should be maintained that abide by the veterinary practice act's regulations.

Ownership will become an issue once again as the animal is leaving the shelter, when policies such as health guarantees, sending medicines home with a newly adopted animal, and trial adoptions come into play. These issues are addressed below.

VETERINARY MEDICINE PRACTICE ACTS

The practice of veterinary medicine is defined and governed by a state's Veterinary Practice Act. It defines what activities are considered the practice of veterinary medicine and who can perform them under what circumstances.

Most states' veterinary practice acts include exemptions, that is, create special circumstance wherein persons not licensed in the state or not holding a doctorate in veterinary medicine may perform the activities defined by the act as the practice of veterinary medicine. Many, if not every, state's practice act has an exemption for owners of animals. The Illinois Veterinary Medicine and Surgery Practice Act includes an owner exemption. 225 ILCS 115/4 states "Nothing in this Act shall apply to any of the following: An owner of an animal, or an agent of the owner acting with the owner's approval, in caring for, training, or treating an animal belonging to the owner, so long as that individual or agent does not represent himself or herself as a veterinarian or use any title associated with the practice of veterinary medicine or surgery or diagnose, prescribe drugs, or perform surgery. The agent shall provide the owner with a written statement summarizing the nature of the services provided and obtain a signed acknowledgment from the owner that they accept the services provided. . . ." Owners generally can obtain some vaccines and medications that are not regulated as controlled substances at local farm suppliers.

The owner exemption is pertinent because shelters own most of their animals, and thus should fall under this exemption. This is not always the case however, so veterinarians who work with shelters should be aware if and how their state's practice act addresses shelter work.

Further, some state veterinary practice acts have a specific exemption for government facilities, employees of licensed animal shelters, and approved humane investigators working under the indirect supervision of a licensed veterinarian. 225 ILCS 115/4 states "Nothing in this Act shall apply to any of the following: An approved humane investigator regulated under the Humane Care for Animals Act or employee of a shelter licensed under the Animal Welfare Act, working under the indirect supervision of a licensed veterinarian. . . ." 225 ILCS 115/3 defines indirect supervision to mean "the supervising veterinarian need not be on the premises, but has given either written or oral instructions for the treatment of the animal and is available by telephone or other form of communication." What is the benefit of such an exemption? In some states at least, the definition of the "practice of veterinary medicine" is broad, including such activities as "performing upon

1. http://www.avma.org/animal_health/vcpr_poster.pdf

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an animal any manual procedure for the diagnosis or treatment of pregnancy" and "determining the health and fitness of an animal." Shelter personnel conduct such activities and make such judgments daily. Such exemptions allow government facilities, shelter personnel, and humane investigators to care for their animals and conduct activities that inform them as to the health and fitness of the animals without running afoul of their states' veterinary practice acts.

And thus, many animal shelters provide care for their animals, perform day-to-day nonsurgical procedures and administer medications, including vaccinations, using shelter staff who are following protocols established by a licensed veterinarian and working under the veterinarian's indirect supervision. The ASV has established a written policy statement indicating that the association believes it is in the interest of community and animal health for every shelter to have a formal relationship with a veterinarian and that diagnosis and treatment of medical conditions in shelter animals should be performed only by veterinarians or under direct veterinary supervision, with limited exceptions. The full policy statement addresses all aspects of veterinary supervision in animal shelters and can be found at www.sheltervet.org, "Position Statements," *Veterinary Supervision in Animal Shelters*. In addition, the ASV used the phraseology "... in the interest of community...." This interest goes to the "public trust" responsibility of a nonprofit. Donors and the government entities that grant nonprofit and tax-exempt status expect shelter management to secure appropriate care for the animals in their charge.

The best practice with strays where ownership is yet unsettled is to administer care only under the direct supervision of a licensed veterinarian. However, in most shelter settings, this is impractical, which is yet another reason why some state veterinary practice acts provide exemptions for licensed shelter staff, certified humane investigators, certified or trained euthanasia technicians and government facilities. In most jurisdictions, however, rabies vaccinations must be administered by a licensed veterinarian only. The National Association of State Public Health Veterinarians (NASPHV) compiles a compendium on the management of rabies that is updated regularly and referred to by many states as a basis for their state regulations. It is important to note that although NASPHV recommends, "Rabies vaccinations may also be administered under the supervision of a veterinarian to animals held in animal control shelters before release" (http:/www.cdc.gov/mmwr/preview/mmwrhtml/rr5702al.html), these recommendations are not law. Shelters must check with their state or public health veterinarian to determine if rabies vaccinations can be *administered legally by shelter personnel*.

This section of the chapter concludes with one last important note with regard to state veterinary practice acts. In some states, state law prohibits nonprofit organizations from hiring veterinarians who will be treating animals owned by a person other than the shelter itself. This issue stems back to a historical requirement that once existed in most state practice acts that prevented non-veterinarian ownership of veterinary practices. The rationale was that veterinary medicine is a licensed and regulated business, and that the non-licensed veterinarian owners would impact the professional judgment of the licensed veterinarians (Guiducci, 2012). Veterinary medicine is not the only profession that prohibits ownership of a practice by a non-licensed professional. A law firm traditionally must be owned and managed by lawyers. Whereas lawyers work for corporations or nonprofits, their duties in that position do not include representing, advising, or working for clients other than their employer.

The status of prohibitions against ownership by non-veterinarians is evolving. In some states, the prohibition has been struck in its entirety. In other states, exceptions governing specific circumstances–such as nonprofit animal shelters–are written into the law. However, in some states the prohibition remains intact and is a significant issue for the state's shelters. This issue again highlights the need for an individual to be familiar with the applicable state veterinary practice act. The veterinarian's state veterinary association or state board are good sources of information regarding the specific requirements of that state's veterinary practice act.

CONTROLLED SUBSTANCES, EUTHANASIA

A certain percentage of the drugs used in the practice of veterinary medicine, and thus shelter medicine, are regulated as controlled substances and/or prescription drugs. Controlled substances are regulated due to the propensity for abuse. Both

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categories of drugs must be securely stored, and all use of such drugs must be accounted for. This is not to say that noncontrolled prescription drugs should be unaccounted for. In fact there is a myriad of reasons why all drugs maintained at a shelter should be accounted for both in medical records and drug logs. Anyone handling controlled substances is subject to a background check. There is an extensive set of federal and state regulations applicable to controlled substances and prescription drugs. The federal controlled substance statute, Title 21 USC, Sections 801-971of the United States Code, may be accessed at http://www.law.cornell.edu/uscode/text/21/chapter-13/subchapter-I; the federal controlled substance regulations, Title 21 USC, Sections 801–971 of the United States Code may be accessed at http://www.law.cornell.edu/uscode/text/21/chapter-13/subchapter-I.

Every veterinarian who orders, dispenses, prescribes, or administers a controlled substance must be registered with the federal Drug Enforcement Agency (DEA). The registered veterinarian is the one responsible for compliance with all applicable regulations. Wherever the controlled substances are stored, there needs to be a registered veterinarian on staff who is responsible for the controlled substances and adherence to the regulations.

It is considered a violation of the controlled substance regulations for a registered off-site veterinarian to order or transfer euthanasia solution to a shelter or government facility for the facility's use (Seibert, 2001). All euthanasia drugs must be shipped to and stored at the address listed on the veterinarian's DEA license.

In order to address shelter facilities that perform euthanasia and yet do not have a registered veterinarian on staff at the facility, the DEA may issue permits for the procurement, storage, and use of the drugs utilized for euthanasia directly to the facility. Such facilities must be regulated under state legislation as certified facilities with certified euthanasia personnel. This accommodation by the DEA has resulted in many states enacting legislation providing for such certification. As an example, see the Illinois Humane Euthanasia in Animal Shelters Act, 510 ILCS 72/1 *et seq*. Such legislation not only sets forth the requirements for the certification of the facility, and the training requirements and certification procedure for the euthanasia technician but also regulates what methods of euthanasia are allowed.

According to a compilation of "State Law Impacting Shelters," generated by the Humane Society of the United States and dated July 2010, 32 states in the nation have adopted statutes that license and certify shelter facilities for humane euthanasia by individually certified euthanasia personnel. Of these, 20 allow for access to ketamine, a pre-euthanasia drug. Another 16 states require certification of euthanasia personnel but do not require direct licensing of the facilities themselves. Of these 16, 6 allow access to ketamine.

Once a shelter is certified and issued a permit, it is of paramount importance to adhere to all requirements of federal and state permits and applicable regulations under state statute. A shelter can run afoul of these requirements by failing to properly implement the euthanasia methods established by statute. A complaint of failure can result in the shelter being placed under investigation. The regulatory agencies may temporarily suspend the shelter's permits pending completion of the investigation and any subsequent prosecution. Any question regarding the integrity of personnel at the shelter, given that these drugs are controlled on the basis of their propensity to be abused, may have the same result. The above holds true even if a veterinarian is on staff and serving as the registered agent for all controlled substances and prescription drugs. It is absolutely critical that all methods and procedures, and all personnel who have access to these substances, be held to the letter of the law. The security of these substances is critical and must be foolproof in prohibiting access to anyone but authorized personnel. Furthermore, every shelter must have very strict supervision of and a quality control program in place for everyone and anyone who has access to controlled substances and prescribed drugs, including board members, veterinarians, and any personnel unaccustomed to taking direction from others in the shelter hierarchy.

The shelter veterinarian or volunteer veterinarians must themselves be knowledgeable of all current requirements of the law, including the type and length of time drug records must be maintained and any newly enacted euthanasia statute requirements. They absolutely cannot use outdated or irregular practices in such a highly regulated environment. It

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cannot be stressed enough that ultimately the responsibility for the disposition of all controlled drugs, including pre-euthanasia drugs such as ketamine or Telazol® falls to the veterinarian regardless of his or her employment status (full or part time, per diem or volunteer) at the shelter. Veterinarians should insist upon strict control over who has access to controlled drugs, how they are received and stored, how euthanasia is performed, and the maintenance and storage of the written records and log books regarding the receipt and dispensing of the drugs to each individual animal.

There is nothing more emotionally charged for shelters than the practice of euthanasia. If a member of the public, a volunteer, a donor, or a staff member even suspects a deviance from the regulations, the shelter can be assured that person will feel compelled to register a formal complaint—as perhaps should be the case from an ethical standpoint as well as in the interest of the public trust. Complaints about breaches of proper euthanasia protocol, regardless of the methodology (carbon monoxide chamber or injection), may result in cruelty charges being filed and may have a dire impact on the veterinarian's license as well as on the shelter's ability to fulfill its mission.

HEALTH GUARANTEES, CARE OF NEWLY ADOPTED ANIMALS, TRIAL ADOPTIONS

Health Guarantees and Care of Newly Adopted Animals

Many shelters offer limited health guarantees for newly adopted animals. For example, a shelter may include in its adoption contract a provision that should it become apparent within, for instance, 7 days of the date of adoption, that the animal has a condition that he or she either had while at the shelter or contracted at the shelter, the adopter may return the animal for a full refund, obtain treatment for the condition by the shelter via a veterinarian designated by the shelter, or in some cases, receive reimbursement for some of the expenses for emergency veterinary care that was required when the shelter was closed.

There are instances where an animal is adopted with a disclosed condition and the adopter has acknowledged and yet agreed to adopt the animal with the known condition. In such an instance, the shelter may send medications home with the adopted animal.

Further, some states that formerly prohibited the practice of transferring animals with infectious diseases will now allow shelters to adopt such animals out as long as it done under terms and conditions of full disclosure. 225 ILCS 605/3.3 states "Adoption of dogs and cats: An animal shelter or animal control facility may adopt out any dog or cat who is not free of disease, injury, or abnormality if the disease, injury, or abnormality is disclosed in writing to the adopter, and the animal shelter or animal control facility allows the adopter to return the animal to the animal shelter or animal control facility." In such instances, the shelter may send medications home with the adopted animal.

In all three scenarios, diagnosis, treatment, and the dispensing and prescribing of drugs can only be performed by a licensed veterinarian or under the direct supervision of a licensed veterinarian. This is true even if the drugs being dispensed are to complete a treatment protocol initiated by an unlicensed individual while the animal was in the shelter and the adopter understands and is willing to accept the animal with the condition. Shelter staff may not provide these services to what are now owned animals. Therefore, as soon as it appears that the adoption of such an animal may be finalized, the animal and his or her medical record should be examined and reviewed by a licensed veterinarian who will then prescribe the medication to be sent home with the animal. As soon as that adoption contract is finalized and/or the adoption fee paid, ownership is transferred and the status of the animal changes. If an adopter invokes the health guarantee, the evaluation and care of the animal must be performed by a licensed veterinarian.

Furthermore, adopters must be counseled with regard to immediately establishing an animal's VCPR with their own veterinarian in order to properly maintain prescriptions and care. Animal medical records should be promptly transferred to the adopter to facilitate immediate establishment of a VCPR with his or her personal veterinarian.

Trial Adoptions

Trial adoptions are a shelter lawyer's nightmare. Why? Because the transfer of liability for an animal goes hand in hand with the clear and clean transfer

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of ownership in that animal. Trial adoptions have become fairly prevalent among some shelters. They occur when potential adopters would like to try an animal in their home for a period of time before finalizing the adoption. It is highly recommended that the shelter develop a written agreement with the trial home that will remain in effect for the duration of the trial. This agreement might be similar to the written agreement the shelter has with its foster homes.

A foster home is a private household that houses animals that are in the care of or are owned by an animal welfare organization. Some rescue organizations are solely foster networks; they do not have a central shelter. All of their animals are maintained in foster homes. Many shelters have affiliated foster homes that provide care for the organization's animals. Such homes allow the organization to expand its capacity, allow animals to be socialized to family life, or they may provide 24-hour care for animals such as bottle-feeding kittens. Generally, the organization has a long-standing relationship with its foster homes and the organization and home are functioning under a formal agreement of shared responsibility.

Contrast such a relationship with a trial home. A shelter generally has no previous relationship with the trial home, and unless the shelter does pre-adoption home visits, the shelter is wholly unfamiliar with the household other than the information provided on the adoption application.

Issues that must be addressed with the trial home are all particulars of care, including veterinary care. The animal remains in the ownership of the shelter, yet all custody and control of the animal exists in the trial home. Should the animal become sick or injured, it does so in the hands of this trial home. Should there be behavioral problems in the trial home, the animal is still owned by the shelter yet the shelter has no custody or control of the animal through which to address the behavior issues. In essence, the shelter still has liability for all health and behavior issues, but no actual control. The shelter's trial home written agreement must include conditions upon which the trial home agrees to end the trial and return the animal to the shelter, thereby withdrawing its adoption application.

From a health and veterinary care standpoint, the shelter can stipulate in the trial home agreement that all care is to be provided by a veterinarian designated by the shelter. Alternatively, the shelter can stipulate in the trial adoption agreement that the trial home is responsible for all veterinary care while the animal is in their custody and control. If the trial home is responsible for providing care, the shelter should set out in writing the level of care that must be maintained, including preventatives, vaccines, nutrition, even grooming. In addition, the trial home must give permission for the shelter to obtain all medical records generated for the animal while in the trial home, should the animal be returned to the shelter for any reason during the trial period. Another healthcare issue that needs to be addressed is what is to occur in the event the trial home's existing animals become ill due to the presence of the shelter's animal in the home. The trial home brought the new animal into their home with the intention to adopt, so any incidence of transferred illness should be a matter of the trial home's own risk. It is best if that is clearly stated.

Behavioral issues are more problematic. Behavioral issues must be evaluated and treated by proper handling of the animal. If the trial home has behavioral issues with the animal, it is best to end the arrangement immediately and have the trial home return the animal to the shelter. The trial home should only be allowed to take custody and control of any animal if, and only if, they agree to accept all liability and indemnify the shelter for any behavioral problem that might occur while the animal is in the trial home's custody and control. If the animal is a dog, the trial adopters should provide the shelter with confirmation that their homeowner's insurance carrier has been made aware of the existence of the new animal in the home as well as the trial home's agreement to accept liability and indemnify the shelter. Even with such an agreement, nothing stops an injured party, or a municipality in the event of a public safety problem, from making a claim against or filing a lawsuit against the shelter, since the shelter still owns the animal.

Most animal control ordinances that govern bite situations, both dog-on-human and dog-on-dog or dog-on-other domestic animal, define "owner" to include anyone who has a right of ownership of the animal and/or had the animal in his or her care or custody at the time of the incident. Thus, in the course of a trial adoption, if an incident results in a municipality taking action in the interest of public health

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and safety, potentially both the entity that had physical control of the animal and the actual owner of the animal will be charged with the offense. If a third party is involved in the incident and a civil action is filed, again, potentially both the person with physical control of the animal and anyone with an ownership interest in the animal may be named in the suit.

In reality, few shelters have written trial adoption agreements in place, nor is there any consultation with insurance carriers. However, shelter management and shelter veterinarians are wise to indeed address the legal issues set forth above. Further, this highlights the need for expertise, care, and consideration in the placement of animals. There is much debate in the world of sheltering regarding what are known as "open" adoptions versus adoptions that receive greater scrutiny, such as reference checks, pre-placement home visits, and follow-up phone calls and visits. The list of issues that can arise in the placement and transfer of animals into private homes demonstrates that an ounce of precaution and the investment of experience and expertise in placing an animal go a long way toward making an appropriate, long-lasting placement. If a shelter feels a home just is not right for any one individual animal, saying "no" to the placement is prudent. The animal is the property of the shelter, and the shelter has every right to decline an adoption application. This holds true for public shelters as well as private shelters.

FOSTER HOMES

Foster homes, in some states, have to be individually licensed as affiliates of a licensed shelter. They must make themselves available for inspection by the licensing agency, and follow state requirements for foster homes. These requirements may include such provisions as a limit to the number of shelter animals that can be maintained in one home, and a provision that the home have the capability to maintain the fostered animals separately if necessary.

Shelters are advised to have a written agreement in place with each of its foster homes that clearly defines the responsibilities of each entity. Sample and model agreements are available (Animal Legal Defense Fund; HSUS). If an individual animal requires particular care, it might be wise to include an addendum to the foster home's general agreement to be in effect during the tenure of care for the particular animal.

Shelters need to anticipate what liability and responsibility each entity will have in the event of a behavioral problem with a fostered animal. The shelter should be ever vigilant in its efforts to make sure animals placed in any one foster home are appropriate for that individual foster home. The best policy is to take all precautions possible to avoid and prevent any incident from ever occurring in one of the organization's foster homes. Insurance carriers for both the shelter's umbrella liability and the foster home's homeowners insurance should be alerted to the relationship and consulted. Generally, the many benefits of fostering an animal far outweigh the rather remote chance of an incident resulting in injury or damage. However, the handling of rescue animals is inherently a fairly risky business, so all parties should be well versed in the ultimate responsibilities and liabilities in the unfortunate event of an incident.

As stated above, for most animal control ordinances that govern bite situations, whether dog-on-human, dog-on-dog or dog-on-other domestic animal, the definition of "owner" includes anyone who has a right of ownership in the animal and/or had the animal in his or her care or custody at the time of the incident. Thus, if an incident results in a county or municipality taking action in the interest of public health and safety, potentially both the entity that had physical control of the animal and the actual owner of the animal will be charged with the offense. If a third party is involved in the incident, and a civil action is filed, again, potentially both the person with physical control of the animal and anyone with an ownership interest in the animal may be named in the suit. Therefore, whether or not there is an agreement regarding liability between the foster home and the shelter, both most likely will be named in any action stemming from the incident. The key question is whether one party has agreed to indemnify the other.

Medical issues that arise with foster homes include the shelter's responsibility to provide and ensure that preventatives are being administered, that all fosters are kept up to date on vaccines and that the home is keeping the shelter advised of all medical and wellness developments. The shelter must provide all necessary medical treatment. The foster home must have adequate space for the foster animal and be able to provide him or her with sufficient exercise and mental stimulation. The foster home must provide good-quality food if the shelter is not supplying food

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for the animal. It should be determined which entity will be responsible for providing for the animal's grooming requirements. The foster home should be provided a copy of the animal's current medical record by the shelter, so the foster home has it readily on hand. The shelter should provide for 24/7 access to emergency care for the fostered animal. Shelter personnel should be in regular (weekly) contact with each foster home, and make periodic visits.

It is extremely important that disease not be transmitted between shelter and foster home environments. Biosafety measures that should be taken are described in the sanitation and infectious disease section of this textbook.

An agreement should be in place as to which entity is responsible for expenses in the event the foster home's personal animals become ill due to exposure to the foster animal, or are injured by the foster animal. In order to minimize the risk of disease transmission to the foster home's pets, the shelter's veterinarian should prepare a list of required vaccinations and deworming protocols for all foster caregivers to provide to their own veterinarians for any current pets, in addition to information about any current disease concerns the shelter may be experiencing. Being up to date with these requirements should be incorporated as a requirement in the foster home written agreement. In the case of foster homes taking in animals rescued from national disasters in other areas of the country, the fosterer's personal animals may be exposed to bacteria or viruses to which they have no immunity. This risk should be taken into consideration when placing rescued animals into foster care.

ADOPTION

One of the greatest concerns of any shelter's board of directors, as well as senior and professional staff involved in the evaluation of animals, is the extent of the shelter's liability once an animal is placed in an adoptive home. This is the key: A shelter must gather all possible available information regarding the health, temperament, and history of the animal, document it, and fully disclose all such information to the adoptive home prior to any commitment on the part of the home to adopt the animal.

The shelter should document all observations and all information provided by the animal's previous owners. The shelter should observe the animal while he or she is in its care and document those observations. The shelter should disclose all known facts to the new owner, including information received from the previous owner, and observations made and documented while in the custody of the shelter (Lutz, 2012). Some state shelter regulatory requirements dictate the bare minimum information the shelter must disclose. The law concerned with transfer of ownership and thus liability dictates that the shelter disclose ***all*** known information about the animal. Liability may result if the shelter negligently or knowingly omits facts.

The critical step in the adoption process is the transfer of ownership of the animal, fully and finally, to the new owner. If the shelter has made a full disclosure, and has cleanly transferred all rights of ownership in that animal, once the animal is in the adoptive home the shelter no longer has custody or control of the animal or any right of or interest in ownership of the animal. Whether your state follows strict liability or the "one bite" rule, the liability for a dog bite is now on the owner. What is the "one bite" rule? In common law, before animal control statutes came into being, the courts would allow any dog one free bite, so to speak. If the dog became a repeat offender, the owner was charged with having knowledge of the animal's propensity to bite and was thus held liable for the actions of the animal.

Very little will stop a third party from naming the shelter in a lawsuit. If nothing else, an injured party is likely to sue under the legal theory of joint and several liability. When two parties (e.g., the current owner and the shelter) are held liable for an injury, depending on the state's tort system, the damages can be split either so both have responsibility in relation to their contribution to the injury, or so that the damages are paid by the party most able to pay, or somewhere in-between. However, if shelters observe, document and disclose information about an animal's medical and behavioral health prior to transfer, they will be in a good position to avoid liability and greatly decrease their chances of being on the wrong side of a lawsuit.

It is recommended that every shelter's adoption contract include a "release and indemnification" clause, such as the following:

> *I/We understand that _____ makes no guarantees or warranties regarding the health or temperament of this*

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animal. I/We promise and agree to be solely responsible for this animal, and to indemnify and hold harmless _____ from any and all claims of liability for the conduct of this animal on or after the date of this adoption. This Release of Liability and Indemnification shall apply to all known, unknown and unanticipated damages resulting from my/our adoption, ownership or control of such animal.

In many cases in which shelters are named in lawsuits, they are named because they failed to disclose information, or perhaps the shelter had animal control responsibilities wherein it failed to properly execute its duties. For instance, failure to properly execute duties may be found when the animal control agency knowingly and recklessly failed to conduct itself in a diligent manner when performing an act that resulted in the adoption of the animal. An example would be animal control personnel who knew an animal had been involved in unprovoked aggressive behavior and yet adopted the animal to an unknowing home. In such an instance, the animal control personnel knowingly and recklessly failed in their duties to responsibly handle an animal known to be potentially dangerous, and also failed to disclose information regarding the animal's temperament. When evaluating any particular case, it is crucial that one properly identify the specific facts in the case that resulted in the shelter itself being named as potentially liable, or ultimately held liable. It is invalid to assume it was the mere fact the adopted animal was involved in a bite incident.

CRUELTY/NEGLECT INVESTIGATIONS, MASS INTAKES, AND ANIMAL VICTIMS OF DOMESTIC VIOLENCE

In shelter medicine, in addition to being asked to ensure the health and wellness of a population of dogs, cats, and other animals, veterinarians also play one of the leading roles in "Companion Animal CSI" (crime scene investigation). Fortunately, excellent references are available today, which was not the case for shelter veterinarians just a few years back.

Many of today's shelters either partner with local law enforcement and/or regulatory units, or have their own humane investigators or animal control officers who participate in the investigation of animal cruelty and neglect cases, including cases of collectors/hoarders and commercial establishments gone awry.

Cruelty/Neglect Investigations

It would behoove any veterinary professional who will be directly involved in animal cruelty work to become familiar with all applicable state and local cruelty provisions as well as applicable provisions of the state veterinary practice act as soon as possible. For more detailed information, please see the chapters in the section on animal cruelty in this textbook.

Under most cruelty statutes there is a state agency that has primary jurisdiction for animal welfare regulation, generally the state department of agriculture, but the statute will also allow for enforcement by credentialed animal control officers and/or humane investigators and law enforcement. In New York, any and all duly appointed law enforcement officers are authorized, and indeed required to enforce the cruelty statutes. Often in New York, for example, particularly in a case of any size, the veterinarian may be working with all four agencies. It is important to determine as quickly as possible who handles the investigation of animal cruelty cases in the shelter's jurisdiction and what role the shelter and veterinarian have traditionally played in these matters.

In the progressive chronology of an investigation case, the first place the investigators will require veterinary assistance is in the evaluation of the conditions of subject animals in the field. Before leaving for the subject location, information should be provided by the investigators to the veterinarian regarding access to the scene of an alleged neglect or cruelty case. Each statute defines the investigator's authority. All statutes will guarantee an individual's constitutional rights. One can never go into a dwelling, or an area called a curtilage, without either consent or a warrant or other special circumstance clearly in place. There needs to be a very well-thought-out plan prior to entering upon any property. The investigators must make sure that everyone's role is clearly defined, specify what is needed from each person, and explain clearly what can and cannot be done. The role of the veterinarian in cruelty cases is to evaluate the condition of the animal and provide documentation of that condition, and ultimately testify at trial, if the case goes to trial, as an expert

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witness. The chief law enforcement officer in any county is the state's attorney or district attorney, whatever the elected prosecutor might be called. He or she ultimately determines how a case is to be assembled. The investigators who are working on the case must satisfy him or her that this is a case he or she can take to court and successfully prosecute. The veterinarian's and investigators' documentation will accompany photographs of the animal and photographs of the environment in which the animal is being kept. Photographs can make or break a case. It is always wise for shelter veterinarians to be able to take their own photographs as they are evaluating the animal. If not taking their own photographs, the shelter veterinarian should not hesitate to point out crucial features that illustrate an injury or condition to whomever is taking photographs, in order to ensure that documentation is available for the case. Concurrent with a medical evaluation, the subject animal should undergo a very thorough and detailed behavioral evaluation. Written medical and behavior evaluation documentation should be supplied to the prosecutor as soon as possible. In the course of the investigation, the investigator will also produce a site sketch, so that the trier of fact—a judge or jury—can clearly visualize the scene of the incident or the environment in which the animals were kept. The investigator will also seek to interview any and all witnesses who might have information relevant to the neglect or cruelty, including the individuals allegedly responsible.

It is beyond the scope of this chapter to provide the details involved in the complete investigation of an animal cruelty case. There are many veterinary forensics resources available today. For more information please see the animal cruelty section in this textbook.

Animal Hoarding

More complicated levels of abuse and neglect occur when the case involves a large number of animals, either as the result of the phenomenon of hoarding, formerly known as collecting, or in the event of an enterprise, be it nonprofit or commercial, going awry. In these instances, the veterinarians are not only called upon to evaluate the animals and document their environment, condition, and care, but in unfortunately too many of these cases, they are also called upon to triage, meaning assign priorities of medical treatment to the subject animals on the basis of urgency and chance of survival. In some instances, triage may result in some animals being euthanized in the field.

Quite often entry onto the property will occur under warrant when a large number of animals are involved, but not always. If the investigators suspect animals will be encountered in severe enough condition to warrant euthanasia, ideally this probability has been addressed with the judge at the time he or she issued the warrant. Whether it has been addressed in the warrant or not, the key is to document, document, document. The warrant will require that the investigators account for every animal identified on site. The warrant may allow for impoundment on site, which means that rather than move all the animals, the site will be secured, the animals will remain, and treatment and care will be provided on site.

Treatment to prevent suffering and death, and to maintain the status quo of a healthful environment at whatever location the animals are to be kept is an allowable level of treatment and care while the animals are in the shelter's custody and the case is pending. If there is any question as to whether an animal can be cared for in a particular manner or administered any treatment, or if the animal might benefit from surgery, the question should be raised with the prosecutor who, in turn, may petition the court for a decision.

Some states, such as Illinois, have provided for the posting of a security bond and/or forfeiture of the animals while the case is pending (510 ILCS 70/3.04). The security bond is addressed in 30-day increments, requiring the owner of the animals to post bond to pay for the care of the animals or to forfeit them. In determining the amount of the bond, the court will require a cost accounting from the shelter for the amount necessary for the care of the animals. (See the chapter on animal hoarding for more information about this problem.)

Animal Victims of Domestic Violence

Cross-disciplinary social services and law enforcement partnering has resulted in greater attention being placed on animals who are the subject of abuse as a result of domestic violence. States are now adopting statutes that allow for orders of protection for pets (Welch, 2009). Animal shelters are working in conjunction with women's shelters to provide

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safe harbor during the initial stages of these cases. Again, shelter veterinarians are asked to evaluate the animals as they are removed from such homes. Such evaluations may then be used not only as evidence in the prosecution of animal abuse but also as evidence of emotional and psychological abuse between human family members.

Just as with any abuse case, the shelter must remain in communication with the prosecutor regarding the status of the animal if the animal came to the shelter as the result of a case of domestic violence. The animal should not be released to either partner until the release is approved by the prosecutor. If the animal was not abused, but merely removed from the home to the safe haven of a shelter under an order of protection, the court must also be involved in the release of the animal. If there is any question as to the status of the animal or as to which partner will ultimately have custody of the animal, the shelter should involve the local prosecutor in the matter.

Shelter veterinarians assisting with cruelty and abuse investigations need to anticipate the unimaginable, and be prepared to obtain all relevant evidence. Cases of bestiality, also known as animal sexual assault, unfortunately, do occur and are not as rare as one would hope. In one local case in Illinois, the animal control veterinarian, having to respond with no notice in the instance of such a case, sought a rape kit from the local hospital as a resource in gathering evidence.

MANDATED REPORTING OF SUSPECTED ANIMAL ABUSE AND PRIVACY LAWS

In many states, provisions have been enacted requiring veterinarians to report injuries most likely to be the result of animal fighting and cruelty [225 ILCS 115/25(1) GG), 51-ILCS 70/10(b)]. Most mandatory reporting provisions provide for immunity to the veterinarian for reporting such instances. Not only should a shelter veterinarian be aware of such requirements should an animal be relinquished to a shelter who obviously is the subject of such abuse, but it is important that shelter veterinarians alert their colleagues in private practice to such requirements so that the local private practices know who to report such cases to, and how.

Case investigation can become quite complicated when various privacy laws come into play. In a recent case in Illinois, the perpetrator of the abuse was under mental health care. Her employer was a veterinary clinic. The clinic was aware of the abuse, but initially felt it could not participate in the investigation due to health privacy requirements. The abuse was believed to be the result of the underlying mental health condition. Employers, in some instances, can be impacted by requirements applicable to covered entities (entity providing healthcare) under the Health Insurance Portability and Accountability Act of 1996 (HIPAA). This might happen if the employer is an intermediary between the employee and the entity providing care, or is self-insured. In this instance, the employee's behavior associated with the mental health condition was the basis for the investigation. The clinic was unaware of its duty to report and participate in an investigation of aggravated cruelty. Once the clinic's lawyers reviewed the state's veterinary practice act's "duty to report" provision, they issued an opinion to the clinic that the clinic should participate in the cruelty investigation. The clinic's participation in the cruelty investigation was critical to the successful prosecution of the case.

Animal Fighting

A discussion on cruelty investigation is not complete without a discussion about animal fighting, most often seen in the form of dog fighting. Shelter humane investigators who are not peace officers must refer these cases to local and regional law enforcement. Gambling, guns, gang involvement, drugs, and high-stakes trafficking in the animals themselves are part of animal fighting. However, the animals will ultimately be handled by a public animal control facility or a private shelter. Each and every animal must be evaluated, their conditions thoroughly documented, and, in some cases, the animals must be treated, and in the more extreme situations, triaged. Unless the prosecutor can obtain court-ordered forfeiture of the animals, the animals will have to be maintained during the pendency of the case. Heightened awareness of the pervasiveness of animal fighting, and the need to address it, have resulted in the development of local, state, regional, and national organizations that are adept at handling these animals. These organizations should be contacted immediately for the benefit of their expertise and also for the benefit of any resources they might

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be able to bring to bear in the maintenance and ultimate disposition of the animals (see the chapter on animal behavior forensics for more information).

The shelter veterinarian should anticipate that he or she will be called to assist with an animal fighting case; it would be wise to help coordinate training and pre-planning with local law enforcement and shelter personnel so that a plan is in place for the day the call comes in. See the chapters in the animal cruelty section for related information.

NATURAL DISASTERS, EMERGENCY RESPONSE

Whether a shelter volunteers to assist with an emergency or disaster, or is obligated to assist because the disaster is in the shelter's own community, the legal issues a shelter is going to be faced with include the handling and treatment of owned animals, and managing the challenges and risks of handling an unusual number of animals safely and competently.

First, just a word about extending services in a single instance of emergency response, that is, an incident not necessarily involving a large number of animals. Shelter veterinarians have the same Good Samaritan immunity as any other veterinarian in an instance of emergency response (See 510 ILCS 70/16.5). What follows is a discussion regarding response to natural disasters or other community crisis.

Planning and Resources

Organization, documentation, supervision, and the garnering of sufficient resources is crucial to manage the risk that is inherent in crisis response. Planning resources are available from many organizations (ASPCA, 2012; HSUS, 2012). Every shelter should have its own emergency plan and should participate in community disaster planning. The Pets Evacuation and Transportation Standards (PETS) Act of 2006 states that regional planning authorities and communities must now take companion animals into account in their emergency response planning. Every animal shelter should be an active participant in such planning efforts.

Most states have a statewide organized veterinary emergency response team, coordinated and trained through the state department of agriculture and Federal Emergency Management Authority (FEMA). Professionally, veterinarians are asked to recognize an ethical responsibility to respond to an emergency circumstance. A shelter should never hesitate to ask for assistance from the local veterinary community during a disaster response. Behavioral specialists and dog trainers are another community resource that may be of assistance when a shelter is faced with evaluating, handling, and caring for a large number of animals for the duration of disaster recovery. Many regional and national organizations now have emergency response assistance programs and teams that provide disaster relief assistance. It is crucial that a shelter garners sufficient resources to address the crisis at hand.

A system of forms is crucial to document all services, care, and observations made of the animals while in the custody of the shelter. Due to the sheer number of animals involved, the stress from the original disaster and separation from home, the many stresses of living in a temporary facility, as well as the threat of an outbreak of disease under such conditions, the shelter should take extra steps to monitor and document all indicators of health and behavior in each animal through the course of the day.

Often a shelter will accept the help of many new volunteers during a period of disaster relief. The volunteers should be asked to provide complete personal information and also sign a release of liability, and perhaps even an indemnification agreement. If a shelter recruits additional foster homes to house animals during a period of disaster relief, these homes must be certified by the state, if such is required, and enter into the shelter's customary foster home agreement. A key component of the agreement must include agreement to relinquish animals to their legal owners.

All of the additional activity, volunteers, and facilities, including additional foster homes, require supervision. If a shelter is unable to adequately manage the undertaking on its own, national animal welfare organizations have trained disaster and emergency response personnel who can help supervise and manage such an effort. In the wake of Hurricanes Katrina and Rita, the National Animal Rescue and Sheltering Coalition (NARSC; www.NARSC.net) was formed to develop protocols and practices, and coordinate response to large-scale natural disasters and significant hoarding and animal cruelty interventions. Not only has the size of a shelter's operation under such circumstance often doubled or tripled,

but many of these additional resources are functioning in this capacity for the first time. Supervision and management are of paramount importance for successful operations.

Issues of Ownership

If a shelter is responding to a disaster in its own community, the first thing that must be done is to establish whether the animal for whom emergency services are being extended is owned, if ownership is unknown or unsettled, or if it is a relinquishment.

If the animal is owned, the shelter must obtain permission to care for and treat the animal, obtain a release of liability and even indemnification in consideration for the emergency services, and gain all available information, such as medical history, contact information, and an agreement as to a definite term at the end of which, unless renewed, the animal will be forfeited to the shelter. The owner should be required to cover the costs of care to the extent he or she is able to do so.

If ownership is unknown or unsettled, the animal is handled as a stray until claimed. If the animal is claimed and yet the owner is unable to care for him or her, the owner either needs to enter into an owned animal agreement, described above, or relinquish the animal.

Immediately upon intake, a licensed veterinarian should examine any and all animals entering a shelter's custody as part of the disaster relief effort. Whether the animal is owned, of unsettled or unknown ownership, or relinquished, each intake should be thoroughly evaluated and documented. Photographs should be taken of the animal, not only for the purpose of identification but to document the condition of the animal upon intake. Some form of physical identification should be securely placed on the animal for ready identification and minimization of error as to the animal's identity and to help ensure proper administration of care for the individual animal. Unless the state deems otherwise or an exception is made to the veterinary practice act because of the disaster or emergency, all vaccinations and preventative medications necessary to maintain the animal in the shelter environment should be administered or directed by a veterinarian licensed to practice in that state. For the duration of time the animal remains in the custody of the shelter, all aspects of care and handling should be documented. Ideally, a licensed veterinarian will view each animal daily and review the ongoing documentation of his or her condition.

Disasters Outside the Shelter Community

If a shelter is likely to assist with regional, national, or international disaster relief efforts, shelter personnel must understand state and national border health regulatory requirements, and the shelter must protect itself with proper intake documentation, releases, and indemnification agreements. The animals should arrive with health and vaccination certifications, medical records, behavior evaluations if available, documentation of ownership, and a relinquishment release from the source to the receiving shelter. Animals coming from a distance, under stressful conditions, should be evaluated by a licensed veterinarian upon intake, and remain under the care of a licensed veterinarian for a period of time equivalent to customary quarantine precautions. They may arrive with or be incubating diseases to which local animals have no immunity. The stress of transport, or multiple transfers between facilities, may weaken the animals and result in a compromised immune system and increased susceptibility to disease.

All of this is important from a legal perspective because proper planning and management are important elements in managing a shelter's risk in meeting its core mission, which may include disaster relief for its local community, and may be broad enough to include taking on such projects as assisting in regional, national, or international disaster relief efforts. If a shelter tries to do too much, and fails, it can find itself in trouble with its licensing agency, the state's attorney general's office with oversight for charitable trusts, its insurance carrier, a third party who believes himself or herself to be harmed by the shelter's failure, or with a particularly litigious donor or volunteer who feels the shelter has failed to live up to its stated mission or public trust responsibilities. If the shelter was negligent or reckless in its actions, it may be liable. For more information, see the chapter on disaster and emergency planning and response for animal shelters.

CHARITABLE IMMUNITY NO MORE

Years ago, and yet it seems to remain in the general populace's subconscious, there existed a legal

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doctrine of "charitable immunity" (Nonprofit Risk Management Center, 2012b). It was a doctrine that relieved a charity of a tort. As stated at the beginning of this chapter, a tort is a private or civil wrong or injury for which the law provides for damages. Charitable immunity was long recognized, but according to Black's Law Dictionary, 6th edition, currently most states have abrogated or restricted such immunity.

Even though the immunity has been whittled away, most people are very reluctant to sue a nonprofit and most are extremely tolerant and forgiving of any failing on the part of a nonprofit. A person may complain, write a letter to the editor, yell and scream at the shelter staff, and threaten to sue, but fairly seldom are shelters actually sued nor do they often become the subject of a serious regulatory investigation.

It is stated best in "Myths About Nonprofit Liability and Risk Management" (Nonprofit Risk Management Center, 2012a), "... although lawsuits are not that common, when they do occur, they can be devastating to an organization's finances and credibility. No wonder the possibility of such action is on the minds of many nonprofit managers. One way to reduce the chance of being sued is to recognize and manage your organization's risks. Non-profits work to improve the quality of life, not endanger it. When organizations strive to protect their people and conserve their resources, they also reduce their chance of being on the wrong side of the 80–20 rule." (In the insurance industry, the 80–20 rule holds that 80% of the losses come from 20% of the policyholders.)

CONCLUSION

This chapter is intended to provide a general overview of how the law interfaces with the practice of shelter medicine. The practice of law is conducted on a case-by-case basis, and thus every factual situation with legal implications must be individually evaluated by legal counsel. As is evident from the foregoing, shelters are regulated entities, most operate as a public trust, they are always in the public eye and their work involves a fair amount of risk. Shelters perform a tremendous service for local communities. It is important that professionals who dedicate their lives to such service be as well versed as possible on every aspect of the many facets of this important work.

REFERENCES

American Bar Association (2002) *Guidebook for Directors of Nonprofit Corporations*, 2nd edn (eds J.C. Frey and G.W. Overton), Committee on Nonprofit Corporations, Section of Business Law, American Bar Association, Chicago, IL.

Animal Legal Defense Fund. *Foster Care Agreement*, www.aldf.org/downloads/samplefosteragreement.pdf (accessed September 2005).

ASPCA (American Society for the Prevention of Cruelty to Animals) (2012) *Shelter Disaster Planning: Step by Step*, www.aspcapro.org/shelter-disaster-planning-step-by-step.php (accessed June 21, 2012.

ASV (Association of Shelter Veterinarians) (2010) http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 Accessed August 27, 2012.

Guiducci, E.J., J.D. (2012) *Options for Non-Veterinarians to Legally Own and Operate a Veterinary Practice*, http://www.guiduccilaw.com/Pages/gry77.html (accessed June21, 2012).

HSUS (Humane Society of the United States) (2012) *Emergency Services, Includes Sample Forms*, http://www.animalsheltering.org/how-we-help/get-help/emergency_services.html (accessed June21, 2012).

HSUS (2012) *Foster Care Agreement Between Shelter and Foster Caregiver*, http://www.animalsheltering.org/resources/sample/volunteer-management-samples/foster_agreement_shelter_owner_1.pdf (accessed June 21, 2012).

IRS (Internal Revenue Service) (2008–2011) *Form 990 Redesign for Tax Year 2008 (Filed in 2009): Frequently Asked Questions*, http://www.nolo.com/legal-encyclopedia/nonprofits-revised-irs-form-990-30274.html (accessed June 21, 2012).

Lutz, B.L. (2012) *Esq., Don't Let Liability 'Hysteria' Keep You From Sending Good Dogs Home*, www.partnersinshelterservices.org/pages/materials.html.

Nonprofit Risk Management Center (2012) *Risk Management Basics*, http://www.nonprofitrisk.org/library/articles/articles.shtml#basics (accessed June 21, 2012).

Nonprofit Risk Management Center (2012a) *Myths about Nonprofit Liability and Risk Management*, http://www.nonprofitrisk.org/library/articles/articles.shtml#basics (accessed June 21, 2012).

Nonprofit Risk Management Center (2012b) *Liability Basics for Nonprofit Organizations*, http://www.nonprofitrisk.org/library/articles/articles.shtml#basics (accessed June 21, 2012).

Nonprofit Risk Management Center (2012c) *Resources for Developing or Revising Conflict of Interest Policies*, http://www.nonprofitrisk.org/library/articles/articles.shtml#basics (accessed June 21, 2012).

Seibert, P.J. Jr., CVT. (2001) *Keeping Controlled Drugs under Control*, Atlantic Coast Veterinary Conference, CITY/STATE TK, http://www.vin.com/VINDBPub/SearchPB/Proceedings/PR05000/PR00494.htm.

Welch, R.F. (2009) *Domestic Violence and Pets: List of States that Include Pets in Protection Orders*, Animal Legal & Historical Center, Michigan State University College of Law, www.animallaw.info; see also Illinois' statute providing for companion animal protective orders: 725 ILCS 5/112A-14.

Wolf, T. (1999) Chapter 2: The board, in *Managing a Nonprofit Organization in the Twenty-First Century*, A Fireside Book, Simon & Shuster, New York, NY.

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Appendix 6.1

Microchip Clinic [Date of Event]

Owner's Name: _____

Address: _____

City: _____ State: _____

Zip: _____ Owner's Home Phone: _____

Owner's Other Phone: _____

Type of Pet: Dog _____ Cat _____ Other _____

Pet's Name: _____

Pet's Gender: _____ Intact: Yes _____ No _____

Breed: _____ Color/Description: _____

Age: _____ Approx. Weight _____

Consent and Waiver of Liability

I hereby authorize the volunteer veterinarians and volunteer veterinary technicians to implant a microchip subcutaneously in the animal described above.

I understand that there may occasionally be some inherent risk of side effects observed in my pet such as mild tenderness, swelling at the site of implantation and possibly a slight amount of bleeding at the site. While rare and generally not serious, I understand that such might occur.

I additionally understand that my pet must be restrained for this procedure, and that some animals may try to bite the handler. While the handler is experienced, I do not hold this organization or the handler responsible for necessary actions to avoid injury. I give my permission for this organization to provide necessary first aid to my pet should this be required.

I am the owner or the person responsible for this animal and have the authority to execute this consent. To the best of my knowledge, this animal is in good health. I accept full responsibility for all pre-procedure and post-procedure care of this animal. I will not hold the _____ (name of organization) responsible for any adverse reaction or complication that may develop as a result of my inability to follow the recommendations provided in conjunction with this procedure. I agree to indemnify and hold harmless the _____ (name of organization), the attending veterinarian and veterinary technicians, and any volunteers and officers of _____ (name of organization) arising out of the performance of the procedure referred to above.

I give full permission for use of my name and photograph in connection with this event.

_____

Signature

_____

Date

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7
Quality of Life, Stress, and Emotional Pain in Shelter Animals

Franklin D. McMillan

WHY QUALITY OF LIFE ASSESSMENT MATTERS IN SHELTERS

The care provided to animals in the shelter environment involves a myriad of important factors, such as disease incidence, cage size, staff-to-animal ratio, type of food, and many other considerations. Yet, from the animal's point of view, one factor sits atop every other one, and that is quality of life (QOL).

At the individual level, QOL assessment is the paramount method for recognizing deficiencies in the animal's care as desired by that animal. QOL assessment permits the determination of enhancements and deteriorations in the pleasantness of the animal's life experience, so that intervention can be instituted and its effectiveness measured. At a more profound level, it is believed by many that there are some states of existence that are less desirable than *no* existence, that is, there are some lives that are worse than death. In this way, decisions about euthanasia rest first and foremost on the assessment of QOL.

Certainly, one of the most valuable aspects of QOL assessment for the individual shelter animal relates to how QOL may influence the animal's adoptability. It is well-known—from personal experience by shelter workers and more recently by scientific studies—that the behavior of an animal plays a prominent role in that animal's chances of being adopted. Favored traits include friendliness, spending more time at the front of the enclosure, calmability, controllability, and trainability (McCobb *et al*., 2005). QOL impacts adoptability because the behavior most beneficial to adoption is the behavior least likely to be seen with a poor QOL (McCobb *et al*., 2005). Emotions frequently associated with a poor QOL, such as helplessness, depression, and fear, are associated with behaviors that are less desirable to prospective adopters. Research in dogs has shown that lengthy periods of time spent in a shelter environment may result in dogs behaving in a manner that is generally considered unattractive by potential adopters, such as staying at the back of the enclosure (Wells, Graham and Hepper, 2002). This creates the potential for a downward spiral of adoptability, as increased length of time in the shelter elicits behavior that lessens the likelihood of being adopted, resulting in an even longer stay in the shelter, and so on (see Figure 7.1). Thus, a homeless animal's chances for a life in a loving home—nothing less than his entire future—greatly depends on his QOL while in the shelter (McCobb *et al*., 2005). Accordingly, the impact of the animal's QOL in the shelter—and the shelter's assessment of it—extends well beyond the confines of the shelter facility itself.

Many terms have been used to capture the concept of how an individual assesses his or her own life, including *well-being* (often specified as subjective, emotional, psychological, or mental well-being), *welfare*, *QOL*, *happiness*, and *life satisfaction* (Novak and Suomi, 1988). With minor variations, all of these subjective concepts refer to one's

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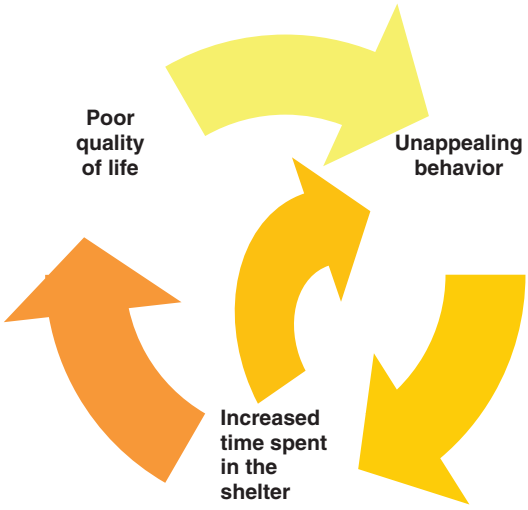


Figure 7.1. The downward spiral of length of time in the shelter and quality of life for dogs.

overall view of how well his or her own life is faring, or how much the individual likes the life he or she leads. In the author's view, scientific descriptions of QOL, well-being, welfare, and happiness can ultimately be reduced to a very simplified concept: the animal *feels good and enjoys life*. In this chapter, QOL is defined as *the affective and cognitive assessment that an animal makes of his or her life overall, of how his life is faring, experienced on a continuum of good to bad. This assessment is derived primarily from the balance between the various pleasant and unpleasant feelings experienced by the animal at and immediately preceding the time of the QOL assessment. In general, the greater the tilt of balance toward pleasant feelings, the higher the QOL. QOL may be considered the equivalent of enjoyment of life*.

PHYSICAL AND EMOTIONAL SUFFERING

There are some intuitive aspects of QOL that have been substantiated with scientific studies, such as the notion that cardiac disease (Freeman *et al*., 2005), chronic pain (Wiseman-Orr *et al*., 2006), and cancer-related pain (Yazbek and Fantoni, 2005) can lower one's QOL. Intuition, however, is not infallible, and one particular area where it has been shown to be flawed is how the impact of emotional and physical suffering on animal QOL is viewed. Emotional suffering comprises all unpleasant, or negative, emotional states. Specific unpleasant emotional states are commonly referred to nonspecifically as *stress*. Emotions comprising this category for which substantial evidence exists in animals include fear and phobias, anxiety, separation anxiety, loneliness, boredom, frustration, anger, helplessness, grief, and depression (Wemelsfelder, 1990; Dodman, 1997; Panksepp, 1998).

Physical-based suffering has long been accorded priority over emotional suffering in all forms of animal care (McMillan, 2003b, 2005). Cruelty and abuse illustrate this point. As has been well described in children, emotional abuse does not generate the public interest or outrage that physical and sexual abuse do, in part because emotional abuse is harder to recognize, as it does not leave visible scars or overtly recognizable injury like that found in physical neglect and abuse (Iwaniec, 1995; Kowal, 1998). Furthermore, it is well known that physical abuse can cause death, whereas this catastrophic outcome would not be expected with emotional abuse. As a result, authorities have historically tended to view childhood emotional abuse as less serious than other forms of abuse (Iwaniec, 1995; Kowal, 1998). The situation in animals runs a close parallel. As an illustration of this lopsided focus in animals, none of the animal cruelty statutes of the 50 states and the District of Columbia include language specifically acknowledging or addressing emotional neglect, abuse, or suffering in their definitions of cruelty. Furthermore, nine states specifically prohibit consideration of emotional suffering by specifying that any injury or suffering be physical in nature (Animal Protection Institute, 2001).

However, contrary to the prevailing sense, there is evidence that emotional pain may induce greater suffering than physical pain. Studies have shown that emotional factors weigh more strongly in animals' behavioral choices than physical pain. In one study (Scott, 1967), an electrified grid was placed between puppies and persons to whom they had formed a social attachment. The puppies crossed the grid, receiving shocks the entire way, to reestablish contact with the person—and no longer be alone. In another study (Weisner and Sheard, 1933), infant rats were taken from their mothers and placed on the opposite side of an electrified grid. The mother

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rats could hear their pups' distress vocalizations—which have been shown in mammals to be emotionally distressing to the mother (Panksepp, 1998)—but to reach them she would have to walk across the painful grid. The mother rats crossed the grid, picked up the pups, and carried them back across the grid to their nest, receiving constant electric shocks in both directions. Experimentally and anecdotally, it appears evident that in some situations animals will choose to endure physical pain in order to alleviate emotional suffering.

MEASUREMENT OF QUALITY OF LIFE

As incorporated in the definition above, one common interpretation of QOL is that it is a matter of feelings, whereby the experience of QOL is a function of the pleasant and unpleasant feeling states (Heinonen *et al*., 2004) and, more specifically, the balance between these feelings (Bradburn, 1969; Spruijt, van den Bos and Pijlman, 2001). In this "affect-balance model," QOL may be viewed as a set of scales with pleasant feelings on one side and unpleasant on the other; QOL increases when the balance tips toward the pleasant feelings and declines when the balance tips toward unpleasant feelings. This model provides a clear view as to which factors contribute to QOL. Anything that tips the QOL scales in either direction has an influence on QOL; anything that does not tip the scales is not relevant to QOL. For example, the reason that dying your carpet a darker color would not affect your dog's QOL whereas replacing your current carpet with one that your dog is allergic to would is because the former would not tip the QOL scales (no feelings elicited), and the latter would (unpleasant feelings of the allergy).

In humans, measurement of QOL continues to be a source of great controversy, debate, and difficulty, and to date there is no consensus as to the best method for assessment. Likewise, there is no widely accepted method of measuring animal QOL (this includes welfare, well-being, and happiness). Because of its highly subjective nature, QOL continues to defy efforts at quantification, and there exists much greater agreement about why QOL should be measured than how to do it. Because of the extreme difficulties the measurement of subjective factors entails, many studies of QOL in humans are designed to use quantifiable objective criteria to reflect the individual's subjective status. Furthermore, objective measures permit standardization and provide an established anchor point that can be compared across studies. In animal shelters, this would facilitate comparison of animal care between shelters. Examples of commonly measured objective criteria have included physical functioning and activity level, disease and physiologic measures, appetite, and social support. However, it is essential to note that objective factors, no matter how accurately measured, cannot be regarded as a true representation of that individual's QOL. Subjective criteria—considered the truest reflection of QOL (Leplege and Hunt, 1997)—involve the way an individual *feels about* aspects of life (including all objective factors) and life overall.

Behavioral Measures of Quality of Life

Behavioral responses are one of the most important methods animals use to respond to and adapt to changes, challenges, and threats encountered in life; behavior is often an animal's first line of defense against a potentially harmful stimulus. With behavior being a primary mechanism for coping with adversity, behavioral changes, especially manifestations of abnormal behavior, can provide information about challenges the animal is facing and how successfully the animal is coping with those challenges.

In evaluating QOL, it is rare for any single behavioral measure to provide all necessary information. It is therefore considered best to use a variety of behavioral measures. The most commonly utilized behavioral criteria are normal, species-typical behavior (e.g., social interactions, grooming, foraging, exploring, play); abnormal behaviors (e.g., pacing, rocking, bizarre postures, self-mutilation); response to environmental manipulations (enrichment techniques); avoidance and aversion behavior; and preference studies in which the animal can select the environment, situation, or stimulus that he or she prefers.

Currently, many researchers believe that animals who feel good are those whose voluntary activities most closely resemble the full behavioral repertoire of their free-ranging conspecifics. In this view, positive well-being is associated with the presence of certain behaviors such as stretching on rising, grooming, and taking an interest in novel stimuli in the environment. However, when utilizing normal, species-typical behavior, it is important to understand that "normal" refers to both the quality and quantity of a

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behavior. A normal behavior may be abnormal when performed too frequently, or for too long. Sleeping, eating, and exhibiting fearful behavior are just a few examples of normal behaviors that become abnormal if performed too much or too little. Thus, when using normal behavior to measure QOL, it is not sufficient just to observe the presence of the behavior, but also that it is being performed at typical levels. Unfortunately, research establishing the optimal quantities of each behavior pattern, particularly in the animal shelter environment, is currently lacking. Ethograms for what constitutes normal behavior for shelter animals are an imperative need.

Abnormal behavior patterns often occur in response to chronic conflict, frustration, anxiety, or other stressors, and for this reason their presence has been used as one indicator of compromised QOL. Abnormal behavior has been defined as a persistent, undesirable action shown by a minority of the population that is not due to any obvious neurologic disorder. Patronek and Sperry (2001), writing about QOL in cats in long-term confinement, suggested that the expression of natural behavior and the presence of grossly abnormal behaviors or stereotypes would be useful in assessing QOL and presented the following abnormal behaviors as potential indicators of negative mental states in confined domestic cats: over-grooming (Willemse and Spruijt, 1995), withdrawal, decreased activity, and inhibition of normal behavior (such as urination, defecation, and eating) (Carlstead, Brown and Strawn, 1993; McCune, 1994, 1995; Kessler and Turner, 1997); aggression, fear and escape behavior, tail-chasing, and self-mutilation (McCune, 1995). The authors also summarized the well-described abnormal behaviors in confined dogs, which included spinning and circling, pacing, pouncing, bounding and rebounding off kennel walls or doors, leaping up and down in a repetitive manner, excessive licking with formation of granulomas, flank sucking and wearing of toenails from pacing, chewing, or digging (Patronek and Sperry, 2001).

Stephen and Ledger (2005) conducted an audit of behavioral indicators of poor welfare in kenneled dogs in the United Kingdom in which they looked at 15 behaviors in 148 dogs housed in 8 rescue shelters. The most commonly observed behavior was excessive barking. Over the 6-week study, the proportion of dogs observed to pace repetitively and wall-bounce increased, and the proportion with a poor appetite and displaying fear-associated behavior decreased. In their report the authors wrote that apathy, unresponsiveness, along with signs of frustration, fear, and lack of control over the environment, are signs that an animal is struggling to cope and hence experiencing poor welfare (Wiepkema, 1987). In addition, they noted that there is considerable variation in the behaviors exhibited by individual dogs housed under similar conditions (Hubrecht, 1995), suggesting that dogs perceive the stressors differently within the kennel, respond differently to the same stressors, or possibly both.

Measuring Stress as a Means to Determine Quality of Life

One common approach to measuring QOL in animals has been to not measure QOL itself, but rather measure "stress." This method of measurement is based on the assumption that stress and QOL are negatively correlated, that essentially stress is the inverse of QOL. As Reid, Goldman and Zawistowski (2004) noted, researchers in general assume that compromised welfare in animals is reflected as higher than normal levels of stress, and that poor welfare is typically inferred by measuring behavioral and physiological indicators of stress (Wiepkema and Koolhaas, 1993).

Can using a measurement of stress help ascertain QOL? One fundamental part of the answer to this question is that QOL involves the positive as well as negative aspects of life, thus making one's stress level only a part of one's QOL. Using only indicators of unpleasant experiences would not provide a true measure of QOL, as the positive, pleasurable experiences would be overlooked.

Numerous studies have examined aspects of the welfare of animals through the lens of stress, and, in fact, it is this field of study that has provided the greatest knowledge about the well-being of animals in shelter and kennel environments. The focus of the following studies is stress rather than QOL per se; however, it is clear that the eliciting stimuli in each of the studies are aversive, and hence the findings would be expected to have implications for QOL.

Carlstead, Brown and Strawn (1993) investigated the behavioral and physiological correlates of stress in cats in a laboratory environment. Hiding was negatively correlated with cortisol concentration,

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leading the researchers to suggest that hiding may be an important behavior for coping with uncontrollable and unpredictable captive environments. Results of other studies in domestic and nondomestic cats indicate that behavioral apathy, hiding, and low levels of activity are stress indicators (Beerda *et al*., 1999a; Kessler and Turner, 1999). In a study of stress in shelter cats, Dinnage (2006) reported that feigned sleep may be a coping mechanism for cats in shelters and suggested that these cats may in fact appear the most relaxed yet have the highest stress levels. These findings are consistent with earlier reports in humans and other animals showing that an increase in the need to sleep can be a sign of biological or physiological stress (Rampin, Cepuglio and Jouvet, 1991; Rushen, 2000), and are supported by the results of previous feline studies involving stressful situations (Carlstead, Brown and Strawn, 1993; Rushen, 2000) that suggest that cats are more likely to show a reduction in general activity, with increased hiding and sleeping as the major signs of stress or anxiety.

McCobb *et al*. (2005) studied methods for assessing feline stress levels in 120 cats in 4 Boston-area animal shelters, looking at behavioral signs and cortisol levels (urinary cortisol:creatinine ratio, UCCR). The behavioral assessment utilized Kessler and Turner's (1997) "Cat Stress Score" . The authors also identified sources of stress for cats in shelters to include altered routine, interactions with unfamiliar people and animals, and separation from familiar surroundings. Research has shown that laboratory cats, when deprived of human contact and exposed to sudden and unpredictable events such as noise, experience a rise in urinary cortisol and suppressed exploratory and play behavior (Carlstead, Brown and Strawn, 1993). Adjustment of cats to the shelter environment has also been the subject of study. In one report (Kessler and Turner, 1999), most cats became adjusted to a shelter environment within 2–5 weeks, but another report suggested that some cats never adjust to confinement and remain distressed for months (McCune, 1994).

Stress in the shelter environment and in rescued animals has been researched most extensively in dogs. Previous reports of behavioral (Stephen, Ledger and Stanton, 2003) and physiological (Hennessy *et al*., 1997) indicators of stress have suggested that dogs experience anxiety and fear almost immediately upon admittance into rescue shelters. Factors including separation of the dog from his or her attachment figure, handling by and interaction with unfamiliar humans, novel surroundings, and a change in husbandry routine are stressors likely to contribute to the behavioral and physiological changes that are observed in the short term (Beerda *et al*., 1997; Hennessy *et al*., 1997).

Bellaio, Normando and Bono (2009) analyzed videotapes of routine training sessions with rescued dogs in an attempt to quantify behavioral signs of stress and found that the most frequently exhibited signs were displacement activities, looking back at the owner, elimination, licking lips, body shaking, and yawning. Behavioral signs of stress have also been observed in dogs kenneled for prolonged periods of time (Beerda *et al*., 1999b, 2000). Stephen and Ledger (2005) reported that dogs in kennels exhibited behaviors associated with frustration and depression 8 weeks following admittance to a shelter.

In a series of studies, Beerda and co-investigators (Beerda *et al*., 1997, 1999a, 1999b, 2000) have proposed that kenneled and sheltered dogs show physiological and behavioral indicators of acute and chronic stress when experiencing suboptimal welfare (Beerda *et al*., 2000), and that measurement of stress parameters constitutes a method of identifying impaired welfare in these dogs. Because of the virtual equivalency of welfare and QOL, these studies provide great insight into QOL assessment. Chronic stress in the confined dogs was manifest by physiological and behavioral changes: physiological changes included increased urinary and salivary cortisol concentrations, diminished responsiveness of the hypothalamic–pituitary–adrenal (HPA) axis, variable increases in heart rate, and suppressed immune function; behavioral parameters included increased locomotor activity, changes from one posture (or state of locomotion) to another, circling, nosing, body shaking, yawning, ambivalent postures, chewing, floor licking, vocalizing, urinating, defecating, crouching, a lowered, fearful posture, digging, self-grooming, drinking, coprophagy, stretching, tail wagging, open-mouth and oral behaviors, and paw lifting. Behaviors toward conspecifics were observed to be submissive, dominant, play-soliciting, and aggressive. Additional conclusions from this series of studies were that high levels of stress, as measured by cortisol levels, are not necessarily concomitant with pronounced behavioral

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expressions of stress; elevated cortisol levels appear to be a strong indication of chronic stress and poor welfare in dogs, although normal cortisol levels do not exclude these adverse states; in chronic stress, behavioral changes are not consistently present, and assessment of chronic stress should therefore not rely solely on behavioral signs; and stress-related behaviors are variable and often nonspecific to stress.

Unresolved Issues in Measurement of Quality of Life

Numerous obstacles continue to impede the *ability to accurately measure QOL*. Mason and Mendl (1993) identified some of the key difficulties in a paper in which they asked why there is no simple way of measuring animal welfare. First, different measures may suggest contradictory things about an animal's welfare. For example, it is believed that stereotypic behavior may indicate a state of distress, but also may represent a successful coping mechanism by the animal to aversive conditions (Mason and Latham, 2004).

Another unanswered question is how long must a feeling or experience last, or how frequently must it occur, for it to be a QOL issue? For an animal, is a shelter stay of 2 hours a QOL issue? One full day? Two weeks? There are three important points here: One, there is no clear line separating momentary experiences from QOL issues. Two, the animals are likely unconcerned with any such distinction; they want to be relieved of unpleasant experiences regardless of duration, and hence, feelings—whether encompassed in a QOL concept or not—are important for shelter managers and caregivers to tend to whether an animal is only being held for a few days or for a prolonged period of time. And third, *QOL is not the only concern for animals in shelters*. Things that affect the animal in the short term, that is, things that may not technically qualify as QOL issues must also be addressed. If the only concern was about QOL, the innumerable momentary experiences that also matter greatly to the animals would be overlooked.

QOL measurement in animal shelters poses a unique set of challenges. The highly unfamiliar and threatening environment both impairs QOL and at the same time makes it very difficult to assess. Due to the adjustment process (Hennessy *et al*., 1997), regardless of the method used, there appears to be little to be gained by assessing QOL in the first few days the animal spends in the shelter. Also, the factors that contribute to an individual animal's QOL may change, such that no interest in—or even fear of—humans at intake may mask the animal's true desire and need for human companionship, which may emerge later.

It is now well established that all currently known factors—objective as well as subjective—have limitations in what they are able to determine about the animal's QOL; therefore no current measure is reliable by itself. Because of this, a consensus view has emerged that multiple measurement techniques should be utilized (Paul, Harding and Mendl, 2005).

HOW TO RECOGNIZE A GOOD QUALITY OF LIFE

Lacking a fool-proof method for assessing shelter animal QOL, a reasonable alternative approach is to use the scientific findings to compose a typical description of a state of good QOL, a good *enjoyment* of life—a happy animal. Such signs would suggest that the animal's physical and psychological needs are fulfilled, the animal is able to successfully cope with stressful stimuli and conditions, there is no distress or suffering, and that the animal is experiencing a substantial degree of and time in a positive emotional state (Morton, 2007).

Nine Signs of a Desirable Quality of Life

To that end, and with the practicality for use in animal shelters in mind, the following list of nine signs of a desirable QOL (subjective well-being, happiness, welfare, enjoyment of life, meaning that the animal is feeling good, with minimal unpleasant feelings and the ability to cope well with adversity) is proposed:

The animal:

1. Is alert, busy (at species-typical levels)
2. Exhibits a substantial range of context-appropriate species-typical behavior
3. Engages in play behavior and activities that appear to cause excited interest and enjoyment, at a level that is typical and appropriate for the species and age of the animal
4. Displays an absence or no more than minimal levels of abnormal behaviors, in particular, exhibits a very low incidence of behaviors associated with

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attempts to cope with (i.e., minimize the intensity and/or adverse psychological impact of) unpleasant affect, for example, limping (to relieve pain), labored breathing (to relieve impaired oxygen intake), or escape behavior, hiding, and/or aggression (to relieve fear)

5. Spends neither more nor less time sleeping than what is typical and appropriate for that species and age of the individual
6. Is confident, moves around freely, is outgoing, and does not display fear toward trivial or nonthreatening stimuli
7. Is able to rest in a relaxed manner, without constant signs of vigilance
8. Eats normal quantities of food and maintains a normal and stable body weight
9. Is in good general physical health

HOW TO RECOGNIZE WHEN A POOR QUALITY OF LIFE JUSTIFIES EUTHANASIA

Perhaps the most obvious and widely accepted notion regarding euthanasia is that the decision to euthanize becomes appropriate when an animal's QOL declines to a certain level. What is not at all obvious is how to describe and recognize that certain level. Up until recently, all decisions in this regard were based on intuition, or "gut-feeling," about the quality of an individual animal's life. This, in turn, has been based on one's sense of how much an animal is suffering. With recently published methods for measuring QOL in specific situations and disease states (Lord and Podell, 1999; McMillan, 2003a; Mellanby, Herrtage and Dobson, 2003; Craven *et al*., 2004; Villalobos, 2004; Freeman *et al*., 2005; Schneider, 2005; Yazbek and Fantoni, 2005; Chang, Mellor and Anderson, 2006; Mullan and Main, 2007; Valsecchi, Prato Previde and Attilio Accorsi, 2007; Budke *et al*., 2008; Levine *et al*., 2008; Tzannes *et al*., 2008; Wiseman-Orr *et al*., 2008; Yeates *et al*., 2008), it is possible to be precise in assessing QOL. Nevertheless, no published assessment tool contains a decision-making mechanism whereby a certain score indicates the appropriateness of euthanasia. All current QOL assessment tools, as well as any to be developed in the foreseeable future, will necessarily be only one—not the sole—factor in deciding on euthanasia. How, then, should the decision be made that QOL has become too low to allow the animal to do nothing but struggle to endure it?

In the author's view, the answer has its basis in the animal's feelings. The first thing that must be done is to comprehensively analyze all the feelings playing any meaningful role in that animal's life: the pleasant and unpleasant, the physical and emotional. Both the intensity and duration of the feelings over the course of a typical day must be factored in. With this conceptual assessment of all the animal's feelings, three red-flag features must be deliberated:

1. "Weigh" all the positive feelings against all the negative feelings on the QOL scales. As QOL declines, for any reason, the scales will tip increasingly toward the side of the unpleasant feelings. When the scales tip predominantly toward the unpleasant feelings, the quality of that life moves from enjoyable to acceptable to tolerable to barely tolerable to unlivable.
2. Are there any positive, pleasant feelings left in the animal's life? Waiting until every last positive experience is gone means that the only experiences comprising that animal's life are unpleasant. Very few people would argue that this life is worth enduring, and a life even approaching this level is clearly undesirable if not unlivable.
3. When the animal being considered is of a species considered able to experience *fun*, is there anything remaining in the animal's life that is fun? This does not refer to those things that are pleasurable or enjoyable, but to things that have that quality we regard as fun. If not, there is a high likelihood that life is losing, or has lost, its positive aspect.

If any one or a combination of these red-flag features applies, then a crucial question needs to be asked: All things considered—that is, medical knowledge, resource availability, etc.—is there any reasonable probability that this negative state of life can be made positive again? If the answer to this question is no, then it would be reasonable to conclude that the animal's QOL has diminished to a level where euthanasia would be the humane way to protect the animal from the suffering of such an existence.

CONCLUSION

Shelters use many different criteria to develop their animal care and euthanasia policies, including their mission, goals, resources, etc. However, there is widespread agreement that the most important goal in animal care is to provide animals with the highest QOL possible. Taken a step further, it is reasonable to assert that within the goal of maximizing QOL is the crucial job of protecting animals from the hurts, pains, and unpleasantness that life can inflict on them. While shelters' decisions regarding euthanasia will never be less than agonizing, placing these decisions in the light of QOL and protection from suffering will always keep the animal's interests first.

REFERENCES

Animal Protection Institute (2001) *State Animal Cruelty Laws*. http://www.api4animals.org (accessed February 20, 2010).

Beerda, B., Schilder, M.B.H., van Hooff, J.A.R.A.M. *et al*. (1997) Manifestations of chronic and acute stress in dogs. *Applied Animal Behaviour Science*, **52**, 307–319.

Beerda, B., Schilder, M.B., Bernadina, W. *et al*. (1999a) Chronic stress in dogs subjected to social and spatial restriction. II. Hormonal and immunological response. *Physiology and Behavior*, **66**, 243–254.

Beerda, B., Schilder, M.B.H., van Hooff, J.A. *et al*. (1999b) Chronic stress in dogs subjected to social and spatial restriction. I. Behavioral responses. *Physiology and Behavior*, **66**, 233–242.

Beerda, B., Schilder, M.B.H., van Hooff, J.A.R.A.M. *et al*. (2000) Behavioural and hormonal indicators of enduring environmental stress in dogs. *Animal Welfare*, **9**, 49–62.

Bellaio, E., Normando, S. and Bono, G. (2009) Stress assessment in rescue dogs during routine training sessions. Abstract. *Journal of Veterinary Behavior*, **4**, 83.

Bradburn, N.M. (1969) *The Structure of Psychological Well-Being*, Aldine Publishing Company, Chicago, IL.

Budke, C.M., Levine, J.M., Kerwin, S.C. *et al*. (2008) Evaluation of a questionnaire for obtaining owner-perceived weighted quality-of-life assessments for dogs with spinal cord injuries. *Journal of the American Veterinary Medical Association*, **233**, 925–930.

Carlstead, K., Brown, J.L. and Strawn, W. (1993) Behavioral and physiological correlates of stress in laboratory cats. *Applied Animal Behaviour Science*, **38**, 143–158.

Chang, Y., Mellor, D.J. and Anderson, T.J. (2006) Idiopathic epilepsy in dogs: Owners' perspectives on management with phenobarbitone and/or potassium bromide. *Journal of Small Animal Practice*, **47**, 574–581.

Craven, M., Simpson, J.W., Ridyard, A.E. *et al*. (2004) Canine inflammatory bowel disease: Retrospective analysis of diagnosis and outcome in 80 cases (1995–2002). *Journal of Small Animal Practice*, **45**, 336–342.

Dinnage, J.D. (2006) Measuring and assessing stress in shelter cats. In: *Proceedings, North American Veterinary Conference*, Orlando, FL, January 7, 2006.

Dodman, N. (1997) *The Cat Who Cried For Help: Attitudes, Emotions, and the Psychology of Cats*. Bantam Books, New York.

Freeman, L.M., Rush, J.E., Farabaugh, A.E. *et al*. (2005) Development and evaluation of a questionnaire for assessing health-related quality of life in dogs with cardiac disease. *Journal of the American Veterinary Medical Association*, **226**, 1864–1868.

Heinonen, H., Aro, A.R., Aalto, A-M. *et al*. (2004) Is the evaluation of the global quality of life determined by emotional status? *Quality of Life Research*, **13**, 1347–1356.

Hennessy, M.B., Davis, H.N., Williams, M.T. *et al*. (1997) Plasma cortisol levels of dogs at a public animal shelter. *Physiology and Behavior*, **62**, 485–490.

Hubrecht, R. (1995) The welfare of dogs in human care, in *The Domestic Dog: Its Evolution, Behaviour and Interactions With People* (ed J. Serpell). Cambridge University Press, Cambridge, UK, pp. 179–198.

Iwaniec, D. (1995) *The Emotionally Abused and Neglected Child: Identification, Assessment and Intervention*. John Wiley & Sons, Chichester, UK.

Kessler, M.R. and Turner, D.C. (1997) Stress and adaptation of cats (*Felis silvestris catus*) housed singly, in pairs and in groups in boarding catteries. *Animal Welfare*, **6**, 243–254.

Kessler, M.R. and Turner, D.C. (1999) Effects of density and cage size on stress in domestic cats (*Felis silvestrus catus*) housed in animal shelters and boarding catteries. *Animal Welfare*, **8**, 259–267.

Kowal, L.W. (1998) Recognizing animal abuse: What veterinarians can learn from the field of child abuse and neglect, in *Recognizing and Reporting Animal Abuse: A Veterinarian's Guide* (ed American Humane Association). American Humane Association, Denver, CO, pp. 40–49.

VetBooks.ir

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Leplege, A. and Hunt, S. (1997) The problem of quality of life in medicine. *Journal of the American Medical Association*, **278**, 47–50.

Levine, J.M., Budke, C.M., Levine, G.J. *et al*. (2008) Owner-perceived, weighted quality-of-life assessments on dogs with spinal cord injuries. *Journal of the American Veterinary Medical Association*, **233**, 931–935.

Lord, L.K. and Podell, M. (1999) Owner perception of the care of long-term phenobarbital-treated epileptic dogs. *Journal of Small Animal Practice*, **40**, 11–15.

Mason, G.J. and Latham, N. (2004) Can't stop, won't stop: Is stereotypy a reliable animal welfare indicator? *Animal Welfare*, **13**, S57–S69.

Mason, G.J. and Mendl, M. (1993) Why is there no simple way of measuring animal welfare? *Animal Welfare*, **2**, 301–319.

McCobb, E.C., Patronek, G.J., Marder, A. *et al*. (2005) Assessment of stress levels among cats in four animal shelters. *Journal of the American Veterinary Medical Association*, **226**, 548–555.

McCune, S. (1994) Caged cats: Avoiding problems and possible solutions. *Companion Animal Behavior Therapy Study Group Newsletter*, **7**, 33–40.

McCune, S. (1995) Enriching the environment of the laboratory cat: A review. In: *Proceedings of the Second International Conference on Environmental Enrichment* (ed B. Holst). Copenhagen, Denmark, pp. 103–116.

McMillan, F.D. (2003a) Maximizing quality of life in ill animals. *Journal of the American Animal Hospital Association*, **39**, 227–235.

McMillan, F.D. (2003b) A world of hurts: Is pain special? *Journal of the American Veterinary Medical Association*, **223**, 183–186.

McMillan, F.D. (2005) Emotional maltreatment in animals. In: *Mental Health and Well-Being in Animals* (ed F.D. McMillan). Blackwell Publishing, Ames, IA, pp. 167–179.

Mellanby, R.J., Herrtage, M.E. and Dobson, J.M. (2003) Owners' assessments of their dog's quality of life during palliative chemotherapy for lymphoma. *Journal of Small Animal Practice*, **44**, 100–103.

Morton, D.B. (2007) A hypothetical strategy for the objective evaluation of animal well-being and quality of life using a dog model. *Animal Welfare*, **16**, 75–81.

Mullan, S. and Main, D. (2007) Preliminary evaluation of a quality-of-life screening programme for pet dogs. *Journal of Small Animal Practice*, **48**, 314–322.

Novak, M.A. and Suomi, S.J. (1988) Psychological well-being of primates in captivity. *American Psychologist*, **43**, 765–773.

Panksepp, J. (1998) *Affective Neuroscience: The Foundations of Human and Animal Emotions*. Oxford University Press, New York.

Patronek, G.J. and Sperry, E. (2001) Quality of life in long-term confinement. In: *Consultations in Feline Internal Medicine* (ed J.R. August), 4th edn. WB Saunders, Philadelphia, PA, pp. 621–634.

Paul, E.S., Harding, E.J. and Mendl, M. (2005) Measuring emotional processes in animals: The utility of a cognitive approach. *Neuroscience and Biobehavioral Reviews*, **29**, 469–491.

Rampin, C., Cepuglio, R.C.N. and Jouvet, M. (1991) Immobilization stress induced a paradoxical sleep rebound in rats. *Neuroscience Letters*, **126**, 113–118.

Reid, P., Goldman, J. and Zawistowski, S. (2004) Animal shelter behavior programs, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski). Blackwell Publishing, Ames, IA, pp. 317–331.

Rushen, J. (2000) Some issues in the interpretation of behavioural responses to stress, in *The Biology of Animal Stress: Basic Principles and Implications for Animal Welfare* (eds G. Moberg and J.A. Mench). CABI Publishing, Wallingford, Oxon, UK, pp. 23–42.

Schneider, T.R. (2005) Methods for assessing companion animal quality of life. In: *Proceedings, North American Veterinary Conference*, Orlando, FL.

Scott, J.P. (1967) The development of social motivation, in *Nebraska Symposium on Motivation* (ed D. Levine). University of Nebraska Press, Lincoln, NE, pp. 111–132.

Spruijt, B.M., van den Bos, R. and Pijlman, F.T.A. (2001) A concept of welfare based on reward evaluating mechanisms in the brain: Anticipatory behaviour as an indicator for the state of reward systems. *Applied Animal Behaviour Science*, **72**, 145–171.

Stephen, J.M. and Ledger, R.A. (2005) An audit of behavioral indicators of poor welfare in kenneled dogs in the United Kingdom. *Journal of Applied Animal Welfare Science*, **8**, 79–96.

Stephen, J.M., Ledger, R.A. and Stanton, N. (2003) Individual differences in the behavioral signs of stress in kenneled dogs. In: *Proceedings of the 36th International Congress of the ISAE*. Wageningen, The Netherlands.

Tzannes, S., Hammond, M. F., Murphy, S. *et al*. (2008) Owners' perception of their cats' quality of life during COP chemotherapy for lymphoma. *Journal of Feline Medicine and Surgery*, **10**, 73–81.

Valsecchi, P., Prato Previde, E. and Attilio Accorsi, P. (2007) Quality of life assessment in dogs living in rescue shelters. Poster Abstract. *Animal Welfare*, **16**, 178.

Villalobos, A. (2004) Quality of life scale helps make the final call. *Veterinary Practice News*, **September**, 38.

Weisner, B.P. and Sheard, N.M. (1933) *Maternal Behavior in the Rat*. Oliver & Boyd, Edinburgh.

Wells, D.L., Graham, L. and Hepper, P.G. (2002) The influence of length of time in a rescue shelter on the behaviour of kennelled dogs. *Animal Welfare*, **11**, 317–325.

Wemelsfelder, F. (1990) Boredom and laboratory animal welfare, in *The Experimental Animal in Biomedical Research* (eds B.E. Rollin and M.L. Kesel). CRC Press, Boca Raton, FL, pp. 243–272.

Wiepkema, P.R. (1987) Behavioral aspects of stress, in *Biology of Stress in Farm Animals: An Integrative Approach* (eds P.R. Wiepkema and P.W.M. van Adrichem). Martinus Nijhoff, Dordrecht, The Netherlands, pp. 113–133.

Wiepkema, P.R. and Koolhaas, J.M. (1993) Stress and animal welfare. *Animal Welfare*, **2**, 195–218.

Willemse, T. and Spruijt, B.M. (1995) Preliminary evidence for dopaminergic involvement in stress-induced excessive grooming in cats. *Neuroscience Research Communications*, **17**, 203–208.

Wiseman-Orr, M.L., Reid, J., Scott, E.M. *et al*. (2008) Measurement of health-related quality of life (HRQL) in dogs with haematological cancer: A pilot study. Poster session, UFAW Animal Welfare Conference, Birmingham, UK.

Wiseman-Orr, M.L., Scott, E.M., Reid, J. *et al*. (2006) Validation of a structured questionnaire as an instrument to measure chronic pain in dogs on the basis of effects on health-related quality of life. *American Journal of Veterinary Research*, **67**, 1826–1836.

Yazbek, K.V.B. and Fantoni, D.T. (2005) Validity of a health-related quality-of-life scale for dogs with signs of pain secondary to cancer. *Journal of the American Veterinary Medical Association*, **8**, 1354–1358.

Yeates, J.W., Stone, M., Mullen, S.M. *et al*. (2008) Owner-rated assessment of quality of life in dogs: Development of a qualitative tool. Poster session, UFAW Animal Welfare Conference, Birmingham, UK.

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8
Population Management

Sandra Newbury and Kate Hurley

AN OVERVIEW OF POPULATION MANAGEMENT

What Is Population Management?

It seems obvious on many levels that an animal shelter population needs to be managed. In most shelters, a large number of animals from diverse settings are housed together under confined conditions. The animals have different needs, health conditions, and personalities. Without proper management, this would easily lead to chaos. Active population management is one of the most fundamental tools a shelter can utilize to save lives, preserve health, provide care, and help solve the problems that bring animals into shelters in the first place.

In communities, managed care for homeless animals is needed for several reasons, including animal health and welfare, reuniting lost pets with owners, public health and safety, re-homing, and wildlife protection; these are the underlying reasons many sheltering programs exist. In shelters, it is clear that staff, volunteers, and budgets need to be managed. But what does it mean to manage a population?

At its simplest, population management means actively and intentionally guiding or controlling what happens, at least to some extent, and having a goal in mind. Goals help define the management plan. Adhering to goals can require making some difficult decisions. But goals help communities and shelters clarify challenges, plan effectively, and prioritize actions.

Population management involves investigation and planning. Many important questions must be answered. Where does the shelter population originate? How many animals are in need of care? How many will enter? Are there alternatives to shelter intake? How many animals will need housing each day? Where will the animals live? How long will they stay? What kind of care will they receive? What are the risks? How can those risks be minimized? Answers to these questions provide a framework for creating a strategy to solve both current, clearly evident problems as well as underlying problems that may need more long-range planning. Solutions must always be balanced with a consideration of what resources are available to help.

Risk

Population management uses an assessment of potential risks for individuals and groups in combination with an evaluation of what resources are realistically available to help implement plans to minimize those risks. Strategies to reduce risk are best developed with a clear understanding of who is at risk and what factors increase or decrease the danger.

Identifying Risk

The risk identified most commonly with animal shelters is risk of death by euthanasia. While saving lives is the ultimate goal, there are some crucial questions to be answered for each organization or community. Who is at risk and what creates the risk? Where does the risk originate? What other kinds of risks are there? Although one primary intention of shelters

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is to protect animals from risks in the community, the fact that shelters themselves pose risks cannot be ignored. Animals entering shelters experience compassion, caring, and safety, but may also experience stress from confinement, crowding, or increased exposure to infectious disease. In some cases, due to limited resources, euthanasia is an almost certain outcome of shelter intake. For animals in some categories, simple population dynamics create the risk of euthanasia; more animals enter than can be placed. For others, risk is more related to their individual characteristics.

Risk may be associated with species, age, immune status, breed, size, health or behavior condition as well as other factors. For example, longer stays have been shown to increase the risk of shelter-acquired illness (Edinboro, Ward and Glickman, 2004). In a recent study by the Animal Rescue League of Boston's Center for Shelter Dogs, large dogs were found to stay an average of 15 days longer in a shelter than small dogs (Center for Shelter Dogs, 2010); for this shelter, large dogs may be more at risk for illness. Large dogs may need improved housing and enrichment to better accommodate a longer stay; targeted programs may be needed to help these dogs achieve a positive outcome (adoption, transfer, etc.) more quickly.

Risks may vary by community or even between smaller neighborhoods within a community (Patronek, 2010). While shelter intake may originate only rarely from one neighborhood, another may be responsible for a large proportion of the animal intake. Some communities experience very little infectious disease, while others are totally and constantly overwhelmed.

Similarly, risk may vary by shelter, even within the same community. In some cases, risk may be associated with problematic practices specific to a particular organization; in some cases, simple corrections such as vaccination on intake may help solve the problem. In others, a fundamental lack of appropriate care undermines the ability to save lives and actually creates unacceptable conditions. While many shelters are taking advantage of new knowledge and are implementing improvements, sadly, other groups describing themselves as animal welfare organizations also make up an increasingly large fraction of cruelty, neglect, and hoarding cases in the United States (*LA Times*, 2010).

Minimizing Risk

Risk can be controlled and lives most effectively saved by identifying the problems that place animals in jeopardy and putting plans in place to solve or minimize them. In sheltering, there has been a general sense that much of what happens with the population cannot be controlled, but that does not mean it cannot be managed. In fact, management plays an essential role, even in situations where the shelter is not the primary control point for what is happening. This is well recognized in disaster-response planning; a hurricane cannot be controlled, but communities can do everything they can to be ready when it hits. In sheltering, just as in disaster response, good planning (population management) can be the difference between life and death. No matter what mission an individual or an organization has, without a plan to meet its goals, it is unlikely they will be realized.

Community-Level Population Management

Population management at the community level facilitates management at the shelter level. Population management at the shelter level must be informed by an understanding of the population dynamics and resources in the community. Preventive community population management strategies should include interventions that will maximize the number of adoptive homes in the community, keep animals in their homes, and reduce both the numbers requiring care in shelters and the number of animals who need new homes. Reducing the overall numbers of animals requiring care lessens health concerns and the animals' impact on public health and wildlife. Without proactive population management in the community, the job of sheltering would be endless. Even in successful communities, vast amounts of resources would be expended to react to this unmanaged population.

Ideally, investments would be made in both proactive and reactive programs. The ultimate goal of every community should be to dramatically reduce the need for care and intake of animals from the community into the shelter. The end goal is not to fill every shelter but to have no more homeless pets.

Challenges vary greatly between communities. Although it can be difficult to make comparisons across communities, absolute numbers of animals as well as intakes per capita have a wide range. As an

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example: according to an analysis by the San Francisco Society for the Prevention of Cruelty to Animals, "The number of animals destroyed each year reveals the disparity: dogs and cats are up to 30 times more likely to be euthanized in surrounding and outlying counties than in San Francisco. In San Francisco, 1.2 stray or abandoned pets are euthanized for every 1,000 residents. That number grows to 1.9 per 1,000 residents in Alameda County and triples in San Mateo County to 4.5. The figure climbs sharply with distance from the city: Contra Costa County (8.8), Solano County (14.3), Monterey County (18.6) and Stanislaus County (40)" (James, 2011).[1]

The differences in these numbers are largely reflected in differences in intake. Intake of cats alone ranged from 2 cats per 1,000 people in San Francisco to 25 cats per 1,000 people in Stanislaus County. The number of adoptions reported per capita has a much more narrow range in these data.

Some communities that have a great disparity between intake and live release now refuse to admit healthy animals into shelters that would have no alternative but to euthanize most of them. Historically, it has been argued that euthanasia that serves as population control is kinder to the animals because it prevents potential suffering. For some shelters, the majority of the annual budget has been spent simply admitting, housing, and euthanizing animals. In many communities, stakeholders have refused to accept this euthanasia strategy, leaving little grassroots support for community population management.

More recently, novel strategies to manage healthy animals in their communities have been successfully adopted. Some of these programs are licensing, microchipping, identification, or return-to-owner strategies that help return lost pets to their homes; trap/neuter/return (TNR) programs where free-roaming animals are neutered and returned to their home communities; and some programs that help support relationships between animals and owners to keep them living together. Most commonly the TNR programs are targeted for cats (see the chapter on management of stray and feral community cats), but some communities, especially internationally, are also using TNR to manage populations of community dogs. These programs engage and energize many stakeholders in the community to recognize and find humane solutions to the underlying problems while conserving resources in order to invest more in prevention.

Vast differences exist not only in how many animals are in need of assistance but also in what condition they are in or the sort of care they require. For example, some communities continue to see large numbers of puppies entering shelters while in other regions, a homeless puppy is rarely seen. In some regions, shelter staff have never seen a case of canine distemper while in others, infected animals are seen daily.

The ways each community manages their population of animals contributes enormously to these differences. As the demand for assistance decreases, it becomes easier to provide basic care; there are more resources per animal when there are fewer animals. But the type of care needed may shift and increase in complexity as communities manage their population numbers better. As fewer animals enter shelters, the animals who do enter may be more difficult to rehabilitate or rehome.

Interventions must be targeted to each population. Community population management requires an understanding of the numbers of animals in the population, which animals are at risk, estimates of the rate of reproduction, and some understanding of the effect interventions may have.

Recent efforts to increase awareness of the importance of data collection and evaluation have led to better understanding of community population dynamics, but there is still much work to be done to collect data that will help better clarify which community population management practices are the best investments.

While efforts to reduce the numbers of animals needing assistance is an essential life-saving tool, this chapter will focus primarily on managing populations within shelters, outlining practices that will help ensure adequate capacity for care.

Shelter-Level Population Management

A comprehensive population management plan is essential to maintain good health and welfare in any animal welfare organization. As mentioned above, the ultimate goal is usually lives saved; this can be

1. http://www.cdph.ca.gov/HealthInfo/discond/Pages/LocalRabiesControlActivities.aspx, accessed June 9, 2012

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best accomplished with careful attention to animal health and well-being.

According to the Association of Shelter Veterinarians' (ASV) Guidelines for Standards of Care in Animal Shelters: "Population management describes an active process of planning, ongoing daily evaluation, and response to changing conditions as an organization cares for multiple animals. Effective population management requires a plan for intentionally managing each animal's shelter stay that takes into consideration the organization's ability to provide care that meets the recommendations outlined in (the) document" (ASV, 2010).

Estimating needs and defining standards for both housing and individual animal care/welfare helps guide daily decisions while keeping the overall goal in sight. Good shelter population management prevents shelter crowding, animal suffering, and unnecessary death.

In addition to the need for planning, two primary interrelated population management concepts are particularly important for shelter-level population management: first, capacity for care should be evaluated and has limits; second, efficiency has beneficial effects for health and well-being. This chapter provides detailed explanations and examples for planning pathways, monitoring progress, and calculating capacity needs for housing and care based on efficiency and expectations for length of stay.

Capacity for Care

Understanding and maintaining adequate capacity for care and housing is fundamental to providing humane care, maintaining animal health, and maximizing live release. Evaluating capacity for care uses a multifactorial approach to understand the overall ability or appropriateness of an environment to provide for the needs of the inhabitants. Each component of the environment, including the caregivers, as well as maintenance of the environment, must be considered. According to the ASV guidelines, "The capacity to provide humane care depends on the number and condition of animals admitted and their duration of stay; the size and condition of the facility; staffing levels and training; and other factors as well as the number of available enclosures." (Throughout this document "staff" includes skilled employees and volunteers who can be relied on to provide daily care activities.)

Capacity for care in a shelter may change. As stated in the ASV guidelines "Many factors can alter the capacity for care. For example, loss of animal care staff, or malfunctioning enclosures, can temporarily decrease the capacity for care until such time as new persons are hired and appropriately trained, or enclosures are repaired or replaced." Increased levels of illness create a need for greater capacity for medical evaluation and treatment. Adding additional kennels to a facility may create greater capacity for housing, but only when matched with additional staffing to provide care.

Societal expectations for better animal care are growing along with an increasing appreciation of the importance of quality of life. These expectations can be seen very clearly in new ordinances passed to protect animals' quality of life in agricultural, zoo, or laboratory settings (California Proposition 2, 2008, for example). With such obvious concern for animals in those settings, it seems reasonable to assume that quality of life is also an important concern for animals who are often considered family members. Shelters have a responsibility to provide for the animals without overextending themselves beyond their capacity to provide adequate care.

The ASV guidelines identify operating beyond an organization's capacity for care as an unacceptable practice. "There are many ways to maintain a population within an organization's capacity for care whether in a shelter or home-based rescue organization. The capacity to provide humane care has limits for every organization, just as it does in private homes" (ASV, 2010).

Efficiency and Length of Stay

Efficiency is a key component of maintaining adequate capacity for care. Being efficient does not mean rushing animals thoughtlessly through the sheltering system. But it does mean being cautious with mandated waiting periods and vigilant about providing care promptly, recognizing that unproductive waiting time in the shelter poses many risks.

Inefficiencies or extensions on holding requirements can start a vicious cycle, particularly in organizations that work near the margins of their resources. Capacity for care and housing are often exceeded

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because of increases in length of stay caused by unproductive waiting time to provide services animals may require (vaccinations, spay/neuter, behavior assessment, etc.).

When housing capacity and capacity for care and service are inadequate to meet the demand, efficiency is impossible. A vicious cycle is created where animal stress and disease becomes inevitable, staff is stressed, and life-saving capacity falls. Animals do not receive the care they need. Without efficient practices in place, an increasing burden on the sheltering system causes animals to suffer and lives are lost unnecessarily.

On the other hand, by eliminating unproductive waiting time, a positive cycle emerges; average length of stay decreases, which in turn decreases the average daily in-shelter population. With a smaller population, the relative capacity for care is increased. Shorter stays lead to decreased daily population, and to some extent, a smaller daily population may lead to shorter stays. This helps protect the health of individual animals as well as the group, decreases stress, and conserves limited resources.

Planning and Review Are Essential to Management

As mentioned above, community planning and shelter population planning should go hand in hand. Community population planning should be guided by shelter capacity, and shelter planning should be guided by the needs of the community in combination with a realistic assessment of available resources and capacity for care.

Proactive, preventive planning improves the lives of the animals in shelter care, saves lives and money, and reduces staff stress. Plans for providing appropriate care should start right from the point of intake (or even sooner) and include:

- Flow-through or pathway planning, including intake and outcome planning as well as structured, systematic plans to move animals efficiently through the shelter system
- Daily monitoring of individuals and the population
- Identifying capacity requirements for housing and care based on contracts, regulations, and the animals needing care
- Identifying actual available capacity to provide care and housing based on facilities, staffing, training, supervision, and resources available.

Systems must also be in place to regularly review management plans in comparison with actual population dynamics, daily population data, and other metrics in order to make effective ongoing decisions to best optimize well-being for each individual and maximize the life-saving capacity of the organization.

Basic management strategies underlie the success of any population management plan. Attempting to implement practices without an appropriate planning, decision-making, training, and supervisory structure to support goals will lead to random movement instead of progress.

PATHWAY PLANNING AND ANIMAL FLOW-THROUGH

Pathway planning is a means of actively tracking each animal's shelter stay from the moment they enter the shelter (or even before) to the moment they leave. The idea behind pathway planning is that each animal is on the road to an outcome from the very beginning so each next step can be anticipated, scheduled, and completed on time. Capacity needs and limits can also be evaluated for each individual pathway, helping to target priorities or identify problems.

Pathway planning does not mean an animal can never change the road they are on. It means that each animal is always understood to be going somewhere, with a plan in place for how to get there. Pathway plans for each animal should be evaluated daily to be sure each animal is on an appropriate path. The pathways themselves should also be monitored regularly to be sure they are running smoothly.

Most shelters have several possible different pathways.

A few examples of possible pathways:

- Foster care to adoption
- Holding to adoption
- No holding required before moving to adoption (e.g., owner surrender)
- Open selection to adoption
- Fast-track adoption (prioritized for move to adoption)

- Holding to transfer program
- TNR program
- Bite quarantine to return to owner
- Probable euthanasia
- Immediate euthanasia for humane reasons (due to injury or illness)

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Many shelters have developed innovative life-saving systems for getting animals through the shelter quickly and efficiently. These systems use good management and proactive planning to reduce risk for the population as a whole and for the individual animals. For example,

A woman calls to say she has found a healthy, friendly 6-week-old male kitten and plans to bring him into the shelter that afternoon. This shelter knows, because of state laws, they will not be able to place the kitten for adoption for another 2 weeks because he is a stray. Rather than have the kitten stay in the shelter, a foster caregiver is told the kitten is being brought in. The kitten is evaluated at entry and found to be free from disease and in good condition, is checked for a microchip, vaccinated, and dewormed. A photograph of the kitten is posted in the shelter and on the shelter web site for lost and found. The kitten is transported to his new foster home that afternoon. The intake staff have already scheduled an appointment for the kitten for neutering, revaccination, and deworming before being made available for adoption in 2 weeks. If the kitten is reunited with his lost family, the appointments will be cancelled. This plan saved a space in the shelter, and at the same time limited the kitten's exposure to stress and illness.

Critical Flow-Through Points

In the example above, an initial pathway of foster to adoption is assigned even before the kitten enters the shelter system. Aside from being a stray who must be held for a set period of time by law, assignment to that category was made based on an understanding that the kitten was healthy, friendly, and too young for adoption. If, at intake, the staff felt the finder did not accurately describe the kitten, the pathway may have changed.

There are several critical flow-through points in this pathway where the kitten will need some kind of care to be able to continue along the pathway toward adoption. The kitten will need an intake exam, foster pickup, foster care, return from foster exam, and neuter, followed by placement in an adoption housing unit. Waiting time due to insufficient capacity at any of these points of care will cause the length of stay for the kitten to increase. The worst place to have delays would be in the shelter. Kittens have high susceptibility to disease and require specialized care to remain healthy and happy. The best place to have delays would be while the kitten is in foster care, but extended stays in foster care mean it will take that much longer to open up space in that foster home again. Additionally, in many communities, kittens tend to have the best chance of adoption when they are very young, so delays in making this kitten available may decrease his potential for adoption.

The Planning Process

This shelter has done an excellent job of planning this pathway based on careful examination of their past history and performance. The first assessment was to compare intake to likely outcomes for kittens. Based on previous years' statistics, they believed they would be able to place most healthy kittens if they could keep them healthy. Adoption-driven capacity (ADC) was evaluated to determine an optimal daily population for kittens on the adoption pathway. Early in the year, well before kitten season, data were evaluated to estimate how many of the kittens likely to enter would need foster care because they are stray or too young. This shelter realized they would need, on average, one litter to go to foster care each day throughout kitten season.

Foster homes were proactively recruited, increasing the shelter's capacity for care. Foster parents received training and were assigned to tiered levels of husbandry difficulty. A "Foster On-Deck" system was created so foster parents would be ready and waiting when kittens were received. Kitten pickup was identified as a problem that could cause in-shelter delays so they planned a volunteer-driven foster kitten delivery service.

Capacity was evaluated for intake exams as well as spays and neuters to ensure they would have adequate opportunity to provide surgery for foster kittens promptly upon their return from foster care. Housing space was evaluated in their adoptions area to be sure kittens would not wait for space to become available. The shelter determined which days of the week kittens are most likely to get adopted and changed their main kitten return day to Thursday,

rather than Sunday, to coincide with higher adoptions for kittens on the weekends.

The shelter also evaluated their intake capacity by looking at their staffing for intake procedures, ensuring sufficient time for a thorough evaluation of the kitten, including all procedures necessary prior to foster placement. Intake capacity is crucial. If this initial critical flow-through point has inadequate capacity, then the kitten would never reach the pathway.

Through careful planning, length of stay for kittens is minimized to what is really necessary both in the shelter and in foster homes, freeing up much needed resources and capacity to care for more animals. In addition, kittens are better protected from the risks associated with being in the shelter.

Making Every Day Count: Programmatic Examples

Fast-Track/Slow-Track Flow-Through Planning

Fast tracking has benefits for all shelter animals and helps maximize life-saving capacity. Minimizing the average length of stay reduces the daily in-shelter population, allowing more resources (e.g., time, housing space, and attention) to be available for each animal present. In shelters that control or limit intake, more "fast-track" animals may be admitted and adopted because fast-track animals leave more quickly.

Fast-track/slow-track flow-through planning considers two largely separate groups for each species when adoption flow-through plans are made for cats and dogs: those on the adoption fast track and those on the slow track. These two separate pathways permit a primary focus on quick turnaround time and infectious disease control for fast-track animals, who are generally younger and more susceptible to disease, and a focus on welfare and enrichment for those in the slow track.

Based on the adoptions experience of each organization, animals who are most likely to be rapidly adopted (usually kittens, puppies, and friendly, small- to medium-sized dogs) should be assigned to the fast track. Animals who may be slower to place due to behavior, age, or physical issues may be assigned directly to the slow track. Animals who do not get adopted out of the fast track within 2–3 weeks should be reassigned to the slow track.

Fast track and slow track should be considered two separate populations. ADC can be estimated for both by setting targets for length of stay and using historical numbers of adoptions in each category. Even setting aside just a small number of adoptions housing units for a fast-track pathway can have a very positive effect. Slow-track housing should be designed to accommodate longer stays with good welfare. Care for slow-track animals should include more plans for enrichment and longer-term care.

Daily evaluation of all available animals helps determine which animals would be the best choice for the available housing units. In some cases, intake may be limited for slow-track or fast-track animals until space becomes available. When slow-track housing units are full, additional animals should not be assigned to the slow track until animals have been adopted or otherwise dispositioned. This will prevent the adoption area from overfilling with slow-track animals, leaving no space for fast-track animals who would otherwise move quickly through the system to adoption.

Open Selection

Open selection is another type of fast-tracking program that makes the most of stray-holding time by using the waiting time productively to allow for selection and preparation for live release. Parties interested in adopting an animal (private adopters, rescue groups, etc.) are allowed to view and select animals during their holding period; they are informed there is a possibility that the animals' owners may come in and reclaim them.

For successful open-selection programs, it is important to create clear priorities and policies. For example, it may be decided that a direct adoption by a private citizen takes precedence over a transfer to another agency. Animals should be assessed briefly on intake and then throughout their stay in an effort to identify any animals who may not be appropriate for interaction during their stray-holding period. It may be necessary to designate some areas of the shelter that are not open to the public. Once animals are selected, testing is performed and spay/neuter surgery is scheduled for the day after the holding period ends. Adopters or rescue groups can pick the animals up the next morning. Open-selection programs require adequate capacity at all critical flow-through points (e.g., disease testing, spay/neuter) so

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that animals may go home or to rescue as soon as their holding time is completed. This system also requires careful record-keeping to ensure that animals promised to one group are not given to another, or released before an owner has a chance to reclaim them.

Every pathway may have detours. Even when everything is planned correctly, animals may still become ill or need something unexpected. When the unexpected is just a detour from a systematic plan, things are easier to manage. When everything is seemingly unexpected, shelter work can become totally overwhelming.

Intake and Outcome Planning

Projections of likely intake with outcomes for each are essential to pathway planning; all pathways lead from intake to outcome. Each intake needs to be realistically paired with a likely outcome since both have important effects on the critical flow-through points, capacity requirements, and limits of each pathway. Even in sanctuaries where lifelong care is the expectation, capacity for care must still be adequate, though flow-through may be less important.

Shelter intake and outcome policies are complex, politically charged issues. In every case, a clear understanding of limits to capacity for care, including likelihood for positive outcomes in each pathway, can help shape intake policies and management decisions in the shelter and drive community investment in both prevention programs (e.g., spay/neuter, community cat education, low-cost medical care, training classes) and programs for increasing positive outcomes (e.g., transfer programs, adoption promotions, trap/neuter/release programs).

Some common intake policies are listed below:

- Open or unlimited intake
- Limited intake
- Selective intake: intake selection based on likelihood of adoption or by need
- Scheduled intake
  - Intake by transfer
  - Intake by appointment

Most shelters combine at least two of these intake strategies, customizing a different flow-through strategy to each kind of intake, or creating a different intake policy to fit each pathway.

A Two-Pathway Intake System

Below is an example of a shelter with a two-pathway system to adoption where intake is controlled in one pathway and uncontrolled but predictable in the second.

The first pathway is an animal transport program collaboration. The destination shelter receives most of their canine intake through this transport program. The destination shelter is able to place the vast majority of dogs who come to the shelter through a prescreened transfer program within a few days of arrival. The pathway for these dogs leads them directly from intake through surgery to the adoption floor. Efficiency and length of stay play an important role in this pathway; because the average length of stay is only a few days, the shelter can plan to "refill the pathway" with another transfer on a regular schedule. Just as the first set of dogs is heading out, the next set of dogs is entering.

Meanwhile, the source shelter has dogs entering every day. The source shelter must have a pathway to transfer dogs regularly in accordance with the destination shelter's capacity; if the dogs are quickly readied for transport by the source shelter, they will stay healthy and be accepted by the destination shelter. Foster homes may be used to temporarily increase space in a safe environment. The destination shelter must prioritize maintaining adequate capacity at all critical flow-through points for dogs on this pathway because doing so helps ensure more positive outcomes.

Shelter Intake's Impact on Capacity for Care

If the destination shelter planned intake for this pathway in excess of the number of animals they could get through their spay/neuter clinic or house in their adoptions area afterwards, their system would become jammed. Dogs would need to wait in holding areas, thus increasing their length of stay. Increased length of stay would lead to an increase in daily population numbers, causing capacity for care to shrink relative to the number of animals. The risk of infectious disease would rise, and more animals would likely get stuck in treatment instead of going through the pathway. Among other problems, this leaves fewer dogs to fill the adoption areas. In addition, the destination shelter would need to limit the number of

dogs for the next transport because space would not be available for housing. The life-saving capacity for both shelters would be negatively impacted.

Intake Planning Helps Pathway Planning

The destination shelter has a second pathway, an open-admission policy for dogs being surrendered. Those dogs are not prescreened and so follow a different route toward adoption. Although the shelter does not control canine intake for this pathway, capacity in the pathway is planned based on historical numbers and current trends so that dogs can receive care and services (behavior evaluation, medical exam, spay/neuter) without delay.

Intake and Outcome Expectations Can be Estimated

In the two-pathway example described above, planning in the second, open-admission pathway showed the shelter they had adequate capacity to open the transfer pathway. Intake numbers and average length of stay in this pathway have been consistent, with some small fluctuation, for several years. If intake or length of stay increased substantially in the local, owner-surrender pathway, the shelter would need to evaluate the impact on their other pathways and on overall capacity and make adjustments as necessary.

Most systems that do the same thing over and over again have a fair amount of internal consistency, and although there is variation from year to year, many sheltering communities have this same consistency. Projections for the future can be made by evaluating past intake and outcome information along with current trends. The success of these projections is dependent upon accurate data collection regarding intake and disposition.

Disparity between Intake and Live Release

In Figure 8.1 it is clear that there has been a substantial ongoing difference between intake and live release (adoptions, reclaims, transfers out) in this community. In the simplest terms, this disparity can be solved either by increasing the number released alive or decreasing the number coming in. Missions, resources, policies, and practices all shape shelter intake numbers in combination with the needs of the animals and the community. Which animals are admitted, shelter programs, community perceptions, and alternative sources for pets shape the number of positive shelter outcomes. However, ultimately, if intake and live release are not brought into balance, the result is either an ever-expanding population or euthanasia.

Marsh elaborates on the connection between intake and euthanasia in his book, *Replacing Myth with Math: Using Evidence-Based Programs to Eradicate Shelter Overpopulation*, by showing the strong correlation between declines in euthanasia and reductions in shelter intake. In the publically available data Marsh reports on from New Hampshire, Michigan, Ohio, Virginia, and Utah, "the correlation between intake and euthanasia rates (per capita) in these five states was 0.964 (high correlation), while the correlation between adoption and euthanasia rates was −0.215 (no correlation)" (Marsh, 2010).

Finding Alternatives to Shelter Intake

Shelters have a responsibility to function within their capacity to provide care that meets the needs of animals. At the same time, shelters are frequently expected or contracted to do more than they can reasonably accomplish. There are many shelters whose intake numbers vastly exceed their live release numbers. Sheltering that does not address the underlying problems that create the disparity between intake and live outcomes is not cost-effective, and when euthanasia is consistently the primary outcome, it frequently runs contrary to the community's expectations for animal protection and welfare.

Actively seeking alternatives to shelter intake may help expand resources in the community for preventive programs as well as improve welfare in the shelter. Some shelters restrict the number of new intakes to the expected number of positive outcomes in an effort to reduce euthanasia related to population dynamics while maintaining adequate capacity for care. Many communities and shelters are testing and implementing various innovative and life-saving preventive programs to reduce shelter intake and the need for euthanasia caused by population dynamics. Such programs include puppy and kitten socialization classes; licensing programs that facilitate faster and direct return of lost animals to owners while bypassing the shelter; dog training classes;

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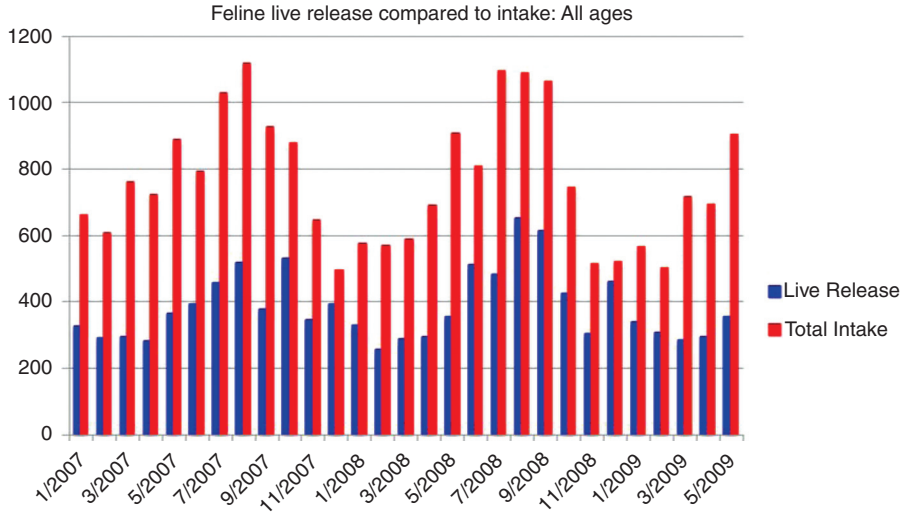


Figure 8.1. This example of community shelter intake and live releases over a 3-year period shows enough consistency to allow planning projections for the current year based on similar expectations while taking into account progress from meeting goals or increased challenges.

medical interventions; and more. These programs engage stakeholders in solving deep underlying problems through tangible positive actions, but may need some time to show positive impact on shelter population numbers.

An example of an increasingly common alternative to shelter intake and euthanasia are the TNR programs that are springing up in many communities. These programs return community cats to the communities where they were found after they are spayed/neutered, ear tipped, and vaccinated. There is widespread support for this type of program in many communities; in some cases ordinances have been written specifically to support these activities. (See the chapter on management of stray and feral community cats for more information.)

Recent studies suggest that this type of alternative management may coincide with public opinion as well. A public opinion telephone survey from 2007 asked, "What would you do about unowned cats in the street?" Eighty-one percent of responders said they would leave the cat alone while 14% said they would trap and kill the cats. When asked," What if you knew the cats only lived for two years", 72% said they would still leave the cats alone, while 21% said they would trap and kill the cats (Chu and Anderson, 2007). Several different studies report between 8% and 26% of households feed community cats in regions as diverse as Florida, Ohio, and Massachusetts (Manning and Rowan, 1992; Centonze and Levy, 2002; Lord, 2008).

TNR programs not only help reduce population management euthanasia but may also help improve community animal health. Vaccination prior to return should help raise the level of immunity to infectious disease (e.g., panleukopenia and rabies) in the community. In addition, Levy and Crawford (2004) have suggested a resource allocation and management model that shows a more significant reduction in feline leukemia virus (FeLV) through surgical sterilization programs than through testing and removal of infected cats. Levy's model uses two key knowledge points: first, testing for FeLV takes money and time away from surgical sterilization programs; and second, the primary mode of transmission of FeLV is from an infected queen to her kittens. The reduction in the rate of infection results primarily from an increased number of spay surgeries, followed by a reduction in the number of kittens born to FeLV-infected queens.

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Increasing Adoptions

There is a substantial range in intake per capita in different communities, and as Marsh (2010) has pointed out, reductions in intake correlate very strongly with reductions in euthanasia. Less variation has been seen in the range of adoptions per capita, and historically this has not been strongly correlated with euthanasia decline: "Despite substantial changes in the canine euthanasia rate (per capita) in California animal care and control shelters between 1970 and 1995, the adoption rate (per capita) in these shelters remained relatively constant" (Marsh, 2010). In other words, most of the progress in reducing the canine euthanasia rate has come from reducing intake rather than increasing adoptions.

Maddie's Fund (Maddie's Fund, 2011) recently released a database to share information from many communities who have reported their shelter data. The 2009 data show an impressive but similarly more narrow range in adoptions per capita (ranging up to 16 adoptions per thousand people) compared to intake (ranging from the low teens up to 142 intakes per thousand people).

Proactive marketing strategies may increase the rate of adoptions per capita in communities. On the other hand, as per capita intake continues to decline, so may per capita adoption. As prevention and diversion programs succeed in keeping many animals from entering shelters, the smaller number that do enter may consist of a higher proportion of animals who are difficult or even unsafe to place. Some communities are already experiencing this. Every organization and community should do everything they can to maximize all of their live release options while balancing their resources to invest equally in prevention of relinquishment. In addition to adoption, programs to maximize other avenues of live release such as returns to owner and transfer partnerships can have a dramatic impact on population numbers. Attacking the problem from both sides—intake reduction and increase of live release—is essential for progress.

DAILY ROUNDS

Daily rounds is a systematic monitoring process to promptly identify any health or welfare problems and help keep the population management plan on track; it is one of the most important activities to support pathway planning and animal well-being. Daily rounds are different from medical rounds; the former are used to identify when care is needed, whereas the latter are used to deliver the care. Detailed instructions for performing daily rounds can be found at www.sheltermedicine.com (see Instructions for Daily Rounds).

Supervision of Daily Rounds and Population Management

There should always be at least one individual performing daily rounds who has been given the authority to make decisions. That person needs support and input from all the departments and staff in the shelter and also needs time allocated every day as a priority to perform this function. If one person is primarily responsible, a plan must be in place for what to do when that person is away or unavailable. A team approach to daily rounds can be very successful. The team should consist of people who can contribute insight from a broad range of perspectives, and the team as a whole (or a team leader) is accountable for success.

For example, a successful team might consist of members from the shelter care, field service, veterinary services, and volunteer departments. Daily rounds with this team could combine medical and population management to monitor for animal health, behavior, and wellness, as well as check on flow-through and make pathway decisions.

A Systematic Approach

There is a lot to keep track of as animals move through a shelter system. A systematized way of approaching daily rounds helps ensure nothing is overlooked. A written checklist for each animal is ideal, but a list of things to check each day for all animals works well too. (A sample flow-through checklist is available at www.sheltermedicine.com.)

A system for following up on actions needed after daily rounds is also essential. Some shelters have the ability to move through the facility with their computer software on a laptop or other mobile device. A clipboard works equally well as long as time is allotted at the end of rounds to enter the information into computer records or an appropriate paper record system. A simple "action list" works well when taken along on a clipboard for daily rounds (a sample action list is available at www.sheltermedicine.com). Actions needed are recorded on the action list and checked off throughout the day as they are

scheduled or completed by the appropriate person or department.

EVALUATING CAPACITY FOR CARE

Capacity for care may be evaluated for housing and for care separately with an understanding that the overall ability to provide care that meets animals' needs is dependent on both. Capacity for housing is defined in terms of the number of available housing units or "spots" for an animal to live, and capacity for providing care is based primarily on staffing (including volunteer time), training, and resources.

Minimums and Maximums

Evaluating Minimum Capacity Requirements for Care and Housing

It can seem daunting for shelters to attempt to provide, let alone maintain, sufficient capacity to care for the seemingly endless population of homeless animals. The good news is that the problem of homeless animals is not simply one of *holding* capacity, but one of *flow-through* capacity and capacity for *care*. If a shelter simply admitted all animals that came through the door and never released them, virtually all facilities would soon be impossibly overcrowded. Ultimately, the problem must be largely solved by reducing the number of animals in need of shelter care through preventive programs, and by ensuring that the remaining homeless animals pass through shelters successfully to a positive outcome. Fortunately, sufficient capacity is a much more attainable goal once it is understood that the solution is not to "house our way out of overpopulation" but simply to provide humane conditions for a finite number of animals as they pass through our care.

If actual capacity is insufficient to meet the demand for care and space, animals may be needlessly euthanized and crowding will be constant, resulting in high levels of stress and disease. These hazardous conditions will persist indefinitely unless required capacity is defined and targeted plans developed to correct gaps between current capacity and actual needs.

Below are a few examples of insufficient capacity for housing and care:

Insufficient number of housing units for holding. If current stray-holding areas have too few housing units to accommodate the number of animals likely to enter for the required holding period, then shelter staff will be left without an appropriate way to manage the incoming population. Shelter staff will be forced to co-house and crowd unrelated animals from different sources together during the holding period. There are three solutions, and any of the three or all in combination could be used to solve the problem. The number of housing units could be increased (along with sufficient staffing to care for the additional animals); the number of animals entering could be decreased; or the required holding period could be shortened so that the number of available housing units can appropriately house the number of animals who are present each day.

Insufficient staffing for care and flow-through. Capacity to provide care is equally as important to consider as number of housing units. The result of chronic understaffing will be ongoing lapses in care that will have adverse effects on animal health, delay flow-through and adoption, and create considerable stress for the staff. It is better to identify and correct the gap through increasing staff or the skilled volunteer workforce, investing in less-labor-intensive systems, or reducing the number of animals housed or flowing through the system at any one time.

Insufficient adoption space. An evaluation of capacity may reveal that adoption areas are insufficient to hold an optimal number of animals in conditions that meet guidelines for care. When this is the case, it would be much better—and probably more cost-effective—to build additional housing rather than chronically compromising adoption numbers or animal care.

Optimal Maximums for Housing Capacity

Understanding *optimal maximum capacity* is a significant part of managing a shelter population. When optimal maximums are unknown or exceeded, this can have adverse effects on the adopter's impressions, length of stay, and use of resources. Thus, it is important to define both minimum capacity required and a recommended optimal maximum population for each organization.

The emerging science of choice provides ample evidence that people confronted with an overabundance of options are less likely to choose any, and less likely to feel positive about any choice made under

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these conditions (Lyengar and Kamenica, 2010). Even if presented well, too many animals available at one place and time may inhibit adoptions.

In addition, maximum capacity may also impact the amount of time each animal spends in the shelter. The number of animals waiting for adoption relative to the number of likely adoptions can have a significant effect on average length of stay. For example, if 60 cats are consistently waiting for adoption, and adoption expectations are about 30 cats per month, then the average waiting time will be about 2 months (60 days). Another way of thinking about it is to realize that each day a supply of cats sufficient for about 2 months of adoptions is available. If only half as many cats are waiting (30 cats), then the average waiting time would be 30 days (half the time). (These calculations use averages so some cats will leave more quickly while others will stay longer.)

Finally, maximum capacity will impact daily operational costs. Clearly it will cost more to staff and operate a shelter with 300 animals on site each day than a facility with only 150 animals. As noted above, it does not make sense, nor is it effective to skimp on needed capacity as a cost-saving measure. However, increasing housing capacity may not be justified unless it has a life-saving benefit, and comes with a proportionate increase in capacity to provide care. Certainly, increased housing capacity would not be a benefit if the primary effect is to increase risk for illness and possibly even decrease adoptions. There are many other priorities for shelters to expend their limited resources, including spay/neuter programs, behavior helplines, support services to keep animals in their homes, and other measures to reduce the number of animals needing shelter in the future.

The goal is to determine housing capacity numbers that are "just right," matched with sufficient resources, such as staffing, to provide care for however many animals are housed. Building capacity for care and housing may require an initial investment, but in the long run nothing is more costly than the adverse effects of chronic crowding and understaffing. Being within capacity, on the other hand, can have positive effects on animals, staff, adopters, live release numbers, and even the financial bottom line.

Basic Capacity Calculations

The four most important capacity calculations are described below. (For more information, see the information sheet entitled "Evaluating Capacity for Care" that can be found at www.sheltermedicine.com.) These can all be calculated using monthly reports of intake numbers by type (e.g., stray, surrender, transfer), outcome number by type (e.g., reclaim, adoption, transfer, euthanasia), and averages or estimates of daily population. Although rough estimates can be obtained using annual numbers, it is generally more effective to look at capacity trends and variability on a monthly basis. This is especially true for cats, because cat intake tends to be more seasonally variable than dogs. Looking at seasonal variation is also important in communities with substantial seasonal effects such as a large student or vacation population.

Capacity needs based at least on species should be calculated, and if possible, by age (juveniles under 20 weeks of age versus adults). Housing, daily care, and flow-through staffing requirements may differ between puppies and kittens, dogs and cats. Breed- or condition-specific capacity should be calculated if special housing or handling is required or if outcome options are different than for other animals of that species (e.g., some cats may be better candidates for spay/neuter/release than for adoption). Some shelters are already collecting most of these numbers. When this is the case, only a few straightforward calculations are needed.

Housing Capacity

Housing capacity estimates are based on the simple principle that the number of animals present in the population on any given day is a result of both the number of animals entering and the amount of time they stay in the shelter. If one of these two variables changes, the number of animals in the daily population will be affected.

The effects of length of stay were discussed earlier: If 5 animals come in each day and the average length of stay is 5 days, then housing is required for 25 animals at a time; if intake remains constant (5 animals per day) but the average length of stay is now 10 days, then 50 housing units (twice as many) will be required. Likewise, if intake doubles but the average length of stay stays the same, the daily population will also double.

Holding Capacity

Holding capacity refers to the physical space required for animals in stray hold, quarantine, or

other required/desired finite holding periods prior to being made available for adoption. This includes animals who can be viewed for adoption but are not currently ready to be released. Subcategories may include stray-holding capacity, owner-surrendered holding capacity, rabies quarantine, etc.

Adoption-Driven Capacity

ADC refers to the optimal number of animals to have actively available for adoption, or for shelters where animals can be viewed for adoption throughout their stay, the number of animals actively moving toward adoption (i.e., on the adoption pathway). While this defines a physical space requirement at the low end, it is defined at the high end by the number of adoptions and the optimal length of stay.

Staffing Capacity

Similar to housing capacity calculations, staffing capacity calculations are based on how many animals need service each day and how long it takes to provide that care. For example, if 5 animals come in each day and it takes 20 minutes to complete intake processing (e.g., brief exam, microchip scan, vaccination, photograph, data entry, etc.), then at least 1 hour 40 minutes of staff time (100 minutes) must be allocated for intake processing. In most cases, for intake, it may be more efficient to calculate the time needed for two people to do the job (it might be half the time or even less) and then multiply the time needed by two to find the total time required. Since the services offered vary widely by organization, staffing capacity is evaluated in two broad categories:

Staff Capacity for Daily Care

Staff capacity for daily care refers to the number of animals who can be adequately cared for on a daily basis, based on recommended and/or internal standards. Even if physical capacity is sufficient, staff capacity may limit the number who can be provided adequate care.

Staff Capacity for Flow-Through

Staff capacity for flow-through refers to the ability to provide each animal with required specific services at several points during their shelter stay, e.g. intake, behavioral evaluation, spay/neuter surgery, and processing for reclaim, adoption, transfer, or euthanasia. If staff capacity for flow-through is inadequate for any of these points, it can lead to a backlog that in turn creates problems with capacity in other areas.

Using the Calculations

The calculations given below can be used to make estimates or projections for what capacity is needed. Required capacity projections should be compared to actual capacity available for both housing and care. Actual daily population numbers should also regularly be compared to projections since both housing and care capacity needs would rise if the daily population exceeds expectations (see Figures 8.2 and 8.3).

Calculating Housing Capacity

Required Holding Capacity (RHC)

RHC refers to the number of housing units required to hold animals for any holding period required by law or policy. RHC defines how many animals will need a "spot" for housing. A group kennel or room may provide five spots while a single run provides space for only one adult or perhaps a small litter of puppies or kittens. Thus, the number of actual kennels or runs to meet RHC depends both on the type of housing and the type of animal to be housed.

To calculate RHC, the required holding periods for different intake types must be known. For many shelters, only strays have required holding, which is defined as a set number of days after intake. But shelters may have other holding requirements, such as a policy for holding 48 hours after owner surrender or a requirement for quarantine after an out-of-state transport. Sufficient holding capacity to meet the needs of all these animals is required.

To calculate RHC, "monthly daily average (MDA) intake" also must be known. This is simply the number of animals admitted during a given month, divided by the number of days in the month. This should be calculated for at least a year's worth of data and ideally for 3 years' worth, so that predictable fluctuations in housing requirements can be anticipated.

When MDA intake and required holding periods have been established for each intake type, RHC can be readily calculated:

Required holding capacity (RHC)
= Monthly daily average (MDA) intake
× Required holding period

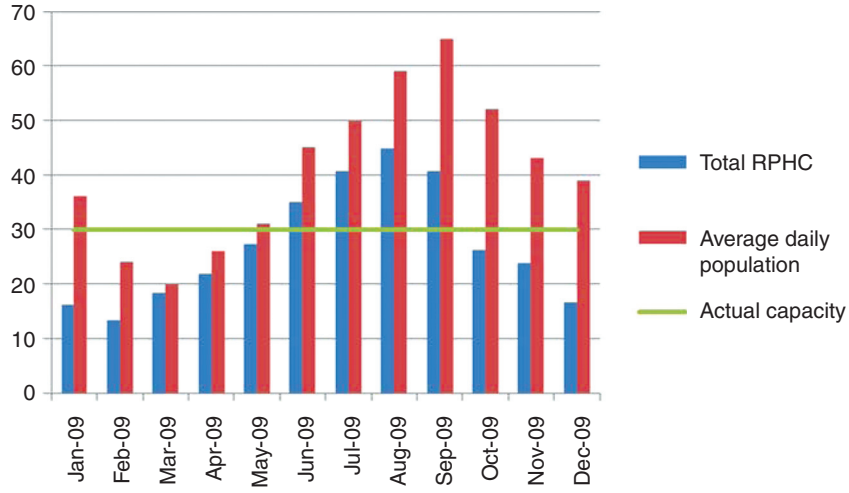


Figure 8.2. Required versus actual average daily population compared to actual capacity. In this shelter, the average daily population in the holding area exceeded the required holding capacity every month by at least a little and sometimes by over 50%. This indicates unplanned delays in moving animals along through the system. Even with the necessary length of stay, this shelter was going to be a little over capacity in the peak months, but prolonged stays led to being over capacity for an additional 4 months from October to January. This is often a consequence of falling behind in necessary procedures during the busiest season, which can carry over for several months if not corrected. Surprisingly often, crowding in holding areas can be relieved with just a few days of effort and overtime (sometimes starting with an adoption push so there is room to move adoptable animals out) and then kept within capacity on an ongoing basis.

The calculation may have several components (stray holding, owner-surrender holding, etc.) that need to be calculated separately and then added together. Capacity requirements for some types of holding, such as rabies quarantine, must be considered separately since specific housing requirements may apply. Since puppies and kittens under 5 months of age have special needs, calculating and considering holding requirements by age is especially important.

Table 8.1 shows how RHC would be calculated using a spreadsheet, where column F is D × E. (The numbers do not add up exactly in this spreadsheet because rounded numbers are presented, while the calculations are made on the actual numbers.) This real-life example for feline holding capacity is a good example of the dramatic seasonal fluctuations expected for cats. Required capacity at peak is more than four times that is needed during the slower intake months. Using monthly data makes these fluctuations clear while using annual data would have given misleading information. Figure 8.2 shows a comparison of the RHC to both the average daily population and the actual number of acceptable housing units. When planning or retrofitting a shelter, sufficient capacity for peak populations should always be considered.

Adoption-Driven Capacity

ADC estimates the ideal number of animals either in adoption areas or assigned to an adoption pathway. For most organizations, ADC is calculated by determining the target average length of stay, and multiplying that by the MDA number of adoptions.

Adoption-driven capacity (ADC)
= Target average length of stay
× Monthly daily average (MDA) adoptions

For animals basically "ready to go" straight to adoption upon admission (old enough and not requiring any treatment or rehabilitation other than the

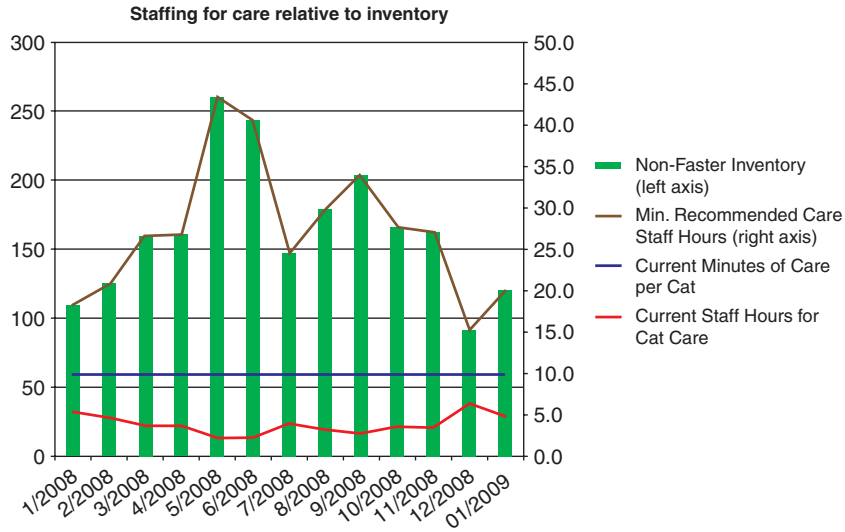


Figure 8.3. This graph shows the relationship between actual staffing hours for care (the orange line, which stayed steady throughout the year), required staff hours for care based on acceptable standards (the dark blue line, right axis, which fluctuated with the population and was between twice and over four times what was actually available), and monthly daily average population (left axis). The olive line shows the actual minutes of care each animal received, which dropped as low as just about 2.5 minutes per day during peak season, or 150 seconds to clean, feed, and monitor a living animal.

Table 8.1. Required holding capacity.

A Time period	B Intake	C Days in month	D MDA intake[a]	E Holding period	F RHC[b]
January 2009	82	31	2.6	6	16
February 2009	68	28	2.4	6	15
March 2009	94	31	3.0	6	18
April 2009	111	30	3.7	6	22
May 2009	168	31	5.4	6	33
June 2009	244	30	8.1	6	49
July 2009	302	31	9.7	6	58
August 2009	344	31	11.1	6	67
September 2009	302	30	10.1	6	60
October 2009	155	31	5.0	6	30
November 2009	132	30	4.4	6	26
December 2009	84	31	2.7	6	16

[a]Monthly daily average.
[b]Required holding capacity.

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Table 8.2. Adoption-driven capacity calculation using a 14-day target length of stay (LOS) and showing an evaluation by age group.

	Adult cat adoptions	Kitten adoptions	MDA[a] cat adoptions	MDA kitten adoptions	Adult cat ADC[b]	Kitten ADC	Total ADC
January	55	23	2	1	25	11	36
February	69	18	2	1	32	8	40
March	57	10	2	0	26	5	31
April	45	4	1	0	21	2	22
May	62	6	2	0	28	3	31
June	71	17	2	1	33	8	40
July	50	42	2	1	23	19	42
August	61	82	2	3	28	38	66
September	62	33	2	1	28	15	44
October	63	43	2	1	29	20	49
November	92	98	3	3	42	45	87
December	69	38	2	1	32	17	49

The calculations in columns 6 (Adult cat ADC) and 7 (Kitten ADC) are the monthly daily average adoptions × 14 days target length of stay.

[a]Monthly daily average.

[b]Adoption-driven capacity.

usual vaccines, spay/neuter, and other wellness care), the total target length of stay should generally be about 2 weeks or less. If animals are held for stray or quarantine in areas where they can be viewed and selected for adoption, this total time can be included when calculating ADC with a goal of approximately14 days total in holding and adoption (e.g., if the time in stray hold is 7 days, the target time in adoption would be approximately 7 days). If holding areas are cut off from public view, the target average length of stay in adoption should generally be at least 10 days to allow animals ample time to be viewed for adoption (with target length of stay to span two weekends, since that is usually peak adoption time).

Consideration must be given to age and species when determining the number of housing units required to meet ADC. Adoption rates as well as housing requirements may differ substantially by age group. In the example given in Table 8.2, an overall ADC for cats with a peak of 87 has been calculated by combining ADC for cats and kittens. However, the ADC calculations by age group suggest a maximum of only about 40 adult cats. The table also shows that the peak month was unusually high because it reflects an adoption special where cats and kittens were brought in from foster care, so this shelter may want to use the lower peak of 66 for their working ADC maximum.

Staffing Capacity

RHC and ADC provide a basic estimate of the housing capacity needed, on average, at any given time to serve the population optimally. There is, however, much more to providing humane conditions than giving animals food, water, and a place to physically reside. Animals need both daily and flow-through care to move successfully through the shelter.

Staff Capacity for Daily Care

At the most basic level, sufficient time for daily care must be available to provide for daily cleaning, feeding, medical care, and monitoring of each animal. Required staffing capacity for daily care is calculated by multiplying the number of animals present on a daily basis by the number of minutes required for basic care per animal per day and dividing by 60:

$$\text{Staffing hours required for daily care} = \frac{\text{Minutes per animal} \times \text{Average daily population}}{60}$$

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The inverse, "staff capacity for daily care" (SCDC), can also be calculated. To estimate the total number of animals who can be adequately and humanely cared for at any one time given current staffing hours, divide the number of staff minutes available for basic care activities per day by the number of minutes required per animal.

$$\text{Staff capacity for daily care (SCDC)} = \frac{\text{Minutes of daily staff time for care}}{\text{Minutes required per animal per day}}$$

How many minutes per animal per day? The amount of time required to provide daily care may vary by species, age, and housing type; it will also vary depending on the needs of the population. A shelter that has mostly healthy juveniles and adults can plan to spend fewer minutes on basic care per day than one with large numbers of animals with significant medical or behavioral rehabilitation needs. As a general guideline, the National Animal Control Association (NACA) and the Humane Society of the United States (HSUS) recommend allocating 15 minutes per animal per day for basic cleaning and feeding. Timing qualified staff performing their duties according to acceptable protocols without rushing provides an actual time per animal estimate for an individual organization. All tasks associated with basic care will need to be incorporated. Specific calculations by area (differing challenges for cleaning) or for species and age (differing animal needs) will best reflect staffing needs.

As with housing capacity, graphically demonstrating the relationship between actual staff time, required staffing capacity, daily population, and average amount of time to care for each animal, as in Figure 8.3, helps to clarify the scope of disparities when staffing is inadequate to meet animal needs.

If the actual daily population exceeds the SCDC, failures in care will be nearly inevitable. As with insufficient housing, this leads to a vicious cycle where animal health suffers due to lapses in care; sick animals have greater care needs and stay longer; which leads to more animals in the shelter each day; overwhelmed staff cannot keep up with moving animals through the system as they scramble to just feed and clean; and the cycle continues. If there is insufficient staffing to care for the population that must be held (RHC and ADC), this desperate situation must be corrected by increasing staff or investing in housing that requires less daily time to provide care (e.g., double-sided guillotine-separated runs that are substantially quicker to clean than single housing). If the actual population is greater than RHC + ADC, the situation is better remedied by investing in quicker flow-through protocols to reduce the number of animals in the building and improve the health and welfare of all concerned.

Staff Capacity for Flow-Through

Even if housing and staff capacity for daily care are theoretically sufficient, insufficient staffing for even a single necessary step to move animals through the system (critical flow-through point) can slow down operations and have a negative impact on every other area. For example, if enough trained staff are not available to complete behavioral evaluations on a daily basis, dogs will linger in holding areas awaiting this next step. This increases the daily population in holding, which increases daily care needs, decreases staffing capacity for each animal, leads to crowding in the holding area, increased risk of disease, and longer lengths of stay. Some dogs will likely deteriorate in health and behavior because of this frustrating cycle. Lack of time to complete a 20-minute assessment on the day it was due can lead to hours of extra costs in daily care, treatment, and ultimately even needless death of shelter animals. It is never cost-effective to under-staff critical flow-through points.

Intake, spay/neuter surgery, behavioral evaluations, pre-adoption testing (e.g., for FeLV/FIV or heartworm), physically moving to adoption, and euthanasia are common critical flow-through points. The simplest flow-through staffing requirement is for intake, so it makes a good basic example.

All animals need to be processed for admission, and the time required for this can be easily determined by observation. For each process, at least 10 instances should be observed, and the average time should be calculated. As an example, if adult feline intake is observed to require an average of 15 minutes per cat (including entering data into the computer, examining the cat, providing vaccines and parasite control, placing the cat into a clean cage, and

Table 8.3. Calculating hours of staff time required for intake on a daily basis each month, where column C is calculated as column B × 15/60.

A Time period	B MDA intake	C Hours of staff time required
January 2009	3	0.7
February 2009	2	0.6
March 2009	3	0.8
April 2009	4	0.9
May 2009	5	1.4
June 2009	8	2.0
July 2009	10	2.4
August 2009	11	2.8
September 2009	10	2.5
October 2009	5	1.3
November 2009	4	1.1
December 2009	3	0.7

providing fresh food and water), staffing for the intake process can be easily defined:

$$\text{Average daily staff hours required for intake} = \frac{\text{Minutes per intake}}{60} \times \text{MDA intake \#}$$

Table 8.3 uses the MDA intake to estimate required intake staffing hours on a monthly basis.

Flow-through staffing for outcomes is more complicated because not all outcomes will be the same (e.g., reclaim, transfer, adoption, euthanasia). The number of animals receiving each outcome is readily available from most shelter databases, and MDAs and time to complete each outcome can be determined exactly as for intake.

Intermediate steps, such as behavior evaluation or spay/neuter surgery, are slightly more complicated if all the animals do not receive the same services. These steps often have to do with evaluating and preparing animals for adoption, but adequate staff time for outcomes other than adoption is also crucial. For some shelters, some services will be performed for virtually all animals not reclaimed. For instance, all adult dogs may receive a behavior evaluation before any decision is made regarding adoption, transfer, or euthanasia. Other services, such as spay/neuter surgery or pre-adoption health testing will only be performed for a certain subset, such as intact animals or those made available for adoption after a behavior evaluation.

The exact details of calculating the number of animals requiring all of these intermediate steps is beyond the scope of this chapter. Detailed examples can be found in the information sheet, Evaluating Capacity for Care, found at www.sheltermedicine.com.

At a shelter where virtually all animals who are made available for adoption do get adopted, the average daily number of pre-adoption processing steps will be about equal to the MDA adoptions. For shelters where a substantial number of animals placed for adoption ultimately have another outcome, such as rescue or euthanasia, an estimate of this should be made (or the exact figure determined) and added to the MDA adoption. For instance, if 25% of animals placed for adoption end up with another outcome, multiply MDA adoptions by 1.25 for the number of animals needing procedures each day before movement to adoption. (Consideration should also be given to this pathway to determine if there are capacity-related problems that may be contributing to euthanasia of animals who have already been made available for adoption.)

Similar adjustments can be made to estimate what percentage of animals will need other flow-through procedures (e.g., spay/neuter surgery or behavior assessment). Stacked graphs can be generated to visually demonstrate required staffing levels for a collection of flow-through points. As with capacity for daily care, this can help identify where there is risk for delays. If only certain staff can provide particular services, these should be graphed and evaluated separately (e.g., time for spay/neuter surgery will require a certain amount of veterinary and technician time, while intake, behavioral evaluation, health testing, and euthanasia may only be performed by certain trained staff members) (see Figure 8.4).

If adequate staffing for flow-through cannot be provided, then these steps must be shortened or eliminated, or the number of animals requiring these

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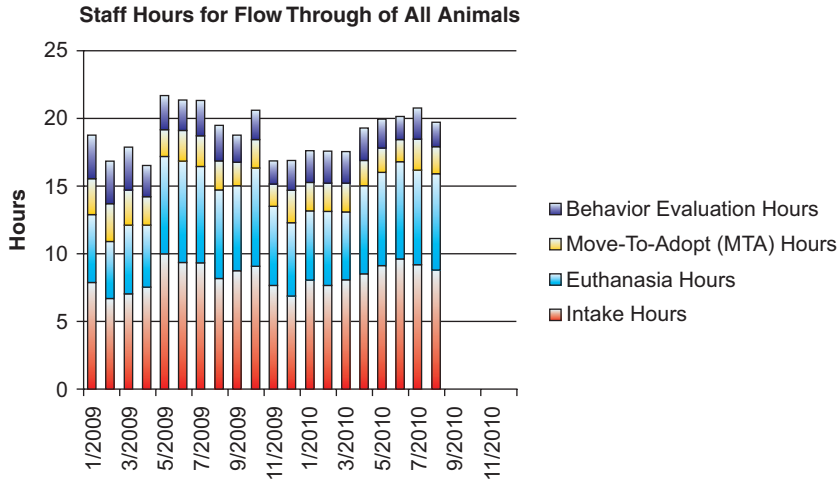


Figure 8.4. This graph shows a summary of required staff for flow-through of all animals through one large municipal shelter. While the hours per process should be calculated separately for each species, it is useful to combine them into a summary graph such as this one if the same staff are responsible for all processes. For example, only dogs received behavior evaluations at this shelter, but the time for that was combined with the time for intake, movement to adoption areas, and euthanasia of all species since these duties fell to the same staff members.

services reduced by decreasing intake. Holding animals back until staff can catch up is untenable. As with all other areas discussed, bringing the population within capacity at every step along the way works synergistically to ensure the quickest, safest path for each animal from the time he or she enters the shelter's care until the moment he or she leaves.

CONCLUSION

Population management is a way to organize the important work being done for shelter animals so that efforts are directed toward life-saving, humane solutions, while risks are minimized and resources are used to their best effect. Why spend time on math and projections? Animal homelessness continues to create more risk of death, disease, poor welfare, and suffering for a greater number of animals than any medical condition encountered. Shelters cannot afford any wasted time or random motion.

REFERENCES

Association of Shelter Veterinarians (ASV) (2010) *Guidelines for Standards of Care for Animal Shelters*, http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 Accessed August 30, 2012.

California Proposition 2, Standards for Confining Farm Animals (2008). http://ballotpedia.org/wiki/index.php/California_Proposition_2,_Standards_for_Confining_Farm_Animals_(2008) (accessed June 9, 2012).

Center for Shelter Dogs (2010) http://www.centerforshelterdogs.org/Home/News/tabid/77/ctl/ReadCSDNews/mid/655/ArticleId/8/Default.aspx (accessed on January 12, 2012)

Centonze, L. and Levy, J. (2002) Characteristics of free-roaming cats and their caretakers. *Journal of American Veterinary Medical Association*, **220**, 1627–1633.

Chu K. and Anderson, M. (2007) U.S. public opinion on humane treatment of stray cats. *Law and Policy Brief*, Alley Cat Allies, Bethesda, MD, http://www.alleycat.org/Document.Doc?id=61 (accessed on June 9, 2012).

Edinboro, C., Ward, M. and Glickman, L. (2004) A placebo controlled trial of two intranasal vaccines to prevent tracheobronchitis (kennel cough) in dogs entering a humane shelter. *Preventive Veterinary Medicine*, **62**, 89–99.

James, S. (April 28, 2011) Bay Citizen, *Animal Euthanasia Rates Vastly Higher Outside San Francisco*, http://www.baycitizen.org/columns/scott-james/animal-euthanasia-rates-vastly-higher/ (accessed on January 12, 2012).

VetBooks.ir

LA Times (2010) http://latimesblogs.latimes.com/unleashed/2010/09/one-fourth-of-new-animal-hoarding-cases-involve-rescuers-aspca-expert-says.html (accessed on January 12, 2012).

Levy, J. and Crawford, C. (2004) Humane strategies for controlling feral cat populations, *Journal of American Veterinary Medical Association, Animal Welfare Forum: Management of Abandoned and Feral Cats*, **225**, 1354–1360.

Lord L. (2008) Attitudes toward and perceptions of free-roaming cats among individuals living in Ohio. *Journal of American Veterinary Medical Association*, **232**, 1159–1167.

Lyengar, S. and Kamenica, E. (2010) Choice proliferation, simplicity seeking, and asset allocation. *Journal of Public Economics*, **94**, 530–539.

Maddie's Fund (2011) http://www.maddiesfund.org/No_Kill_Progress/Searchable_Database.html (accessed June 9, 2012).

Manning, A. and Rowan, A. (1992) Companion animal demographics and sterilization status: Results from a survey in four Massachusetts towns. *Anthrozoos*, **5**, 192–201.

Marsh P. (2010) *Replacing Myth with Math: Using Evidence-Based Programs to Eradicate Shelter Overpopulation*. Town and Country Reprographics, Inc., Concord, NH.

Patronek, G. (2010) Use of geospatial neighborhood control locations for epidemiological analysis of community-level pet adoption patterns. *American Journal of Veterinary Research*, **71**, 1321–1330.

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9
Canine Care in the Animal Shelter

Lila Miller and Stephanie Janeczko

INTRODUCTION

The care of dogs in shelters has changed dramatically over the years as research has revealed more about their biology and behavior, and the bond between dogs and humans has deepened. Because it is commonly acknowledged that good health is linked to physical and emotional well-being and is not merely the absence of disease, it is no longer acceptable for a shelter to place a dog in an enclosure, provide food and water, and consider its job well done. In 2010, the Association of Shelter Veterinarians (ASV) released Guidelines for Standards of Care in Animal Shelters. The guidelines are based on the Five Freedoms (see Table 9.1) developed in 1965 by the Brambell Commission in the United Kingdom to address the welfare of animals confined in agricultural settings (ASV, 2010). The ASV felt that the Five Freedoms are broadly acceptable as guidelines for the welfare for all animals; dogs and cats confined in shelter settings deserve no less consideration for their welfare than farm animals. The guidelines and recommendations are based on what dogs and cats require for their welfare, not what might be dictated by the mission or resources of a particular sheltering organization, or by guidelines developed for other confinement settings such as dog kennels and laboratories. Because the basic needs of animals remain the same, the guidelines have wide applicability to all sheltering operations.

Providing appropriate care for dogs in shelters is a complex subject that requires attention to many management topics that are not strictly medical. Unlike the first edition of this text that provided much of the information pertinent to caring for dogs and cats in one chapter, this expanded edition will frequently direct the reader to other chapters on cat care, sanitation, spay neuter, shelter design, population management, etc., for more information.

UNDERSTANDING DOGS

The domestic dog is a member of the order Carnivora, family Canidae, genus *canis*, and species *familiaris*. The family Canidae also includes the wolf, coyote, dingo, jackal, fox, and Cape Hunting Dog. Dogs were once classified as *Canis familiaris* but are now more properly classified as *Canis lupus familiaris*.

Domestication of the dog is believed to have occurred approximately 12–15,000 years ago when humans became less nomadic and began to live in relatively permanent settlements. As dogs adapted to living with humans, a process of natural and artificial selection resulted in several physical changes, most notably significant variations in size, but also variation in ears, tails, coat type, and behaviors depending on the type of work that many dogs were bred to perform.

A dog breed is considered to be a group of animals with uniform size, body conformation, color pattern, and behavior. According to Case (2005), it is believed that there are somewhere between 370 and 400 breeds of dogs worldwide. Other sources place the number at 500 or even higher, especially when counting breed mixes and designations by the various

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Table 9.1. Five Freedoms for farm animal welfare.

1. Freedom from hunger and thirst	By ready access to fresh water and a diet to maintain full health and vigor
2. Freedom from discomfort	By providing an appropriate environment including shelter and a comfortable resting area
3. Freedom from pain, injury or disease	By prevention or rapid diagnosis and treatment
4. Freedom to express normal behavior	By providing sufficient space, proper facilities and company of the animal's own kind
5. Freedom from fear and distress	By ensuring conditions and treatment which avoid mental suffering

Source: http://www.fawc.org.uk/freedoms.html (accessed June 18, 2012).

kennel clubs and breed organizations throughout the world (Gerstenfeld, 1999). Because dog breeds are nonscientific classifications, they may be described differently by different kennel clubs. In general, most breeds originated from working dogs who fit into spitz, mastiff, sight hound, scent hound, terrier, herding, or gun-dog classifications; in contrast, the toy breeds were developed primarily as companions (Case, 2005). Although the predominant population of most shelters is mixed breed, a good working knowledge of breed characteristics will help a shelter meet the differing behavioral needs of certain breeds, and is also necessary if the shelter is to work collaboratively with breed rescue and foster care groups. This knowledge is also important for shelters that operate lost-and-found programs because of their reliance on breed identification and physical descriptions as well as tags and microchips to reunite lost animals with their owners. It is beyond the scope of this chapter to describe the physical and behavioral characteristics generally associated with the various breeds, but every shelter should have a good, well-illustrated dog breed chart and breed reference text. Wall charts and posters are available at www.akc.org/store/akc/ or online from other sources. It should be remembered that despite the wide variation in canine physical characteristics and appearance, all dogs have the same basic special senses and genetic and skeletal structure, and thus the same basic needs must be met.

Dog Senses

The olfactory and auditory senses in dogs are highly developed, sensitizing them to noise and odors in shelters that may go unnoticed by humans but serve as a source of stress for them. Dogs can hear over a distance four times farther than humans and are also more sensitive to high-frequency sounds. Noise that is barely audible to humans at a distance of 50 feet will sound very clear to dogs at a distance of 200 feet (Gerstenfeld, 1999). Humans can hear up to 20,000 cycles per second, while dogs can hear 40,000 cycles per second (Case, 2005). Efforts to identify areas and activities with problematic levels of noise, along with attempts at noise abatement, should be prioritized; slamming cage doors, loud equipment or music, or even constant barking have a more detrimental effect on dogs than humans because the sound is louder to them and can be heard over a greater distance.

The dog's ability to detect odors is one hundred times greater than humans. Shelter staff should be aware that dogs may be adversely affected by odors emanating from a distance from their primary enclosure as well as by what is within their immediate vicinity, and that odors that are only slightly noxious to humans may be very objectionable to dogs. For example, chemical disinfectants should be diluted and applied properly and rinsed so residues and odors do not linger. Shelters that use sodium hypochlorite (bleach) should be aware that when properly diluted at 1:32 with water for routine use, there should be minimal odor. But if used to kill ringworm spores at a 1:10 dilution, animals must be removed from the enclosure because this dilution is very caustic and may cause respiratory tract irritation in both humans and animals.

Because of the various skull shapes and placement of their eyes, dogs have variable fields of vision,

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but they all have very good dim-light vision that is very sensitive to movement. They are not color blind as is commonly believed; they are most capable of detecting blues and greens but cannot distinguish reds and oranges, a fact worth noting when working with and training dogs (Case, 2005).

Life Span

The maximum life span of a dog is estimated to be about 27 years (Case, 2005), but the average life span of most dogs varies from 12–15 years. Mature body weight, reproductive status, and breed type tend to be important factors in determining longevity. Small neutered dogs tend to live longer than large intact ones; the life span of some large breeds such as Bernese Mountain Dogs and Saint Bernards may be as short as only 5–6 years. Adopters may ask staff to predict the longevity of the dog they are adopting; in all cases it should be made clear that is it impossible to know because there are many factors in addition to genetics that affect longevity. However, the important point to be made is that the placements shelters make hopefully will be long-term, lifelong matches, and that adopters understand that dogs may live for several years or a decade or more.

Reproduction

Female dogs (bitches) reach sexual maturity between 6 and 16 months of age, whereas male dogs generally reach sexual maturity at about 10 months of age. However, some large breed dogs do not reach sexual maturity until they reach 2 years of age. Dogs are seasonally monoestrous, releasing one set of ova (eggs) per estrous cycle. They are capable of producing several puppies in each litter and may have mated with more than one male, resulting in a litter having more than one father or sire. The estrous cycle has many stages, but estrus, or "heat" as it is commonly called, refers only to the period when a female will allow the male to mount her for breeding. Estrus generally lasts from 5–9 days, and dogs have one or two estrous cycles per year. The gestation period in dogs ranges between 56 and 72 days, with an average of 63 days.

Behavior

The behavioral aspects of shelter animal care have historically been overlooked, probably due in part to lack of knowledge among shelter staff about dog behavior or its importance in relation to animal well-being. Also, the duration of most shelter stays was fairly short, and animals showing signs of aggression, distress or "bad" behavior were usually quickly euthanized. The change in attitude about the importance of behavioral care is reflected in the ASV guidelines, which devote one of nine sections to behavioral care, stating "good health and well-being depend on meeting both the mental and behavioral needs, as well as the physical needs, of animals." They recommend that a thorough behavioral history and the reason(s) for relinquishment of the dog should be obtained at the time of intake, and that animals showing behavioral signs of stress be treated as seriously as animals with physical injuries (ASV, 2010).

It is fairly common knowledge that dogs are considered social animals. The primary social group of most pet dogs is humans. Socialization of puppies and regular positive interactions with humans is an important part of normal canine development. If there is more than one dog in the household, or if dogs are group housed or paired together in the shelter, they will develop social attachments with the other dogs.

Dogs have a variety of responses to fear, including fleeing, freezing, or fighting. They may exhibit a variety of body postures (including position of ears and tail) and facial expressions that indicate dominance, submission, happiness, tension, and so on (see Figure 9.1). It should also be acknowledged that along with being bred for physical characteristics, dogs bred to accomplish particular work tasks may also have breed-specific temperaments to help them accomplish that work. For example, in general, terriers and mixed breeds who are predominantly terriers were originally bred to hunt small rodents and may possess traits such as a high prey drive, high reactivity, low to medium trainability, and may be aggressive (Case, 2005). While each dog should be assessed as an individual, breed characteristics are important background information to keep in mind when housing, handling, evaluating, and adopting these dogs to the public.

Shelter staff who work with dogs should have basic training in dog behavior so they can learn how to handle them humanely and meet their needs. They should be able to recognize body postures and facial

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Figure 9.1. Playful dog posture. Shelter staff should be trained to recognize this as a playful posture—the dogs ears are up and forward, the tail is up and he is exhibiting a play bow. (Courtesy ASPCA.)

expressions that signify aggression, stress, pain, fear, etc. They should also be able to distinguish normal from abnormal behavior. Without this type of training, the shelter cannot provide dogs with four of the Five Freedoms: freedom from pain, fear and distress, discomfort, and to express normal behavior. Behavioral indicators of stress, social conflict, pain, or other suffering include persistent hiding, hostile interactions with other animals, reduced activity or appetite, depression and/or social withdrawal, barrier frustration or aggression, stereotypic behaviors (e.g., repetitive spinning, jumping, or pacing), or other abnormal behaviors (ASV, 2010). When these or other behavioral signs of stress and maladaptation appear, the shelter must take steps to alleviate the suffering just as it would if the dog was suffering from a physical disease or injury. The chapters on quality of life, behavioral pharmacology, behavior enrichment, and behavior evaluations in this textbook provide more information on behavioral care.

INTAKE CONSIDERATIONS

At the time of intake into the shelter, every dog and puppy should at the very least receive a preliminary physical examination and be issued an identification band and shelter record that contains all the pertinent information for that animal, including physical description, medical information, relinquishment information, and any communications. Many shelters maintain computerized records that do not travel with the animal from room to room, while others rely on paper records that are fastened to the animal's cage and travel with that animal whenever he or she is moved to another location. In most cases, an identification band is affixed to the animal's neck unless the animal is too aggressive at intake to be safely handled. As soon as the animal can be handled, however, identification should be attached. Staff should take the time to verify that each animal has an identification band issued by the shelter and that any accompanying paperwork matches the animal and the identification band. Verification of the animal's identity as soon as possible and each time she or he is handled, examined, or treated may avert treatment and euthanasia mistakes.

All dogs, including owner relinquishments, should be checked for identification, rabies or license tags, tattoos (ears, abdomen and the inguinal region are primary sites), and scanned for a microchip. For best scanning results, metal tags should be removed, and guidelines and directions provided by the scanner manufacturer should be followed closely (Lord *et al*., 2008). Animals should be scanned more than once and definitely prior to transport, adoption, or euthanasia. See the chapter on introduction to animal sheltering for more information on microchipping.

Physical Examination

Physical examinations that include preliminary behavior assessments should be performed on dogs and puppies as soon as they arrive at the shelter. There should be a separate area in the shelter where entering animals are held temporarily until these triage examinations can be performed. The primary reasons for this urgency are to identify animals with injuries needing immediate medical attention and to isolate those with infectious disease symptoms before they have contact with the general population. An additional consideration is that the behavior evaluation be used to identify aggressive, extremely shy, or otherwise distressed animals

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who may need special housing and handling. For example, aggressive animals may need to be housed in double-sided cages with appropriate warning signs to protect staff, whereas shy animals may benefit greatly from housing in a quiet area with more experienced staff better able to meet their needs. This preliminary behavior assessment should not be the final determinant of the dog's adoptability.

If a veterinarian is not available to examine animals at intake, veterinary technicians or other staff should be trained to perform basic physical examinations. The dog's body weight should be recorded and the body condition score (BCS) documented using a standard system (e.g. Hills or Purina scales) to indicate the overall muscle mass and fat deposits. (See the chapter on feline care for more on BCS). An estimate of age should made and the gender should be determined as well as the reproductive status. An examination that assesses for infectious diseases, injuries and pain should be conducted. Possible signs of infectious disease include nasal and ocular discharge, sneezing and coughing, vomiting, diarrhea, loss of appetite, depression, dehydration, fever, etc. The eyes, ears, mouth and teeth, mucus membranes, mentation and demeanor, and ambulation should be evaluated. The heart and lungs should be auscultated to detect any abnormalities that should be further evaluated by a veterinarian. The skin should be checked for hair loss, inflammation, lesions, lumps, infections, and signs of fleas and ticks. An assessment of temperature, pulse, and respiratory rate may not be required for every animal, but should be performed on any animal who is sick or debilitated, injured, or suspected of having an infectious disease. It must be remembered that these physiologic parameters can vary if the animal is excited or stressed, or if the environmental temperature is very high; in such cases, the assessments may need to be repeated to get a true picture. Normal physiologic values for dogs and puppies can be found in Table 9.2. (Table 10.1 in the chapter on cats contains a sample physical examination form that can help facilitate recording examination findings.)

Table 9.2. Normal physiologic values for dogs.

	Adult dog	Puppy (5 wk)
Temperature (Fahrenheit)	99.5–102.5	98–100
Pulse rate (beats/min)	60–180	150–220
Respiratory rate (breaths/min)	10–30	15–35

Physical Characteristics

Dogs have been described as having more morphological variation within the species than any other land mammal (Spady and Ostrander, 2008). Small dogs such as Chihuahuas may only be a few inches in height (measured at the withers or shoulders) whereas an Irish Wolfhound may be 3 feet tall. Although providing an accurate physical description of a dog or its breed can be a very important factor in returning a lost dog to his or her owner, unfortunately, shelter staff and the public are often inaccurate when using physical characteristics to identify dog breeds. According to a study by Voith, 87.5% of the dogs identified by an adoption agency as having specific breeds in their ancestry did not have all of those breeds detected by DNA analysis (Voith *et al*., 2009). The tendency is to try and characterize dogs as being a mix of two breeds when, in fact, they may be a mix of several, and no predominant breed can be visually identified. When breed type is unknown or uncertain, rather than guess, it is more helpful to designate dogs as mixed breeds and describe them as fully and accurately as possible. Their coats may be described as short, long, thick, thin, woolly, coarse, curly, etc. The description of the coat must include *all* colors, which can range from white to black, and the color pattern. Their tails may be short, long, straight, cork screwed or docked, and be carried low, straight up, or curled over the back. Their ears may be cropped, erect, or floppy. Some dogs may have dewclaws, different color eyes, or other distinguishing characteristics. All of this information, also referred to as part of the signalment, should be entered in the animal's shelter record on intake.

Age Determination

If the dog's age is unknown, most estimates are made by evaluating the dog's teeth. Dogs have 28 deciduous or temporary teeth, and 42 permanent teeth designated as upper and lower incisors (I), canines (C), premolars (P), and molars (M). With the numerator representing upper teeth and the denominator representing lower teeth, the dental pattern for deciduous teeth is 2 I(3/3), C(1/1), P(3/3) = 28. The formula for permanent teeth is 2 I(3/3), C(1/1), P(4/4),

Table 9.3. Estimate of age by dental wear pattern.

Age	Description
The dental formula for an adult dog is 2 incisors (3/3), canines (1/1) premolars (4/4), and molars (2/3) = 42.	
The dental formula for a puppy is 2 incisors (3/3), canines (1/1), premolars (3/3) = 28.	
1 year	Teeth are white and clean
1–2 years	Teeth may appear dull with some tartar and yellowing on back teeth
1½ years	Cusp worn off lower first incisor
1½–2½ years	Cusp worn off lower second incisor
3½ years	Cusp worn off upper first incisor
4½ years	Cusp worn off upper second incisor
5 years	Cusp of lower third incisor and canine teeth show slight wear, occlusal surfaces of lower first and second incisors appear rectangular
6 years	Cusp worn off lower third incisor; canine teeth are blunt, lower canine shows impression from upper third incisor
8 years	Occlusal surface of lower first incisor inclines forward
10 years	Lower second incisor and upper first incisor have elliptical occlusal surfaces
12 years	Incisors begin to fall out, more tartar yellowing and wear seen

Source: Adapted from Merck Veterinary Manual (1998) (ed C. Kahn) 8th edn. p.139, Merial, Whitehouse Station, NJ; and HSUS (1996) *Animal Sheltering* Series on How to age a dog or cat by its teeth.

and M(2/3) = 42 (see Table 9.3 and Figure 9.2a and b).

Guidelines for estimating the age of puppies by the eruption of deciduous and permanent teeth can be found in Table 23.1 in the chapter on medical evaluation of abused live animals. Table 9.3 contains an estimate of age based on the wear pattern of teeth. This wear pattern will vary depending upon the dog's diet and the degree of dental care previously received. Other features that help determine a dog's age include graying of the hairs around the muzzle, and nuclear sclerosis, or clouding of the lens of the eye, which appears at about 6–8 years of age. Nuclear sclerosis differs from cataracts, which are opacities of the lens that may also appear in young animals as a congenital problem or in association with diabetes, trauma, or malnutrition (see Figure 9.3a and b). In cases where an accurate estimate of age may be critical, such as in a cruelty case, a method of determining age by examining the lens has been described by Tobias, Tobias and Abood (2000). Records should indicate if and how an estimate of a dog's age is being made or if accurate information is presented from a registration certificate, veterinary record, or other proof of date of birth.

Determining the Dog's Sexual Status

Unlike small kittens, the determination of the sex of male puppies is much more straightforward because the testicles are located below the anus, and the penis is easily located on the abdomen; in very young puppies, the penis may appear as a bump and cannot yet be extruded from its sheath. The testicles usually descend into the scrotum during the first two weeks of life or by the time the puppy is 2 months old, although later descent at 4–6 months of age is possible. Because some puppies undergo pediatric neutering at 6–8 weeks of age, if both testicles are missing he either has been castrated or is a bilateral cryptorchid, meaning the testicles are retained in the abdomen or inguinal region. (For more information about cryptorchidism, see the chapters on pediatric neutering and surgical techniques for spay/neuter.)

If only one testicle is missing, the animal should be considered to be a unilateral cryptorchid, as it is highly unlikely that only one testicle was removed during a castration. He should be examined carefully to see if the missing or retained testicle can be located in the inguinal region. If both testicles are missing, in addition to searching both inguinal regions for them, the animal should be examined

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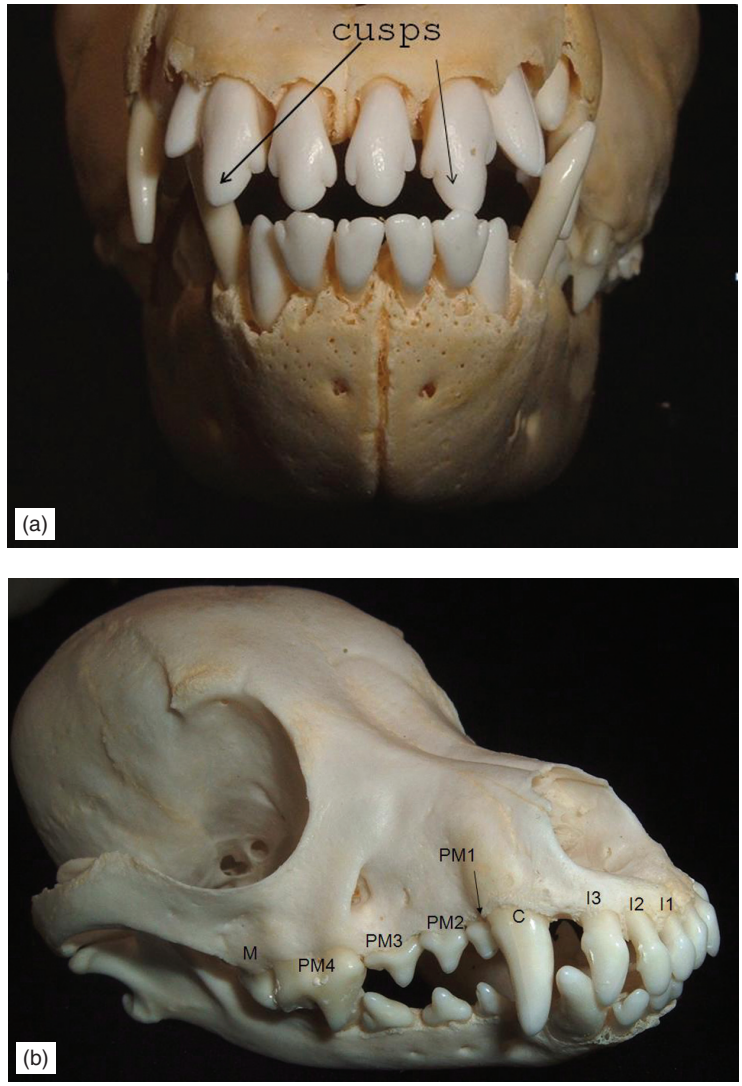


Figure 9.2. This should read: (a) Dentition of a 4–5 month-old puppy. Both I1 and I2 are permanent adult teeth. I3 is partially erupted and the canine teeth are deciduous. Note the cusp on the permanent incisors. (b) Dentition of an adult dog. The maxillary arcade is labeled to facilitate identification of the different teeth; the second molar is not visible in this image. I, incisor; C, canine; PM, premolar; M, molar.

for a tattoo or scar in the prescrotal or scrotal area that would indicate he has been castrated. If no scar can be found he may still have been castrated, or the testicles are retained in the abdomen and he is a bilateral cryptorchid. A description of a test utilizing gonadotropin-releasing hormone (GnRH) to determine if testosterone is present and hence whether a dog has been castrated or not can be found in the chapter on surgical techniques for spay/neuter.

The vulva of female puppies is easily located as a slit below the anus. Due to pediatric spaying of female puppies as young as 6–8 weeks, it can no longer be automatically assumed that a female under the age of 6 months has not been spayed and is intact. Many, but not all, pediatric spay-neuter programs identify their patients by applying tattoo ink in the groin area or within or adjacent to the surgical incision. If there is no tattoo, identifying whether a female dog has been spayed can be problematic if a spay scar on the abdomen cannot be found. For the best detection results, the dog should be examined while on her back and the abdomen must be shaved, but even with shaving and a bright light, a spay scar cannot always be found. A description of

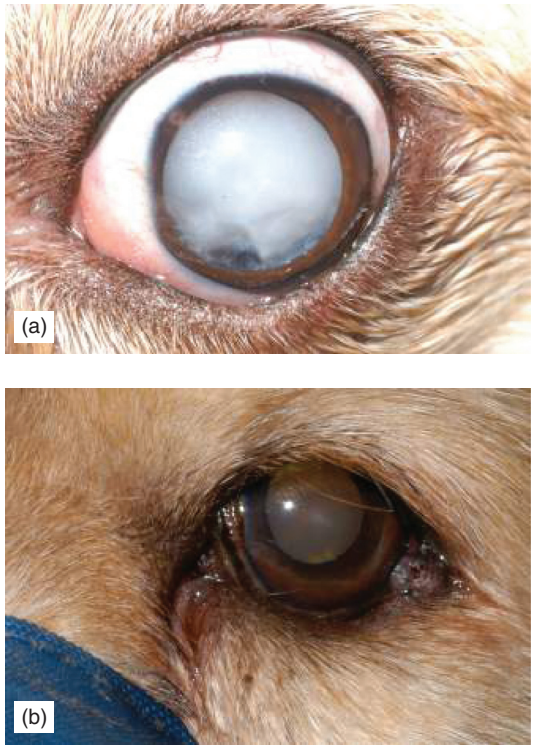


Figure 9.3. (a) Cataracts and (b) nuclear sclerosis. (Photo courtesy Lila Miller.)

the use of luteinizing hormone (LH) to determine whether a female dog (bitch) has been spayed or not can be found in the chapter on surgical techniques for spay/neuter. When the pregnancy status of a female is unknown, many shelters that do not routinely spay or neuter animals before adoption will arrange to have her spayed before she is released to avoid adopting out a possibly pregnant animal.

Staff should be able to recognize when a bitch is in heat, especially if physical examinations are not performed at the time of intake or dogs are group housed, as their status will affect how they behave and where and how they are housed. Bitches in heat will secrete pheromones that attract male dogs and contribute to sexual frustration and fighting. They should be housed securely at a distance away, preferably in a ward separate from male dogs, as pheromone scents can travel over a wide distance. Signs of estrus include a vaginal discharge that ranges from slightly pink to red in color, and the vulva will be swollen. (If the discharge is brownish in color and has a foul odor, the dog may have an infection in her uterus, or a pyometra, which should be considered a serious medical problem requiring immediate veterinary attention.) Bitches in heat will crouch and elevate their hindquarters toward male dogs, assuming postures that are conducive to being mounted for breeding. It is a good idea to spay bitches who will be held in the shelter for long term or stray adoptable dogs in heat whose mating history is unknown, as they may be in the very early stages of pregnancy.

Pregnancy detection should be a routine part of the physical examination of any bitch with an unknown reproductive status. This is particularly important if dogs are not routinely spayed prior to adoption. It can be very problematic for a shelter to unknowingly provide an adoptive owner with a surprise litter of unwanted puppies. Fetuses can be palpated in the abdomen as distinctly separate, oval to round swellings between day 20–30 of the gestation period, but obvious abdominal swelling may not be apparent until day 35 of gestation. Ultrasonography and radiography can also be used for pregnancy diagnosis, but these tools usually are not readily available in most shelters. If access to radiography is possible, it will show calcified fetal skeletons after day 42. Other signs of pregnancy include enlargement of mammary glands at about day 35 with loss of hair around the nipple or teat, milk production around day 58–60, and a clear vaginal discharge also at day 35. If it is determined that a pregnant bitch is adoptable, she can either be placed in a foster home to await delivery of the puppies, or the pregnancy can be surgically terminated even in its latter stages. (See the chapter on surgical techniques for spay/neuter.)

Pain Recognition and Management

One of the Five Freedoms is freedom from pain. Animals should be examined for traumatic injuries, wounds, burns, or other painful conditions at intake and have a pain assessment performed. Appendix 23.1 in the chapter on examination of the abused live animal contains recommendations for performing a pain assessment. A canine pain assessment form is also available from Colorado State University (Canine Acute Pain Scale, 2006). Staff must be proactive in obtaining veterinary care to ensure adequate analgesia is provided for as long as the pain persists. Pain, in addition to causing animal

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suffering, results in a number of other harmful consequences, including increased susceptibility to infection, delayed healing and convalescence from disease, reduced food and water consumption, altered sleep and behavior patterns, etc. All of these can adversely affect a dog's welfare as well as chances for successful rehoming or placement.

The physiological signs of pain may include increased blood pressure, heart, and respiratory rate, or peripheral vasoconstriction resulting in pale mucus membranes. Behavioral responses to pain may include changes in normal vocalization, and whining, growling, or whimpering. Dogs may become timid or aggressive, develop a fixed stare or arching posture. They may also guard, lick, or chew injured parts. While it is clearly recognized that conditions such as fractures will require pain relief, the degree of pain associated with some conditions may be underestimated, such as with arthritis, chronic ear infections, cancer, dental procedures, and after any surgery, including spay/neuter surgery (Tranquilli, Lamont and Grimm, 2004). However, when in doubt it should be assumed that an animal is in pain and requires analgesia if the condition he or she is afflicted with would be considered painful to humans; this assumption should be made even in the absence of clear behavioral or physiological indicators of pain. American Animal Hospital Association (AAHA) and American Association of Feline Practitioners (AAFP) have jointly published pain management guidelines (AAHA and AAFP, 2007), and a significant body of new work regarding recognition and management of pain in companion animals has been published in the last decade; numerous resources exist to assist the veterinarian in the diagnosis and treatment of pain associated with a medical condition. The best approach to effective pain management is to seek veterinary care to provide multimodal analgesia preemptively and to provide it for the duration of the animal's discomfort. Treatment for pain should be considered successful if the animal resumes normal activities (sleeping peacefully, eating normally, etc.) and ceases abnormal behaviors and vocalizations. See the chapter on anesthesia and pain management for more information on drug therapies.

Attention to and management of pain is a fundamental aspect of patient care regardless of circumstance or condition. If an animal's pain cannot be adequately controlled in the shelter, it is inhumane to allow that animal to remain at the facility. Shelters that must hold animals with traumatic and painful conditions and do not have the ability to provide appropriate treatment in-house either must make arrangements to transfer them for care at some other suitable setting such as a private veterinary hospital or humanely euthanize the animal. Criteria and legal requirements for euthanizing animals for humane reasons (EHR) during a legal holding period should be identified in advance of an emergency situation; written guidelines for the veterinarian to utilize when making EHR decisions should be created. (See the chapters on emergency care and euthanasia for more information.) These guidelines should consider the availability of resources and the shelter's ability to provide a level of care necessary to maintain an ill or injured animal in a pain-controlled and relatively stable condition.

Vaccinations

Vaccination at or before the time of intake to the shelter is considered a significant component of shelter wellness plans (ASV, 2010; Larson, Newbury and Schultz, 2009). However, vaccinations alone are not sufficient to safeguard animal health and prevent disease transmission, despite often unrealistic expectations attached to their use. In fact, they are likely to be of little benefit when used in a vacuum without adequate attention to other preventive strategies. (See the chapters in the section on infectious disease for a more in-depth discussion of disease control.) Vaccinations cannot guarantee successful immunization and do not work instantaneously, and they are not available for every disease of concern in a shelter setting. They must be handled carefully and administered appropriately. Animals receiving the vaccinations must be able to mount an adequate immune response prior to exposure in order to be protected; the vast majority of adult animals will respond to inoculation of a single dose of modified live vaccine (MLV), but maternal antibodies may block the immune response in dogs 4 months of age and younger. In addition, though rare, some dogs are immunologic nonresponders who are incapable of developing an adequate immune response following vaccination (AAHA, 2011).

When administered appropriately to an animal capable of a response, vaccines will induce a

Table 9.4. Obstacles to successful immunization.

Maternal derived antibody (MDA) interference
Nonresponders
Delay in onset of immunity (e.g., 1–7 days or longer for modified live vaccines (MLV))
Prolonged delay in onset of immunity for killed products (e.g., 1 week following booster)
Variable effects in animals incubating disease
Possibility of mild clinical signs resulting from intranasal vaccination
Viral shedding induced by MLV products
Less than 100% efficacy
Nonsterilizing immunity
Stress

protective immune response in the animal that will limit the severity of disease should the animal become exposed in the future. Some vaccines are able to prevent infection (e.g., rabies, parvovirus) but most, particularly the vaccines for respiratory disease, limit the duration and severity of clinical signs following infection (e.g., *Bordetella bronchiseptica*, canine distemper virus). Some factors to consider when recommending a vaccination protocol are described in the chapter on outbreak management, and a detailed description of vaccination strategies for shelters can be found in *Infectious Disease Management* by Miller and Hurley (2009). Some common obstacles to successful immunization are summarized in Table 9.4.

Canine Vaccination Protocols

It is important to note that vaccination protocols commonly recommended for animals in shelters differ from those recommended for most privately owned pets seen in general practice. Such distinctions are made because, in general, dogs entering shelters are at much greater risk of being exposed to infectious disease than the average owned pet. Indeed, dogs arriving at shelters are frequently housed in high-density environments with daily exposure to animals with unknown medical histories who also may have had little or no preventive care prior to admission. As such, the likelihood of infection is much greater, and the risk of not vaccinating is elevated. Recently published guidelines by the AAHA, the World Small Animal Veterinary Association (WSAVA), and AAFP highlight these differences between owned dogs and cats and those being cared for in shelters; separate discussions and recommendations are included in published guidelines reflecting these differences (AAFP, 2006; WSAVA, 2010; AAHA, 2011).

Vaccinations are categorized as core, noncore, and not recommended. Core vaccines are defined as those vaccines generally recommended for administration to all dogs, while noncore vaccines are those products not recommended for use in the general population but for specific individuals based on their exposure, lifestyle, and risk factors. Core vaccinations for dogs housed in a shelter setting include parenteral DA_2PP (providing protection against canine distemper virus, adenovirus-2, parainfluenza, and parvovirus) and an intranasal product providing protection against *Bordetella bronchiseptica* and canine parainfluenza virus. These vaccinations should be given at or before intake to maximize their efficacy, and the use of modified live rather than killed products is strongly recommended because of the more rapid onset of immunity and greater efficacy resulting from generation of both humoral (e.g., antibody formation) and cell-mediated immunity. Because of the high risk of exposure to infectious disease, nearly all dogs 4 weeks of age and older should be vaccinated at intake, including those with mild fever, illnesses, or injuries as well as pregnant and nursing dogs. Animals who are suspected of having been exposed to disease should also be vaccinated. It may or may not help them, but it would not hurt them. Dogs remaining in the shelter, particularly puppies less than 16 weeks of age, should be revaccinated in 2–3 weeks in accordance with published shelter vaccination guidelines. A theoretical concern exists, largely extrapolated from human medicine, regarding response to vaccines administered at the time of surgery or anesthesia; the limited data that exist on this topic for veterinary medicine suggest that this concern is largely unfounded, and while administration of vaccines prior to anesthesia and surgery is ideal, concurrent administration is not contraindicated (Fischer *et al*., 2007; Reese *et al*., 2008). As a general rule of thumb, any animal who is deemed too sick for vaccination should be hospitalized for intensive care therapy or removed to an off-site location to receive appropriate care.

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Unless valid medical records are available documenting an adequate previous vaccination history, shelters should not assume that a particular population of animals or an individual is likely to have immunity, from either previous vaccination or natural infection, and therefore not require vaccination. For example, one study of dogs entering a northern Florida shelter found that nearly two-thirds of the dogs had inadequate protection against canine distemper virus, canine parvovirus, or both. Although older dogs and neutered dogs were more likely to have protective levels of antibodies, the dogs' source, health status, and the type of community from which they originated were not associated with protective levels (Lechner *et al*., 2010). Clinical impression supports the same conclusion, and other authors (Larson, Newbury and Schultz, 2009) have reported similar findings.

Available literature as well as clinical impression indicate that the onset of clinically significant immunity is rapid in the absence of maternal antibody interference, ranging from as little as 24 hours for canine distemper virus, approximately 72 hours for canine parvovirus, to nearly a week for canine adenovirus-2 (Shroeder, Bordt and Mitchell, 1967; Larson and Schultz, 2006; Schultz, 2006; AAHA, 2011). Because even vaccination at intake will leave naïve dogs without immediate immunity during their initial stay in the shelter, it is critical that administration of vaccines is not delayed; a day's delay can result in inadequate protection prior to exposure and apparent vaccine failure. Failure to vaccinate at the time of intake, or at all, is likely to result in more outbreaks of preventable disease, leading to unnecessary morbidity and mortality as well as probable criticism for the shelter.

Shelters should not be dissuaded by financial considerations when developing vaccination protocols; the cost of a single outbreak of serious infectious disease in terms of loss of life, negative public perception, and poor staff and volunteer morale can be far greater than what vaccination would ever have cost. Rabies vaccination for all dogs 12 weeks of age or older should be administered by a licensed veterinarian at the time of release or when there is an expectation of a long-term stay. Canine influenza virus (CIV) vaccination is noncore but may be recommended for certain shelters in communities that have or import dogs from locations with endemic CIV infection, provided that exposure to infection can be limited to allow for onset of protection from the vaccination. Because the only CIV vaccine currently on the market is a killed product, it can be assumed that there will be limited or no protection afforded for at least 3 weeks (e.g., 1 week following the second vaccine that is given 2 weeks after the first); thus vaccination will be of limited use in facilities with early exposure and/or short lengths of stay where booster vaccination is not feasible. Vaccines not recommended for routine use in shelter dogs include leptospirosis, canine coronavirus, and canine Lyme borreliosis as well as parenterally administered *Bordetella* and parainfluenza vaccination. Table 9.5 summarizes current shelter vaccination guidelines for dogs.

Parasite Control

Internal and external parasites are not uncommon in shelter dogs. Parasites encountered range from species-specific to zoonotic, from clinically inapparent to life-threatening, and from relatively rare to exceedingly common. The prevalence of a particular parasite depends in part on the population and community served as well as geographic location of the shelter in question, and apparent prevalence will vary depending on the shelter's protocols for diagnosis, treatment, and wellness care. Gastrointestinal parasites commonly identified in shelter dogs include hookworms (*Ancylostoma caninum* or *A. braziliense*, *Uncinaria stenocephala*), roundworms (*Toxocara canis*, *Toxascaris leonina*), whipworms (*Trichuris vulpis*), tapeworms (*Taenia* spp. and *Dipylidium caninum*), coccidia (*Isospora* spp.), and *Giardia* spp. Common external parasites include various fur mites (*Cheyletiella* spp), ear mites (*Otodectes cynotis*), sarcoptic mange (*Sarcoptes scabiei*), demodectic mange (*Demodex* spp.), fleas (*Ctenocephalides felis* and *C. canis*), and ticks (*Rhipicephalus sanguineus* and *Dermacentor variabilis*). Finally, heartworm (*Dirofilaria immitis*) is a common parasitic infection in certain geographic areas of the United States.

Parasite control is of particular importance to and a challenge for shelters because many parasites are ubiquitous, may cause serious disease themselves (particularly in juvenile animals) or subclinical infections, may reduce disease resistance so other pathogens may cause concomitant disease, and

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Table 9.5. Summary of vaccination guidelines for dogs housed in animal shelters.

Category	Vaccination	Age group	Initial vaccination	Subsequent vaccination	Comments
Core	MLV DA_2PP	Adults, 18 wk of age and older	At or before the time of intake	One year later. Consider additional vaccination 2–4 wk later, particularly for dogs ill or injured at the time of initial vaccination	
		Puppies under 18 wk of age	At or before the time of intake unless <4 wk old	Every 2 wk until 18 wk of age (e.g., when maternal antibody wanes)	
Core	Intranasal *Bordetella bronchiseptica* and parainfluenza virus	Adults and puppies 6 wk of age and older	At or before the time of intake	Not indicated	Must be given by the intranasal route. IM or SQ injection can lead to severe reactions, including abscessation, liver damage, and death
		Puppies 3–6 wk old	At or before the time of intake	Repeat in 2 wk	
Noncore	Parenteral *Bordetella bronchiseptica*	Puppies and adults	At or before the time of intake	Repeat in 2 wk unless the dog has been vaccinated within the previous 12 mo	Only indicated if administration of the intranasal product is not possible; cannot be administered IN in place of an intranasal product; must be given SQ
Core	Rabies	Adults and puppies 12 wk of age and older	At the time of release for most facilities; administer at intake if long-term stay is anticipated	Repeat in 1 yr, then every 3 yr	Dogs with proof of current rabies immunization do not require re-vaccination until 1 or 3 yr later based on history
Noncore	Canine influenza virus (CIV)	Adults and puppies 6 wk of age and older	Administer at intake[a]	Repeat in 2 wk	May be indicated for shelters able to administer both doses and with significant risk of CIV infection (e.g., in or transferring from a CIV-endemic community)
Not recommended	Lyme				
Not recommended	Leptospirosis				
Not recommended	Canine coronavirus				

[a]Refers to a section of the comments.

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often have eggs, larvae, or oocysts that are highly resilient in the environment. Furthermore, if a human contracts disease from an adopted animal who was never treated by the shelter for a zoonotic parasite such as roundworms or hookworms, the medical concerns and financial and public relations repercussions from a lawsuit could be considerable. Thus, prompt diagnosis and treatment, strong biosecurity programs, and adequate cleaning and disinfection protocols are critical in controlling the extent of parasitism in both animals and humans. Animals with known or suspected parasitic infections should be confined to more biosecure areas of the shelter and not co-mingled with other animals or allowed access to areas that cannot be adequately disinfected (e.g., outdoor gravel or grass play yards) until they are no longer a risk as a source of infection. Preventive treatment during a dog's stay in the shelter, particularly for those who will be housed long term, should be strongly considered as part of the wellness routine to reduce the risk of transmission to other animals or people and to limit environmental contamination that may affect the current population as well as animals admitted in the future. A variety of products can be used for this purpose. A list of selected preparations is provided in Table 9.6; choices include oral and injectable medications, topical spot-on products, dips, powders, and collars—some of which are prescription-only while others are available over the counter. The choice of which product to use on which animal and with what frequency or regularity will often depend on the shelter's available resources, but the ultimate impact on human and animal health of a failure to treat parasites should not be underestimated. The ASPCA Poison Control Center (http://www.aspca.org/pet-care/poison-control/ or (888) 426-4435; charges may apply) is an excellent resource for information about the use of new insecticides or other products to treat animals and/or the environment.

Patient Selection, Diagnostic and Care Guidelines

Animals with a high risk of parasitism based on signalment (e.g., young stray puppy), clinical signs (e.g., highly pruritic dog with lesions suggestive of scabies), or history should have a diagnosis confirmed as quickly as possible to minimize the risk to other animals and people and to facilitate initiation of appropriate treatment decisions. In many cases, with minimal equipment and at little cost to the shelter, in-house tests, blood smears, direct fecal smears, skin scrapes, tape preps, and fecal flotations can aid in the quick and accurate diagnosis of many parasitic infections.

Extensive information and guidelines for management of many parasitic conditions of dogs are available online through the Companion Animal Parasite Council (CAPC, accessed at www.capcvet.org). In addition, specific and detailed recommendations for the treatment and prevention of ascarid infections have been issued by the Centers for Disease Control (CDC, accessed at www.cdc.gov), highlighting the serious zoonotic potential of these parasites. These two agencies recommend treating puppies for ascarids upon intake and every 2 weeks until the puppy reaches 3 months of age, then monthly until the puppy is 6 months old, and then regular surveillance and treatment as indicated. Most puppies are not in a shelter for that length of time but they may be in foster care, so awareness of and adherence to these recommendations is advised. At a minimum, all dogs should be treated with a drug or product effective against hookworms and roundworms prior to release from the shelter, preferably given upon intake and repeated as needed during the shelter stay. The broad-spectrum spot-on products that are labeled to control heartworms and other external and internal parasites should not be used in place of a primary deworming product.

Flea and Tick Control

The importance of flea and tick control should not be underestimated. These parasites are more than just nuisances to the animal. In addition to causing discomfort, allergic reactions, and anemia in very young animals, there are many serious flea- and tick-borne diseases that affect both dogs and humans. Furthermore, releasing a dog with fleas can affect other household pets and result in environmental contamination that can be very expensive and time consuming to clean up. As with internal parasites, there are many veterinary and over-the-counter products available to treat external parasites. With most external parasites, attention must be paid to environmental decontamination as well as treatment of the animals. For more information about external parasites, see the chapter on overview of diseases.

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Table 9.6. Select medications for treatment of parasites in dogs.

Common trade names	Active ingredient	Dose	Preparation(s)	Indications for use	Comments
Droncit	Praziquantel	5–7.5 mg/kg	Oral, injectable	Tapeworms	
Strongid, Nemex, Virbantel	Pyrantel pamoate	5 mg/kg	Oral	Hookworms (*Uncinaria* and *A. caninum*), roundwoms	Safe and highly effective; recommended as minimum for deworming
Panacur	Fenbendazole	50 mg/kg	Oral	Hookworms (*Uncinaria* and *A. caninum*), roundwoms, whipworms, tapeworms (*Taenia* sp.), *Giardia* sp.	Specific dosing regimens typically range from 3 to 5 d; liquid formulation marketed for cattle as well as in granular form for dogs
Drontal Plus	Febantel, praziquantel, pyrantel pamoate	25–62 mg/kg, 5–12 mg/kg, 5–12 mg/kg	Oral	Hookworms (*Uncinaria* and *A. caninum*), roundwoms, whipworms, tapeworms (*Taenia* sp.), *Giardia* sp.	
Interceptor	Milbemycin	0.5 mg/kg	Oral	Hookworms (*A. caninum* only), roundworms, whipworms, heartworm prevention	Monthly administration
Sentinel	Milbemycin lufenuron	0.5 mg/kg, 10 mg/kg	Oral	Hookworms (*A. caninum* only), roundworms, whipworms, heartworm prevention, prevents flea eggs from hatching	Monthly administration
Heartgard Plus	Ivermectin pyrantel pamoate	0.006 mg/kg, 5 mg/kg	Oral	Hookworms, roundworms, heartworm prevention	Monthly administration

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Advantage Multi	Moxidectin imidacloprid	2.5 mg/kg, 10 mg/kg	Topical	Heartworm prevention; kills adult fleas; treats adult hookworms, roundworms, whipworms	Cat and dog products are not interchangeable
Advantage	Imidacloprid		Topical	Fleas	
Revolution	Selamectin	6 mg/kg	Topical	Heartworm prevention; treats adult fleas, ear mites, sarcoptic mange, *Dermacentor variabilis* ticks	Cat and dog products are not interchangeable
Frontline Plus	Fipronil methoprene		Topical	Fleas, ticks, and lice	
Capstar	Nitenpyram	1 mg/kg	Oral	Adult fleas	Rapid onset, can be repeated as needed but does not prevent reinfestation
Ivomec	Ivermectin		Oral, topical, injectable	Heartworm prevention, roundworms, hookworms, *Demodex* and sarcoptic mange, ear mites	Versatile and inexpensive; dose and frequency depends on what parasite(s) is/are being treated
Marquis 15% paste	Ponazuril	20–50 mg/kg	Oral	Coccidia	Safe and highly effective; usually requires a single dose but may be given for 3 consecutive days to debilitated animals and weekly if a single treatment does not clear the infection

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Disease Testing

Each shelter must determine what, if any, screening and/or diagnostic disease testing is a necessary part of their healthcare program. Factors such as prevalence in the community, severity of disease, and likelihood of transmission within the shelter should be considered in addition to the shelter's resources. Whenever possible, testing decisions, including interpretation of results, should be made in consultation with a veterinarian experienced in shelter medicine in order to reduce error and inadvertent or unjustified euthanasia decisions made by professionals who are not well versed in population medicine. In most cases, no single test should be used as the sole basis for diagnosis without historical information (often unavailable in a shelter setting), consistent clinical signs, and/or adjunctive laboratory testing. Factors such as the test's sensitivity (Se) and specificity (Sp) as well as positive and negative predictive values (PPV and NPV, respectively) should also be considered. (For more information see the chapter on disease recognition and diagnostic testing.) This is particularly true for shelters using a commercially available product designed to detect multiple vector-borne diseases (SNAP® 4DX® Test and SNAP® 3DX® Test, IDEXX Laboratories, Westbrook, ME) as well as for those shelters that test for heartworm infection in low-prevalence areas of the country. For example, diagnosis of Lyme disease solely on the basis of a positive in-house test detecting antibodies against *Borrelia burgdorferi* may lead to inappropriate treatment, adoption, and euthanasia decisions as it has been reported that up to 95% of dogs testing positive for such antibodies will remain asymptomatic (Littman *et al*., 2006).

Heartworm Testing

Heartworm testing should be conducted in areas where the disease is commonly encountered if resources permit. It is also advisable to test dogs who may be in the shelter on a long-term legal hold to protect against claims the disease was contracted while in the shelter's care, before using medications that may cause adverse effects in heartworm-positive animals (e.g., ivermectin), and for adopted animals in cases where the shelter would be unwilling or unable to treat heartworm-positive animals. However, results must be interpreted with caution and should be questioned if a dog without a known travel history tests positive for heartworm antigen in a low-prevalence area.

Parvovirus Testing

Shelters that test for parvovirus using fecal antigen tests should be aware of the tests' limited use as effective screening tools. Despite good sensitivity and specificity, the positive predictive value is relatively poor when used indiscriminately for a population with a low prevalence of infection. In other words, some dogs without disease will test positive even if they are not infected, and when large numbers of healthy dogs are tested, the proportion of false positives will be quite high. The test is best used when there is a high suspicion of infection with parvovirus (e.g., history of possible exposure, consistent clinical signs, and inadequate vaccine history); further confirmation, such as blood smear to document leukopenia, is helpful and may be necessary for accurate interpretation. In addition, shelters should be familiar with concerns that viral shedding following vaccination with a modified live product may affect test interpretation. Recent (e.g., within 14 days) vaccination of kittens with a modified live panleukopenia vaccine resulted in a very small number of animals testing positive on a parvovirus fecal antigen test in one study (Patterson *et al*., 2007). Such findings support the concern and anecdotal reports that false (usually "weak") positives following recent vaccination may occur in dogs, but more research is needed. Regardless, positive test results in symptomatic dogs should be taken seriously, and further testing (e.g., blood smears or a complete blood count) should be performed to confirm the results.

Shelters should also be aware of false negative test results. Recent studies have shown that at least one commercially available test kit detects circulating strains of canine parvovirus, including CPV-2 (Decaro *et al*., 2010), but infected dogs may test negative due to improper technique, the relatively short duration of viral shedding, and antibody–antigen binding. For more information on parvovirus, see the chapters on practical overview of common infectious disease agents and disease recognition and diagnostic testing.

Grooming

Shelters should provide basic grooming at the time of intake and then regularly throughout a dog's

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stay. The extent of grooming that will be necessary depends in part on the type of dog and coat, as well as the animal's condition upon arrival at the shelter. Regular brushing, and bathing as needed help not only to keep the coat and skin in good condition but provide an opportunity to identify external parasites, skin lesions, and even weight loss before these problems progress, help maintain or improve appearance to facilitate adoption, and provide a source of enrichment for the dog through social interactions with the caregiver. Bathing is also an important consideration in minimizing disease transmission from a recovered dog for pathogens directly transmitted by the fecal–oral route, such as *Giardia* and parvovirus, which can remain viable and infectious on hair for months. Equipment used for grooming should be in good condition and be disinfected between uses on different dogs or single-use equipment should be utilized to reduce risk of fomite transmission. Sedation or occasionally general anesthesia may be necessary to allow adequate grooming for severely matted and/or difficult-to-handle dogs.

Medical Grooming

Varying degrees of matted fur and overgrown nails may be seen in dogs who have been neglected, the extent of which will be influenced by the chronicity and severity of the neglect, the environmental conditions under which the dog has been living, the breed, and type of coat among other factors. Matted fur is uncomfortable at best, pulling on the skin and creating underlying dermatitis (see Figure 9.4a). More extensive matting can impede a dog's ability to see, urinate or defecate, or even walk. Matted fur can result in urine scald, skin infections, and myiasis (e.g., fly strike and maggot infestation). In the most severe cases, circumferential matting around limbs or even the tail can be seen in association with gangrenous lesions of the extremities or bony lesions, which are likely a result of constrictive pressure necrosis and circulatory compromise caused by the matted fur. An example of severe tissue damage secondary to matted fur is shown in Figure 9.4b. Severe, generalized matting can result in serious, even life-threatening injury and illness, and medical grooming

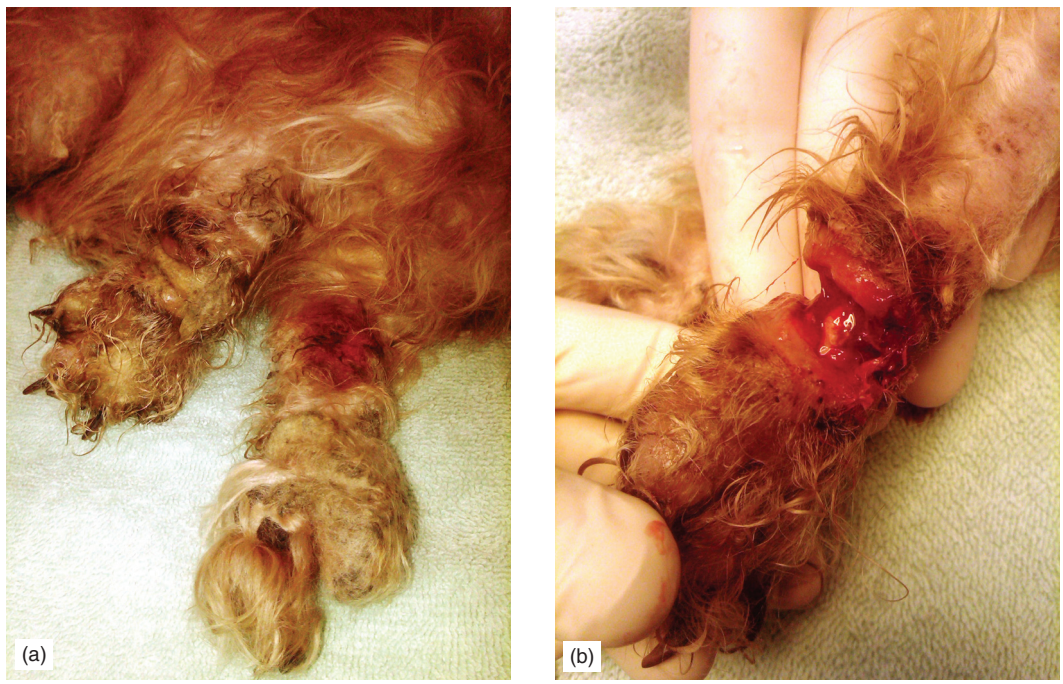


Figure 9.4. (a) Badly matted dog. (Photo courtesy Ali Bradley.) (b) Soft tissue damage from severe matting. (Photo courtesy Ali Bradley.)

to alleviate the condition should be considered an emergency.

Dental Care

The importance of dental care should not be overlooked in terms of its contribution to an animal's health, comfort, and well-being as well as his or her adoptability. The teeth and gums should be evaluated as part of the routine physical examination. The primary dental problems found most commonly in older dogs are bad breath (halitosis), gingivitis, and periodontal disease. At a minimum, treatment should be provided for animals with excessive tartar, gum disease, and loose teeth, as these conditions may affect the animal's ability to eat and indicate other underlying health problems as well as cause pain and discomfort. Dental care can often be provided at the same time animals undergo spaying or neutering. Dental scaling and care should be performed under appropriate levels of anesthesia.

SPECIAL CARE CONSIDERATIONS

Although shelters are not hospitals, they are expected to provide care for animals with a wide variety of medical conditions and behavior problems. The authors are aware of several cases over the years where shelters were heavily criticized for euthanizing lost dogs who could have been held in private home or veterinary hospital settings, but whose conditions were such that the shelter felt it would be inhumane or dangerous for staff to hold the animal for the legal holding period. It is important to have and adhere to written guidelines outlining procedures for managing various situations and conditions and to have information on how to contact veterinarians and management staff during emergencies readily available so that decisions do not appear to be arbitrary or capricious. For more information please refer to the chapters on legal issues, emergency care, and treatment strategies.

Care for Geriatric Dogs

Older dogs are likely to have orthopedic conditions that necessitate the provision of extra care to make them comfortable, such as soft bedding and extra warmth. Dental problems may require feeding moistened dry or canned food that is easier to chew. Older dogs may experience cognitive decline, have cataracts that interfere with their vision, or suffer from hearing loss, all conditions that require handling by experienced staff to ensure their safety and comfort. Large breed dogs age faster than small breeds, so even a 7-year-old Great Dane may have geriatric problems. In most cases, older, less-active dogs should be housed singly or with other compatible older dogs. They should be monitored closely for their food and water intake as well as their urinary output, as kidney disease can be a problem in older animals. Male dogs should be monitored because they may have difficulty urinating because of prostatic hypertrophy. Elderly dogs should be weighed regularly to make certain they are maintaining their weight, as weight loss can be an early sign of disease. If they are staying at the shelter long term, a regular schedule of veterinary checkups should be set up that includes appropriate clinical lab tests.

Orphans, Bitches with Litters, and Neonates

While many shelters are still dealing with a large seasonal or steady supply of cats, it is much less common today to find litters of puppies being relinquished to shelters than it was 20 years ago. Shelters therefore may no longer be accustomed to handling neonates or very young orphaned puppies. In fact, many shelters in certain areas of the country have too few adoptable puppies to meet public demand and are importing them from other areas where they are still at risk of being euthanized. However, when orphans, neonates, or lactating bitches with puppies do arrive at a shelter, the ideal management strategy is to place them in foster care as soon as possible. Not only does this alleviate the strain on shelter resources, it increases their chances of remaining healthy by reducing stress and exposure to infectious disease.

Lactating Bitches with Litters

Separate housing should be set aside for nursing mothers with their litters, especially away from any isolation and quarantine areas and areas housing adult dogs who may pose an infectious disease threat. Extra bedding should be provided for their comfort and warmth. The bitch should be vaccinated with DA2PP and dewormed. Although puppies with their mothers should need minimal care and handling, the bitch should be regularly checked to make sure she is producing adequate milk and the puppies checked daily to ensure that each is receiving

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adequate nutrition. In addition to their physical appearance, neonatal health can be best measured by weight gain. There should be a steady weight gain of about 1–1.25 g (0.03–0.04 ounces) per day per pound of the expected adult weight for the first month of life (Case, 2005). For example, if the expected adult weight is 50 pounds, puppies should gain 50 g (1.75 ounces) per day for the first month.

Orphan and Neonatal Care

If a foster home cannot be quickly located, orphans and neonates will have to be cared for in the shelter. A few details will be provided here, but the reader is directed to utilize the numerous other resources that exist on how to raise orphan puppies. These animals should be housed in separate areas with extra bedding. Because very young puppies cannot thermoregulate well without the warmth of the bitch or littermates, ambient temperatures may need to be maintained as high as 85–95°F for the first week of life and gradually dropped by 5° each week until week four when the temperature can be 70–75°F (Case, 2005). They should be bottle or tube fed commercial puppy formula by experienced caregivers every 2–3 hours for the first few days, then every 4–5 hours until they reach 3 weeks of age, and then four times a day until they reach 6 weeks of age. Weaning can begin as early as 3 weeks of age by gradually adding canned food or moistened dry food designated for growth to their diet. Puppies who are still with their mothers should be removed for a few hours to ensure they are hungry enough to try the new diet.

Orphans should be weighed daily for the first week and stimulated to urinate and defecate by gently rubbing the abdominal, genital, and anal areas with wet cotton or a washcloth. It cannot be emphasized enough that puppies less than the age of 6 weeks should be removed from the shelter as soon as possible and placed into foster care to ensure their best chances of survival. Most shelters cannot provide the proper environment or do not have enough staff to provide the level of care needed to successfully raise very young puppies.

Other Conditions

Ideally, dogs who are badly injured, suffering from severe illness, various degrees of paralysis, have chronic medical conditions such as epilepsy that require close monitoring, or who are recovering from surgeries other than routine spay and neuter should not be routinely housed in shelters unless the shelter has a veterinary clinic staffed with licensed or registered technicians and/or a separate isolation area staffed with trained animal care personnel dedicated to their care. Animals who need intensive nursing care, such as having their bladders expressed, periodic removal of ocular and nasal discharges, assisted or forced feeding, being assisted to rise or turn over, etc., fall into this category. Shelters that house and care for these animals should expect that, should questions arise, the standards of care required are likely to be judged the same as they would be in a private veterinary hospital.

HOUSING

The manner of housing dogs has an enormous impact on their welfare. Housing options for dogs in animal shelters have evolved tremendously over the years as the mission of shelters has shifted, and in some cases, available resources and interest from the public have increased. At one time, colony kennels were commonly used for housing all dogs, and at the end of the holding period, a few animals were selected for adoption while most of the others were euthanized. Veterinarians were consulted about animal housing only when issues regarding standards of care, overcrowding, or cruelty were raised; concerns about welfare, stress or disease transmission were less important as sick and behaviorally distressed animals were usually euthanized. Over time, individual housing of animals became the goal of most progressive animal shelters to minimize disease transmission, eliminate fighting, and facilitate individual animal monitoring. (Ironically, and appropriately, there has been a recent trend toward returning to carefully managed group housing in an attempt to provide behavioral enrichment, stress reduction, and a more pleasant appearance and experience for potential adopters, while still controlling disease transmission.)

As evidence of the impact of proper housing on animal health, in addition to the brief information provided in this chapter, housing and environmental considerations are covered in several other chapters in this textbook, including shelter design, quality of life, behavior enrichment, population management, feline care, etc. The ASV guidelines also provide

considerable information about the shelter's physical environment and considerations for housing dogs.

General Housing Considerations

The ASV guidelines state that primary enclosures must permit animals to maintain their normal body temperature and that temperature and humidity must be monitored at the level of the dog within his or her enclosure (ASV, 2010). The American Veterinary Medical Association (AVMA) companion animal care guidelines recommend that the ambient temperature in the animal areas of a kennel be maintained between 60°F and 80°F with a relative humidity of 30–70% (AVMA, 2008). Ambient temperatures should not fall below 50°F for geriatric, very young, sick, infirm dogs not acclimated to and breeds that cannot tolerate lower temperatures (BVAAWF/FRAME/RSPCA/UFAW, 2004).

Because there is wide variation within the canine species, dogs should be monitored individually to ensure their comfort. The thermostat should be adjusted if dogs are shivering or panting excessively, and individual care provided as needed to ensure their comfort; i.e., cold dogs should be provided with extra bedding or moved to a warmer location, whereas dogs who are overheated and panting should be treated immediately for heat stress and moved to cooler locations, provided with fans, and monitored, as untreated heat stroke can be a life-threatening medical emergency. The temperature should be monitored in each room and inside or at the level of each dog's enclosure rather than just in one room, as it may vary considerably throughout the shelter and if the cage is in direct sunlight or shade, or receives limited ventilation, etc.

Dogs should be housed away from other species to minimize spread of pathogens that may affect multiple species (e.g., parvovirus, *Bordetella*) and because their scent and barking can be a profound stressor for prey species such as rabbits as well as cats. Housing should be conducive to the maintenance of each individual animal's physical health, meet the dog's behavioral needs, be durable and capable of safely and securely confining the animal while providing sufficient space, and be readily cleaned and disinfected.

Facilities and primary enclosures must be maintained in proper condition. They should be durable and sturdy, with no sharp, rusty, or jagged edges. Dogs should be prevented from escape from their enclosures with a secure latch or other means of keeping the housing unit closed and other animals out. Drains located within the enclosure should be covered with grates with small openings that will prevent injuries to legs, paws, or nails. See the chapter on shelter design for more information about animal housing.

Minimum Space Requirements

Guidelines or recommendations for housing dogs, including minimum space requirements, vary widely, and have been published by a variety of organizations and regulatory bodies; some of these recommendations are summarized in Table 9.7. Because of the wide variation in dog sizes and behaviors, most shelters will need to have a variety of types and sizes of enclosures.

Dogs may be housed in cages, runs, enclosures, pens, or kennels, but no dog should be housed in an enclosure that prevents him from fully sitting up, standing and stretching or eating, drinking, urinating, defecating or otherwise moving about in a comfortable and natural position. Separation of feeding, elimination, and resting areas should be maximized as many dogs prefer not to eat or sleep near their excrement. Walls that are a minimum of 4 feet high (and higher) may be necessary to prevent some dogs from having visual or direct contact with other dogs; design should be such that dogs are able to avoid visual contact with other animals but see out of the enclosure should they so choose. Primary enclosures should allow easy handling and visualization of dogs to facilitate caretaking by the staff and observation by the public.

Primary Enclosures

In general, larger and more varied primary enclosures designed to provide an enriched environment become more critical as the dog's length of stay increases. Smaller cages may be acceptable for small dogs and in treatment areas, isolation wards, and recovery rooms, where the stay may be short and/or restriction of excessive movement is desirable. Large dogs will be more comfortable in runs or rooms (See the chapter on shelter design). Short-nosed brachycephalic breeds such as Pekinese, Pugs, and Bulldogs should be placed in primary enclosures that are well ventilated and easily

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Table 9.7. Minimum space guidelines for dog housing.

Source	Dog's size	Floor space	Height	Co-housing requirements	Additional requirements, comments
Animal Welfare Act[1]					"Must allow space for each animal to express all species-typical postures, social adjustments, behaviors, and movements. For example, animals must be able to lie down with limbs extended in a normal manner without obstruction from enclosure sides or having to extend feet through feeder doors or bars."
Canadian Veterinary Medical Association (CVMA) Code of Practice for Canadian Kennel Operations[2]	Adults <12 kg	1.1 m^2	1 m	1.4 m^2 per dog when pair or group housed	Each dog should be provided with a minimum floor space equal to the length of the dog plus 15 cm. Add 10% to requirements for each puppy up to 7 weeks of age housed with an adult dog. Dogs confined in cages require at a minimum of 20 minutes exercise twice daily.
	Adults 12–30 kg	1.86 m^2	2 m	1.4 m^2 per dog when pair or group housed	
	Adults >30 kg	2.2 m^2	2 m	1.4 m^2 per dog when pair or group housed	
	Puppies <3 kg	0.5 m^2	0.5 m		For puppies 7–16 wk of age
	Puppies 3–11 kg	0.5 m^2	0.6 m		
	Puppies >11 kg	0.6 m^2	0.6 m		
Colorado law: Title 35 Agriculture, Article 42.5-101, Animal Shelters and Pounds[3]		Minimum 6 sq ft; maximum 24 sq ft	Minimum 18 inches; maximum 48 inches		Floor space is calculated as the square of the sum of the dog's length (inches), plus 6 inches, divided by 144 and multiplied by 2. Height is calculated as 1.5 times the height at the shoulders.

(*continued*)

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Table 9.7. (*Continued*)

Source	Dog's size	Floor space	Height	Co-housing requirements	Additional requirements, comments
Humane Society of the US (HSUS)[4]		Cages:			
	10–35 pounds	12 sq ft			
	36–50 pounds	20 sq ft			
	50 pounds	24 sq ft			
	Not specified	Kennels: minimum 4 × 6 ft Runs: minimum 4 × 8 ft			
Model License Conditions and Guidance for Dog Boarding Establishments (United Kingdom)[5]	All	Sleeping area at least 1.9 m^2			Holding kennels (<24 hours) minimum 25 sq ft
	Up to 24 inches at shoulders	Exercise area 26 sq ft	6 ft		
	>24 inches at shoulder	Exercise area 36 sq ft	6 ft		
New Jersey law; N.J.A.C. 8.23A-1.6(a), 7b, and 8.23A-1.99(g)[6]		Calculated as the square of the sum of the dog's length (inches), plus 6 inches			
New Zealand Code of Recommendations and Minimum Standards for the Welfare of Animals in Boarding Establishments[7]	<7 kg	Night box:[a] 0.9 m × 0.7 m; Kennel:[b] 0.5 m × 0.5 m; Run:[c] 0.6 m × 1 m			3 m × 2 m exercise area[d] with 1.2 m fence + 1 m each way for additional dog.
	7–20 kg	Night box:1.2 m × 0.8 m; Kennel: 0.6 m × 0.7 m; Run: 0.8 m × 1 m			3 m × 3 m exercise area with 1.8 m fence + 1 m each way for additional dog.
	20–40 kg	Night box: 1.0 m × 1.5 m; Kennel: 0.8 m × 0.8 m; Run: 0.8 m × 1 m			4 m × 4 m exercise area with 1.8 m fence + 1 m each way for additional dog.
	>40 kg	Night box: 1 m × 2 m; Kennel: 1.2 m × 1.2 m; Run: 1.2 m × 2.4 m			5 m × 5 m exercise area with 1.8 m fence + 1 m each way for additional dog.

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Victoria Code of Practice for the Operation of Boarding Establishments[8]	<40 cm at shoulder	1.5 m^2, width 90 cm	180 cm	Add 1 m^2 per additional dog	One-third of the area of each pen must be weatherproof and include raised sleeping quarters. Individual sleeping quarters and food bowls must be provided when adult dogs are housed in the one pen.
	40–70 cm at shoulder	2.4 m^2, width 90 cm	180 cm	Add 1.2 m^2 per additional dog	
	70 cm at shoulder	3.5 m^2, width 120 cm	180 cm	Add 1.7 m^2 per additional dog	
Victoria (Australia) Code of Practice for the Management of Dogs and Cats in Shelters and Pounds (Revision 1)[9].	<40 cm at shoulder	1.5 m^2, width 90 cm	180 cm	Add 1 m^2 per additional dog	Animals housed for long term must have environmental enrichment daily. Adult dogs may only be housed singly during the statutory and quarantine period. Thereafter up to two compatible dogs assessed suitable for rehoming may be housed together. Minimum one full-time animal attendant for every 50 animals housed at the establishment.
	40–70 cm at shoulder	2.4 m^2, width 100 cm	180 cm	Add 1.2 m^2 per additional dog	
	70 cm at shoulder	3.5 m^2, width 120 cm	180 cm	Add 1.7 m^2 per additional dog	

[1]Animal Welfare Act Title 9, Chapter 1, Part 3, Subpart A Sections 3.2 and 3.3.
[2]CVMA (2007.
[3]Colorado Statute. *Title 35 Agriculture, Article 42.5-101 Animal Shelters and Pounds.*
[4]HSUS (2011).
[5]Chartered Institute of Environmental Health (1995).
[6]New Jersey law; N.J.A.C. 8.23A-1.6(a), 7b, and 8.23A-1.99(g).
[7]New Zealand Animal Welfare Advisory Committee (1993).
[8]Victoria Department of Primary Industries (2004)
[9]Victoria Department of Primary Industries (2011).
[a]Night box—a kennel with no run, designed principally for the animals to sleep in.
[b]Kennel—a night box with a run attached.
[c]Run—an area which allows the animal space in which it can urinate and defecate.
[d]Exercise area—an area usually separated from the kennels and runs, in which an animal or animals can be released for exercise.

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monitored as they are very susceptible to heat stress and are prone to breathing difficulties.

Tethering is never an acceptable or alternative means of permanently confining animals in an animal shelter. Although Animal Welfare Act standards do not apply to animal shelters and are minimal guidelines only pertaining to confinement of certain types of animals and situations, they prohibit tethering as a means of permanently confining dogs in kennels. The ASV guidelines also disapprove of tethering and the use of crates and carriers intended for temporary transport as permanent housing of dogs.

All surfaces of primary enclosures, including the flooring, must be composed of durable nonporous materials that can easily and frequently be cleaned and disinfected, particularly when used to house puppies or dogs with known or suspected infectious disease. Double-sided or compartmentalized housing units, such as runs with guillotine dividers, are preferred since they allow cleaning and care without removing the dog from his or her enclosure and minimize the risk of disease transmission. (See the chapter on shelter design.) Because surfaces that facilitate cleaning and disinfection are generally unappealing and uncomfortable for dogs, resting surfaces and bedding must be provided as well. Mats, resting boards, blankets, towels, or other bedding should be provided to all dogs, but are especially important for dogs with short thin hair coats, and those who are pregnant, nursing, sick or injured, prone to developing decubital ulcers and/or are being held for long term. Older, arthritic animals will benefit from having soft bedding or blankets to rest on and a cement floor and rubber mat rather than stainless steel or fiberglass so they are less likely to slip and fall (see Figure 9.5). Dogs need to be monitored regularly to ensure that bedding is not being destroyed or ingested, and alternate materials should be provided for destructive dogs.

Some enclosures should be designed to withstand destruction and/or escape by strong or active dogs who are determined to get out of the enclosure. Some dogs will even destroy metal water bowls (see Figure 9.6) or copper tubing from automatic watering systems, so the entire enclosure and its contents should be inspected regularly when cleaned. Shelters that house large, strong, energetic, or aggressive breeds must pay particular attention to housing these animals in sturdy, escape-proof housing; escape may lead to injury or even death of the dog, other animals, or people. Provision of this type of enclosure is particularly important for shelters housing aggressive dogs, who are best kept in enclosures such as guillotine-divided runs that minimize the need for handling for cleaning purposes.

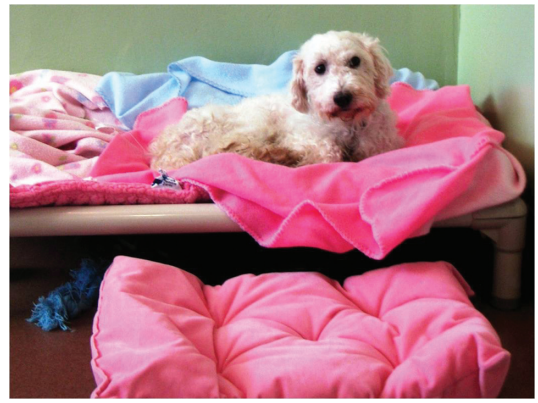


Figure 9.5. Resting platform and comfort for geriatric dog. (Photo courtesy Stephanie Janeczko.)

Shelters that hold animals long term will need larger cages and enclosures and more space devoted to play and exercise areas Although all healthy dogs should be walked and provided with daily exercise, dogs who are housed in cages that only meet minimum space requirements and do not provide



Figure 9.6. Water bowl destroyed by pit bull terrier. (Photo courtesy Lila Miller.)

adequate separation between resting, eating, and areas for elimination should receive extra attention to ensure they have opportunities for relieving themselves and exercising outside their cages at least once and preferably twice a day. In some jurisdictions (e.g., New Jersey (http://www.awfnj.org/?page_id=20) and Colorado (http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1175705262987) a requirement for daily exercise is mandated by law.

Group Housing and Social Interactions

The social and behavioral benefits of housing dogs in pairs or small groups must be weighed against the risks of disease spread, the stress associated with incompatible pairings, and even the chance of injury from possible aggression. In general, housing dogs individually in enriched environments while providing them with social interaction with other dogs and adequate time out of their primary enclosure is preferable in most shelters unless the dogs are less than 4 months of age. Older dogs from the same litter or household may be housed together in a single enclosure with careful supervision and frequent monitoring, as the stress of a shelter environment may result in aggression between dogs previously known to live together successfully.

If a decision is made to group house unrelated dogs as a means of providing behavioral enrichment, cagemates should first be quarantined, vaccinated, tested for endoparasites and treated either according to the test results or prophylactically with a broad-spectrum anthelmintic, neutered, and evaluated for behavioral compatibility. As in individual housing, it is crucial to ensure that co-housed or group-housed dogs are provided with an adequate-sized enclosure as previously described and outlined in Table 9.7. Additional regulations may also exist in such circumstances; Colorado state guidelines require each additional dog be given one-half the minimum space required (http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1175705262987), whereas the Humane Society of the United States (HSUS, 2011) recommends that each dog should have a minimum of 4 feet × 4 feet of floor space (http://www.animalsheltering.org/resource_library/policies_and_guidelines/guidelines_for_animal_shelter_operations.html). Singly housed dogs may benefit from play time with other compatible dogs and from regular positive social interactions with humans. Some shelters allow compatible dogs to be placed together in small groups during the day to play and socialize, but return them to their individual cages for meals and at night when fewer or no staff are present to monitor their activities. Potential play mates should be identified and matched after the same physical and behavioral assessments recommended for group housing in a primary enclosure have been completed.

SANITATION

Sanitation procedures are covered in depth elsewhere in this textbook. Because they occupy a significant portion of the day in many facilities and can have an enormous impact on animal health and well-being, a few key points will be made here. Adequate numbers of trained staff must be available to fully complete sanitation procedures in a timely fashion each day so that dogs do not spend long periods of time in wet or dirty cages. Staff dedicated to working in specific areas of the shelter and with certain populations is ideal; establishing a routine time to clean each day will also help minimize animal stress. If the same staff is utilized to clean different areas, at a minimum, appropriate personal protective equipment should be utilized between the different areas.

Procedures must be designed so they do not inadvertently spread disease. Rooms within a facility should be cleaned in an order that minimizes disease transmission, with the vulnerable animals (e.g., puppies) cared for first, followed by less vulnerable animals (e.g., healthy adult dogs), and ending with unhealthy, infected animals. Supplies and equipment in good working order must be provided and confined to each area.

Primary animal enclosures should be fully cleaned and disinfected before another animal is housed within. When the same animal will be returning to his or her enclosure, full disinfection is not necessary, but at least once-daily cleaning to remove urine and fecal matter, soiled newspapers or bedding, and other obvious dirt is required to ensure the animal is kept in clean, dry, and comfortable quarters and that odors are minimized. This "spot cleaning" may help to best utilize precious time and resources while minimizing stress on the animal, but it should never be substituted for full cleaning and disinfection when odors and dirt have accumulated or a new animal is entering the enclosure. Enclosures must never be

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hosed down or disinfected while the animal is within the enclosure.

Nutrition

Good nutrition is a basic, critical component of any shelter's wellness plan; it is essential for the maintenance of good health and an important treatment tool whose value is often overlooked. There are many products available to completely or partially meet the nutritional needs of dogs, but these products vary significantly in their nutrient composition, presentation, palatability, digestibility, and cost—to name but a few factors. The decision regarding which foods to feed will vary from shelter to shelter and should be determined after considering their suitability for meeting the needs of the population as well as the availability and cost of the products. A wealth of information exists regarding the nutritional needs of dogs specific to their life stage, health, medical and behavioral conditions, and even breed; the reader is referred to such sources for more specific information.

All dogs should be fed a complete and nutritionally balanced life-stage-appropriate diet of as high a quality as possible, and have access to fresh clean water at all times. Food and/or water should only be withheld for pre-surgical fasting or for a medical reason as directed by a licensed veterinarian. Treats should be limited and generally are not recommended to exceed more than 10–25% of the daily caloric intake. Feeding a balanced diet ensures that the amount to be fed can be based on energy requirements rather than on the needs for a specific nutrient, which greatly simplifies feeding calculations. Dietary consistency is also important to reduce stress, inappetance, and gastrointestinal irritation. The food product's ingredient list, which contains all ingredients in the food in descending order of composition, can be consulted for general information regarding a particular diet, but it should not be too heavily relied upon as it does not provide information about the quality of the dietary components. Less-expensive, lower-quality foods seldom provide the value that one might assume from their cost. These diets tend to use lower-quality ingredients which are less digestible, thereby resulting in the need to feed a greater volume of food and increasing the per meal cost. Less-digestible diets also result in greater waste production, increasing the time needed for cleaning fecal material and environmental disinfection. Several commercial pet food manufacturers offer partnership programs to animal shelters that allow them to receive food at greatly reduced or no cost, increasing the ability for shelters to feed a consistent, high-quality diet on a limited budget.

Evaluating Food Quality

Diets should have a statement of nutritional adequacy on the label, frequently referred to as an Association of American Feed Control Officials (AAFCO) statement, and should not be expired. The AAFCO is a nonprofit organization that sets standards for the quality and safety of animal food products and establishes definitions, guidelines, and nutritional requirements for pet foods. Foods labeled "complete and balanced for all life stages" provide suitable nutrition for puppies and adult dogs as well as those who are pregnant or nursing. These diets are most appropriate for general use in shelters, particularly in those facilities that are unable or unwilling to stock and feed a variety of different diets. Diets with a limited claim will specify which life-stage dogs they should be fed to (e.g., growth, adult maintenance, geriatric, etc.) while other diets may be labeled for only temporary or intermittent feeding, such as diets designed to dissolve bladder stones. Finally, some diets are designed for therapeutic intervention and are labeled only for use under the supervision of a licensed veterinarian. Dogs are omnivorous, and a meat-only diet is not balanced or appropriate. Home-cooked and/or raw-food diets are seldom nutritionally balanced or evaluated, and their use, particularly in the shelter, may result in a variety of health problems such as *Salmonella* infection (LeJeune and Hancock, 2001; Finley *et al*., 2008; Lenz *et al*., 2009).

Over the past several years there have been many safety recalls for dry and canned dog food, treats, supplements, and other pet food products. Recalls, which are actions taken to remove a product from the market, may be initiated by the manufacturer or by request or order from the Food and Drug Administration (FDA). While most recalls are for products not deemed likely to cause serious adverse health consequences, there have been recalls of dog food products that have been identified as posing a serious risk to animal health or death; between 1998 and 2002 there were a total of 22 class I

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and II pet food recalls (Rumbeiha and Morrison, 2011). The potential detrimental health effects of feeding recalled food should not be underestimated. Despite early recognition, manufacturer recall, and widespread publicity of food contaminated with aflatoxin in late 2005, more than 100 dogs apparently died as a result of the toxic effects of consuming the affected products (Stenske *et al*., 2006). It is prudent that all shelters regularly check that they are not using products known or suspected of posing a health risk to the animals in their care; at the time of publication both the AVMA (http://www.avma.org/petfoodsafety/recalls/default.asp) and the FDA (http://www.accessdata.fda.gov/scripts/newpetfoodrecalls/) were maintaining regularly updated online listings of recalled products. This issue is of concern to all pet food consumers, but of particular concern to those shelters utilizing food donations as they are likely to have a variety of products and may not receive direct communications from manufacturers or distributors regarding recalls and other concerns.

Amounts to Feed

Careful attention to the amount fed in the shelter is also critical. Although the most accurate way to determine the amount to feed a particular dog is to use a metabolic energy requirement (MER) calculation based on body weight and age, this is seldom practical or necessary in a shelter setting where a large number of dogs are cared for at one time. MER estimates provided by the National Research Council (NRC, 2006) range from $95 \times$ body weight in kilograms$^{0.75}$ to $130 \times$ body weight in kilograms$^{0.75}$ due to variations in total body surface area across breeds. Such calculations, along with the caloric content of the food in question, can provide a starting place to estimate the amount to feed and can be particularly helpful in adjusting the diets of particular dogs, including those who are very underweight and/or losing weight in the shelter or those animals who are very overweight and/or are gaining weight in the shelter. However, for routine use in relatively healthy dogs, it is often adequate to base at least initial feeding decisions on instructions provided on the packaging by the manufacturer. AAFCO regulations require that all "complete and balanced" diets include average feeding estimates for the life stage of the animal being fed that specific product. It must be remembered that the amount to feed will vary from product to product and that the manufacturer's recommendations are for the average dog. The amount that must actually be fed to an individual animal for the desired result may differ from the manufacturer's recommendation. Recommendations and caloric density should always be verified for the specific product that is fed, as substantial variation may exist even between similar diets (Linder and Freeman, 2010). The use of measuring cups and spoons is encouraged to ensure that dogs are being offered an accurate, appropriate portion based on either a calculated or recommended amount of food.

Regular portion feeding at least once or, ideally, twice daily for adult dogs is important to ensure that they receive adequate nutritional support, and for monitoring appetite and consumption as well. Large, deep-chested dogs should be fed twice a day or more often to help avoid development of life-threatening bloat and gastric torsion. This condition is more commonly seen in dogs who eat very fast and swallow air, but certain breeds such as Collies, Saint Bernards, Standard Poodles, and Basset Hounds seem to be predisposed to develop the condition.

Puppies less than 6 months of age and those animals with greater metabolic demands (e.g., pregnant or nursing, underweight, debilitated, etc.) should be fed more frequently and/or offered dry food ad libitum based on their age and specific condition. Dogs should be fed on a regular schedule, and food should be examined regularly to ensure that it has been consumed, is free from debris, and is not spoiled. Contaminated or vermin- and pest-infested food should be discarded immediately and uneaten food discarded at least once every 24 hours. Uneaten food must not be offered to other animals. Dogs should be fed separately, or if co-housed and fed together, must be monitored to ensure that all individuals have access to an adequate amount of food and are not being stressed or injured by cohabitants who show guarding or bullying behavior. Regular assessment and monitoring of weight and body condition is critical to ensure health and early detection of problems.

Many commercially available pet foods are both highly palatable and energy dense, leading to a risk of weight gain and obesity when fed in excess of a dog's caloric requirement. Some dogs will overeat if fed freely while others will not consume an adequate amount of calories to meet their metabolic needs.



Figure 9.7. Emaciated dog. (Photo courtesy Stephanie Janeczko.)

Dogs who are not consuming an adequate amount of food may be stressed in the shelter environment, have dental problems, or another underlying medical condition causing anorexia, or may find the type, flavor, or physical form of the food undesirable. Further investigation is warranted to determine the underlying cause and appropriate treatment.

Particular caution must be exercised when feeding very underweight or emaciated dogs to avoid development of a condition known as refeeding syndrome (see Figure 9.7). Chronic negative energy balance results in metabolic shifts to enable to body to utilize fat and muscle and also results in significant alterations in electrolytes. When food is reintroduced in an uncontrolled fashion, serious and potentially fatal metabolic derangements can occur, particularly as electrolytes shift in and out of cells (Miller and Bartges, 1999). Symptoms may include weakness, seizures, coma, irritability, aggression, and even death. Veterinary oversight in developing a feeding plan and monitoring the reintroduction of food is critical, particularly during the first week of feeding. For more information on the refeeding syndrome, see the chapter on medical evaluation of abused live animals.

In addition to considerations regarding the type and amount of food to feed, basic provisions for adequate storage and use of the food should not be overlooked. Appropriate food storage is critical to preserve the health of the animals and to minimize the introduction and/or proliferation of rodents and other pests in the shelter. Storing food off the ground in sealed plastic or metal containers is particularly important. Temperature extremes should be avoided, and perishable products must be refrigerated. Product should be rotated to ensure that it is used before the expiration date; expired product should be discarded. Bowls, trays, and utensils used for preparing or offering food should of an appropriate size, shape, and material to enable access by the dog and to minimize the risk of toxicity, injury, and ingestion. All materials must be able to be adequately cleaned and disinfected between animals or should be discarded after a single use.

CONCLUSION

Good shelter care requires attention to veterinary science, principles of animal welfare, and sound population management. Regardless of the mission of the shelter, proper dog care involves more than providing just food, water, and a place to sleep, especially as the average length of stay for many dogs increases. The provision of appropriate care for dogs in shelters requires balancing individual physical and behavior needs against the welfare of the entire population. The Five Freedoms provide a good starting place for shelters to assess what those basic needs are. Shelters must then decide how to best use their resources and not hesitate to reach out to the community and shelter medicine experts when necessary to help meet those needs.

REFERENCES

American Association of Feline Practitioners (AAFP) (2006) The 2006 American Association of Feline Practitioners feline vaccine advisory panel report. *Journal of the American Veterinary Medical Association*, **229**, 1405–1441.

AAHA/AAFP Pain Management Task Force (2007) AAHA/AAFP pain management guidelines for dogs and cats. *Journal of Feline Medicine and Surgery*, **9**, 466–480.

AAHA Canine Vaccination Task Force (2011) 2011 AAHA canine vaccination guidelines. *Journal of the American Animal Hospital Association*, **47**, 1–42.

Animal Welfare Act (no date) *Title 9, Chapter 1, Part 3, Subpart A Sections 3.2 and 3.3*, http://www.aphis.usda.gov/ac/9CFR99.html (accessed June 13, 2012).

VetBooks.ir

Association of Shelter Veterinarians (ASV) (2010) *Guidelines for Standards of Care in Animal Shelters*. http://sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 (accessed June 13, 2012).

American Veterinary Medical Association (AVMA) (2008) *AVMA Companion Animal Care Guidelines*, www.avma.org/issues/policy/companion_animal_care.asp (accessed December 10, 2011).

BVAAWF/FRAME/RSPCA/UFAW (2004) Refining dog husbandry and care. Eighth report of the BVAAWF/FRAME/RSPCA/UFAW Joint Working Group on Refinement. *Laboratory Animals*, **38** (Suppl. 1), 1–94

Canadian Veterinary Medical Association (CVMA) (2007) *A Code of Practice for Canadian Kennel Operations* (2nd edn), http://canadianveterinarians.net/Documents/Resources/Files/93_Kennel%20Code%20(ENTIRE)%20July%202007.pdf (accessed June 131, 2012).

Case, L. (2005) *The Dog: Its Behavior, Nutrition and Health*. 2nd edn, Blackwell, Ames, IA.

Centers for Disease Control (CDC) (2010) *Prevention of Zoonotic Transmission of Ascarids and Hookworms of Dogs and Cats: Guidelines for Veterinarians*, http://www.cdc.gov/parasites/zoonotichookworm/resources/prevention.pdf (accessed June 13, 2012).

Chartered Institute of Environmental Health (1995) *Model License Conditions and Guidance for Dog Boarding Establishments*, http://www.cieh.org/policy.dog_guidance.html (accessed June 13, 2012).

Colorado State University (2006) *Canine and Feline Acute Pain Scales*, http://www.ivapm.evetsites.net/refId,20471/refDownload.pml (accessed June 13, 2012).

Colorado Statute. (no date) *Title 35 Agriculture, Article 42.5-101 Animal Shelters and Pounds*, http://www.colorado.gov/cs/Satellite/Agriculture-Main/CDAG/1175705262987 (accessed June 13, 2012).

Companion Animal Parasite Council (CAPC) (2011) *CAPC Recommendations for the Diagnosis, Treatment, Prevention and Control of Parasitic Infections in U.S. Dogs and Cats*, http://www.capcvet.org/recommendations/index.html (accessed June 13, 2012).

Decaro, N., Desario, C., Beall, M.J. *et al*. (2010) Detection of canine parvovirus type 2c by a commercially available in-house rapid test. *The Veterinary Journal*, **184**, 373–375.

Finley, R., Reid-Smith, R., Ribble, C. *et al*. (2008) The occurrence and antimicrobial susceptibility of salmonellae isolated from commercially available canine raw food diets in three Canadian cities. *Zoonoses and Public Health*, **55**, 462–469.

Fischer, S.M., Quest, C.M., Dubovi, E.J. *et al*. (2007) Response of feral cats to vaccination at the time of neutering. *Journal of the American Veterinary Medical Association*, **230**, 52–58.

Gerstenfeld, S. (1999) *ASPCA Complete Guide to Dogs*, Chronicle Books, San Francisco, CA.

Humane Society of the United States (HSUS) (2011) *Guidelines for the Operation of an Animal Shelter*, http://www.animalsheltering.org/resource_library/policies_and_guidelines/guidelines_for_animal_shelter_operations.html (accessed June 13, 2012).

Larson, L. and Schultz, R.D. (2006) Effect of vaccination with rCDV vaccine immediately before exposure under shelter-like conditions. *Veterinary Therapeutics*, **7**, 113–118.

Larson, L.J., Newbury, S., and Schultz, R.D. (2009) Canine and feline vaccinations and immunology. In: *Infectious Disease Management in Animal Shelters* (eds L. Miller & K. Hurley), 1st edn, Wiley-Blackwell, Ames, IA, pp. 61–82.

Lechner, E.S., Crawford, P.C., Levy, J.K. *et al*. (2010) Prevalence of protective antibody titers for canine distemper virus and canine parvovirus in dogs entering a Florida animal shelter. *Journal of the American Veterinary Medical Association*, **236**, 1317–1321.

LeJeune, J.T. and Hancock, D.D. (2001) Public health concerns associated with feeding raw meat diets to dogs. *Journal of the American Veterinary Medical Association*, **219**, 1222–1255.

Lenz, J., Joffe, D., Kauffman, M. *et al*. (2009) Perceptions, practices, and consequences associated with foodborne pathogens and the feeding of raw meat to dogs. *Canadian Veterinary Journal*, **50**, 637–643.

Linder, D.E. and Freeman, L.M. (2010) Evaluation of calorie density and feeding directions for commercially available diets designed for weight loss in dogs and cats. *Journal of the American Veterinary Medical Association*, **236**, 74–77.

Littman, M.P., Goldstein, R.E., Labato, M.A. *et al*. (2006) ACVIM small animal consensus statement on Lyme disease in dogs: Diagnosis, treatment, and prevention. *Journal of Veterinary Internal Medicine*, **20**, 422–434.

Lord, L. K. Pennell, M., Ingwersen, W. *et al*. (2008) Sensitivity of commercial scanners to microchips of various frequencies implanted in dogs and cats. *Journal of the American Veterinary Medical Association*, **233**, 1729–1735.

Miller, C. and Bartges, J. (1999) Refeeding syndrome. In: *Kirk's Current Veterinary Therapy*

VetBooks.ir

(ed J. Bonagura), 13th edn, WB Saunders, Philadelphia, PA, pp. 87–89.

Miller and Hurley (2009) *Infectious Disease Management in Animal Shelters* (eds L. Miller and K. Hurley), 1st ed. Wiley-Blackwell, Ames, IA.

National Research Council Ad Hoc Committee on Dog and Cat Nutrition (2006). *Nutrient Requirements of Dogs and Cats*. National Academies Press, Washington DC, p. 2.

New Jersey Department of Health and Senior Services (no date) http://www.awfnj.org/?page_id=20 (accessed June 13, 2012).

New Jersey law; N.J.A.C. 8.23A-1.6(a), 7b, and 8.23A-1.99(g).

New Zealand Animal Welfare Advisory Committee (1993) *Code of Recommendations and Minimum Standards for the Welfare of Animals in Boarding Establishments*, http://www.biosecurity.govt.nz/animal-welfare/codes/boarding/index.htm (accesses June 16, 2012).

Patterson, E.V., Reese, M.J., Tucker, S.J. *et al*. (2007) Effect of vaccination on parvovirus antigen testing in kittens. *Journal of the American Veterinary Medical Association*, **230**, 359–363.

Reese, M.J., Patterson, E.V., Tucker, S.J. *et al*. (2008) Effects of anesthesia and surgery on serologic responses to vaccination in kittens. *Journal of the American Veterinary Medical Association*, **233**, 116–121.

Rumbeiha, W. and Morrison, J. (2011) A review of class I and class II pet food recalls involving chemical contaminants from 1996 to 2008. *Journal of Medical Toxicology*, **7**, 60–66.

Schultz, R.D. (2006) Duration of immunity for canine and feline vaccines: A review. *Veterinary Microbiology*, **117**, 75–79.

Shroeder, J.P., Bordt, D.W., and Mitchell, F.E. (1967) Studies of canine distemper immunization of puppies in a canine distemper-contaminated environment. *Veterinary Medicine & Small Animal Clinician*, **62**, 782–787.

Spady, T.C. and Ostrander, E.A. (2008) Canine behavioral genetics: Pointing out the phenotypes and herding up the genes. *American Journal of Human Genetics*, **82**, 10–18.

Stenske, K.A., Smith, J.R., Newman, S.J. *et al*. (2006) Aflatoxicosis in dogs and dealing with suspected contaminated commercial foods. *Journal of the American Veterinary Medical Association*, **228**, 1686–1691.

Tobias, G., Tobias, T.T., and Abood, S.K. (2000) Estimating age in dogs and cats using ocular lens examination. *Compendium on Continuing Education for the Practicing Veterinarian*, **22**, 1085–1091.

Tranquilli, W., Lamont, L.A., and Grimm, K. (2004) *Pain Management for the Small Animal Practitioner*, 2nd edn, Teton NewMedia, Jackson, WY.

Victoria Department of Primary Industries (2004) *Code of Practice for the Operation of Boarding Establishments (Revision 1)*, http://www.dpi.vic.gov.au/pets/about-pets/legislation-and-regulation/domestic-animal-business/operation-of-boarding-establishments (accessed June 13, 2012).

Victoria Department of Primary Industries (2011) *Code of Practice for the Management of Dogs and Cats in Shelters and Pounds (Revision 1)*, http://www.dpi.vic.gov.au/pets/about-pets/legislation-and-regulation/management-of-dogs-and-cats-in-shelters-and-pounds/code-of-practice-for-the-management-of-dogs-and-cats-in-shelters-and-pounds (accessed June 13, 2012).

Voith, V., Ingram, E., Mitsouras, K. *et al*. (2009) Comparison of adoption agency breed identification and DNA breed identification of dogs. *Journal of Applied Animal Welfare Science*, **12**, 253–262.

WSAVA Vaccination Guidelines Group (2010) WSAVA guidelines for the vaccination of dogs and cats. *Journal of Small Animal Practice*, **51**, 1–32.

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10
Feline Care in the Animal Shelter

Brenda Griffin

INTRODUCTION

More cats than dogs enter most animal shelters in the United States today (HSUS, 2009). Providing care for them presents unique challenges for a variety of reasons. First, the sheer number of cats who enter shelters, particularly during kitten season, makes the provision of proper care difficult. This is compounded by the fact that most shelters were not designed for housing large number of cats. Furthermore, as length of stay increases beyond a few days, inadequate housing design often makes it impossible to provide for the cats' physical and behavioral needs. Finally, the unique behavior and biology of cats represent a significant challenge for providing humane care. Their biological and psychological makeup predisposes cats in the shelter environment to experience profound stress and all of its negative effects.

Nonetheless, shelters have an obligation to provide the best possible husbandry and care for cats. This is true whether they remain in the shelter for hours, days, or months. Tragically, approximately 70% of cats entering US shelters are euthanized (ASPCA, 2010). However, even for those who will be euthanized, providing compassionate care during their stay is a requirement. Ultimately, much work is needed to reduce the number of cats entering shelters and to increase the live release rates for those who do.

Understanding Cats

Cats are unique among domestic species. Descendants of the African wildcat (*Felis libyca*), domestic cats (*Felis catus*) were relatively recently domesticated compared to dogs and livestock species, and the process changed few of their structural and behavioral characteristics. True carnivores and predatory by nature, cats are biologically equipped to sense and avoid danger. They possess astonishing sensory capabilities including specialized eyesight that is highly sensitive to movement and functions in low levels of light. Their sense of hearing extends into the range employed by bats and mice, allowing them to detect their high-frequency chattering. Their senses of smell and touch also are particularly keen, enabling them to perceive many sensations in the environment that go unnoticed by humans (Fogle, 1997).

Animal shelters intrinsically are stressful environments, filled with an assortment of new and novel stimuli including noises and odors and other stressors that may be apparent only to the animals. Because of their unique biology, cats are particularly prone to experiencing acute stress and fear in such environments. With their heightened senses, cats readily become apprehensive in any new situation. If given the option, however, cats will always choose to hide or escape rather than to defend themselves. Thus, allowing cats to hide or to perceive that escape is possible is key to reducing their stress response during handling and housing (Griffin and Hume, 2006).

Providing Proper Husbandry for Cats in the Shelter

Measures to reduce stress are particularly crucial for ensuring good husbandry for cats. Confinement in

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the shelter can result in a wide variety of behavioral indicators of stress including hypervigilance, feigned sleep, constant hiding, activity depression, and loss of appetite. In addition, stress and immunity are intimately linked, and stress is a leading factor in the development of infectious disease, particularly feline upper respiratory infections (Gaskell and Povey, 1977; Griffin, 1989).

Proper husbandry of cats in the shelter requires an understanding of the wide spectrum of feline lifestyles and an approach tailored to the individual needs of each group. Domestic cat lifestyles and levels of tractability range from the most docile, sociable housecat, to free-roaming strays and truly unsocialized feral cats who will not allow any handling. Stray cats include those who may have been previously owned or are "loosely owned" neighborhood or barn cats (Miller, 1996).

Proper husbandry is intimately linked to many aspects of shelter operations that are discussed in other chapters of this book. In this chapter, key aspects unique to the husbandry of cats are presented. The reader is reminded that a holistic approach is essential to ensure delivery of proper cat care in the shelter.

CONSIDERATIONS AT INTAKE

Stress Reduction

Shelters should have protocols in place to minimize feline stress whenever possible, beginning prior to cats' arrival at the shelter and continuing throughout their stays. Fearful cats may resort to overt aggression or may "teeter on the edge" of defensive aggression (Beaver, 2004). These responses can compromise both cat welfare and staff safety and may hinder adaptation to the shelter environment. First impressions are always powerful, and this holds true for the experience of cats at the time of intake. Whenever possible, cats should be transported in carriers or traps that are covered so that the cat is not exposed, allowing them to feel hidden and more secure. They should be transferred as soon as possible to the highest (i.e., most elevated) available holding cage that is readily accessible. Cats instinctively feel more secure when they can perch at a high point, and studies indicate that feline stress responses are significantly reduced when cats are housed in elevated cages compared to floor-level cages (McCobb *et al*., 2005). From the time of intake, care also should be taken to minimize noise and loud sounds, particularly that of barking dogs.

Because of their lack of socialization, capture and handling is extremely stressful for feral cats. However, it can be challenging to differentiate truly feral cats from those who are tame but very frightened and reactive, especially when they arrive in traps (Griffin, 2009a). Cats who enter the shelter in traps may behave the way a feral cat would, but are not necessarily feral. Even the tamest house cats who are trapped or otherwise very stressed may exhibit the same behaviors as feral cats. In fact, pampered house cats and geriatric cats are often among the cats most stressed by the shelter environment (Patronek and Sperry, 2001; Dybdall, Strasser and Katz, 2007).

Whenever possible, cats who are exhibiting marked stress at the time of entry to the shelter should be housed in specially designated quiet areas away from other animals and heavy or busy foot traffic. All cats and kittens, regardless of their demeanor, should be provided with a hiding box in their enclosures at the time of entry because the ability to hide has been shown to substantially reduce feline stress (Carlstead, Brown and Strawn, 1993). For those cats who are severely stressed or reactive, covering the cage front, in addition to providing a hiding box, and posting signage to allow the cat time to calm down or "chill out" for several hours or even a few days can facilitate adaptation to their new environment (Griffin, 2009a). This is important; once highly stressed or provoked, cats often remain reactive for a prolonged time and may become more reactive if they are stimulated again before they have been allowed a period of time to adapt (Beaver, 2004).

Soft bedding—blankets or towels—should be available for comfort and so cats may establish a familiar scent environment that aids in acclimation to a new environment. Bedding should remain with the animals throughout their stay and only be laundered when soiled. Care should be taken during cleaning procedures to minimize stress and noise, and cats should be allowed to hide while their cages are quietly tidied and supplies replenished around them as needed. Commercially available feral cat dens are ideal for this purpose as they can be secured

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Figure 10.1. A commercially available feral cat den (ACES, Boulder, CO) serves as a secure hiding place for a cat. The circular door can be closed from a safe and non-threatening distance while the cage is spot cleaned as needed. The cat can also be securely transported in the den.

from a safe distance so the cats are closed inside a secure, familiar hiding place during cleaning procedures (Figure 10.1). Cats should be returned to the same cages, and only spot cleaning should be performed in order to preserve their scent, which is necessary for stress reduction. If it becomes necessary to house a cat in another location, the den and towel should accompany the cat to ease the transition. Finally, although some controversy exists regarding their effectiveness, the use of commercially available synthetic analogues of naturally occurring feline facial pheromones (Feliway®, Veterinary Product Laboratories, Phoenix, AZ) have been shown in some cases to be useful for stress reduction in cats during acclimation to new environments, and can be sprayed onto bedding and allowed to dry prior to use, or dispersed in the room using plug-in diffusers (Griffith, Steigerwald and Buffington, 2000).

The way a shelter handles a cat at intake has a profound impact on the cat's behavior, health, and well-being, and may even impact the ultimate outcome for that cat. When stress is successfully mitigated, cats are more likely to adapt to the shelter environment rather than reacting defensively. Over a period of a few days, many cats who did not appear to be "friendly" at intake will become tractable and responsive to their human caregivers, facilitating care and greatly increasing their odds of adoption. In turn, a decrease in infection rates can also be expected since stress and immunity are closely linked.

Staff should be trained to evaluate cats beginning at intake, assign behavioral designations, and recognize and respond to indicators of stress. Active daily monitoring of cats for signs of stress or adjustment to the shelter should be performed, and behavioral designations should be updated. Staff should record their findings daily, noting trends and making adjustments in the care of individual cats and the population as indicated. (See the chapter on behavior evaluations for additional information.)

Handling and Physical Examination

Handling and restraining cats of varying ages, personality types, social experiences, and stress levels requires skill, knowledge of normal feline behavior and signaling, finesse, and proper equipment (Griffin and Hume, 2006). Minimal, gentle restraint should be used to handle tractable cats, since research indicates that gentle human contact can attenuate the adverse effects of unpleasant stimuli, eliminate fear responses, and alleviate signs of pain in animals (McMillan, 2002). In order to minimize stress and "fight or flight" behaviors, it is important for cats to perceive that they are maintaining some control over their situation during restraint and handling. For example, allowing cats to "hide" their faces under a towel or in the nook of a caregiver's arm can alter their perception of the stressor and enable them to cope, permitting handling. In addition, a variety of "diversion" techniques, for example, gentle tapping or rocking, that distract and redirect their focus during a procedure can be utilized to aid in humane handling of cats.

Providing cats time to acclimate to new surroundings before handling—avoiding escapes and the need

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to recapture—and using transport carriers are also helpful methods of successfully reducing stress when handling cats (Griffin and Hume, 2006). Easing restraint may allow cats to continue to cope rather than to attempt escape or defense. In some cases, chemical restraint should be administered with the use of humane restraint equipment such as nets or squeeze devices. When the need arises to carry or lift a fractious or feral cat, purpose-designed boxes, nets, or traps should be used as determined by the specific situation. When used properly, this equipment will minimize stress, prevent injury of the animal, and ensure staff safety. In contrast, the use of control poles or cat tongs for restraint of cats poses significant risk of injury to the animal and exacerbates stress. For these reasons, their use is considered inhumane and must be avoided (HSUS, 1996; Griffin and Hume, 2006).

Taking care to minimize stress, every cat who is safe to handle should receive a physical examination at or as close to the time of admission to the shelter as possible. Following a physical examination form will ensure a complete and systematic review of all body systems. If a veterinarian is not available to examine incoming animals, staff can be trained to perform basic evaluations including sexing, aging, body condition scoring, and looking for evidence of fleas, ear mites, dental disease, overgrown claws, advanced pregnancy, or other obvious physical conditions. A sample intake physical examination form is provided in Box 10.1. Normal values for body temperature, heart rate, and respiratory rate for cats and kittens are provided in Table 10.1.

Of particular importance in the shelter, physical examination includes an accurate physical description of the animal and careful inspection for the presence of identification, both of which may aid in pet-owner reunification (Griffin, 2009b). Because owners and shelter staff often describe cat coat color and patterns differently, photographs that can be posted online are a useful method of improving lost-pet matching and enable owners to look for their pets even if they are physically unable to come to the shelter. A cat coat color chart is available on the University of Florida's shelter medicine website to facilitate proper description (University of Florida, 2000). Examination should include careful inspection for the presence of a microchip. Microchip scanning should be systematically performed on every animal at the time of intake as well as prior to the animal being made available for adoption or being euthanized because studies have demonstrated that using proper technique and scanning more than once are crucial to avoid missing microchips (Lord *et al*., 2008a, 2008b).

An additional critical aspect of the intake examination for cats is identification of physical conditions that will necessitate special considerations for housing or care (Griffin, 2009b). For example, cats suspected of being infected with contagious diseases should be isolated from the general population. Persian, Himalayan, and other brachycephalic (e.g., short-nosed) cats are predisposed to respiratory disease and tend to be more severely affected than other cats due to their poor airway conformation. For this reason, these cats should be housed in highly biosecure areas that are well ventilated and should be prioritized for immediate adoption or transfer to foster care or rescue.

Determining Age and Sex

It is not always easy to determine the sex of cats, especially small kittens. Unlike dogs, where the penis and testicles are readily visible in the inguinal (groin) area, the external genitalia of cats are relatively small and located in the perianal region beneath the tail. On visual inspection, the penis is not obvious in males (tomcats) and, before weaning age, the testicles also are difficult to distinguish. As kittens mature, the testicles become more obvious and are visible beneath the anus by 6–10 weeks of age. Following neutering, the absence of testicles can also make sexual determination difficult for the untrained observer.

The best way to determine the sex of a cat or kitten when there are no obvious testicles present is to look at the distance between the anus and genital opening and the shape of the genital opening. In the male, the anus and opening to the penis are spaced relatively far apart since the testicles lie between them. The opening to the penis is shaped like a small dot or period. For this reason, the males' anogenital anatomy is sometimes described as a colon (:) (Figure 10.2). In the female, the anus and opening to the vulva are spaced very close together, with the vulva situated just beneath the anus. Furthermore, the opening to the vulva is shaped like a small slit or comma. For this reason, the females' anogenital

Box 10.1 Sample Intake Examination Form

Date: _____ Animal ID: _____ Name: _____
Scan for microchip: _____ none found _____ number: _____ initials
Species/Breed: _____ coat length: _____ color: _____ pattern/identifying marks: __
Sex: __ male __ female __ spayed __ spay scar __ neutered __ intact __ unknown
Age/DOB: _____ Body weight: _____ body condition score: _____
Temperature: _____ HR: _____ RR: _____ mm color/hydration:
Physical Examination: circle all that apply; record any additional findings
Attitude: _____
bright/alert __ quiet/alert __ mildly depressed __ severely depressed __ non-responsive
Temperament/Behavior: _____
bold/friendly __ shy/friendly __ handle w/caution __ feral-behaving
General comments: _____
Eyes: _____
normal __ abnormal __ red __ cloudy __ watery clear/brownish mucous __ yellow/green pus
Other: _____
Ears: _____
Normal __ abnormal __ red __ foul odor __ itchy __ painful __ dark waxy discharge __ pus
Ear mites _____ Other:
Mouth: _____
normal __ abnormal __ painful __ __ dental disease: none mild __ moderate __ severe
Other: _____
Nose: _____
normal __ abnormal __ sneezing __ __ nasal discharge: none clear yellow/green __ blood
Other: _____
Lymph nodes: normal __ abnormal __ not examined
Other: _____
Heart/lungs: normal __ abnormal __ not examined __ coughing
murmur __ referred upper airway sounds __ wheezes __ moist rales
Abdomen: normal __ abnormal __ not examined
Other: _____
Urogenital: normal __ abnormal __ lactating __ possibly pregnant
Other: _____
Musculoskeletal: normal __ abnormal __ lame __ stiff
Other: _____
Skin/hair coat: normal __ abnormal __ itchy __ fleas __ hair loss __ sores __ scabs wounds _____
Woods Lamp: _____ Other: _____
Feet: normal __ abnormal __ declawed __ overgrown nails
Other: _____
Neurologic: normal __ abnormal _____ if abnormal: submit for rabies testing
Other: _____
Comments: _____
Vaccination: FVRCP __ Rabies __ other:
Deworming: pyrantel _____ other:
FeLV test: _____ FIV test:
Flea treatment: _____ Ear mite treatment:
Asilomar designation: _____
Examined by: _____

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Table 10.1. Normal vital signs for cats and kittens.

Parameter	Neonatal kittens (birth to 4 weeks)[a]	Kittens > 4 weeks and cats[b,c]
Temperature	96–99°F	100–102.5°F
Heart rate	150–220 beats/minute	120–220 beats/minute
Respiratory rate	16–40 breaths/minute	16–40 breaths/minute

[a]Greco, D.S. and Partington, B.P. (1995) The physical examination and diagnostic imaging techniques, in *Veterinary Pediatrics* (ed J.D. Hoskins), W.B. Saunders, Philadelphia, Pennsylvania, pp. 1–21.

[b]Aiello, S.E. (ed) (1998) *Merck Veterinary Manual*, 8th edn, Merck and Co, Whitehouse Station, New Jersey, pp. 2188–2197.

[c]Kirk, R. and Bistner, S. (2000) *Handbook of Veterinary Procedures and Emergency Treatment*, 7th edn, W.B. Saunders, Philadelphia, Pennsylvania.

anatomy is sometimes described as a semicolon (;) (Figure 10.3).

Older intact tomcats are easy to distinguish because the testicles, which are well covered by hair, are obvious. Neutered males, however, may be mistaken for females—the key is to look closely at the distance between the anus and genital opening and the shape of the genital opening, as in kittens. The same rules apply: a neutered male looks like a widely spaced colon, compared to the female semicolon (Figure 10.4).

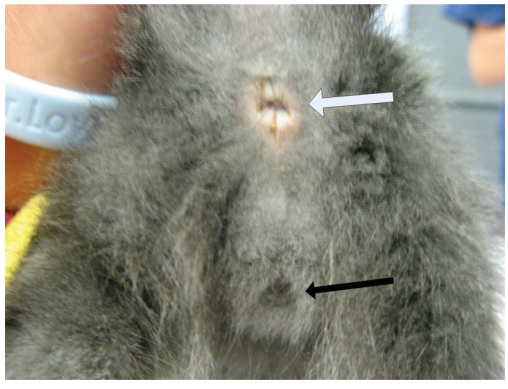


Figure 10.2. Anogenital anatomy of a male kitten. White arrow: anus. Black arrow: small dot-like opening of penis. Note the relatively large distance between the anal and genital openings.

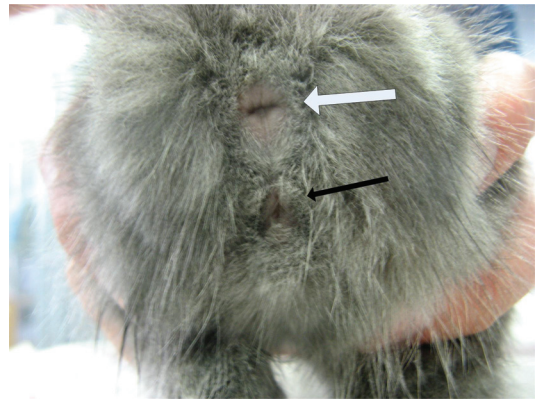


Figure 10.3. Anogenital anatomy of a female kitten. White arrow: anus. Black arrow: small slit-like opening of vulva. Note the relatively small distance between the anal and genital openings.

Accurately aging kittens and cats can be challenging, but following some simple rules and guidelines can help (Box 10.2 and Figure 10.5). In particular, it can be difficult to accurately pinpoint the age of adult cats. Veterinarians can learn to more accurately estimate the age of adult cats by examining the lens of the eye and evaluating changes in its appearance and reflection (Tobias, Tobias and Abood, 2000).

At intake, several other procedures are necessary for routine husbandry, preventive healthcare, and disease control. These include procedures for identification, vaccination, parasite control, and in some cases, testing for feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV).

Identification (Collars/Tags, Microchips)

Identification of cats in the shelter by use of a neckband, collar, and tag and/or a microchip is essential for preventive healthcare and ongoing surveillance of individuals, particularly where animals are group-housed. Enclosures should also be labeled with

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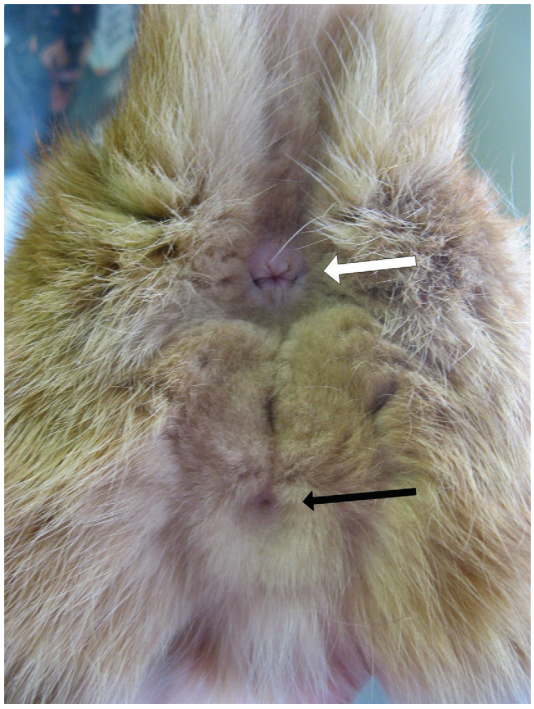


Figure 10.4. Anogenital anatomy of a neutered male adult cat. White arrow: anus. Black arrow: small dot-like opening of penis. Note the relatively large distance between the anal and genital openings. The empty hair-covered scrotum lies in between.

the animals' unique identification numbers and/or names. Contrary to popular belief, most cats will reliably wear collars safely and comfortably (Lord *et al*., 2010). Even for kittens, collars can be used and may be especially beneficial since they will learn to wear them from an early age. Microchips may also be used for identification and are safe and simple to implant (Box 10.3). The procedure is well tolerated by the vast majority of cats and kittens. For more information on microchipping, see the chapter on introduction to animal sheltering.

Vaccination

The high likelihood of exposure and the potentially life-threatening consequences of illness in shelters make vaccination against certain diseases essential. There is no doubt that proper vaccination will substantially reduce disease in shelters and improve animal health. Furthermore, serious adverse reactions are rare. The American Association of Feline Practitioners (AAFP) (Richards *et al*., 2006) has published guidelines for vaccination of cats in animal shelters.

What to Vaccinate Against

Although many vaccines are commercially available for cats, only a few are recommended for routine use in shelters. Unnecessary use of vaccines should be avoided in order to minimize the incidence of adverse reactions and reduce cost. Detailed vaccination records should be maintained for each cat including vaccine name, manufacturer and serial number, date, the initials of the person who administered the vaccine, and any adverse reactions (Richards *et al*., 2006).

Core Vaccines for Cats

Certain "core vaccines" are recommended for all cats entering shelters. Core vaccines involve diseases that represent significant morbidity and mortality, are widely distributed, and against which vaccination has been demonstrated to provide relatively good protection. Core vaccines for shelter cats include feline parvovirus (FPV or panleukopenia), FHV-1 (feline herpesvirus type 1 or feline rhinotracheitis virus), and feline calicivirus (FCV) (Table 10.2) (Richards *et al*., 2006). These are usually given in a combination product commonly referred to as an FVRCP vaccine (feline viral rhinotracheitis, calicivirus, and panleukopenia).

Rabies Vaccination

Although rabies is considered a core vaccination for cats and may be required in some jurisdictions, there is no benefit in terms of disease prevention to vaccinating cats against rabies on entry to shelters (Richards *et al*., 2006). Rabies vaccination is recommended for cats prior to release or adoption when a licensed veterinarian is available to administer it (or as otherwise legally prescribed by state laws) and should be given in the right hind leg according to AAFP guidelines.

Alternatively, when the rabies vaccine cannot be administered by the shelter prior to a cat's release, the shelter should recommend that it be administered as soon as possible by a private practitioner. Rabies

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Box 10.2 Rules and Guidelines for Aging Kittens and Cats

Seven Simple Rules

1. **A-Pound-A-Month Rule (for kittens only)**
   In general, kittens grow at the rate of ~1 lb per month. For example, a kitten that weighs 3 lb may be estimated at 3 months of age. A kitten that weighs 3/4 lb may be estimated at 3/4 of a month or 3 weeks of age. Male kittens tend to be slightly over the rule, while females tend to be slightly under. For example, in a litter of 2-month-old kittens, the males may weigh $2\frac{1}{8}$ lbs, while the females weigh just less than 2 lb.
2. **Eye-Opening Rule**
   Kittens open their eyes at ~7–10 days of age.
3. **Baby Teeth Rule**
   Baby teeth erupt at ~3 weeks of age. Therefore, a kitten with open eyes and no teeth could be estimated at $2\frac{1}{8}$ weeks of age. A kitten whose teeth are beginning to erupt could be estimated at 3 weeks of age. Complete eruption of baby teeth (crowns fully exposed) occurs by 4 weeks. A kitten with a full set of baby teeth could be said to be at least 4 weeks old.
4. **Learning to Walk Rule**
   Kittens learn to walk at ~3 weeks of age. By 4 weeks of age, they are gaining coordination and can run and play. Therefore, if a kitten appears unsteady as though they just learned to walk, they are 3 weeks old. If they are walking and playing well, they are at least 4 weeks old. (Remember: a 4-week-old kitten should weigh ~1 lb and have a full set of baby teeth.)
5. **Permanent Incisors Rule**
   The incisors are the first permanent teeth to erupt. They erupt in order: I1, I2, I3. In kittens, eruption of these teeth begins just prior to and is complete by ~4 months of age. A kitten with erupting permanent incisors can be estimated at 4 months of age. A kitten with all permanent incisors erupted who still has deciduous upper canines could be estimated at 5 months of age. Remember, this kitten should weigh ~5 lb.
6. **Permanent Canines Rule**
   The canine teeth are the last easily identifiable teeth to erupt, and they do so at ~$5\frac{1}{2}$–6 months of age. Therefore, kittens with fully erupted adult canine teeth can be estimated to be at least 6 months of age.
7. **Size Matters Rule**
   For young tomcats, it is also helpful to examine the testicles. In juvenile cats, they can be expected to be small and relatively undeveloped. If a male has permanent canine teeth, but still has very small testicles, he can be estimated to be 6–9 months of age. Slightly larger: 9–12 months of age. Over 12–14 months of age, tomcats usually have mature testicles.

Guidelines by Age Range

<4 months

- The cat will weigh less than 4 lb (cats typically grow at a rate of 1 lb per month)
- All teeth will be deciduous (permanent incisors erupt around 4 months of age)

4–5 months

- The cat will likely weigh 4–5 lb
- The cat will have permanent incisors, but deciduous canine teeth (these erupt at 6 months)

5–12 months (juvenile)
- Weight usually more than 5 lb
- Canine teeth fully erupted
- Teeth appear "pearly white"
- Face appears small and "kitten-like"
- Males will have juvenile (small) testicles

1–2 years
- Features similar to the juvenile period, but facial features mature (larger head)
- Males will have mature (large) testicles
- Intact tomcats begin to develop jowls at 18 months

3–10 years
- May be very difficult to pinpoint age
- Intact tomcats will have well-developed jowls

>10 years
- Nuclear sclerosis (increased opacity of the lens of the eyes) may develop (less common than in dogs)
- Iris atrophy (mottling, granular or moth-eaten appearance of the colored part of the eye) is common
- Loss of fat around the eyes and top of the head may result in lean, angular "old cat" facial appearance
- Dorsal muscle wasting may be present as age increases

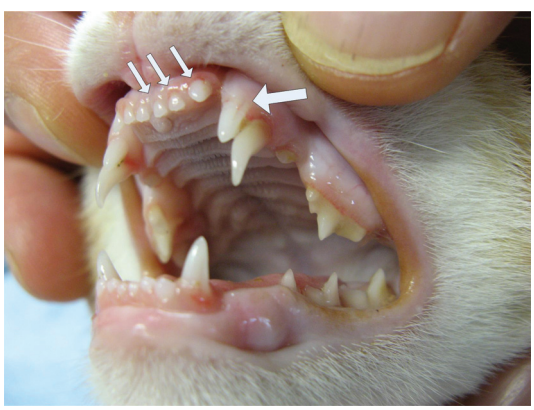


Figure 10.5. Determining the age of a kitten using eruption of teeth. Eruption of permanent teeth in a kitten. Small white arrows indicate all permanent incisors are fully erupted. Large arrow indicates permanent canine tooth is just beginning to erupt in front of the more narrow, curved deciduous (baby) one. (The deciduous canine tooth will eventually be lost as the permanent tooth fully erupts.)

vaccination is also warranted when cats are housed long-term in shelter facilities. In addition, if individual cats must be held for bite quarantines, they should be vaccinated against rabies in accordance with the current *Compendium of Animal Rabies Prevention and Control* (NASPHV, 2011).

Noncore Vaccines

Noncore vaccines include those that may offer protection against diseases, but because the diseases in question are not widespread or only pose a risk of exposure in certain circumstances, these vaccines are recommended on the basis of the individual risk assessment of an animal or population of animals. Noncore vaccines include FeLV, FIV, *Chlamydophila*, and *Bordetella* (Richards *et al*., 2006). Although vaccination against FeLV is not generally recommended in the shelter, it may be warranted when cats are group housed. When administered, injection of this vaccine should be performed in the left hind leg according to AAFP guidelines, and a booster should follow initial vaccination in 2–4 weeks. Similarly, FIV vaccination is not generally recommended in the shelter. An additional confounding feature of FIV vaccination is that

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Box 10.3 How to Properly Implant a Microchip

1. Be certain the animal does not already have a microchip by performing a systematic scan of the entire animal. The scanner should indicate "no ID found."
2. Scan the microchip applicator syringe to confirm the ID code is correct.
3. Prep of the injection site is NOT necessary (no clipping, swabbing, or scrubbing).
4. Remove the applicator syringe cap. Be careful not to point the needle down as the chip may slide out of the needle and fall out.
5. If the patient is awake, restrain as needed and distract with treats. Many patients will allow chip administration with no resistance while they eat a treat.
6. Tent the skin over the dorsal shoulder blades and inject the needle, burying it all the way to the hub.
7. Depress the plunger then turn the needle 90 degrees to one side before withdrawing it. (Note: Turning the needle prior to withdrawal does not cause patient discomfort and serves to dislodge the chip from the applicator tip, preventing it from accidentally being withdrawn from the injection site along with the needle.)
8. Inspect the injection site as you remove the needle. Apply gentle pressure with your fingers if any bleeding is noted.
9. Scan the pet and recheck the ID code.
10. Discard applicator needle in sharps disposal.
11. Complete the registration process. Enter microchip ID number in the shelter database and the national microchip registry.
12. Attach the corresponding tag to the pet's collar.

vaccinated cats develop false-positive test results. If FIV vaccination is elected, vaccinated cats should be permanently identified (e.g., by use of a microchip) to clarify their status.

Chlamydophila felis (*C. psittaci*) and *Bordetella bronchiseptica* vaccines may be of benefit when clinical signs of these diseases are present in the shelter and diagnosis is confirmed by laboratory evaluation. Their efficacy is moderate, and reactions are more common than with most other feline vaccines; therefore, ongoing use should be periodically reassessed.

Vaccines Not Recommended

Some vaccines are not generally recommended for use because of undemonstrated efficacy. These include feline infectious peritonitis (FIP) and giardia vaccines (Richards *et al*., 2006).

What Type of Vaccine to Use

Because modified live vaccines (MLV) evoke a more rapid and robust immune response and are better than killed products at overcoming maternal antibody interference, their use is strongly recommended in shelters and foster homes (Richards *et al*., 2006). A single modified live FVRCP vaccine will usually afford protection to cats who are at least 4 months of age, whereas killed products require a booster in 2–3 weeks to confer immunity. This makes the use of killed FVRCP vaccines generally undesirable and largely ineffective in shelters. To ensure rapid protection against panleukopenia, injectable FVRCP vaccines are preferred, but intranasal vaccines may offer advantages for feline respiratory disease since they have been shown to rapidly induce local immunity at the site of exposure and are better at overriding maternal antibody in young kittens. If intranasal vaccines are used, they should be used in combination with injectable FVRCP vaccines to ensure and optimize response against all of these diseases (Richards *et al*., 2006).

Regardless, vaccines do not always prevent disease. In many instances, they provide only partial protection, lessening the severity of clinical signs but not preventing infection. Even the best vaccines take

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Table 10.2. Core vaccines for shelter cats.

Core vaccine	Type of vaccine recommended	Route/frequency/site of administration		Vaccine prevents disease altogether or reduces severity of disease	Comments
		Kittens <4 months of age	Kittens >4 months of age and adults		
Feline panleukopenia vaccine	MLV	Administer SQ right dorsal shoulder as a three-way vaccine (FVRCP) on entry and then every 2 weeks beginning at 4–6 weeks of age and continuing to 16 weeks of age or when permanent incisors erupt	Administer SQ right dorsal shoulder as a three-way vaccine (FVRCP) on entry. A single boost in 2 weeks is ideal; however, most cats will respond to a single injection	Prevents	Because intranasal vaccination may not provide reliable protection against feline panleukopenia, cats should be vaccinated with an injectable MLV panleukopenia vaccine, regardless of whether IN respiratory vaccines are used[a]
Feline herpesvirus type 1 (FHV-1 or feline viral rhinotracheitis)	MLV			Reduces	Administration of an intranasal vaccine against FHV-1 and FCV in addition to the injectable vaccine may provide extra protection presumably due to rapid onset of local (mucosal) immunity[b] Mild self-limiting reactions are common including sneezing and/or mild nasal discharge and occur within days of vaccination Reactions may be severe in brachycephalic (short-nosed) breeds such as Persians
Feline calicivirus (FCV)	MLV			Reduces	

[a]Richards, J.R., Elston, T.H., Ford, R.B. *et al.* (2006) AAFP feline vaccine advisory panel report. *Journal of the American Veterinary Medical Association*, **229**(9), 1405–1441.

[b]Edinboro, C.H., Janowitz, L.K., Guptill-Yoran, L. *et al.* (1999) A clinical trial of intranasal and subcutaneous vaccines to prevent upper respiratory infection in cats at an animal shelter. *Feline Practice*, **27**, 7–13.

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some time to provide protection, and vaccine failure may occur when animals enter the shelter already infected with disease. Although vaccination cannot prevent feline upper respiratory disease, it can still be of substantial benefit. In contrast, timely vaccination against panleukopenia will usually prevent clinical disease (Richards *et al*., 2006).

Who and When to Vaccinate

Timing of vaccination is critically important. Ideally, all cats should be vaccinated 1 week or more before entering an animal shelter. Since this is usually not feasible, as the next best practice, all incoming cats and kittens 4 weeks of age and older who can be safely handled should receive MLV core vaccination (e.g., MLV FVRCP vaccine) immediately on entering an animal shelter; this can provide clinically significant protection for the majority of cats. Even injured cats, those with medical conditions and those who are pregnant or lactating should be vaccinated on entry because vaccination will likely be effective and the small risk of adverse effects is outweighed by the high risk of disease exposure and infection in the shelter. A delay of even a day or two significantly compromises the vaccine's ability to provide timely protection (Paul *et al*., 2006). In fact, immunity usually begins developing within hours of vaccination. Furthermore, if neither maternal antibody nor another cause of vaccine failure interferes, modified live vaccinations against panleukopenia will often confer protection against disease in only 5 days (Brun *et al*., 1979). Intranasal vaccines against respiratory infections including FHV, FCV, and *Bordetella* typically provide partial protection within 2–4 days (Cocker *et al*., 1986; Edinboro *et al*., 1999; Gore *et al*., 2005). While vaccination cannot ensure disease protection, when combined with excellent husbandry and performed in a timely manner, it can substantially reduce disease risk and severity.

When vaccination of all cats on entry is not feasible, the next best practice is to vaccinate all those who are deemed adoptable at the time of entry, or are likely to be in the shelter long-term (Griffin, 2009b). Whenever possible, vaccinated cats should be separated from those who will remain unvaccinated as soon as that determination can be made.

A series of vaccinations should be administered to kittens younger than 4 months of age in order to minimize the window of susceptibility to infection and to ensure that a vaccine is received as soon as possible after maternal antibodies have decreased sufficiently to allow vaccine response (Richards *et al*., 2006). For shelter kittens, vaccines should be administered every 2 weeks until they are 16 weeks (e.g., 4 months) of age or until their permanent incisors have erupted. By this time the vast majority of kittens will have lost maternal antibody and be able to respond to a vaccine. In the case of an outbreak of panleukopenia, extending vaccination to 5 months of age may be warranted because maternal antibody interference may persist beyond 16 weeks of age in some cases. Box 10.2 and Figure 10.5 provide information on how to determine the age of a kitten. A vaccination interval of less than 2 weeks is not recommended since it may actually blunt the immune response from previous vaccination (Greene, 1998).

Just as in owned pets, booster vaccines for adult cats are generally not required before 1 year for MLV, but would ideally be administered once in 2 weeks if resources permit. This may be especially important for cats who were ill at the time of initial vaccination. Revaccination in shelters that house animals long-term should follow the guidelines set forth for adult pets (boost at 1 year, then every 3 years for FVRCP and according to local and state ordinances for rabies) (Richards *et al*., 2006).

Vaccine Handling and Storage

Proper handling and storage of vaccines is critical to their effectiveness (Richards *et al*., 2006). MLV are particularly sensitive to temperature changes and are unstable once reconstituted. On arrival of a shipment, vaccines should be refrigerated immediately and never left unrefrigerated or, conversely, frozen since both heat and excessive cold can result in inactivation. For best results, vaccines should be removed from the refrigerator only as they are being used and should be administered within 30 minutes of reconstitution.

Parasite Control/Prevention

Control and prevention of internal and external parasites represent another important consideration for cats at the time of intake. Common products used for their management are described in Table 10.3. Of particular importance are roundworms and hookworms, common intestinal parasites with

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Table 10.3. Common drugs for parasite treatment and control.

Generic name	Trade name	Dosage	For treatment or control of	Comments
Amprolium	Corid®, Merial Limited, Duluth, GA	60–100 mg total dose orally once-daily for 7 days	Coccidia	Water additive; may inhibit drinking, not recommended
Dinotefuran, pyriproxifen	Vectra® for cats, Ceva Animal Health, Rutherford, NJ	Apply topically once a month according to package	Adult fleas Immature fleas	
Emodepside, praziquantel	Profender®, Bayer Animal Health, Shawnee Mission, KS	Administer topically according to package	Roundworms Hookworms Tapeworms	Effective against adult and larval stages of round- and hookworms making it an effective single dose treatment Safe for use in pregnant and lactating mothers (European label claim)
Febantel, pyrantel pamoate, praziquantal	Drontal Plus®, Bayer Animal Health, Shawnee Mission, KS	Administer orally at label dose once a day for 5 days	Roundworms Hookworms Tapeworms Giardia	Not labeled for cats, but has been recommended for treatment of giardia in cats[a]
Fenbendazole	Panacur®, Intervet Schering Plough, Whitehouse Station, NY	50 mg/kg orally daily for 3 days	Roundworms Hookworms Tapeworms (taenia only)	Treat for 5 days for giardia; treat for 10 days for lungworms; not effective against *Dipylidium caninum*

(*continued*)

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Table 10.3. (*Continued*)

Generic name	Trade name	Dosage	For treatment or control of	Comments
Fipronil	Frontline® Spray and Frontline® Topspot, Merial Limited, Duluth, GA Fiproguard™, Sentry Pet Care Products, Inc., Omaha, NE PetArmor®, FidoPharm, Yardley, PA EasySpot™, Novartis Animal Health, Basel, Switzerland	Apply topically once a month according to package	Adult fleas Ticks Chewing lice Ear mites Cheyletiella[b,c]	Spray is very cost-effective and is safe for neonates; safe for use in pregnant and lactating mothers; dog and cat product can be used interchangeably (off label)
Fipronil, (*S*)-methoprene	Frontline Plus®, Merial Limited, Duluth, GA Fiproguard Plus™, Sentry Pet Care Products, Inc., Omaha, NE PetArmor Plus®, FidoPharm, Yardley, PA EasySpot, Novartis Animal Health, Basel, Switzerland	Apply topically once a month according to package	Adult and immature fleas Ticks Chewing lice Ear mites Cheyletiella[b,c]	Safe for use in pregnant and lactating mothers
Imidacloprid	Advantage II®, Bayer Animal Health, Shawnee Mission, KS	Apply topically once a month according to package	Adult and immature fleas Lice	Dog and cat product can be used interchangeably (off label); also safe for rabbits

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Imidacloprid, moxidectin	Advantage Multi® for cats, Bayer Animal Health, Shawnee Mission, KS	Apply topically once a month according to package	Adult and immature fleas Roundworms Hookworms Ear mites Heartworm prevention	Effective against adult and larval stages of round- and hookworms making it an effective single dose treatment; Do NOT use dog product on cats—higher concentration of moxidectin makes it unsafe
Ivermectin-based heartworm preventives	Heartgard® for cats, Merial Limited, Duluth, GA Iverhart®, Virbac Animal Health, Fort Worth, TX	Orally once a month according to package	Heartworm prevention Hookworms	
Lime sulfur	LymDyp, DVM Pharmaceuticals, St. Joseph, MO	Biweekly dipping until negative	Ringworm Feline demodex	
Lufenuron	Program®, Novartis Animal Health, Basel, Switzerland	Orally once a month according to package	Immature fleas	Not effective against ringworm[d]
Metronidazole	Flagyl®, Pfizer, New York	10–25 mg/kg orally twice daily for 5–10 days	Giardia	
Milbemycin	Interceptor®, Novartis Animal Health, Basel, Switzerland	Orally once a month according to package	Roundworms Hookworms Heartworm prevention	

(*continued*)

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Table 10.3. (*Continued*)

Generic name	Trade name	Dosage	For treatment or control of	Comments
Milbemycin, lufenuron	Sentinel®, Novartis Animal Health, Basel, Switzerland	Orally once a month according to package	Roundworms Hookworms Heartworm prevention Immature fleas	
Milbemycin oxime, praziquantel	Milbemax® for cats, Novartis Animal Health, Basel, Switzerland	Orally once a month according to package	Roundworms Hookworms Heartworm prevention Tapeworms	Not currently available in the United States (2011)
Nitenpyram	Capstar®, Novartis Animal Health, Basel, Switzerland	Give orally as needed according to package	Adult fleas	Rapid kill
Ponazuril	Marquis®, Bayer Animal Health, Shawnee Mission, KS	20–50 mg/kg orally once daily for 1–3 days +/− repeat in 1 week	Coccidia	
Praziquantel	Droncit®, Bayer Animal Health, Shawnee Mission, KS	Dose according to label	Tapeworms	
Pyrantel pamoate	Strongid T®, Pfizer, New York Anthelban®, Columbia Laboratories, Livingston, NJ	10 mg/kg orally; repeat in 2 weeks	Roundworms Hookworms	Recommend using 50 mg/mL suspension

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Pyrantel pamoate/ praziquantel	Drontal®, Bayer Animal Health, Shawnee Mission, KS Virbantel®, Virbac Animal Health, Fort Worth, TX	Oral dose according to label; repeat in 2 weeks	Roundworms Hookworms Tapeworms	
Selamectin	Revolution®, Pfizer, New York	Apply topically once a month according to package	Roundworms Hookworms Ear mites Fleas Heartworm prevention	
Spinetoram	Assurity®, Elanco Animal Health, Greenfield, IN	Apply topically once a month according to package	Adult fleas	Rapid kill
Spinosad	Comfortis, Elanco Animal Health, Greenfield, IN	Orally once a month	Adult fleas	Rapid kill; labeled for dogs; also safe for cats
Sulfadimethoxine	Albon®, Pfizer, New York	50 mg/kg once daily for the first day, then 25 mg/kg once daily for 14–20 days	Coccidia	Questionable efficacy

[a]Scorza, A.V., Radecki, S.V. and Lappin, M.R. (2006) Efficacy of a combination of febantel, pyrantel, and praziquantal for the treatment of kittens experimentally infected with *Giardia* species. *Journal of Feline Medicine and Surgery*, **8**, 7–13.

[b]Coleman, G.T. and Atwell, R.B. (1999) Use of fipronil to treat ear mites in cats. *Australian Veterinary Practitioner*, **29**(4), 166–168.

[c]Scarampella, F., Pollmeier, M., Visser, M. *et al*. (2005) Efficacy of fipronil in the treatment of feline cheyletiellosis. *Veterinary Parasitology*, **129**(3/4), 333–339.

[d]Moriello, K.A. (2004) Treatment of dermatophytosis in dogs and cats: Review of published studies. *Veterinary Dermatology,* **15**(2), 99–107.

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zoonotic potential. Although uncommon, the risk of human infection from contaminated environments is real and can result in organ damage, blindness, and skin infections. For this reason, the Centers for Disease Control and Prevention (www.cdc.gov) and the Companion Animal Parasite Council (www.capcvet.org) strongly advise routine administration of broad-spectrum anthelmintics for their control. Pyrantel pamoate is one of the most cost-effective and efficacious drugs for treatment and control of roundworms and hookworms. The author recommends administration of pyrantel pamoate at a dosage of 10 mg/kg on entry to all adoptable cats with retreatment in 2 weeks and then at monthly intervals. In addition, kittens should be treated at 2-week intervals until 4 months of age. For cats with diarrhea, fecal examination [e.g., flotation or centrifugation, direct fecal smear and cytology, +/− giardia ELISA (enzyme-linked immunosorbent assay)] should be performed with treatment according to results. Even if results are negative, the administration of broad-spectrum anthelmintics should be strongly considered (Griffin, 2011a).

Ectoparasites, particularly ear mites and fleas, are also very common in cats and kittens. Shelter staff should be trained to recognize infestation, and protocols should be established for treatment. For ear mites, the author recommends treatment with ivermectin because it is highly efficacious and costs only pennies per dose (Table 10.4). For fleas, the author recommends topical treatment with fipronil (Frontline®, Merial Limited, Duluth, GA) as a spray or top spot. In particular, the spray is very cost-effective. It is safe for use in cats of all ages, including pregnant and nursing mothers and neonatal kittens. In addition, fipronil also has activity against ear mites, Cheyletiella, chewing lice, and ticks (Coleman and Atwell, 1999; Scarampella *et al*., 2005). See the chapter on practical overview of common infectious disease agents for more information.

Table 10.4. Dosing chart for ear mite treatment using ivermectin 1% solution (0.3 mg/kg).[a]

Cat's body weight (lb)	Volume to administer (mL) SQ or PO once
<5 lb	0.05 mL
5–7 lb	0.10 mL
8–10 lb	0.15 mL
11–14 lb	0.20 mL
15–20 lb	0.25 mL

[a]Extra label use. Repeat in 2 weeks. This dose is also effective against many other ecto- and endoparasites including cheyletiella, notoedres, sarcoptes, cuterebra, roundworms, hookworms, and lungworms.

Disease Testing

FeLV and FIV

FeLV and FIV are infectious diseases that affect cats, and although the time between infection and development of clinical disease may be months to years, immunosuppression and a variety of serious illnesses are associated with them. The prevalence of FeLV and FIV ranges from less than 2% in healthy cats to between 6% and 33% in cats who are ill or considered to be at high risk (O'Connor, Tonelli and Scarlett, 1991; Moore *et al*., 2004; Levy *et al*., 2006). Risk factors for infection include contact with other cats and living outdoors. In particular, adult tomcats are often at highest risk particularly if they are not neutered and allowed outdoors. Because close contact with infected cats or their body fluids is required for transmission, identification and separation of infected cats is the basis of control for both viruses. It may take as long as 60 days following exposure for a cat to test positive (Levy, Crawford and Hartman, 2008; Levy, 2009).

The AAFP's detailed professional guidelines for the management of these important feline infections include recommendations specifically for shelters (Levy, Crawford and Hartman, 2008). The guidelines state that all cats should ideally be tested on entry to shelters and again in 60 days in case of recent exposure. When testing is performed, point-of-care ELISA tests are excellent for screening cats for these infections. When cats test positive on such screening tests, AAFP recommends that the results be confirmed with additional testing over time since false positives can occur. However, such confirmatory testing requires substantial time and monetary investment, may be difficult to interpret, and may not be feasible for many shelters. The Association of Shelter Veterinarians' (ASV) position statement, *Management of Cats Who Test Positive for FeLV and*

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FIV in an Animal Shelter, states that the logistics and cost of holding and retesting unowned cats may be an ineffective use of resources (ASV, 2008). In addition, it can be difficult to find homes for positive cats, which can in turn result in prolonged shelter stays, compromised quality of life, and additional emotional stress for caregivers who may later be faced with euthanizing cats who have been held for long periods awaiting confirmatory testing or adoption opportunities. For all of these reasons, many shelters elect to euthanize cats who test positive on screening tests (Griffin, 2011a).

If shelters cannot test cats on entry, the next best practice might be to test cats prior to adoption as well as those who are housed in the shelter long-term. In addition, cats should be tested prior to placement in group housing with unfamiliar cats, prior to foster care, treatment, or spay/neuter surgery. Each shelter should evaluate its own resources and determine their best use. When testing is performed, samples must never be pooled, and the negative results of one cat (such as a mother cat) should not be extrapolated to other cats (such as her kittens). Such practices are invalid and can falsely lead to misidentification of a cat's true infection status (Levy, 2009).

If testing is not performed prior to adoption, adopters should be advised to have their new pet tested and to keep them separate from any other cats they may own before doing so. In contrast, testing of feral cats is not routinely recommended for cats enrolled in trap/neuter/return programs (Levy, 2009). For more information see the chapter on management of stray and feral community cats.

Feline Heartworm Disease

Heartworm infection, which is spread by mosquitoes, is well recognized as an important disease that is endemic in most areas throughout the United States. Fortunately, compared to dogs, cats are much more resistant to infection with adult heartworms. Necropsy surveys of shelter cats have demonstrated that the prevalence ranges from 5% to 15% of that of susceptible dogs in a given area (American Heartworm Society, 2007). Many cats tolerate their infections without noticeable clinical signs, while a few develop severe disease or even experience sudden death. Because worm burdens are typically very low (e.g., one to three worms), serologic testing for heartworm disease in cats is not always rewarding, and interpreting results of antibody and antigen tests may be difficult. According to the American Heartworm Society, a primary reason for heartworm testing of cats is to establish an etiologic diagnosis in those individuals who are suspected of being infected based on the presence of related clinical signs (American Heartworm Society, 2007). Unfortunately, routine definitive treatment for heartworm disease is not available for cats.

Despite their limitations, point-of-care heartworm tests for cats have recently become more widely available and serve the purpose of increasing pet owners' awareness of this important feline disease. With tests readily available, many shelters have been faced with determining whether to perform routine screening of cats in their care. To answer this question, it is helpful to consider the following:

- Infected cats pose no risk to other cats and usually remain asymptomatic.
- Even if infection is diagnosed in asymptomatic patients, definitive treatment is neither practical nor safe.
- Most infections resolve spontaneously over time and are not associated with a shortened lifespan (Genchi, 2008).
- Counseling owners about positive test results poses unique challenges.
- Positive test results may alter a cat's disposition within the shelter.

In consideration of these facts, the author does not recommend routine screening of cats for heartworm disease in shelters. Monthly chemoprophylaxis, however, is a safe and effective option for cats sheltered in areas where heartworm infection is considered endemic (Griffin, 2011a).

Dermatophytosis (Ringworm)

Dermatophytosis or ringworm is the most common skin infection of cats and is a known zoonosis. It is caused by infection of the skin, hair, and nails with microscopic fungal organisms (usually *Microsporum canis*) that cause varying degrees of hair loss and dermatitis. Control is difficult because the infective spores formed by *M. canis* quickly contaminate the environment and are extremely resistant to disinfectants, and because some cats are asymptomatic carriers, making it difficult to readily recognize all infected cats. Once a population is infected

with dermatophytosis, it can be very challenging to eliminate it. For all of these reasons, cats should be screened for ringworm upon entry to the shelter whenever possible, and cats with suggestive skin lesions should always be segregated from the general population. Physical examination, Wood's Lamp examination, and microscopic evaluation of affected hairs are all useful diagnostic techniques; however, culture is usually required for definitive diagnosis. For more information see the chapter on practical overview of common infectious disease agents.

GROOMING

Attention must be given to proper grooming of cats. Fortunately, most cats require minimal grooming because of their fastidious nature. Long-haired cats are a notable exception and sometimes enter animal shelters with heavily matted hair, which can be painful and difficult to remove, occasionally necessitating shaving under sedation. Overgrown nails may also be a problem for some cats, particularly those who are geriatric or polydactyl (e.g., have extra toes). When animals are held in the shelter for long-term stays, a system of regular grooming must be implemented in order to prevent matting and overgrown nails. The use of stainless steel combs or undercoat rakes that can be readily disinfected is generally preferable to the use of bristle brushes because the latter are impossible to disinfect and have the potential to spread common skin infections such as ringworm. Regular grooming also provides an excellent opportunity to monitor body condition, and some cats enjoy the contact and attention.

NUTRITION AND FEEDING

Cats are true carnivores and as such have much higher protein requirements than dogs and humans. They also lack the ability to synthesize essential nutrients such as taurine, arginine, and vitamin A that would have been present in their prey (Hand and Novotny, 2002; Case, 2003). These nutritional idiosyncrasies result in stringent dietary requirements, making it crucial that cats be fed only nutritionally complete, commercially prepared feline diets in the shelter. Raw food diets should not be fed because they have been associated with bacterial contamination and public health risk (Strohmeyer *et al*., 2006). As for all species, fresh clean water should always be available for cats.

When to Feed

The wild ancestors of domestic cats hunted to eat, feeding up to 30 times in a 24-hour period. This style of feeding behavior is preferred by many domestic cats, who, if left to their own devices, would nibble throughout the day and night, consuming many small meals. However most cats are capable of adapting to either free-choice or meal feeding as their daily feeding pattern (Hand and Novotny, 2002; Case, 2003). There are advantages and disadvantages to each.

Free-choice or ad libitum feeding is a method where food is always available, allowing the animal to eat as much as she wants whenever she chooses. Dry food should be used for this method of feeding as canned products left at room temperature are prone to spoiling. The major advantages of free-choice feeding are that it is quick and easy: caregivers simply need to ensure that fresh dry food is always available. Major disadvantages include the facts that animals who are not eating may go unnoticed for several days, especially when several animals are fed together, and some animals may continually overeat and become obese. Free-choice feeding is an excellent method for cats who require frequent food consumption. These include kittens up to 5 or 6 months of age, queens in late gestation, and those who are nursing. Unlike dogs, who are competitive eaters by nature, free-choice feeding may benefit group housed cats as it ensures that there will be ample time for all members to eat, provided that dominant members of the colony do not block the access of subordinate cats (Hand and Novotny, 2002).

Meal feeding using controlled-size portions of dry and/or canned food may be an alternative or used in conjunction with free-choice feeding. When used alone, adult cats should receive a minimum of two meals per day (Hand and Novotny, 2002). Meal feeding is ideal for any cat who requires controlled food intake, and it facilitates monitoring the cat's appetite. Meal feeding also has the benefit of enhancing caregiver–cat bonding and provides a pleasant and predictable experience for cats when provided on a regular daily schedule. Using a combination of free-choice plus once-daily meal feeding takes advantage of the positive aspects of both methods and works

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well for most cats in the shelter setting. Typically, dry food is available free choice, and a small meal of canned food is offered once daily. This combination approach accommodates the normal feeding behavior of cats by allowing them to eat several smaller meals throughout the day while allowing caregivers to monitor the cat's appetite at least for the canned food meal (Griffin, 2011a). Some individual cats may require additional meals of canned food to ensure adequate nutritional support.

How to Feed

Many cats prefer to eat from shallow dishes or plates, and care should be taken to select dishes and bowls that are large enough to easily accommodate the cat's entire face and whiskers. Paper plates are ideal for canned foods as they are biosecure, inexpensive, easy to use and disposable. In addition to offering food in the usual way, novel presentation to stimulate "pseudopredatory activity" can be used as a source of enrichment for some cats. Dry cat food or treats can be hidden in commercially available food puzzle toys, or in cardboard boxes, tubes, or rolling toys with holes such that the cat has to work to extract pieces of food (Griffin and Hume, 2006). This method of feeding may be a very useful adjunct, especially in those cats housed for more than a couple of weeks.

Finally, proper food storage is essential to prevent contamination or spoilage. Foods should be used before their recommended expiration date. Containers for food and water should be kept clean and sanitary and must be completely disinfected or discarded between individual cats or group enclosures.

How Much to Feed

Formulas have been published for calculating the daily energy requirements of cats based on their body weight, age or life stage, and activity level (Box 10.4). These formulas are meant to serve as guidelines and not absolutes; they are starting points or estimates that must be adjusted to suit the unique metabolic requirements of each individual as necessary to maintain a healthy body condition.

Daily energy requirement calculations are used to estimate the amount of kilocalories required for the animal. The specific calorie content of various cat foods can usually be found via simple Internet searches. In general, the calorie content ranges from 350 to 500 kcal per cup for dry food and 120 to 190 kcal per 5.5 oz can of wet food. Here the terms kilocalorie and calorie are used interchangeably: If a cat's daily energy requirement is calculated to be 240 kcal, then the cat needs 240 calories worth of food per day (Hand and Novotny, 2002). In most instances, it will not be necessary to calculate precise requirements because following the feeding instructions provided by the manufacturer will provide a guide for the quantity of food necessary for most cats. In some instances, however, calculating daily energy requirements will be necessary to ensure proper nutritional support, especially when cats are ill or underweight.

As a general rule of thumb, treats should comprise no more than 10% of the animal's total daily intake. Supplements should not be routinely provided to cats, and if administered, should be given only for a specific medical indication.

What to Feed

A common question that is posed is whether to feed a regular commercial brand of cat food or a premium brand diet. Whatever brand is selected for feeding, the most important consideration is that it should be one that has been through feeding trials to validate its nutritional adequacy (Hand and Novotny, 2002). The food label should clearly state that the diet is adequate for the life stages indicated on the basis of the Association of American Feed Control Officials (AAFCO) feeding trials and not merely on their procedures (meaning it was fed to cats before being marketed).

Although some cats tolerate changes in food without apparent problems, it is important to recognize that for others, changing from one diet to another can cause loss of appetite and/or gastrointestinal upset. For this reason, it is generally best to provide the most consistent diet possible in the shelter. Some pet food companies offer feeding programs, providing a consistent food for purchase at a special rate for shelters. However, some shelters rely heavily on donations of food. In this case, by requesting donation of certain brands of food, shelters may be able to provide a consistent diet. It is also feasible to mix donated foods with the shelter's usual diet to

Box 10.4 Formulas for Calculating Daily Energy Requirements

Formula A[a]

First, the cat's resting energy requirement (RER) is calculated:

$$30 \times \text{ideal weight in kg} + 70 = \text{RER}$$

$$30 \times \frac{\qquad}{\text{(Ideal weight kg)}} + 70 = \frac{\qquad}{\text{(RER)}} \text{ kcal/day}$$

Then, the cat's daily energy requirement (DER) is calculated on the basis of the RER and an "activity factor" as defined in the chart below.

$$\text{RER} \times \text{activity factor} = \text{DER}$$

$$\frac{\qquad}{\text{(RER)}} \text{ kcal/day} \times \frac{\qquad}{\text{(Activity factor)}} = \frac{\qquad}{\text{(DER)}} \text{ kcal/day}$$

(Note: To convert body weight in lb to kg, divide by 2.2)
(e.g., 1 kg = 2.2 lb)

Life stage	Activity factor
Neutered adult	1.2–1.4
Intact adult	1.4–1.6
Obese-prone adult	1.0
Senior adult (7–11 years old)	1.1–1.4
Geriatric (12+ years old)	1.1–1.6
Gestation	1.6–2.0
Lactation	2.0–6.0
Kittens (up to 6 months old)	2.5–3.0
Juveniles (5–12 months old)	2.0

Formula B[b]

As an alternative to the above calculation, daily energy requirements can be estimated using the following formulas by life stage and activity level for cats

Life stage and activity level	Kilocalories required per day
Very active adult	80 kcal × body weight in kg
Moderately active adult	70 kcal × body weight in kg
Inactive adult	60 kcal × body weight in kg
Kitten 2–5 months of age	250 kcal × body weight in kg
Kitten 5–7 months of age	130 kcal × body weight in kg
Kitten 7–12 months of age	100 kcal × body weight in kg
Adult pregnancy	1.25–1.5 × adult maintenance last trimester
Adult lactation	2–3.5 × adult maintenance

[a]Hand, M.S. and Novotny, B.J. (2002) *Small Animal Clinical Nutrition*, 4th edn, Mark Morris Institute, Topeka, Kansas.

[b]Case, L.P. (2003) *The Cat: Its Behavior, Nutrition and Health*, 1st edn, Blackwell, Ames, Iowa.

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minimize problems caused by abrupt diet changes while taking advantage of other donated products (Griffin, 2011b).

Monitoring

Proper nutrition is essential for good health and is especially important during times of stress or illness since malnutrition compromises immune function, making animals more prone to infectious disease. Good body weight and condition and a healthy hair coat are evidence of an adequate nutritional plane and proper nutritional management. Both appetite and stool quality should be monitored daily. Normal stools should be well formed and medium to dark brown. Adult cats typically defecate once daily, although healthy adults may defecate anywhere between twice a day and twice a week. Kittens tend to produce a larger volume of stool more frequently, which is often lighter in color and softer formed than that of adults (Griffin, 2011a). Appetite and stool quality should be monitored daily and abnormalities noted. Simple scales can be used for monitoring appetite (e.g., good, some, none), and fecal scoring charts are available. The author recommends the Purina Fecal Scoring System chart available online and from Nestlé Purina PetCare Company (St. Louis, MI).

In addition to appetite and stool quality, it is essential to monitor body weight and condition. Body condition can be subjectively assessed by a process called body condition scoring which involves assessing fat stores and to a lesser extent muscle mass. Fat cover is evaluated over the ribs, down the top line, tail base, and along the ventral abdomen and inguinal (groin) areas. Body condition score charts have been established on scales of 1–5 and 1–9. The author recommends use of the Purina body condition score chart which is based on a scale of 1–9 with 1 being emaciated and 9 being severely obese (Purina body condition score).

Cats should have their body condition scored at intake and at routine intervals throughout their shelter stays. Body weight should also be recorded at intake, and ideally once a week during the initial month of shelter care, after which it could be recorded once a month or more often as indicated based on the animal's condition. This is especially important for cats since significant or even dramatic weight loss may be associated with stress or upper respiratory infection during the first few weeks of confinement.

Anorexia (Cats Who Will Not Eat)

Cats may lose their appetite or refuse to eat due to illness or stress. As a result, they risk the development of severe complications. For example, young kittens under the age of 4 months who do not eat for longer than 24 hours should be examined as soon as possible by a veterinarian, as their health can deteriorate rapidly, leading to hypoglycemia, weakness, and even death. Hand-feeding young kittens can, in some cases, help to stimulate their appetite and may be lifesaving provided they swallow the food, but veterinary advice should still be sought.

When adult cats refuse to eat for more than 3–5 days, they should be examined by a veterinarian. Adult cats who do not eat at least half of their daily energy requirements for several days or more risk developing hepatic lipidosis, a life-threatening condition that causes liver failure and other metabolic derangements that lead to death without aggressive veterinary care (Griffin, 2000a;b).

Cats who suffer from upper respiratory infections or other conditions that may affect their appetite should be examined by a veterinarian and a specific course of treatment prescribed. In addition to appropriate medical treatment and supportive care, cats with upper respiratory infections should be fed canned food with a strong odor because a cat's appetite is tied to their sense of smell, which can be compromised by the infection. Canned food is also easier to swallow if the cat has a sore throat, and because its water content is approximately 80%, it can also help promote hydration.

Stress can also induce anorexia and result in the development of hepatic lipidosis and liver failure. In the author's experience, this is not uncommon especially when timid housecats are housed in the shelter. This underscores the critical importance of both stress management and weight monitoring for ensuring proper husbandry in the shelter.

Food Aversion

To complicate matters, some cats (particularly adults) develop food aversion when they are ill (Hand and Novotny, 2002). This occurs when they are continually offered foods and learn to associate the sight and smell of the food with feeling sick or nauseous.

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Consequently, they may refuse to eat even after they are feeling better. For this reason, when cats refuse to eat on their own, it may be best to offer them food periodically but not to leave it in their cage all of the time. That being recognized, it is important to allow shy cats who may not eat in front of caregivers an opportunity to eat in privacy, but leaving food next to them all of the time when they are sick may lead to food aversion in some cases.

Obese Cats

The nutritional management of cats who are severely obese poses unique challenges for shelters. Deciding whether to institute a weight reduction plan for such cats during their shelter stay requires careful consideration. Controlled meal feeding to prevent overeating is required for weight reduction. Individual cat housing may be very confining, and obese cats may benefit more if they are housed in a colony-style enclosure where they will likely get more exercise, but this is confounded by the fact that free-choice feeding is generally preferred for colonies.

Reduced-calorie cat foods and formulas for calculating calorie requirements for weight loss are available, but it is important to recognize that some obese cats will refuse novel low-calorie food, and it often takes several months for cats to achieve meaningful weight loss. Furthermore, rapid weight loss is dangerous, especially for obese cats, who are at higher risk for developing hepatic lipidosis (Hand and Novotny, 2002). In the author's experience, obesity does not necessarily hinder a cat's chances for adoption. Curiously, the "fat cat" image may even draw attention to overweight cats in the shelter. Weight reduction may best be left for the new owner who should be educated on the risks associated with obesity for cats (e.g., diabetes mellitus) and instructed to consult their veterinarian for a safe weight-reduction plan once the cat has acclimated to her new home (Griffin, 2011a).

Starved Cats

Cats who are victims of starvation may enter the shelter in a malnourished, underweight, or emaciated body condition. Examination by a veterinarian as soon as possible is always recommended, and careful consideration should be given to other medical causes of weight loss and poor body condition. If the cat is bright, alert, and readily eats when offered food, an in-shelter feeding program designed for weight gain can be implemented (Box 10.5). Vaccination and parasite control should be performed as usual on entry. In addition, other appropriate documentation (e.g., laboratory work, photographs) should be obtained if the cat is part of a legal case. If weekly weight gain does not occur, or other signs arise,

Box 10.5 Calculation of Energy Requirements for Weight Gain[a]

Record baseline body weight and body condition score

1. Resting energy requirement at present weight (RER) = 30 × body weight in kg + 70

$$30 \times \frac{\text{(Present weight kg)}}{} + 70 = \frac{}{\text{(RER)}}\ \text{kcal/day}$$

2. Daily energy requirements for weight gain (DER) = RER (desired weight) × 1.3 (weight gain factor)

$$30 \times \frac{\text{(desired weight kg)}}{} + 70 = \text{——}\ \text{kcal/day} \times 1.3 = \text{DER for weight gain}$$

- Start feeding at 50–100% RER at present weight divided into 4 meals over the day
- Increase amount fed by ~25% each day to reach DER for weight gain
- If animal is doing well clinically after the initial 48 hours, feedings may be increased a little more rapidly
- Record body weight daily for the first week, then biweekly or weekly as indicated based on patient's progress

[a]Hand, M.S. and Novotny, B.J. (2002) *Small Animal Clinical Nutrition*, 4th edn, Mark Morris Institute, Topeka, Kansas.

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the cat should be further evaluated by a veterinarian (Griffin, 2011a).

REPRODUCTION

Some basic knowledge of feline reproduction is necessary in order to provide proper care of cats and kittens in the shelter. In particular, caregivers should be able to recognize those cats exhibiting signs of estrus (heat) or pregnancy, or those who are lactating (nursing). Cats are among the most prolific of the domestic species: female cats (called queens) can easily bear 50 to 150 kittens over their lifetime if allowed to breed naturally. For this reason, ensuring that cats adopted from animal shelters are spayed and neutered must always be a high priority.

Cats are seasonal breeders and become sexually active when day length increases (Griffin, 2001a). In the northern hemisphere, breeding season begins a few weeks after the winter solstice (December 21), as the days get longer in late January or February. On average, queens "come into heat" or display estrus behavior every 2 weeks during the season until they become pregnant, are spayed, or the season ends in the fall. Heat or estrus is the period of sexual receptivity and lasts from 4 to 7 days on average, with interestrus periods of sexual inactivity of 1–3 weeks occurring between the fertile periods.

In contrast to dogs, where physical changes such as vulvar swelling and the presence of bloody discharge often make heat detection easy, the queen's vulva undergoes only subtle physical changes, remaining very small and well covered by hair. In addition, vulvar discharge is scant, and because of the fastidious grooming habits of queens, rarely observed. During estrus, queens crouch and posture with their back swayed, treading in place with their hind limbs. In this position, the queen's ventral thorax and abdomen touch the floor, her perineum is elevated, and her tail is deflected so she can present herself to a mate. When in heat, many queens will vocalize or cry excessively, causing inexperienced caregivers to believe the cat is in pain.

The gestation period (length of pregnancy) averages 65 days or approximately 9 weeks with three to five kittens being the typical litter size (Root, Johnston and Olson, 1995; Griffin, 2001a). There is a bimodal incidence of pregnancy: the majority of kittens are born in mid-spring and late summer, corresponding to the peaks in kitten intake typically seen in shelters between May and October. If allowed, a female may accept a number of males during her estrus period, and therefore litters may have multiple fathers.

Female cats usually reach puberty or experience their first estrous cycle between 5 and 9 months of age, although the onset may range from 3.5 to 18 months of age (Griffin, 2001a). Because of the profound effect of day length, kittens born during the previous spring and summer months frequently reach puberty at similar times (e.g., late January or February) despite age differences. For cats allowed outdoor access, pregnancy is almost certainly unavoidable, and many young queens become pregnant by 6 months of age.

Although not as precocious as females, tomcats typically reach puberty or attain sexual maturity between 8 and 13 months of age (Griffin, 2001a). Puberty is associated with the development of secondary sex characteristics in tomcats including well-developed jowls (big cheeks), a thick neck, and tough skin. In addition, males also typically begin urine spraying at puberty, and their urine takes on a characteristically strong odor.

Pregnancy Diagnosis

The 9-week pregnancy of the queen may be divided into three trimesters, each of approximately 3 weeks duration. Many queens become increasingly docile during the initial 6 weeks of pregnancy, and their nipples become pinker and more erect (commonly referred to as "pinking" of the nipples). By the third trimester or last 3 weeks of pregnancy, behavioral and physical changes are obvious and include abdominal distension, enlargement of the mammary glands, excessive grooming of the mammary and perineal areas, and nesting behavior. It is important to recognize that when a cat begins to appear obviously pregnant (e.g., distended abdomen with pink, erect nipples), she is usually less than 2 weeks away from giving birth. Caution should be taken not to mistake overweight spayed cats for pregnant cats: the former usually can be distinguished by their overall distribution of fat stores and lack of mammary development, as well as the presence of a "spay" scar on the abdomen.

Definitive diagnosis of pregnancy can be made by veterinarians who are skilled at abdominal palpation. Palpation of the pregnant uterus is possible as early as days 14–17 of gestation, at which time small spherical dilations of the uterus (approximately 1 cm

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in diameter) may be evident (Johnston, Root Kustritz and Olson, 2001). By days 21–25, the vesicles are prominent, usually measuring ≥2 cm in diameter, and are easiest to palpate at this time. After days 30–35, the segmental fetal dilations (≥3 cm) become more oblong in shape and tend to become confluent, making palpation more difficult since the enlarged, fluid-filled uterus may be difficult to distinguish from bowel loops. However, by late gestation (e.g., after day 45), fetal heads and bodies can usually be distinguished, and fetal movement is frequently evident. Although generally not required, (and often unavailable) in most cases in the shelter, imaging methods such as ultrasound (ultrasonography) and radiography may be used to confirm pregnancy if necessary. Because fetal skulls may not be calcified until day 43 of gestation, radiography cannot differentiate other causes of uterine enlargement until after this time (Boyd, 1971). Abdominal ultrasonography, however, can detect pregnancy much earlier, with the first indications becoming evident as early as day 10 of gestation (Zambelli and Prati, 2006). Finally, a blood test for relaxin, the only pregnancy-specific hormone presently recognized in cats, may also be used to confirm pregnancy. After day 25 of gestation when serum relaxin concentrations are typically elevated, a positive result can be expected on a commercially available point-of-care relaxin assay (Griffin, 2006; DiGangi *et al*., 2010).

Birth of Kittens (Parturition or "Queening")

Delivering and raising kittens in the shelter setting is stressful for the new family, and the risk of infectious disease exposure and serious illness is high. For these reasons, the author recommends that pregnant queens be spayed whenever possible. Even for those queens near term, spaying can be safely and humanely performed (see the chapter on surgical techniques for spay/neuter). Fortunately, queens do not commonly experience signs of maternal loss following late-term spaying. If spaying is not possible, those queens in an advanced state of pregnancy should be placed in qualified foster homes.

Spay/Neuter

Shelters should ensure that cats who are adopted are spayed or neutered. In some instances, spay/neuter can also be important for cat husbandry in the shelter. In shelters where cats awaiting adoption may be held for long periods, reproductive stress from estrous cycling in queens and sex drive in tomcats can decrease appetite, increase odor from urine spraying, and increase social and emotional stress (Griffin and Hume, 2006). For these reasons, when shelters house cats for longer than a few weeks, for example, spaying and neutering sexually mature animals is recommended since these procedures can be expected to rapidly decrease urine spraying and eliminate heat behavior. In addition to reducing stress and odor, this will facilitate group housing, which may be especially beneficial for cats being housed longer term (see housing section later in this chapter).

ORPHAN KITTENS

Orphan kittens commonly are brought to most shelters, and when they are too young to eat solid food or gruel on their own, managing their care can be very time-consuming. Raising orphan kittens is best accomplished by a willing feline foster mother who can meet many of the kitten's needs including the provision of proper nutrition, warmth, regular elimination, hygiene, security, and socialization. Fortunately, lactating queens commonly are found in shelters and can be distinguished by their engorged mammary glands and prominent nipples, without the usual surrounding hair, from which milk may be expressed. Most mother cats will readily foster orphan kittens. Selecting a queen whose own kittens are of similar size or are recently weaned prevents competition between smaller, younger and larger, older kittens. The introduction should take place in a non-stressful setting: a quiet, warm nest away from humans and other animals (Griffin, 2001b). Some queens thrive as foster mothers and can safely raise multiple consecutive litters in a single season provided they maintain good body condition and attitude. The best measure of a queen's lactation is the body weight and daily growth of her kittens (Hand and Novotny, 2002). The normal birth weight of kittens is approximately 100 grams (g), and they should gain 10–15 g per day as neonates. A daily gain of less than 7 g is inadequate and should alert caregivers that supplemental feeding is necessary and/or health problems may be present. Lactating queens should be fed a high-quality kitten food free choice and provided with ample water, as their fluid requirements will be increased.

Whenever possible, both foster mothers and orphan kittens should be screened for FeLV and FIV prior to their introduction. Newborn kittens rely on

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passive transfer of maternal antibodies for protection against infectious disease during the first several weeks of life. In kittens, passive immunity results primarily from ingesting colostrum (the new mother's first milk), which is rich in immunoglobulins. Newborn kittens need to begin nursing right away in order to ingest a sufficient amount of colostrum within the first 12 hours following birth, after which time immunoglobulins can no longer be absorbed. Kittens who fail to nurse within 12 hours of birth should be isolated and can be vaccinated (using a killed product) at 2–4 weeks of age. Alternatively, SQ (subcutaneous) or IP (intraperitoneal) injection of kittens with a total of 15 mL of serum over 24 hours from a FeLV/FIV-negative, well-immunized adult cat will provide adequate passive immunity (Claus, Levy and MacDonald, 2006). After 4 weeks of age, MLV are recommended (See Table 10.2).

The author recommends that kittens younger than 6–8 weeks of age not be housed in the shelter as they invariably become seriously ill from infectious disease despite aggressive vaccination procedures and environmental management. Underage kittens should be removed from the shelter and placed in foster care as soon as possible—within 48 hours of arrival. In addition, when recently weaned litters enter the shelter, every effort should be made to triage them immediately through intake into biosecure adoption areas. This is because holding time dramatically increases the risk of disease, especially respiratory infection (Dinnage, Scarlett and Richards, 2009), which could compromise the kittens' health and chances for adoption. In most states, legal holding periods can be bypassed for litters younger than 4–6 months of age when brought in by members of the public. This is because the intent of legal holding requirements is to allow owners an opportunity to claim their pets, which is not generally applicable to a litter of small kittens. In order to maximize the odds of maintaining good health, the author strongly recommends that whenever possible shelters avoid holding litters of kittens prior to adoption. Instead, healthy weaned kittens should be made available for adoption immediately following intake examination (Griffin, 2010).

If a foster mother is unavailable, kittens may be hand raised. Hand raising kittens is time-consuming and sometimes difficult and is usually best accomplished outside the shelter with a trained caregiver. Information about hand rearing and weaning kittens is available from many other sources and will not be covered here.

WEANING

It is inevitable that queens and their litters will end up in shelters, and that the kittens must be weaned prior to placement for adoption. The process of weaning requires that kittens be offered semisolid food beginning at 3–4 weeks of age in a shallow pan or dish. Gruel can be made from a quality kitten food; it can be made more enticing by the addition of a small amount of kitten formula. Kittens typically walk in the gruel more than actually eat it during the first few feedings. But within a few days their appetites will usually improve, and the frequency of nursing or the amount of formula they are receiving can be reduced accordingly. For kittens without access to nursing mother cats, weaning from bottle-feeding should be complete by 5–6 weeks of age because long-term feeding of formula is not recommended. For litters with a nursing mother, it can be behaviorally beneficial for kittens to remain with her for a longer period of time when feasible (Beaver, 1992; Griffin and Baker, 2002; Case, 2003). Left to their own devices, queens frequently will not fully wean their kittens until 12–14 weeks of age. If older kittens are housed with their mother, it is important to provide the queen with a perch or other retreat where she can periodically rest away from her young if she desires.

The mother–kitten relationship is crucial for normal social and emotional development, and orphans may fail to develop normal social skills and/or may have maladaptive responses to stress when hand reared (Griffin, 2001b). Suckling may occur among orphan littermates, and they may try to nurse the tails, ears, or genitalia of their littermates, occasionally causing significant trauma. Non-lactating queens or even a neutered tomcat may sometimes accept a litter of kittens, and although hand feeding is still necessary, the kittens will benefit from the standpoint of behavioral and social development. This is especially important for singleton orphans who would otherwise be deprived of both maternal and sibling relationships.

Fading Kittens

Fading kitten syndrome is a common term used to describe the acute, rapid decline and death of young kittens during the first few weeks of life.

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Although necropsy of kittens who have died is often the best tool for making a definitive diagnosis, in many cases it is not rewarding, and a cause of death may remain undetermined. Many causes are possible including genetic and environmental processes as well as infection with viral and/or bacterial agents (Freshmen, 2005; Lawler, 2008). When kittens fade or die abruptly, consideration should be given to testing for panleukopenia. (See the chapters on practical overview of common infectious disease agents and recognition of disease and diagnostic testing for more information.) Bacterial septicemia is also one of the most common causes of fading kitten syndrome in pre-weaned kittens.

Regardless of the cause, prompt intervention will be necessary to prevent death. Tube feeding to ensure adequate hydration and nutrition and administering warm SQ fluids to provide immediate warmth are crucial priorities in treating fading kittens. It is common for one or two kittens in a litter to fade, followed by others over the course of a few days. When one member of the litter is affected, it is generally prudent to aggressively treat the remaining littermates. If examination does not reveal an apparent cause and parvoviral testing is negative, a presumptive diagnosis of septicemia can be made. In this case, if treatment is elected, the author recommends providing aggressive supportive treatment to all remaining littermates including the administration of broad-spectrum antibiotics (such as enrofloxacin) by SQ injection. Administration via injection is preferred to oral administration to ensure absorption. Treating fading kittens in the shelter is problematic, however, because of the high likelihood of exposure of the kittens to other infectious agents that could further compromise their health as well as the risk that could be posed to the general population. If orphan kittens are being treated, success is most likely when treatment is reserved for those in skilled foster care under veterinary guidance. In addition, this will pose the least risk to the general population should a contagious agent be the underlying cause.

HOUSING

The way cats are housed in the shelter is crucial for proper husbandry. Appropriate housing should meet their behavioral as well as physical needs (shelter, warmth, good ventilation); it should always include a comfortable resting area and allow animals to engage in species-typical behaviors while ensuring freedom from fear and distress, regardless of the species in question (ILAR, 1996). A sense of control over conditions is one of the most critical needs for behavioral or mental health and well-being in animals (McMillan, 2002). Specifically for cats, their living environment must take into account the following behavioral needs (Griffin and Hume, 2006):

- Opportunities for social interactions with humans and/or compatible cats
- The ability to create different functional areas in their living environments for elimination, resting, and eating
- The ability to hide in a secure place
- The ability to rest/sleep without being disturbed
- The ability to change locations within their environment, including utilizing vertical space for perching
- The ability to regulate their temperature by moving to warmer or cooler surfaces in their environment
- The ability to scratch (necessary for claw health and stretching, as well as for visual and scent marking)
- The ability to play and exercise at will
- The opportunity for mental stimulation (see the chapter on behavioral enrichment)

Because these needs will vary depending upon such factors as life stage, personality, prior socialization, and experience, shelters should maintain a variety of housing styles in order to meet the individual needs of different cats.

Housing Considerations

The design of housing for short-term stays should include provision for individual animals, litters, families, or bonded housemates for intake evaluation and triage. Housing must be easy to clean and sanitize, well ventilated, and safe for animals and caregivers. Short-term housing should provide sufficient space to cats to stand comfortably, stretch, walk several steps, sit or lay at full body length, and separate areas for elimination, feeding, and resting. Resting areas should include comfortable surfaces, soft bedding, and a secure hiding place to provide a refuge. In addition, cages should be elevated off the floor by at least 18 inches because this serves to reduce stress as well.

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For longer-term housing (e.g., longer than 2 weeks), consideration also should be given to providing space that is both mentally and physically stimulating for cats and esthetically pleasing to humans—an important consideration in facilitating adoptions. Alternatives to traditional cage housing should be available (Griffin and Hume, 2006; Newbury *et al*., 2010). Most cats will benefit from colony-style housing provided there is sufficient space, easy access to feeding and elimination areas, an adequate number of comfortable hiding and resting places, and careful grouping and monitoring to ensure social compatibility. Not every cat, however, will thrive in a group setting, and certain individuals will require enriched single housing depending on their unique physical or behavioral needs. These may include cats who bully other cats or are otherwise incompatible, and those with special medical needs. It is important to recognize that such singly housed cats will require more regular contact with their human caregivers.



Figure 10.6. Intake housing for a single cat. Note the large 4-foot-long cage, provision of a secure hiding place and perch with bed, separation of litter from resting and feeding areas and appropriately sized litter box for this large cat.

Size of Enclosures

Enclosures for cats should be large enough to meet the objectives mentioned above while maintaining separate areas, at least 2 feet apart, for sleeping, eating, and elimination. When food and litter are too close together, some cats may refuse to eat (Bourgeois *et al*., 2004). Unfortunately, many animal shelter facilities in the United States are equipped with small cages (e.g., 1.5–2.5 feet long) that are inadequate for proper housing of cats. The ASV recommends a minimum enclosure size of 11 square feet for adult cats (ASV, 2010). Commercially available cages typically are approximately 29″–30″ deep (e.g., an arm length deep for ready access); therefore, a cage with a length of 4 feet would be required in order to provide this approximate square footage and also allow for adequate separation of food, water, and litter (Figure 10.6). Similarly, the Cat Fanciers' Association (CFA) recommends a minimum of 30 cubic feet of space per cat for those weighing 4 lb or more (CFA, 2010). Cubic measurements take into account the use of vertical space in addition to floor space, which is crucial for improving the quality of the environment. For example, a 30-cubic-foot enclosure would measure approximately 30″ deep × 48″ wide × 36″ high. Larger enclosures also allow for better air circulation, which is an important consideration for control of feline upper respiratory infections. Double-sided enclosures with living spaces on two sides of a dividing wall (e.g., cat condos) are ideal for meeting these specifications and have the benefit of preserving staff safety and easily allowing cats to remain securely in one side of the enclosure while the opposite side is cleaned (Figure 10.7). This also helps to minimize stress and exposure to infectious disease, which is especially crucial for newly arrived cats. Traditional cages can be modified into condo-style enclosures by creating portals to adjoin two or three smaller cages (Figure 10.8).

Regardless of the precise specifications of the enclosures, the importance of the overall quality of the living environment cannot be overemphasized. This includes a holistic approach to husbandry with careful attention to the way in which cats are handled, noise levels, the provision of creature comforts, positive contact with caregivers and strict avoidance of overcrowding, as well as good sanitation, medical protocols and careful monitoring to ensure health and welfare (Griffin, 2011a).

Group (Colony Style) Housing

Group housing affords cats with opportunities for healthy social contact with other cats. When

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Figure 10.7. Condo-style housing for cats. This unit (Tristar Metals, Boyd, TX) is constructed of powder-coated steel, offering durability and ease of cleaning and disinfection while being more comfortable and less noisy than uncoated stainless steel. Note the elevation from the floor and the grills on both the front and back that allow flow-through ventilation.

properly managed, this housing arrangement can successfully meet many of the cats' social needs, enhancing welfare (Kessler and Turner, 1997; Griffin, 2001c; Griffin and Baker, 2002; Doweling, 2003; Griffin and Hume, 2006; Griffin, 2009b). Insufficient space and crowding serve to increase stress and negate the benefits of the colony environment. Group housing should never be used as a means of simply increasing the number of cats that a facility can hold. The high turnover rate of cats in shelter settings contributes substantially to feline stress levels, especially when placing unfamiliar animals together in groups. Because it may take days to weeks to acclimate to a group environment, enriched individual housing is often preferable when a brief stay is anticipated. However, the benefits of enriched social group housing become evident when shelter stays extend beyond a couple of weeks.

Selection Criteria

Careful attention to preventive healthcare and grouping of cats is essential for group housing to be successful. Family groups and previously bonded housemates are natural choices for co-housing (Bradshaw and Hal, 1999; Griffin and Hume, 2006), but unfamiliar cats may also be grouped using careful selection criteria. Many cats have preferences for housemates, but with a high-quality environment and the right pairings, most cats will benefit from social group housing. Groupings of unfamiliar cats should

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Figure 10.8. Conversion of existing cage units into condo units. A hole is cut through the walls of adjacent cages.

be prioritized for the largest available enclosures, and selection criteria should include the following (Griffin and Hume, 2006; Griffin, 2011a):

1. *Health Status*. All cats should be free from signs of contagious disease, tested for FeLV and FIV, vaccinated and treated for parasites.
2. *Age*. Healthy young kittens (6–20 weeks of age) will benefit behaviorally from being co-housed with their littermates, or before weaning, with their littermates and mother. They should be segregated by litter and housed in large cages or condos to enhance biosecurity and optimize infectious disease control. Juveniles and adults can be housed in colony rooms or runs, but should be segregated by age (e.g., juveniles between 5 and 12 months, young adults, mature adults, geriatrics). Well-socialized juveniles tend to adapt quickly in a group setting with other cats of similar ages. In contrast, mature adults and geriatric cats often have little tolerance for the high energy and playful antics of many younger cats, which can cause them substantial stress. Thus, in most cases, cats of various ages should be housed in separate quarters with the notable exception of previously bonded cats or family groupings that enter the shelter together.
3. *Personality Type*. Cats are divided into two basic personality types: those who are outgoing, confident, and sociable, and those who are relatively timid and shy. Cats with bold, friendly temperaments tend to cope and adapt more readily than shy, timid cats. A subset of the bold, friendly personality type is the assertive or "bully" cat. Bully cats constantly threaten other cats in a group setting in order to control access to food, litter, perches, or the attention of human caregivers. To maintain harmony, removing cats of this personality type from a colony is usually necessary. Reassignment is possible, but may prove difficult, necessitating placement in enriched single housing. Shy, timid cats sometimes have difficulty interacting successfully with more dominant members of a group, resulting in chronic stress and increased hiding. Placement of shy cats in smaller groups or with calm juvenile cats where they will not be intimidated or harassed is generally rewarding. Similarly, dominant cats will often accept calm, younger cats as opposed to other adults by whom they may feel threatened. And finally, in the case of some dominant males, the introduction of a female cat will be more likely to be successful (Lindell, Erb and Houpt, 1997; Overall, 1997; Griffin and Hume, 2006).
4. *Spay/Neuter Status*. Group housing of sexually intact cats of breeding age should be avoided. At a minimum, mature tomcats should be neutered to prevent inter-male aggression, urine spraying, and breeding. Reproductively intact females may be co-housed with other intact females or with neutered males.

Group Size and Space

The precise space requirements for group housing of cats will vary because it is dependent on many factors (Box 10.6) (Kessler and Turner, 1999b; Griffin and Hume, 2006). Of paramount importance is that group size must be small enough to prevent negative interactions among cats and to permit daily monitoring of individuals. Cats typically prevent social conflict through avoidance, and adequate space must be available so that cats can maintain social distance as needed. Both crowding and constant introduction of new cats induce stress and must be avoided to ensure proper welfare. In

Box 10.6 Factors Influencing Spatial Needs of Housed Cats[a,b]

Length of stay
Overall quality of the environment including use of vertical space
Overall quality of behavioral care
Physical and behavioral characteristics of the cat (e.g., age, personality type, prior experience and socialization)
Individual relationships between cats (e.g., family groupings, previously bonded housemates, versus unfamiliar groupings and degree of social compatibility among cats)
Turnover of cats (e.g., frequency of introduction of new members)
Total room size
Absolute number of cats
Individual needs and levels of enrichment being used to meet these needs

[a]Griffin, B. and Hume, K.R. (2006) Recognition and management of stress in housed cats, in *Consultations in Feline Internal Medicine*, 5th edn (ed J.R. August), Elsevier Saunders, St. Louis, Missouri, pp. 717–734.

[b]Kessler, M.R. and Turner, D.C. (1999) Socialization and stress in cats (*Felis silvestris catus*) housed singly and in groups in animal shelters. *Animal Welfare*, **8**, 15.

particular, the addition of new cats always results in a period of stress for the group, and if there is constant turnover within the group, cats may remain stressed indefinitely. High turnover also increases the risk of infectious disease. Crowding can make it impossible for animals to maintain healthy behavioral distance, creating situations where individuals may not be able to freely access feeding, resting, or elimination space due to social conflicts over colony resources. For these reasons, housing cats in small groups is preferred.

In most instances, the author recommends housing cats in compatible pairs or small groups of not more than three or four individuals. Housing cats in runs is ideal for this purpose (Figure 10.9). A well-equipped, $4' \times 6'$ run can comfortably house two to three adult cats depending on their familiarity and compatibility, or up to four juveniles. Juveniles tend to accept a slightly higher housing density than adults. Likewise, previously bonded housemates and families will generally peacefully co-exist at a higher density than will unfamiliar cats. When runs are used, they must have a top panel and should be at least 6 feet high to allow caregivers easy access for cleaning and care. If chain link is used, 1-inch mesh is ideal, but larger mesh can be used. For colony rooms, the author recommends a minimum enclosure size of approximately $10–12' \times 16–18'$ for colonies of up to a maximum of eight adult cats, or in the case of juveniles, a few more. Doubling the size of an enclosure does not necessarily allow a twofold increase in the number of cats who can be properly housed. Another author recommends 18 square feet per cat as a general guideline for group housing, acknowledging that many factors influence the spatial needs of cats, including the overall quality of the environment as well as the relationships of the individual animals (Kessler and Turner, 1999a).

In sanctuary situations where cats are housed for months to years in stable colonies, larger groupings of cats may be feasible provided ample space is available. Housing arrangements can also be created where individual enclosures are maintained within a colony room. In this case, cats could be allowed to wander and interact freely in the colony room by day, but be confined to their respective enclosures at night, enabling caregivers to better monitor individual appetites and litter box usage while allowing cats a period of rest away from one another. Alternatively, individual enclosures may be used for brief periods for feeding of canned food, with dry food available free choice in the colony. This sort of arrangement can also be used to facilitate introduction of new cats to the group and represents a desirable option. If the facility layout allows, portable intake enclosures could even be transferred to group adoption rooms

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Figure 10.9. This 4′ × 6′ run has been appropriately outfitted for pair housing two adult cats. Note the multiple separate areas for resting, perching, hiding, feeding, eliminating, scratching, and playing. Cats enjoy the increased behavioral options provided by run-style housing.

to smooth the transition of new cats from intake to adoption areas.

Introduction of New Cats

Tremendous individual variation exists among cats in the context of social relations with other cats. While introduction of some previously unfamiliar cats will seem effortless and uneventful, introduction of others will result in considerable stress not only for the new cat but also for the entire group (Griffin and Hume, 2006). For this reason, introductions should always be done under supervision and whenever possible, they should be gradual. To accomplish this, a new cat can be kept in a separate cage within or adjacent to the group enclosure equipped with food, water, litter, and a hiding box. Usually within a few days, it will be evident from the behaviors of the cats whether the new cat can be transferred into the group enclosure without risk of fighting. Well-socialized kittens and juvenile cats frequently adapt readily to group accommodations, and prolonged introductions may not be necessary.

If only one or two cats are responsible for social destabilization of a group, they can usually be reassigned to another colony, because it often is the social grouping, not the individual, who is the problem. If a cat shows persistent incompatibility with other cats, he or she should be housed singly. Studies indicate that cats who fight at the time of initial introduction are nearly 40 times more likely to continue fighting

in the following weeks and months (Levine *et al*., 2005). If overt fighting occurs, cats should be permanently separated. Co-housing of incompatible cats, or cats who fight, is unacceptable (Newbury *et al*., 2010). Finally, some shelters elect to utilize an "all-in-all-out" approach to avoid repeated introductions of new cats into stable groups.

Colony Living Environment

The success of group housing depends not only on selection of compatible cats and the size of the enclosure but also on the quality of the environment (Griffin, 2001c; Griffin and Baker, 2002; Doweling, 2003; Griffin and Hume, 2006; Key, 2006; Griffin, 2009a; Rochlitz, 1999; Griffin, 2011a). In addition to ample space, a variety of elevated resting perches and hiding boxes should be provided to increase the size and complexity of the living space, and to separate it into different functional areas, allowing a variety of behavioral choices. The physical environment should include opportunities for hiding, playing, scratching, climbing, resting, feeding, and eliminating. Whenever possible, the author recommends that a minimum of one litter box and one food and water bowl should be provided per two to three cats and arranged in different locations of the colony space, taking care to separate food and water from litter by at least 2 feet. In addition, placement should allow cats to access each resource from more than one side whenever possible without blocking access to doorways. Litter boxes should be uncovered to allow easy access and to prevent entrapment or ambush by other cats.

The number of resting boards and perches should exceed the number of cats and should be arranged in as many locations within the enclosure as possible. Open single perches should be separated by at least 2 feet or staggered at different heights to ensure adequate separation, while one or more larger perches should be available for cats who choose to rest in close proximity. Many cats enjoy hammock-style perches, or semi-enclosed box-style perches where they can hide. It is important to provide enough comfortable, desirable resting and hiding places so cats will not be tempted to lie in inappropriate places, such as litter boxes.

In larger colony rooms, installation of freestanding towers provides additional living and activity space and contributes to functionally reducing overcrowding (Figure 10.10). When designing vertical space for cats, it may not be desirable for cats to be able to access areas above the level of an arm's reach so that cleaning is easy and cats can be easily retrieved from the highest perches if needed. Colony room design should also ensure that cats cannot easily escape. Ceilings should be constructed of solid surfaces because cats can easily dislodge the panels typically used for dropped ceilings, and escape into the rafters.

Finally, comfortable bedding that is either disposable or can be easily laundered should be provided. Not only do cats demonstrate preferences for resting on soft surfaces, they experience longer periods of normal deep sleep with soft bedding (Crouse *et al*., 1995).

Monitoring

Shelter cats require regular active monitoring by staff or volunteers trained to recognize signs of stress and social conflict. Daily monitoring and recording of findings is required to identify trends. This will ensure that cats who are persistently stressed are promptly recognized so that steps can be taken to mitigate their stress and enhance the odds that they will be able to cope effectively and acclimate to the shelter environment.

Signs of stress in cats include social withdrawal, activity depression, constant hiding, poor appetite, absence of grooming, inability to rest, feigned sleep, disruptive behavior (disrupting cage contents), vocalization (growling, hissing, screaming), tense body posture, and urine spraying or other elimination outside of the litter box. These signs are often subtle, even when stress is severe. Likewise, signs of social incompatibilities may not always be obvious to the untrained observer. In a few cases, they may be overt (e.g., fighting), but more often they involve covert resource guarding or dominant posturing and staring (Bernstein and Strack, 1996; Overall, 1997; Griffin, 2001c; Crowell-Davis, 2004; Griffin and Hume, 2006). For example, subtle manipulations by dominant cats may result in subordinate cats being sequestered on perches or in other locations where they are restricted from access to food, water, or litter, while the dominant members of the colony monopolize prime resources. In such circumstances, subordinate cats sometimes only move about in the colony room when caregivers are present. Careful observers

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Figure 10.10. In larger colony rooms, freestanding towers can be used to create additional functional space in the interior of the room.

will note these behaviors and respond accordingly in order to ensure that conflicts do not persist.

When cats are well adjusted and housing and husbandry meets their behavioral needs, they display a wide variety of normal behaviors including a good appetite and activity level, stretching, rubbing, exploring, sociability, grooming, appropriate play behavior, and restful sleeping. Colonies should be monitored to ensure that all colony members are content in the social environment.

Ultimately, the successful acclimation of cats to the shelter environment will depend on both the quality of the environment and the adaptive capacity of the individual. Although most adapt to new environments over time, some never adjust and remain stressed indefinitely, which ultimately results in a decline of physical as well as emotional health. When cats fail to adjust to the shelter environment and remain markedly stressed/fearful despite appropriate behavioral care, every effort must be made to prevent long-term stays. Transfer to foster care, adoption, placement as a barn cat, or when no other options exist, euthanasia will be necessary to minimize stressful shelter stays and ensure cat welfare. For cats who adapt and remain in the shelter for a period of time, regular opportunities for mental and physical activity must be provided to prevent the development of chronic stress and depression. These

must always be viewed as essential components of daily husbandry (see enrichment chapter).

PAIN RECOGNITION

Good husbandry also requires prompt recognition and treatment of pain. Signs of pain in cats may include lethargy, decreased appetite and grooming, persistent hiding, restlessness, altered posture, elimination outside of the litter box, unusual sensitivity to touch (e.g., increased body tension or flinching in response to gentle palpation) and changes in physiologic parameters such as increased heart and respiratory rates and dilated pupils (ACVA, 2006). In general, any injuries or conditions that cause pain in humans should be assumed to cause pain in cats, including trauma, dental disease, or other physical ailments. Treatment of pain should be prompt and carried out under veterinary supervision. (For more information about pain recognition see the chapter on the medical evaluation of the abused live animal.)

TOXICOLOGY

Because of their unique metabolism, cats are especially sensitive to toxicity from exposure to many substances, some of which could easily be encountered in a shelter setting. For this reason, staff should be aware of those common substances and products that pose significant danger to cats. These include common insecticides, such as those used for the lawn and garden or for flea control in dogs, rodenticides (e.g., rat poisons), common disinfectants, nonsteroidal anti-inflammatories such as aspirin and ibuprofen, acetaminophen (e.g., the active ingredient in Tylenol®, McNeil Laboratories, Philadelphia, PA), baby foods that contain onion powder, and flowers of the lily family.

Flea and tick products labeled for dogs, such as those that contain permethrins, can cause tremors, seizures, and even death if applied to cats. Cats are also extremely sensitive to organophosphates and other compounds used to control insects in the environment. Flea control products that are not specifically labeled for use on cats must never be used on them without specific veterinary oversight and instruction. Similarly, products used to treat the environment must be selected carefully. In many instances, it will be necessary to remove cats during their application and only return them to the environment once it is thoroughly dried and ventilated. In addition to insect control, many shelters experience a need for rodent control. When rodenticide baits are used, cats (and dogs) can be exposed even if the bait is not within their reach. For example, rodents who have ingested the poison may enter a cat enclosure, and if the cat ingests the rodent, the poison will affect that cat. For this reason, the use of rodenticides is not recommended in animal shelters. Humane live traps can be used to capture rodents for removal from the facility. If animals ingest a rodent who has been exposed to rodenticide, veterinary treatment should be provided immediately, because treatment will prevent the life-threatening toxic effects that will likely develop in the following days.

Many common disinfectants may also pose a risk for toxicity to cats. These include quaternary ammonium compounds, phenols, and pine oils. Although quaternary ammonium compounds may be safely used in cat housing areas, care should be taken to follow the manufacturer's directions and dry surfaces thoroughly before returning cats to them. Cats who lick quaternary ammonium compounds may develop ulcers of the tongue that can be severe. In contrast, the use of phenol- and pine oil-containing disinfectants in cat housing should be avoided. Exposure to these compounds can cause serious neurologic effects and liver damage.

Baby food is commonly fed to cats to stimulate their appetite. Onion powder, a common ingredient in many baby foods, is toxic to cats and can cause serious anemia (Robertson, Christopher and Rogers, 1998). For this reason, care must be taken to read baby food labels carefully and to avoid the use of any that contain onion powder.

One idiosyncrasy of cats deserves special note as it is often mistaken for a toxic reaction. If a cat licks a topically applied product, such as a cat-safe flea control product, a "taste reaction" may occur in which the cat salivates profusely and may become agitated. Such signs may be quite dramatic but are simply a reaction to the unpleasant taste. Removing the product from the tongue by rinsing the cat's mouth with water will usually help to resolve the signs (Merola and Dunayer, 2006).

CONCLUSION

Proper cat husbandry in the shelter is essential, and the goal is simple: healthy and happy cats. A proactive, holistic approach coupled with compassion

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is required, with careful attention to the unique needs and stress responses of cats. Even a few small changes have the potential to profoundly impact feline welfare in the shelter environment. For this reason, it is important to always remember the utter comfort and scientifically proven benefits of things as simple as a soft bed, a quiet hiding spot, a familiar caregiver, and ample space to perch, rub and scratch.

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REFERENCES

American College of Veterinary Anesthesiologists [ACVA] (2006) Position Statement: Treatment of pain in animals. Available online at www.acva.org/docs/Pain_Treatment (accessed June 10, 2012).

American Heartworm Society (2007) Current feline guidelines for the diagnosis, treatment and prevention of heartworm (*Dirofilaria immitis*) infection in cats. Available online at http://www.heartwormsociety.org/veterinary-resources/feline-guidelines.html (accessed January 6, 2012).

American Society for the Prevention of Cruelty to Animals [ASPCA] (2010) Pet statistics. Available online at http://www.aspca.org/about-us/faq/pet-statistics.html (accessed January 6, 2012).

Association of Shelter Veterinarians [ASV] (2008) Position Statement: Cats who test positive for FeLV and FIV. Available online at http://tinyurl.com/6qxg6pv (accessed June 10, 2012).

Association of Shelter Veterinarians [ASV] (2010) ASV guidelines for standards of care in animal shelters. Available online at http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 Accessed August 30, 2012.

Beaver, B.V. (1992) Female feline sexual behavior, in *Feline Behavior: A Guide for Veterinarians* (ed B.V. Beaver), W.B. Saunders, Philadelphia, Pennsylvania, pp. 141–169.

Beaver, B.V. (2004) Fractious cats and feline aggression. *Journal of Feline Medicine and Surgery*, **6**, 13.

Bernstein, P.L. and Strack, M. (1996) A game of cat and house: Spatial patterns and behavior of 14 domestic cats (*Felis catus*) in the home. *Anthrozoos*, **9**, 25.

Bourgeois, H., Elliot, D., Marniquet, P. *et al*. (2004) *Dietary Preferences of Dogs and Cats*, Focus Special Edition Royal Canin, Aniwa Publishing, Paris.

Boyd, J.S. (1971) The radiographic identification of the various stages of pregnancy in the domestic cat. *Journal of Small Animal Practice*, **12**, 501–506.

Bradshaw, J.W.S. and Hal, S.L. (1999) Affiliative behaviours of related and unrelated pairs of cats in catteries: A preliminary report. *Applied Animal Behavior Science*, **63**, 251–255.

Brun, A., Chappuis, G., Precosta, P. *et al*. (1979) Immunisation against panleukopenia: Early development of immunity. *Comparative Immunology Microbiology and Infectious Diseases*, **1**(4), 335–339.

Carlstead, K., Brown, J.L. and Strawn, W. (1993) Behavioral and physiological correlates of stress in laboratory cats. *Applied Animal Behaviour Science*, **38**, 143.

Case, L.P. (2003) *The Cat: Its Behavior, Nutrition and Health*, 1st edn, Blackwell, Ames, Iowa.

Cat Fanciers' Association [CFA] (2010) CFA Cattery Standard Minimum Requirements. Available online at www.cfainc.org/Client/catterystandard.aspx (accessed January 9, 2011).

Claus, M.A., Levy, J.K. and MacDonald, K. (2006) Immunoglobulin concentrations in feline colostrum and milk, and the requirement of colostrum for passive transfer of immunity to neonatal kittens. *Journal of Feline Medicine and Surgery*, **8**(3), 184–189.

Cocker, F.M., Newby, T.J., Gaskell, R.M. *et al*. (1986) Responses of cats to nasal vaccination with a live, modified feline herpesvirus type 1. *Research in Veterinary Science*, **41**(3), 323–330.

Coleman, G.T. and Atwell, R.B. (1999) Use of fipronil to treat ear mites in cats. *Australian Veterinary Practitioner*, **29**(4), 166–168.

Crouse, M.S., Atwill, E.R., Laguna, M. *et al*. (1995) Soft surfaces: A factor in feline psychological well-being. *Contemporary Topics in Laboratory Animal Medicine*, **34**, 94.

Crowell-Davis, S.L. (2004) Social organization in the cat: A modern understanding. *Journal of Feline Medicine and Surgery*, **6**, 19.

DiGangi, B.A., Griffin, B., Levy, J.K. *et al*. (2010) Pregnancy detection in cats using a commercially available relaxin test. *Journal of the American Veterinary Medical Association*, **237**(11), 1267–1274.

Dinnage, J.D., Scarlett, J.M. and Richards, J.R. (2009) Descriptive epidemiology of feline upper respiratory tract disease in an animal shelter. *Journal of Feline Medicine and Surgery*, **11**(10), 816–825.

Doweling, J.M. (2003) All together now: Group housing cats. *Animal Sheltering*, **Mar–Apr**, 13.

Dybdall, K., Strasser, R. and Katz, T. (2007) Behavioral differences between owner surrender and stray domestic cats after entering an animal shelter. *Applied Animal Behaviour Science*, **104**, 85–94.

Edinboro, C.H., Janowitz, L.K., Guptill-Yoran, L. *et al*. (1999) A clinical trial of intranasal and subcutaneous vaccines to prevent upper respiratory infection in cats at an animal shelter. *Feline Practice*, **27**, 7–13.

Fogle, B. (1997) *The Encyclopedia of the Cat*, 1st edn, Dorling Kindersley, New York.

Freshmen, J. (2005) Causes of fading puppy and kitten syndrome. *Veterinary Medicine*, **100**, 781–788. Available online at http://veterinarymedicine.dvm360.com/vetmed/Medicine/ArticleStandard/Article/detail/197161 (accessed January 6, 2012).

Gaskell, R.M. and Povey, R.C. (1977) Experimental induction of feline viral rhinotracheitis virus reexcretion in FVR-recovered cats. *Veterinary Record*, **100**, 128–133.

Genchi, C. (2008) Feline heartworm (*Dirofilaria immitis*) infection: A statistical elaboration of the duration of the infection and life expectancy in asymptomatic cats. *Veterinary Parasitology*, **158**(3), 177–182.

Gore, T.M., Headley, M., Laris, R. *et al*. (2005) Intranasal kennel cough vaccine protecting dogs from experimental *Bordetella bronchiseptica* challenge within 72 hours. *Veterinary Record*, **156**(15), 482–483.

Greene, C. (1998) Immunoprophylaxis and immunotherapy, in *Infectious Diseases of the Dog and Cat*, 2nd edn (ed C. Greene), W.B. Saunders, Philadelphia, Pennsylvania, pp. 717–750.

Griffin, B. (2000a) Feline hepatic lipidosis: Pathophysiology, clinical signs and diagnosis. *Compendium on Continuing Education for the Practicing Veterinarian*, **22**, 847–856.

Griffin, B. (2000b) Feline hepatic lipidosis: Treatment recommendations. *Compendium on Continuing Education for the Practicing Veterinarian*, **22**, 910–921.

Griffin, B. (2001a) Prolific cats: The estrous cycle. *Compendium on Continuing Education for the Practicing Veterinarian*, **23**(12), 1049–1055.

Griffin, B. (2001b) Prolific cats: The impact of her fertility on the welfare of the species. *Compendium on Continuing Education for the Practicing Veterinarian*, **23**(12), 1058–1067.

Griffin, B. (2001c) Lessons on the importance of proper social housing in laboratory cats, in *A Model of Non-Invasive Monitoring of Feline Ovarian Function in the Domestic Cat*. Master's thesis, Auburn University.

Griffin, B. (2006) Diagnostic usefulness of and clinical syndromes associated with reproductive hormones, in *Consultations in Feline Internal Medicine*, Vol. 5 (ed J.R. August), Elsevier Saunders, St. Louis, Missouri, pp. 217–226.

Griffin, B. (2009a) Scaredy cat or feral cat? *Animal Sheltering*, **Nov/Dec**, 57–61.

Griffin, B. (2009b) Wellness, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K.F. Hurley), Blackwell, Ames, Iowa, pp. 17–38.

Griffin, B. (2010) Kittens: Coming to a shelter near you. *Animal Sheltering*, **Jul/Aug**, 47–51.

Griffin, B. (2011a) Population wellness: Keeping cats physically and behaviorally healthy, in *The Cat: Clinical Medicine and Management* (ed S.E. Little), Elsevier, St. Louis, Missouri, pp. 1312–1353.

Griffin, B. (2011b) Meow . . . cat chow! Feeding kitties in the shelter. *Animal Sheltering*, **Sep–Oct**, 47–51.

Griffin, B. and Baker, H.J. (2002) Domestic cats as laboratory animals, in *Laboratory Animal Medicine* (ed J.G. Fox), Harcourt Academic, San Diego, California, pp. 460–482.

Griffin, B. and Hume, K.R. (2006) Recognition and management of stress in housed cats, in *Consultations in Feline Internal Medicine*, 5th edn (ed J.R. August), Elsevier Saunders, St. Louis, Missouri, pp. 717–734.

Griffin, J.F. (1989) Stress and immunity: A unifying concept. *Veterinary Immunology and Immunopathology*, **20**(3), 263–312.

Griffith, C.A., Steigerwald, E.S. and Buffington, T. (2000) Effects of a synthetic facial pheromone on behavior of cats. *Journal of the American Veterinary Medical Association*, **217**, 1154.

Hand, M.S. and Novotny, B.J. (2002) *Small Animal Clinical Nutrition*, 4th edn, Mark Morris Institute, Topeka, Kansas.

Humane Society of the United States [HSUS] (1996) How-to series: How to use a control pole. Available online at http://www.animalsheltering.org/resources/magazine/sep_oct_1996/how-to-use-a-control-pole.pdf (accessed June 10, 2012).

Humane Society of the United States [HSUS] (2009) Pet overpopulation estimates. Available online at http://www.humanesociety.org/issues/pet_overpopulation/facts/overpopulation_estimates.html (accessed January 6, 2012).

Institute for Laboratory Animal Research [ILAR] (1996) *Guide for the Care and Use of Laboratory Animals*. National Academies Press, Washington, DC.

Johnston, S.D., Root Kustritz, M.V. and Olson, P.N. (2001) Feline pregnancy, in *Canine and Feline Theriogenology*, W.B. Saunders, Philadelphia, Pennsylvania, pp. 414–430.

Kessler, M.R. and Turner, D.C. (1997) Stress and adaptation of cats (*Felis silvestris catus*) housed singly, in pairs, and in groups in boarding catteries. *Animal Welfare*, **6**, 243.

Kessler, M.R. and Turner, D.C. (1999a) Socialization and stress in cats (*Felis silvestris catus*) housed singly and in groups in animal shelters. *Animal Welfare*, **8**, 15.

Kessler, M.R. and Turner, D.C. (1999b) Effects of density and cage size on stress in domestic cats (*Felis*

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silvestris catus) housed in animal shelters and boarding catteries. *Animal Welfare*, **8**, 259.

Key, D. (2006) *Cattery Design: The Essential Guide to Creating Your Perfect Cattery*, Cambridge University Press, Cambridge, UK.

Lawler, D. (2008) Neonatal and pediatric care of the puppy and kitten. *Theriogenology*, **70**(3), 384–392.

Levine, E., Perry, P., Scarlett, J. *et al*. (2005) Intercat aggression in households following the introduction of a new cat. *Applied Animal Behavior Science*, **90**, 325–336.

Levy, J.K. (2009) Feline leukemia virus and feline immunodeficiency virus, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K.F. Hurley), Blackwell, Ames, Iowa, pp. 307–317.

Levy, J.K., Crawford, C. and Hartman, K. (2008) American Association of Feline Practitioners feline retrovirus management guidelines. *Journal of Feline Medicine and Surgery*, **10**, 300–316.

Levy, J.K., Scott, H.M., Lachtara, J.L. *et al*. (2006) Seroprevalence of feline leukemia virus and feline immunodeficiency virus infection among cats in North America and risk factors for seropositivity. *Journal of the American Veterinary Association*, **228**, 371–376.

Lindell, E.M., Erb, H.N. and Houpt, K.A. (1997) Intercat aggression: A retrospective study examining types of aggression, sexes of fighting pairs and effectiveness of treatment. *Applied Animal Behavior Science*, **55**, 153–162.

Lord, L.K., Griffin, B., Levy, J.K. *et al*. (2010) Evaluation of collars and microchips for visual and permanent identification of pet cats. *Journal of the American Veterinary Medical Association*, **237**, 4, 387–394.

Lord, L.K., Pennell, M.L., Ingwersen, W. *et al*. (2008a) Sensitivity of commercial scanners to microchips of various frequencies implanted in dogs and cats. *Journal of the American Veterinary Medical Association*, **233**(11), 1729–1735.

Lord, L.K., Pennell, M.L., Ingwersen, W. *et al*. (2008b) In vitro sensitivity of commercial scanners to microchips of various frequencies. *Journal of the American Veterinary Medical Association*, **233**(11), 1723–1728.

McCobb, E.C., Patronek, G.J., Marder, A. *et al*. (2005) Assessment of stress levels among cats in four shelters. *Journal of the American Veterinary Medical Association*, **226**(4), 548–555.

McMillan, F.D. (2002) Development of a mental wellness program for animals. *Journal of the American Veterinary Medical Association*, **220**, 965.

Merola, V. and Dunayer, E. (2006) Toxicology brief: The 10 most common toxicoses in cats. *Veterinary Medicine*, **Jun**, 339–342.

Miller, J. (1996) The domestic cat: Perspective on the nature and diversity of cats. *Journal of the American Veterinary Medical Association*, **208**, 4, 498–502.

Moore, G.E., Ward, M.P., Dhariwal, J. *et al*. (2004) Use of a primary care veterinary medical database for surveillance of syndromes and diseases in dogs and cats. *Journal of Veterinary Internal Medicine*, **18**, 386.

National Association of State Public Health Veterinarians [NASPHV] (2011) Compendium of animal rabies prevention and control, 2011. Available online at http://www.nasphv.org/Documents/RabiesCompendium.pdf (accessed January 3, 2012).

Newbury, S., Blinn, M.K., Bushby, P.A. *et al*. (2010) The Association of Shelter Veterinarians Guidelines for standards of care in animal shelters. Available online at http://tinyurl.com/7flvf7e, pp. 26–32 (accessed June 10, 2012).

O'Connor, T.P., Tonelli, Q.J. and Scarlett, J.M. (1991) Report of the National FeLV/FIV Awareness project. *Journal of the American Veterinary Medical Association*, **199**, 1348–1353.

Overall, K.L. (1997) Recognizing and managing problem behavior in breeding catteries, in *Consultations in Feline Internal Medicine*, 3rd edn (ed J.R. August), W.B. Saunders, Philadelphia, Pennsylvania.

Patronek, G.J. and Sperry, E. (2001) Quality of life in long term confinement, in *Consultations in Feline Internal Medicine*, 4th edn (ed J.R. August), W.B. Saunders, Philadelphia, Pennsylvania, pp. 621–634.

Paul, M.A. Carmichael, L.E., Childers, H. *et al*. (2006) AAHA canine vaccine guidelines, revised. Available online at http://www.aahanet.org/PublicDocuments/VaccineGuidelines06Revised.pdf (accessed January 6, 2012).

Purina body condition score. Understanding your cat's body condition. Available online at http://www.purina.com/cat/weight-control/bodycondition.aspx (accessed January 9, 2011).

Richards, J.R., Elston, T.H., Ford, R.B. *et al*. (2006) The 2006 AAFP feline vaccine advisory panel report. *Journal of the American Veterinary Medical Association*, **229**(9), 1405–1441.

Robertson, J.E., Christopher, M.M. and Rogers, Q.R. (1998) Heinz body formation in cats fed baby food containing onion powder. *Journal of the American Veterinary Medical Association*, **212**, 1260–1266.

Rochlitz, I. (1999) Recommendations for the housing of cats in the home, in catteries and animal shelters,

VetBooks.ir

in laboratories and in veterinary surgeries. *Journal of Feline Medicine and Surgery*, **1**(3), 181–191.

Root, M.V., Johnston, S.D. and Olson, P.N. (1995) Estrous length, pregnancy rate, gestation and parturition lengths, litter size, and juvenile mortality in the domestic cat. *Journal of the American Animal Hospital Association*, **31**, 429–433.

Scarampella, F., Pollmeier, M., Visser, M. *et al*. (2005) Efficacy of fipronil in the treatment of feline cheyletiellosis. *Veterinary Parasitology*, **129**(3/4), 333–339.

Strohmeyer, R.A., Morley, P.S., Hyatt, D.R. *et al*. (2006) Evaluation of bacterial and protozoal contamination of commercially available raw meat diets for dogs. *Journal of the American Veterinary Medical Association*, **228**(4), 537–542.

Tobias, G., Tobias, T.T. and Abood, S.K. (2000) Estimating age in dogs and cats using ocular lens examination. *Compendium on Continuing Education for the Practicing Veterinarian*, **22**(12), 1085–1091.

University of Florida College of Veterinary Medicine (2011) Feline identification: Guide to cat colors and patterns. Available online at http://ufshelter medicine.com/files/2011/11/identification-and-coat-colors-patterns.pdf (accessed January 3, 2012).

Zambelli, D. and Prati, F. (2006) Ultrasonography for pregnancy diagnosis and evaluation in queens. *Theriogenology*, **66**, 135–144.

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11
The Care of Small Mammals in the Animal Shelter

Christopher S. Hanley

INTRODUCTION

This chapter on ferrets, rabbits, and guinea pigs is intended to provide an overview of the basic husbandry, housing, and potential adoption concerns regarding the small mammals most commonly seen in a shelter setting and to highlight the medical care and most commonly encountered diseases in these species. There are many good references available that provide greater detail about these species than can be presented here, and readers are encouraged to consult these references for more information.

FERRETS

Ferrets (*Mustela putorius furo*) are a member of the family Mustelidae in the order Carnivora. While often considered an "exotic" animal, they have been domesticated for millennia (Lewington, 2007). Historically used for rodent control and hunting, in the United States they are mainly found in biomedical research and as companion animals.

Anatomy, Physiology, and Husbandry

Ferrets are long and thin and amazingly flexible, easily able to turn their bodies 180°. Ferrets do undergo both a significant seasonal change in body weight, losing up to 40% of their weight in the summer and regaining it in the winter (Quesenberry and Carpenter, 2003), and molt, with shorter hair in the summer and a heavier coat in the winter. Both of these natural events can be mistaken for disease. As with all mustelids, they have well-developed anal glands but their musky odor is largely due to sebaceous secretions. Ferrets have a very simple, short gastrointestinal tract. Transit time to digest a meal is only 3–4 hours in an adult (Bell, 1999) and their feces is normally semi-formed and voluminous. Even in a healthy ferret, the spleen can be quite large. Reference physiologic values can be located in Table 11.1.

Gender and Age Determination

Ferret gender is easy to determine. Males have a preputial opening on the ventrum, caudal to the umbilicus. The os penis can be palpated as well. Females have a vertical urogenital opening in the perineum, ventral to the anus. The opening is just a slit in the nonestrous female but becomes very swollen during estrous.

It can be difficult to determine age in a ferret once they have reached maturity. Clues such as dental calculi, broken or chipped canines, and evidence of the commonly seen geriatric diseases can help provide a reasonable estimate.

Housing

In Europe and Australia, ferrets are commonly housed outdoors but in the United States they are housed indoors. Ferrets should be housed in a secure, well-ventilated wire cage. With their flexibility, they can escape from openings that appear too small for

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Table 11.1. Selected physiological, hematological, and biochemical parameters for ferrets, rabbits, and guinea pigs.

Physiologic parameters	Ferret[a–d]	Rabbit[a,c,e]	Guinea pig[a,c]
Life span (years)	5–11	6–12	5–6
Body weight (grams)	800–1200 (neutered)	Varies with breed	♂: 900–1200 ♀: 700–900
Body temperature (°F)	100–104	101.3–104	99.0–103.1
Heart rate (beats/min)	200–400	130–325	240–310
Respiratory rate (breaths/min)	33–36	30–60	42–104
Sexual maturity (months)	♂: 6–12 ♀: 6–12	♂: 6–10 ♀: 4–9	♂: 3–4 ♀: 2–3
Estrous cycle length (days)	Induced ovulator	Induced ovulator	15–17
Gestation length (days)	41–43	29–35	59–72 (average: 68)
Litter size	1–18 (average: 8)	4–10	1–13 (average: 2–4)
Birth weight (grams)	6–12	30–80	45–115 (average: 70–110)
Weaning age (weeks)	6–8	4–6	3 (or 180 g body weight)
Laboratory values	**Fitch ferrets**		
Hematocrit (%)	♂: 46–57 ♀: 47–51	33–50	32–50
Hemoglobin (g/dL)	♂: 15.2–17.7 ♀: 15.2–17.4	10.0–17.4	10.0–17.2
Red blood cells ($\times 10^6/\mu L$)	♂: 9.65–9.69 ♀: 9.3–9.34	5.1–7.9	3.2–8.0
White blood cells ($\times 10^3/\mu L$)	♂: 5.6–10.8 ♀: 2.5–8.6	5.2–12.5	5.5–17.5
Neutrophils (%)	♂: 24–78 ♀:12–41	20–75	22–48
Lymphocytes (%)	♂: 28–69 ♀: 25–95	30–85	39–72
Monocytes (%)	♂: 3.4–8.2 ♀: 1.7–6.3	1–4	1–10
Eosinophils (%)	♂: 0–7 ♀: 1–9	1–4	0–7
Basophils (%)	♂: 0–2.7 ♀: 0–2.9	1–7	0–2.7
Platelets ($\times 10^3/\mu L$)	♂: 735–766 ♀: 730–764	250–650	260–740
Mean corpuscular volume (μm^3)	♂: 51.4 ♀: 52.1–52.2	57.8–66.5	71–96
Mean corpuscular hemoglobin (pg)	♂: 17.3 ♀: 17.5	17.1–23.5	23–27
Mean corpuscular hemoglobin concentration (%)	♂: 33.7–33.8 ♀: 33.4–33.5	29–37	26–39
Total protein (g/dL)	5.3–7.2	5.4–8.3	4.2–6.8
Albumin (g/dL)	3.3–4.1	2.4–4.6	2.1–3.9

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Table 11.1. (*Continued*)

Physiologic parameters	Ferret[a–d]	Rabbit[a,c,e]	Guinea pig[a,c]
Globulin (g/dL)	2.0–3.1	1.5–2.8	1.7–2.6
Glucose (mg/dL)	94–207	75–155	60–125
Blood urea nitrogen (mg/dL)	10–45	13–29	9.0–31.5
Creatinine (mg/dL)	0.4–0.9	0.5–2.5	0.6–2.2
Sodium (mmol/L)	137–162	131–155	120–152
Potassium (mmol/L)	4.5–7.7	3.6–6.9	3.8–7.9
Chloride (mmol/L)	106–125	92–112	90–115
Calcium (mg/dL)	8.0–11.8	5.6–12.5	8.2–12.0
Phosphorus (mg/dL)	4.0–9.1	4.0–6.9	3.0–7.6
Alanine aminotransferase (U/L)	82–289	48–80	25–59
Aspartate aminotransferase (U/L)	28–120	14–113	26–68
Alkaline phosphatase (U/L)	9–84	4–16	55–108
Bilirubin (mg/dL)	<1.0	0.0–0.7	0.0–0.9
Cholesterol (mg/dL)	64–296	10–80	16–43

[a]Quesenberry and Carpenter (2003); [b]Lewington (2007); [c]Johnson-Delany (1996); [d]Carpenter (2005); [e]Harkness and Wagner (1995).

them to do so. They do best with an area or room in which to play and exercise but should always be supervised. Care must be taken to "ferret proof" the play area. Ferrets will burrow into furniture and mattresses, consuming the foam and developing a gastrointestinal obstruction. They will chew on wires and often will seek out foam and rubber substances to chew on, including erasers, headphones, flip-flops, and rubber bands.

Being burrowing creatures, ferrets should be provided soft material for digging, such as shredded paper or nonclumping litter, as well as tunnel-like areas, such as cardboard tubes. Ferrets should also be provided a dark, enclosed area to sleep in. Custom items can be purchased, such as hammocks, slings, and tubes, but towels, T-shirts, and boxes can all be utilized.

Ferrets are fastidious and will defecate and urinate away from the burrow. They prefer to back into a corner, using the feces, urine, and anal gland secretions to mark their territory. This natural behavior makes it easy to litter box train them. They will pick a corner to deposit their wastes and a litter box can be placed in that spot. Pelleted litter is the preferred substrate.

Enclosures should be cleaned and sanitized routinely, removing soiled materials daily. The enclosure should be washed and disinfected when it is visibly soiled or has an odor. Any disinfectant can be used but the enclosure should be rinsed thoroughly before the animals are returned to it.

Ferrets can be housed in groups, and it is often preferred as they like to play, even as adults. Unfamiliar animals can be housed together, especially if they are neutered, but should be monitored during the introduction for signs of aggression.

As a reminder, ferrets are predators and should not be housed near birds, rodents, or rabbits.

Diet

Ferrets are obligate carnivores and require a diet high in fat and good-quality meat-based protein and low in carbohydrates and fiber. As a general rule, the fat content should be 15–20% and the protein should be 30–35%.

There are a number of commercially available ferret diets. Adult cat food is not high enough in protein, but a high-quality kitten food may be fed. Dry food should be available at all times, as ferrets cannot go for long periods without eating.

Although ferrets like the taste of sugar, it is not healthy for them, and sweet treats should be offered in very limited amounts or avoided altogether.

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Ferrets can be finicky eaters, and changing their diet as adults can take time and effort. Patience and a slow changeover are important to avoid anorexia and other possible repercussions.

Water can be provided in either a sipper bottle or bowl. If uncertain which the animal is accustomed to, offer both and monitor their usage. Ferrets will play with their water and tip the bowl over if it is not heavy enough. Regardless of how the water is provided, the container should be emptied and refilled daily so that fresh water is always available.

Grooming

Ferrets will commonly groom themselves and their companions, so grooming by caretakers is not routinely necessary. As needed, ferrets can be brushed with a small cat brush. Some ferrets will tolerate it readily but others will need to be scruffed (Figure 11.1). Ferrets can be given a malt-based cat or ferret laxative weekly to help prevent hairballs. Cat nail trimmers can be used for ferret nail trims.



Figure 11.1. Restraint of a ferret by scruffing the loose skin on the back of the neck.

Behavior

Ferrets, like other carnivores, tend to sleep frequently between bouts of enthusiastic activity. As stated before, adult ferrets will still play. This play can sometimes turn aggressive toward other ferrets or people. Signs of aggression include lunging, sideways attacks, dancing, and a staccato clucking sound (Poole, 1967). Ferrets can also bite when they are fearful, and signs of defensive threats include hissing, screaming, and snapping of the jaws (Poole, 1967).

General Veterinary Care

For veterinarians unfamiliar with small mammals but wanting to learn, ferrets are the ideal animal to start with. Their long, tubular shape makes abdominal palpation straightforward. They require little specialized equipment or supplies. Their nutrition likewise is relatively straightforward and there are multiple good references available to aid the clinician (Johnson-Delany, 1996; Quesenberry and Carpenter, 2003; Lewington, 2007).

Handling

Most ferrets can be gently restrained on the table with one hand while the other hand is free to perform the exam. Ferrets are very inquisitive by nature so care must be taken to make sure they do not fall off the table. For animals who are too active or are biting, scruffing the neck and elevating the animal so all four feet are off the table will allow the exam to be performed (Figure 11.1). This is often necessary for auscultation and taking a rectal temperature. Also, when ferrets are held in this manner, they will often yawn, allowing for a good oral examination. Very wriggly ferrets who need oral medication or additional restraint can be wrapped snugly in a towel forming a "ferret burrito."

Examination

The physical examination of a ferret should be performed the same way as any other physical examination; the veterinarian should follow the same sequence of steps each time to make sure nothing is missed. Particular concerns for ferrets are described in this section. Based on common diseases seen in

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ferrets, clinicians should perform a thorough dental exam (fractured canines are common but rarely cause a problem, but dental disease can be seen). Lymph nodes should be palpated, including cervical, axillary, popliteal, and inguinal, as ferrets commonly develop lymphoma as they age. Cardiac disease can be seen, most often in geriatric animals, but heartworm infestation can be seen at any age. Ferrets will normally have a pronounced sinus arrhythmia. A significant amount of time and care should be dedicated to thorough abdominal palpation. Foreign bodies, enlarged adrenal glands, urinary blockage, enlarged spleens, and enlarged livers are all relatively common. In spayed females (jills), the size of the vulva can be an important clinical sign of adrenal disease. Finally, while their hair coat does change seasonally, generalized alopecia is a major indicator of adrenal disease.

Blood Collection

Blood collection can be difficult in conscious ferrets as they have thick skin, relatively small veins, and often struggle. For small volume samples, such as packed cell volume (PCV)/total protein (TP) or blood glucose, the cephalic or lateral saphenous veins will often work. Ferrets can be manually restrained for jugular collection with a good restrainer. The jugular vein is located more lateral than in cats and dogs and shaving the neck can aid in its visualization. When a full complete blood count (CBC) and biochemical profile are required, the author prefers to mask the ferret down with isoflurane or sevoflurane. The jugular vein can be approached as described above, or the ferret can be bled from the cranial vena cava. With the ferret in ventrodorsal recumbency, a 22–25 gauge needle on a 3 cm^3 syringe is introduced into the thoracic cavity just off the midline where the first rib meets the manubrium at approximately a 15° angle. As soon as the skin is penetrated, vacuum should be applied to the syringe. Slowly advance the needle toward the medial portion of the contralateral rear limb and watch for blood filling the syringe (Figure 11.2). It is common to go through the cava; the slow approach will decrease that likelihood. If unsuccessful, pull the needle all the way to the level of the skin before redirecting to prevent lacerating the vein. Reference laboratory values can be located in Table 11.1.



Figure 11.2. Blood collection from the vena cava in an anesthetized ferret.

Preventative Medicine

As with other pets, preventative medicine is the cornerstone to health and longevity. Annual examinations for young animals and twice yearly examinations for animals over the age of three are recommended.

Vaccination against canine distemper and rabies is recommended, but clinicians should be aware that vaccine reactions are common. Many ferrets can be vaccinated easily by having an assistant scruff the animal and offer them something sweet to distract them from the injection; Nutri-Cal® on a tongue depressor works well.

Heartworm preventative in endemic areas should be utilized. It is easiest to make an oral suspension of diluted injectable ivermectin and administer it orally at the feline dosage (0.024 mg/kg) monthly. Endoparasites are relatively rare so routine prophylactic deworming is not recommended, but ectoparasites can be seen, including fleas, lice, and ear mites (*Otodectes cynotis*). As there are no ectoparasite medications approved for usage in ferrets, the clinician should choose a product approved for use in cats, including Advantage®, Frontline®, and Revolution®, and follow the labeled age and dose recommendations.

Infectious Diseases and Zoonotic Concerns

Ferrets are very susceptible to canine distemper, and infection is nearly 100% fatal (Ivey and Morrisey, 1999). Therefore, prevention is paramount. Any

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ferret who could be exposed to canine distemper should be vaccinated. A series of three vaccinations should be given every 3–4 weeks starting at 8 weeks of age. Adult ferrets with an unknown vaccination history should be vaccinated twice at 3–4-week intervals. All ferrets should then receive annual boosters. Veterinarians must use caution with vaccine choice, as most vaccines labeled for dogs will induce the disease in ferrets, due to their susceptibility. There is a distemper vaccine licensed for ferrets (Purevax® Ferret Distemper; Merial, Athens, GA); before that was available, an alternative distemper vaccine was used off label (Galaxy® D; Intervet/Schering-Plough Animal Health, Omaha, NE).

Ferrets can contract rabies, although they do not appear to be very susceptible. There is a rabies vaccine licensed for use in ferrets at least 12 weeks of age (Imrab®; Merial). One milliliter is given subcutaneously and boostered annually. If the vaccination status of a ferret is unknown, it would be well advised to administer a booster. Regulations regarding rabies vaccination and disposition of ferrets who have bitten people vary from state to state, and it is recommended that a shelter contact their public health department for the current regulations.

It is important for veterinarians to know that ferrets suffer from a relatively high prevalence of anaphylactic reactions to both rabies and distemper vaccinations. One study put the reaction rate in ferrets between 0.5% and 1% of vaccinations (Moore *et al*., 2005). Most reactions occur within 25 minutes, and signs commonly include vomiting, diarrhea, nausea (pawing at mouth, drooling), tachycardia, and erythema. Severe cases can result in hypotension and collapse. Animals should be observed for 30–60 minutes after vaccination. If signs occur, treat with diphenhydramine (2–4 mg/kg IM or IV). Severe reactions may require epinephrine, dexamethasone, and oxygen. Animals who have had anaphylactic reactions once will likely have them again so the risks/benefits of vaccination should be considered in those cases, and animals can be pretreated with diphenhydramine to prevent anaphylaxis.

Ferrets are susceptible to strains of the human influenza virus. Ferrets contract the disease from humans and can pass the disease on to other ferrets or humans. Clinical signs include mucoid or serous nasal and ocular discharge, sneezing, coughing, lethargy, and transient pyrexia. Diagnosis is based on clinical signs and history of possible exposure, and treatment is supportive. The disease is usually self-limiting and associated with low mortality, except in neonates.

An important consideration in introducing young and older ferrets is epizootic catarrhal enteritis (ECE). ECE, caused by a coronavirus, is commonly called "green slime disease" due to the color and consistency of the diarrhea seen. It is highly transmissible and presents in adult ferrets after they are introduced to new, young ferrets. Within 48–72 hours, the older ferrets are anorexic, lethargic, and break with green, mucoid diarrhea. Aggressive supportive care, including fluids, antibiotics, and syringe feeding are crucial to limiting mortality.

Ferrets can carry a number of enteric bacteria, and these are most commonly associated with the animal's consumption of undercooked or raw meat. *Salmonella* sp., *Escherichia coli*, and *Campylobacter jejuni* have all been isolated from sick ferrets. *Campylobacter* has been isolated from the feces of clinically normal ferrets, it is uncertain if *E. coli* can be found as normal intestinal flora, and asymptomatic carrier states with *Salmonella* are rare in ferrets (Powers, 2009). These pathogens should be considered in animals with diarrhea who have been fed whole prey or undercooked meat. Care must be taken to prevent the infection from being spread to other ferrets via contamination of food or water, or to humans.

Noninfectious Diseases

Ferrets develop a number of diseases as they age, the three most common being lymphoma, adrenal disease, and insulinoma. As a general rule, one-third of ferrets over 3 years of age will develop one of these diseases. If they live long enough, it is common for them to develop one or both of the other diseases as well. Shelters must determine whether treatment within their facilities is a reasonable option.

Adult ferrets most commonly develop lymphocytic lymphoma. Generalized lymphadenopathy may be noted, or the animal may have nonspecific lethargy, weight loss, and anorexia. If lymph nodes are enlarged, most commonly the cervical or popliteal, an excisional biopsy should be performed. There are a number of different chemotherapy protocols that have been developed. Ferrets handle chemotherapy well, but prognosis for

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complete remission is relatively poor. If chemotherapy is not an option, prednisone can be utilized for palliative therapy.

Ferrets develop insulinomas or beta-cell tumors of the pancreatic islet cells. Clinical signs can be chronic, such as increasing lethargy, weakness, ataxia, weakness in the hind legs, or nausea, usually seen as pawing at the mouth. Other ferrets present an acute hypoglycemic crisis with collapse, coma, and rarely seizures. Diagnosis is supported by blood glucose below 60 mg/dL. Treatment can be surgical, with removal of the cancerous nodules on the pancreas, or medical, with prednisone or other medications used to prevent hypoglycemia.

Adrenocortical disease is a syndrome seen in ferrets almost exclusively in the United States and is likely due to the early-age spaying and neutering. It is important to note this is not Cushing's disease as the cause, diagnostics, and treatment are very different.

Bilaterally symmetrical alopecia, starting at the tail base and progressing to complete loss of the fur coat is the most common clinical sign. Pruritus is seen in one-third of cases and increased aggression can be seen, most often between ferrets. Females will develop a pronounced vulvar swelling, and males may suffer from prostatic hypertrophy and dysuria. Diagnosis is confirmed by ultrasound or measurement of adrenal hormones. Treatment can include surgical removal of the affected adrenal gland or medical treatment, of which there are a number of options. The reader is advised to consult other more complete references for further details.

Spaying and Neutering

In the United States, the majority of ferrets come from a single commercial breeding facility (Marshall Farms, North Rose, NY). All their ferrets are spayed or neutered, descented, and given their first canine distemper vaccine at 6 weeks of age. When this is done, two blue dots are tattooed in the animal's right ear. Looking for these dots can help determine if a jill has been spayed.

Because most pet ferrets are already altered, few animals presented at a shelter will need to be spayed or neutered. If an intact female is presented, it is very important that she be spayed. Ferrets are induced ovulators and if not bred, the jill will develop nonregenerative anemia when chronic hyperestrogenemia leads to bone marrow suppression. Intact males can be castrated similarly to a feline neuter.

Adoption Issues

Although they can make wonderful pets, ferrets are not suitable for young children. Ferrets can be introduced into households that have other ferrets present. The legality of ferret ownership is the biggest potential adoption issue. It is important to know the laws of the state, county, and city as laws on owning a ferret will vary widely, even at the local level.

RABBITS

Domestic rabbits (*Oryctolagus cuniculus*) are descended from the wild European rabbit. Many different breeds are now recognized. Size ranges vary greatly between the dwarf breeds (1 kg) to the giant breeds (7 kg) (see Table 11.1). Wild rabbits and hares native to the United States are in different genera and do not make suitable pets. All rabbits are in the order Lagomorpha because they have two pair of maxillary incisors as opposed to rodents, which have a single pair.

Anatomy, Physiology, and Husbandry

Rabbits are relatively delicate animals. Their skeletons are very lightweight, representing only 7–8% of their body weight, while skeletal muscle can reach 50% of their weight (Quesenberry and Carpenter, 2003). This disparity between muscle and bone means that fractures can occur easily, especially with improper handling. When lifting or carrying a rabbit, the hindquarters must always be supported.

Rabbits have a total of 28 teeth, and they are all hypsodont (open-rooted), meaning they grow continuously. There are two pairs of maxillary incisors, and the smaller more caudal pair is commonly called "peg teeth"; the mandibular incisors should rest between the primary maxillary incisors and the peg teeth. This allows the incisors to wear properly.

Rabbits are "hind-gut" fermenters; their gastrointestinal anatomy and physiology is similar to that of horses. In the rabbit, most of the nutrition is derived from fermentation in the cecum. This large organ uses muscular contractions to separate fiber and nonfiber. The fiber is passed through the large intestines as fecal pellets while the nonfiber component is passed as small, soft pellets called cecotrophs. These cecotrophs are ingested directly from the anus

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by the rabbit in the early morning (cecotrophy or coprophagy) and are essential for the animal's well-being.

Rabbits are obligate nasal breathers and have a relatively small thoracic cavity compared to their abdominal cavity. Therefore, clinicians should note that both upper respiratory infections and any abdominal distention can cause considerable dyspnea. In addition, one must be cautious of obstructing the nasal cavity in restraint and in positioning the rabbit for surgery. The author always elevates the head and thorax relative to the abdomen to prevent the abdominal viscera from pressing on the diaphragm and interfering with normal respirations. Reference physiologic values can be located in Table 11.1.

Gender and Age Determination

Gender determination is relatively straightforward in the rabbit. Lifting the tail to stretch the perineum provides a clearer view of the external genitalia. Females (does) have an elongated vulva with a vertical slit opening that is a short distance from the anus. Males (bucks) have a rounded prepuce and the penis often everts with the lifting of the tail. Males also have two hairless scrotal sacs lateral to the penis. While the testes descend at approximately 3 months of age, bucks have open inguinal rings and can retract the testicles into the abdomen.

It is difficult to accurately estimate the age of rabbits once they have reached maturity. Clues that would be used in other species to help provide a reasonable estimate are limited in rabbits.

Housing

Rabbits at shelters should be housed indoors. Ventilation is crucial, and cage sides should be open mesh; glass aquariums are not suitable for housing rabbits. It is also important that a significant portion of the floor of any rabbit hutch be solid. Too much time spent on wire flooring will lead to pododermatitis, which can be very difficult to treat; therefore wire flooring should be avoided. Slats can be considered, but solid floors and daily cleaning of feces and urine is recommended. Bedding material can include straw or hardwood shavings, but pine and cedar shavings should be avoided because aromatic compounds in soft woods present a health hazard. As they have continuously growing teeth, it is important to provide appropriate items for chewing such as cardboard boxes or clean, pesticide- and herbicide-free fruitwood branches.

Many owners will allow their rabbits out of the hutch to roam around. If the animal is let outdoors, it is important to use a "grazing ark" which will contain the rabbit and keep predators out. Rabbits will climb and will chew almost anything so care must be taken to prevent exposure to poisonous plants and especially electrical cords.

Rabbits can be litter box trained as they deposit their feces and urine in one location. However, intact males are known to deposit feces for scent marking and will rub objects to mark them with their scent glands. Clumping litter should be avoided as some rabbits will ingest it, leading to gastrointestinal obstruction. Nonclumping litter, straw, or paper litter can all be used.

Rabbits can often be housed together, especially if the animals are introduced at a young age or the animals are spayed or neutered. Some rabbits, especially intact does, can be quite aggressive and territorial, and it is not generally recommended to cohouse multiple intact males or females.

Diet

Being hind-gut fermenters, rabbits require a primarily hay-based diet. Timothy or another grass hay should be available at all times. Alfalfa hay should only be fed to pregnant, lactating, or growing rabbits, or the animal may otherwise develop problems due to the high concentrations of dietary calcium.

Feeding too many pellets can contribute to obesity, which is a common problem in rabbits. Nongrowing or nonlactating rabbits should be fed, on average, one-quarter cup of pellets per 5 pounds of rabbit per day. Some rabbits will eat less and will do fine with sufficient hay. There are a number of commercially available pelleted feeds and any one of high quality can be utilized. It should be noted that most pellets are alfalfa-based. While most rabbits will do fine on them, some animals are more susceptible to the high-calcium concentrations and are best fed a timothy-based pellet.

Water is best provided in a sipper bottle. Some rabbits will drink from a bowl, so when uncertain which the animal prefers, offer both and monitor for usage. Rabbits will commonly knock over or contaminate water in a bowl, so water should be checked frequently and replaced at least daily. Rabbits have a

high water intake compared to other animals (120–150 mL/kg), so consumption should be monitored (Quesenberry and Carpenter, 2003).

Grooming

Normal, healthy rabbits will groom themselves and require little assistance. However, some long-haired rabbit breeds, such as Lionheads, Angoras, and Jersey Woolies, will require routine brushing and care. Bad knots or mats may need to be clipped off. In addition, rabbits who are overweight, arthritic, or affected by other diseases will often have poor personal hygiene. These animals will also require grooming and cleaning. Cat brushes will work well for most rabbits. Some animals will tolerate it readily but others will need to be restrained. Cat-sized nail trimmers can be used to clip rabbit nails.

Behavior

Rabbits generally make good pets, but individuals who are nervous or not used to being handled do have a tendency to scratch and some will even bite. This is also true of does with their young. Patience and proper handling will go a long way to preventing injury to the rabbit or the handler. Some animals will resist being picked up but will be fine with petting and grooming.

General Veterinary Care

The veterinarian dealing with rabbits for the first time should know that there are a number of important details to consider. Antibiotic choices, differential diagnoses, nutrition, and housing are quite different from dogs and cats. The following sections are a starting point, but it is recommended that other references be consulted for more details (Harkness and Wagner, 1995; Johnson-Delany, 1996; Quesenberry and Carpenter, 2003).

Handling

The importance of proper restraint and handling of rabbits cannot be overemphasized. Rabbits are prone to vertebral fractures or luxations if they are allowed to kick out without their hindquarters supported. Control of the spine and hind legs is therefore critical. Rabbits are generally calm on the examination table but should be watched to prevent them from falling. When lifted, one hand should be placed over the shoulders or under the sternum and the other hand used to support the hindquarters so that the rabbit is in a "C-shape" (Figure 11.3a). For longer transport or for more nervous rabbits, the author prefers the "football hold." One hand grasps the hindquarters and the rabbit's head is tucked into the elbow so that the forearm of the handler supports the entire rabbit. The second hand is placed over the top of the rabbit to prevent it from leaping. Covering the rabbit's eyes like this will decrease his or her anxiety (Figure 11.3b). Lastly, rabbits who need oral medication or other basic, nonpainful procedures but are too wiggly can be wrapped snugly in a towel forming a "bunny burrito" (Figure 11.3c).

Examination

A complete and consistent physical examination is essential. Upper respiratory disease and pneumonia are common, so close attention to the nares for signs of discharge, sneezing, or wet fur is important. As rabbits have a large digestive tract, anorexia is a common presenting complaint. A thorough history including diet evaluation, dental examination, abdominal palpation, and abdominal auscultation (listening in the four quadrants for sounds as one would for a horse or ruminant) are very important. Otitis and head tilts are also common.

Blood Collection

Blood can be collected from a number of sites, some of which depend on the size and demeanor of the patient. The author most commonly uses the cephalic, lateral saphenous or femoral veins. For small volumes, the author will use ear veins (approaching from the lateral pinnae (ear flap)) but does not give injections this way because of the risk of thrombosis and pinnae necrosis with this technique. Jugular veins are sometimes difficult to access in a conscious rabbit, especially those with a big dewlap (the longitudinal flap of tissue under the lower jaw and neck). Anesthesia should be considered for nervous animals or if the blood sample cannot be obtained on an awake animal. Reference laboratory values can be located in Table 11.1.

Infectious Diseases and Zoonotic Concerns

Rabbits are very sensitive to the effects of certain antibiotics, and their use should be avoided. This includes any antibiotics with a strong

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Figure 11.3. Proper rabbit restraint techniques. (a) The "C-shaped" hold used when lifting the animal. (b) The "football hold" used for carrying the rabbit. Note how the head is nestled in the crook of the elbow. (c) A "bunny burrito" used to maximize restraint of the animal.

gram-positive or anaerobic spectrum, including β-lactams, macrolides, and lincosamides. If indicated doxycycline, trimethoprim-sulfas, and fluoroquinolones can be used.

Pasteurella multocida is the classic example of infectious diseases in pet rabbits. While present in many asymptomatic animals, it will opportunistically cause upper respiratory disease (snuffles), pneumonia, and otitis externa, media, and interna. While once considered the only cause of all of these diseases, a number of other bacterial organisms have been isolated including *Bordetella*, *Pseudomonas*, and *Staphylococcus*. Therefore, bacterial cultures should be taken, especially in cases when the rabbit is not responding to treatment.

Rabbits can contract ringworm, although it is usually self-limiting or asymptomatic. Most cases are due to *Trichophyton mentagrophytes* and occasionally *Microsporum* sp. Clinical signs include dry, crusty, alopecic areas of skin, most commonly around the head, legs, and feet that may become pruritic, erythematous, and occasionally abscessed (Quesenberry and Carpenter, 2003). Ringworm is a zoonotic concern, and can also be contagious to other animals, including dogs and cats. Screening using a Wood's light may be a useful initial screening tool, but definitive diagnosis requires a fungal culture and identification of the fungal spores. Treatment in most cases involves clipping the fur and applying a topical antifungal cream or solution. It is also important to disinfect the environment thoroughly and to implement biosecurity measures (isolate suspect and confirmed cases, wear gloves and protective garments, etc.) to prevent disease spread. Bleach at a 1:10 dilution can be used to disinfect the enclosure if the animal is removed and the enclosure is thoroughly rinsed and dried before the animal is returned. (See the chapter on sanitation and the

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section on infectious disease for more information about cleaning and biosecurity measures.)

Ectoparasites in rabbits include *Psoroptes cuniculi*, (the ear mite) and *Cheyletiella parasitovorax*, (the rabbit fur mite). *Psoroptes* causes severe crusting of the pinnae with head-shaking, pruritus, and in severe cases, a head tilt. Diagnosis is made by microscopic examination of the ear crust and treatment with ivermectin (0.4 mg/kg SQ (subcutaneously) (every) 10–14 days for three doses) is effective. *Cheyletiella* is contagious to people, dogs, and cats. Called "walking dandruff," the mite is large, white, and mobile. Often subclinical, it can cause dry, scaly, and sometimes pruritic dermatitis. Tape preparations can be used to identify the organism, and SQ ivermectin is an effective treatment. It is also important to decontaminate the environment using routine disinfectants.

Encephalitozoon cuniculi is an intracellular protozoal organism that inhabits the central nervous system. It is found in healthy, asymptomatic animals but can cause signs such as head tilt, nystagmus, vestibular dysfunction, ataxia, paresis, paralysis, uveitis, urinary incontinence, and occasionally seizures (Figure 11.4). The only test currently available measures *E. cuniculi* antibodies and a number of "normal" rabbits will be positive. A presumptive diagnosis is made if the rabbit is antibody-positive and has clinical signs consistent with the disease. Treatment, consisting of a benzimidazole anthelmintic, such as albendazole (30 mg/kg PO (orally) SID (once a day) for 30 days) or fenbendazole (20 mg/kg SID for 30 days), and anti-inflammatories should be initiated quickly as treatment will often stop the progression of the disease but may not lead to improvement of the existing signs. This organism will not cause disease in immunocompetent humans, but has been associated with zoonotic disease in immunocompromised humans.



Figure 11.4. A head tilt present in a pet rabbit. It is common for a residual head tilt to remain after treatment.

One uncommon but important zoonosis in domestic rabbits is *Francisella tularensis*, the causative agent of tularemia or "rabbit fever." This disease is more commonly seen in wild rabbits but can be transmitted by aerosolization, direct contact, or ectoparasites, so rabbits housed outdoors could come in contact with this disease. Clinical signs in rabbits include diarrhea, neurological signs, and death. This disease is reportable in a number of states, so the department of health should be contacted if a possible case is encountered. Wearing gloves, masks, and eye protection are key to preventing disease transmission to people.

Noninfectious Diseases

A number of noninfectious diseases may develop in rabbits, most commonly involving the gastrointestinal tract. Rabbits who present with any gastrointestinal signs (anorexia, weight loss, diarrhea) require a full dental examination. While a speculum or otoscope can be used for a limited view of the teeth, the author recommends that animals presenting for possible gastrointestinal disease be anesthetized for a complete dental examination. In most cases, the author masks the animal down with an inhalant anesthetic. For nervous or high-strung rabbits, the author premedicates with 1–2 mg/kg of midazolam IM (intramuscular) or SQ and reverses the effect with flumazenil upon completion of the examination. Anesthesia allows for radiographs, blood collection, and other diagnostics at the same time. Proper equipment, including an incisor speculum, cheek speculum, strong light source, and Dremel® or dental drill, is needed (Figure 11.5). It should be remembered that all rabbit teeth grow continuously and the health of the incisors do not reflect the health of the cheek teeth. Dental points, abscesses, oral ulcers, and infected teeth can all be identified during a thorough oral examination.

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Figure 11.5. A full dental examination being performed on a rabbit. Note the anesthesia, the equipment, and the positioning.

Another important point regarding gastrointestinal disease is that while there are infectious causes of gastrointestinal disease in rabbits, it is much more likely that the cause is noninfectious *and* the improper use of antibiotics can make the condition worse.

A common presentation of rabbits, especially those with a history of dental and/or upper respiratory disease is excessive lacrimation and periocular crusting. The reason for this is that rabbits have a single ventral nasolacrimal gland associated with each eye, rather than a pair as most other animals do. An obstruction of the duct leads to lacrimation. Most rabbits' ducts can be flushed using just topical anesthesia, such as proparacaine drops. The lower eyelid is then everted and abducted, revealing a "V" in the medial canthus. A 24–26 gauge intravenous catheter is advanced into the duct. A syringe full of saline is attached and pressure is applied to unblock the duct. Sometimes the procedure will have to be repeated to unblock the duct, and in some cases the duct has been permanently damaged and cannot be unblocked.

Another unique problem in rabbits is the development of urinary "sludge." Rabbits have vitamin-D-independent calcium absorption from the intestines. In other words, rabbits absorb almost all of their dietary calcium and then get rid of the excess through



Figure 11.6. Urine passed after expression of the bladder in a rabbit with severe bladder "sludge."

urinary excretion. If rabbits are getting too much calcium, such as found in alfalfa hay, that calcium begins to settle in the urinary bladder and can lead to sludge or sand formation and even to the formation of cystic calculi. Rabbits may present with signs of a urinary tract infection and pass very thick, sandy urine (Figure 11.6). While a small amount of urinary sludge on radiographs can be an incidental finding, it should direct the veterinarian to fully review the animal's diet for excess calcium.

It is also important to note that rabbits can have orange to red urine that is due to porphyrin excretion rather than blood. It is intermittent, lasts for only 3–4 days, and does not cause disease. If there is uncertainty as to the cause of the colored urine, examination of the urine sediment will distinguish between hematuria and porphyrinuria.

Spaying and Neutering

Singly housed intact bucks do not always need to be castrated as testicular disease is rare. Castration is usually utilized to prevent reproduction or for behavioral reasons. Bucks will mature around 6 months of age, so owners may note an increase in aggression or spraying around this time. Neutering is straightforward and is most commonly done with a scrotal approach, as would be done for a male cat. The testes in rabbits can move into the abdomen; gentle pressure on the inguinal canals will usually cause the testes to descend into the scrotum. Do not try to tie

the cord on itself as it is very thick, and it is likely the knot will slip off. Use ligatures instead. A closed castration is recommended to prevent inguinal herniation. The scrotal incisions can be closed with tissue glue or left open.

All does who will not be used for breeding should be spayed regardless if they are housed alone or with other rabbits. Does can be quite aggressive and territorial, more so than bucks. But even more important is that up to 80% of does over the age of 4 years will develop uterine adenocarcinoma (Quesenberry and Carpenter, 2003). Rabbits deposit fat in their broad ligament, so spaying is easier in rabbits less than a year of age. The procedure is very similar to that in a feline but the pedicles are even more friable so care must be taken in handling. (See the chapter on Surgical Techniques for Spay/Neuter chapter for more information on rabbit surgery.)

Adoption Issues

There are few issues with adoption, and most rabbits will make excellent pets. Rabbits who are nervous or shy should not be handled by children, and supervision should occur even when children handle calm rabbits. New rabbits may not always integrate well into a household with resident rabbits.

GUINEA PIGS

Guinea pigs (*Cavia porcellus*), also known as cavies, have been domesticated for between 1000 and 3000 years and are descended from the wild cavies of South America (Quesenberry and Carpenter, 2003). Members of the rodent family, they have been raised as pets and laboratory animals.

Anatomy, Physiology, and Husbandry

Guinea pigs weigh between 700 and 1200 g, and there are a number of breeds, some with short hair and others with very long coats. All have 20 hypsodont (open-rooted) teeth that grow continuously. Dental disease is a common problem in this species and in some cases entrapment of the tongue can occur.

Cavies, being monogastric herbivores, have a very large and thin-walled cecum. Like rabbits, guinea pigs also practice cecotrophy or coprophagy, consuming the cecotrophs directly from the anus; but instead of just in the morning like rabbits, guinea pigs perform this activity multiple times throughout the day.

There are multiple sebaceous scent glands along the dorsum and around the anus used for marking, especially in males. Cavies have large adrenal glands.

An important anatomical feature in sows (females) is that the pubic symphysis is initially fibrocartilaginous and will relax before parturition to allow the large fetuses to pass. After 7–8 months of age, the symphysis fuses if the animal has not had any litters, and the risk of dystocia is greatly increased. Reference physiologic values can be located in Table 11.1.

Gender and Age Determination

Even in young animals, gender determination is straightforward. Male animals (boars) have a smooth horizontal ridge of tissue between the urethral opening and anus and very large testicles that can be retracted due to the presence of open inguinal rings. The penis can be everted with digital manipulation. Sows have a Y-shaped depression in the perineal tissue that surrounds the urethral opening and connects to the anus at the base of the "Y."

As with other small mammals, determining the age of a guinea pig once it is mature is very difficult and cannot be done with much accuracy.

Housing

Guinea pigs should be housed in cages with solid floors to prevent foot problems and mesh walls to provide adequate ventilation. Shredded paper, recycled newspaper pellets, and hardwood shavings (such as ash) can all be used for bedding. Pine and cedar shavings should not be used as their aromatic compounds present a health hazard. Guinea pigs produce a large amount of urine and feces, so it is important that cages are cleaned daily and disinfected routinely.

Cavies are very sensitive to heat, humidity, and drafts. A hide box and a quiet area to place the cage are also vital. As they have continuously growing teeth, it is important to provide appropriate items for chewing such as cardboard boxes or clean, pesticide- and herbicide-free fruitwood branches.

Guinea pigs are social, and intact females or neutered males can all be kept together. They can also be housed in harems, with 1 male kept with up to 10 females.

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Diet

Being herbivorous, guinea pigs should be provided with plenty of fresh, clean grass hay at all times. Pellets should also be offered. Some guinea pigs will become obese if fed free-choice pellets, but most will not. Fresh vegetables and greens should be provided to complete the diet. Only small amounts of fruits and sweet treats should be offered as the digestive system of the cavy is not evolved to handle simple sugars.

An important fact to remember is that guinea pigs cannot make their own vitamin C (ascorbic acid) and must obtain it from their diet. For this reason, only pellets made specifically for guinea pigs should be used as they contain extra ascorbic acid. Vitamin C oxidizes quickly, so it is good to supplement the diet with foods high in vitamin C such as oranges, kale, and peppers. Additionally, cavies can be offered one-quarter of a chewable vitamin C tablet daily, either directly as a treat or crushed and sprinkled on the food.

Guinea pigs have a high daily water requirement, and it is best to use a water bottle to prevent spilling or contamination of the water. Bottles should be emptied and refilled daily so that fresh water is always available.

Grooming

Short-haired guinea pigs will require little in the way of grooming. The long-haired breeds, however, may require extensive grooming to prevent knots, tangles, and matting. Human or cat nail trimmers can be used to trim the nails of most cavies.

Behavior

Guinea pigs make gentle, interactive pets if cared for properly. They will frequently respond to their owners with vocalizations. They bite or scratch very rarely unless they feel threatened and cannot hide.

General Veterinary Care

As with rabbits, clinicians dealing with guinea pigs for the first time should consult detailed veterinary references to aid in the diagnostics, differential diagnoses, and treatment considerations for these animals. A guinea pig who is sick should always be considered to have a guarded to grave prognosis; they do not handle stress or illness well.

Handling

Most guinea pigs will sit calmly on the table and will not require much restraint in order to perform an examination. They should never be left on a table unattended though, as they have a tendency to fall off and injure themselves. When lifting or holding a guinea pig, provide support for the back limbs. If the animal's back end is unsupported they will struggle and flail. For that same reason, keep the animals close to your body rather than out away from you. They will be calmer and more comfortable.

If a cavy is to be carried, support the animal's weight with one hand and arm against the body and the other hand over the dorsum.

Examination

Consistency is the key to a good physical examination. Anorexia is a common presenting complaint, as are respiratory and dermatological problems. A thorough history including diet evaluation, dental examination, abdominal palpation, and abdominal auscultation (listening in the four quadrants for sounds as you would for a horse or ruminant) are very important.

Blood Collection

Except for very small volumes, which can be collected from the saphenous or cephalic vein, the author prefers to anesthetize guinea pigs for phlebotomy. Access to the jugular vein or vena cava is then possible, and other diagnostics can be completed at the same time. Reference laboratory values can be located in Table 11.1.

Infectious Diseases and Zoonotic Concerns

Guinea pigs are extremely sensitive to the effects of certain antibiotics, and their use should be avoided. This includes any antibiotics with a strong gram-positive or anaerobic spectrum, including β-lactams, macrolides, and lincosamides. If indicated, trimethoprim-sulfas, doxycycline, and fluoroquinolones can be used but owners should still monitor for diarrhea. The improper use of antibiotics will lead to enterotoxemia from the overgrowth of *Clostridium difficile*.

Pneumonia is one of the most common diseases seen in guinea pigs, especially if their husbandry is not ideal. A variety of bacteria, and some viruses, can be responsible. It is important that the

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underlying husbandry deficiencies be corrected. One bacteria of note is *Bordetella bronchiseptica*, which can cause severe bronchopneumonia in cavies. Rabbits can be asymptomatic carriers, so they should not be housed with guinea pigs. *Bordetella* can also cause respiratory disease in dogs and cats and, in rare cases, immunocompromised humans. Infected animals should be isolated and placed on antibiotics (trimethoprim-sulfa, doxycycline, or fluoroquinolone) and treated supportively with fluid therapy and assisted feeding.

Guinea pigs are susceptible to ringworm, especially young animals. Most cases are due to *T. mentagrophytes*, although *Microsporum canis* has also been cultured (Quesenberry and Carpenter, 2003). This is a zoonotic concern as well as a problem for cats and dogs. Clinical signs include pruritic, circular alopecic areas with crusts that begin on the face and head and spread over the dorsum and down the limbs. Treatment in most cases involves topical antifungal treatment and correcting any underlying stressors, such as husbandry problems or overcrowding. Disinfection of the environment is critical to prevent disease spread. Bleach at a 1:10 dilution can be used to disinfect the enclosure if the animal is removed and the enclosure is thoroughly rinsed and dried before the animal is returned.

The sarcoptic mite, *Trixacarus caviae*, is the most common ectoparasite in guinea pigs. These burrowing mites cause a severe pruritus leading to excoriations and can be bad enough to cause the animal to seizure. Diagnosis is by skin scrape, and treatment with ivermectin is effective (0.2–0.4 mg/kg SQ q10-14d for three doses). *T. caviae* can cause a temporary infection in humans. Environmental decontamination should be used to ensure all mites are killed. Bleach at a 1:10 dilution can be used to disinfect the enclosure if the animal is removed and the enclosure is thoroughly rinsed and dried before the animal is returned. It is important to make sure all cage furniture and toys are either disposed of or disinfected. The author recommends simple paper bedding and disposable cage furniture during treatment to make decontamination simple.

Noninfectious Diseases

A number of noninfectious diseases may develop in guinea pigs and, as with rabbits, the most common ones involve the gastrointestinal tract. Guinea pigs who present with any gastrointestinal signs (anorexia, weight loss, diarrhea) require a full dental examination, which necessitates anesthesia. The equipment and details are similar to those used in rabbits.

By 5 years of age, 76% of sows will develop ovarian cysts (Quesenberry and Carpenter, 2003). These cysts are commonly asymptomatic and may be unilateral or bilateral. The cysts will continue to grow as the animal ages and can become space-occupying masses. The sow will then commonly present with decreased fertility, anorexia, abdominal distention, and lethargy. Some cysts are functional, leading to bilaterally symmetrical truncal alopecia. The diagnosis is made from the history and physical examination and confirmed by ultrasonography. Ovariohysterectomy (removal of ovaries and uterus) or ovariectomy (removal of ovaries only) is the recommended treatment.

Spaying and Neutering

Singly housed intact boars do not always need to be castrated as testicular disease is uncommon and most intact males will make good pets. The main reason for castration is to prevent reproduction or to be able to house multiple males together. Neutering is straightforward and performed with a scrotal approach. The testes can move into the abdomen, but gentle pressure on the inguinal canals will cause the testes to descend into the scrotal sac. The tunic is very wide and should be ligated with suture. A closed technique is recommended to prevent inguinal herniation, and the scrotal incisions can be closed with tissue glue.

Sows are most commonly spayed to treat ovarian cysts, as described above. Elective ovariohysterectomy can also be performed. Important surgical points to consider include the relatively cranial position of the ovaries, the short ovarian ligament that can make it difficult to exteriorize the ovaries, and the massive amount of gastrointestinal viscera present in the abdomen that must not be disturbed or irritated.

Adoption Issues

There are few issues with adoption, and most guinea pigs will make excellent pets. They do require some specialized care and considerations that potential owners should take into account.

Generally, guinea pigs can be adopted into households with other cavies if a few recommendations are followed. First, two intact boars cannot be housed together. Neutering is an option in that case. Owners also need to make sure sufficient space is being provided for the additional cavies, so that animals have their own hiding boxes and food dishes to prevent fighting or food dominance.

CONCLUSION

Shelters that are housing small mammals in addition to dogs and cats are obligated to provide them with proper husbandry and appropriate medical care. Adopters of small mammals are encouraged to take these animals to a veterinarian familiar with their care to ensure continued good health and quality of life.

REFERENCES

Bell, J.A. (1999) Ferret nutrition. *Veterinary Clinics of North America: Exotic Animal Practice*, **2**, 169–192.

Carpenter, J.W. (2005) *Exotic Animal Formulary*, 3rd edn, Elsevier Saunders, St. Louis, MO.

Harkness, J.E. and Wagner, J.E. (1995) *The Biology and Medicine of Rabbits and Rodents*, 4th edn, Williams & Wilkins, Philadelphia, PA.

Ivey, E. and Morrisey, J. (1999) Ferrets: Examination and preventive medicine. *Veterinary Clinics of North America: Exotic Animal Practice*, **2**, 471–494.

Johnson-Delany, C.A. (1996) *Exotic Companion Medicine Handbook For Veterinarians*, Wingers Publishing, Lake Worth, FL.

Lewington, J.H. (2007) *Ferret Husbandry, Medicine, and Surgery*, 2nd edn, Saunders, New York.

Moore, G.E., Glickman, N.W., Ward, M.P. *et al*. (2005) Incidence of and risks factors for adverse events associated with distemper and rabies vaccine administration in ferrets. *Journal of the American Veterinary Medical Association*, **226**, 909–912.

Poole, T.B. (1967) Aspects of aggressive behavior in polecats. *Zeitschrift fur Tierpsychologie*, **24**, 351–364.

Powers, L.V. (2009) Bacterial and parasitic diseases of ferrets. *Veterinary Clinics of North America: Exotic Animal Practice*, **12**, 531–562.

Quesenberry, K.E. and Carpenter, J.W. (2003) *Ferrets, Rabbits, and Rodents: Clinical Medicine and Surgery*, 2nd edn, Saunders, St. Louis, MO.

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12
Reptile and Amphibian Care in the Animal Shelter

Natalie Isaza and Ramiro Isaza

INTRODUCTION

Reptiles and amphibians are popular pets in the United States. In 2004, an estimated 4% of American households owned reptiles, and during the 1990s, about 2 million live reptiles were imported each year into the United States (Jacobson, Heard, and Isaza, 2006). With the availability of many reptile and amphibian species at pet stores, herpetology trade shows, and via the Internet, it is inevitable that many of these animals are obtained by individuals unfamiliar with their natural history and proper husbandry. Many animals are subject to unintentional neglect and abuse due to the owners' lack of knowledge about the particular species' needs. Inexperienced owners may become overwhelmed with the husbandry requirements and relinquish their pets to the shelter. Still others are abandoned when owners move, or are relinquished to shelters when their owners realize that the pet has grown too large or aggressive to properly care for. Some are inappropriately released into the wild to fend for themselves and may be trapped and brought to shelters as nonnative, invasive wildlife.

Animal shelters should be a place of temporary housing only, as many of these species require specialized care that cannot adequately be delivered long term by a shelter that may be more accustomed to handling dogs and cats. This chapter will concentrate on providing basic husbandry guidelines for both reptiles and amphibians in the animal shelter, including feeding and nutrition, and aid the veterinarian in the recognition of common diseases found in captive species. It is not meant to be a comprehensive guide to reptile husbandry and medicine. For more detailed descriptions of diagnostic procedures, medicine, and surgery of reptiles, the following excellent textbooks found in the reference list are suggested reading: (De Vosjoli, 1999; Wright and Whitaker, 2001; O'Rourke and Schultz, 2002; O'Rourke and Schumacher, 2002; Ballard and Cheek, 2003; Mayer and Martin, 2004; McBride and Hernandez-Divers, 2004; Mitchell, 2004; Wappel and Schulte, 2004; Mader, 2006).

SHELTER POLICIES

Prior to accepting reptiles into a shelter, a thorough review of local laws pertaining to reptile and amphibian ownership is necessary. Federal, state, county, and municipal regulations may impose restrictions on ownership of particular species. For example, ownership of venomous species in many areas of the country is either strictly regulated or banned altogether. From these laws and ordinances, shelter policies regarding reptiles should be developed that conform to the law. Specifically, shelter managers should know which species can be legally accepted by the shelter and who to contact regarding disposition of illegal species.

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Shelters must develop a policy that addresses their role in dealing with routinely presented "pet" reptiles and amphibians. Shelter management should provide regular staff training on safe handling and husbandry of reptiles. These policies should outline the typical length of stay, which employees will provide care, and how and where the animals will be cared for in the shelter. Policies that address the disposition of both native and non-native reptile species should also be in place. Many non-native exotic species can be potentially harmful to the environment and should never be released into the wild. In contrast, native wildlife species often are relinquished as "pets" or presented to the shelter as nuisance species. These animals can potentially be released back into the wild but must be correctly identified and evaluated for injuries or illnesses stemming from their captivity or capture. Ideally, the shelter should work closely with licensed rehabilitators or state wildlife agencies to determine the best habitat for release. See the chapter about the temporary care of wildlife in shelters for more information.

Another policy and plan is needed for accepting and housing potentially dangerous reptiles and amphibians. These include venomous species, carnivorous reptiles such as large constricting snakes, large monitor lizards, and most crocodilian species. Housing these species often requires specialized caging, equipment, and training that is difficult to provide in a shelter. Individuals with expertise in handling these species should be contacted immediately, and consideration should be given to housing the animals at a facility that can provide specialized care. Dangerous and/or venomous species should not be housed in an animal shelter, nor be handled by inexperienced personnel.

BASIC SHORT-TERM HUSBANDRY AT THE SHELTER

Simple adaptation of dog and cat cages, without regard for the husbandry and security necessary for reptiles, will usually fail to provide adequate housing for these species. If adequate husbandry cannot be provided, it is strongly recommended that shelters find alternative placement for reptile species, especially if the animals are involved in a legal investigation that will require evaluation by a veterinarian with experience handling these species and long-term care pending resolution of the case. Whenever possible, it is best to compile ahead of time a list of experienced veterinarians and options for alternative placement in order to avoid last-minute, emergency crisis responses.

Shelter staff may also be unsure about the correct identification of reptile species, so it is recommended that all reptiles admitted to the shelter be properly identified by a local herpetologist or someone familiar with reptiles and amphibians. This identification is the key component to formulating a basic husbandry plan for that particular species, as there are many species of reptiles, and many come from distinctly different geographic areas of the world.

Identification and Medical Records

All animals should have a unique identification number and separate medical record that meets the standards recommended for dogs and cats at the shelter. It is unacceptable to use a single record for groups of animals. Verifiable, individual animal identification is necessary to link the animal to their medical record information. Sterilely implanted transponders (microchips) are ideal for individual identification, but are expensive and difficult to place in very small animals. Alternatively, temporary markings such as nontoxic paint used to number tortoise shells, or fingernail polish for coloring lizard nails may work to temporarily identify individual animals. Avoid permanent marking techniques such as clipping toes or scales, or the use of external skin-piercing tags, as these procedures are painful and can lead to infections or other medical complications.

Reptile and Amphibian Housing Area

Ideally, shelters should have an area separate from dog and cat holding areas to house reptiles and amphibians. The elevated ambient temperatures required in reptile areas make it impossible to maintain an optimal temperature for both mammals and poikilotherms (cold-blooded) housed in the same room. An area dedicated to reptiles should be maintained at a temperature between 80–85°F. If a full room cannot be dedicated to their housing, then provisions need to be made for increasing the air temperature around the enclosures. Chemicals routinely used in cat and dog areas for disinfection, topical sprays and other products used for external parasite control, and insecticides used to control pests may be toxic to many reptiles and amphibians and should not be used in their areas. Visual, auditory, and olfactory stimulation that occur when housing reptile and

amphibian species in a room of carnivorous mammals can be a subtle but pervasive stressor. Alternatively, escapes of large carnivorous reptile species into an area housing dogs and cats can have serious consequences.

Quarantine

Keeping individual animals in separate enclosures is the best practice when providing short-term care for reptiles. The full duration of time that these animals are kept in the shelter should be considered a form of quarantine. The segregation of individual animals is an important barrier to the spread of infectious pathogens. Reptiles are generally not social species and are often stressed if housed with other animals. Territorial aggression and cannibalism are common when reptiles are housed together, and animals previously housed together may change their behavior when placed in a new environment. Separate caging also provides the opportunity to assess individual animals as they adapt to their new environment.

Sanitation

In shelters the need for effective sanitation is critical. Waste accumulation within an enclosure can increase the potential pathogen load in a contained environment. A routine cleaning and disinfection protocol should be a regular part of the husbandry practices for reptiles and amphibians. All animals must be removed from their enclosures prior to cleaning and disinfection. The first step in sanitation is to remove all gross contamination from the enclosure. Waste must be physically removed before the enclosure is cleaned with a mild detergent and water, which will remove any residual organic matter prior to disinfection. A disinfectant can be applied to the cleaned and dry surfaces, allowing adequate contact time before rinsing thoroughly. Recommended disinfectants include dilute bleach solutions (1:32) and quaternary ammonium compounds (diluted as directed on the label). Phenolic and glutaraldehyde compounds are toxic to many reptile and amphibian species and should never be used. Some species with delicate skin may be very sensitive to even "safe" chemicals used for cleaning and disinfection; thorough rinsing of enclosure surfaces with clean water following disinfection is essential.

Sanitation before housing new groups of animals is very important to prevent disease transmission. All contaminated components of the enclosure that are impossible to disinfect (e.g., wood, cardboard boxes) should be discarded. All enclosures should be completely dismantled and the components thoroughly disinfected prior to use by another animal. Objects that will be reused should be soaked in disinfectant solution, thoroughly rinsed with water, and dried in the sun if possible. Many pathogens including viruses, fungi, and mites can spread between animals due to improper sanitation of contaminated caging materials.

Enclosure Design

Reptiles and amphibians will escape from poorly designed and unsecured enclosures. Once out, many are able to find very small hiding places and can be almost impossible to locate and recapture. Small, disposable plastic containers with securely sealing lids, drilled with small air holes for ventilation, can be used for very small species. Larger, plastic "sweater boxes" with similarly drilled ventilation holes and securely fitting lids can be used for larger snake and lizard species. Aquariums with screen tops can also be used, but must be secured with weights, clips, or elastic bands to prevent escape. Larger, professionally designed cages are generally more secure, but may require an additional lock to prevent escape.

Enclosure Size

The quality of available space must also be appropriately matched to the environmental needs of each particular species. Arboreal or tree-living species should be given vertical space to climb, terrestrial species should have room to explore their horizontal space, and aquatic species should have adequate space for both swimming and basking (exposure to warmth.). Cage size considerations should be tailored to the size and species of the animals presented. In general, minimal cage size area should be at least one and one-half times the animal's total body length, so the animal is able to move and stretch completely within the enclosure. For snakes, the perimeter of the enclosure should be longer than the length of the snake. Most common reptile species can be kept in 10–20 gallon aquarium enclosures. However, a large adult iguana or adult tortoise may need a much larger cage. In such cases zoos, rescue groups, or herpiculture hobbyists may be able to provide the needed caging in alternative locations.

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Enclosure Types

The most basic enclosure is a terrestrial cage typically used for snakes or small lizards. Using materials readily available at pet stores or online, and with simple configurations, the majority of pet reptiles and amphibians can be housed appropriately for short-term care at a shelter. The most simple cage design consists of a primary enclosure, such as an aquarium, with a secure wire mesh top (see Figure 12.1). Aquariums or plastic cages are preferred because their surfaces are nonporous and easy to disinfect. The recommended setup includes clean newspaper as a substrate; a hiding place such as an overturned cardboard box; a removable heavy ceramic water bowl; and a focal secondary heat source. This design can be modified to simulate specific environmental conditions (see Figure 12.2). For example, the cage can be made to mimic a dry desert environment by placing a smaller water container, increasing ventilation, and providing additional heat. Alternatively, a more humid environment can be simulated by providing a larger water bowl, periodic manual



Figure 12.1. Simple terrestrial enclosure showing basic components including two secondary heat sources, UVB light, hiding area, newspaper substrate, and water bowl. Two thermometers in the aquarium document the temperature differences in separate areas of the enclosure. A hygrometer estimates the relative humidity.

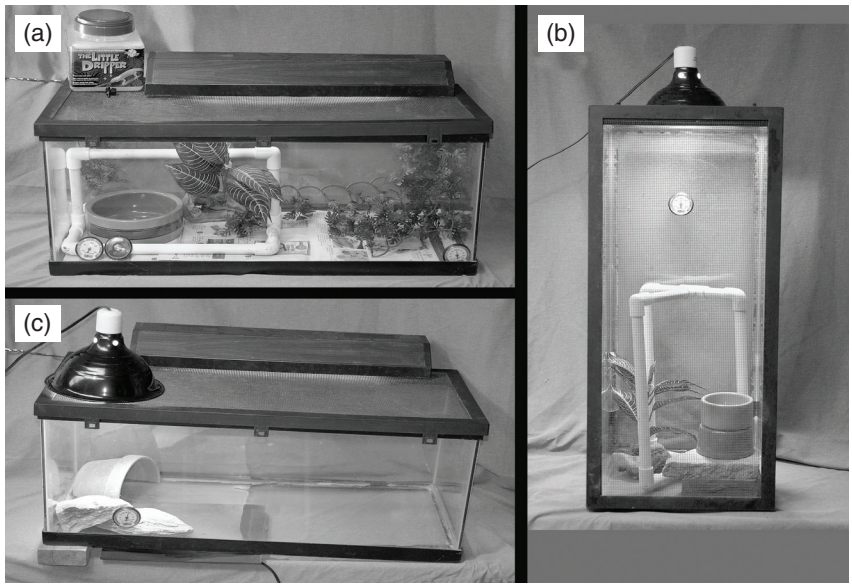


Figure 12.2. Modifications of a simple terrestrial enclosure to provide different habitats. (a) A humid terrestrial enclosure, with a perch and plastic plants for hiding. This enclosure lacks a secondary heat source and would be adequate for most amphibians. (b) An arboreal terrestrial enclosure with a tall perch and elevated water bowl. The heat lamp is placed above the perch to encourage basking behavior. (c) A semi-aquatic terrestrial enclosure, with the aquarium tilted slightly so that half of the floor surface is flooded with water. The terrestrial portion provides a hiding and basking area with two secondary heating sources.

misting with water, and decreasing the ventilation. An arboreal humid environment can be simulated by changing the orientation of the cage to stand on its end, placing elevated perches and adding a continuous water drip system. A semi-aquatic environment can be simulated by providing a larger removable water container that covers about half the ground area, designed so that the animal can choose to fully submerge or move to a dry area for basking. A true aquatic environment can be simulated by modifying a typical filtered aquarium used for fish. Although aquatic reptiles and amphibians can live most of their lives submerged in water, most still require an area where they can choose to leave the water and bask. Stacks of rocks or other solid objects can be partially submerged to provide a dry basking area, or floating platforms can be placed in the tank. In aquatic environments, water quality must be maintained to the standards required by fish. Minimally, adequate mechanical filtration and frequent water changes are needed to remove particulate material and waste products. More elaborate biological and chemical filtration systems used in fish tanks can be added to provide optimal water quality.

Enclosure Substrate

For most shelters, multiple layers of clean, recycled newspaper are the best and most practical choice of substrate. Newspaper is readily available, allows for easier cleaning, and is totally disposable. Other substrates that are often used but not recommended for short-term shelter care include particulates such as pebbles, sand, aspen wood chips, pelleted corn cob, rabbit food pellets, and cypress mulch. These products tend to trap moisture and waste products, and are impossible to properly clean and disinfect. Use of sand or pebbles can result in gastrointestinal impactions or mouth injuries if the animals ingest these particles during feeding. Aromatic wood chips from cedar, pine, and redwood should be avoided as they can be toxic and irritating to tissues. Corn cob pellets should be avoided because they tend to become moldy when moistened. Cat litter should never be used because it is a desiccant and can cause severe dehydration in reptiles and amphibians.

Enclosure Furniture

Each enclosure should provide an appropriate hiding place such as an overturned cardboard box, section of clean PVC pipe, or half of a ceramic glazed clay pot. These hiding areas should be dark and relatively small so that the animal is able to remain hidden within their enclosure. Most simple enclosures should contain solid objects such as rocks or branches for rubbing and climbing. A removable, wide-based, heavy water bowl should be placed within the enclosure. The size and depth should allow animals to drink yet permit exit from the bowl to prevent drowning. Most terrestrial species should not have access to a water bowl so deep and large that animals immerse themselves completely and excessively soak in its water.

Enclosure Temperature

Poikilotherms behaviorally regulate their body temperature to a species-specific preferred optimal temperature range (POTR) using external heat sources. These animals must be able to effectively "choose" their body temperature from heat sources in the environment in order to meet their varying thermal requirements. If kept too cold, chronic hypothermia may cause immunosuppression, delayed digestion, and lethargic behavior. Conversely, even moderate elevations in temperature beyond an animal's POTR can lead to hyperthermia, thermal burns, or acute death. Reptiles receive heat from two external sources that can be controlled in captivity: ambient air temperature and secondary radiant heat.

Ambient air temperature is the average temperature of the room. This is considered to be the primary and most important heat source for the reptile enclosure and should be closely regulated to between 80°F and 85°F for most species. Most indoor mammal rooms at shelters are kept at ambient temperatures that are too cold for most poikilotherms and often are poorly regulated at night and in the winter. In addition to the room temperature, each enclosure should have at least one secondary heat source. The secondary heat should be localized to a specific area within the enclosure that provides a thermal gradient of about 10°F. This warm area should be at the upper range of the POTR, while other areas of the enclosure may be at the lower portion of the temperature range. This is a key concept in reptile husbandry that allows the poikilotherms to maintain their body temperature as they move around their enclosure, thus giving them the ability to choose and maintain optimal body temperature in a captive environment.

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There are two types of secondary focal heating for the enclosure. Radiant heat from the ground warms the ventral surface of the animal and is similar to heat radiating from a warmed surface in the natural environment, like a rock that has been warmed by the sun. Examples of ground-heating elements include heating pads or thermal wires placed under the cage. A second type of heat is a radiant source from above the enclosure. This heat is intended to mimic the heat produced by the sun; examples include light bulbs and ceramic heat lamps placed above the cage. The heat produced by either type of heat source should be thermoregulated and diffuse enough so that selected spots within the cage do not become excessively hot. A rule of thumb is that once a heater is installed and has equilibrated, the surface that the animal will rest upon should not burn or feel hot to the human hand after about a minute of touching the surface. Heating elements should never be placed directly within the enclosure. Placing the heat source outside the enclosure prevents the animal from climbing onto the heating elements, which can result in severe thermal burns. Removable thermometers can be placed inside the cage to document that a proper thermal gradient is established, and all areas of the cage are within the preferred optimal temperature range.

Enclosure Humidity

Requirements for humidity are very species specific and often seasonal. Although the fine details of humidity regulation are important for breeding and long-term care, maintaining humidity between 30% and 80% is acceptable for most species. Similar to a temperature gradient, an area of higher humidity should be available in the enclosure. Extremes of humidity for the entire enclosure should be avoided and can be controlled by providing open water containers; larger water bowls provide more surface area for evaporation. Spraying water into the cage periodically, providing water-soaked absorbent material, or setting up a water drip system are other methods of increasing humidity. Humidity can be measured periodically using a hygrometer placed within the cage.

Enclosure Lighting

In nature, sunlight provides a full spectrum of radiation for animals, as well as proper photoperiods with ambient day/night cycles. In captivity, all reptiles and amphibians should be provided with appropriate lighting and photoperiods that attempt to mimic natural sunlight. In fact, the best source of light for any species is unfiltered natural sunlight. This can be provided by the use of outdoor enclosures, or access to natural light within a room. Reptiles should not be kept in a dark room without any light. Enclosures that provide improper lighting or lighting that lacks the proper UVB spectrum can be a potential source of stress in these animals. Another common husbandry mistake is to use a light as a secondary heat source 24 hours a day. Reptiles and amphibians should be exposed to no more than 10–14 hours of light per day. Although these secondary light sources do provide heat, the light results in an endless day for the animals within the enclosure and disrupts natural photoperiods. For short-term care, the intensity and quality of lighting can be typical of most indoor areas designed for human working conditions.

The quality and intensity of the light is more important for herbivorous and omnivorous reptile species that utilize infrared light as their primary method of activating vitamin D precursors in the skin to synthesize metabolically active vitamin D. These species need light that produces ultraviolet radiation in the range of 290–320 nm. This range of light is most effectively provided by daily exposure to natural, unfiltered sunlight. When animals are kept indoors, most commercial lights do not produce adequate amounts of light within that range. Therefore, specially designed and labeled UVB lights should be purchased for use in reptile enclosures. The lights need to be placed within 12–18 inches of the cage and not be filtered through glass or acrylic. Because the effective delivery of the correct spectrum of light from each bulb is both limited and unpredictable, the bulbs should be replaced at 6–12-month intervals.

Food and Water

Poikilotherms need to ingest fewer calories compared to mammals and birds, and should be fed comparatively smaller amounts at decreased intervals. Reptile diets should be of good quality, nutritionally balanced, and appropriately presented. There are three types of reptile and amphibian diets: carnivorous, omnivorous, and herbivorous.

Carnivore Diet

Carnivorous reptiles eat primarily animal tissues, which can include a full range of vertebrates and

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invertebrates found in the animals' natural environment. In captivity, the typical carnivore diet consists of commercially raised rodents. Species that eat whole animals tend to have few nutritional problems if fed high-quality mice and rats. However, feeding live prey in the shelter environment should be avoided because live prey may injure the reptile. Frozen rodents of various sizes can be purchased online or at pet stores for feeding and are preferable to live animal feeding. Additionally, commercially prepared carnivorous reptile diets are available and provide an alternative to whole animals; they can be used as short-term substitutions for whole prey. The substitution of commercial dog or cat food for whole animals is not recommended for carnivorous reptiles and amphibians. The most common problem in carnivorous species is overfeeding leading to obesity. Most of these species should not be fed more than one meal every 1–2 weeks; some larger species only require feeding once a month.

Insectivorous carnivores need a variety of insects and other invertebrates to provide a nutritionally balanced diet. In captivity, these diets may include mealworms, crickets, wax worms, fruit flies, termites, ants, pill bugs, grasshoppers, moths, earthworms, bloodworms, crayfish, and krill. Using only one or two commercially available insects like mealworms and crickets makes it difficult to provide sufficient variety for adequate nutrition. Additionally, mealworms and crickets have excessively tough chitin exoskeletons, and their ingestion can lead to the development of gastrointestinal impactions. These insects often lack the nutritional value of other insects that the animal may find naturally in the wild, and ingestion of these commercially raised insects in long term may lead to the development of metabolic bone disease. Commercially available insectivore diets designed for reptiles are helpful in supplying the missing components of insectivorous diets and can be useful in a shelter. Most insectivores should be fed every 1–2 days.

Omnivore Diet

Many reptiles eat a mixture of plants and animals, but the ratio of plant to animal must be tailored to meet the requirements of the species being offered the diet. In general, many species will accept the same insects listed for the insectivore diet above. For some of the larger species, rodents, cooked meat, and commercially available carnivore diets can replace the insects. These protein sources should be added sparingly, generally consisting of approximately 10–30% of the total diet. The remainder should be a mixture of fresh vegetables, including pre-packaged spring salad mixes, collard, mustard, kale greens, sweet potatoes, carrots, peas, beans, corn, dandelion greens, and alfalfa hay. Commercial omnivore diets are available and can be used as a short-term substitute or to supplement the diet described above. Omnivores vary in the frequency of their requirements for feeding; those consuming mostly vegetables should be fed every 2–3 days, and animals consuming more meat can be fed less often.

Herbivore Diet

It is difficult to provide a balanced diet for strictly herbivorous reptiles. A typical herbivore diet consists of a majority (60%) of leafy greens, vegetables, browse (tender shoots, leaves, or twigs of shrubs and trees), and grasses. The diet should contain a varied mixture of fresh vegetables including collard, turnip, mustard, kale greens, carrots, zucchini, squash, sweet potato, bell peppers, and dandelion greens. Examples of browse species to be included in the diet are hibiscus and mulberry tree leaves. Fresh cut grass and good-quality hays can also be added. Fruits should be limited to 20–25% of the total diet and should include bananas, grapes, raspberries, blueberries, strawberries, mangos, cantaloupe, papayas, and apples. Fruits and vegetables that are readily available at grocery stores and safe for human consumption are generally safe for reptiles as well. Approximately 10–15% of the diet can be grain products, including cereals, bread, rice, corn, and pasta. The smallest portion of the diet (1–5%) should consist of non-animal proteins such as tofu, beans, peanuts, and bean sprouts. Many nutritionists recommend dusting the diet with a reptile-formulated vitamin and calcium powder. Commercially prepared herbivore diets are also available and can be used to supplement up to 50% of the above diet. Most herbivores should be fed every 1–2 days, taking care to remove uneaten food within a few hours to avoid spoilage.

Water

Access to clean, fresh water should be provided to all reptiles and amphibians and should be changed

at least once daily. Some desert-adapted animals can obtain most of their water from the food they eat, but in a new environment many will drink to compensate for dehydration. Some species prefer to obtain water from licking damp surfaces or while being sprayed with a mist of water. Debilitated animals adapting to new environments must often be encouraged to drink by placing them in a shallow water bowl for 15–30 minutes every day. These animals must be monitored during soaking for overall weakness, which may make them unable to leave the water bowl on their own.

Weight Charting

Every animal should be weighed at least weekly to monitor changes in body weight. Weights should be recorded in the animal's medical record and graphed to indicate trends. Increases or decreases in body weight of 10% or more should lead to further evaluation by a veterinarian.

INITIAL ASSESSMENT

Reptiles and amphibians are highly diversified vertebrate classes with over 10,000 identified combined species. The class Reptilia contains the orders Squamata (snakes, lizards, and amphisbaenids), Testudines (turtles and tortoises), Crocodylidae (alligators, caiman, crocodiles, and gharial), and Rhynchocephalia (tuataras). The class Amphibia contains the orders Anura (frogs and toads), Caudata (salamanders), and Gymnophiona (caecilians). A list of some of the most common species seen in the American pet trade along with basic husbandry information is given in Table 12.1.

Table 12.1. Short-term husbandry recommendation for common pet reptiles and amphibians.

Common name	Scientific name	POTR (F)	Humidity (RH%)	Enclosure type	Secondary heat source	Light type	Diet type
Boa constrictor	*Boa constrictor*	80–85	50–80	ST	Under	N	CR
Ball python	*Python regius*	80–85	50–65	ST	Under	N	CR
Burmese python	*Python molurus bivittatus*	80–85	60–80	ST	Under	N	CR
Corn snake	*Elaphe guttata*	77–85	40–70	ST	Under	N	CR
Green iguana	*Iguana iguana*	85–95	50–80	AT	Heat lamp	U	H
Leopard gecko	*Eublepharis macularius*	77–85	40–70	ST	Under	N	CI
Bearded dragon	*Pogona vitticeps*	84–90	30–50	DT	Heat lamp	U	OM
Uromastyx	*Uromastyx* sp.	85–98	30–50	DT	Heat lamp	U	H
Savannah monitor	*Varanus exanthematicus*	80–88	50–80	ST	Heat lamp	N	CR
Veiled chameleon	*Chamaeleo calyptratus*	80–88	60–90	AT	Heat lamp	U	CI
Red-eared slider	*Trachemys scripta elegans*	80–84	60–90	AQ	Heat lamp	U	OM
Box turtle	*Terrapene*	80–89	50–80	ST	Heat lamp	U	OM
Leopard tortoise	*Geochelone pardalis*	80–88	40–70	ST	Heat lamp	U	H
African bullfrog	*Pyxicephalus*	75–80	50–70	AT	None	U	CG
Ornate horned frog	*Ceratophrys ornata*	75–80	50–70	AT	None	U	CG
Whites's tree frog	*Litoria caerulea*	75–80	40–60	ST	Heat lamp	N	CI
Marine toad	*Bufo marinus*	70–80	40–60	ST	Under	N	CG
Poison dart frog	*Dendrobates* sp.	70–85	70–90	HT	None	U	CI

POTR, preferred optimal temperature range (Fahrenheit) for each listed species; ST, standard terrestrial setup; AT, arboreal terrestrial setup; DT, desert terrestrial setup; AQ, aquatic setup; HT, humid terrestrial; Under, heat source placed under the enclosure; Heat lamp, heat lamp placed above the enclosure; CR, carnivore rodent; H, herbivore; CI, carnivore insects (insectivore); OM, omnivore; CG, carnivore general, eating both rodents and insects depending on species and size.

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History

Documentation of the history of each animal entering the shelter is ideal, and the information should be recorded in the animal's record. Important questions to ask include: Why was the animal brought to the shelter? Where was the animal purchased? Who legally owns the animal? How long has the animal been in captivity? What was the prior husbandry? What was the previous diet? How many animals were in the collection? Did any animals in the collection die or become ill? Were different species mixed together?

Warmth and Shelter

Following initial assessment and depending on their condition, many reptiles and amphibians admitted to the shelter may require supportive medical care. The first step is to provide a warm, stress-free environment. Examination of a weak, cold, and stressed animal can precipitate rapid decompensation. In contrast, providing a period of warmth and rest prior to examination will allow the animal to stabilize. Ideally, debilitated animals should be placed in a prewarmed incubator with supplemental oxygen and a hiding place available. During this preliminary period of rest, placing the animal in a warm water bath to soak for a short period of time may help in rehydration (Figure 12.3).



Figure 12.3. White's tree frog being rehydrated in de-chlorinated water bath.

Physical Examination

Shortly after admission and assuming the animal is stable, a complete physical examination should be performed. Documentation of physical examination findings provides the baseline data used to evaluate the subsequent care received at the shelter, as many animals in poor condition at presentation rapidly improve after receiving proper care and nutrition. Initial physical exam findings can also be used as legal evidence of preexisting conditions and can support findings of neglect or abuse. Photographic documentation of the animal at initial presentation is recommended in all cruelty and neglect cases, just as with mammals involved in legal cases.

Radiographs

If the shelter has access to an X-ray machine, it is strongly recommended that a survey radiograph be taken at admission, especially if underlying disease is suspected. It is the best tool for diagnosing multiple diseases that reptiles suffer from. It is the simplest way to document bone density and fractures due to metabolic bone disease. Additionally, evidence of gastrointestinal foreign bodies, bladder stones, and pneumonia can be documented that might otherwise have been missed during a routine physical examination (see Figure 12.4). Initial radiographs can also be extremely valuable evidence in cases undergoing legal investigation.

Laboratory Samples

Routine collection of blood samples for CBC and plasma chemistry can be considered on an individual basis. During the initial assessment, a small blood sample for packed cell volume (PCV), total protein, glucose levels, and a blood smear can give valuable preliminary information. Fecal samples can be collected to document and evaluate the intestinal parasite load.

Fluids

Many reptiles and amphibians may present in a state of dehydration. Signs of dehydration include dry, tacky oral and cloacal mucous membranes, sunken eyes, and abnormally dry feces or urates. Urates, composed of uric acid, are the white, chalky urine of most terrestrial reptile species. Healthy, well-hydrated reptiles pass urates in a moist, semi-solid form that eventually dries into a solid

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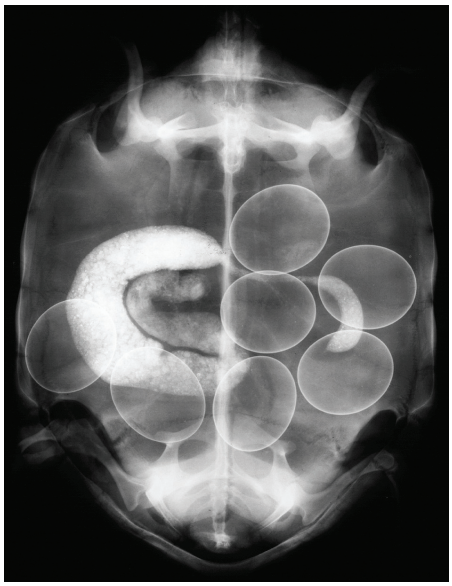


Figure 12.4. Survey dorsal-ventral radiograph of a tortoise showing sand in the intestinal tract and seven eggs in the reproductive tract. These radiographic findings would not have been detected on routine physical examination.

chalky mass. In addition to treating by soaking as previously described, parental fluids can be administered during the initial assessment by subcutaneous (SQ) or intracoelomic injections (Intracoelomic refers to within the body cavity). Lactated Ringer's solution is a good fluid choice and is usually readily available in most shelter clinics. Generally, daily fluid maintenance requirements are 10–30 ml/kg per day. Severely dehydrated animals should be rehydrated over 3–4 days to avoid overwhelming the circulatory system.

Antibiotics

Gram-negative septicemia and focal gram-negative infections are common in reptiles and amphibians who have been subjected to prolonged poor husbandry and inadequate care. However, other bacterial pathogens including gram-positive and anaerobic bacteria should also be considered. Ideally, antibiotic treatment choices should be guided by culture and sensitivity results. However, many shelters are prohibited by budget constraints from performing routine culture and sensitivity tests. If antibiotics are used without culture and sensitivity results, care should be taken to ensure that the drug chosen will have appropriate efficacy against most of the common reptile pathogens. Commonly used antibiotics include enrofloxacin (5 mg/kg PO (orally) or IM (intramuscularly) every 1–2 days), amikacin (2.5–3 mg/kg IM every 3 days), trimethoprim sulfadiazine (20–30 mg/kg PO or IM every 1–2 days), ceftazidime (20 mg/kg IM every 3 days), ceftiofur (2–4 mg/kg IM once per day), and azithromycin (10 mg/kg PO every 5 days) (Carpenter, Mashima, and Rupiper, 2000, Coke *et al*., 2003). Older dosage recommendations for gentomycin found in the veterinary literature are associated with the development of renal disease and subsequent renal failure in reptiles and amphibians and should not be used.

Analgesics

Reptiles and amphibians do feel pain, and analgesics for pain control should be administered in reptiles and amphibians, if indicated. Reptiles are very stoic (as are most wild animals) and difficult to assess for pain. There are not any objective pain-rating scales or published descriptions. If it looks like it hurts, it probably does and therefore should be treated. The selection of narcotics for use in reptiles is currently controversial, with several studies showing confounding species-specific results and wide dosage range recommendations. Studies in turtles, bearded dragons, and green iguanas have shown that morphine (0.4–2.0 mg/kg IM or SQ every 12 h) and buprenorphine (0.02–0.2 mg/kg IM or SQ every 12–24 h) are more effective than butorphanol for acute pain control (Schumacher and Yelen, 2006, Sladky *et al.,* 2007; Sladky, Kinney and Johnson, 2008). Several textbook sources have mentioned the use of meloxicam (0.1–0.2 mg/kg PO once daily) in reptiles, but the relative analgesic effects and safety of this drug have not been studied fully in reptiles or amphibians. Where appropriate, bupivacaine (1–2 mg/kg local infusion every 4–12 h), or lidocaine (2-5 mg/kg local infusion every 4–12 h) can be used as local nerve blocks for analgesia (Schumacher and Yelen, 2006). Nerve blocks were confirmed to be effective in crocodilians given mepivacaine (1 mg/kg single tissue infusion) for dental extractions (Wellehan, Gunkel and Kledzik, 2006).

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Salmonellosis

Reptiles and amphibians, and most notably turtles, have been implicated in the spread of Salmonella to people. According to the Centers for Disease Control (CDC), an estimated 70,000 people get Salmonellosis from contact with reptiles in the United States each year (http://www.cdc.gov/healthypets/animals/reptiles.htm). As with most cases of zoonosis, young children, elderly persons, and those with weakened immune systems are more likely to develop severe illness from the infection. It should also be noted that since 1975, it has been illegal in the United States to sell or distribute turtles with shells that measure less than 4 inches in length because of this disease. While there have been documented cases of Salmonellosis in people after handling reptiles, it should be noted that many animals, including dogs, cats, and horses, have the ability to shed these organisms and infect the people handling them. Proper hand washing after handling all animals should be standard practice, especially in a shelter situation, to prevent the spread of all zoonotic diseases, including Salmonella.

SNAKES

Although snakes include a large and diverse group of animals, different snake species have many things in common. All snakes are carnivorous, usually consuming only whole, fresh prey. Most of the common snake species in the pet trade will eat rodents. Snakes generally do well in simple terrestrial enclosures with newspaper as a substrate. Snakes are also very adept at escaping from poorly secured enclosures and then hiding in obscure locations.

Physical Examination

Most snake species popular as pets are usually docile and may be used to being handled. Most snakes, if approached quietly and handled gently, can usually be examined with minimal restraint. Snakes are most comfortable when their heads are free and their bodies are well supported. Snakes who are acting aggressively, either by positioning themselves into a coiled defensive posture or attempting to strike, can be restrained by grasping the neck just caudal to the skull after first placing a towel or newspaper over the head.

The assessment of snakes should begin with observing them in their enclosure. Normal snakes should be active and alert in their enclosure and during subsequent handling. They should have strong body tone with the ability to hold their bodies appropriately. They should be actively investigating their surroundings and flicking their tongues often. Snakes lack movable eyelids and external ear canals. Unless they are in the process of shedding, the eye caps covering the corneas should be clear and smooth. The snake should resist opening the mouth for an oral examination, but this can be achieved by placing a soft but firm object (e.g., a soft plastic spatula) gently into the mouth. The mucosa and gingival surfaces should appear smooth, moist, and pale pink or white in color. Any areas of caseous necrosis or the presence of plaques in the oral cavity are abnormal. The scales of the body should be supple and clean. The cloaca should be closed and free of fecal material. The cloacal mucosa should be smooth and moist. The heart and lungs of a snake are located at roughly one-third of the body length from the head. The heart can be palpated for a pulse, but heart and lung sounds are rarely auscultated successfully in a normal snake.

Nutritional Status

Body condition can be assessed by evaluating the musculature of the back and the prominence of the dorsal spinous processes. A normal snake should have a slightly rounded dorsal surface with the tips of the dorsal spinous processes just barely palpable. A thin snake has very prominent dorsal spinous processes with receding musculature on either side. An obese snake has bulges of fat and musculature completely covering the dorsal spinous processes. An alternate method of assessment is palpation of the ventral body wall. Very thin snakes are easy to palpate deep into the coelomic (body) cavity due to the lack of intracoelomic fat bodies.

Determining the Sex of Snakes

The sex of snakes usually cannot be determined visually by obvious sexual dimorphism. Snake sexing probes can be used to locate the two inverted hemipenes of male snakes. An appropriately sized, K-Y lubricated, blunt probe is gently placed into the caudal aspect of the cloacal opening. The probe is then directed toward the tail tip. In males, the probe will slip caudally into one of the inverted hemipenes to the depth of several ventral scales. In females, the

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Figure 12.5. Blood collection from the tail vein of a snake. Note that the needle is inserted caudal to the cloaca and on midline of the ventral tail.

probe's progress is stopped just after insertion due to the presence of a blind diverticulum.

Phlebotomy

Most snakes can be bled from the ventral (coccygeal) tail vein. The vein runs beneath the caudal vertebrae in the tail (see Figure 12.5). The snake is held in dorsal recumbency with the head held higher than the tail. After aseptic preparation of the skin, the needle tip is inserted into the skin at the ventral midline about halfway between the cloaca and the tail tip. The needle is then directed at a 45° angle cranially and advanced dorsally until the vein is punctured. Once a flash of blood is seen, pulling back gently on the syringe plunger allows the blood to slowly fill the syringe. This technique is similar to blood collection from the tail of a cow.

Common Problems

Although many of the conditions discussed in the following paragraphs occur commonly in reptiles, a veterinarian should evaluate and diagnose each animal individually and direct the course of treatment. In some cases, a veterinarian with more extensive training in reptile medicine may need to be consulted to ensure proper diagnosis and treatment. The following disease conditions are meant to aid the veterinarian in reaching a diagnosis and do not cover specifics of medical treatment, which is beyond the scope of this chapter. Treatment plans can be developed by referring to more in-depth reptile medicine textbooks, or by consultation with a veterinarian experienced in reptile medicine.

Stomatitis

Bacterial stomatitis, commonly referred to as "mouth rot," can be associated with dirty particulate substrate within the enclosure (see Figure 12.6). As the snake eats, small pieces of substrate can become lodged in the mouth resulting in irritation that leads to a local bacterial infection. Along with unsanitary conditions and poor substrate choices, chronic hypothermia and resulting immunosuppression are important factors leading to this condition.

Thermal Burns

Burns are common in snakes, often from inappropriately placed heating elements. Thermal burns are usually located on the ventral abdomen from the animal resting on a hot surface, or on the dorsum from



Figure 12.6. A Burmese python exhibiting severe stomatitis. Note the caseous nodules and adherent substrate on oral mucosal surfaces.

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Figure 12.7. A healing mouse bite wound on the back of a ball python. This snake had been left overnight with a live mouse in its enclosure.



Figure 12.8. Albino boa constrictor showing severe neurologic symptoms due to boid inclusion body disease (IBD).

a heat source above the enclosure placed too close to the snake. Severe burns can occur when snakes coil their bodies around a heat source. For this reason, heating lamps should never be placed inside the snake cage.

Rodent Bites

Snakes fed live rodents are at risk of injury from their prey. Snakes who do not strike and kill the rodent immediately may lose interest. After a period of time the rodent can bite the snake's back, and with time can remove large areas of skin and muscle, exposing bone (see Figure 12.7). The cause of the passive behavior in snakes that results in the rat bites is not fully understood, but overfeeding and chronic hypothermia may be contributing factors. Feeding killed rodents is always the recommended best husbandry practice.

Nose Rub Injury

Active snakes in small cages often try to escape their enclosure. When the cage contains abrasive surfaces, especially wire cage tops, the snake's nose can become severely abraded. The wounds can extend into the bone and can become secondarily infected with bacteria. If left untreated the infection can develop into stomatitis, osteomyelitis, or septicemia.

Inclusion Body Disease (IBD)

Boa and python species found in the pet trade are commonly infected with "Boid Inclusion Body Disease" (IBD). Although the exact etiology is unknown, the disease is thought to be caused by a chronic viral infection. The clinical signs may include generalized neurologic symptoms or chronic regurgitation, but often the affected snakes are asymptomatic (see Figure 12.8). The disease is associated with chronic immunosuppression that can lead to secondary bacterial stomatitis and pneumonia. There is no reliable antemortem diagnostic test, but blood smears and other tissue samples can be screened for characteristic eosinophilic, intracytoplasmic, inclusion bodies.

Spinal Osteopathy

Snakes that present with stiffness of the back, reluctance to eat, and occasionally paresis or paralysis may be suffering from osteomyelitis of the vertebral bodies. The clinical signs are the result of a chronic bacterial infection and inflammatory response that results in bony proliferative lesions in focal segments of the spine. The spine becomes fused over time and the animal becomes subject to pathological fractures of the spine (Isaza, Garner and Jacobson, 2000).

Dermatitis

Snakes allowed to remain in dirty environments may develop bacterial or fungal dermatitis. Areas of discolored and moist necrotic skin can be observed on the belly or back of the snake. Vesicular dermatitis, termed "blister disease," is a specific form of snake dermatitis associated with chronically damp enclosures. Focal and coalescing areas of skin develop

pockets of fluid, resulting in the appearance of blister-like lesions.

Snake Mites

Snakes in captivity can often be infested with massive numbers of snake mites (*Ophionyssus natricis*). These small, black, or dark red mites can often be visualized between scales, around the eye caps, under the chin, or near the cloaca. If present in large numbers they can cause anemia, and can potentially spread infectious organisms between snakes. Once established, mites are difficult to eradicate from the enclosure and can spread rapidly throughout the facility. The free-living stages of the mite can be killed with multiple applications of dilute bleach (1:32) on all enclosure surfaces. The snakes can be soaked in a lukewarm water bath for 30 minutes, or olive oil can be rubbed on the skin of the snake to dislodge and kill the mites.

Dysecdysis (Problems with Shedding)

Normally, snakes shed several times a year, with young, rapidly growing snakes shedding more often than older animals. As a snake prepares to shed, the scales become dull in color and the eye caps become bluish and opaque. During the period leading up to the shed, the snake should not be fed or handled. Dysecdysis tends to occur with low humidity or lack of solid objects to rub against in the enclosure. Incomplete shedding, or shedding in small pieces (rather than one large, complete piece) is abnormal in snakes. Generalized weakness, malnutrition, neurological problems, and other underlying diseases can also result in abnormal shedding.

LIZARDS

Because husbandry requirements in lizards are very species specific, few generalizations can be made for this group of reptiles. For each lizard species, the diet, enclosure design, heat source, and lighting described in the general husbandry section should be selected to best match the particular species' needs.

Physical Examination

Most habituated pet lizards are used to being handled and can be examined on a table with minimal restraint. Large lizards may scratch with their nails in an attempt to get away or secure traction on a slippery surface. Large, aggressive lizards such as iguanas and monitors can cause significant bite wounds. Aggressive lizards can be restrained behind the head and with a towel wrapped around and supporting the pelvic limbs to prevent scratching. Because many lizards have the ability to voluntarily break off their tails in an effort to get away from predators, no lizard should ever be grasped or lifted by the tail.

Healthy lizards are usually active and responsive when observed within their enclosure. When handled they should be strong and alert and have good body tone. A normal lizard's head and the cranial third of the body is held up, elevated by the front legs. Gently tapping lizards on the nose with a finger often causes them to defensively open their mouths, allowing an oral examination. The normal oral mucosa may be white or pigmented. The corneas should be clear, and eyelids should be free of exudates or ectoparasites. The legs, feet, and toes should be symmetrical with no swelling or obvious fractures. The skin and scales should have a vibrant color and be free of obvious lesions such as missing scales, areas of discoloration, or crusting. Coelomic palpation should be performed to identify abdominal masses, gastric foreign bodies, or enlarged kidneys.

Nutritional Status

The body condition of a lizard can be judged by the relative thickness of the epaxial area in a manner similar to snakes (see Figure 12.9). A thin lizard may also have prominent scapulas and pelvic bones.

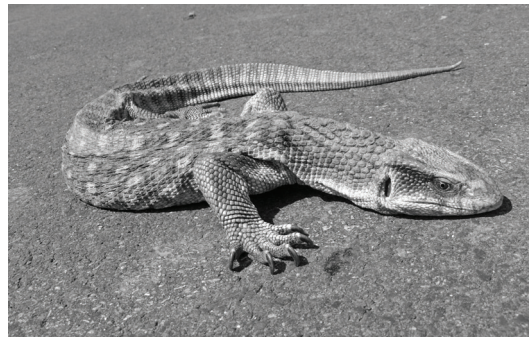


Figure 12.9. An example of a dehydrated and cachectic Savannah monitor lizard. Note the thin tail with bony prominences apparent.

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Some lizard species store fat in the tail, so the size and thickness of the tail can be an indicator of body condition. Palpation of the coelom through the ventral body wall can also give an indication of fat stores in the intracoelomic fat bodies.

Determining the Sex of a Lizard

Because of the wide diversity and morphology of lizard species, there is no single, simple method of determining the sex in this group of animals. Many lizards are not sexually dimorphic (show obvious physical differences between males and females) or have only very subtle physical differences. However, male green iguanas have larger femoral pores on the underside of their thighs, larger dorsal spines on their neck, and thicker jowls.

Phlebotomy

Blood can be collected from the tails of most lizards. Similar to snakes, the ventral (coccygeal) tail vein runs beneath the caudal vertebrae of the tail. The needle should be placed on the ventral midline and directed dorsally as in the snake. Alternatively, the same tail vein can be accessed by a lateral approach. The needle is placed on the lateral aspect of the tail just under the transverse process of the caudal vertebra, about half the distance from the cloaca.

Common Problems

Metabolic Bone Disease

Lizards fed inappropriate diets, coupled with inadequate exposure to sunlight or artificial UVB light, may develop metabolic bone disease. Herbivorous and omnivorous lizards are generally fed diets deficient in calcium, while carnivorous species fed unbalanced meat diets ingest excess phosphorus. In both cases, nutritional hyperparathyroidism, abnormal calcification of the bones, and pathologic bone fractures can result. Although carnivorous lizards usually obtain adequate levels of preformed vitamin D in their meat diet, omnivorous and herbivorous species must have adequate sunlight exposure in their skin to make the active form of vitamin D. A relative lack of vitamin D prevents calcium absorption from the intestine and prevents normal bone metabolism, leading to decalcification of bones. As calcium levels in the body decrease, a complicated hormonal system works to maintain the body's serum-ionized calcium at normal levels at the expense of the bones. Since decalcified bones are weakened, the body compensates by adding abnormal amounts of cartilage around the bone for structural strength. Despite this thickening of the decalcified bones, the bones are structurally weak, and pathological fractures eventually occur in the long bones and vertebrae. Over time, the calcium stores become so depleted that the serum calcium levels fall below critical physiological levels. As lizards become hypocalcemic, their posture becomes increasingly abnormal, with a characteristic inability to hold up their heads, and ambulating by crawling with their ventrum dragging on the ground. In the final stages of the disease, the lizard is recumbent, with the muscles twitching dramatically from the lack of calcium. At this point, nerves, muscles, and the gastrointestinal tract fail to function and the animal dies of hypocalcemia. In older animals who have survived the disease, large calluses in the long bones and kyphosis of the spine can be seen long after the calcium deficiency has been corrected. Radiographs at the initial examination are helpful in documenting this disease and can provide valuable prognostic information (see Figure 12.10).

Renal Failure

Older herbivorous lizards, specifically green iguanas, may develop renomegaly (enlarged kidneys), chronic renal failure, and secondary gout. Although the cause is multifactorial and not totally understood, it is believed that chronic dehydration and oversupplementation of protein in the diet are important husbandry-related risk factors. Sadly, these lizards were likely provided diets that helped prevent the development of metabolic bone disease, but contained high levels of protein. Older veterinary literature recommended that herbivorous iguanas be fed significant amounts of monkey biscuits and dog food in the diet. This recommendation helped to maintain proper calcium levels in the diet, but resulted in too much protein for the animals' needs. Herbivorous lizards are properly maintained in large, elaborate enclosures that contain many branches for climbing. Because they are arboreal, iguanas tend to remain in the branches and often do not come down, even to drink. As a result, these animals can become chronically dehydrated. Animals in renal failure present in poor body condition, with anorexia (loss of appetite) and generalized weakness. On

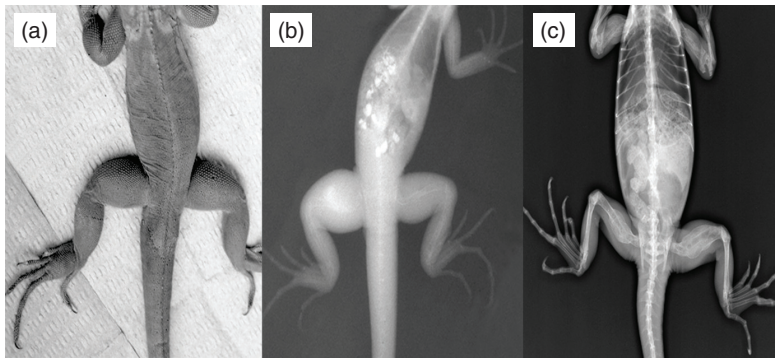


Figure 12.10. Metabolic bone disease in three different juvenile green iguanas. (a) A photograph showing swollen limbs, giving the false appearance of increased muscle mass. (b) A radiograph showing very poor bone density and lack of distinct skeletal structures. Note the presence of substrate foreign bodies in the intestinal tract. (c) An animal that has recovered from the disease, but has evidence of healed folding fractures and abnormal calluses of many of the long bones.

physical examination, the swollen kidneys can be palpated in the caudal abdomen, abnormally protruding from within the pelvis. On post-mortem examination, the enlarged kidneys typically exhibit glomerulonephrosis and tubulonephrosis. A true vegetarian diet with lower levels of protein, along with ensuring water consumption by misting the animal daily, may help prevent this problem. Expert veterinary care should be sought immediately for diagnosis and treatment if renal failure is suspected.

Skin Lesions

Like snakes, lizards can be burned by the inappropriate use of heating elements. Burns on the abdomen, feet, and distal tail are common. Large white scars on the body are often healed burn wounds. Lizards can develop subcutaneous abscesses similar to snakes from rubbing on enclosure surfaces or from bites of other animals (both cage-mates and uneaten prey) in their cage. Although abscesses often appear as obvious areas of swelling and superficial dermal excoriation, some may be only subtle localized lesions. If undetected or left untreated, these abscesses can become sources of localized osteomyelitis or generalized septicemia.

Retained Eggs

Many reproductive female lizards, even those not housed with a male, can produce eggs. Gravid females will often search for a suitable nesting site within their enclosure, which is usually impossible to find in an artificial environment. As a result, these females often retain their eggs (dystocia) or have abnormal ovulation (retained follicles), both of which lead to an eventual metabolic crisis. Affected animals are often thin and anorectic, weak, and have a noticeably swollen abdomen. Due to the body's high demand for calcium necessary for egg production, many affected lizards develop hypocalcemia; clinical signs include muscle twitching and profound weakness.

TURTLES, TERRAPINS, AND TORTOISES

Although the term "turtle" is often used as a general descriptive term for any reptile with a shell, the group is divided into four specific types of animals who have distinct husbandry requirements: sea turtles, turtles, terrapins, and tortoises. All sea turtles are endangered species that live exclusively in salt and brackish water and rarely present to animal shelters. True turtles live primarily in fresh water and are usually carnivorous animals requiring semi-aquatic or fully aquatic enclosures, depending on the species. The terrapins, such as the box turtle, are terrestrial or semi-aquatic, omnivorous species. Tortoises are entirely terrestrial animals, and generally are herbivorous. Given this broad diversity, each species has very specific and unique husbandry requirements.

Physical Examination

Most of the common pet turtle species are docile and easy to handle. Generally, they attempt to escape by

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crawling away or hiding within their shell. Holding them in the air or placing them on an object that supports their body but does not allow their feet to touch the ground is usually all that is needed for restraint. Some less common species such as snapping turtles can inflict serious bites and must be handled with care, or not at all.

Healthy turtles are usually alert and uncooperative when examined. They tend to withdraw into their shells and resist traction on their limbs. Some species can close portions of their shells to make examination even more difficult. Forceful extraction of their heads and legs can cause serious trauma and bone fractures, and should not be attempted. Often a visual examination can be performed by waiting until the turtle relaxes and begins to extend the head and limbs to explore the environment. The eyes, nose, and mouth should be clean and free of exudates. The tympanic membranes of the ears are easily visualized on the external lateral surfaces of the head. After restraining the head by gently grasping the neck behind the skull, the mouth can be opened with gentle traction using a soft rubber or plastic spatula. The oral mucosa and tongue should be moist and generally smooth. The legs and feet should be strong and symmetrical. The shape of the shell will vary with different species, but should be symmetrical and lack cracks or lesions. The cloaca is often hidden under the tail. The cloacal mucosa should be contained inside the cloacal opening and not be extruding.

Nutritional Status

Body condition assessment in turtles is very difficult because most of their fat stores are in the coelomic cavity and cannot be palpated due to their shells. Although there are formulas available that can be used to predict normal body condition on the basis of the ratio of turtle weight to the shell length, these are very species specific and often inaccurate. The clinician must make a subjective assessment of the body condition on the basis of the apparent density of the turtle relative to the animal's size. Cachectic (undernourished and debilitated) turtles feel like an empty shell when lifted off the ground.

Determining the Sex of Turtles

Many common pet turtle species have subtle sexually dimorphic characteristics. Adult male tortoises have concave plastrons (ventral shell) to accommodate breeding with the female. Some male water turtles have very long nails on their front toes and relatively longer tails.

Phlebotomy

It is difficult to collect blood from most turtle species. The best site for blood collection is the jugular vein. The head must be gently extended so that the lateral neck is exposed. After the skin is aseptically prepared, the jugular vein is visualized under the skin, running from the mandible toward the base of the neck. Placing a finger to occlude the vein and pushing the trachea ventrally often helps the vessel distend and become more visible.

Common Problems

Vitamin A Deficiency

One of the most classically described reptile diseases is vitamin A deficiency of turtles. Terrapins and water turtles fed poor diets consisting primarily of ground muscle meat often present with this condition. A dietary deficiency of vitamin A leads to multifocal squamous metaplasia and hyperkeratosis of the epithelium. This process of abnormal cell proliferation causes cellular debris to accumulate between cells, resulting in swelling and local inflammation. Epithelial tissues often affected are the periocular glands, respiratory tract, oral mucosa, gastrointestinal tract, and kidneys. On physical examination, most affected animals have bilateral conjunctivitis and blepharedema (swollen eyelids). Other less classic clinical signs include nasal discharge, anorexia, and lethargy. These animals are often responsive to parenteral vitamin A supplementation and the addition of vitamin A rich foods to the diet, such as dried apricots, cantaloupe, carrots, hot chili peppers, collard greens, grapefruit, leaf and romaine lettuce, mango, spinach, sweet potato, tomato and watermelon.

Aural Abscesses

Box turtles and water turtles are often presented with large swellings behind one or both tympanic membranes caused by an infection of the middle ear (see Figure 12.11). The normal turtle ear lacks an external opening, so the tympanic membrane lies on the surface of the head. Turtles also have a relatively large, open eustachian tube that directly communicates with the oropharynx. Aural abscesses can be



Figure 12.11. Eastern box turtle with an aural abscess of the left ear. Arrow indicates the swollen tympanum. Swelling of the eyelids can be associated with inflammation from the aural infection, or be symptomatic of a concurrent hypovitaminosis A.

extensive, sometimes almost the same size as the head of the affected animal. When drained, they are filled with a caseous exudate that is typical of reptile pus. Although most animals have bacterial infections at the time of diagnosis, the primary cause of these aural abscesses is not fully understood. Potential causes include ascending oral bacteria, mycoplasmal infections, hypovitaminosis A, and environmental toxins.

Necrotic Dermatitis of the Shell

Older veterinary literature describes a condition termed "septicemic cutaneous ulcerative disease" (SCUD) of water turtles. This condition is part of a spectrum of bacterial or fungal necrosis and dermatitis of the superficial scutes of the shell. Turtles kept in cold, dirty water present with the internal layers of the keratinized scutes of the shell infiltrated with serosanguinous fluid. The edges of the scutes begin to separate, and in severe cases ulcers can form. This dermatitis can progress to septicemia or osteomyelitis of the shell.

Upper Respiratory Disease

Rhinitis, stomatitis, and upper respiratory disease are very common in captive turtles. The animals present with copious serous discharge from the nares. Ulcers and excessive mucous can be seen in the opened mouth. As in most species of animals, upper respiratory disease in tortoises is complex and usually multifactorial. Tortoises have been found to be co-infected with *Mycoplasma* and *Pseudomonas,* which are prevalent in captive collections. Infection with herpesvirus and iridovirus can cause similar clinical signs in turtles and tortoises.

Bladder Stones

Tortoises have a high incidence of developing large, solid bladder stones. The cause of these stones is probably multifactorial, but husbandry problems such as excess protein in the diet and chronic hypovitaminosis A are potentially important. Bladder stones are radiographically obvious, but must be differentiated from retained eggs.

Metabolic Bone Disease

Turtles can develop metabolic bone disease as a result of the same nutritional and husbandry problems described for lizards. The major difference is that in turtles, the shell becomes the most obviously affected part of the body. Turtles with metabolic bone disease often present with grossly deformed shells.

Pyramiding of the Carapace

Young, rapidly growing tortoises can develop an abnormally raised series of scutes on the carapace (upper shell). The abnormal shell growth is very slowly progressive, but can eventually lead to an obviously deformed carapace. Although a conspicuous abnormality, affected tortoises have few apparent negative effects. The cause seems to be a nutritional oversupplementation of protein and calories. However, other less conspicuous nutritional imbalances such as excess calcium and vitamin A should be investigated.

Shell Injuries

Shell fractures are common in wild turtles presented for treatment to shelters and wildlife rescues. Common causes of injury are trauma caused by automobiles and, lawn mowers, and being chewed on by dogs. These injuries can be extensive and life-threatening. The shell is living bone, and shell fractures should be approached as orthopedic cases. Initial shock treatment with control of hemorrhage and hydration is essential. The wounds should be debrided and cleaned carefully to remove contamination. Finally, stabilization and anatomic reduction of the shell should be performed under general

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anesthesia. Shell repair is complicated, with several excellent descriptions in the textbook references provided.

ALLIGATORS AND CROCODILES

All crocodilians are carnivorous and require semi-aquatic terrariums. They are often too large to accommodate in typical aquarium enclosures and must be kept in larger tanks. Consultation with a reptile specialist for proper species identification, husbandry, and restraint is strongly recommended.

Physical Examination

Healthy crocodilians of any size are aggressive and should always be considered to be dangerous. When small, they can be handled similarly to large lizards, with one hand grasping the back of the head and the other supporting the body while pinning the back legs. For additional safety during the examination, the mouth can be taped closed and the legs taped to the sides of the body. Restraint of larger animals should be relegated to trained professionals only.

While in their enclosure most crocodiles should be alert and reactive to stimulation. They will either try to avoid capture or become defensive. Once restrained, the physical examination is similar to lizards.

Nutritional Status

As in the lizard, the body condition of crocodilians can be assessed by evaluating the tail, epaxial musculature, and legs. Crocodilians tend to store most of their body fat in the coelomic cavity, so when the animal appears thin, it is often extremely cachectic.

Determining the Sex of Crocodilians

Most crocodilians can be sexed by inserting a gloved finger into the cloacal opening and feeling for a penis. Some species have distinguishable sexual dimorphism as adults.

Phlebotomy

Crocodilians can be bled from the ventral tail vein as described for the lizard.

Common Problems

Metabolic Bone Disease

When rapidly growing crocodiles are fed only muscle meat and internal viscera, they are very susceptible to development of metabolic bone disease. These diets are extremely high in phosphorus and low in calcium. The clinical signs of metabolic bone disease are similar to lizards. Unlike some commercial diets made for other pet reptile species, many excellent diets have been developed for crocodilians and are recommended for exclusive feeding in these species in commercial farms.

Pododermatitis

Because crocodilians are often kept in makeshift containers, the flooring is often abrasive and hard. As the animals walk on these surfaces they abrade the bottoms of their feet. These wounds soon become infected and often progress to osteomyelitis.

AMPHIBIANS (FROGS AND SALAMANDERS)

Amphibians can be one of the most difficult species to provide adequate care for in captivity, and consultation with a knowledgeable person is advised for amphibian species presented to the shelter. In contrast to reptiles, most amphibians are comfortable at room temperatures ranging from 70°F to 80°F. Generally, most amphibian species can be housed in semi-aquatic, terrestrial enclosures. Preferred habitats range from fully aquatic to desert-adapted terrestrial species. Most adult amphibians are carnivorous, with the majority being primarily insectivores. Many amphibians are sensitive to chlorinated tap water, and de-chlorinating chemicals used for fish aquariums can be used safely with amphibians and can be purchased at pet stores. Amphibians kept in captive environments are also very sensitive to poor water quality. Water contaminated with excess food and animal waste creates an ideal environment for the growth of bacteria and fungus. In a shelter, care must be taken to ensure that amphibians are not exposed to organophosphates, pyrethrins/permethrins, and other toxic chemicals that may be used for parasite and pest control in mammals.

Physical Examination

Many amphibians have delicate, moist skin making them difficult to restrain. Observation while the animal is in the enclosure can often provide important information prior to the physical examination. If it is necessary to restrain an animal, powder-free latex gloves should be worn. The gloved hands should be rinsed with water prior to use, and should be

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wet when touching the animal. Large frogs can be restrained by gently holding them by their waist, just anterior to the pelvic limbs. For smaller frogs, the extended pelvic limbs can be held between the thumb and index finger at the pelvis.

Amphibians housed in a well-designed enclosure should use their available microhabitats appropriately. They should hide and rest in areas that provide shelter and humidity. When active, amphibians should be alert and investigating their enclosure for food and water. The corneas and lenses of the eyes should be clear. The conjunctiva and eyelids should be symmetrical and free of exudates. Some animals may open their mouths defensively, but most will not cooperate for an oral examination. Forcing the mouth open is not advised, and can often result in significant soft tissue trauma and possibly jaw fractures. The skin should not have areas of discoloration, inflammation, or ulceration. Amphibians routinely shed their skin, so some pieces of sloughed epithelium visible on the skin can be normal. The legs, feet, and toes should be symmetrical and well muscled. The cloaca is usually inconspicuous and closed. Any exposed tissue from the cloaca should be investigated for prolapse.

Nutritional Status

Amphibians' body condition can be difficult to assess. Obviously thin or obese animals can be recognized by assessing the pelvis, shoulders, back, and legs. The abdomen is more difficult to assess for fat stores, because many amphibians will defensively inflate their lungs with air to appear larger. Other abnormalities of frogs that may make them appear larger include ascites (fluid in the abdomen) and eggs in gravid females.

Determining the Sex of Amphibians

Many pet amphibian species are not obviously sexually dimorphic. However, to the experienced observer, subtle differences can be seen in several species. Males and females are often different sizes, but which sex is larger is not consistent between species. In some frog species, the males have visible nuptial pads (areas of thickened skin on the inner aspect of each forearm that are used by the male to grasp the female during copulation), vocal sacs, and enlarged flexor muscles.

Phlebotomy

The most common site for blood collection in frogs is the ventral abdominal vein. This vessel is intracoelomic, running midline from the pelvis to the ribs. The frog is placed in dorsal recumbency, and a needle is carefully placed through the skin and body wall on the ventral midline of the abdomen. The single large vein lies ventrally, above the underlying intestines and coelomic structures.

Common Problems

Erythema and Skin Disease

Diffuse reddening of the skin (erythema) is a common abnormality in amphibians. Because of the potential for contact irritation from a chemical in the environment, this should be ruled out first. Common examples include exposure to chlorinated tap water or residual disinfectants from cleaning the enclosure.

If the erythema is associated with morbidity, a bacterial dermatitis and septicemia termed "red leg" should be considered. This disease has been classically associated with *Aeromonas* sp., but other gram-negative bacteria can cause the skin infection. Clinical signs include reddening and ulcers of the skin (including the legs). In severe cases, animals can develop ascites, anorexia, and lethargy that suggest septicemia. Animals kept in dirty, crowded enclosures are predisposed to this skin infection.

It is important to note that erythema can also be one of the first clinical signs of iridovirus infection, a common viral pathogen of captive amphibian populations. Captive and wild amphibians around the world have also been found to be infected with an invasive skin fungus (*Batrachochytrium dendrobates*) (Garner *et al*., 2006). This pathogen has global implications for the health of amphibian populations, and is a common cause of mortality in captivity. Infected animals have abnormally pale areas of thickened skin and abnormal shedding. The cause of death is not well established, but is likely due to functional changes in the infected areas of skin.

Metabolic Bone Disease

This disease is common in rapidly growing amphibian species fed meat diets containing elevated phosphorus levels. The need for ultraviolet radiation for conversion of vitamin D in amphibians has not been fully investigated. Providing moderate access to

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indirect sunlight and artificial UVB-rich light is recommended and not likely to cause harm. Amphibians with metabolic bone disease usually present with pathological folding fractures of long bones or paralysis from spinal fractures.

Gastrointestinal Foreign Bodies

Some amphibians have an aggressive feeding response that often causes them to ingest foreign bodies when pursuing prey. A common cause of anorexia resulting in repeated attempts at regurgitation are stones and other particulate materials within the stomach. Routine radiographs can be used to screen animals for foreign bodies, which are often identified in asymptomatic animals.

Corneal Lipidosis

Cholesterol deposits within the cornea can cause dense, white lesions to develop on one or both eyes. These lesions often begin small, but with time they may cover the entire cornea and result in blindness. Although lesions can develop in many species of amphibians, they are most commonly reported in the White's tree frog and the Cuban tree frog. The deposition of cholesterol is thought to be associated with feeding commercial insectivore diets that are too rich in fats (Shilton *et al*., 2001).

Spindly Leg Syndrome

Frogs in captivity, particularly *Dendrobates* sp. (poison arrow frogs), can emerge from metamorphosis with abnormally thin and malformed front legs. The specific cause is undetermined, but a combination of environmental temperature, diet, toxins, and genetics is likely important in the pathology of the disease. Similar leg malformations have been reported globally in wild frog populations.

EUTHANASIA METHODS

Effective and humane euthanasia is difficult in reptiles and amphibians and often controversial. This subject has been reviewed extensively and euthanasia guidelines have been published (Baer, 2006). Because of a slower metabolic rate and lower oxygen consumption compared to mammals, many reptiles and amphibians can survive anoxia for extended periods of time. Animals with no detectible blood circulation or heart beat, and even those undergoing complete decapitation, may continue to have viable brain function.

Reptiles are poikilothermic, so their metabolism decreases with correspondingly lower body temperatures. Since the animal is nonresponsive when cold, it could be assumed that the animal is unconscious. However, reptiles and amphibians have been documented to survive long periods of refrigeration where the circulation has effectively stopped. These animals appear to be dead, only to revive when their body temperature is elevated. Hypothermia in reptiles and amphibians does not prevent them from feeling pain, although they may be unresponsive to noxious stimuli. The process of freezing, with the development of ice crystals in body tissues, is extremely painful. Decapitation, refrigeration, and freezing are unacceptable euthanasia practices and are not humane methods for any reptile or amphibian.

The most acceptable method of euthanasia is to render the animal unconscious with a drug to achieve a deep surgical plane of anesthesia. Intramuscular injections of high doses of ketamine (40–100 mg/kg) or telazol (20–40 mL/kg) can be given, allowing 15–30 minutes for the drug to take effect. Alternatively, an intravenous injection of propofol (10–20 mg/kg) will provide an excellent anesthetic induction. Mask or chamber induction with inhalant anesthetic gases can be used, but induction times can be prolonged due to the ability of reptiles and amphibians to hold their breath for long periods of time. Anesthesia can be induced in aquatic amphibians by adding high concentrations (>3 g/L) of buffered tricaine methane sulfonate (MS-222) to water and placing the animal into this anesthetic bath. Once the reptile or amphibian is completely unconscious, barbiturate euthanasia solutions can be injected intravenously, intracardiac, or intracoelomically. Death is confirmed by ascertaining that the heart has stopped with a Doppler ultrasound, ultrasound images, or ECG. Since Doppler equipment is unlikely to be available in most shelters, the presumed dead animal should be left at room temperature and rechecked in approximately 2 hours to reconfirm death.

REPTILE AND AMPHIBIAN PLACEMENT

Once a reptile or amphibian has been admitted to a shelter facility, shelter staff must begin to think about permanent placement. Assuming the animal is healthy and not under legal hold because of an

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investigation, rapid removal from the shelter should be the goal. Depending on local laws and ordinances, many pet reptiles may be made available for adoption through the shelter, or shelter management may wish to transfer the animal to a local herpetology group to ensure appropriate placement. Other options for placement include museums and zoological collections. Native species brought to the shelter should not be released into the wild without first contacting a licensed rehabilitator or state fish and game authorities. Non-native species should never be released into the wild. Regardless of final disposition, these animals should not be euthanized simply because they require different care than mammals in a shelter. There are many resources available in most communities for proper placement, and euthanasia should only be performed on those animals deemed to be suffering from severe diseases or injuries.

CONCLUSION

Reptiles and amphibians, although not normally found in animal shelters, are becoming more common as they gain popularity as pets across the country. Shelter management and staff should have specific protocols in place to provide adequate temporary care for these species and strive to move these animals to permanent placement as soon as possible. If animals are kept for long term, veterinarians with experience in handling these species should be consulted to provide guidelines for medical care and treatment when problems arise. If adequate care cannot be provided by the shelter, alternatives must be considered for these species.

REFERENCES

Baer, C.K. (ed) (2006) *Guidelines for Euthanasia of Nondomestic Animals*, American Association of Zoo Veterinarians (AAZV), Lawrence, Kansas.

Ballard, B. and Cheek, R. (2003) *Exotic Animal Medicine for the Veterinary Technician*, Iowa State Press, Ames, Iowa.

Carpenter, J.W., Mashima, T.Y. and Rupiper, D.J. (2000) *Exotic Animal Formulary*, 2nd edn. W.B. Saunders, Philadelphia, Pennsylvania.

Coke, R.L., Hunter, R.P., Isaza, R. *et al*. (2003) Pharmacokinetics and tissue concentrations of azithromycin in ball pythons (*Python regius*), *American Journal of Veterinary Research*, **64**, 225–228.

De Vosjoli, P. (1999) Designing environments for captive amphibians and reptiles. *Veterinary Clinics of North America*, **2**, 43–68.

Garner, T.W.J., Perkins, M.W., Govindarajulu, P. *et al*. (2006) The emerging amphibian pathogen *Batrachochytrium dendrobatidis* globally infects introduced populations of the North American bullfrog, *Rana catesbeiana*, *Biology Letters*, **2**, 455–459.

Isaza, R., Garner, M. and Jacobson, E. (2000) Proliferative osteoarthritis and osteoarthrosis in fifteen snakes, *Journal of Zoo and Wildlife Medicine*, **3**, 20–27.

Jacobson, E., Heard, D. and Isaza, R. (2006) Future directions in reptile medical education. *Journal of Veterinary Medical Education*, **33**, 373–381.

Mader, D.R. (2006) *Reptile Medicine and Surgery*, 2nd edn, Saunders Elsevier, St. Louis, Missouri.

Mayer, J. and Martin, J. (2004) Reptile care in the animal shelter, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski), Blackwell Publishing, Ames, Iowa, pp. 177–188.

McBride, M. and Hernandez-Divers, S.J. (2004) Nursing care of lizards. *Veterinary Clinics of North America*, **7**, 375–396.

Mitchell, M.A. (2004) Snake care and husbandry. *Veterinary Clinics of North America*, **7**, 421–446.

O'Rourke, D.P. and Schultz, T.W. (2002) Biology and diseases of amphibians, in *Laboratory Animal Medicine*, 2nd edn (eds J.G. Fox, L.C. Anderson, F.M. Loew *et al*.), Elsevier Science, Academic Press, San Diego, California, pp. 827–860.

O'Rourke, D.P. and Schumacher, J. (2002) Biology and diseases of reptiles, in *Laboratory Animal Medicine*, 2nd edn (eds J.G. Fox, L.C. Anderson, F.M. Loew *et al*.), Elsevier Science, Academic Press, San Diego, California, pp. 827–860.

Schumacher, J. and Yelen, T. (2006) Anesthesia and analgesia. In: *Reptile Medicine and Surgery*, 2nd edn (ed D.R. Mader), Saunders Elsevier, St. Louis, Missouri, pp. 442–452.

Shilton, C.M., Smith, D.A., Crawshaw, G.J. *et al*. (2001) Corneal lipid deposition in Cuban tree frogs (*Osteopilus septentrionalis*) and its relationship to serum lipids: An experimental study. *Journal of Zoo and Wildlife Medicine*, **32**, 305–319.

Sladky, K.K., Miletic, V., Paul-Murphy, J. *et al*. (2007) Analgesic efficacy and respiratory effects of butorphanol and morphine in turtles. *Journal of the American Veterinary Medical Association*, **230**, 1356–1362.

Sladky, K.K., Kinney, M.E. and Johnson, S.M. (2008) Analgesic efficacy of butorphanol and morphine in bearded dragons and corn snakes. *Journal of the American Veterinary Medical Association*, **233**, 267–273.

Wappel, S.M. and Schulte, M.S. (2004) Turtle care and husbandry. *Veterinary Clinics of North America*, **7**, 447–472.

Wellehan, J.F.X., Gunkel, C.I. and Kledzik, D. (2006) Use of a nerve locator to facilitate administration of mandibular nerve blocks in crocodilians. *Journal of Zoo and Wildlife Medicine*, **37**, 405–408.

Wright, K.M. and Whitaker, B.R. (2001) *Amphibian Medicine and Captive Husbandry*. Krieger Publishing Co., Malabar, Florida.

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13
Avian Care in the Animal Shelter

Debra A. Nicholson

INTRODUCTION

The plight of homeless avian species is a complex one. There is very little enforced protection for birds in the wild or captivity. Parrots have sadly been left out of the efforts to assist in "companion animal issues." Even well-trained rescue groups face many difficulties.

It is difficult to determine how many captive birds there are in the United States because there are few federal and state regulations, and unfortunately most of those that do exist are very loosely enforced. Under the Wild Bird Conservation Act it is illegal to import exotic birds into the United States as pets. However, persons returning to the United States after being out of the country for more than 1 year who bring personally owned birds with them may import up to two exotic birds as pets per year (Born Free USA, 2003–2011).

Under the Endangered Species Act (ESA) it is illegal to possess, sell, or buy an endangered species regardless of whether transactions occur over the Internet or not, unless a person obtains a captive-bred wildlife permit. The ESA does not regulate private possession of birds; it merely allows the Fish and Wildlife Service (FWS) to prosecute individuals who are in possession of endangered species illegally (Born Free USA, 2003–2011).

The Lacey Act allows the US government to prosecute persons who possess an animal illegally obtained in a foreign country or another state. Again, this act does not regulate private possession of birds; it merely allows the FWS to prosecute individuals who have illegally obtained birds (Born Free USA, 2003–2011).

The Animal Welfare Act (AWA) is a federal law that seeks to ensure the humane care of certain species of animals in specific commercial situations and research. Species that are not regulated under this act are birds, mice, and rats. The USDA agreed to start the process of extending the AWA to protect these species in 2000, but as of 2011, birds are not protected under this act (Armstrong, Farinato and Telecky, 2001).

Studies conducted by veterinary and pet industry institutions often fail to account for breeding facilities, wholesale/retail facilities, zoos, shelters, sanctuaries, entertainment venues, and conservation programs. A 1998 article in the *Journal of the American Veterinary Medical Association* (*JAVMA*) that is referenced as the most extensive demographic study of pet birds reported the US pet bird population to be 35–40 million. The industry data indicated an annual growth rate of approximately 5%. Other population studies report significantly lower estimates (Kelly, McCarthy and Engebretson, 2007). The inability to determine an accurate estimate of captive bird populations has been a serious impediment to effectively addressing many avian welfare issues.

With the commercialization of birds as pets there has been mass production in breeding operations, resulting in shelters and avian welfare organizations witnessing an alarming increase in the number of displaced/unwanted birds. Many people believe that the purchase of a young hand-raised bird will result

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in an animal who will be bonded to humans and be a much tamer pet. This belief is very damaging, leading to parrots being raised not knowing how to behave as a bird. Many birds will self-mutilate, attack people, especially upon reaching puberty, and develop many other social problems that make them difficult pets. It requires a great deal of work, knowledge, and patience to successfully keep a parrot as a pet. Many breeders, pet stores, or other venues that sell birds do not thoroughly educate people about appropriate care. Birds are being sold as pets, but failure to understand the challenges of keeping these animals as pets often leads to their relinquishment to a shelter or sanctuary, or simple abandonment. The pet industry continues to breed and sell birds for profit despite the increasing numbers in shelters and rescue groups. Thus, the cycle continues, with more birds being bred and sold and more being abandoned.

Many psittacine species are endangered or threatened in the wild due to habitat destruction, poaching, hunting, and trapping for the pet trade. Conservation breeding facilities breed large numbers of parrots in the hopes of releasing them in the wild. Parrot survival skills and social behaviors are determined by generations of evolution, interaction with the flock and environment, and these traits are passed on by parents to offspring. The probability of successfully releasing captive birds into the wild (assuming their native habitat even exists) is very low (Kelly, McCarthy and Engebretson, 2007). These breeding programs add to the problem of more parrots in captivity that are actually wild animals left homeless.

Shelters have limited ability to provide appropriate care for birds and many will not accept them at all. Just like a new bird owner, a shelter must have funding, space, knowledge, and patience to be able to care for the birds properly. The goal of shelters should be to provide short-term, temporary housing for birds until an appropriate permanent home can be found, and to educate the public about the plight and care of birds in captivity.

SPECIES

Psittaciformes are the most common pet birds found in shelters, including cockatiels, parakeets, conures, Amazons, cockatoos, lories/lorikeets, eclectus parrots, African grays, and macaws. Passerines are also kept as pets and may end up being relinquished to shelters, including canaries, finches, mynahs, and others (AWC, API and ASPCA, 2009). Unlike dogs and cats, which are separate species with multiple breeds within the species, there are many different species of birds. There are 352 known species of parrots alone. In the wild, these species are found in many different ecosystems all around the world and thus have a diversity of needs to be met in captivity. Whenever a new species is presented to a shelter, it is imperative to correctly identify the species and to research that individual's specific needs. See Forshaw (2010) in Appendix 13.1 for guidelines on parrot identification. See Figures 13.1 and 13.2 for examples of a Hawk headed parrot and Indian ringneck parakeet.



Figure 13.1. Hawk-headed parrot (*Deroptyus accipitrinus*).

HUSBANDRY

Housing

Birds should be housed separately in a quiet area away from other animals, including dogs, cats, reptiles, etc. The bird room should be well ventilated but free from drafts.



Figure 13.2. Indian ringneck parakeet (*Psittacula krameri*).

Many experts recommend separating Old World and New World parrots due to concerns about spreading viruses that birds may be more susceptible to because they have never been exposed. However, these viruses are rarely encountered in a shelter setting, and standard quarantine protocols should alleviate those concerns.

Different species can be paired, but this must be done carefully. Certain species are known to be aggressive, while certain individual birds are aggressive, so it is difficult to create a rule for cohousing these birds. For socialization purposes, it is best to find birds who can be housed together. Breeding pairs are sometimes fine to keep together if they are not laying eggs but are bonded to each other, but sometimes that can make them less friendly with humans and less likely to be adopted.

Most birds are comfortable at temperature ranges of 60–80°F, but birds who are healthy, acclimated, and with feathers intact can do fine at a much wider range of temperatures. Birds generally are very susceptible to a variety of different environmental toxins and should not be exposed to harsh chemicals such as bleach or ammonia, and cooking odors, Teflon, smoke (including second-hand smoke), household paint, candles, insecticides, etc. Chemicals with an odor should not be stored in the bird room. If air filtration or purifier systems are used they should not produce ozone or utilize ionization technology, and they must receive regular maintenance in strict accordance with the manufacturer's recommendations.

Bird cages or aviaries should be of sturdy construction with doors that can be locked to prevent escape. Cages should not be constructed of wood because it cannot be effectively disinfected, and most parrots will chew through it readily. The cage should not contain iron, lead, or zinc due to toxicity and rusting problems. Stainless steel is ideal. The bottom of the cage can be lined with newspaper (except for the glossy sheets), plain or waxed paper, which should be removed daily. The use of sawdust, shavings, woodchips, etc. is discouraged because bird droppings and food can contribute to bacterial growth. At a minimum, cages must be large enough so birds can spread and flap their wings in all directions, climb the bars of the cage, jump from one perch to another, and contain toys the birds can play with.

There are minimum standards set for cage design for birds in captivity. Small birds like finches, lovebirds, and parakeets should have cage bar spacing not exceeding 0.5 inch, and the cage should measure at least 1 square foot. Medium-sized birds like cockatiels, small conures, and caciques should have cage bar spacing not exceeding three-quarters of an inch, and the cage should be at least 1.5 square feet. Larger birds like macaws, cockatoos, African grays, and Amazons should have cage bar spacing according to their size so that their heads cannot fit through the bars. The cage itself should provide space that is 1.5 times the bird's wing span in all directions and large enough so that the tail does not extend through the bars of the cage (AWC, API and ASPCA, 2009).

Birds should have perches appropriate for the size of their feet; there are different options for perch thickness and material. There should be perches small enough for the bird's feet to encircle them and large enough so the bird can sit with his/her feet flat. Perches should not be placed above water or food dishes to avoid birds defecating into them. There should be enough perches so birds can perch simultaneously in a natural position without crowding other birds.

Birds need full-spectrum light to allow adequate production of vitamin D. Full-spectrum bulbs are recommended if birds are kept indoors; bulbs should be replaced frequently. Natural sunlight is much more efficient than any bulb, and it is recommended that birds have daily access to natural sunlight (preferably 5 hours), but they must also be able to move out of direct sunlight. They must also have

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access to darkness for approximately 10 hours so they can sleep.

Newspaper is commonly used at the bottom of bird cages, preferably on a tray underneath the barring of the cage where the bird cannot step in the feces. Newspaper should be changed daily. Water bowls should be replaced daily with a new clean bowl and fresh water. All bowls, perches, and toys that are not of cloth material can be put in the dishwasher at high heat every 2 weeks. Cloth material toys can be put in the washer and dryer. Every month the whole cage should be scrubbed down with a disinfectant. This author uses either Trifectant or chlorhexidine as a disinfectant, but others can also be safe to use. Once the cage is thoroughly scrubbed, the cage can be rinsed with water. Power washers work great for this job. After cleaning is complete, the cage should be left outside for 3–4 hours to make sure all the fumes have dissipated before placing the bird back in the cage. If there is concern about an outbreak of an infectious disease, diluted bleach can be used also to disinfect the cage and then left outside to air out for 24 hours before returning inside.

These are minimum housing standards described, but birds are meant to fly and normally spend the majority of their days in the wild foraging and feeding (Echols, 2004). Therefore, just putting a bird in a cage with food and water does not meet all the bird's needs. Some parrots are highly intelligent and very social. Enrichment will be essential to have a physically and emotionally healthy bird. Birds should have sturdy toys that are made for birds and are appropriate for their size. Ideally, the bird cage or aviary should be large enough so the bird can fly. Alternatively, birds should be provided with time out of the cage in a safe environment with supervision by someone with avian experience. Evidence that a bird's needs are not being met may include undesirable behaviors such as screaming, biting, feather picking, aggression, etc. See Figure 13.3 for an example of a properly configured bird cage.



Figure 13.3. Cage setup with perching options and foraging toys.

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Diet

There is no species-specific formulated diet for exotic birds. In general, it is recommended to provide a diet that has 60–75% pellets and very few seeds. Psittacines fed a diet with a high percentage of seeds are known to develop medical problems such as fatty liver, atherosclerosis, vitamin A deficiency, etc. (Fiskett and Reavill, 2004). Some recommended brands of pellets include Harrisons, Lafeber, Roudybush, and Zupreem. It is a good idea to have more than one brand name of pellets to help ensure the ability to switch all birds from seeds to pellets. Most psittacines love nuts and seeds and will choose them over what is healthy for them. Nuts and seeds are acceptable in small amounts for healthy birds and can be used for behavioral training and in foraging toys because most psittacines are seed-motivated. Many birds will be food-motivated with healthy treats, as well. About 25–40% of the remaining diet should consist of whole grains, fresh vegetables, and small amounts of berries and other fruits. Acceptable whole grains include spelt, oat grouts, barley, flax seed, millet, etc. Dark leafy greens, broccoli, cauliflower, brussel sprouts, beans, sweet potatoes, peppers, etc. are good vegetables to feed. All food fed to the birds should be of human-grade quality to avoid contamination with fungal spores and other toxins. Fresh food should not be left in the cage overnight.

As stated earlier, there are many species in captivity consuming a variety of diets in the wild; therefore one standard protocol is difficult to recommend for all species. Researching the specific species' dietary requirements is important. These are some general dietary considerations for various species:

- Granivorous budgies and cockatiels should have 50% whole grains and 50% pellets, with leafy vegetables and minimal fruit.
- Cockatiels fed an all-pellet diet have been known to have problems with hypercalcemia leading to renal mineralization (Fiskett and Reavill, 2004).
- Macaws require a higher fat content in their diet, so a higher percentage of nuts—about 10%—is recommended.
- Lories/lorikeets should never be given seed. They require a diet of ground pellets or specially formulated lorie food, with fruits supplemented with soft leafy vegetables. Pureed fruits and vegetables, natural juices, and commercial human baby foods can be used as an alternative to fresh produce. (See Appendix 13.1 for lists of safe and unsafe foods for birds.)

As a general rule, 90% of birds can be switched easily from a seed to a pellet diet. A small percentage of the birds will take more work to accomplish the changeover. To avoid starvation during the process, close attention must be paid to what the birds are eating. Most "seed junkies" are overweight and could have fatty liver disease, whereas losing too much weight too quickly could be detrimental. The key is to keep them hungry enough to want to try other foods, but to not let them drop too much weight too quickly. Regular weighing and observation is needed to smoothly switch birds who only want seeds to a healthy diet.

All birds should be provided with access to clean fresh drinking water at all times. Water dishes should be placed securely against the sides of the cage to prevent birds from overturning them. Some birds like to bathe in the water so it should be monitored and changed twice a day. Because birds are sensitive to contaminants in the water that may not harm humans, bottled or filtered water should be used or tap water allowed to run for a few minutes before filling the dish (AWC, API and ASPCA, 2009).

Food and water dishes should be easy to clean and disinfect. Dry food can be placed in stainless steel or ceramic dishes. Water bottles are discouraged for use in shelters because they are more difficult to clean and disinfect quickly and more likely to harbor harmful bacteria and molds.

HISTORY AND PHYSICAL EXAMINATION

Psittacines and passerines are prey species. Prey species mask clinical signs of illness to avoid being killed by a predator. Birds are commonly found dead by owners who never realized anything was wrong. In order to provide appropriate care it is essential for the shelter to obtain a complete history and perform a physical exam of the bird. If a microchip is to be used to identify the bird, the author recommends inserting it while the bird is under anesthesia, which many shelters would probably be uncomfortable with or unable to do. Leg bands can be used for identification, although the author has reservations about

their use in a shelter. Band identification is largely for regulatory purposes and some injuries have been inadvertently inflicted via attempts to remove them.

The History

Although it is not always possible to obtain much information about a bird who has been relinquished to the shelter or seized for various reasons, a history should strive to obtain the following details from the owner or whoever seized or relinquished the bird:

- the bird's origin
- where the bird was kept in the house
- what other species the bird was in contact with
- whether any other animals or humans in the household were sick
- what the cage was made of
- what was in the cage
- what diet was provided and what the bird actually ate
- when the bird began exhibiting any abnormal behaviors such as plucking feathers
- whether there were any recent environmental changes

Physical Examination

As with the examination of any animal, the physical exam should be methodical and thorough, taking into account the health and stress level of the bird. All birds should have an individual medical record that includes their species, an accurate physical description, complete results of the physical examination, behavioral and medical history, diet, past and present medical problems and treatments, etc. There are situations, especially if the bird is ill, when the exam and diagnostic work should proceed slowly in phases depending on the stability of the patient. Although complete instructions on how to examine a bird cannot be included in this textbook, a few important guidelines will be provided. Shelters that admit birds should have at least one of the many avian textbooks (see Appendix 13.1) available for basic information and work closely with a veterinarian who has experience with birds to ensure birds are properly examined. The bird's overall appearance and demeanor should be evaluated first and then the exam should proceed from head to feet. The bird should appear bright and alert, responsive to external stimuli, and exhibit normal behaviors, including self-grooming (preening), normal eating, and vocalizing.

After being observed in the cage, the bird will need to be caught for further examination. It is important to cause as little stress as possible when restraining birds. There are many references available to describe this process for handlers who may lack experience or be uncomfortable. Perches, bowl, and any other obstacles in the cage should be removed. The handler can gently and calmly place a towel over the bird. The handler then can use one hand to support the bird's body in the towel while using the other hand to stabilize the bird's head. The bird's head should be held gently with the thumb and middle finger under the mandible and the index finger on top of the head so the handler has full control of the head. The handler should not attempt to move the bird out of the cage until the head is secure, and then can resume the rest of the exam.

The eyes, cere (soft, fleshy swelling found on the beak), ears, nares, and mouth should be examined, looking for any swellings, masses, discharge, etc. Birds with upper respiratory infections may have swellings around their eyes in the paranasal sinuses. They may also sneeze, wheeze, or exhibit open-mouthed breathing. The choanal slit, which is found on the bird's hard palate, will have blunted or missing papillae with vitamin A deficiency, which is common with birds on all-seed diets. Papillae do not grow back, so their absence only shows that there was a deficiency at some point in the bird's life. (See the section Hypovitaminosis A later in this chapter.) The bird's heart, lungs, and air sacs should be auscultated for any abnormalities. The pectoral muscle mass should be palpated to determine the body condition of the bird. Palpating a sharp prominent keel (breastbone) would indicate very poor body condition, whereas palpating no keel at all would indicate a severely overweight patient.

The feathers and skin should be thoroughly examined as they can provide clinical signs of nutritional, metabolic, and infectious abnormalities. Feathers should be smooth, vibrant, and glossy and lie flat against the body. The beak should be free of discharges, swellings, chips or dents, and be aligned when closed so the bird may eat and preen properly. Decreased preening and feather maintenance may be a sign of illness. The bird's cloaca (vent or region analogous to the anus in mammals) should be

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examined, everting the tissue to examine the proctodeum (the most distal chamber of the cloaca) for papillomas or other abnormalities.

The feet should be dexterous and flexible and be examined to be certain there are no signs of swelling or inflammation, growths, or sores. It is normal for birds to stand with one leg tucked under them, but both legs should be examined for any problems.

Birds should be visually assessed during daily rounds to check their health status. Early detection is the best way to avoid serious disease and resolve health problems. Some signs of illness include changes in appetite, weight or activity (preening, vocalizing, playing, etc.), frequent rubbing or scratching, inability to perch, limping, assuming irregular postures, swollen joints, vomiting, changes in the consistency, color or frequency of bird droppings, etc.

If the primary flight feathers are intact, the feathers should be trimmed by a veterinarian or someone experienced in this procedure to avoid the bird escaping and hurting him/herself. Beaks usually do not need to be trimmed unless they are mal-aligned, and this should be done by a veterinarian who is experienced with birds. Nails may need to be trimmed, which can be done by two people. One person will need to restrain the bird while the other does the trimming. Bleeding is common because the nails tend to be black; Kwik Stop® is usually sufficient for controlling and stopping the blood flow. Nail trims are done with the traditional trimmers used on dogs and cats or with a Dremel®. A Dremel gives a smoother surface, making it less likely that the nails will scratch persons handling the bird.

Bird droppings should be observed during rounds. Normal droppings do not have an odor and consist of three parts: the feces, urates, and urine. The actual feces are dark and worm-like in appearance, but they may be green if the bird is consuming seeds; brown if the diet is primarily pellets; or pink, purple, or red depending on the consumption of other foods. The urates are usually off-white or cream-colored, while the urine is the clear part of the mixture and should not be mistaken for diarrhea (AWC, API and ASPCA, 2009).

Guidelines for Disease Management

Birds can mask the signs of many illnesses and also be carriers of diseases that are infectious to other birds and humans. Any newly admitted birds should be screened for infectious disease and ideally quarantined for at least 30 days before being exposed to other birds in the shelter. All birds at the Best Friend's Animal Sanctuary are tested for Chlamydia by submitting a paired sample (choanal and/or cloacal swab and whole blood) for PCR testing. Even if a bird tests negative for Chlamydia, it still cannot be proven that he/she is not a carrier of the disease, which is zoonotic, or transmissible to humans. In addition, the bird can still carry the disease after the quarantine period has ended. Birds from Africa, Asia, and Australia are tested for Psittacine beak and feather disease; macaws, Amazons, and conures are tested for Pacheco's disease. Complete blood counts and blood chemistries, including bile acids are also performed upon intake of a new bird. Radiographs are performed routinely at the time of intake of new birds because they are relatively inexpensive, and problems are commonly detected radiographically that were not detected upon physical exam or blood work, such as heart disease, proventricular dilatory disease, neoplasia, etc. Complete fecal exams and gram stains are also recommended to detect parasites, bacterial infections, *Candida* overgrowth, etc. When a bird is presented to a shelter or sanctuary, much of the history is often missing and a thorough workup is therefore even more essential to determine the complete health status of that bird.

INFECTIOUS DISEASE

It is impossible to list all the infectious diseases that may affect birds in this chapter. The brief, basic disease descriptions included here are for the ones that the author believes are most commonly encountered or of greatest concern to shelters. It is not intended to replace the care and advice of veterinary professionals or avian experts. All diagnostic, treatment, and adoption placement decisions should be based upon the advice and input of the shelter veterinarian or a veterinarian experienced with birds.

Viral Diseases

Psittacine Beak and Feather Disease (PBFD)

Psittacine beak and feather disease (PBFD) is a circovirus that is known to infect birds from Asia, Australia, and Africa (Phalen, 2006a). African gray parrots, lovebirds, eclectus parrots, budgerigars,

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lories, and lorikeets are most commonly infected with the disease (Schmidt, Reavill and Phalen, 2003). New World parrots can have PBFD, but it is rare and a less severe form of the disease. Lovebirds can be infected without showing any signs of disease at all (Phalen, 2006a). The acute form of the infection is associated with pneumonia, enteritis, feather lesions, and death. The chronic form has progressive dystrophic feather lesions, and beak pathology is commonly present in cockatoos (Fiskett and Reavill, 2004).

PBFD can be very infectious, spreading throughout a shelter environment through feather dust. It has a carrier state. Quarantine for 30 days and testing is recommended for screening for the disease. Diagnosis is achieved by PCR (Polymerase Chain Reaction) swabs and whole blood from the birds, environment PCR probe testing, and biopsy of the affected feathers. Many birds arriving at shelters will have plucked and/or poor feather conditions. It is important to rule out PBFD and to not assume the bird is missing feathers from a nutritional deficiency and/or behavioral issue. Treatment is supportive only, and birds who recover should only be placed in a home without other susceptible birds. The severity of the disease varies with the species and age of the bird; birds who are severely affected and for whom there are no placement possibilities may need to be euthanized. An important management measure includes controlling the spread of feather dust through good sanitation.

Herpes Viruses

There are several psittacine herpes viruses. Pacheco's disease is highly contagious, and birds who exhibit clinical signs generally die. Macaws, Amazons, and some species of conures are most likely carriers of the virus (Phalen, 2006a). The disease is more severe in New World parrots, but many bird species are susceptible. Birds tend to die from massive liver necrosis. The incubation period is 3–14 days; disease transmission occurs via inhalation, ingestion, and conjunctival exposure to the virus via fomites (i.e., inanimate objects, hands, and clothing). PCR testing is available for identification of the serotypes that cause Pacheco's disease; submission of a paired sample of combined cloaca/choanal swab and blood is recommended (Phalen, 2006a).

Any bird who recovers from the disease should be considered a carrier. Acyclovir can be used for treatment and can help minimize the fatalities in an outbreak. There is a vaccine available, but it is unknown whether it protects against all serotypes of the herpes virus. It would be important to know the herpes serotype involved before considering vaccination.

Papillomatosis, which is also caused by a herpes virus, is characterized by a whitish/gray growth on mucous membranes in the oral cavity, upper gastrointestinal tract, cloaca, and the bile and pancreatic ducts. The lesions are linked to Pacheco's disease/herpes virus and are most commonly seen in Amazons, macaws, and hawk-headed parrots (Fiskett and Reavill, 2004). Cloacal lesions will turn white with the application of acetic acid, and histology and PCR probes will aid in diagnosis. Many birds can live for years with the condition; treatment is based on the severity of the disease. Papillomatosis is also linked to bile and pancreatic duct carcinomas (Phalen, 2006a).

Polyomavirus

Polyomavirus can cause disease in all psittacine birds, but cockatiels, lovebirds, and macaws are commonly affected. The infection was first recognized in budgerigars when it caused explosive outbreaks in commercial aviaries (Phalen, 1997). Nestlings and juveniles are most commonly affected; young nestling canaries and finches have a high morbidity and mortality rate. Some nestlings and juveniles will have concurrent infection with PBFD. The development of clinical disease depends on the age, species, and condition of the bird exposed. Clinical signs include anorexia, crop stasis, subcutaneous hemorrhage, tremors, ataxia, and reduced formation of down and contour feathers. The virus is excreted in feather dander and bird droppings and can be spread horizontally or vertically. A carrier state does exist wherein the virus persists in the kidney and is intermittently spread, especially during times of stress. Diagnosis is best accomplished by DNA-PCR probes of a blood or tissue sample and/or the environment.

There is a vaccine that can be helpful in the event of an outbreak (Fiskett and Reavill, 2004; Phalen, 2006a). The vaccine is mostly used as a prevention tool, when the nestlings are around 4 weeks of age and then a booster is given in another 4 weeks. There is controversy on how protective the vaccine is because birds commonly contract the disease before 8 weeks of age. For this reason, it is not practical for a shelter to administer or carry the vaccine. It is highly

recommended to routinely quarantine all incoming birds for 30 days for this disease and to obtain a good history, especially if the bird came from a breeding situation. Positive baby birds should be isolated or euthanized. Extensive cleaning and disinfection should be done to prevent the spread of the disease to other young birds.

Paramyxovirus

There are several serotypes of paramyxovirus that infect birds. Exotic Newcastle disease (END)—parmyxovirus-1—is considered a very high risk to the poultry industry and of great concern for all birds being imported into or out of the United States. Regulations regarding transport of birds into or out of the country as well as from state to state are in place, but birds illegally smuggled into the United States could be carrying END. END is a contagious and fatal disease that can affect all species of birds. The incubation period is 2–15 days. Parrots infected with END can be asymptomatic or may have respiratory, gastrointestinal, and nervous system signs (USDA and APHIS, 2003). END can infect and cause death in chickens whether vaccinated or not. END is so virulent that many birds die without showing any clinical signs. If a bird exhibits clinical signs of END or may have been exposed to other birds with the disease, immediately isolate the bird and notify federal and state animal health officials (USDA and APHIS, 2003).

Adenovirus

Adenovirus can cause sporadic disease outbreaks in budgies, parrotlets, lovebirds, cockatiels, African grays, and pionus species. Clinical signs include anemia and can involve the respiratory, gastrointestinal, renal, and central nervous systems. Birds can also suddenly die from disease without clinical signs. Kidney enlargement may be seen radiographically, but diagnosis is more commonly made upon necropsy (Fiskett and Reavill, 2004). It is not a very common disease, but if it was diagnosed, other birds who were exposed to the diseased bird would be at risk.

Poxvirus

There are many pox viruses: Amazona pox, canary/finch pox, and lovebird pox are commonly recognized and may affect several species of birds. The dry cutaneous form of pox involves the apteric (featherless) regions of the body where papules or raised scab lesions develop around the eyes, beak, nares, tibiotarsus, and feet. The wet diphtheroid form affects mucous membranes and has a higher mortality rate. Lesions are seen on the conjunctiva, oral membranes, trachea, and bronchi. If lesions are obstructing airways or causing clinical signs, they should be surgically removed.

The septicemic form is common in canaries and finches. It has an acute onset, causing ruffled plumage, anorexia, and cyanosis. Cutaneous lesions are rare in the septicemic form. Birds will commonly die within 3 days. Diagnosis is obtained via histology of the lesions (Fiskett and Reavill, 2004; Phalen, 2006a). The poxvirus cannot be treated except by providing supportive care and treating secondary infections. The severity of disease would determine if treatment should be attempted in a shelter setting. Prevention of the spread of the disease is by controlling insects (mosquitoes can spread the disease) and preventing contact with other birds with lesions.

Proventricular Dilatation Disease (PDD)

Proventricular dilatation disease (PDD) is caused by lymphoplasmacytic inflammatory infiltrates within the peripheral and/or central nervous system. A borna virus has been proven to be involved with the disease, but there is no definite proof whether other viruses and conditions are involved in the disease process (Rinder *et al*., 2009). Macaws, African grays, conures, cockatoos, and eclectus parrots are commonly affected. African gray parrots tend to have central nervous system signs. Clinical signs include depression, weight loss, constant and intermittent regurgitation, undigested seed in feces, ataxia, seizures, and proprioceptive and motor deficits. Diagnosis is via a combination of radiographs showing a dilated proventriculus, slow gastrointestinal emptying time, PCR testing for borna virus, biopsy of highly vascular areas of the crop, and clinical signs. It is difficult to definitively diagnose this disease on a live bird, and there is no treatment. Nonsteroidal anti-inflammatory drugs (NSAIDs) such as meloxicam can be helpful to alleviate the clinical signs, and treatments for secondary infections are often needed (Fiskett and Reavill, 2004; Phalen, 2006a). Birds showing clinical signs

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should be isolated from other birds, and standard isolation procedures should be followed.

Avian Influenza

The highly pathogenic avian influenza (HPAI) virus causes a serious and often fatal infection that is most commonly seen in domestic poultry, but there can be fatal infections in other gallinaceous species. In 1983–1984 there was an outbreak in the United States that cost nearly $65 million and resulted in the destruction of roughly 17 million birds. HPAI has the potential to infect psittacines and other species, but it should be stressed that poultry most commonly show the typical signs of HPAI, and it is rare in companion birds (CDC, 2008; CFSPH, 2009b).

HPAI results from a type A influenza virus. Type A influenza viruses of all species are similar, but viruses typically will have a higher specificity for one species or related groups of animals. Human sub type A influenzas tend to infect humans only, but subtypes of avian influenza have been reported in humans, usually when humans have had contact with infected poultry. Influenza A virus is constantly changing; some of the human subtypes (H1N1, H1N2, and H3N2) may have originated from birds. Avian influenza in companion birds will show nonspecific clinical signs and may have signs related to the central nervous system. If the disease is detected by a swab of the cloaca or trachea, it should be reported.

Bacteria and Other Infectious Causes of Disease

Chlamydia Psittaci (Psittacosis)

Chlamydia is an intracellular bacterial parasite that is zoonotic. It is also sometimes known as parrot fever or ornithosis. Many avian species have been diagnosed with *C. psittaci,* including pigeons, but companion bird species are the greatest public health concern. Amazons tend to present with the classical form of disease, with clinical signs including sinusitis, dyspnea, conjunctivitis, polyuria, diarrhea, lethargy, anorexia, yellow to dark-green droppings, poor feathering, and chronic weight loss. Hematology, radiographs, biochemistries, PCR probes, antigen capture tests, antibody tests, cytology, and cultures all help in the diagnosis of psittacosis. Leukocytosis is common in acute infections. The fact that the bacteria is intracellular and shed intermittently makes the disease difficult to diagnose. If the bird has been on antibiotics, this will create false negatives as well. There is no definitive test to show that the bird is free of disease.

The incubation period is 5 days to several weeks. Inhalation of dried dust contaminated with bird droppings is the most common method of transmission, with ingestion being less common. Fomites and insects can also spread the disease. Subclinical infections commonly occur. The virus is commonly shed by carrier birds when they are stressed.

The disease is zoonotic, causing a respiratory infection in humans. Chlamydia responds well to tetracyclines and is usually not fatal to humans or birds if diagnosed and treated promptly. Birds should be quarantined for 30 days whenever psittacosis is suspected. Handlers should wear protective clothing, gloves, surgical cap, and mask. Necropsies should be performed under a hood by staff wearing protective gear as described above, and the bird should be immersed in a disinfectant to prevent the infectious feather dust from spreading. Waste material in the cage can remain infectious for weeks, so good sanitation is essential to prevent disease transmission. Chlamydia is susceptible to quaternary ammonium compounds, chlorophenols, iodophor disinfectants, formaldehyde, 80% isopropyl alcohol or 1:100 dilution of household bleach (Gerlack, 1994; Fiskett and Reavill, 2004; Tully, 2006; CFSPH, 2009a).

Birds with Chlamydia should not be adopted.

Salmonella

Salmonella is a zoonotic bacterial disease that can result in high mortality of young birds, lories, and African gray parrots. Most vertebrates can be infected with Salmonella; however, the host susceptibility and development of carrier states vary widely among species.

Salmonella is shed in feces, nasal and ocular secretions; transmission is by ingestion of contaminated food or water or by direct contact with aerosolized fecal or feather dust. It can also be spread by flies, insects, rodents, and other vermin. It is most commonly seen as a result of stress, overcrowding or in poorly ventilated environments. There is a carrier state to the disease, and feces of chronically infected birds are the most common source of infection. Diagnosis is difficult due to intermittent shedding of the bacteria, but it may be accomplished by isolation and identification of the bacterium, PCR or sequence assays.

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Depression, lethargy, diarrhea, pasty vents, lameness, abscesses, convulsions, dehydration, crop stasis, meningitis, osteoarthritis, and sudden death are all clinical signs of disease. African gray parrots are particularly susceptible and suffer from chronic disease, exhibiting discharge from the nares, arthritis, excessive thirst, and dermatitis. Lories suffer from acute disease and may die suddenly. Therapy is based upon the results of bacterial culture and sensitivity tests (Fiskett and Reavill, 2004). Several antibiotics are effective against salmonella; treatment decisions should be based on culture and sensitivity.

The bacterium can remain alive outside the bird's body for prolonged periods of time. Contaminated droppings appear similar to dust when dry. Cage sanitation is critical to prevent disease transmission. Salmonella is inactivated by several disinfectants commonly employed by shelters, such as quaternary ammonium products. Birds suspected to be infected with salmonella should be handled by as few staff as possible, who should be wearing protective garments as described in the section on Chlamydia, placed in quarantine for observation, and given a full course of treatment before their release or transfer. A culture should be performed 3–6 weeks after treatment to confirm that the bird is cleared of the disease and can be adopted without any warnings. It should be noted that humans may also infect birds with salmonella.

Mycobacterium

Psittacines do not commonly contract mycobacterium, but when they do it is commonly *M. genavense* or *M. avium*. These two types of mycobacterium do have the potential to be zoonotic, but it is rare. Psittacines have been reported to have *Mycobacterium tuberculosis,* but this is more commonly reported as the bird contracting the disease from a human who has tuberculosis. Amazons, pionus, and finches/canaries are most commonly affected. Transmission is commonly from ingestion or inhalation of soil or water that is contaminated with mycobacterium from feces of other animals. Susceptibility to the disease greatly varies among individuals.

Lesions range from diffuse granulomatous inflammation, usually within the gastrointestinal tract, to multiple granulomas that are easily confused with tumors. Less commonly, there can be respiratory granulomas, skin disease, and ocular lesions. Patients can have a significantly elevated leukogram, or it can be perfectly normal. Diagnosis is by biopsy or aspiration of the mass; cytology and acid fast stains are performed to evaluate the mass or intestinal thickenings. If the disease is diagnosed, all people in contact with the bird must consult their physician. Surgical excision of granulomas is indicated if possible. If the disease is disseminated, multidrug and other successful therapies based on culture and sensitivity should be implemented (Pollock, 2006). A bird confirmed to have mycobacterium by biopsy will likely need to be euthanized in a shelter setting, due to the extensive surgical and medical treatment needed, poor prognosis, and zoonotic potential.

Aspergillosis

Aspergillosis is the most frequent cause of respiratory disease in pet birds. Most birds have been exposed to this fungus that is commonly found in the environment. The African gray parrot and pionus parrots are reported to have an increased susceptibility to this disease, but it can be seen in almost all avian species.

Aspergillosis usually occurs secondary to immunosuppression or results from an exposure to large numbers of spores. It can be seen in acute or chronic forms and as a localized mass or disseminated systemic infection. The environment should be evaluated to determine if it is a source of fungal spores; samples to test include wood shavings, corncob bedding, and seed hulls. Nonhuman-grade foods, commonly peanuts, can be a source for aspergillosis as well. If it is likely that food is a source of aspergillums, it should be discarded. Steps should be taken to make sure that only fresh food is provided and that the environment is sanitary, without molds growing in the enclosure. In most cases, exposed birds do not contract the disease unless there is an exposure to severely unsanitary conditions or the bird is immunocompromised.

Aspergillosis tends to cause a significant heterophilic leukocytosis, which can be associated with the acute or chronic form of disease. Serology, radiographs, endoscopy, and cytologic evaluation all aid in the diagnosis of aspergillosis. Antifungal drugs, surgical excision, nebulization, and treatment of any underlying compromised states with supportive care are all indicated in the treatment of aspergillosis. Diagnosis and treatment of the disease is difficult (Dahlhausen, 2006). If a bird is confirmed to have systemic aspergillosis in a shelter setting, euthanasia

may need to be considered depending on the severity of the case.

Macrorhabdus–Avian Gastric Yeast

Macrorhabdus ornithogaster, also known as avian gastric yeast or megabacteria, was once thought to be a bacteria but is now known to be a yeast. Budgies, cockatiels, finches, canaries, lovebirds, neophema parakeets, rosellas, lesser sulfur-crested cockatoos, and chickens have been commonly reported to have avian gastric yeast. Affected birds show signs of weight loss and depression. Avian gastric yeast can be a normal part of the upper alimentary tract in budgies and canaries. The organism inhabits the lower portion of the proventriculus within the superficial mucosal glands of the isthmus. The mode of transmission is unknown. The yeast can be identified on gram stains, wet mounts, and by PCR probe tests. Budgies have nonspecific signs of anemia, leukocytosis, heterophilia, monocytosis, lymphocytosis, and basophilia. Amphotericin B and nystatin may be effective treatment for the clinical signs, but most likely will not completely rid birds of the disease (Fiskett and Reavill, 2004; Phalen, 2006b).

Candida Albicans

Alterations in the normal bacterial flora, loss of integrity of the alimentary mucosa, or immune incompetence can permit an overgrowth and possible dissemination of resident yeast—most likely *Candida albicans*. Cockatiels, budgies, and lovebirds are highly susceptible. Disease is more common in young birds and may progress to fatal systemic disease. Antibiotics, hypovitaminosis A, spoiled foods, a stressful unsanitary environment, malnutrition, and bacterial or viral infections are all possible predisposing factors for this disease. Improperly handfed baby birds will tend to have crop stasis, contributing to Candida overgrowth. Diagnosis is by clinical signs, history, lesions, and laboratory samples. Culture alone will not diagnose a yeast infection. Underlying conditions leading to infection must be identified and addressed to successfully resolve this condition (Fiskett and Reavill, 2004).

Sarcocystis

Sarcocystis is a protozoan infection that causes a high morbidity and mortality in Australian, Asian, and African psittacine birds and occasionally exotic columbiformes. Lories and lorikeets are the species most commonly affected, followed by African gray and eclectus parrots, and cockatoos. Transmission is by the definitive host—the opossum's fecal material and by mechanical vectors such as cockroaches. Intermediate hosts include cowbirds and grackles. Death occurs rapidly due to asexual reproduction of the protozoans in the lung, which leads to fatal respiratory collapse. Pulmonary congestion and hemorrhage may be the only lesions recognized. Pyrimethamine may be of benefit if the disease is diagnosed and treated early, and control of opossums and cockroaches is important (Fiskett and Reavill, 2004).

Parasites

Knemidokoptes

Knemidokoptes is a common mite of budgies and canaries. Mites are usually found around apteric areas of skin, like the beak, cere, vent, legs, and feet. Hyperkeratosis can result in deformed growth of the beak and nails. Mites are transmitted from bird to bird, but vertical transmission to featherless offspring can occur. Severe secondary infections can occur due to decreased immune function. Diagnosis is from observation of the mites microscopically from the hyperkeratotic skin. Ivermectin is commonly used for treatment (Fiskett and Reavill, 2004). The cage should be cleaned and disinfected and all toys, bowls, and removable items should be run through the dishwasher on high heat or thoroughly disinfected by hand.

Giardia

Giardia has been diagnosed in a variety of psittacines, poultry, waterfowl, finches, and toucans, where the clinical signs can vary from weight loss and diarrhea to failure to thrive. Cockatiels have been known to be infected with Giardia, resulting in extensive pruritus and feather picking. The disease in cockatiels is now more likely caused by *Hexamita*/*Spironucleus* spp. Diagnosis is by direct wet mount or by fecal PCR test. Ronidazole and metronidazole are common treatments for giardia but *Hexamita*/*Spironucleus* spp. is more difficult to clear successfully (Gelis, 2006). (See Table 13.1 for a summary of some important avian diseases.)

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Table 13.1. Common infectious avian diseases.

Infectious diseases	Clinical signs	Common species	Zoonotic	Route of transmission
Psittacine beak and feather disease	Dystrophic feathers, beak lesions, enteritis, pneumonia, death	African grays, lovebirds, eclectus, lories, lorikeets, and budgies, but many Old World parrots susceptible	No	Feather dust commonly
Pacheco's disease	Few clinical signs, death	Amazons, cockatoos, cockatiels, and macaws	No	Ingestion, inhalation, and conjunctival
Amazon tracheitis	Respiratory signs	Amazons, conures, parakeets, lorikeets, and rosellas	No	Inhalation
Proventricular dilatory disease	Depression, weight loss, regurgitation, undigested seeds, ataxia, neurologic deficits, and seizures	Macaws, African grays, conures, eclectus, and cockatoos	No	Unknown
Pox	Lesions on apteric skin or lesions within the respiratory tract	Amazons, canaries, finches, lovebirds, and more	No	Fomites, arthropods, insects or direct contact
Bordetella/ enterococcus	Respiratory signs, locked jaw	Cockatiels	No	Inhalation
Psittacosis	Respiratory, polyuria, green urates, weight loss, poor feathering, and other nonspecific signs	Cockatiels commonly, amazons, and many others	Yes	Inhalation commonly, also ingestion, fomites, and insects
Mycobacteriosis	Gastrointestinal, respiratory tract, usually signs associated with granulomas	Amazons, pionus, finches and canaries, and many other species	Yes	Inhalation, ingestion of feces, environmental
Salmonella	Gastrointestinal signs and death	Young birds, lories, African gray, and others	Yes	Inhalation or ingestion of feces, contaminated water or food, and also feather dust
Aspergillosis	Respiratory, death	African grays and pionus, but many species susceptible	No	Inhalation from environment or ingestion of contaminated foods

(*continued*)

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Table 13.1. (*Continued*)

Infectious diseases	Clinical signs	Common species	Zoonotic	Route of transmission
Avian gastric yeast	Weight loss, depression	Budgies, canaries, finches, lovebirds, and some parakeets, but others susceptible	No	Unknown
Candida	Gastrointestinal signs, crop stasis	All, common in young	No	Normal flora, disease common in immunocompromised or as a secondary problem to disease or to antibiotics
Sarcocystis	Respiratory, sudden death	Lories, lorikeets, African grays, eclectus parrots, and cockatoos common, Old World parrots highly susceptible	No	Fecal ingestion from opossums, mechanical vectors of insects
Knemidokoptes	Deformed beaks and nails, hyperkeratotic skin on apteric skin areas	Canaries and budgies	No	Environmental, horizontal direct contact
Giardia	Gastrointestinal, pruritus, polyuria, and feather picking	Cockatiels, finches, lovebird, and budgies	Yes	Ingestion from contaminated food, water, or environment

NEOPLASIA

It is beyond the scope of this chapter to describe the various types of neoplasia that companion birds are subject to. Tumors that have been found commonly in birds include malignant melanoma, Sertoli cell, lipomas and myelolipomas, lymphoma, fibrosarcomas, gastric carcinomas, renal, and pulmonary tumors. Whenever neoplasia is suspected, a full workup including a complete physical examination, radiographs, appropriate imaging, and biopsies should be undertaken.

NUTRITIONAL/METABOLIC DISORDERS

Chronic Liver Disease

Chronic liver disease is common in psittacines. Lesions may result from previous hepatic insults such as infectious inflammatory hepatitis, severe vacuolar hepatopathy or fatty liver, chronic congestion from heart disease, or exposure to hepatotoxins. Fatty liver disease is commonly seen in psittacines who are fed all-seed diets and who get very little exercise. Bile acids are specific to the liver and very useful in determining decreased liver function. Radiographs help to detect an enlarged liver or masses. Diagnosis of liver disease is obtained by aspirate or biopsy of the liver. Identification and correction of contributing and underlying disease conditions, nutritional counseling, antibiotics, lactulose, milk thistle, colchicines, and other nutriceuticals are all used in hepatic disease management (Fiskett and Reavill, 2004; Hochleithner, Hochleithner and Harrison, 2006). In a shelter setting, many birds will appear clinically normal; each individual will have

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to be assessed to determine quality of life and if placement in a home is feasible.

Renal Disease

Renal disease is likely to be common in psittacines, but difficult to diagnose. Elevated uric acid and protein levels are indications of disease, but there can also be perfectly normal blood work along with significant disease. Renal disease can also be caused by multiple other disease processes in the body. Gout is common in cockatiels and budgies; many birds will have underlying kidney disease and produce high amounts of uric acid in the blood circulation. In articular gout, urates will be deposited and cause white swellings over the joints and tendons, particularly in the feet. Shifting leg lameness, inability to bend toes, and nonspecific feather picking are clinical signs of disease. Visceral gout occurs secondarily to high uric acid levels and will cause deposits to form on visceral organs. Visceral and articular gout commonly occur separately, but have been found simultaneously in the same bird with urate deposits on internal organs and in joints. Allopurinol has been used to decrease uric acid production, but does not affect the deposits in the tissues. Treatment for renal disease includes fluid therapy, omega-3 fats, and dietary modifications. NSAIDs (non steroidal anti-inflammatory drugs) are indicated for articular gout due to the high level of pain and inflammation associated with the disease (Fiskett and Reavill, 2004; Echols, 2006).

Atherosclerosis

Atherosclerosis is defined as plaque lesions of the tunica media and tunica intima of elastic and muscular arteries. The plaques cause abnormal vascular flow and loss of endothelial integrity with decreased elasticity and variable degrees of vessel narrowing. Changes in the vessel walls can cause thrombosis. African gray parrots, lovebirds, Amazon parrots, and cockatiels most commonly develop the disease. In birds, the lesions are usually in the aorta and brachiocephalic arteries.

Atherosclerosis is caused by obesity, lack of exercise, and poor diet. This disease is a common reason why psittacines may die suddenly without any clinical signs. If clinical signs are present, they include dyspnea, muscle wasting, progressive paresis of legs, and seizure activity. Treatment is weight loss, dietary improvements, omega-3 fats, and heart medications if indicated (Fiskett and Reavill, 2004).

Hypovitaminosis A

Hypovitaminosis A is common in pet birds fed a primarily seed or cereal grain diet. Decreased levels of vitamin A cause epithelial squamous metaplasia, which results in hyperkeratosis of the oral cavity, conjunctiva, nasolacrimal duct, upper alimentary tract, and the respiratory tract. Keratinizing epithelium will block the ducts of the submucosal glands, causing the glands to enlarge with secondary infections that produce large keratin granulomas within the nasal or oral cavity. This also alters the mucosal defenses leading to secondary fungal and bacterial infections, especially within the respiratory tract. Diagnosis is commonly obtained by physical exam and history. Epithelial changes will occur when concentrations of vitamin A in the liver decrease below 50 IU/kg. Treatment is vitamin A supplementation, diet change, and treatment of secondary infections (Fiskett and Reavill, 2004).

Hypocalcemia

Hypocalcemia is associated mostly with African gray parrots with decreased levels of blood calcium in conjunction with tetany or seizures. The condition is most likely diet related. There has been a strong correlation between total calcium and albumin concentration in the plasma, so the calcium levels should be interpreted along with the albumin (Fiskett and Reavill, 2004).

Scissors Beak

Scissors beak is common in macaws. It is a lateral deviation of the upper beak over the lower beak. The cause is unknown, but may result from a low or unbalanced calcium level in the diet, viral diseases, trauma, improper hand-feeding techniques, and alterations in the mandibular occlusal surface. If detected early, it can be corrected by trimming the gnathotheca (lower beak) and reshaping the occlusal surface of the rhamphotheca (upper and lower beak) by therapeutic massage methods. If not successful, then a ramp built from dental acrylic over a stainless steel mesh can be attached to the gnathotheca to apply pressure to correct the rhinotheca (upper beak), being careful to not over-correct (Martin and Ritchie, 1994). Treatment should be provided by a veterinarian with experience handling birds.

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Other Conditions

Chronic Obstructive Pulmonary Disease (COPD)

Chronic obstructive pulmonary disease (COPD) is common in macaws, especially blue and gold macaws housed with cockatoos, cockatiels, and African grays. It is a pulmonary hypersensitivity that is generally associated with polycythemia. Early diagnosis is difficult due to the reserve capacity of avian lungs and relative inactivity of captive macaws. Lung lesions are advanced once the polycythemia occurs. Most of these macaws have been kept in aviaries with poor ventilation. Treatment is improved ventilation and separation from cockatoos, cockatiels, and African gray species (Fiskett and Reavill, 2004).

Brown Hypertrophy of the Cere

In female budgerigars, a brown color change to the cere is normal from estrogen production. In older females, the cornified layer of the cere can undergo extensive hyperplasia, where the growth will have the appearance of a horn. This condition may or may not need surgical correction depending on the severity.

Millet Seed Aspiration

Seed aspirations in cockatiels, budgies, and canaries are fairly common. The bird will show clinical signs of upper respiratory distress. Placing an air sac breathing tube will often be indicated and removal of seeds by flushing or aspirating. Cytology of the flush is recommended. This is best treated by a veterinarian with experience working with birds. (For air sac tube placement, see Harrison, Lightfoot and Flinchum, 2006.)

Choanal Atresia

Choanal atresia occurs when the persistent membrane on the bony place of the palate of the nasal cavity results in a closed choanal slit. This condition blocks the normal drainage of the nasal secretions into the oral cavity. Young birds present with a chronic nasal and ocular discharge and in some cases the infraorbital sinuses will be distended with a clear secretion. Depending on severity, surgical correction is recommended.

Hematuria Syndrome of Neonates

Reddish urine and urates have been described in juvenile African gray parrots and some Amazon and pionus species. It can occur with certain hand-feeding formulas and is more pronounced on certain bedding materials. Diagnosis is by a fecal occult blood test. The condition is not associated with any pathology or clinical signs, and no treatment is necessary.

Amazon Foot Skin Necrosis

Amazon foot skin necrosis occurs in Amazons, particularly the yellow-naped Amazon. Clinical lesions appear as irregular patterns of erythema or brown to black discoloration of the apteric skin of legs and feet. Birds are very pruritic and will attack the affected areas of the skin; auto-mutilation is very common. The cause is unknown and treatment consists of preventing the mutilation while permitting the lesions to heal. Some birds will have recurring episodes.

Feather Follicle Cysts

Feather follicle cysts are a hereditary condition, but the mode of inheritance is unclear; viruses may be a possible cause of the secondary folliculitis. Norwich, crested, crest-bred, and dimorphic new color canaries produce an extra down-type feather that predisposes them to cyst formation. Pectoral and scapular feather tracts are a frequent site for cysts. If solitary, the cysts can be removed surgically, but if they are widespread throughout the body, surgery is not a good option. These birds should not be allowed to breed.

Tail Avulsions

Tail avulsions are common in wing-clipped fledglings after falling and hyper-extending their tails. Muscles of the ventral tail base are ripped off the pygostyle and they may have a prolapsed cloaca as well. Surgical closure of the skin may be indicated.

Self-Mutilation/Feather Picking

Feather picking and auto-mutilation are very common in psittacines (see Figure 13.4). It is important for the clinician to perform a complete medical workup to determine if there is an underlying

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Figure 13.4. Great-billed parrot (*Tanygnathus megalorynchos*) who has plucked out almost all feathers that are within his reach. This bird tested positive on a PBFD PCR test, but then later tested negative. Biopsy results were negative for PBFD as well. This is a behavioral issue, not PBFD.

condition causing the behavior or if it is a primary behavior problem. Mutilation of the sternum is common along the point of the keel and there may be an open wound of the skin and muscle. Continued self-trauma may lead to necrosis and infection, which can extend to deeper muscles and to the bone of the keel. Mixed bacteria of *Streptococcus species*, *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas species*, *Klebsiella*, and occasional fungal organisms are often found. Pruritus tends to lead to the secondary infections (Fiskett and Reavill, 2004). Self-mutilation can be due to improper wing trim of heavy-bodied birds like African grays and Amazon parrots and will result in a traumatic landing and damage to the keel. When all medical reasons are ruled out for the mutilation, then behavior modifications have to be addressed. A good history is very helpful in these cases to find what the trigger was for the behavior and what can be done to change the behavior. In the author's experience, Moluccan cockatoos tend to be the most difficult self-mutilation cases to resolve. Once they begin to mutilate themselves, it becomes a compulsive, repetitive disorder, and they cannot seem to stop themselves. These birds, with a lot of time and attention, can have their energy redirected into a positive behavior. These are very time-consuming cases, and if the shelter does not have experienced staff or the time to address this kind of case then the bird should be placed with a facility or person who can. If these birds sit in a cage without much attention, their condition worsens quickly and will cause irreversible damage medically and emotionally (see Figure 13.5).

BEHAVIOR

Psittacines are prey species and respond very differently than dogs and cats to stimuli. In the wild, they commonly live in flocks, which may make parrots less tolerant to isolated captivity situations than other species. They spend the majority of their time looking for food, watching for predators, and taking care of themselves. In captivity, there is an enormous



Figure 13.5. Moluccan cockatoo (*Cacatua moluccensis*) who has to wear a sweater to avoid self-mutilation to his chest.

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Figure 13.6. Outdoor enclosure grouping amazons together with lots of space, and foraging toys.

surplus of time and energy because their basic needs for food, water, and safety from predators are met. This leads to obesity, boredom, and many behavioral problems. See Table 13.2 for some easy ways to provide the kind of stimulation that helps eliminate behavior problems associated with inactivity and lack of purpose.

Psittacines are diurnal prey species with an acute sense of vision and hearing. In homes and shelters, sleep can easily be interrupted, and birds will beak grind, roost, and may become excessively vocal when kept awake. Natural photoperiods are preferred, but some birds with overactive breeding behaviors will need to have their exposure to light shortened, since birds naturally breed when the days get longer in the spring.

Improper cage placement can cause fear and anxiety in psittacines. Some individuals who are either timid or aggressively defending their cage will benefit from being in low-traffic areas. Other friendly,

Table 13.2. Tips for keeping birds happy.

1. Provide lots of foraging opportunities.
2. Use positive reinforcement training for basic commands.
3. Provide daily opportunities for exercise outside in a flight aviary or enclosure, or a foraging tree in the shelter.
4. Regularly provide bird-safe toys and rotate them among birds; if rotated, they must be disinfected first.
5. Avoid responding to negative behaviors.
6. Avoid activities that increase reproductive behaviors such as providing increased day length, housing breeding birds in close contact, petting bird on back where genitals are located, etc.

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social birds will need to be placed in a high-traffic area with lots of human stimulation. Due to the flock behavior in the wild, although it will depend upon the individual bird, most birds in captivity require lots of interactions with other birds and/or humans. It has been found that orange-winged Amazon parrots who were housed with another bird spent less time preening, less time screaming, and more time being active than the singly housed cohorts (Meehan, Millam and Mench, 2003). Parrots housed in pairs were less fearful of human handlers and did not develop repetitive behaviors (Hooijmeijer *et al*., 2004). (See Figure 13.6).

Foraging Toys

Foraging toys are devices that are made so food items can be hidden inside, requiring birds to work to find the food. Toys range from easy to difficult. Some birds will be able to readily figure out the difficult toys whereas others will have to start with easy ones and work their way up to the more difficult ones. One can start by wrapping the food bowl with paper or cardboard or placing treats in wadded up small paper cups. A foraging perch can be made by drilling in holes into where nuts, seeds, or other rewards can fit tightly or by hanging various foraging toys. A foraging tree is great to have in a shelter where different birds can rotate through during the day, and it can have all levels of foraging stations built in to meet all of the different birds' foraging abilities (see Figure 13.7). (See Appendix 13.1 for Echols Captive Foraging video and foraging toy ideas.) Only healthy birds should be permitted access to the tree.

CONCLUSION

Unlike dogs and cats who are abandoned, unwanted birds are not as visible as strays on the street—but they are becoming ever more visible in the skies. There has been a marked increase in feral flocks of Quaker parrots, peach-faced lovebirds, and budgerigars, as well as mixed species feral flocks



Figure 13.7. Foraging tree made for indoor birds that can be used for several birds at the same time or taking turns.

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that include conures, Amazons, and macaws in scattered areas of the United States. Although a serious problem clearly exists and the number of displaced captive birds is on the rise, it remains a hidden crisis of which the full ramifications for both the escaped exotic birds and native species have yet to be identified.

Psittacines are often placed in shelters due to unrealistic expectations about the level of care they require, owner's inability to meet their needs, outliving their owners, behavior problems, etc. When psittacines are brought to shelters, many times they are not euthanized as frequently as dogs and cats due to being considered uncommon and desirable, or having monetary value. They are often kept isolated in a cage without enrichment opportunities and offered for adoption. This situation may create or worsen behavior problems and decrease the chances of the bird finding a suitable, permanent home. If a shelter does not have the resources to properly care for the bird, then the bird should immediately be placed in a facility that does. A proactive working relationship among animal welfare/advocacy, animal shelters, rescue groups, and conservation organizations is needed to enlighten the public and to provide protection for and assure the welfare of all wild and domestic birds.

REFERENCES

Armstrong, M.C., Farinato, R.H. and Telecky, T.M. (2001) A wing and a prayer: Birds and their protection under law. *Journal of Avian Medicine and Surgery*, **15**, 310–315.

Avian Welfare Coalition, Animal Protection Institute, American Society for the Prevention of Cruelty to Animals (2009) *Captive Exotic Bird Care: A Guide for Shelters*, www.avianwelfare.org.

Born Free USA (2003–2011) *Current Law and Suggested Approaches to Improving Captive Bird Welfare*, http://www.bornfreeusa.org/b4a2_birdwelfare.php.

Center for Food Security and Public Health (CFSPH), Iowa State University (2009a) *Chlamydiosis (Avian)*, *Technical Factsheet*, pp. 1–4, www.cfsph.iastate.edu/DiseaseInfo.

Center for Food Security and Public Health (CFSPH), Iowa State University (2009b) *Highly Pathogenic Avian Influenza. Technical Factsheet*, pp. 1–4, www.cfsph.iastate.edu/DiseaseInfo.

Centers for Disease Control and Prevention (2008) *Key Facts about Avian Influenza (Bird Flu) and Highly Pathogenic Avian Influenza A (H5N1) Virus*, http://www.cdc.gov/flu/avian/gen-info/facts.htm.

Dahlhausen, R.D. (2006) Implications of mycoses in clinical disorders, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 691–704.

Echols, S.M. (2006) Evaluating and treating the kidneys, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 451–491.

Echols, S.M. (2004) The behavior of diet. *Proceedings of Annual Conference, Association of Avian Veterinarians*, AAV, Denver, Colorado, pp. 267–270.

Fiskett, R.F. and Reavill, D.R. (2004) Disease conditions and clinical signs of pet birds. *Proceedings of Annual Conference, Association of Avian Veterinarians*, AAV, Denver, Colorado, pp. 245–263.

Gelis, S. (2006) Evaluating and treating the gastrointestinal system, in *Clinical Avian Medicine*, Vol. I (eds G.J. Harrison and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 411–440.

Gerlack, H. (1994) Chlamydia, in *Avian Medicine: Principles and Application* (eds B.W. Ritchie, G.J. Harrison and L.R. Harrison), Wingers Publishing, Inc., Lake Worth, Florida, pp. 984–996.

Harrison, G.L., Lightfoot, T.L. and Flinchum, G.B. (2006) Emergency and critical care, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison and Lightfoot, T.L.), Spix Publishing, Palm Beach, Florida, pp. 213–240.

Hochleithner, M., Hochleithner, C. and Harrison, L.D. (2006) Evaluating and treating the liver, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 441–449.

Hooimeijer, J., Wilson, L., Gore, J. *et al.* (2004) Standards of care for parrots within a rescue and/or sanctuary facility. Available online at http://www.thegabrielfoundation.org/HTML/standardsofcare.htm.

Kelly, D., McCarthy, E. and Engebretson, M. (2007) *Avian Welfare Issues: An Overview. Avian Welfare Coalition*, www.avianwelfare.org.

Martin, H. and Ritchie, B.W. (1994) Orthopedic surgical techniques, in *Avian Medicine: Principles and Application*, (eds B.W. Ritchie, G.J. Harrison and L.R. Harrison), Wingers Publishing, Inc., Lake Worth, Florida, pp. 1137–1169.

Meehan, C.L., Millam, J.R. and Mench, J.A. (2003) Foraging opportunity and increased physical complexity both prevent and reduce psychogenic feather

picking by young Amazon parrots. *Applied Animal Behavior Science*, **80**, 71–85.

Phalen, D.N. (1997) Viruses, in *Avian Medicine and Surgery* (eds R.B. Altman, S.L. Chubb, G.M. Dorrestein, and K. Quesenberry), W.B. Saunders Company, Philadelphia, Pennsylvania, pp. 281–322.

Phalen, D.N. (2006a) Implications of viruses in clinical disorders, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison, and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 721–746.

Phalen, D.N. (2006b) Implications of macrorhabdus in clinical disorders, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 721–746.

Pollock, C.G. (2006) Implications of mycobacteria in clinical disorders, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 681–690.

Rinder, M., Ackermann, A., Kempf, H. *et al*. (2009) Broad tissue and cell tropism of avian bornavirus in parrots with proventricular disease. *Journal of Virology*, **83**, 5401–5407.

Schmidt, R.E., Reavill, D.R. and Phalen, D.N. (2003) *Pathology of Pet and Aviary Birds*, Blackwell Publishing, Ames, Iowa.

Tully, T.N. (2006) Update on *Chlamydophila psittaci*: A short comment, in *Clinical Avian Medicine*, Vol. II (eds G.J. Harrison and T.L. Lightfoot), Spix Publishing, Palm Beach, Florida, pp. 679–680.

United States Department of Agriculture and Animal and Plant Health Inspection Service (2003) *Animal Disease Alert: Exotic Newcastle Disease*, http://www.aphis.usda.gov/publications/animal_health/content/printable_version/ada_ahend.pdf.

Appendix 13.1
Avian Resources

ONLINE

ASPCA Animal Poison Control Center:
1-888-4ANI-HELP or 1-888-426-4435.
http://www.aspca.org/pet-care/poison-control/

For a list of poisonous and safe plants and foods for birds.
www.avianweb.com

For a wide variety of resources and information about pet birds and wild birds.

MEDICAL TEXTS

Carpenter, J.W. (2004) *Exotic Animal Formulary*, 3rd edn. Saunders, Philadelphia, Pennsylvania.

Harrison, G.J. and Lightfoot, T.L., eds (2006) *Clinical Avian Medicine*, Vol. 1 and 2. Spix Publishing, South Palm Beach, Florida.

Ritchie, B.W., Harrison, G.J. and Harrison, L.R. (1994) *Avian Medicine: Principles and Applications*. Wingers Publishing, Lake Worth, Florida.

SPECIES IDENTIFICATION

Forshaw, J.M. (2010) *Parrots of the World: An Identification Guide*. Princeton University Press, Princeton, New Jersey.

JOURNAL ARTICLES

Seibert, L.M. (2007) Husbandry considerations for better behavioral health in psittacine species. *Compendium: Continuing Education for Veterinarians*, **29**, May, pp. 303–306.

VIDEO

Dr. Echols S.M., D.V.M (2006) *Captive Foraging: The Next Best Thing to Being Free*, www.avianstudios.com

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14
Temporary Care of Wildlife in the Animal Shelter

Scott Diehl and Cheryl Diehl

INTRODUCTION

Animal shelters often are limited in their ability to assist wildlife in their communities, either by their mission or a lack of resources. Nevertheless, shelters often are called upon by their communities to assist wildlife in distress. A survey of nearly 100 animal shelters in the United States found that more than half of them handle injured, orphaned, or "nuisance" wildlife more than 500 times each year (Kirkwood, 1998). However, many of the critical needs of wild animals in rehabilitation are very different than the needs of sheltered companion animals. Therefore, being a well-equipped companion animal shelter with a highly capable staff does not automatically make a shelter a humane and effective wild animal care facility.

This chapter is intended primarily for shelters that do not have a "full-service" in-house wildlife rehabilitation hospital. It is intended to help shelters that accept wildlife on a limited or temporary basis or are considering doing so. Establishing an effective, well-planned wildlife program for a shelter can decrease animal suffering in the community and enhance community confidence in the shelter. Reference materials that the authors believe are essential for shelters handling wildlife on a temporary basis are listed in Appendix 14.1.

PREVENTIVE MEDICINE

The authors consider public education that reduces the occurrence or likelihood of injury, illness, needless disruption, or death for wildlife in a community to be essential preventive medicine. As important as it is to provide humane care for injured, sick, and orphaned wildlife, it is much better to *prevent* suffering from occurring in the first place.

Investigating the causes of anthropogenic (man-made) injury, sickness, and death of wildlife in a community may reveal one or more key issues upon which a positive impact can be attained through public education. In this way, even a shelter without an in-house wildlife rehabilitation hospital can reduce injury and suffering for wild animals in the community.

The public can be educated about these key issues in a number of ways, including media stories, brochures, facility displays, automated telephone tip-lines, stories in shelter newsletters, blogs, on the shelter's website, or through social networking media such as Facebook, You Tube, and Twitter. The authors discuss some of these methods in greater depth elsewhere (Diehl and Diehl, 2001).

MAKE CONNECTIONS

It is important to identify what resources already exist for wildlife in the service area before starting a program. Are there similar services for wildlife already available from another competent organization or individual in the area? Are the services that are already available readily accessible, humane, and effective?

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The idea that a shelter will be providing *temporary* care for wildlife means there must be somewhere else to transfer wildlife in need of assistance. This "somewhere else" really means a capable, licensed wildlife rehabilitator, or wildlife rehabilitation center.

To begin work on the shelter wildlife plan, compile a list of the licensed wildlife rehabilitators, humane societies, wildlife veterinarians, state and federal agencies, and others who provide services for wildlife in the community. A good place to start is with the state department of conservation, fish and game, or natural resources (DNR). This agency should have a list of the licensed wildlife rehabilitators in your area. It should be able to provide you with a list of the state and federally endangered and threatened species in the state. It is also important to inquire about the state's wildlife rehabilitation permitting process. Other important questions to ask the DNR include

- What are the requirements for the shelter to become a temporary holding facility for wildlife?
- What services does the DNR (or other agency) have to offer to the wildlife that the shelter may be called upon to assist? For instance, will it help transport injured wildlife to the shelter, or from the shelter to a local wildlife rehabilitator?
- What species are considered rabies-vector species in the state, and what restrictions does the DNR have on handling these species?
- What steps should be taken if a person finds and brings an animal on the endangered species list to the shelter?
- What limitations exist for shelter staff regarding performing euthanasia on wildlife that cannot be rehabilitated? For example, in the authors' state, Wisconsin, veterinarians must also be licensed wildlife rehabilitators to legally euthanize a wild animal unless they are assisting a licensed wildlife rehabilitator with an animal covered under the rehabilitator's license.

In addition to asking these questions, it is important to find out how these various agencies and individuals view and work with one another, especially when services may overlap and guidelines and boundaries are not clear. What types of services for wildlife does each provide? Ask if the shelter's services are needed, how they think the shelter fits in, and how all can work together. The ideal situation would be for these parties to meet together to establish or redefine the network of services for wildlife in the community.

CREATE AN OPERATING FRAMEWORK

At some point before initiating a shelter wildlife program, it is recommended to check the shelter's insurance carrier to make sure it will cover a wildlife program, or if changes to the insurance policy are needed. With this information and the list of available resources, an operating framework for the shelter's wildlife program (Parker, 2000) can and should be established. An operating framework will help take the guesswork out of what the shelter will and will not do. It will help provide answers for the questions about "who," "what," "when," "where," and "why." For example, if a call about an injured hawk comes in to the shelter, who will handle the call? What happens to calls for help after the shelter is closed? Will shelter staff answer the caller's questions or will these calls be directed to a local licensed wildlife rehabilitator? What hours is the rehabilitator available? Who will capture the bird, transport it, and ultimately provide care? What if it needs to be euthanized? What if it is an endangered species?

Admission Protocols

One important aspect of the operating framework is admissions protocols. Work with consulting wildlife rehabilitators to create a list of criteria and indicators that will help the staff determine which animals need help and which animals are actually exhibiting natural behaviors that may be unfamiliar to the public. For example, many fledgling songbirds do not fly well when they initially leave the nest and they spend the first several days on the ground being fed by their parents. The parent birds are busy foraging for food and often are not in the immediate vicinity of the fledglings. People will find a fledgling, see that no parent is nearby, and assume that the bird is orphaned. A well-designed admissions protocol that screens for these situations will prevent the intake of healthy animals that do not need human assistance.

LEGALITIES

Most states require permits or licenses, even for veterinarians and animal shelters, to care for wildlife.

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State rehabilitation permits generally cover mammals, reptiles and amphibians, and nonmigratory birds.

The requirements to obtain a permit or license vary widely from state to state. Some states simply require applicants to write a letter describing their experience and facilities, while other states have formal applications and examinations. At least 43 states require an inspection of proposed wildlife facilities (Casey and Casey, 2000a). It may be possible for the shelter to be subpermitted under the license of a local wildlife rehabilitator.

A federal permit issued by the United States Fish and Wildlife Service (USFWS) is required to care for migratory birds, and a rehabilitation permit issued by the state will be needed in order to obtain a federal permit. A federal permit is not required to care for rock pigeons (feral pigeons—*Columba livia*), house sparrows (*Passer domesticus*), European starlings (*Sturna vulgaris*), or nonmigratory game birds such as turkeys and quail.

Both state and federal permits may have limits as to the species for which the permit holder is allowed to provide care. Special permits may be required to care for or euthanize federally endangered species and are likely to be required to care for or euthanize species on a state's endangered and threatened species list. However, state or federal agencies may grant permission for the euthanasia of an endangered or threatened animal on a case-by-case basis.

In addition to obtaining a list of a state's endangered and threatened species from the DNR (often available on its website), it is essential to obtain a list of federally endangered species encountered in the state from the USFWS, available on its website (http://www.fws.gov/endangered/). Moore and Joosten (2002) provide a list of regional USFWS offices and addresses for the various states' DNRs. Information about federal permits and contact information for the various regional USFWS permit offices is available on the USFWS website at http://www.fws.gov/permits/. Parker (2002) provides information about obtaining permits in Canada.

Some states and provinces limit the rehabilitation of rabies-vector species. Also, some states will not allow the release of some rehabilitated nonnative (invasive) species (Casey and Casey, 2000a) such as mute swans (*Cygnus olor*). It is prudent to check local ordinances (e.g., zoning) regarding keeping wildlife in the community. Authorities will often allow an unlicensed individual a brief time period (e.g., 24 h) to transport an injured wild animal to a licensed wildlife rehabilitator.

TRAINING

The authors highly recommend the training offered by the National Wildlife Rehabilitators Association (NWRA) and the International Wildlife Rehabilitation Council (IWRC). (See Appendix 14.2 for a list of wildlife organizations that offer training.) For example, the latter offers classes such as "Basic Wildlife Rehabilitation" that includes basic anatomy and physiology, calculating drug dosages, animal handling and physical restraint, gavage (tube-feeding), and much more. However, as valuable as these classes are, hands-on training with a licensed wildlife rehabilitator is still essential for gaining experience with animal identification, handling, treatment, housing, nutrition, wild animal behavior, and natural history.

Classes in bird identification and the natural history of the area's wildlife, such as those offered by nature centers, can be helpful. Correct identification of species handled by a shelter is necessary for properly selecting appropriate handling and husbandry techniques and housing, for identifying endangered species, and for accurate record keeping. Natural history information is needed for determining if animal behaviors observed or reported to shelter personnel are normal or indicate that an animal is injured, sick, or orphaned.

STRESS

Controlling stress for wildlife is essential. Unlike most companion animals, wild animals view humans as a threat, sometimes even as predators, and being handled, petted, or hearing, seeing, and even smelling humans can be very stressful to them. The authors have seen injured or sick wildlife, already under great cumulative stress, die almost instantly from simply being picked up by a human. Furthermore, wild animals also view companion animals as predators. Therefore, wildlife must not be housed with companion animals within their view and hearing.

Stress is cumulative (Fowler, 1986a) and all wild animals presented to an animal shelter are already

stressed. In addition to somatic stressors such as injury, infection, parasites, heat or cold, inanition (exhaustion due to starvation), and dehydration, they have also experienced psychological and behavioral stress from fear, anxiety or even terror, and frustration.

To minimize stress for wildlife in a shelter facility, the following actions will be required: (1) Eliminate unnecessary handling. Do not "pet" wild animals. (2) Eliminate unnecessary talking and other noise, for example, radios, intercom loud speakers, and barking around wildlife. As tempting as it may be for everyone to want to see wild animals, staff and volunteers should not congregate unnecessarily around them or disturb them just to have a look at them. Communicate necessary information to coworkers in a quiet voice. (3) Avoid prolonged direct eye contact with the animal. (4) Use visual barriers such as towels or sheets draped over enclosures (see Temporary Housing) to prevent wild animals from viewing humans, companion animals, or other wild animals that may be their natural predators.

ANIMAL HANDLING

First, a word about public safety: In the interest of human and animal health and safety, a person who brings a wild animal to a facility should not be allowed to handle the animal once on the shelter's property. This will eliminate the chance of a client being bitten, scratched, or otherwise injured; reduce the chances of the animal's escape; and will ensure safe and humane handling for the animal. It is important to always remember that wild animals fear humans and perceive handlers as a threat. Consequently, they will use their bills, teeth, talons, or claws to protect themselves. It is not true that a wild animal will sense that a handler is trying to help and therefore not injure that person. In the case of possible rabies-vector mammals, preventing bites will also protect the animal from euthanasia required to test for rabies (see "Zoonoses" section later in this chapter).

Because handling is almost invariably stressful for the wild animal patient, it must be kept to a minimum. In fact, handling can cause profound stress and physiological changes that may result in death (Spraker, 1982; Schulz, 1997). The animal should only be handled or physically restrained when absolutely necessary to render essential care. Shelter staff who handle wildlife should receive hands-on animal-handling training from an experienced wildlife rehabilitator.

General Guidelines for Handling Birds

In general, other than for birds of prey (hawks, owls) it is recommended to use a towel or bed sheet (for large birds) to cover and wrap the bird loosely but securely around the body with the wings folded against the body in a natural position. This wrap must be secure enough to limit the bird's movements but must not be too tight: birds lack a diaphragm and excessive restraint will impair respiration and possibly even cause suffocation. When handling a bird's bill, be certain not to cover the nares (nostrils). Drape the bird's head with a cloth during handling to minimize visual stimuli for the patient (see Figures 14.1a and b). This often helps calm the bird and reduces struggling.

A bird who is loose in the facility should be captured by noting the location of the bird in the room, then darkening the room and approaching and capturing the bird in the dark, either by hand or with a net. Most birds other than owls (Strigiformes) and nightjars (Caprimulgidae: e.g., nighthawks, whip-poor-wills) are reluctant to fly in the dark and can usually be captured in this manner with a minimum of stress to the patient or handler.

This technique should also be used to capture smaller birds already in their housing for examination or treatment. Attempting to catch a bird in a cage or box without darkening the room will often result in the bird fluttering around frantically trying to avoid capture. This is likely to result in considerable stress for the patient and may cause or exacerbate injuries. Darken the room, open the cage door just enough to slip a hand in, and feel around gently in the container to capture the bird.

Handling Herons and Cranes

Handlers and their assistants should wear a clear polycarbonate face shield when working with herons and cranes. These birds defend themselves by jabbing at the handler, usually at the face and eyes, with their sharply pointed bills.

When approaching the bird, hold open at arm's length a large sheet or towel and drape it over the bird. Handlers should wear leather gloves and control the bird's head and neck by grasping the tip of

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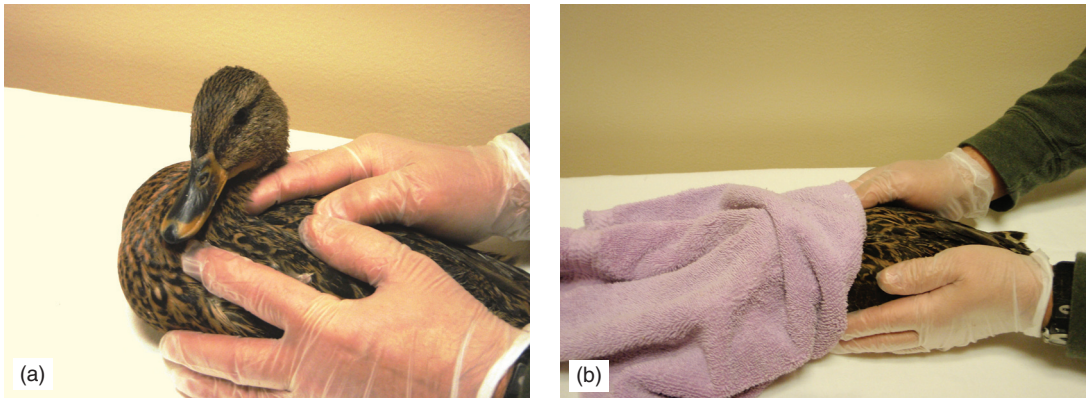


Figure 14.1. (a, b) Covering a bird's head with a cloth during restraint reduces visual stimuli and often reduces struggling. (Photo courtesy Stacy Kerley).

the bird's bill with a gloved hand, being careful not to block the bird's nares (nostrils), which usually are located on the proximal one-third of the maxilla (upper bill). It is a good idea for the handler to open the bird's bill slightly and insert the tip of one gloved finger between the upper and lower bills to ensure an adequate air supply just in case the bird's nares are occluded.

Handling Hawks and Owls

Heavy leather, gauntleted animal-handling gloves are required for handling large birds of prey (raptors) such as red-tailed hawks (*Buteo jamaicensis*) and great horned owls (*Bubo virginianus*). Even with these gloves, handlers and their assistants must use caution when handling these birds. Birds of prey will protect themselves by grasping their "attacker" with their very powerful, sharply pointed talons, although they also sometimes bite, especially owls. Bird of prey talons are capable of piercing heavy gloves, so skilled handling and control of the bird's feet is essential to prevent injury to the handler and to keep the bird from grasping and injuring one of its own feet (see Figure 14.2). Smaller birds of prey such as screech owls (*Megascops* sp.) and American kestrels (*Falco sparverius*) should be handled with lightweight leather gloves.

Good control of birds of prey is afforded, provided neither leg is seriously injured (i.e., fractured, dislocated), by grasping each of the bird's legs in a gloved hand as high up on each upper leg as



Figure 14.2. Proper handling of a barred owl (*Strix varia*) using heavy leather handler's gloves. (Photo courtesy Wisconsin Humane Society Wildlife Center).

possible so that both legs are restrained. The handler's assistant can drape the bird's head and body with a towel. If necessary, the bird can then be "cast" (laid) on its back on a table for examination or treatment, while the handler still maintains good control of the bird's legs and talons. Schulz (1997) discusses raptor restraint and transport in greater detail.

Handling Miscellaneous Birds

No special protective equipment other than disposable exam gloves is required to handle most small nonraptorial birds. However, because some grosbeaks (family Cardinalidae) and shrikes (family Laniidae), crows and ravens (family Corvidae), and gulls (family Laridae) bite very hard, lightweight leather gloves should be worn when handling these birds. Keep these birds well away from your face and other body parts to avoid being bitten. Small nonraptor birds are best handled by grasping them around the body, while holding the wings against the body in their naturally folded position (see Figure 14.3). Be sure not to restrain them too tightly: doing so could impair respiration and even cause suffocation.

Some small- and medium-sized, fine-mesh (butterfly) nets should be kept on hand for capturing small to medium-sized birds who may escape inside the shelter. Fine mesh (1/4 inches or smaller) is required to prevent birds from becoming entangled in the mesh, or causing injury or feather damage. The pouch should be at least 16–18 inches (~41–46 cm) deep. Large birds, that is, crow-sized or larger, can be captured using the technique described above for herons and cranes.



Figure 14.3. Proper restraint for a songbird. (Photo courtesy Stacy Kerley).

Handling Small- and Medium-Sized Mammals

Avoid directly handling non-anesthetized biting mammals such as adult raccoons (*Procyon lotor*), foxes and coyotes (family Canidae), woodchucks (*Marmota* sp.), and squirrels (e.g., *Sciurus* sp.). A good-quality pole snare (approximately 1.3 m in length) is essential for handling some of these animals. For wild mammals other than canids, the snare is placed so that the animal's neck and one front leg are through the loop of the snare. This will minimize the chance for the animal to back out of the snare while affording greater animal control and comfort and preventing restriction or injury to the animal's airway. With the snare properly positioned as described, the handler can briefly lift the animal off the ground if necessary to guide it into or out of a container. Due to canids' relatively long legs, it can be difficult to achieve this snare placement on them. If necessary, a wild canid can have a snare placed around the neck to prevent escape while the animal is guided into an open container placed on the ground. Do *not* lift the animal off the ground by the neck, and be sure to not restrict the animal's airway.

If re-caging these animals is necessary, it often is possible to get them to move from cage to cage on their own by placing the cages door to door with both doors open. Cover the cage you want the animal to move into with a towel, and uncover the other cage. The animal will often voluntarily move from the uncovered cage to the covered cage. The doors of the two cages must be similar in size, or any gaps between and around the entrances through which the animal might escape must be blocked. If the animal will not move voluntarily, blowing on him or her through the ventilation holes or mesh in the cage wall, or squirting him with a stream of fresh water from a "plant mister" pump spray bottle may encourage him to move.

The authors have found that chemical restraint using a 5:1 mixture of 100 mg/mL ketamine HCl and 100 mg/mL xylazine HCl or Telazol® (tiletamine HCl and zolazepam), (Fort Dodge Animal Health, Fort Dodge, IA) is often required in order to perform a thorough physical examination and to provide necessary first aid.

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Handlers should wear heavy leather, gauntleted gloves to increase their level of protection against bites and scratches when working with these animals. However, even heavy leather gloves designed for animal handling are usually inadequate to provide complete protection against bites: careful handling and prudent use of a pole snare, squeeze cages, and/or chemical restraint are essential for safe handling of biting animals.

RECORD KEEPING

Thorough and accurate information taken at the time of admission can provide very important clues to an animal's problems, and can later be used to help track possible causes and locations of morbidity and mortality for the wild animals entering a shelter. Accurate information is also essential for shelter staff or the cooperating wildlife rehabilitator to find the location of origin for infant or juvenile animals who were brought in by well-meaning people who mistakenly thought the animals were orphaned. This is a very common occurrence, and having information regarding the animal's location of origin is necessary so an effort can be made to reunite a juvenile with his or her parents. It is also important to know an animal's location of origin so if a nonmigratory animal can be rehabilitated, he or she can be returned to his home range.

Moreover, accurate records regarding the species of animals admitted, their injuries or illnesses, the dates of admission and the dates of transfer to wildlife rehabilitators or other final disposition will be needed for annual and sometimes quarterly reports required of wildlife rehabilitation license or permit holders by state and federal wildlife agencies.

The information gathered at the time of admission should include the location where the animal was found; the cause of illness or injury (if known); the name, address, and phone number of the finder; when the animal's distress was first noticed; when the animal was captured; any food, water, or prior care the animal has received; and in the case of mammals, whether anyone was bitten or scratched by the animal (See "Rabies" section below).

A copy of this information, along with the findings from a physical examination of the animal and a record of any care given while at the shelter, should be provided to the cooperating wildlife rehabilitator when the animal is transferred to his care.

THE INITIAL PHYSICAL EXAMINATION

The animal should be quickly examined upon admission to identify any serious problems that need to be addressed right away. These problems include shock, hypo- or hyper-thermia, breathing difficulties, serious bleeding or severe injuries that would warrant immediate intervention. It is important to work with cooperating wildlife rehabilitators to establish a list of injuries and illnesses for various species that would necessitate immediate euthanasia. The euthanasia criteria for wildlife are often very different from the criteria established for the euthanasia of companion animals in the shelter.

Beyond the initial exam, because the wildlife presented for care will already be stressed by the time they are received, additional handling (unless emergency intervention is needed) should be delayed until the animal has had a chance to rest. The animal should be allowed to rest in a dark, warm (provided the animal is not hyperthermic), quiet place for 30–60 min. While the animal is resting, staff can review the patient's history for clues to his or her problems.

After the animal has rested, a more thorough examination should be performed. If possible, the animal should be observed in an enclosure and evaluated for abnormal behavior, attitude, posture, and perhaps gait. It is important for the examiner to have a good knowledge of the natural history, general anatomy, and normal behavior of the animal in question in order to perform an accurate evaluation.

The animal should now be restrained (physically or using appropriate drugs) to perform a complete physical examination, taking care to not stop with the first significant problem found. In the authors' experience, multiple injuries/illnesses are commonplace. Be prepared to stop the exam temporarily if the animal shows signs of excessive stress, such as gasping, panting, or deterioration of vital signs. A national survey of licensed wildlife rehabilitators showed the following categories as the nine most frequently seen problems in wildlife admitted for rehabilitation (Casey and Casey, 2000b):

- shock and dehydration
- head trauma (concussion, bruising, swelling)
- wounds (punctures, lacerations, bites)
- neurological injuries (head or body tilt, paralysis, damaged nerves)

- diet and nutrition problems (emaciation)
- musculoskeletal problems (fractures, sprains, muscle tears)
- blood-related concerns (severe blood loss, bleeding from orifices, anemia)
- ectoparasites
- emotional states (fear of others, general fear, aggression)

SUPPORTIVE CARE AND FIRST AID

It is important to work with your consulting wildlife rehabilitator to provide training for staff and to establish treatment protocols, including pain management, to appropriately address the needs of the animals brought to you for care. Few drugs are actually approved for use in wildlife, therefore nearly all of the drugs used in wildlife medicine are considered to be extra-label use. The Willowbrook Wildlife Center Pharmaceutical Index (Brown, 2000) and the Exotic Animal Formulary (Carpenter, 2005) are valuable formularies of medications and dosages used in wildlife medicine. Kirchgessner (2007) discusses emergency drugs used in wildlife medicine.

Bleeding

If it is safe to do so, wear disposable exam gloves and use gauze sponges to apply direct pressure to the area to stop any serious bleeding. Avoid the use of tourniquets unless staff are trained and experienced in their appropriate use, and it is absolutely necessary to save an animal's life. Once the bleeding has stopped, further assess the cause of the bleeding and apply a temporary pressure—or other bandage—or take other action to minimize the chance of recurring bleeding.

Shock

Shock can quickly become life-threatening, especially if treatment is delayed. The signs of shock are prostration; apathy; a rapid, thready pulse; rapid, shallow respiration; low body temperature; and poor peripheral circulation (cool extremities, pale mucous membranes, slow capillary refill rate).

Veterinarians should establish a written treatment protocol and training for other shelter personnel for dealing with shock if animals are being admitted to the shelter when veterinary personnel are not on site. Nonveterinarians should immediately notify their consulting or shelter veterinary staff about animals who are in shock. Until veterinary staff respond, slowly warm the animal, ideally in an incubator or isolette; eliminate further stress (e.g., excessive noise or visual stimuli); stop any bleeding; and make sure that the animal has a clear air passageway.

Hypothermia

Hypothermia is very common in wildlife presented for care. The animal should be warmed slowly in an incubator or isolette, or with one-half of the animal's box or cage placed on a heating pad set on "low." Placing only half the animal's cage on the heating pad allows him or her to move to the unheated side of the cage if he gets too warm (see Figure 14.4). Animals who are unable to move on their own should be examined and moved frequently to make sure they do not get too warm. Placing heating pads directly on animals should be avoided as they can cause very serious burns very quickly.

If the animal is also wet, if possible, gently blot or wipe the animal dry with a clean cloth or paper towel. Dry a bird's feathers by wiping them in the direction of feather growth only; doing otherwise may break or damage feathers.

Dehydration

Like hypothermia, dehydration is a very common problem. Proper treatment methods and fluids for



Figure 14.4. Plastic pet carrier covered with a towel to reduce visual stimuli. Note the heating pad located under half of the pet carrier. (Photo courtesy by Stacy Kerley).

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fluid therapy vary depending on the species of animal and the degree and cause of dehydration.

Generally speaking, for mildly (<5%) dehydrated patients with functioning gastrointestinal tracts, an oral electrolyte solution such as Pedialyte® (Abbott Nutrition, Abbott Park, IL), or Electramine® (Life Science Products, Rutherford, NJ), or lactated Ringers solution should be administered. The fluid should be warmed so that it feels warmer than human body temperature, but not hot.

If not hypothermic, unconscious, seriously injured, or highly stressed, small birds can be offered oral fluids by using a small syringe to place a drop at a time on the seam of the bill (where upper and lower bill meet) and waiting for the drop to be swallowed before more is given. "Tickling" the bird's throat with the tip of an index finger may help to stimulate swallowing. If the bird shakes his head to reject the fluid, too much is being placed into the mouth at one time, or the patient is unable to swallow.

Infant and juvenile mammals who are not hypothermic, unconscious, seriously injured, or highly stressed can also be offered this same warmed solution orally using a dropper or 0.5–1 mL syringe (see Figure 14.5).

Do not offer fluids in a bowl to unconscious or semiconscious animals or to infants or young juveniles, as they may drown or get wet and become chilled. Some animals will benefit from being gavaged with fluids (See Figure 14.6). Consult with your cooperating wildlife rehabilitator for instruction in gavaging various species; this procedure should be part of any comprehensive, routine training that is offered to staff who handle wildlife.



Figure 14.5. Oral administration of fluids to an orphaned gray squirrel (*Sciurus carolinensis*). (Photo courtesy Wisconsin Humane Society Wildlife Center).

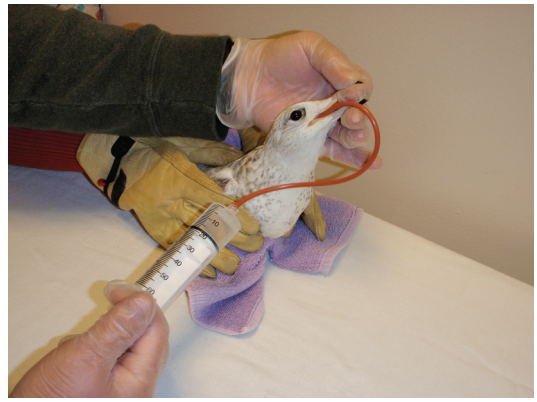


Figure 14.6. Gavaging a ring-billed gull (*Larus delawarensis*). (Photo courtesy Stacy Kerley).

For weak, debilitated patients, rehydration may be started with a volume of 0.01 mL of fluids per gram of patient body weight. A volume of 0.025 mL/g patient body weight is an average stomach or crop capacity for patients who handle the initial volume well or are not badly debilitated. For most animals, 0.05 mL/g body weight is considered a maximum stomach or crop capacity.

The volume of fluids administered per day must provide for the patient's maintenance requirements while beginning to compensate for any fluid deficit or losses. Clinical signs corresponding to varying degrees of fluid deficit are shown in Table 14.1. Daily maintenance fluid requirements are computed and given at a rate of 50 mL/kg per day for birds and 55 mL/kg/ per day for mammals. The fluid deficit is computed by estimating the percent of dehydration as shown in Table 14.1. This deficit is stated as a decimal: for example, 8% dehydration is written as "0.08%." This figure is multiplied by the patient's body weight, in grams. If the patient is underweight, the patient's normal body weight should be estimated and the latter figure should be used to compute the fluid deficit. The figure that results from multiplying the estimated fluid deficit stated as a decimal (e.g., "0.08") by the patient's estimated normal body weight (in grams, e.g., "1000 g") is the volume of

Table 14.1. Clinical signs of dehydration.

Dehydration (%)	Clinical signs
<5%	History of fluid loss; no detectable clinical signs; normal mucous membranes; normal skin pliability; skin turgor (return time of tented skin to normal position): ≤1 second
5%	Clinical signs first appear; slight dryness of mucous membranes; skin turgor: 1–2 seconds
6%	Moderate and obvious fluid deficits, dry, red, "tacky" mucous membranes; skin turgor: 2–5 seconds; eye orbits slightly sunken; slight concentration of urine; oliguria (decreased urine output)
8%	Severe fluid loss; dry, red, tacky mucous membranes; skin turgor: 2–5 seconds; eyes sunken in orbits; oliguria; pulse may be weak; slight prolongation of capillary refill time; overall depressed condition
10–12%	Extremely serious, may be life-threatening; dry mucous membranes; skin turgor: >5 seconds or no return, eyes sunken in orbit, signs of shock possible (tachycardia, cool extremities, rapid and weak pulses)
12–15%	Life-threatening; definite signs of shock, death imminent

Source: Wolf, L. (1993) *NWRA Quick Reference*, p. 72.

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fluid deficit. In the case of a 1000 g (1 kg) bird who is estimated to be 8% dehydrated, the volume of fluid deficit would be 80 mL ($0.08 \times 1000 = 80$ mL). The goal should be to replace this volume of fluids over the next 48 h, while providing maintenance fluids. Additional fluids will need to be given to replace ongoing losses (Redig, 1993; Wolf, 1993).

Although preferred or even essential for some patients (e.g., when in shock), intravenous (IV) fluids can be difficult to administer to many wild animal patients. Difficulties with animal restraint during the procedure and the small size of the patient's veins can make IV fluid administration difficult or even impossible. However, bolus IV fluids for birds can be administered, often with very good effects (Redig, 1993). The authors often administer subcutaneous fluids, for example, lactated Ringers solution, or 0.9% sodium chloride, when IV administration is not possible. Myers (2007) provides further information about assessing hydration status, selecting appropriate fluids, and routes of administration in the wildlife patient.

Feeding

Because the wild animals admitted to the shelter may only be there for a few hours, with the exception of nestling and fledgling birds, feeding is generally not needed or even advised. Feeding an emaciated animal too soon, too much, or an inappropriate food can actually be quite detrimental for the patient due to starvation-induced metabolic derangement (refeeding syndrome). Many species of wild animals have very specialized dietary needs and feeding techniques, and there are far too many to be addressed here. Cooperating wildlife rehabilitators should be able to provide specific protocols for feeding wildlife at a shelter. Hoggard (2007) provides valuable information on enteral formula composition and selection, gavage and other feeding techniques, the refeeding syndrome, and other important nutritional considerations for the critical wildlife patient.

TEMPORARY HOUSING

Wildlife should be housed in an area separate from those areas used to house companion animals. This separation can help minimize the risk of animal-to-animal disease transmission and reduces stress for all of the animals involved. The wildlife holding room should also be isolated from the sounds and activities associated with other shelter operations. The ideal wildlife holding room is well ventilated, though warm. It has a counter or other workspace, a sink with running water, a gram scale for weighing animals, and a small refrigerator for storing fluids

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and nutritional items such as food for baby birds. It is easily disinfected.

The holding room's floor should be sealed concrete, epoxy, tile, or another hard, nonporous washable surface. The room should become completely dark when the lights are switched off to facilitate capturing an escaped bird in the room. Gaps between items such as cabinets, cages, and walls should be eliminated to prevent escaped animals from entering these gaps where it may become difficult or impossible to recapture them. Make sure the room is secure so that escaped wild animals cannot get into the ceiling, ventilation system or other parts of the shelter where they may become irretrievably lost, injured, cause injury to other animals, or do damage to the facility.

Housing

A cardboard box makes a good temporary holding container for most types of birds. The box should be large enough to hold the bird without cramping or forcing it into an unnatural position, but not so large that the bird can make large movements that may cause further injury.

The box should have enough pencil-diameter air holes to provide adequate ventilation. Avoid large holes as they may permit escape or allow the bird's head to get caught. A three-sided door cut into the side of the box and secured by tape will make it easier to capture the bird while it is in the box in order to perform necessary procedures.

A cardboard box can also be used for temporarily housing many types of infant and juvenile mammals. Boxes can also work well for bats and nonvenomous snakes, but these containers must be *very secure* to prevent escape. Double caging (e.g., a box placed inside a ventilated, securely covered glass aquarium) is highly recommended for these animals.

Plastic pet carriers make good containers for holding medium-sized birds, larger birds, and nongnawing mammals. Be advised that this type of housing is not recommended for gnawing mammals; determined woodchucks or tree squirrels can gnaw their way out of a plastic pet carrier in a matter of minutes.

A sturdy wire-mesh cage will be needed to house alert, active gnawing mammals such as woodchucks. However, *do not* use wire cages for wild birds as feather damage and serious injury can occur! Covering the cage with newspaper or a cloth will provide the animal a sense of security and minimize visual stimuli, although adequate ventilation must be kept in mind.

Nestling birds should be placed on multiple layers of clean facial tissue or toilet paper in a clean plastic surrogate "nest" such as a clean, empty margarine tub. This should be placed inside a warm box or incubator. Plant material or material from the original nest should be avoided, as it may be damp or harbor parasites.

Housing Substrate

Newspaper or soft, ravel-free (without loose strings or loops) cloth on the cage floor makes good substrate or bedding. Loose strings or loops are dangerous because they can wrap around the animal's limb or neck and cause strangulation. Most mammals appreciate shredded newspaper on top of sheet newspaper for bedding. Strips torn from the edges of computer paper can cause entanglement and should be avoided.

For a bird who cannot stand upright, roll up a towel or other suitable cloth and form a ring of this cloth around the bird. The bird's head should rest on the edge of the ring of cloth. Birds should not be deliberately laid on their back other than briefly for necessary examination or treatment procedures.

DISEASE TRANSMISSION

The following are general guidelines for the prevention of wildlife disease transmission in the shelter: (See other chapters in this book for more information on the prevention of disease transmission in general and on general sanitation.)

1. Educate all staff and volunteers, including those who do not handle animals, so they become aware of the prevalent diseases in your area that affect wildlife. This information can be provided by area wildlife rehabilitators, your state DNR, and your local and state health departments.
2. House wildlife in a room separate from companion animals.
3. Disinfect wild animal housing and all equipment such as pole snares after each use. Use disposable equipment or equipment liners or covers whenever possible, and discard contaminated or

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dirty cardboard boxes, bedding, etc. after use. The authors incinerate towels, cardboard boxes, and paper products used to contain, handle, or clean up after animals suspected of having a virulent disease such as canine distemper, rabies, or parvovirus.

4. Do not house animals near other animals: wild or domestic, wild animals who appear overtly ill or have signs of infectious disease (ocular or nasal discharge, sneezing, fever, coughing, seizuring, diarrhea, etc.), or are suspected of having an infectious disease.
5. Protect staff against animal bites by requiring and providing training in wild animal-handling techniques and providing them with well-maintained, proper equipment that is in good working order and readily at hand.
6. Develop written shelter safety equipment protocols and handling instructions.
7. Give strong consideration to providing pre-exposure rabies vaccinations for all staff who handle animals in the shelter. For guidelines on who should receive pre-exposure rabies vaccinations, see the Centers for Disease Control and Prevention (CDC) website (http://www.cdc.gov/rabies/specific_groups/veterinarians/staff.html).
8. Wear disposable exam gloves for wild animal cleanup and for handling animals who do not require use of other handling equipment, for example, leather gloves.
9. Wash your hands thoroughly with disinfectant soap and water after each animal is handled. Wash before eating and when entering or leaving the wildlife area, and avoid rubbing or touching your face, abraded or cut skin, or mucus membranes with unwashed hands.
10. Keep a pair of "sick gloves," that is, leather handler's gloves that are used only on animals suspected of having a transmissible disease.
11. Keep a set of animal-handling equipment for use exclusively with wildlife.
12. When handling wild animals, avoid holding them close to your body. This will reduce the potential for fomite transmission of pathogens and transmission via fleas, ticks, lice, and mites.
13. Do not wear shoes and clothing outside of the shelter that are worn while working with wildlife.
14. Consider placing a disinfecting footbath between your companion animal and wildlife holding areas, or provide disposable shoe covers for staff working in the wildlife area (see the chapter on sanitation for more information about foot baths).
15. Inspect incoming wildlife for fleas, ticks, lice, and mites. Treat adult animals who have ectoparasites with a species-appropriate anti-parasitic product, for example, 8in1® UltraCare™ Mite and Lice Bird Spray; 8in1® UltraCare™ Flea and Tick Spray for Small Animals (Spectrum Brands, Hauppauge, NY). Treat nestling and fledgling birds for mites, and juvenile mammals for fleas and other ectoparasites by spraying an appropriate topical anti-parasitic product (see above) on a cotton ball and wiping it sparingly on their feathered/furred areas (avoid bare skin). Alternately, spray an appropriate topical anti-parasitic product on bathroom tissue or paper towel and wrap this treated paper around the animal's body for a few minutes at a time. Remove the wrap and wait about 30 min before applying more treated wrap. Repeat until the patient is free of ectoparasites.
16. Launder wild animal bedding separately from companion animal bedding.

Zoonoses

Like domestic animals, wild animals are capable of carrying a wide variety of diseases that are transmissible to humans. A partial list of possible zoonotic diseases includes rabies, visceral, ocular and neural larva migrans, leptospirosis, Lyme disease, salmonellosis, aspergillosis, dermatophytosis (ringworm), chlamydiosis, hantavirus, hydatidosis (echinococcosis), and Sarcoptic mange (Fowler, 1989; Wolf, 1997). Zoonotic disease transmission can largely be prevented by establishing protocols for safe animal handling and disease transmission prevention, and providing training for staff and volunteers. Most important among disease prevention protocols is for shelter personnel and clients to always wash their hands thoroughly with soap and water

after handling animals and equipment, and to establish and enforce strict premise and equipment cleaning and disinfecting procedures.

The two zoonotic diseases that deserve special emphasis here are rabies and visceral, neural or ocular larva migrans.

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Rabies

It is beyond the scope and purpose of this chapter to describe rabies in detail. Only a few facts especially pertinent to rabies in wildlife are provided here. For a more thorough general resource on rabies, see the Centers for Disease Control and Prevention (CDC) website (CDC, 2011a).

Rabies is caused by a Lyssavirus and is almost always spread by animal bites or scratches. It travels via the nerves to the brain where it causes an encephalitis that is invariably fatal once clinical signs appear. Post-exposure prophylaxis injections are most successful in treating the disease if given within 10 days of exposure. Rabies can affect any mammal, although it is uncommon in most small rodents and rabbits; a case of transmission from these species to a human has not been documented (CDC, 2011a). Although dogs are one of the most common causes of spread of the disease worldwide, over 90% of rabies cases in the United States are attributed to wildlife. The most common wild animal vector species in the United States varies by region and includes raccoons, bats, skunks, and foxes (CDC, 2010). According to Porter (2002), "The incubation period [for rabies in wildlife] varies from nine days to greater than one year depending on the virus strain, host species, dosage, and site of inoculation." Therefore, unlike domestic dogs, cats, and ferrets, there are no rabies quarantine and observation periods established for wild animals, and the 10-day holding period, that most shelters are accustomed to, does not apply to wildlife. There is no ante-mortem test for rabies that is considered to be sensitive enough to be consistently reliable, so any mammal belonging to a species considered to be a possible rabies vector in your area who has bitten someone will likely need to be euthanized for rabies testing.

Staff should be familiar with the signs of rabies, which can be varied and not limited to "classic" neurological signs such as seizures or vicious behavior; some animals may actually become very quiet and withdrawn. Other signs, similar to many other illnesses, are inappetance, malaise, depression, and licking at the site of the bite. While the authors rarely encounter rabid animals in their service area (southeastern Wisconsin), they do frequently encounter raccoons, skunks, and foxes suffering from canine distemper. Some of the neurological signs of canine distemper in these species include stuporous, aimless wandering, lack of fear of people, circling, and seizures. Contact your state and local public health departments for specific information about rabies-vector species in your area and how and where to submit specimens for rabies testing. The CDC provides a directory of state and local rabies consultation contacts on its website (CDC, 2011b).

Larva Migrans

There are a number of carnivore ascarids, like *Toxacara canis* in dogs and wild canids and *Toxacara cati* in cats and wild felids that are capable of causing visceral, neural, or ocular larva migrans in humans. The ascarid that is currently receiving the most attention from rehabilitators is the raccoon roundworm *Baylisascaris procyonis*. However, skunks, badgers (*Taxidea taxus*), fishers and martens (*Martes* sp.), and bears (*Ursidae*) can also carry their own *Baylisascaris* species (Fowler, 1986b; Kazacos and Boyce, 1989).

Baylisascaris larva has a predilection for migration through the central nervous system in intermediate hosts where they cause intense inflammation and tissue destruction. Although reported cases of *Baylisascaris* encephalitis in humans are quite rare, the seriousness of the disease and the fact that there is currently no curative treatment warrant very careful attention to appropriate sanitation techniques where carnivore feces are concerned. As transmission is via the fecal–oral route, and *Baylisascaris* eggs must develop externally for 2–4 weeks after they are shed to become infectious (Kazacos and Boyce, 1989), shelter staff and volunteers are urged to promptly pick up, wipe up, and properly dispose of (landfill or incinerate) carnivore feces. Personnel should also wash up thoroughly after working in animal care areas, especially before eating or drinking; wear disposable gloves when cleaning up after carnivores; and not eat or drink in animal care areas.

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Baylisascaris eggs are reportedly very resistant to destruction by routine disinfectants. They can remain viable in a moist environment (e.g., soil) for years. A 20% bleach solution (1% sodium hypochlorite) will reportedly wash away sticky eggs but does not kill them. A xylene–ethanol mixture has been reported to be effective for cleaning hard surfaces after feces have been removed. Heat, from boiling water, steam-cleaning, flaming, or fire are reportedly highly effective methods for decontamination of heat-resistant materials (Gavin, Kazacos and Shulman, 2005). Shafir *et al*. (2007) demonstrated that *Baylisascaris* eggs were destroyed in vitro when they were exposed to water heated to 62°C (143.6°F), but says that further work still needs to be done to determine the effectiveness of heat and other disinfection methods in inactivating *Baylisascaris* eggs in feces or soil.

The authors deworm raccoons over 6 weeks of age staying in their facilities for rehabilitation by administering either pyrantel pamoate, 5 mg/kg PO, or fenbendazole, 50 mg/kg PO, in readily eaten food, repeated weekly, throughout their stay in captivity. Concrete-floored outdoor raccoon enclosures are flamed using a propane torch (e.g., The Red Dragon, Flame Engineering, Inc., LaCrosse, KS) after raccoons are released.

CONCLUSION

The continued encroachment of cities into wild animal habitats and the adaptation of some wild species (e.g., raccoons, coyotes, deer, gulls, Canada geese) to living in close proximity to humans will continue to result in many thousands of injured, sick, and orphaned wild animals being brought to shelters and wildlife rehabilitators in the coming decades.

Through public education, sheltering practices adapted to provide for the special needs of wild animals, and working closely with nearby licensed wildlife rehabilitators and other wildlife professionals, a shelter can play an important role in preventing and alleviating suffering for wild animals in its community. An added bonus can be increased community confidence in the sheltering organization.

Like all shelter programs, effective planning and management, trained staff, a properly equipped facility, and adequate financial resources are essential to operate a successful wildlife program.

REFERENCES

Brown, C.M. (2000) *Willowbrook Wildlife Center Pharmaceutical Index*, 3rd edn, Willowbrook Wildlife Foundation, Glen Ellyn, Illinois.

Carpenter, J.W. (2005) *Exotic Animal Formulary*, 3rd edn, Elsevier Saunders, St. Louis, Missouri.

Casey, A.M. III and Casey, S.J. (2000a) A study of state regulations governing wildlife rehabilitation during 1999, in *Wildlife Rehabilitation*, Vol. 18 (ed D.R. Ludwig), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 173–192.

Casey, A.M. III and Casey, S.J. (2000b) A survey of conditions seen in wildlife admitted for wildlife rehabilitation, in *Wildlife Rehabilitation*, Vol. 18 (ed D.R. Ludwig), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 143–160.

CDC (2010) *Terrestrial Rabies Reservoirs in the United States, 2010*, http://www.cdc.gov/rabies/location/usa/surveillance/wild_animals.html (accessed June 18, 2012).

CDC (Centers for Disease Control and Prevention) (2011a) *Rabies*, www.cdc.gov/rabies/index.html (accessed August 11, 2011).

CDC (2011b) *State and Local Rabies Consultation Contacts*, www.cdc.gov/rabies/resources/contacts.html (accessed August 11, 2011).

Diehl, S. and Diehl, C. (2001) Education: No time? No talent? No problem! in *Wildlife Rehabilitation*, Vol. 19 (ed D.R. Ludwig), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 161–168.

Fowler, M.E. (1986a) Stress, in *Zoo and Wild Animal Medicine*, 2nd edn (ed M.E. Fowler), W.B. Saunders Co., Philadelphia, Pennsylvania, pp. 34–35.

Fowler, M.E. (1986b) Ursidae (Bears), in *Zoo and Wild Animal Medicine*, 2nd edn (ed M.E. Fowler), W.B. Saunders Co., Philadelphia, Pennsylvania, pp. 811–816.

Fowler, M.E. (1989) Zoonoses of concern to volunteers and staff of wild animal rehabilitation centers, in *Current Veterinary Therapy Vol. X: Small Animal Practice* (ed R.W. Kirk), W.B. Saunders Co., Philadelphia, Pennsylvania, pp. 697–703.

Gavin, P.J., Kazacos, K.R. and Shulman, S.T. (2005) Baylisascariasis. *Clinical Microbiology Reviews*, **18**, 703–718. http://www.ncbi.nlm.nih.gov/pmc/articles/PMC1265913/ (accessed August 9, 2011).

Hoggard, C. (2007) Nutritional considerations for critical wildlife patients, in *Topics in Wildlife Medicine: Emergency and Critical Care*, Vol. 2 (eds F.S. Tseng and M.A. Mitchell), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 112–126.

Kazacos, K.R. and Boyce, W.M. (1989) Zoonosis update: *Baylisascaris* larva migrans. *Journal of the*

American Veterinary Medical Association, **195**, 894–902.

Kirchgessner, M. (2007) Emergency drugs used in wildlife medicine, in *Topics in Wildlife Medicine: Emergency and Critical Care*, Vol. 2 (eds F.S. Tseng and M.A. Mitchell), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 10–25.

Kirkwood, S. (1998) Answering the call of the wild. *Animal Sheltering*, **21**, 4–5.

Moore, A.T. and Joosten, S. (2002) State and federal permits, in *Principles of Wildlife Rehabilitation* (eds A.T. Moore and S. Joosten), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 1.21–1.26.

Myers, D. (2007) Fluid therapy considerations for wildlife, in *Topics in Wildlife Medicine: Emergency and Critical Care*, Vol. 2 (eds F.S. Tseng and M.A. Mitchell), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 26–39.

Parker, K. (2002) Getting started in Canada, in *Principles of Wildlife Rehabilitation* (eds A.T. Moore and S. Joosten), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 1.31–1.37.

Parker, K. (2000) Creating an operating framework for wildlife rehabilitation, in *Wildlife Rehabilitation*, Vol. 18 (ed D.R. Ludwig), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 163–171.

Porter, S.L. (2002) Rabies in wildlife, in *Principles of Wildlife Rehabilitation*, 2nd edn (eds A.T. Moore and S. Joosten), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 4.21–4.23.

Redig, P. (1993) *Medical Management of Birds of Prey*, 3rd edn rev, The Raptor Center at the University of Minnesota, St. Paul, Minnesota, pp. 49–53.

Schulz, T.A. (1997) Raptor restraint, handling and transport methods, in *Principles of Wildlife Rehabilitation* (eds A.T. Moore and S. Joosten), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 105–119.

Shafir, S.C., Wang, W., Sorvillo, F.J. *et al*. (2007) *Thermal Death Point of Baylisascaris procyonis Eggs [letter]. Emerging Infectious Diseases [Serial on the Internet], 2007 Jan [date cited]*, http://wwwnc.cdc.gov/eid/article/13/1/06-0966_article.htm (accessed June 18, 2012).

Spraker, T.R. (1982) An overview of the pathophysiology of capture myopathy and related conditions that occur at the time of capture of wild animals, in *Chemical Immobilization of North American Wildlife* (eds L. Nielsen, J.C. High and M.E. Fowler), Wisconsin Humane Society, Milwaukee, Wisconsin, pp. 83–118.

Wolf, L. (1993) *Quick Reference*, National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 83–85.

Wolf, L. (1997) Zoonoses: What you don't know can hurt you, in *Principles of Wildlife Rehabilitation* (eds A.T. Moore and S. Joosten), National Wildlife Rehabilitators Association, St. Cloud, Minnesota, pp. 143–152.

Appendix 14.1
Essential Wildlife Rehabilitation Reference Materials

Field guides to the identification of birds, mammals, reptiles, and amphibians, such as the Peterson Field Guide series, Houghton Mifflin Company and Houghton Mifflin Harcourt, Boston, Massachusetts (1934–2008).

Miller, E.A., ed. (2000) *Minimum Standards for Wildlife Rehabilitation*, 3rd edn, National Wildlife Rehabilitators Association, St. Cloud, Minnesota, http://www.nwrawildlife.org/sites/default/files/MinimumStandards3rdEdition.pdf (accessed June 18, 2012).

Moore, A.T. and Joosten, S., eds. (2002) *Principles of Wildlife Rehabilitation*, 2nd edn, National Wildlife Rehabilitators Association, St. Cloud, Minnesota.

Miller, E.A., ed. (2006) *Quick Reference*, 3rd edn, National Wildlife Rehabilitators Association, St. Cloud, Minnesota.

Tseng, F.S. and Mitchell, M.A., eds. (2007) *Topics in Wildlife Medicine: Emergency and Critical Care*, Vol. 2, National Wildlife Rehabilitators Association, St. Cloud, Minnesota.

Brown, C.M. (2000) *Willowbrook Wildlife Center Pharmaceutical Index*, 3rd edn, Willowbrook Wildlife Foundation, Glen Ellyn, Illinois.

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Appendix 14.2
Wildlife Rehabilitation Organizations

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INTERNATIONAL WILDLIFE REHABILITATION COUNCIL (IWRC)

PO Box 3197
Eugene, Oregon 97403
Phone: (866) 871-1869
Fax: (408) 876-6153
E-mail: director@theiwrc.org
Website: http://theiwrc.org/

NATIONAL WILDLIFE REHABILITATORS ASSOCIATION (NWRA)

2625 Clearwater Road, Suite 110
St. Cloud, Minnesota 56301
Phone: (320) 230-9920
Fax: (320) 230-3077
E-mail: NWRA@nwrawildlife.org
Website: http://www.nwrawildlife.org/

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15
Equine Care in the Animal Shelter

Jeannine Berger, John Madigan and Kathryn Holcomb

INTRODUCTION

Few animals fascinate like the horse. Even nonhorse people are fascinated. Horses inspire, provide enjoyment, and serve us in many ways. In turn, because domestic horses depend upon us for all their needs, we are obligated to provide them with the best possible care. If horses become neglected, abandoned, or unwanted—as happens all too often, especially during an economic recession—they may end up at a rescue or shelter-type situation. These facilities house and rehabilitate horses and then rehome them, or may instead provide lifetime sanctuary.

Equine shelter facilities vary widely. Some specialize in providing care for a certain breed or animals involved in a certain sport, such as Thoroughbreds from the racetrack. Some admit horses seized by law enforcement agencies as a result of neglect and abuse, or the animals may be relinquished by individual owners who love their horses but can no longer provide for them. Other individuals and agencies attend auctions to rescue horses from being sold for slaughter. No matter the location, type of horse, or organizational mission, caring for these animals requires facilities appropriate for a large animal, passion, funding, and specific knowledge about equines. In addition, many rescued horses have special needs, arriving at the shelter with one or more conditions that merit extra attention, such as injury, starvation, trauma, old age, and disease. Shelter personnel must be able to assess horses for medical, nutritional, and behavioral concerns and work closely with an equine veterinarian to triage them for appropriate care. This chapter will address husbandry aspects of introducing a horse to the shelter, assessing and providing for ongoing needs while they are housed at the shelter, and considerations for rehoming.

BASIC EQUINE BIOLOGY

Horses are single-hoofed mammals and are a subspecies of the family Equidae. There are over 300 breeds of horses. They are often described by color (chestnut, bay, or black are the basic horse colors) or temperament as well as by breed. For centuries horses have been used for work, war, sport, and in some cultures, for meat and milk. In the United States, horses are increasingly classified as companion animals.

Horses reach adulthood by age five, and their average life span is 25–30 years. Young horses under the age of one are referred to as foals, yearlings are one to two years of age, young males under the age of four are colts, young females under the age of four are fillies, intact males over the age of four are stallions, females over the age of four are mares, and castrated males of any age are geldings.

Evolution has adapted horses' bodies for flight from predators; therefore, horses have a strong "flight or fight" instinct. They have great vision, with their eyes placed on the sides of their heads providing a wide angle of sight. They also have a well-developed sense of balance and are very sensitive to touch. They are unique in that they are able to sleep standing up, although one phase of their sleep pattern requires them to lie down, even if only for a few

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minutes or hours during a 24 hour period. Therefore, each horse must have enough space and a suitable surface for lying down.

Horses are herbivores, but they are not ruminants. They have a single stomach and a specialized area in the large intestine, known as the cecum, which can digest cellulose. Unlike many other animals, horses cannot vomit, so digestive problems often lead to colic, which can be fatal.

These are just a few pertinent facts about horses that anyone caring for them should be aware of. The reader is referred to any number of equine references and medical texts that can provide more information about equine biology, husbandry, and medicine (McGreevy, 2004).

FIRST CONSIDERATIONS UPON INTAKE

Relocation and transport is stressful for horses, particularly long-distance transport (Stull, 1998; Stull and Rodiek, 2000). In addition, horses may have suffered physically or emotionally in their previous homes or environment. Therefore, it is helpful if shelters have a quiet and secure holding area such as a large stall or pen where newly arrived horses can settle in. If multiple horses come from the same location and have previously been housed together, they will probably be less traumatized if they can remain together. Otherwise, it is recommended to provide individual housing with visual but no physical contact in order to reduce stress. Horses frightened by relocation may try to escape, so the facility must be constructed with fences and barns suitable for horses. Any horse, but especially a frightened horse, requires experienced handlers, well-fitted halters, and lead ropes that are in good condition.

Biosecurity requires that all new horses be isolated for 14 days from other horses already in residence. Incoming horses may have been exposed to an infectious disease prior to intake at the shelter but not show signs of illness yet, so quarantine is extremely important to protect the health of the shelter's other horses. Ideally, this quarantine area will include a quiet place for physical examination and triage to take place. Shelter staff should follow strict biosecurity practices to prevent contamination to and from other areas of the property. Shelter staff should wear protective clothing, including footwear that should be kept in the quarantine area and not worn in other areas of the facility. Feed, bedding, farm equipment, and tack must be kept separate for use on diseased animals only and disinfected appropriately to prevent fomite transmission of disease. Insect and pest control methods should also be implemented to prevent disease transmission (Ferraro, Stull and Madigan, 2009; AAEP, 2011a, 2011b). (For more general information on biosecurity measures, see the chapters in this textbook on sanitation and outbreak management)

Initial Examination

Of utmost importance is to evaluate each new horse entering the shelter as if he or she were a patient at a veterinary clinic. The patient's health status and existing identification such as lip tattoo (Thoroughbreds) or freeze brand (Mustangs, Arabians, and others) need to be evaluated first. Each arriving horse should be clearly identified with an individual tag or collar. Microchipping is an excellent way of clearly identifying each individual. However, a very low percentage of horses in the general population are microchipped, and therefore alternate means of identification must also be used. A personal record including signalment should be established and maintained for each horse. A detailed history should be obtained if possible, including prior and current medical problems and treatments, previous vaccinations and deworming, diet, behavioral issues, and prior housing. The next step on the day of arrival is a full physical exam, including an assessment of the horse's gaits and overall demeanor. Minimal data should include

1. Digital photographs, from all four sides
2. Breed or breed type
3. Color and markings
4. Age (estimated by teeth eruption and wear); The American Association of Equine Practitioners (AAEP) website contains a chart showing the approximate ages at which different teeth erupt that can be used for estimating age (AAEP, 2011d).
5. Gender
6. Height (measured in hands, a standard measure of horses that is 4 inches, from top of withers to the ground)
7. Body weight (using a livestock scale or estimating by use of equine weight tape)

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8. Body condition score per Henneke scoring system (Henneke, 1985). [The authors recommend using the figure from Equine Sanctuary and Rescue Facilities Guidelines (Ferraro, Stull and Madigan, 2009).]
9. Vital signs (normal ranges for adult horses: temperature 99.5–100.5°F; pulse 24–36 beats per minute; respiration 12–24 breaths per minute)
10. Reproductive status (mares should be checked for pregnancy, stallions at sanctuaries should be kept separated from other horses until gelded)
11. Wounds, masses, skin lesions, injuries, and other abnormalities

Further examinations should include evaluation of dental health and hoof condition, a fecal exam and possibly basic blood work such as complete blood count (CBC), chemistry, and a Coggin's test for equine infectious anemia (Bayer, 2006).

As mentioned previously, separation from other horses is recommended for at least 14 days after arrival at the shelter. Daily monitoring should include a visual check of vital and behavioral signs, with temperature recorded. Signs of illness such as loss of appetite, fever, diarrhea, nasal and ocular discharges, coughing or respiratory distress, lameness, lethargy, wounds or lesions, or any other symptom of concern should be noted in the record and a veterinarian immediately consulted.

Special caution: Horses in a state of starvation require a strict, specific nutrition program to prevent "refeeding syndrome" (Witham and Stull, 1998). This is a potentially fatal condition caused by rapid introduction of high-carbohydrate feeds. Recommendations for preventing this problem are provided later in this chapter.

The horse's personal records should be used to document baseline values and track any medical or behavioral problems and their treatments, behavior modification plans, and updates. Details of feeding and careful records of weight loss or gain should also be noted for horses requiring an individualized nutrition program.

The results of the initial examination will determine if the horse is in need of any immediate care and a treatment plan. Any horse with an infectious disease must be appropriately isolated and the biosafety measures described previously immediately put in place. In some cases, euthanasia may need to be considered. This decision is discussed in more detail later in the chapter.

Behavioral Assessment

An assessment of the horse's behavioral traits is important for at least two reasons. First, any behaviors that are potentially dangerous either to the horse or the shelter staff should be identified immediately so the appropriate safety precautions can be taken. Second, behavioral traits more than anything will affect adoptability of the horse. Performing a behavior assessment can identify the excellent qualities a horse may have or may point to areas that need behavior modification. It can also provide an indication of how much training or experience with humans the horse has had if a history is not available.

Horses should be allowed an adjustment time of a few days before a behavior assessment is undertaken since horses who are stressed and in an unfamiliar environment may behave in a completely different way than they will after they have settled in. A behavior assessment that prompts for objective evaluation of certain behaviors in response to various situations should be used on each horse. Each staff member performing the evaluation should be trained how to score the different behavior observations in order to achieve objective scoring and good inter-observer reliability. It is important to use an assessment protocol that provides information about various behavior aspects and an easy-to-use scoring system. Appendix 15.1 is an example of a behavior assessment form. After review of the assessment form, areas of concern can be identified and a plan for each horse developed with a training professional.

Categories of behavior testing should include, but are not limited to

1. Observations for any repetitive behaviors such as weaving, cribbing, fence walking, head bobbing, tongue rolling
2. Ground handling with halter: following, stopping, and turning with handler
3. Specialty handling, for example, for farrier, vaccine and injection administration, coat clipping, loading into a horse trailer, washing with water, applying fly spray, etc.

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4. Saddling and bridling
5. Being ridden (if applicable)
6. Fear/flight responses to different stimuli, for example, waving flags, loud noises, equipment, dogs and other animals, including unfamiliar horses

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Preventative Care

Vaccines

An equine extension specialist or state veterinarian familiar with the geographic location of the shelter can help decide which core vaccines to administer in a shelter setting. Vaccinations should be administered under the guidance of a veterinarian who is familiar with horses. If possible a vaccination history of the horse should be obtained, but many horses arrive at a shelter without any medical history. These horses should receive initial core injections on intake, followed by boosters at recommended intervals. The first vaccine for young horses should be given at 4–6 months of age.

At a minimum, these core vaccines will include West Nile Virus, rabies, and the readily available four-way vaccine against equine influenza, eastern equine encephalitis (EEE), western equine encephalitis (WEE), and tetanus (see Table 15.1). Depending upon disease prevalence in the area, other vaccines to consider are Potomac horse fever, equine herpes virus (EHV), and rhinopneumonitis. The most current, detailed equine vaccination protocols can be found at the equine practitioner's website (AAEP, 2011e). They should be consulted because recommendations may differ according to geographic location, risk assessment of the individual animal, new research studies, and development of new vaccine products.

Parasites

Internal gastrointestinal parasites that need to be considered include nematodes (round worms), cestodes (tapeworms), and bots. A fecal parasite egg floatation test should be performed on a fresh sample of the horse's manure to identify the internal parasite load so the correct type of dewormer can be used. A full dosage of dewormer should *not* be used on starved horses or those with an extremely high parasite load because it can result in intestinal blockage and colic. A routine, 8-week interval deworming schedule might not be necessary or economically feasible in a shelter setting with multiple horses. Recent studies indicate that use of fecal egg counts is more accurate and will help determine the frequency and type of medication needed for a sound deworming program (Kaplan and Nielsen, 2010).

External parasites that need to be considered include lice, mange, and ticks. Management of these parasites includes prompt treatment of the animal and sanitizing the environment. External parasites can be treated with over-the-counter pyrethroid-based compounds that carry a product label for killing lice and ticks. Older organophosphate-based external parasite treatments should not be used due to significant adverse side effects.

Castration and Spaying

Any stallion arriving at a shelter, when deemed by a veterinarian to be healthy enough to undergo anesthesia, should be gelded to eliminate further breeding and to increase the ease of handling and compatibility with other horses at the shelter. Whereas stallions become easier to handle after neutering, this is not necessarily true for mares. Mares' ovaries are therefore not routinely removed unless there is a medical reason, such as a granulosa cell tumor. Mares should undergo a reproductive examination by a veterinarian to rule out pregnancy and ovarian health problems.

THE SENIOR HORSE

Any horse over the age of 20 years is considered a geriatric horse and may require additional care. Uneven tooth wear, missing teeth, and dental disease can cause pain and affect the ability of horses to properly chew their feed, in turn reducing the nutrients they can absorb from that feed. A thorough dental exam (that may require sedation to accomplish) will assess these issues and determine what kind of treatment is needed. This should be considered a standard part of a senior horse's intake physical examination. Older horses' digestive systems become less efficient, leading to weight management challenges. Substituting part or all of the hay with complete feeds, such as pelleted rations specifically formulated for senior horses, may be necessary. These contain the roughage, calories, and

Table 15.1. Summary of recommended core vaccines for healthy adult horses.[a]

Vaccine	Previously vaccinated	First time or unknown history	Other notes
Tetanus toxoid (*Clostridium tetani*)	Annually	On intake and booster within 4–6 weeks, then annually	Vaccinate immediately if injured or surgery takes place more than 6 months after last vaccination
Western Equine Encephalitis (WEE)[b] Inactivated (KV) vaccine	Annually, before vector season begins	On intake and booster within 4–6 weeks, and then annually	Transmitted by mosquitoes Follow manufacturer's guidelines for vaccination of foals, pregnant mares, high-risk exposures, etc.
Eastern Equine Encephalitis (EEE)[b] Inactivated (KV) vaccine	Annually before vector season begins	On intake and booster within 4–6 weeks, and then annually	Transmitted by mosquitoes Follow manufacturer's guidelines for vaccination of foals, pregnant mares, high-risk exposures, etc.
West Nile Virus[b] Modified live (MLV), recombinant (REC) and inactivated (KV) vaccines	Annually before vector season	On intake and booster within 4–6 weeks for REC and KV, then annually Start at 5 months for MLV and booster in 1 year, then annually	Transmitted by mosquitoes Revaccination intervals may be different for foals, geriatric and immunocompromised animals and in areas of high risk
Rabies Inactivated (KV) vaccine only	Annually	IM, on intake and booster in 1 year, then annually	
Equine influenza Inactivated (KV), Modified live (MLV)-IN, or Canary pox vector (REC)	Annually or every 6 months depending on risk	On intake with MLV-IN and annually On intake with KV, booster in 3–4 weeks, and then annually On intake with REC, booster in 4–6 weeks	Booster interval will vary with risk of exposure and may need to be given every 6 months

All vaccines should be stored and handled following the manufacturer's recommendations and administered upon the advice of and under the supervision of a veterinarian, preferably one with equine experience. IM, intramuscular; IN, intranasal.

[a]These are suggested guidelines only. Vaccination recommendations may vary for foals, sick horses, pregnant mares, etc. Core and optional vaccine recommendations can be found at http://www.aaep.org/vaccination_guidelines.htm.

[b]Humans may contract this disease if bitten by an infected mosquito.

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essential nutrients required by older horses in a palatable, easy-to-chew form.

Senior horses often present with chronic conditions and orthopedic problems, including lameness and arthritic pain. The veterinarian and shelter staff should assess for these conditions and devise a management plan that includes designing a regular and appropriate exercise regimen, monitoring of body condition score, and providing joint supplements and pain medication if needed. With the long-term use in older horses of nonsteroidal anti-inflammatories such as butazolidine, adverse side effects need to be taken into consideration. Ideally, the geriatric horse deserves stress-free housing including areas with additional soft bedding for resting. Although horses rest and nap while standing, regardless of age, all horses require some time lying down in order to obtain REM sleep. Older horses may experience difficulty lowering themselves and rising from this position. Providing adequate space, a social environment, and comfortable bedding can minimize the physical and mental stress that otherwise may cause a geriatric horse to avoid lying down.

CARE OF HORSES HOUSED AT THE SHELTER

The routine care of horses in a shelter situation is not much different than daily care of any horse. However, many horses who enter a shelter facility require more attention, care, and training than the average horse (Holcomb, Stull and Kass, 2010). After the initial exam has been performed, the horse should be categorized as regular maintenance or special needs.

Regular Maintenance

The Nature of Horses

Horses in their most natural state are prey animals whose safety depends in part on their rapid flight response, and even more so on herd structure and dynamics. Dominance hierarchies help maintain herd stability. Long-term bonds are formed among herd mates, and companionship is important to well-being. Horses evolved to digest relatively low-nutrient grasses, which required them to graze as many as 18 hours per day to meet their nutritional needs. This entails considerable walking between food patches, exercise that is also important to digestive health. Finally, they are large, strong animals with an inclination to injure or become injured, especially when their flight response is activated. Status as a prey animal, social herd structure, and the need for exercise and a constant but small amount of feed in the gut, all are important factors for successful equine husbandry.

Nutrition

Nutrient requirements for horses have been determined and published by the Committee on Nutrient Requirements for Horses of the National Research Council (NRC, 2007). Each individual horse's caloric requirement will be based on age, body condition score, general health, amount of exercise, and reproductive status, with nursing mares in need of the highest plane of nutrition. The NRC publication and numerous equine nutrition texts provide details on feedstuffs and the balancing of rations.

Horses generally like to graze all day, move around freely, and socialize with other horses while eating. As a rule, horses consume from 1.5% to 2% of their body weight daily in dry feed with the bulk of that being high-quality roughage (e.g., hay, hay pellets, pasture) fed at least 2–3 times per day, with access to fresh, clean water and a salt block at all times. (Additional salt is required because many diets are deficient in sodium chloride, and horses lose sodium chloride when they sweat.) Foals should be weaned no sooner than 5–6 months of age; optimally they should have free access to grass or a balanced roughage diet. Studies show that if they are weaned onto concentrated foods like grains, they are more likely to develop oral stereotypic behavior (Waters, Nicol and French, 2002). Foals need to be kept in a social, herd environment with other foals of the same age or gentle adult horses, and be provided with plenty of room for physical exercise and play.

The average horse weighs about 1000 pounds, so 15–20 pounds of dry feed (hay) should be provided daily. The most common hays fed are timothy, alfalfa, and other cereal and grass hays. A concentrate (e.g., oats, barley, rice bran, commercial mix) may be added to the diet of horses needing additional calories or nutrients, but should generally not exceed 1% of total dry feed. Another source of calories could be corn oil. In some cases, vitamins, minerals, or

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protein supplements may be added to the ration. In addition to satisfying the horse's natural preference to eat several small meals daily, multiple feedings may also help curb boredom and the development of behavior problems (Ferraro, Stull and Madigan, 2009).

Horses are very sensitive to the quality of their feed. Dust, mold, and toxins can lead to colic, respiratory or gastrointestinal diseases, laminitis, and death. Food should be stored securely to prevent contamination, vermin infestation, or exposure to the weather. Horses should be monitored daily for their appetite and to ensure they are eating their rations.

Horses must have free and continuous access to fresh, clean water. They may consume anywhere from 4–25 gallons of water daily. If watering devices are used, they must be sufficient in number to meet the needs of all the animals, and should be checked at least twice daily and more frequently in extremely hot weather to ensure they are clean and functional. Buckets and water troughs should also be checked to ensure that they are not dirty or contaminated, as some horses will refuse to drink dirty water, and a dirty trough can serve as a reservoir for disease. In the winter, when the temperature may be extremely cold, the water should be heated to ensure horses have access to it and consume sufficient amounts to prevent dehydration and "wintertime colic." Any change that results in decreased water consumption can cause dehydration and colic. Snow and water sources that freeze in the winter or provide unclean water are unacceptable.

Housing

Group Housing

When housing horses who are unfamiliar with one another, one needs to consider whether to house them in groups or singly. Group housing will allow more economic use of space and is behaviorally advantageous for the social nature of horses. However, incompatibility of certain horses or the need for individualized care might outweigh those advantages.

When horses are grouped together, they should generally be matched by gender, age, and size. Older animals or those with disabilities ideally should be housed with other older animals or those with similar disabilities. New individuals joining the group should be introduced gradually, during daylight hours and under close supervision. Overcrowding can lead to fighting and should be avoided. There must be enough space so that each animal can separate himself or herself from the group (Ferraro, Stull and Madigan, 2009).

Group housing should consist of a well-fenced pasture or dry-lot with shelter from the elements, including access to shade. The minimum size should allow each horse enough space in the shelter and at feeding time so that conflicts and fights are infrequent and even the lowest-ranked horse can consume an adequate amount of feed. If pasture is expected to be a food source, the carrying capacity (appropriate number of horses per acre) will depend upon pasture management and the forages that grow in the facility's climate and soil type. The nearest agricultural extension service can provide information specific to each locale.

Individual Housing

Individual housing may consist of stalls or paddocks. The use of trailers designed for transport is unacceptable as a form of housing. Horses benefit from visual and physical contact with other horses, even when housed singly (Bachmann, Audige and Stauffacher, 2003). Design should balance safety, health, and these social/behavioral needs. Horses must have sufficient space to move about freely and lie down. The Federation of Animal Science Societies (FASS) recommended stall size for an average light horse (1000 pounds) is a minimum of $12' \times 12'$ with a height of $8'–10'$ to provide for adequate light and ventilation. At the very least, the height must be at least 1 foot above the tips of an animal's ears when held as high as possible (FASS, 2010). If more than one horse is housed, 120 square feet are recommended for the first horse, and 60 square feet for each additional horse (FASS requirements). Larger horses, pregnant mares, and some stallions require more space.

Floors should be sturdy and made of compact and easily cleanable materials. Interior stall surfaces should be smooth without any protrusions that could injure the animals. Stall doors should open outward from the stall, fit tightly so horses cannot get their feet or legs trapped, and open widely to provide ingress and egress without injury.

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Bedding

All confined horses should have bedding provided for their comfort and to provide an appropriate area to lie down for sleep. Bedding also promotes good sanitation if properly handled. Bedding materials should absorb moisture and ensure sound footing. Bedding materials include straw, wood shavings, peat, and shredded paper. Sand should be avoided as bedding material because ingestion of sand can cause colic. The best-quality wheat, oat, or rye straw should be used. Old, dirty, dusty, or moldy hay or straw pose health hazards and are unacceptable. Also, shavings from black walnut trees, pressure-treated lumber, or freshly cut cedar are toxic to horses and should be avoided.

Sufficient quantities must be used to create a soft ground surface that allows the horse to recline comfortably and stand up safely. Hard floor surfaces will require more bedding than soft ones to achieve this goal. The bedding should be as clean and dust-free as possible to avoid compromising the health of the horses. For this reason, good-quality products should be selected and stored properly to avoid water damage, pests, and other contamination.

Stalls with bedding in them must be thoroughly cleaned daily, with removal of all feces, urine, and wet material, and replacement of the soiled bedding. The buildup of dust over a period of time creates a health hazard that necessitates periodic cleaning of the barn or stalls (Ferraro, Stull and Madigan, 2009).

Waste Management and Sanitation

A typical 1000-pound horse will produce about 30 pounds of fecal matter and 20 pounds of urine per day (Wheeler and Zajaczkowski, 2009). This waste provides a breeding ground for insects and parasites as well as a source of contamination of the water supply and unpleasant odors. While maintaining horses on pasture eliminates the daily chore of manure removal, the health of pastures also depends upon careful manure management. A regular schedule should be established for removal of manure and maintenance of the pasture. Disinfectant procedures are appropriate when new animals arrive, but typical stall cleaning procedures are adequate for standard care. Facilities must therefore consider how waste is to be removed, provide a designated location for temporary storage, and a plan for ultimate disposal. Will manure be hauled away to a landfill or used as fertilizer? Spread over cropland or pasture? Composted? Options will vary, but all must take into account environmental concerns (e.g., drainage, odor, and pests), local ordinances, and feasibility for the staff (Wheeler and Zajaczkowski, 2009).

Exercise

Horses kept in a stall or small pen require some form of daily exercise, such as riding if feasible, walking, or turnout into a larger area. Physical condition and presence of injury or lameness should be considered when determining the type and duration of daily exercise.

Dental Care

Horses' teeth continue to emerge throughout their lives but are worn down by the chewing/grinding of their feed. Sharp points and uneven wear are common and can be painful and reduce feed efficiency. A dental checkup and floating (filing) of rough edges should be performed by the veterinarian as soon as possible after the horse arrives at the rescue facility, and every 6–12 months thereafter.

Hoof Care

Regular hoof care is an essential part of horse maintenance. Older and very young animals, or those with disabilities or orthopedic problems require additional attention. The AAEP recommends that hooves be trimmed and/or shod according to individual needs, which vary depending upon housing, musculoskeletal problems, conformation, environment, and type of exercise. Horses' hooves grow about 0.24–0.4 inches per month, requiring trimming every 6–8 weeks. Foals may require more frequent trimming because their hooves grow more rapidly. If a horse's hooves wear down too rapidly in that period, or if there is injury or disease, the horse may need shoes as well. A veterinarian or a qualified farrier will help decide if a horse needs any shoes at all and, if so, whether special shoeing is necessary.

Vaccination and Deworming

Routine vaccination and deworming also are an essential part of good health maintenance. Although

basic recommendations were made earlier in the chapter, shelters should consult their veterinarians to determine the schedule and products to be used, as they will vary depending on location, season, and the individual needs of the horse.

Disease Conditions

It is beyond the scope of this chapter to discuss equine diseases. An equine veterinarian should be consulted promptly whenever a horse shows any signs of illness. Gastrointestinal disorders can cause serious illness and even death very quickly. Respiratory disease may spread rapidly through a facility, causing severe distress and endangering the lives of many animals. Horses showing any signs of infectious disease should be isolated immediately. Orthopedic problems can have a variety of causes, including trauma or poor, inadequate, or unbalanced nutrition, and should always receive immediate attention from a veterinarian. Delay can result in unnecessary pain and suffering, and increased medical costs.

In general, zoonotic (animal to man) infections are low risk in horses. Compared to other animals, there are very few significant zoonotic diseases unique to the horse. Therefore rare, species-specific viruses of horses such as influenza, herpes, and West Nile virus are not transmissible to people. Some diarrhea conditions can be associated with salmonella, and avoiding fecal–oral contact is a simple and general precaution. Horses can develop rabies, rarely, and any horse showing neurological signs should be isolated and a veterinarian should be called. Recent studies suggest that horses, like many other companion animal species, can have methicillin-resistant staph infections (MRSA), so standard hygiene of hand washing is recommended. The largest public health risk from horses is injury from kicks, bites, and trampling-related incidents.

Records

Again, even though a group of horses may arrive at the shelter together, it is important to maintain records on each individual animal to keep track of the daily feed ration, medical and behavioral history and results of the physical examination, and any treatments such as vaccination, deworming, dental and hoof care. A copy or synopsis of the medical record should be provided to adopters upon request.

Special Needs

The Sick or Injured Horse

The importance of timely evaluation of each horse by a veterinarian cannot be overemphasized. The veterinarian can assess the health status of the horse, diagnose any health issues, and establish a treatment plan. Sick or injured horses might require special diets, treatments, medications, or surgery. Caloric intake and needs might increase significantly with any health problems, therefore weight and health status need to be carefully monitored daily. Horses with infectious diseases must be quickly placed in isolation and kept separate from all other horses on the premises until there is a resolution of the problem. Shelters should realistically assess their ability to meet the special healthcare needs of horses before undertaking labor- or resource-intensive procedures, or treating infectious disease that may endanger the lives of the other horses.

The Starved Horse

Horses with severely decreased body condition scores (Henneke score of 1–3) need special attention and evaluation of their nutrition plan. They should be evaluated by a veterinarian, as there may be serious associated health problems. The prognosis for survival for horses who have lost more than 50% of their body weight is extremely poor. Their caloric intake, nutrients, and vitamins have to be gradually increased over a period of several weeks. While it may seem kind to provide these horses with as much hay and grain as they can eat, and ravenous horses will certainly oblige, a starved horse's body cannot handle this sudden increase of nutrients. "Refeeding syndrome" can be fatal within days (Witham and Stull, 1998). A carefully performed study regarding refeeding starved horses has been performed (UC Davis, 2003), and recommendations are as follows (www.vetmed.ucdavis.edu/vetext/animalwelfare/equine/nutrition-hr03jul.pdf): Small feedings of alfalfa, multiple (about six) times per day, are recommended to begin. The daily digestible energy (DE) requirement for the average-sized horse is 15 Mcal DE/day, which can be provided with 6.6 kg

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or 14.5 lb of good-quality alfalfa hay (Witham and Stull, 1998). The amount fed can be gradually increased at each meal and the number of feedings gradually reduced over a period of about 10 days to 2 weeks. After about 2 weeks, increased amounts of hay can be fed until the horse can be fed free choice. In some cases, horses may reach their normal body weight in 3–5 months, but grain should not be fed until horses have reached their normal weight, which may take as long as 6 months (Stull, 2003). Routine preventative vaccinations and deworming should be delayed upon advice of a veterinarian and performed after the refeeding protocol has been established for 2–3 weeks (Ferraro, Stull and Madigan, 2009).

The Obese Horse

Overweight horses need to be carefully evaluated for metabolic diseases and orthopedic problems such as laminitis, joint disease, and navicular disease, and then a decrease in caloric intake or an increase in aerobic activity can be considered. In most ordinary, uncomplicated cases, dietary management of obesity consists of a reduction in the amount of carbohydrates and calories fed rather than a reduction in the amount of roughage offered. Group housing of horses who need to increase or decrease body weight may be possible; however, social rank and status need to be carefully assessed. The lower ranking horse may not get enough to eat and may need to be fed individually. One alternative is to keep the horses in groups except at feeding time, when they can be separated from one another.

The Behaviorally Challenged Horse

An initial behavior assessment should provide information about the general behavior and demeanor of each horse. Typically, horses are bright, alert, responsive, and inquisitive about their surroundings. The most important point of such an initial assessment is to evaluate aggression problems, either toward people or other horses. It is imperative to have stallions gelded (castrated) immediately. In addition to eliminating the ability to breed, castration will in most cases also help to make the horse easier to handle and decrease behavior problems.

Horses who are aggressive toward other horses should be housed individually initially. Gradual familiarization over time, using desensitization and counter conditioning, can be helpful in introducing that horse to another horse or even a group of horses. This type of behavior program should be undertaken only by a professional with expertise in equine behavior and training. However, even with treatment, some horses may need to be housed individually for life.

If a horse is aggressive to people, the liability of keeping such a horse at the facility needs to be carefully evaluated. If the decision is made to keep the horse, measures need to be taken to keep staff, visitors, and volunteers safe. A person with experience in equine behavior should determine the motivation for the aggression and design a behavior modification plan to change the horse's unwanted aggressive behavior into a more appropriate behavior. No confrontational methods are recommended, but instead positive reinforcement should be used to reward desired behavior. Punishment-based approaches should be entirely avoided in addressing aggression in horses.

EUTHANASIA

A horse with severe injury, disease, dangerous behavior, in a state of starvation or other condition, may need to be humanely euthanized, whether at intake or later on during the horse's stay at the shelter. Indications of quality of life are viewed differently by different people, but these decisions should ultimately be made in consultation with a licensed veterinarian in accordance with all local regulations and possible contractual obligations with previous owners. Because making a decision to end life is often very difficult, each shelter should determine in advance what their criteria will be, based on the mission, resources, and ethical and moral values of the organization. If the shelter is run by a board of directors, these criteria should be agreed upon and understood by the group. Clear procedures and criteria will ensure a well-considered decision and minimize the guilt that might be felt by the persons who must decide. The AAEP criteria for equine euthanasia takes into account quality-of-life issues that may be useful for shelters struggling with these decisions to consider (AAEP, 2011c).

As part of a previous publication, one of the authors (JEM) created a four-step process to aid in determining when to end the life of a horse in a sanctuary or shelter setting. The basic considerations

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of movement, eating, drinking, and body weight (MEDW) are discussed in detail in the Equine Sanctuary and Rescue Facilities Guidelines (Ferraro, Stull and Madigan, 2009). These are provided here with slight modifications of the original, with appropriate references (Ferraro, Stull and Madigan, 2009):

MEDW Criteria Expanded for Chronic Conditions

Movement (M)

Horses are able to walk, trot, lie down, and get up without substantial lameness or lack of weight bearing on all four limbs. In veterinary medicine, lameness is graded on a 5-point scale with mild conditions a grade of 1 progressing to total lack of weight bearing graded a 5. When a given horse must constantly struggle to move, his or her condition may very well have progressed to a point where euthanasia should be considered.

Eating (E)

Horses must be able to eat long-stem hay, processed feed pellets or cubes, and/or supplements. A loss of appetite, a general disinterest in feed or the physical inability to chew and swallow are all signs for concern. If eating desire or ability is severely compromised and dental or other conditions cannot be corrected, then euthanasia may be considered.

Drinking (D)

Horses must be able to easily seek, move toward, and consume appropriate amounts of water daily for proper fluid balance and digestive function. Failure to consume adequate amounts of water leads to a rapid and dangerous deterioration of health. Horses with a physical or neurological impairment that prevents them from adequate water consumption should be considered for euthanasia.

Weight (W)

Horses' body condition scores (BCS) will vary with time of year, age, and response to a medical condition. An older, skinny horse who is eating, drinking, and moving is not a candidate for euthanasia unless there is a question raised as to their ability to live a life without pain and/or severe physical restrictions. Each case must be evaluated carefully and individually as a degree of subjectivity is often an unavoidable part of the decision-making process. Often a horse may have to be closely observed and monitored for a period of time with multiple and sequential evaluations to determine the magnitude of a disability and its consequences. An equine sanctuary or rescue facility should never become a hospice for horses who are severely infirmed, in chronic pain or for whom the humane continuance of life is not sustainable. Animals whose health status puts them in such a category should receive careful consideration for a humane end of life. Modern veterinary medicine has the ability to humanely end the life of an animal whose pain and suffering cannot otherwise be alleviated. "While medicine aims at restoring or maintaining healthy living, similarly, it is also conceptually part of the veterinarian's duty to end suffering totally erosive of the animal's quality of life" (Rollin, 2006).

Factors to consider regarding euthanasia that are addressed in these guidelines are as follows:

1. Who makes the decision and when?
2. How is suffering determined? Are maintenance behaviors such as eating, drinking, resting, and grooming being performed by the horse?
3. How much is the horse suffering? Can the suffering be adequately treated in the shelter or should the horse be transferred to a veterinary hospital?
4. What are the chances of recovery and rehoming (medically and behaviorally)?
5. What are the costs, time, and manpower needed for recovery time? Are they realistically available? Is there any impact on the other animals being cared for at the shelter?
6. Did the previous owners relinquish the right to this decision at the time of relinquishment or do they need to be contacted first? This question is especially applicable to retirement facilities.
7. Is this horse part of a legal case? When a shelter works with animal control agencies to house horses who have been seized by law enforcement, the decision may not be up to the shelter. If it is being recommended to euthanize the animal for humane reasons, careful documentation of the horse's medical condition must be provided to prove this was the best decision in these particular circumstances.

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Euthanasia Procedures

How will euthanasia be carried out, where, and by whom? Each facility should have a protocol for making the decision, contacting the veterinarian, and arranging for carcass disposal. Biosafety issues must be considered when the method of euthanasia is barbiturate overdose, as landfills may refuse to take the carcass. Local ordinances may also dictate the method for carcass disposal.

Any methods employed on an emergency basis should adhere to guidelines to be found on the websites of UC Davis (Hullinger and Stull, 1999), the American Veterinary Medical Association (AVMA, 2007), or the American Association of Equine Practitioners (AAEP, 2011c). The use of intravenous (IV) injection of a pentobarbital overdose as a preferred method of euthanasia has been suggested by veterinarians over the past few years. However, recent complications associated with carcass contamination and scavengers (bald eagles have died when feeding on a horse put down by pentobarbital injection) have been reported. In some circumstances, other AVMA-approved methods, including gunshot or captive bolt, may be the optimal method. For example, for a horse trapped in a remote area where burial will be delayed or complicated, gunshot by trained individuals may be used to humanely end the horse's life. Additionally, local ordinances and rendering plant acceptance policies may be important considerations in determining the mode of euthanasia. The most important factor is a humane end of life for the horse. Human preferences due to "feelings" can compromise this process. All acceptable methods of euthanasia including pentobarbital, gunshot, and captive bolt should be equally considered. Numerous instances of shelters with horses in dire conditions have damaged the sanctuary movement and effort. Realistic approaches must be part of a shelter's governing board's policy decisions, and the euthanasia policy is among the most important.

Ideally, euthanasia should take place in an area that is easily accessed by equipment that will be necessary to dispose of the carcass, and enough space for the horse to drop without injury to attending personnel. Isolating horses from people and other animals is suggested for safety reasons when possible. Horses being euthanized by pentobarbital injection drop rapidly, similarly to an anesthetized horse, and this response can be objectionable to individuals. Pre-euthanasia sedation by chemical means may decrease anxiety and often involves first administering an IV (intravenous) sedative followed by pentobarbital injection. There is no research to indicate that other horses who may be present show what might be considered emotional reactions to the procedure.

The cost of veterinary-administered euthanasia and rendering can be $300–$500 per horse. Many communities have restrictions on disposal of large animal carcasses. When untimely death or euthanasia occurs, carefully determining that the horse is actually deceased is important. Covering the body with a tarp is also advisable until the carcass is removed to prevent animal scavenging.

REHOMING THE RESCUED EQUINE

If the rescue organization adopts out their rescued horses, a systematic method for finding qualified new owners is important to success. Advertising, interviewing potential adoptive owners, making the transaction happen, and follow-up are components of the process.

Some Considerations on Adoptability

Depending on a shelter's resources and philosophy, a determination must be made as to whether horses will remain at the facility for the rest of their lives, or if new homes will be sought. If rehoming is an option, the adoptability of each horse needs to be evaluated. Ideally, the right home will be found where the horse can stay for life. The cost to maintain horses at a shelter for long term might influence this decision, although spending the time to rehabilitate a horse to become a healthy, well-mannered companion increases the chances of adoption. On the other hand, adoptability might be a challenge for horses in need of lifelong medication (e.g., for metabolic diseases such as Cushings), or who cannot be ridden due to chronic lameness or injury, or who have serious or unmanageable behavior problems.

Advertising

Advertising the availability of adoptable horses can be accomplished in many ways. Nationally, a number of Internet sites regularly list adoptable horses from

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rescue facilities (e.g., www.thehorse.com). At the local level, rescue facilities can use word of mouth or publicity from open houses and educational events. Good volunteer and foster care programs that involve members of the community not only help with the workload and spread the word, but sometimes volunteers themselves become adoptive owners.

Interviewing Prospective New Owners

Perhaps the most critical component of the adoptive process is learning as much as possible about the expectations of prospective new owners. Do they want a horse who can be ridden, or are they looking for a pasture pet? What previous experience with horses do they have, if any? How will the new owners provide for the horse's needs? This is especially important if the horse requires higher than normal maintenance. How will housing, companionship, and care be provided, by whom, and where? It is important to discuss the cost of keeping a horse, including feeding, stabling, and routine preventative medical care, as well as potential cost for unforeseen veterinary care. For prospective owners who wish to adopt a horse for riding, what activities do they want to participate in? This will help in deciding on a breed or type of horse, the best temperament, and past experience or required training level.

This is matchmaking! Time spent finding out as much as possible to make a good fit will benefit the horse, the new owners, and the rescue facility.

The Transaction and Follow-up

Currently, there are no regulations governing equine rescue adoptions and transfers of ownership. New owners may be charged an adoption fee, may be asked for a donation, or may negotiate a purchase price as in any private sale. The amount of the fee/donation/purchase price varies greatly.

Maintaining contact with new owners can significantly improve the success of adoption. Inexperienced horse owners, in particular, can benefit from continued education and support from the shelter facility. Many equine rescues offer to take the horse back if the adoption does not work out. Others do not even transfer ownership, but make a contractual lease of the horse to the new home, requiring regular health and progress reports (Holcomb, Stull and Kass, 2010). In this way, the rescue organization can be sure the horse has a good home for life and can assist or intervene if necessary.

CONCLUSION

Many rescued horses arrive at the shelter with one or more conditions that merit extra medical and/or behavioral attention. Injury, starvation, trauma, old age, and infectious disease processes are the most common problems. Shelter personnel must be able to assess horses for medical, nutritional, and behavioral concerns and work closely with an equine veterinarian to triage horses for appropriate care.

Additional veterinary assistance in equine health care can be found at the following websites:

- Center for Equine Health, UC Davis: www.vetmed.ucdavis.edu/ceh
- International Animal Welfare Training Institute, UC Davis: www.vetmed.ucdavis.edu/iawti
- American Association of Equine Practitioners: www.aaep.org

REFERENCES

American Association of Equine Practitioners [AAEP] (2011a) *Biosecurity Guidelines*, http://www.aaep.org/pdfs/control_guidelines/Biosecurity_instructions%201.pdf (accessed June 19, 2012).

American Association of Equine Practitioners [AAEP] (2011b) *Equine Infectious Disease Outbreak: AAEP Control Guidelines*, http://www.aaep.org/control_guidelines_intro.htm (accessed June 18, 2012).

American Association of Equine Practitioners [AAEP] (2011c) *Euthanasia Guidelines*, www.aaep.org/euthanasia_guidelines.htm.

American Association of Equine Practitioners [AAEP] (2011d) *The Importance of Maintaining the Health of Your Horse's Mouth. Dentistry, A Bayer HealthCare Animal Health Brochure, June 16, 2002*. http://www.aaep.org/health_articles_view.php?id=29 (accessed June 18, 2012).

American Association of Equine Practitioners [AAEP] (2011e) *Vaccination Guidelines*, www.aaep.org/vaccination_guidelines.htm.

AVMA (2007) *AVMA Guidelines on Euthanasia (Formerly Report of the AVMA Panel on Euthanasia), June 2007*, www.avma.org/issues/animal_welfare/euthanasia.pdf.

Bachmann, I., Audige, L. and Stauffacher, M. (2003) Risk factors associated with behavioural disorders of crib-biting, weaving and box-walking in Swiss horses. *Equine Veterinary Journal*, **35**, 158–163.

Bayer (2006) *Equine Infectious Anemia: The Only Protection is Prevention. A Bayer Health Care Animal Health Brochure*, http://www.bayerequineconnection.com/main/conditions_diseases/eia.cfm.

Berger, J., Valdez, S., Puschner, B. *et al.* (2007) Effects of oral tetrachlorvinphos fly control (Equitrol®)administration in horses: Physiological and behavioral indicators of toxicity. *Veterinary Science Research Communications*, **32**, 75–92.

Federation of Animal Science Societies (FASS) (2010) *Guide for the Care and Use of Agricultural Animals in Agricultural Research and Teaching*, 3rd edn, Federation of Animal Science Societies, Savoy, Illinois.

Ferraro, G., Stull, C. and Madigan, J. (2009) *Equine Sanctuary and Rescue Facility Guidelines*, Center for Equine Health, University of California, Davis, California, www.vetmed.ucdavis.edu/vetext/animalwelfare/equine/SanctuaryRescueGUIDE.0909.pdf.

Henneke, D.R. (1985) A condition score system for horses. *Equine Practice*, **7**, 13–15.

Holcomb, K.E., Stull, C.L. and Kass, P.H. (2010) Unwanted horses: The role of nonprofit equine rescue and sanctuary organizations. *Journal of Animal Science*, **88**, 4142–4150.

Hullinger, P. and Stull, C.L. (1999) *The Emergency Euthanasia of Horses: Consideration for Owners, Equine Facility Managers, Auction Market Operators, Horse Transporters, and Law Enforcement Officers*, UC Davis Veterinary Medicine Extension, http://www.vetmed.ucdavis.edu/vetext/INF-AN/INF-An_Emergeuth-Horses.html.

Kaplan, R.M. and Nielsen, M.K. (2010) An evidence-based approach to equine parasite control: It ain't the 60s anymore. *Equine Veterinary Education*, **22**, 306–316.

Mackenzie, S.A. and Thiboutot, E. (1997) Stimulus reactivity tests for the domestic horse (*Equus caballus*). *Equine Practice*, **19**, 21–22.

McCall, C.A., Hall, S., McElhenney, W.H. *et al.* (2006) Evaluation and comparison of four methods of ranking horses based on reactivity. *Applied Animal Behaviour Science*, **96**, 115–127.

McGreevy, P. (2004) *Equine Behaviour: A Guide for Veterinarians and Equine Scientists*, Saunders Ltd, Philadelphia, Pennsylvania.

National Research Council (2007) Committee on nutrient requirements for horses, in *Nutrient Requirements of Horses*, The National Academies Press, Washington, District of Columbia.

Rollin, B.E. (2006) Euthanasia and quality of life. *Journal of the American Veterinary Medical Association*, **228**, 1014–1016.

Stull, C.L. (1998) Health and welfare parameters of horses commercially transported to slaughter. *Journal of Dairy Science*, **81**, 88.

Stull, C.L. and Rodiek, A.V. (2000) Physiological responses of horses to 24 hours of transportation using a commercial van during summer conditions. *Journal of Animal Science*, **78**, 1458–1466.

Stull, C. (2003) Nutrition for rehabilitating the starved horse. *Journal of Equine Veterinary Science*, **23**, 456–457.

UC Davis Center for Equine Health (2003) Nutrition for rehabilitating the starved horse. *The Horse Report*, **21**, 1–4, www.vetmed.ucdavis.edu/vetext/animalwelfare /equine/nutrition-hr03jul.pdf.

Waters, A.J., Nicol, C.J. and French, N.P. (2002) Factors influencing the development of stereotypic and redirected behaviours in young horses: Findings of a four-year prospective epidemiological study. *Equine Veterinary Journal*, **34**, 572–579.

Wheeler, E. and Zajaczkowski, J.S. (2009) *Horse Stable Manure Management*, Pennsylvania State University, College of Agricultural Sciences, University Park, Pennsylvania, http://panutrientmgmt.cas.psu.edu/pdf/G97.pdf.

Witham, C. and Stull, C.L. (1998) Metabolic responses of chronically starved horses to refeeding with three isoenergetic diets. *Journal of the American Veterinary Medical Association*, **212**, 691–696.

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Appendix 15.1
Handling and Reactivity Test (Ferraro, Stull and Madigan, 2009)

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GROUND HANDLING

Ground handling behavior is important for all horses whether or not they will be ridden. This assessment is carried out after the medical exam *if* the horse has been determined to be healthy enough. Some horses will require rehabilitation (e.g., refeeding of starved animals, treatment of injuries) before this assessment can be performed.

Approach by Human

1. Comes toward person or remains still, nonaggressive (ears forward, relaxed facial expression)
2. Backs or turns away calmly
3. Turns away, reactive, possibly fearful; rapid movements, high head, may kick, may see whites of eyes
4. Comes toward person, aggressive (ears back, tense facial muscles, may show teeth, may try to bite, may show rapid movement)

Haltering

1. Stands still or moves toward person, head position neutral, allows haltering
2. Remains still but raises or tosses head out of reach, then allows haltering
3. Backs or turns away, nonaggressive, then stops, allows haltering
4. Turns away, may run and/or position to kick person, does not allow catching, cannot be haltered
5. Comes toward person, aggressive (ears back, tense facial muscles, may show teeth, may try to bite); may or may not be able to be haltered
6. Not able to be tested

Leading in Straight Line or Gentle Curves

1. Readily follows at pace of handler without pressure on lead or halter
2. Follows with pressure on lead, might stop and start requiring repeated pressure on lead
3. Does not move from pressure on lead
4. Moves faster than handler, may trot and circle handler but does not make contact with handler's body
5. Moves faster than handler, bumps into handler, may knock handler off feet, may rear, pull away
6. Not able to be tested

Tieing to Rail or Tie Ring

1. Horse stands still, leaves slack in rope
2. Horse moves around but leaves slack in rope
3. Horse takes slack out of rope but does not fight being tied
4. Horse pulls back on rope and reacts with violent movements; may sit down, rear, fall, break rope
5. Not able to be tested

Grooming (Soft Brush over Body from Neck to Rump)

1. Horse stands still for being brushed over all of body
2. Horse does not remain still while being brushed but allows it
3. Horse flinches or avoids touch of brush
4. Horse bites or kicks at handler
5. Not able to be tested

Head

1. Allows head to be touched and brushed
2. Avoids contact with hand or brush by tossing or raising head
3. Not able to be tested

Ears

1. Allows ears to be touched
2. Avoids contact of hand on ears by tossing or raising head
3. Not able to be tested

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Handling Hooves

1. Allows all four hooves to be lifted, cleaned, set down
2. Does not allow all four hooves to be cleaned; nonaggressive, but may be unable to lift one or more due to physical/medical condition, or lack of training
3. Does not allow all four hooves to be cleaned; reactive or aggressive. Would not stand still, may kick or strike with one or more hooves
4. Not able to be tested

RIDING (IF AGE APPROPRIATE AND CLEARED FOR HEALTH AND SOUNDNESS BY MEDICAL EXAM)

Saddling

1. Remains still when approached with saddle and pad, allows saddle to be placed on back, may show mild signs of irritation (slight ear pinning, tail swishing) when girth is tightened
2. Objects to placement of saddle on back; may try to bite, kick, and buck—may be due to pain, little or no experience with saddle, or negative experience
3. Alarmed when approached with saddle, may have never seen one before
4. Unable to be tested

Bridling (Simple Headstall with Fitting Snaffle Bit)

1. Lowers head into bridle and takes bit within 5 seconds
2. Allows bridling after more than 1 minute
3. Would not open mouth for bit
4. Tosses or holds head very high
5. Unable to be tested

Similar items for weight in saddle, direction cues, give to pressure on bit, walk, trot, canter/lope, halt, back, circles.

REACTIVITY

See previously published reactivity tests: turn horse loose in pen with novel object; assistant opens umbrella as horse is led past it by handler; loud noise (clanging metal, clapping); novel footing (e.g., tarp, mattress, bridge); wave stick with plastic bag at end (Mackenzie and Thiboutot, 1997; McCall *et al*., 2006), and reactivity responses and movement control to a flag (Berger *et al*., 2007).

Section 3
Infectious Disease

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16
Strategies for Management of Infectious Diseases in a Shelter

Miranda Spindel

THREE AIMS OF INFECTION CONTROL

Animals housed in shelters have an increased risk to either acquire or transmit infectious diseases. Some animals are already sick, injured, stressed, parasitized or otherwise immunocompromised. Without a systematic approach to infectious disease control, shelters risk creating situations that can ultimately lead to introduction and spread of infectious diseases. Infectious disease control in the shelter prioritizes the utilization of measures that prevent and manage infectious diseases in individual animals as well as steps to ensure that the health and welfare of the entire population is also protected. Infectious disease control programs should revolve around three main aims: (1) to minimize any factors that may lead to increased host susceptibility; (2) to optimize every individual shelter animal's ability to resist disease; and (3) to simultaneously decrease likelihood of exposure to the infectious pathogens that cause disease (Traub-Dargatz, 2001; Bain and Weese, 2004). Although this appears quite simple, there are many details that must be attended to and understood in order for a shelter to successfully achieve these basic goals.

In the shelter, a comprehensive wellness program is critical to optimizing animals' resistance and minimizing susceptibility and exposure to infectious diseases during their shelter stay. Wellness programs, in their essence, promote physical and mental aspects of animal health in order for animals to be best equipped to fight off infection, while simultaneously creating a healthy environment for animals to exist within. A strong wellness plan is the basic building block for infectious disease control.

Ideally, rather than reactively responding to each disease issue after a problem occurs in the shelter, a flexible plan for managing infectious diseases is created with the combined input of management and medical staff ahead of time. (For more information on plan development, see the chapters on treatment strategies and outbreak management.) Although there must be room to adapt in response to unexpected conditions and to revise and evolve plans over time, documented, shelter-specific plans with well-developed policies and protocols for limiting diseases provide a solid foundation for those working to limit diseases in the shelter. This does not have to be a time-consuming or exhaustive process. Some plans may be lengthy, and others quite concise. Although the details included in every facility's actual plan will vary based on shelter mission, resources, facility design etc., the overarching strategies for minimizing susceptibility, optimizing disease resistance and minimizing exposure remain the same. Every shelter should have a documented infection-control plan that can continue to

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evolve and change along with the field of shelter medicine.

Aim One—Host Susceptibility

Animals entering shelters inherently have an increased risk for developing and/or transmitting infectious diseases. Regardless of the quality of a shelter's medical program, conditions where animals of different ages, backgrounds, stress levels, and health conditions come together naturally create situations where infectious diseases will occur. Furthermore, limited serologic studies indicate that a significant percentage of dogs and cats entering shelters have not received the benefit of prior vaccination or natural exposure to vaccine-preventable diseases (Larson, Newbury and Schultz, 2009). Vulnerability must therefore always be assumed and actively countered.

Simply encountering a pathogen does not always guarantee that an animal will develop a disease. The pathophysiology of diseases is complicated, and some animals and certain situations create an increased susceptibility. Understanding the serious implications of diseases in most shelters, and measures that minimize susceptibility to diseases are important to include in infection-control plans as much as possible. Avoiding dietary changes and the use of feeding protocols and weight checks to ensure that nutritional intake is adequate can help prevent stress to the immune system. Shelters often take in animals experiencing chronic or acutely painful medical conditions and the provision of adequate pain control is another area where shelters can positively affect the host immune function. Lack of pain relief is not only unacceptable, but can lead to animals developing illnesses. Susceptibility to diseases can also be influenced by avoiding widespread, and sometimes unnecessary treatments (such as antimicrobial therapy for viral diseases) that might increase vulnerability to other diseases (AAHA, 2009). Keeping population numbers within a shelter's capacity to provide care, and actively enriching the environment to decrease animals' stress are other ways that susceptibility to infectious diseases can be decreased. Stress and overcrowding are important factors in immunosuppression. While it may be impossible to create a stress-free shelter environment, every effort should be made to minimize common stressors in daily shelter life for the animals. It has been demonstrated that some infections, like feline herpes virus, recrudesce less often when care is taken to prevent undue stress to the animals (UC Davis, 2009). In other cases, animals may be more apt to fight off infections if stress is not affecting the immune system. Shelters also must develop ways to raise awareness of those individuals who may have increased susceptibility that is not alterable. This includes animals who are immunocompromised due to disease or medical treatment, who are being treated with antimicrobial drugs, have open wounds, or who are pregnant or pediatric. Good communication between veterinary personnel, management, staff, volunteers, and the public is important to protect these animals as well as those who are providing care for them while they are at the shelter.

Aim Two—Optimizing Shelter Animals' Ability to Resist Diseases

Provision of preventative healthcare measures like vaccination and parasite treatment on arrival are the key tools available to shelters that actively improve animals' ability to resist diseases. While vaccines are never a guarantee against infection, and protocols must be tailored for a given operation by a consulting veterinarian, panels of experts (AAFP, 2006; AAHA, 2006) agree that immediately vaccinating all animals as they enter a facility, including those pregnant and mildly ill, with those vaccines considered to be core is one of the mainstays of shelter infection control, and should be every facility's priority.

Similarly, routine provision of parasiticides on intake and when needed throughout animals' shelter stays helps to limit the immunologic drain that parasite infestations create. Animals can carry a wide variety of internal and external parasites. Some parasites are environmentally persistent, zoonotic, and can cause significant diseases and discomfort in their host. It is not possible or practical to test or treat each animal for all possibilities. Programs should, with veterinary oversight, create and follow written guidelines for prophylactic parasite control. These should be tailored to zoonotic parasites and to regional and facility parasite prevalence, and be based upon the sheltering facility and mission (CDC, 2009; CAPC, 2011).

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Other measures that increase resistance, such as probiotic and nutraceutical administration, have not been studied extensively in shelter environments but may prove to be important tools.

Aim Three—Decreasing Exposure to Pathogens in the Shelter

There are three requirements for diseases to spread and the basic cycle of infectious diseases to perpetuate in any setting. There must be (1) a source of infection sufficient to cause disease (pathogen); (2) a susceptible host; and (3) a mode of transmission of the infection to another host for disease to continue (Canadian Committee on Antibiotic Resistance, 2008). In most shelters, the population of animals is constantly fluctuating and it is difficult, if not impossible, to control the source and host aspects of this cycle. The focus of infection control for healthcare settings is typically on breaking the cycle of transmission, which means that for shelters, decreasing exposure to pathogens should receive the most emphasis in infection control. While measures that are specific to certain diseases are useful when an outbreak is occurring, understanding and interrupting the common modes of disease transmission can prevent many animals from becoming infected and requiring treatment in the first place. A strong emphasis on precautions to reduce the risk of pathogens being transmitted can help animals remain healthy and move quickly from shelter entry to exit into lifelong homes.

There are differing classification schemes for disease transmission, but for the purposes of shelter work, five common modes of transmission that occur in most shelter environments should be understood. Direct transmission involves a body surface of one animal contacting a body surface of another. Indirect transmission (also known as fomite transmission) occurs when a susceptible host contacts a contaminated inanimate object. This is often the result of poorly washed hands. Droplet transmission occurs when small, infectious droplets that do not remain suspended in air travel a short distance through the air and land on the host's mucosal surfaces. Droplets can also land in the environment and lead to indirect transmission. Airborne transmission occurs when infectious residue from dried droplets or dust remains suspended, able to travel distances through the air. Lastly, vector transmission occurs in the shelter when another living animal serves as an intermediary to transmit diseases to the next animal (e.g., a mosquito or a rodent). More detail on schemes/modes of disease transmission is provided in the chapter on epidemiology of infectious diseases in shelter populations.

Preventing disease transmission is complicated by a number of factors. Many diseases can cause similar clinical signs and animals may be infected with a combination of agents. While some animals show obvious clinical signs of illness, other shelter animals can appear healthy, yet be infected with and capable of transmitting multiple infectious agents through multiple routes (oral, nasal, blood, feces, vomit, etc.). Some diseases are short in duration, some do not survive long in the environment, and some are less apt to be of population significance. Other diseases have long incubation periods, may be environmentally persistent, or can induce carrier states with periodic shedding, and thus are much more problematic for shelters. Standard practices that limit the five routes of disease transmission as much as possible from both recognized and unrecognized sources of infection should be a part of everyday precautions. The key to disease control in the shelter is to ensure that shelter staff who work with animals understand that there are many agents of diseases capable of being transmitted by a variety of modes. While most veterinarians and veterinary technicians know this, many individuals working in shelters may not. Ongoing training and education should provide information about how diseases are transmitted and how daily precautions are designed to stop each of the routes of disease transmission.

Based on the human medical field, precautions to limit transmission and thus exposure can be categorized by whether they are built into the facility's design, whether they are accomplished through administrative measures or whether they are implemented through the use of personal protective equipment (Canadian Committee on Antibiotic Resistance, 2008). Personal protective equipment, though often effectively used in the shelter, is probably the least desirable way to decrease exposure to infectious disease because it is only acting as a temporary physical barrier. There is obviously greater opportunity for plans to reduce exposure in some areas than

in others. Each facility must determine how to plan in a way that has the greatest potential impact when implemented.

Facility Design

There are factors related to reducing transmission of diseases that are or can be built into a facility's design. This is an area where flexibility is limited once a building is established. For this reason, it is valuable anytime a new animal shelter facility is being planned or an older building undergoes renovations to seek input from an experienced shelter medical expert. Sink, drainage and water/hose supply placements, heating, ventilation and air conditioning systems (HVAC), animal housing and isolation rooms, and animal/human traffic patterns in a building should be considered from an infection-control perspective. Perhaps most important to consider in the design of the facility is that direct disease transmission can be greatly reduced by grouping animals based on their likelihood of either developing infectious diseases or transmitting it. This is often referred to as segregation. Segregation will always differ based on a building's design, the current infection status of animals in the building, and other factors, but there are minimum themes that can be hard to meet without adequate room in a building. From the point of shelter entry, animals should be able to be separated by species and age as well as by their physical and behavioral health status (ASV, 2010). At a minimum, young animals (puppies and kittens under 5 months of age) are more susceptible to disease and so should be provided greater protection from possible exposure. Healthy animals should not be housed or handled with animals who have clinical signs of illness.

Administrative Measures

Measures that require oversight, implementation, and compliance fall into this category. As important as it is to have plans for controlling diseases, it is equally important that established protocols are properly communicated and followed. Administrative precautions include protocols for hand hygiene, for monitoring and removing ill animals from the population, for managing animals and people during an infectious disease outbreak, and protocols for caring for animals with zoonotic infections.

Hand hygiene reduces indirect disease transmission. Most healthcare facilities teach this to be the single most important, though frequently overlooked, aspect of infection control (CDC, 2002; Weese, 2004). Hand hygiene should be performed before and after handling animals or items from the animals' environment. Since studies show that healthcare workers perform hand hygiene less than half the number of times they should (CDC, 2002), education and making supplies conveniently available must be considered. Waterless antimicrobial solutions can be used, but everyone must realize the restrictions of such products. They do not remove foreign matter or debris from the hands. Instructions for proper use of all products for hand washing should be included in the infection-control plan. Performing a documented health examination of animals on intake is vital to disease control and management. This practice not only helps recognize and record any problems immediately, but also allows any changes that develop during an animal's shelter stay to be recognized, distinguished from preexisting conditions, responded to, and statistically tracked. Ideally, a shelter should determine which infectious diseases are of most concern and will be actively controlled. The ecology of these diseases should be understood and subsequent strategies developed for grouping and housing affected animals in a manner where transmission can be best minimized.

There are numerous opportunities for indirect (fomite) transmission to occur in shelters that must be constantly countered. All shelters need solid sanitation plans as described in the chapter on sanitation to decrease everyday exposure to fomites. Particularly in shelters that were not originally designed for animal care or in buildings beginning to experience structural wear, proper and routine cleaning and disinfection procedures greatly minimize opportunity for disease pathogens to persist in the environment; the importance of this concept cannot be overemphasized. Sanitation extends beyond environmental cleanliness. Since healthy animals can be shedding infectious agents, people often inadvertently transmit diseases on their hands and clothing during routine shelter activities. Directing staff to clean in order of susceptibility (from least infectious animals to most) and routing visitors through the facility in this

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manner can also aid in reducing fomite transmission. Not only must the shelter work to keep the environment and people from transmitting disease, but attention must also be paid to the equipment that comes in contact with animals. Any inanimate object with frequent animal contact should be readily sanitized between uses, or used and then disposed of.

Personal Protective Equipment

The use of personal protective equipment (PPE) is a part of infection control in the shelter setting (Rocky Mountain Regional Center for Excellence, 2007). See Table 32.7. Since PPE only serves as a barrier to pathogens rather than actively eliminating pathogens from the environment etc., it should not be the only precaution utilized. During animal handling, especially when many animals are handled quickly and in succession (e.g., when cleaning), PPE can reduce opportunity for indirect disease transmission. The use of disposable gloves, disposable or routinely laundered gowns, and protective footwear should be encouraged in the shelter.

CONCLUSION

In summary, animals entering shelters are a population that are at high risk for developing infectious diseases for a variety of unpreventable reasons. Many animals who appear healthy may actually be incubating disease that can soon affect other animals and even people. Proper forethought must be given to an infection-control plan to prevent the very shelters that are striving to rehabilitate animals from becoming unhealthy havens themselves. Although considerable time may be invested in developing a comprehensive plan for infectious disease control, the real value of any plan lies in how a shelter collects, interprets, and then uses data reflecting outcomes of the plan. Ideally, one day data will guide all shelter infection-control decisions. Until then, control of diseases in the shelter involves assessing contributing factors, recognizing those that are outside the realm of recognition or intervention, and concentrating resources on areas that can be measured and modified. Ultimately, learning to reduce infectious diseases in an animal shelter will result in more healthy animals finding lifelong homes.

REFERENCES

AAFP (2006) American Association of Feline Practitioners Web site. Feline vaccine panel advisory report. Available at: http://www.catvets.com/professionals/guidelines/publications/?Id=176. Accessed July 31, 2012.

AAHA (2006) American Animal Hospital Association Web site. AAHA canine vaccine guidelines, revised. Available at: http://www.aahanet.org/PublicDocuments/VaccineGuidelines06Revised.pdf. Accessed July 31, 2012.

AAHA (2009) American Animal Hospital Association Web site. AAHA Basic Guidelines of Judicious Therapeutic Use of Antimicrobials. Available at: http://secure.aahanet.org/eweb/dynamicpage.aspx?site=resources&webcode=BasicGuidelinesofJTUA. Accessed January 25, 2010.

ASV (2010) Association of Shelter Veterinarians Guidelines for Standards of Care in Animal Shelters. Available at: http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29. Accessed July 31, 2012.

Bain, F. and Weese, S. (2004) Infection control. *Veterinary Clinics of North America: Equine Practice*, **20**, xiii–xiv.

Canadian Committee on Antibiotic Resistance (2008). Infection Prevention and Control Best Practices for Small Animal Veterinary Clinics. Available at: http://www.designit.ca/ccar/english/home-e.shtml. Accessed January 25, 2010.

CAPC (2011) Companion Animal Parasite Council. *General guidelines: controlling internal and external parasites in U.S. dogs and cats*. Available at: http://www.capcvet.org/recommendations/guidelines.html#. Accessed July 31, 2012.

CDC (2002) Centers for Disease Control and Prevention, *Guidelines for Hand Hygiene in Health-Care Settings*. Available at: http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5116a1.htm. Accessed July 31, 2012.

CDC (2009) Centers for Disease Control and Prevention, *Healthy pets, healthy people*. Available at: http://www.cdc.gov/HEALTHYPETS/browse_by_diseases.htm. Accessed July 31, 2012.

Larson, L., Newbury, S, Shultz, R.D. (2009) Chapter 5: Canine and feline vaccinations and immunology. In: *Infectious disease management in animal shelters*. Miller L, Hurley K., eds., pp. 61–82.

Rocky Mountain Regional Center of Excellence for Biodefense and Emerging Infectious Diseases (2007). *Veterinary Guide to Personal Protective*

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Equipment. Available at: http://www.colovma.com/associations/2956/files/PPE%20Guide.pdf. Accessed July 31, 2012.

Traub-Dargatz, J., Dargatz, D., Morley, P., *et al*. (2001) Infection Control Strategies for Horses in the New Millennium. *Proceedings of the Annual Convention of the AAEP*. (47), 36–40.

UC Davis Koret Shelter Medicine Program (2009) University of California Available at: http://www.sheltermedicine.com/. Accessed July 31, 2012.

Weese, J. (2004) Barrier precautions, isolation protocols and personal hygiene in veterinary hospitals. *Veterinary Clinics of North America: Equine Practice*, **20**, 543–559.

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17
Epidemiology of Infectious Diseases in Shelter Populations

Janet Scarlett

INTRODUCTION

The frequency of occurrence of infectious disease in a shelter population influences the health of individuals in the facility, and the health of individuals directly influences the overall health of the population. Therefore, shelters must strive to keep both the population and individuals healthy. Prevention of disease (or preservation of health) is always preferable to treatment of disease, and both approaches require a thorough understanding of the epidemiology of all diseases found in shelters.

EPIDEMIOLOGIC CONCEPTS OF INFECTIOUS DISEASE

Agent, Host, Environmental Determinants of Disease

The occurrence of disease is affected by host, agent, and environmental factors, all of which are affected by management decisions. Having a disease agent in the environment is not synonymous with a high frequency of disease, nor does having susceptible animals equate with high disease incidence. It is the blend of host, agent, and environmental factors, and how each component is managed in a population that determines whether disease will occur and with what frequency. Epidemiologists refer to the confluence of agent, host, and environmental factors as the epidemiologic triad. Shelters developing preventive and control measures must consider characteristics of the agent, hosts, *and* environment when designing their disease prevention and control protocols.

Agents and Agent Factors

Infectious agents are classified into five general types: bacterial, viral, fungal, parasitic, and prion. Of these, only prion-associated diseases are not recognized to occur in shelters. Agents, regardless of their type, differ in their infectivity, immunogenicity, pathogenicity, and virulence (Nelson and Masters Williams, 2007). These characteristics influence the selection of effective disease management measures. Agents such as parvovirus or panleukopenia have high *infectivity.* That is, they enter, survive, and multiply in animals and are easily transmitted to other hosts. Other agents, such as the feline leukemia virus, are not nearly as infectious, and require close, prolonged contact between animals to be transmitted effectively. *Immunogenicity* is the characteristic of an agent that relates to how effective the agent is at invoking an immune response. Agents with high immunogenicity, for example, canine distemper virus, produce a sterilizing, durable immune response following vaccination or natural infection that protects animals from that disease for years, if not a lifetime. Other agents, such as the feline upper respiratory agents, have low immunogenicity that does not protect against infection. Vaccination for these agents does not protect against infection, and immunity following natural

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infection is short-lived. The *pathogenicity* of an agent is equated with virulence by some authors. Epidemiologists prefer to define pathogenicity as an agent's ability to cause clinical disease in infected animals. Using cats as an example, the rabies virus has high pathogenicity because almost all, if not all, non-immunized, infected cats develop rabies. Panleukopenia in adult cats, on the other hand, has relatively low pathogenicity as many infected cats fail to develop clinical disease (Tuzio, 2009). *Virulence* relates to the severity of disease that an agent produces. The rabies virus has high virulence (as well as high pathogenicity) because infection results in death, whereas *Microsporum canis* infection (one cause of ringworm) has low virulence in cats, producing relatively mild clinical signs.

These agent characteristics influence veterinary approaches to infectious disease prevention and control. For example, diseases with high immunogenicity usually have vaccination as a primary preventive measure, whereas those with low immunogenicity either have no vaccines, or vaccination is a less important disease control strategy. Fomite control and sanitation may be the primary response to a low pathogenic agent whereas isolation will be used as well for high-pathogenic agents.

Host Factors

The risk of an individual developing disease often varies by host-related factors such as age, breed, reproductive, or immune status. Age commonly affects infectious disease risk; very young and very old animals are generally the most vulnerable, both in terms of frequency and severity of illness. Puppies, for example, are the age group most vulnerable to parvovirus and canine distemper. With diseases such as the canine respiratory complex and canine influenza, the difference in risk between puppies and adult dogs is not as pronounced. In terms of gender, most infectious diseases of dogs and cats in shelters are diagnosed with equal frequency in male and female animals. One exception, also related to reproductive status, is feline immunodeficiency virus (FIV) infection, which is more frequently diagnosed in intact, male cats, most likely due to higher levels of fighting.

Host-related factors such as immune and nutritional status can be modified to enhance host resistance to disease through appropriate management strategies, for example, by vaccination; reduction of stress; or high-quality, consistent feeding protocols. These factors are particularly important to disease reduction in shelter populations.

Environmental Factors

There are numerous environmental factors that influence disease occurrence in the shelter, some of which, such as ventilation and building materials, can be difficult to change, and others that are easily addressed. Environmental factors can profoundly contribute to increased or reduced disease in shelter animals, and management of these factors is key to maintaining their health. (Environmental factors are discussed in more detail in the chapters on dog and cat husbandry, shelter design, sanitation, population management, and behavioral enrichment.)

Impact of Management

Fortunately, management approaches can mitigate many host, agent, and environmental factors to reduce disease occurrence. Protocols requiring vaccination at entry, for example, dramatically reduce the likelihood of outbreaks of diseases such as parvovirus or canine distemper, and protect individual animals. Cleaning and disinfection protocols that are effective at removing the agent from the environment are important management strategies to combat most infectious diseases in shelters by reducing the dose of agent an animal may contact. Good ventilation dilutes and removes aerosolized agents such as *Bordetella bronchiseptica* or parainfluenza virus, reducing the incidence of the canine respiratory complex. Shelters should employ management of host and environmental factors to affect agents and transmission, minimizing the occurrence of disease.

Modes of Transmission

Infectious disease can be transmitted vertically (from the bitch or queen to her offspring), horizontally between conspecifics (animals of the same species), and occasionally between species. Vertical transmission can occur in utero, during delivery or suckling, or by direct exposure of offspring to an infected mother. Vertical transmission is of much lesser importance in shelters, especially where pregnant animals are ovariohysterectomized (spayed). Understanding vertical transmission is important, however, when developing protocols for diseases such as feline leukemia, where an infected queen can transmit

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virus to her offspring shortly after birth during nursing or grooming. When resources permit, protocols regarding feline leukemia testing should specify that queens and all of their kittens be tested at entry to the shelter. Understanding that vertical transmission can occur is central to protocols regarding roundworms; these parasites are readily transmitted in utero, and this forms the rationale for routine worming of all young puppies and kittens.

Horizontal transmission is far more common than vertical transmission and probably accounts for well over 95% of disease transference in shelters. Horizontal transmission can be divided into two general types: direct and indirect (Heymann, 2008). Many common shelter agents can be spread both directly and indirectly.

Direct: Direct transmission is the immediate transfer of infectious agents from an infected animal to a receptive portal of entry in another animal—usually within a distance of 1 meter or less. Direct transmission can take place by biting or direct projection (droplet spread) onto the mucous membranes, including the conjunctiva, of another animal during sneezing, coughing, licking, spitting, or sexual intercourse. Diseases that can be spread by direct contact in shelters include the canine respiratory complex, feline leukemia, and feline upper respiratory tract infections in colony-housed cats.

Indirect: Indirect transmission can result when an animal encounters an infectious agent on inanimate objects or human skin, from vectors, or when a suspended agent is inhaled in dust or in the air. These three types of indirect transmission are labeled (1) vehicle-borne, (2) vector-borne, and (3) airborne transmission.

Vehicle-borne: Vehicle-borne transmission, often referred to as fomite transmission, can occur when objects such as toys, smocks, hands, towels, water, food, mops, cage surfaces, and other inanimate objects become contaminated with an infectious agent. The agent is transferred by the contaminated object(s) from infected animals to uninfected animals. The agent may or may not have multiplied in or on the vehicle before transmission. People, including their hands, clothing, and shoes, can act as fomites, and staff and volunteers must be trained to minimize this method of transfer. Most, if not all, of the infectious agents of concern in shelters can be transmitted by fomites, including feline upper respiratory disease, canine respiratory disease complex, ringworm, parvovirus, panleukopenia, and many others. Fomite transmission is probably the single most important mode of disease transmission in shelters.

Vector-borne: Vector-borne transmission requires an arthropod such as a mosquito, flea, or tick for transmission of the agent. Vector-borne transmission can be mechanical or biological. When mechanical vector-borne transmission occurs, some parts of the vector, such as mouth parts or feet, become contaminated with the agent that then travels on that vector from an infected to an uninfected animal. Parvovirus is thought to be transmissible in shelters on the appendages of insects. If a vector ingests an agent and it exits via the intestinal tract but does not require development in the vector for transmission, this is also considered mechanical transmission. Agents using a biological vector-borne mode of transmission, on the other hand, require multiplication or further development inside the vector to be effectively transmitted. One example of biological vector-borne transmission is seen in heartworm disease, where the parasite must be transmitted to cats and dogs by mosquito bite.

Indirect airborne: Indirect airborne transmission, also referred to as aerosol transmission, is distinguished from droplet transmission (a form of direct transmission) by the difference in the size of the particles/transmitting agent. Indirect transmission results when infectious diseases produce microbial aerosol (droplet nuclei) carrying agents that can remain suspended in the air, and are inhaled into the alveoli of the lungs (usually 1–5 μm in size). The agent usually remains suspended for some period of time before a susceptible animal encounters it. Agents causing the respiratory disease complex in dogs are transmitted in this way, as well as by other modes.

Impact on Disease Prevention and Control

In shelters, most of the common infectious agents are transmitted by fomites, the direct and indirect airborne route, direct contact between animals, and to a lesser degree, by vectors. Knowing the mode(s) of transmission enables the veterinarian to plan preventive and control measures that interrupt agent transfer. Agents can and frequently do have multiple modes of transmission, which complicates their prevention and control in shelters.

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Importance of the Carrier State

As described above, infectious disease agents have evolved modes of transmission that insure their perpetuation in populations. Clinically ill animals usually shed the largest quantities of agent. Infected cats or dogs with nasal discharge, sneezing or coughing, vomiting or diarrhea are more likely to be shedding large quantities of infectious particles into the environment. Recognizing that these animals are highly efficient at spreading disease to uninfected animals is the basis for recommendations for isolation of sick animals. Agents have also evolved more insidious means of ensuring their transmission, including the evolution of carrier states. An infectious disease carrier is an animal that is shedding agent, but is not displaying clinical signs and serves as a potential source of infection to susceptible animals. Definitions differ somewhat, but it is helpful to think of four common types of carriers: healthy or inapparent, incubatory, convalescent, and chronic.

Inapparent carriers are infectious (i.e., shedding agent), but will not develop clinical signs and can spread the agent to other dogs or cats unnoticed. Among carriers these are often the most problematic because without laboratory testing they will never be recognized, especially for diseases of low pathogenicity such as Giardiasis. *Incubatory carriers* are those animals who are shedding agent without showing symptoms, but will develop clinical signs when the incubation period ends. Incubationary shedding is usually relatively short, lasting a few days, with the notable exception of feline leukemia and feline immunodeficiency virus infections. An example of a disease transmitted in shelters via incubatory carriers is parvovirus. *Convalescent carriers* are animals who were clinically ill, have recovered, but are still shedding agent. Dogs convalescing from canine distemper can shed for up to 16 weeks post infection (Newbury, Larson and Schultz, 2009). *Chronic carriage* results when an animal continues to shed agent long after the initial infection. Chronic carriers are fairly rare in shelters, but some cats can shed calicivirus for months and rarely years following recovery (Scarlett, 2009).

The importance of carriers as a source of infection for uninfected animals in outbreaks and disease control programs is not always clear. For example, while *Bordetella bronchiseptica* bacteria have been recovered from the oropharynx of cats for up to 19 weeks post infection, the infectiousness of affected animals has not been demonstrated conclusively. Similar to multiple modes of transmission, agents can produce more than one type of carrier state, and precautions may be necessary at more than one stage of infection.

Another type of carrier peculiar to herpesvirus-infected hosts is the *latent carrier*. Latent carriers do not regularly shed virus; when stressed, however, they can recrudesce (reactivate) their infection and begin shedding again. Following infection with the feline herpesvirus, cats almost always become latent carriers. When these cats are stressed, about 45–50% of them re-shed virus within approximately 4–11 days. They can continue shedding for 1–13 days following reactivation and infect susceptible cats (Gaskell, Dawson and Radford, 2006).

Other Important Epidemiologic Concepts

Several other epidemiologic disease concepts are important when considering preventive and control measures for infectious disease in shelters. For example, the *communicable period* must be considered. As the term suggests, this is the time period during which an infected animal is shedding agent and is, therefore, capable of transmitting it to other animals (Porta, 2008). The period of communicability can vary among diseases, but is less than 10–14 days for most diseases of concern to shelters.

Disease transmission among animals is hampered when the population has high *herd immunity*—that is, a high proportion of animals in a population are immune. If the herd immunity is high in a shelter, then infected animals or infected vectors are unlikely to come into contact with susceptible animals, limiting transmission. Vaccination at entry (regardless of the euthanasia rate in a shelter) is advised not only to protect individuals from developing disease but also to achieve high herd immunity as quickly as possible.

An understanding of the natural course of an infectious disease is essential to effectively managing that disease. Some infections (e.g., parvovirus, canine distemper virus) produce a sterilizing immunity following natural infection (and following vaccination) such that once an animal recovers, he or she is immune for years, if not for life. This knowledge is important, for example, for segregating groups of dogs by their risk during a canine distemper

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outbreak. Other infections may recur following re-exposure (e.g., calicivirus-associated respiratory disease) or relapse (e.g., herpesvirus-associated respiratory disease) resulting from stress. Still other infections remain chronic (e.g., FeLV (feline leukemia virus), FIV (feline immunodeficiency virus)) and eventually do enough damage to cause clinical disease. Some can produce permanent pathology (e.g., turbinate disease caused by feline herpesvirus infection) that may lead to chronic disease (e.g., chronic respiratory signs) over time even though the agent is no longer active.

Patterns of Disease Occurrence

Before proceeding with a discussion of the diagnosis of disease and monitoring of the health of populations, general patterns of disease in populations will be described.

Endemic disease: Endemic disease is regularly and continuously present. The endemic level is the usual frequency of disease occurrence, measured by incidence, in a population. The endemic incidence of disease can vary due to numerous factors including the type of disease, species, geographic location, shelter, and type of shelter population.

Epidemic disease (also called disease outbreak): An epidemic exists when the frequency or incidence of disease occurring is clearly in excess of its expected frequency based on previous experience in that population. The endemic level of disease is most often the baseline for comparison. The technical definition of an epidemic is when the incidence is greater than two standard deviations above the average observed incidence. In shelters it is typically based on the judgment of staff or a veterinarian that an unusually high incidence is occurring in the shelter. In most epidemics in shelters (e.g., parvovirus, kennel cough) there is little doubt that the disease incidence or severity has increased dramatically. While outbreaks are often obvious, they can be more subtle (e.g., an epidemic of incision infections), and adhering to recommendations for conducting an outbreak investigation of the cause(s) should be followed (Nelson and Masters Williams, 2007). When gauging whether an outbreak is occurring, the frequency measure of interest is the incidence of disease. Since some diseases regularly increase during certain seasons of the year, the assessment of an outbreak should be done in relation to the usual incidence for that time of year. If intake remains relatively constant each year, shelters can count the number of newly diagnosed cases to monitor whether the frequency of disease has increased compared to previous years. If the population at risk of developing disease is changing through changing intake or duration of residence in the shelter, then rates, not just counts, must be calculated in order to assess changes in incidence and to make comparisons.

MONITORING THE HEALTH OF A POPULATION

Introduction

Identifying a "sick" population—diagnosing an outbreak—assessing the severity of its illness, monitoring its recovery, and preventing disease in the future has many similarities to handling illness in individual animals (Table 17.1).

Similar to looking for clinical signs in an individual animal, veterinarians and staff in shelters must watch carefully for signs of changing health in the shelter population. The primary sign of interest is the incidence, or frequency of disease or death. If the incidence of disease is increasing, it is important to ascertain whether an outbreak is beginning or in process, and intervene to halt or limit its progression. An increase in disease or death is usually associated with a breakdown somewhere in the shelter's health management protocols. Identifying the lapse as quickly as possible is essential to maintaining shelter population health.

Just as taking a good history is crucial for individual animal diagnosis, taking a good history regarding disease in a population is also important. The history can reveal the source of an outbreak (e.g., introduction of a new animal or a change in protocol) and what has led to an increased frequency of disease. A "physical examination" of a population incorporates examining the patterns of disease in that population, including the incidence or mortality of disease by host factors, by location in the shelter, and by time of occurrence. The influence of time on disease occurrence is often demonstrated by drawing an epidemic curve, or graphing disease incidence by season or by year to look for trends over a longer period. Incidence or mortality is calculated for common host factors such as age group, breed, and intake status (e.g., owner-surrender or stray).

Table 17.1. Conceptualizing disease management in populations: comparison of approaches by veterinarians to sick individuals and sick populations.

Sick individual animal	Sick population
Take history	Take history
Assess signs	Calculate incidence (frequency of disease) and mortality
Conduct physical exam	Characterize disease patterns by host, place, and time factors
Develop differential diagnoses	Formulate hypotheses regarding the cause(s) and transmission of disease in the population
Develop plan for making the diagnosis	Develop plan to test hypotheses
Conduct diagnostic tests/procedures to identify the cause(s) of illness	Test hypotheses to identify the cause of high disease rates: explain how agent entered; why it caused disease; how it was transmitted
Implement treatment	Implement control measures
Make preventive recommendations	Make preventive recommendations

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Comparing incidence rates by location in the shelter (e.g., holding area, ward X) can identify where disease may have entered or where changes in management are needed. Looking at the frequency of disease by time may help localize when changes in adherence to protocols began (or other changes occurred) before the incidence of disease increased.

When discrepancies in incidence or mortality measures occur by host (kittens vs. adults), place (holding wards vs. adoption wards), or time (June vs. July), this may provide clues as to how the agent entered and how it spread. The clues lead to hypotheses to explain the cause of the increased incidence, the precipitating event(s) and the factors supporting transmission in the shelter. This knowledge then becomes the basis for preventive and control measures. If these measures are effective, disease rates should begin to decline, and recommendations to prevent future increases in disease incidence can be made. (See the chapter on outbreak investigation for more information.)

Collecting Data Regarding Disease and Factors Affecting Disease in Shelters

Disease data can be used for a variety of purposes in shelters, and since collection and summarization require significant resources, the data collected should be limited to what will influence thinking and actions in the shelter. Databases in many organizations are filled with data that are never used. Possible uses of disease and disease-related data are listed in Table 17.2. Some of these uses enhance the quality of care for individual animals, some are important for population care, and some assist both. The following discussion focuses on data collection for population health monitoring, although using data to facilitate individual animal care is equally valuable.

Disease Surveillance

Disease surveillance is (1) the ongoing systematic collection, orderly consolidation, analysis, and interpretation of health-related data in populations, and (2) the prompt dissemination of this information to the people who are in a position to act on that data (Nelson and Masters Williams, 2007).

The management of the health of a population can be accomplished using both medical and nonmedical data. Data such as intake and outflow, shelter census in relation to capacity, and median length of stay in the shelter are essential to optimize the healthcare delivered to animals in a shelter. These data are discussed at length in the chapter on population management. Similarly, behavioral data should also be collected and monitored in shelters, but are not discussed in this chapter. Collection and monitoring of medical data are discussed in greater detail later in this chapter.

Shelters considering initiating a disease surveillance system should outline the questions they would

Table 17.2. List of some uses of disease and disease-related data in animal shelters.

Use of disease or disease-related data	Primary level of concern
Monitor disease trends over time (e.g., by month, year, season)	Population
Monitor mortality/euthanasia by disease	Population
Identification of epidemics (outbreaks)	Population
Assessment of the effectiveness of changes in prevention or control measures over time	Population
Monitor average time to recovery from disease	Population
Monitor average time from intake to disease occurrence	Population
Monitor average time from intake to vaccination	Population
Comparisons among potential risk groups (e.g., by host characteristics and location in shelter)	Population
Monitor average length of specific treatments	Population
Monitor surgical complication rates over time	Population
Facilitate ordering of medical supplies	Population
Generation of list of animals requiring intervention (e.g., treatment, vaccination, deworming) by due date	Individual animal care
List of animals requiring veterinary check	Individual animal care
Monitor response to treatment	Individual animal care

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like to answer using disease surveillance. Traditionally, surveillance has been used to plan, implement, and evaluate preventive and control measures for disease in populations. When shelters begin this process, focusing on a few goals initially will make the process more manageable. One of the first objectives should be to establish the usual frequency, or endemic level of the common infectious diseases in the shelter.

Requirements of an In-Shelter Disease Surveillance System

There are numerous prerequisites to developing and maintaining a shelter-based disease surveillance system. These include good animal identification, clear definitions of diseases, a medical records system, a clear understanding of why monitoring is important, incentives to report, a clear plan for affected animals, prompt analysis, means to generate clear surveillance reports, and the ability to interpret and utilize the surveillance reports. Computerization of the medical data greatly facilitates this process, but is not essential.

Unique identification for each animal entering the shelter is essential for disease surveillance (as well as for many other shelter activities, including medical care). This need continues while animals are in the shelter, and must also be accessible and integrated when previously sheltered animals reenter the shelter after foster care or returned adoptions.

Starting a surveillance system begins with defining those diseases/signs that the shelter chooses to monitor. Since collection of data uses time and resources, judiciously selecting what diseases/signs will be captured in the system is critical. When beginning, shelters would be well advised to start monitoring a short list of diseases and signs, adding others as shelter staff become adept at collecting, analyzing, and interpreting data.

The collection of data regarding diagnoses is preferable to collecting data regarding signs. With that said, collection of data regarding signs can be helpful in recognizing changes in disease incidence or severity before a definitive diagnosis is made. An unusual frequency of diarrhea, for example, might prompt collection and submission of samples for diagnostic testing and identify an outbreak of Giardiasis. Also, it can be helpful to have data regarding both the diagnosis and signs, particularly if the diagnosis is not confirmed or the shelter wishes to monitor severity.

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Types of Surveillance Systems

There are three general types of surveillance systems: active, passive and sentinel.

Active Surveillance Systems

Active surveillance systems are dynamic and involve a regular, systematic effort to *actively* identify disease in populations. This form of surveillance is most commonly used in shelters and is the most needed. The goal is to identify diseased animals as signs become apparent. When a case is identified, there must be a clear protocol as to what the observer should do (e.g., notify the shelter manager, the veterinarian) and what action should be taken with regard to the animal (e.g., move to isolation). It involves daily case identification, which requires staff training and accountability.

Passive Surveillance Systems

Passive surveillance systems rely on veterinarians or laboratories, following diagnosis, to initiate a report of disease (from a list of designated reportable diseases), to the appropriate authorities. This type of surveillance is common in veterinary medicine but rarely used in shelters unless a reportable disease such as rabies is diagnosed.

Sentinel Surveillance Systems

In sentinel surveillance systems, key sources such as animal shelters agree to monitor for and report confirmed or suspected cases of a particular disease to an interested organization. Sentinel surveillance often seeks to identify newly emerging diseases or to monitor the spread of disease into populations not previously affected. With the recognition of canine influenza in New York City, for example, the Maddie's Shelter Medicine Program at Cornell University began testing dogs with respiratory signs from upstate shelters (where the disease was not generally seen) for influenza in order to monitor its spread from endemic regions within and outside of the state.

Level of Disease Surveillance

In human and veterinary medicine, disease surveillance takes place at various levels such as national, statewide, and within hospitals. Currently, most shelter disease surveillance occurs within the individual shelter or organization operating multiple facilities. Specific research projects have collected disease data from several shelters, and the potential exists for routinely monitoring disease across shelters in the future. For this to be useful, however, shelters must agree to such things as standardized disease definitions, timely data entry, and reporting.

Types of Data and Reports to Consider When Monitoring Shelter Population Health

Disease-Related Data

Suggested types of medical data for collection are summarized in Table 17.3.

Diagnosis and date of diagnosis: As discussed earlier, collection of data regarding diagnoses is preferable to data collection of signs. Minimally, diagnoses of common infectious diseases in shelters should be made and data collected to assess the frequency of disease. Timely diagnosis and data collection that includes the date of diagnosis is *essential* to mark the onset of each new case so that incidence measures (rather than prevalence) can be calculated for specific time periods.

Type, dates, and outcomes of diagnostic or screening tests: Collection of these data, when available,

Table 17.3. Suggested types of medical data to collect.

Data types
Diagnoses and dates of diagnoses
Basis of diagnosis (e.g., signs, tests performed)
Disease signs (e.g., diarrhea) if no diagnosis
Date when first sign was noticed
Date of recovery
Outcome of illness
Diagnostic test(s) performed
Outcome of test(s)
Vaccines administered with dates of administration
Surgical procedures(s) and dates when performed
Type(s) and dates of medications administered
Types and dates of complications
Type of treatment and response to treatment

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can identify the strength of the data regarding diagnosis. Some human databases incorporate case descriptors such as "possible," "probable," or "confirmed" to facilitate different levels of analysis.

Type and dates of treatments: The name and dose of drugs and treatments should be entered or checked off daily and monitored to facilitate individual animal care and evaluate treatment effectiveness. The last date of treatment can be used to mark the time of recovery and allow monitoring of average time to recovery in the population if a recheck examination confirming resolution of disease is not possible or recorded.

Outcome of illness: The final outcome of illness (e.g., recovered, euthanized, died, chronically affected) should be recorded. The criteria for recovery should also be explicitly defined.

Types and dates of all medical and surgical procedures: Dates of vaccination, deworming, spaying, castration, and other medical/surgical procedures should be entered in order to calculate time to events. This information will help identify bottlenecks in the movement of animals through the shelter. These data also can be used to monitor their relationship to stress-related diseases and for budget estimates.

Summaries of Data and Reports

Disease-related data summaries or reports used by a shelter should reflect the goals of the shelter (Table 17.4). The approach to summarizing and reporting medical data can take many forms and will depend largely on whether the shelter already uses a computerized shelter software program, the technical expertise available to the shelter, and the questions of interest. Current shelter software packages (e.g., Pet Point, Chameleon) contain some medically related reports, primarily aimed at individual animal care, and software producers are actively working to enhance their programs to facilitate collection and summarization of additional medical-related data, including morbidity and mortality metrics.

Shelters without computerized databases can also collect medical data in programs such as Microsoft Excel® that can calculate total and average numbers of events such as new cases or medical procedures. Most shelters have some staff or volunteers who are familiar with Excel® and could, for example, generate graphs displaying disease trends over time or create bar graphs of cases by age group.

Table 17.4. Reports to monitor regarding population health.

What to monitor?
Incidence rates of common shelter diseases
Number of new cases of common shelter diseases
Incidence rates (based on date that sign was first noticed) of major signs of infectious disease
Number of animals that began displaying major signs of infectious disease
Time from first diagnosis to recovery
Time from intake to vaccination
Percentage of disease-related outcomes
Number and rates of disease-related outcomes
Mortality (died in shelter) rates
Mortality (euthanasia) rates
Number and nature of surgical procedures
Surgical complication rates

Sharing of the Summaries and Reports

Commitment by staff and management to high-quality data collection is essential. Staff must understand the rationale and importance of completely and accurately collecting such information. If the data are not of high quality, the old adage of "garbage-in, garbage-out" becomes applicable. Once summary reports are available, they should be shared with the staff on a regular basis. The data can be used to convey to staff members the frequency of disease in the shelter, where it is occurring, and among which groups. Review of the data can facilitate discussions of how staff can help reduce disease rates, or celebrate their contribution to declining disease rates!

CONCLUSION

A thorough understanding of the epidemiology of infectious diseases common in animal shelters is essential to designing and implementing effective disease control and prevention programs. Monitoring the effectiveness of these programs is enhanced by disease surveillance systems which are also a vital

component of shelters' overall population health programs.

REFERENCES

Gaskell, R., Dawson, S. and Radford, A. (2006) Feline respiratory disease, in *Infectious Diseases of the Dog and Cat* (ed C.E. Greene), Saunders Elsevier, St. Louis, Missouri, p. 147.

Heymann, D.L. (2008) *Control of Communicable Diseases Manual*, American Public Health Association, Washington, District of Columbia, pp. 703–716.

Nelson, K.E. and Masters Williams, C.F. (2007) *Infectious Disease Epidemiology*, Jones & Bartlett Publishers, Boston, Massachusetts, pp. 25–42.

Newbury, S., Larson, L.J. and Schultz, R.D. (2009) Canine distemper virus, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K. Hurley), Wiley-Blackwell, Ames, Iowa, p. 131.

Porta, M. (2008) *A Dictionary of Epidemiology*, Oxford University Press, Oxford, p. 47.

Scarlett, J.M. (2009) Feline upper respiratory disease, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K. Hurley), Wiley-Blackwell, Ames, Iowa, p. 131.

Tuzio, H. (2009) Feline Panleukopenia, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K. Hurley), Wiley-Blackwell, Ames, Iowa, pp. 183–196.

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18
Practical Overview of Common Infectious Disease Agents

Elise Gingrich and Michael Lappin

INTRODUCTION

Many infectious agents associated with clinical disease can strain shelter resources and lead to animal suffering and death, both directly and indirectly, through euthanasia and decreased adoptions. This chapter will present an overview of the most common infectious disease agents that may be encountered in the shelter setting, and will provide basic diagnostic, therapeutic, and prevention guidelines. This information should be incorporated into an overall shelter health management plan. The chapter is organized by clinical signs as they typically present in shelter animals. Since extensive diagnostic testing is not always possible for many shelters, the most practical diagnostics for the shelter setting will be emphasized. Following diagnostics, basic treatment and prevention guidelines will be presented with an emphasis on herd management of the disease. Doses for drugs routinely used in the treatment of the diseases are listed in Table 18.1. These guidelines are not intended to replace comprehensive disease information or to usurp the role of the veterinarian in developing the shelter's healthcare plan.

GASTROINTESTINAL DISEASE

There are numerous causes of gastrointestinal (GI) disease in the shelter environment. Stress, dietary changes, primary pathogens, and opportunistic organisms can all cause signs of GI upset, which is usually manifested as vomiting and/or diarrhea. The following is a brief overview of the most common pathogens that can contribute to GI disease in shelter animals as well as management strategies that can be implemented to control such infections.

Viral Pathogens

Canine Distemper Virus

Agent: Canine distemper virus (CDV) is a RNA virus that affects all members of the canidae family as well as raccoons, ferrets, several large wild cats, and some sea mammals including seals and sea lions (Greene and Appel, 1998).

Transmission: The virus is shed in body secretions, but is most commonly spread by aerosol or droplet exposure. It can be excreted for prolonged periods of time after infection (up to 90 days); however, typical shedding lasts approximately 2 weeks postinfection. Thus, dogs who resolve clinical manifestations of disease are probably safe to rehome to households with other pets, provided those animals are properly vaccinated.

Clinical signs: Infection affects several different body systems, leading to a variety of respiratory, GI, and neurological (central nervous system (CNS) clinical signs. The clinical manifestations depend on many factors, including the existence of maternal antibodies, the dose of virus encountered, and cofactors like other infections (including internal

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Table 18.1. Drugs used to treat infectious diseases of dogs and cats and general dosing guidelines.[a]

Drug	Trade name	Canine dosage	Feline dosage
Antibiotics			
Aminoglycosides			
Amikacin	Amiglyde-V®	15–20 mg/kg, q (every) 24h, IV, IM, SC	15–20 mg/kg, q24h, IV, IM, SC
Gentamicin		6 mg/kg, q24h, IV, IM, SC	6 mg/kg, q24h, IV, IM, SC
Neomycin		22 mg/kg, q8–12h, PO	22 mg/kg, q8–12h, PO
Tobramycin	Nebcin®	2 mg/kg, q8h, IV, IM, SC	2 mg/kg, q8h, IV, IM, SC
Cephalosporins			
Cefadroxil (first generation)	Cefa-Tabs®	22 mg/kg, q12h, PO	22 mg/kg, q24h, PO
Cephalexin (first generation)		20–60 mg/kg, q8–12h, PO	20–60 mg/kg, q8–12h, PO
Cefazolin (first generation)		20–33 mg/kg, q8–12h, SC, IM, IV	20–33 mg/kg, q8–12h, SC, IM, IV
Cefoxitin (second generation)	Mefoxin®	15–30 mg/kg, q8h, SC, IM, IV	15–30 mg/kg, q8h, SC, IM, IV
Cefixime (third generation)	Suprax®	5–12.5 mg/kg, q12–24h, PO	5–12.5 mg/kg, q12–24h, PO
Cefotaxime (third generation)		20–80 mg/kg, q8h, SC, IM, IV	20–80 mg/kg, q8h, SC, IM, IV
Ceftiofur	Naxcel®	2.2 mg/kg, q24h, SC	2.2 mg/kg, q24h, SC
Macrolides/ lincosamides			
Azithromycin[b]	Zithromax®	5–10 mg/kg, q12–24h, PO	7–15 mg/kg, q24h, PO
Clindamycin	Antirobe®	5–20 mg/kg, q12–24h, PO, SC, IM, IV	5–25 mg/kg, q12–24h, PO, SC, IM, IV
Erythromycin		10–25 mg/kg, q8–12h, PO	10–25 mg/kg, q8–12h, PO
Tylosin		10–40 mg/kg, q12–24h, PO	10–40 mg/kg, q12–24h, PO
Metronidazole[c]	Flagyl®	10–30 mg/kg, q8–24h, PO	10–30 mg/kg, q12–24h, PO
Penicillins			
Amoxicillin		10–22 mg/kg, q8–12h, PO, SC	10–22 mg/kg, q8–12h, PO, SC
Amoxicillin-clavulanate	Clavamox®	12.5–25 mg/kg, q8–12h, PO	62.5 mg, q8–12h, PO
Ampicillin sodium		22 mg/kg, q8h, SC, IM, IV	22 mg/kg, q8h, SC, IM, IV
Penicillin G		22 000 U/kg, q6–8hr, PO, IM, IV	22 000 U/kg, q6–8h, PO, IM, IV

(*continued*)

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Table 18.1. (*Continued*)

Drug	Trade name	Canine dosage	Feline dosage
Quinolones			
Ciprofloxacin	Cipro®	5–15 mg/kg, q24h, PO	5–15 mg/kg, q24h, PO
Difloxacin	Dicural®	5–10 mg/kg, q24h, PO	
Enrofloxacin	Baytril®	5–20 mg/kg, q12–24h, PO, IM, SC, IV	5 mg/kg, q24h, PO, IM, SC, IV
Marbofloxacin	Zeniquin®	2.75–5.5 mg/kg, q24h, PO	2.0 mg/kg, q24h, PO
Orbafloxacin	Orbax®	2.5–7.5 mg/kg, q24h, PO	2.5–7.5 mg/kg, q24h, PO
Potentiated sulfas			
Trimethoprim	Tribrissen®	15–30 mg/kg, q12h, PO	15–30 mg/kg, q12h, PO
Sulfonamide	Sulfadiazine		
Tetracyclines			
Doxycycline[d]		5–20 mg/kg, q12–24h, PO, IV	5–20 mg/kg, q12–24h, PO, IV
Tetracycline		22 mg/kg, q8–12h, PO	22 mg/kg, q8–12h, PO
Antivirals			
Alpha interferon (Routine infections)	Intron A®		10–30 IU, q24h, PO
Cidofovir 0.5%			1 drop, q12h
Famciclovir			62.5 mg/cat, q12h, PO
Antiprotozoals			
Agent: *Cryptosporidium* spp.			
Azithromycin	Zithromax®	10 mg/kg, q12–24h, PO	10 mg/kg, q12–24h, PO
Paromomycin		150 mg/kg, q12–24h, PO × 5 days	150 mg/kg, q12–24h, PO × 5 days
Tylosin		15 mg/kg, q12h, PO	15 mg/kg, q12h, PO
Ponazuril	Marquis Paste®	50 mg/kg PO once	50 mg/kg, PO once
Agent: *Giardia* spp.			
Febantel/pyrantel/praziquantel	Drontal Plus®	Label dose, PO, daily × 3 days	
Fenbendazole		50 mg/kg, PO, q24h × 3–5 days	50 mg/kg, PO, q24h × 3–5 days
Metronidazole		15–25 mg/kg, PO, q24h × 7 days	25 mg/kg, PO, q24h × 7 days
Agent: *Toxoplasma gondii*			
Azithromycin		10 mg/kg, q12–24h, PO	10 mg/kg, q12–24h, PO
Clindamycin		12.5 mg/kg, q12h, PO	12.5 mg/kg, q12h, PO
Trimethoprim-sulfadiazine		15 mg/kg, q12h, PO	15 mg/kg, q12h, PO

(*continued*)

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Table 18.1. (*Continued*)

Drug	Trade name	Canine dosage	Feline dosage
Agent: Tritrichomonas foetus			
Ronidazole			20 mg/kg q24h × 14 days
Agent: *Isospora* spp.			
Sulfadimethoxine	Albon®	Label dose, PO, daily × 10 days	Label dose, PO, daily × 10 days
Ponazuril	Marquis Paste®	50 mg/kg, PO once	50 mg/kg, PO once
Trimethoprim-sulfadiazine		30mg/kg, PO q24h × 10 days	30 mg/kg, PO q24h × 10 days
Antifungals			
Fluconazole	Diflucan®	2.5–5.0 mg/kg, q12–24h, PO	50–100 mg/cat, q12–24h, PO
Itraconazole	Sporonox®	5 mg/kg, q12h, PO for 4 days and then 5 mg/kg, q24h, PO	50–100 mg/cat, PO, daily
Ketoconazole	Nizofal®	10 mg/kg, q24h, PO	10 mg/kg, q24h, PO

IM, intramuscular; IV, intravenous; SC, subcutaneous; PO, oral.
[a]The dose ranges and intervals in this table are general. Please see appropriate sections in the text to determine the optimal dose and duration of therapy for specific syndromes or infections.
[b]For simple infections, azithromycin can be given daily for 3 days and then every third day.
[c]The maximum daily dose should be 50 mg/kg.
[d]The drug can be given once daily to cats for the treatment of simple infections and animals with ehrlichiosis.

parasites), stress, and poor nutrition. Some dogs may exhibit very minimal to inapparent clinical signs. Clinical signs can include clear or green nasal discharge, ocular discharge with or without uveitis, lethargy, and decreased appetite. Respiratory signs may progress to pneumonia and subsequent dyspnea 1–2 weeks postinfection. GI signs such as vomiting and diarrhea may develop at this time. Neurologic signs are variable, including seizures, ataxia, tics or twitching, weakness or paralysis, or behavioral changes, and may be seen with or without other clinical evidence of distemper. If the infected animal has no prior immunity, the signs may be evident within 2 weeks of infection, but partially immune dogs may not develop neurological signs until months after the primary respiratory or GI system signs of disease have resolved. Generally, if neurologic signs are evident, the prognosis is poor.

Diagnosis: Definitive antemortem diagnosis of distemper can be difficult to obtain. In the shelter setting, presumptive diagnosis may be based on clinical suspicion; however, in the early stages of the disease it can be difficult to differentiate from other causes of canine infectious respiratory disease complex (CIRDC). Direct fluorescent antibody staining can be used to detect inclusion bodies in conjunctival scrapes, buffy coat, cerebrospinal fluid (CSF), and urine sediment. This test is most useful in the early course of the disease, and false negatives are common. However, false positive test results occur, and positive results can be induced by vaccination. Serology results can be affected by recent vaccination and may have minimal diagnostic benefit without interpretation in the shelter setting where dogs are often vaccinated on intake. Use of reverse transcriptase polymerase chain reaction (RT-PCR) to amplify distemper virus RNA from secretions is available but is currently expensive and the effect of recent vaccination on these test results is unknown. Necropsy and histopathologic exam of tissues remain the most reliable methods of CDV diagnosis.

Treatment: Supportive care is the only treatment option. Affected animals should be isolated and treated appropriately for the clinical signs that are

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evident, including antibiotics for secondary bacterial respiratory infections, fluid replacement as needed, and antiemetics for uncontrolled vomiting. If neurologic signs are evident, the prognosis is much poorer and treatment is less effective than supportive care for systemic signs. Quality of life must be carefully considered along with the risk an animal would pose to the rest of the shelter canine population.

Prevention: Vaccination is the primary method of prevention. All dogs should be vaccinated with a modified live or recombinant vaccine upon intake or at the time of an outbreak (Paul *et al*., 2006), and in keeping with recommended shelter guidelines, puppies under the age of 18 to 20 weeks should be revaccinated at 2–3-week intervals. The recombinant vaccine may provide superior protection when maternal antibodies are present and may therefore be the best choice for young puppies in areas where distemper is endemic and where outbreaks have occurred (Larson and Schultz, 2006; Paul *et al*., 2006). Careful monitoring of dogs for evidence of distemper will allow for immediate isolation of clinically ill and exposed/at-risk animals and prevent further spread to the rest of the shelter population. The virus does not survive for long periods of time in warm or dry environments; however, it is able to withstand colder temperatures, remaining viable at temperatures below freezing. It is easily killed with most routine shelter disinfectants.

Canine Parvovirus

Agent: Canine parvovirus (CPV) is a DNA virus that can cause severe enteritis in canines, and less commonly, in cats (see feline panleukopenia). The virus infects cells of the intestinal crypts leading to blunting of the villi that are necessary for proper absorption of nutrients. These changes lead to the clinical signs observed with parvovirus infection. Several strains, including CPV-2a, CPV-2b, and the recently recognized CPV-2c, can infect canines (Kapil *et al*., 2007). Illness is typically seen in puppies less than 16 weeks of age, but can be seen in any dog who has inadequate protective immunity.

Transmission: The virus spreads easily between dogs via the fecal–oral route but can be spread through all secretions. Spread generally occurs via contact with canine feces, vomit, or contaminated food, water, or the environment. Fomites are a significant contributor to spread of the virus in the shelter setting. The virus is able to persist for prolonged periods under adverse environmental conditions.

Clinical signs: The most common clinical signs are a rapid onset of inappetance, vomiting, and severe diarrhea, which often contains frank blood. Affected dogs usually develop signs of extreme lethargy and become depressed and dehydrated; many have elevated rectal temperatures and may have evidence of leukopenia on laboratory analysis. In severe cases, death can occur rapidly.

Diagnosis: The sudden onset of vomiting and bloody diarrhea is highly suspicious for CPV infection. However, all suspected cases should be tested for CPV as there are numerous other causes of bloody diarrhea. In-hospital enzyme-linked immunosorbent assay (ELISA) tests are available for testing for parvovirus infection. At least one of the commercially available tests detects CPV-2a, CPV-2b, and CPV-2c (Larson *et al*., 2008). Viral shedding is short lived and usually not detected by 10–12 days postinfection, and so false negative results occur in some dogs. Administration of vaccines that contain modified live strains of the virus can result in positive test results within 2 weeks of vaccination. However, in these cases the colorimetric assay result is usually a weak positive. PCR assay to document parvovirus DNA in feces is currently offered by some commercial diagnostic laboratories, but whether these assays have better predictive value for diagnosis of parvovirus infections is unknown. In a shelter setting, a complete blood count or blood smear documenting leukopenia can provide helpful information. Postmortem examination can be used to confirm the diagnosis.

Treatment: Treatment for CPV infection consists of correcting fluid and electrolyte imbalances and providing supportive care as needed. Antiemetics and gastric protectants may be indicated if vomiting persists. Antimicrobial agents are beneficial in most cases to prevent the development of sepsis. Coinfection with other agents, including canine corona virus, nematodes, and protozoans may occur. Controlled data are not available for treatments such as passive immune therapy (administration to the affected puppies of serum or plasma from dogs with high titers) or high-dose interferon, but such therapies are promoted by some in an attempt to lessen severity of clinical disease. The use of oseltamivir (Tamiflu®) in dogs with suspected parvovirus infections did not

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have clear benefit in one study (Savigny and Macintire, 2010).

Prevention: Vaccination on intake to the shelter with high-titer, modified live strains of the virus is probably the single most important preventive measure for CPV infections. Current research has shown that available vaccines will induce immune responses that cross-protect against CPV-2a, CPV-2b, and CPV-2c (Larson and Schultz, 2008; Spibey *et al*., 2008). Shelters should develop and adhere to a rigorous vaccination protocol in keeping with accepted shelter guidelines to protect the shelter population (Larson, Newbury and Schultz, 2009). Consistent monitoring of dogs for clinical signs suggestive of parvovirus will allow for the immediate isolation of any suspects. If the shelter elects to treat infected dogs, strict isolation protocols must be adhered to in order to prevent spread of the disease to the rest of the shelter population. This disease can be very expensive to treat, can strain shelter resources, and may place the rest of the shelter population at risk. Therefore, shelters need to focus efforts on preventing the disease through vaccination, sanitation, and by ensuring that all staff are familiar with clinical signs so suspect cases can be immediately isolated. CPV is environmentally persistent, and contaminated environments are best sanitized through repeated cleaning to physically remove all organic debris, dirt, and the virus, followed by; use of disinfectants with proven efficacy against the virus such as bleach (sodium hypochlorite diluted 1:32 with water), potassium peroxymonosulfate, and accelerated hydrogen peroxides.

Feline Enteric Coronavirus

Agent: The feline enteric coronavirus (FECV) is a RNA virus that is very transmissible and thus ubiquitous in cats. For example, after being housed in shelters, up to 60% of cats will test positive for the virus in feces (Pedersen *et al*., 2004). Mutated strains of the virus have been associated with the commonly fatal disease, feline infectious peritonitis (FIP). This disease requires both a mutated virus and susceptible hosts, and therefore not all cats are affected when outbreaks occur.

Transmission: Coronaviruses are shed in feces of infected cats and are highly contagious. Cats are infected when they ingest the virus, which can occur when cats share litter boxes, through mutual grooming, or if they ingest contaminated food or water.

Clinical signs: Cats infected with FECV usually are subclinically infected, but may develop mild, self-limited, small-bowel diarrhea, and/or vomiting. FIP is typically observed in two forms, the effusive form and the noneffusive form. Cats with the effusive form usually have fluid production in body cavities and can have a distended (pot-bellied) abdomen from peritonitis or dyspnea from pleuritis. The fluid is a characteristic straw color and has low cell counts but high protein concentrations. Those suffering from the noneffusive form develop granulomatous masses within abdominal organs, brain, and eyes. Most cats with FIP are also very unthrifty in appearance.

Diagnosis: There is no specific test that can prove diarrhea is induced by FECV. It can be assumed to be the cause of diarrhea in a cat who is RT-PCR positive in feces only when all other causes of diarrhea have been ruled out. In a recent study, RT-PCR results for coronavirus did not correlate with the presence of diarrhea (Gingrich *et al*., 2010). Serology and RT-PCR assay results on blood or feces cannot differentiate between FECV and FIP. Serological results are indications of exposure, and do not necessarily correlate to a state of disease. If PCR is to be used in cats with suspected FIP, assays that use primers that amplify the mRNA of the *M* gene may be superior to other assays (Simons *et al*., 2005; Can-Sahna *et al*., 2007;). However, positive results can occur in healthy cats (Can-Sahna *et al*., 2007). Since RT-PCR assays are expensive and the positive predictive value is not very high, the utility in shelters is questionable. Diagnosis of the wet form of FIP is often made on the basis of clinical signs, characteristics of the abdominal or pleural fluid, and laboratory findings which can include hyperglobulinemia, neutrophilia, and increased total protein. The peritoneal and pleural fluids generally have high protein concentrations with relatively low cell counts with a predominance of neutrophils and macrophages. The ratio of albumin to globulin in the serum or fluids can aid in the diagnosis of the wet form of FIP. In one study, an albumin to globulin ratio of 0.5 had a positive predictive value of 89%, and an albumin to globulin ratio of 1.0 had a negative predictive value of 91% (Hartmann *et al*., 2003). In addition, positive

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RT-PCR assay results performed on fluids are generally predictive of the disease.

Treatment: Most cases of FECV-associated enteritis are self-limiting and will require little treatment. There is currently no specific treatment for FIP and little that can be done to manage the disease. The use of glucocorticoids with feline omega interferon was promoted in one small study, but further controlled data are needed before making this a general recommendation (Ishida *et al*., 2004). In another study, no effect was noted following interferon therapy (Ritz and Egberink, 2007). The use of immunosuppressive agents may slow the course of the noneffusive form of disease, but all affected cats will eventually die or require euthanasia.

Prevention: Since the virus is ubiquitous in the environment, it is impossible to prevent FECV from entering shelters. There is no way to determine which isolates may mutate and cause FIP. For this reason, efforts should be aimed at maintaining the health of all cats in the shelter, reducing stress, and decreasing the viral load through routine cleaning. A vaccine for FIP is currently available; however, its efficacy is low for both FECV and FIP and it is not routinely recommended in the shelter setting (Richards *et al*., 2006). Corona viruses are readily destroyed in the environment through use of routine disinfectants.

Feline Panleukopenia

Agent: Panleukopenia is caused by the feline parvovirus, a DNA virus that can infect cats and can cause life-threatening diarrhea and vomiting and sudden death. It typically affects young kittens. Although older animals can also be infected, they generally suffer from milder disease. Occasionally, clinically ill kittens have been proven to be infected by CPV-2 variants, but clinical disease is generally more severe following infection by FPV (Decaro *et al*., 2010).

Transmission: The virus is shed in all secretions of an infected cat and so is easily transmitted by direct contact with affected cats. Fomite transmission is a significant source of infection in the shelter environment due to the prolonged survival time of the virus.

Clinical signs: The most common clinical signs are depression, and vomiting and diarrhea leading to dehydration. The virus also causes a precipitous drop in white blood cells, leading to immunosuppression. Affected animals may be observed with their heads hanging over their water or food bowls. Severely affected animals may die within 12 hours of presentation.

Diagnosis: Presumptive diagnosis is often made with the presence of clinical signs and leukopenia. Salmonellosis is one of the primary differential diagnoses. The commercial ELISA tests designed to detect CPV can be used to detect parvovirus in feces of cats as well (Patterson *et al*., 2007). False positive results may be obtained if the cat was vaccinated with a modified live panleukopenia vaccine within the previous 2 weeks. False negatives may result if the animal is not currently shedding virus, such as early or late in the course of the disease. Pilot data have shown that a PCR assay used to document panleukopenia DNA in feces was commonly positive in healthy shelter cats who were previously administered a modified live vaccine, which lessens the positive predictive value of these assays (Gingrich *et al*., 2010).

Treatment: Supportive care is the primary method of treatment for cats with clinical signs of FPV infection. Parenteral fluids should be administered to correct fluid losses and maintain adequate hydration. Antiemetics may be necessary to control persistent vomiting. If cats are able to survive for several days with supportive care, they usually develop adequate immune response to overcome the infection.

Prevention: Parenteral administration of modified live FVRCP products with high viral titers induces rapid immunity (Richards *et al*., 2006). All cats should be vaccinated on intake into the shelter environment, and kittens should be boostered every 2–3 weeks until they reach 18–20 weeks of age. Just as with CPV in dogs, consistent monitoring of cats for clinical signs suggestive of panleukopenia will allow for the immediate isolation of suspect cases. Strict isolation protocols must be adhered to in order to prevent spread of the virus to the rest of the shelter population. The virus can persist in the environment for prolonged periods of time and is resistant to many disinfectants; chemicals specifically tested for efficacy against parvoviruses must be used for effective disinfection to occur. (See the section on Canine Parvovirus.) Cleaning and disinfection protocols need to be strictly adhered to, and the fewest staff members possible should handle suspect cats to prevent disease transmission.

Bacterial Pathogens

Campylobacter

Agent: *Campylobacter* spp. are gram-negative curved bacteria that infect multiple species including dogs, cats, and humans. There are numerous *Campylobacter* species: *Campylobacter jejuni* and *C. coli* are likely pathogens in dogs and cats and can be transmitted zoonotically to humans and cause disease. *C. jejuni* is reported to cause more than two million human intestinal infections annually (Centers for Disease Control and Prevention, 2010). Adult dogs and cats are often asymptomatic carriers of the organisms, but young (<6 months) or immunocompromised animals are most susceptible to disease.

Transmission: *Campylobacter* spp. are transmitted by the fecal–oral route. Most often the organism is acquired from contaminated food or water.

Clinical signs: When animals are clinically ill, symptoms typically include vomiting, anorexia, and mild to severe large-bowel diarrhea. Fever is rare in clinically ill animals. The majority of animals who culture positive are clinically normal.

Diagnosis: Presumptive diagnosis is often made by detecting the characteristic "seagull" shaped bacteria or curved motile bacteria on fecal cytology. However, there are many spirochetes in feces so culture is necessary for definitive diagnosis. Some *Campylobacter* spp. can be difficult to grow, and culture requires specialized transport media and culture techniques. The laboratory should be contacted for appropriate sample-handling methods. Since the organisms are frequently detected in healthy animals, culture should be reserved for animals showing evidence of clinical disease.

Treatment: The diarrhea is often self-limiting if the animal is in good health and only has minor clinical signs. However, animals with evidence of systemic illness require antibiotics and supportive care. The antibiotics tylosin or erythromycin is commonly administered for 5–7 days. Quinolones can also be effective. These protocols may also decrease the shedding of the organism in feces and thus the potential zoonotic risk.

Prevention: The organism is susceptible to heat, dryness, and most routine disinfectants; therefore, proper cleaning and biosecurity methods will reduce spread of the organism within shelters. Appropriate signage should be placed on the cage of an affected animal, and staff handling should be kept to a minimum. Staff should pay special attention to hand washing to prevent zoonotic spread of the organism.

Clostridium

Agent: Clostridial organisms are anaerobic, gram-positive, spore-forming, rod-shaped bacteria. *Clostridium perfringens* and *C. difficile* are the two most commonly isolated species that can cause GI disease in dogs and cats.

Transmission: *Clostridium* spp. can be isolated from normal dogs and cats. *C. perfringens* is part of the normal intestinal flora and can overgrow in certain conditions, leading to the production of enterotoxins and secondary GI disease. The environmentally resistant spores are transmitted by the fecal–oral route. A recent study showed evidence of transmission of *C. difficile* from humans to dogs. Dogs participating in animal-assisted therapy at human healthcare facilities were 2.4 times more likely to acquire *C. difficile* than were dogs participating in animal-assisted therapy at nonhealthcare facilities (Lefebvre *et al*., 2009).

Clinical signs: Diarrhea, which can be watery to hemorrhagic, vomiting, and anorexia are common clinical signs. Disease may recur throughout the life of some animals. Clinical disease is often seen in shelter animals secondary to stress and dietary change. *C. perfringens* may be responsible for the clinical signs of hemorrhagic gastroenteritis (HGE) in dogs.

Diagnosis: In the shelter, presumptive diagnosis of clostridial diarrhea is often made through presence of clinical signs and demonstration of the characteristic "safety pin" type spores on fecal or rectal cytology. However, since spores may be detected in both healthy and diseased animals, the predictive value of this finding is low. Most cases respond rapidly to therapy, so advanced diagnostics are usually not needed. In a recent study, RT-PCR results for *Clostridium* enterotoxin were statistically correlated with the presence of diarrhea in cats housed in an animal shelter (Gingrich *et al*., 2010).

Treatment: Clinical disease should be treated with parenteral fluids as needed and antibiotic therapy to prevent endotoxemia. Commonly used antibiotics include amoxicillin, metronidazole, and tylosin. A bland or high-fiber diet along with probiotics

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may also be beneficial to prevent further bacterial overgrowth.

Prevention: *Clostridium* spp. spores are very environmentally resistant; therefore, rigorous cleaning protocols should be in place to avoid nosocomial transmission. Reduction in stress may also aid in decreasing the occurrence of diarrhea in *Clostridium* spp. carriers. Biosecurity measures and hygiene principles should be stressed to shelter staff to limit possible zoonotic transmission.

Salmonellosis

Agent: *Salmonella* are nonspore-forming, gram-negative, zoonotic bacteria that have a broad host range including dogs and cats. Numerous serovars have been identified; however, *Salmonella enterica* subspecies *typhimiurium* is the organism that most frequently infects dogs and cats.

Transmission: *Salmonella* are spread through fecal–oral contact with contaminated food and water or via fomite transmission. The bacteria are able to survive in the environment for extended periods of time, which can contribute to environmental contamination. Disease can also be spread by contact with infected birds, reptiles, or rodents. *Salmonella* spp. are directly infectious to humans, and some strains can cause serious life-threatening disease.

Clinical signs: Disease may range from inapparent subclinical carriers to severe, potentially life-threatening disease. If signs are present, they typically include diarrhea, which can range from small to large bowel, vomiting, and fever. In cats, approximately 50% have fever without GI signs of disease (Tauni and Osterlund, 2000). In otherwise healthy animals, the disease is often self-limiting, but in young or stressed animals infection can lead to septicemia and death.

Diagnosis: The most common diagnostic test to detect *Salmonella* is culture of feces or blood. PCR can also be used to amplify *Salmonella* DNA from blood or feces, but does not provide antibiotic susceptibility testing which is important to know in potential shelter outbreaks. In addition, in a recent study, PCR assay results for *Salmonella* did not correlate with the presence of diarrhea (Gingrich *et al*., 2010). Animals who are not responding to empirical therapy for diarrhea, or those with systemic signs of bacteremia or sepsis should be cultured for *Salmonella*.

Treatment: Animals showing clinical signs of systemic disease and culture positive should be placed in isolation, treated with appropriate antibiotics, and provided with adequate supportive care. Appropriate signage should be placed on their cages, and staff handling should be kept to a minimum. Most small animal *Salmonella* isolates are susceptible to penicillins or quinolones. Treatment should be continued until clinical signs resolve. Most individual animals become low-level carriers of *Salmonella*, even once clinical signs resolve. Therefore, shelters need to evaluate the risk of treatment and isolation of affected animals. However, animals with normal stools are not generally health risks for humans.

Prevention: Prevention in a shelter environment can be accomplished though routine cleaning and disinfection, proper biosecurity measures, and removal of any potential reptile, rodent, or bird vectors. Animals should not be fed raw meat diets as these have been shown to lead to shedding of *Salmonella* (Lenz *et al*., 2009).

Protozoal Parasites

Cryptosporidium Species

Agent: *Cryptosporidium* spp. are coccidian parasites that replicate in the GI tract of many animals including dogs, cats, and humans. There are multiple species, but *C. felis* (cats) and C. canis (dogs) are most common in domestic animals (Bowman and Lucio-Forster, 2010). These species only rarely infect immunocompetent individuals. Most humans are infected with *C. hominus* which is not common in dogs or cats.

Transmission: *Cryptosporidium* spp. oocysts are sporulated when passed in feces and so are immediately infectious. Infection is via the fecal–oral route. In people, infection is thought to be most commonly from ingestion of oocysts in contaminated food or water.

Clinical signs: Most infected animals will show no clinical signs. When signs are present, small-bowel diarrhea is most common, especially in young, immunosuppressed, or coinfected animals. *Giardia* (dogs and cats) and *Tritrichomonas foetus* (cats) are common coinfections.

Diagnosis: *Cryptosporidium* spp. can be difficult to diagnose on fecal flotation due to the small and colorless oocysts that are usually only shed in small

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numbers. An acid fast stain on a thin rectal or fecal smear has greater sensitivity than fecal flotation alone. Human antigen tests do not reliably detect small animal *Cryptosporidium* spp. However, a commercially available fluorescent antibody assay for detection of *Cryptosporidium* oocysts and *Giardia* cysts in human feces detects both organisms in feces of dogs and cats. PCR assays are the most sensitive testing methods available, but are generally only used when additional sensitivity or genotyping are needed.

Treatment: More than 150 compounds have been studied for the treatment of cryptosporidiosis and none have been proven to consistently eliminate infection. Diarrhea can resolve spontaneously, and administration of several different drugs has seemingly lessened clinical signs in some infected dogs and cats. Tylosin, azithromycin, and ponazuril are used most frequently. Nitazoxanide is labeled for the treatment of humans with cryptosporidiosis or giardiasis and has been used in some dogs and cats.

Prevention: *Cryptosporidium* spp. oocysts are immediately infectious when passed in the feces, therefore strict adherence to routine cleaning and prompt removal of fecal material is imperative to decrease environmental contamination. Oocysts can withstand routine disinfectants. Steam cleaning can be used to rupture the oocysts.

Giardia Species

Agent: *Giardia* are binucleate, flagellated protozoans that can infect numerous animal species as well as humans. The organism has two forms: a motile trophozoite that lives in the small intestine, and an environmentally resistant cyst. *Giardia* is comprised of multiple genetic assemblages. Dogs and cats are most commonly infected with the host-adapted assemblages: C, D, and F. Thus, most infected dogs and cats are of minimal public health risk if there is no diarrhea and the owners are immunocompetent (Bowman *et al*., 2009).

Transmission: Infection occurs via the fecal–oral route after ingestion of the resistant cyst stage of the organism. The cyst can be found in the environment, where it survives under humid conditions, or on the fur of infected animals.

Clinical signs: Many infected animals appear normal but when clinical signs occur, they can range from self-limiting small-bowel diarrhea with mucus to weight loss as a result of severe malabsorptive small-bowel diarrhea. Young or otherwise immunocompromised animals or those with other coinfections are the most severely affected.

Diagnosis: The motile trophozoite stage can be directly visualized in fresh feces or mucus or feces/mucus mixed with one drop of saline or water, covered with a cover slip and examined microscopically at 100×. The cyst stage can be detected on microscopic examination of feces after a variety of fecal flotation techniques; centrifugation techniques give the highest sensitivity. A fluorescent antibody assay that simultaneously detects *Giardia* cysts and *Cryptosporidium* oocysts is also available. Multiple *Giardia* antigen tests for use with feces are available. In one study, when the kit labeled for use with dog and cat feces was combined with zinc sulfate centrifugation, sensitivity was 97.8% (Mekaru *et al*., 2007). PCR assays are available as well, but are less sensitive than the fluorescent antibody assay and so are generally recommended only if the genotype of *Giardia* is to be determined. However, it is important to remember that none of the results indicate *Giardia* is the cause of diarrhea because subclinical infection is common. For example, in one study in north central Colorado, *Giardia* spp. infection was detected in 10% of healthy dogs (Lappin, Clark and Scorza, 2008). Resolution of signs following administration of a drug with anti-*Giardia* activity is often used to obtain a presumptive diagnosis in the shelter setting. However, the drugs used to treat *Giardia* also affect other infectious agents.

Treatment: Metronidazole, fenbendazole, and febantel are the drugs most commonly prescribed to dogs or cats with *Giardia* infections (Zajac *et al*., 1998; Bowman *et al*., 2009). Addition of fiber to the diet and repeat treatment can be of benefit in some cases with resistant diarrhea. Animals with confirmed or suspected *Giardia* infections should have the perianal region clipped and bathed to reduce cyst burden on the fur and in turn prevent reinfection (Payne *et al*., 2002). As it is difficult to eradicate *Giardia* from the intestines and reinfection is common, the primary goal of treatment is to resolve diarrhea.

Prevention: In the shelter, prompt removal of fecal material, reduction of stress, isolation of clinically ill animals, and reduction of moisture/standing water may help lessen spread of disease within a population. The organism is readily killed in the

environment with quaternary ammonium disinfectants, so proper biosecurity protocols should prevent outbreaks from occurring. The previously available dog and cat *Giardia* vaccines have been discontinued by the manufacturers.

Isospora Species

Agent: *Isospora* spp. are coccidians that complete the sexual phase of the lifecycle in the intestines of dogs and cats, resulting in the passage of oocysts in feces. The agents are host-specific; dogs serve as the definitive hosts for *Isospora canis*, *I. ohioensis, I. neorivolta, and I. burrowsi*, and cats are the definitive hosts for *I. felis* and *I. rivolta*.

Transmission: Coccidiosis results from ingestion of sporulated oocysts from the environment or from consuming an infected intermediate host. Infection from direct contact is less common because oocysts require at least 12 hours to sporulate and become infectious.

Clinical signs: *Isospora* spp. infections can be clinically insignificant or cause very mild clinical signs (diarrhea) in older healthier animals. However, clinical signs of coccidiosis in young or immunocompromised animals can include mild to severe watery diarrhea that occasionally contains blood, abdominal pain, dehydration, vomiting, and general debilitation. Death can ensue in extreme cases, particularly in young animals.

Diagnosis: *Isospora* spp. infections are diagnosed by observing oocysts on microscopic examination of feces after flotation. Serial fecal flotations may be required to document oocysts in some animals but in general, oocysts are usually identified in feces of animals with clinical signs of disease. Since many animals can have subclinical infections with *Isospora* spp., detection of oocysts does not prove coccidiosis is the cause of the symptoms.

Treatment: The GI signs of coccidiosis are usually self-limiting and will resolve in healthy animals without therapy. However, in the shelter environment, if an animal is suffering from clinical signs of disease and *Isospora* oocysts are present, treatment may speed resolution of clinical signs and likely decrease shedding of oocysts into the environment. Sulfadimethoxine is an approved drug commonly used to treat coccidiosis. Other drug regimens have been used with some success, and these include trimethoprim-sulfa, ponazuril, and toltrazuril. Ponazuril and toltrazuril are coccidiocidal so they are superior to the other drugs for the treatment for coccidiosis (Lloyd and Smith, 2001).

Prevention: If shelters utilize proper isolation and cleaning protocols, including prompt removal of fecal material, *Isospora* should not cause much of a problem because of the time needed for oocysts to sporulate and become infective. Transport hosts like flies, cockroaches, dung beetles, and rodents must also be controlled to prevent disease spread. Oocysts can be very difficult to eradicate in the environment and can withstand routine disinfectants. Steam cleaning can be used to rupture the oocysts.

Toxoplasmosis

Agent: *Toxoplasma gondii* is a coccidian that is shed in the feces of cats, the definitive host. Infection of cats is common, with approximately 30% of clinically ill cats having serum antibodies (Vollaire, Radecki and Lappin, 2005). Most cats and dogs are subclinically infected. The most significant risk is to pregnant women, as the organism can cause severe birth defects if the first *T. gondii* infection occurs during pregnancy.

Transmission: On completion of the sexual phase of the life cycle, cats shed millions of unsporulated oocysts, which require 1–3 days to sporulate in the environment and become infective. Sporulated oocysts can survive for months. Infection occurs by ingestion of sporulated oocysts or by ingestion of the tissue phase of the organism in an intermediate host. Infection can also occur transplacentally and through lactation in cats.

Clinical signs: Most animals exposed to *T. gondii* develop subclinical infections. When fatal disease occurs, it is usually in immunosuppressed or young animals and often involves the liver and the central nervous and respiratory system. GI disease is uncommon. Fever, uveitis, and muscle disease occur in some dogs and cats.

Diagnosis: A presumptive diagnosis of toxoplasmosis is based on a combination of serum antibody testing and response to therapy. IgM titers are more indicative of a recent or active infection than IgG titers. Rising titers can also be used to document recent infection. PCR assays can be used to document microbial DNA in CSF and aqueous humor.

Treatment: Supportive care and antimicrobial therapy are used to treat clinical toxoplasmosis.

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Clindamycin is commonly prescribed; other drug choices include potentiated sulfa drugs or azithromycin. Pyrimethamine has been used historically but is commonly associated with serious side effects. Prognosis is poor if CNS disease, liver disease, or dyspnea from respiratory disease is present. Fever, uveitis, and muscle pain generally respond to therapy.

Prevention: It is impossible to prevent *T. gondii* from entering the shelter environment since the majority of cats show no clinical signs of infection. In addition, the organism can be transmitted to cats by ingestion of transport hosts like rodents. Emphasis should be placed on maintaining cleanliness in the shelter, and daily cleaning of litter boxes will prevent infective oocysts from accumulating. Oocysts can be very difficult to eradicate in the environment and can withstand routine disinfectants. Steam cleaning can be used to rupture the oocysts. Strict adherence to biosecurity and hygiene will prevent zoonotic transmission among staff members.

As cats only shed oocysts for short periods of time, healthy seropositive cats are not considered human health risks (Brown *et al*., 2003). It should be stressed that human infection is more likely to occur from consumption of undercooked meat or environments contaminated with sporulated oocysts than from direct contact with cats.

Tritrichomonas foetus

Agent: *Tritrichomonas foetus* is flagellate protozoa that can cause GI disease in cats and more rarely in puppies. The organism is genetically similar to the organism isolated from cattle (Gookin *et al*., 1999).

Transmission: There is no known environmental reservoir for the organism. Transmission occurs via direct contact with an infected cat or through ingestion of contaminated food or water.

Clinical signs: Subclinical infection with *T. foetus* can occur. Affected cats usually have severe large-bowel watery diarrhea. It is most common in young cats (<1 year) in crowded or stressful facilities; clinical disease seems overrepresented in pedigreed cats. The perianal region is often very red and swollen, and prolapses can occur. Coinfections, including *Giardia* and *Cryptosporidium,* can exacerbate clinical disease from *T. foetus*.

Diagnosis: As with *Giardia*, the *T. foetus* motile trophozoite stage can be directly visualized in fresh feces or mucus or feces/mucus mixed with one drop of saline or water, covered with a cover slip and examined microscopically at 100×. There is no cyst form of the organism, so diagnosis cannot be based on fecal flotation. The trophozoite has an undulating membrane, and the organism moves in a relatively straight-line motion in contrast to the "falling leaf" motion characteristic for *Giardia*. If the agents cannot be distinguished on wet mount examination, a *Giardia* antigen test can be performed immediately and if negative, *T. foetus* infection is likely. The organism can also be cultured using the InPouch culture media (BioMed Diagnostics, White City, OR) or amplified from feces by PCR. Both techniques are valid for confirming infection; PCR has the advantage of rapid return of results.

Treatment: Ronidazole is the treatment of choice for *T. foetus* infections (Gookin *et al*., 2006). This drug has neurotoxic side effects similar to those seen with metronidazole; therefore, this drug should be administered with caution and only if the diagnosis of *T. foetus* has been confirmed. The recommended dosage is currently 20 mg/kg, PO, q24h for 14 days because of potential side effects. Tinidazole was evaluated in one study but was less likely than ronidazole to lead to a parasitological cure. Other antibiotics such as metronidazole or enrofloxacin may improve clinical signs temporarily, but diarrhea usually recurs after treatment.

Prevention: Any cat suspected of being infected with *T. foetus* should be housed separately from other cats. Basic cleaning protocols and biosecurity measures will help to reduce fomite spread; however, reduction of overcrowding may be the most important prevention measure in the shelter.

Nematodes

Agent: There are multiple nematodes that can infect the GI tract of dogs and cats. Some of the more common agents (they are not always pathogens) are *Toxocara canis* (canine roundworm), *T. cati* (feline roundworm), *Toxascaris leonina* (feline roundworm), *Trichuris vulpis* (canine whipworm), *Ancylostoma caninum* (canine hookworm), and *A. tubaeforme* (feline hookworm).

Transmission: All nematodes can be transmitted via the fecal–oral route. Roundworms can also be transmitted transplacentally in dogs and through lactation in dogs and cats. Transplacental and

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lactation transmission can lead to severe clinical illness in puppies and kittens. Several of the nematodes can also be ingested by intermediate hosts, such as rodents, which can then transmit the nematode to cats and dogs if the tissues of the intermediate hosts are ingested.

Clinical signs: Clinical signs range from subclinical infection to profuse diarrhea. Diarrhea can be bloody if a heavy hookworm burden exists. With heavy parasite infection, animals may have a poor body condition. Puppies and kittens with roundworm infestations may have a typical pot-bellied appearance, and vomiting is common. Large-bowel diarrhea is most common with *T. vulpis*.

Diagnosis: Routine fecal flotation is used to detect nematode eggs in the feces. False negative results can occur but are most common with *T. vulpis,* which is an intermittent shedder. Diagnosis may also be made when adult worms are seen in the feces or vomit.

Treatment: Administration of appropriate anthelmintics is typically sufficient to control infection. Commonly used anthelmintics include pyrantel (not effective against *T. vulpis* when used alone), fenbendazole, febantel, and milbemycin. Animals with severe clinical signs of disease may need supportive care such as parenteral fluids to correct fluid deficits.

Prevention: Routine administration of broad-spectrum anthelmintics, such as pyrantel or fenbendazole, on admission to the shelter will aid in control of nematodes. All puppies and kittens, and ideally adult animals, should be treated routinely regardless of fecal results. Prompt removal of fecal material from kennels and common exercise areas will also aid in decreased spread of the parasites as time is required for larvation to occur. Strict rodent control measures should be in place to prevent intermediate hosts from gaining access to the shelter facilities.

RESPIRATORY DISEASES

Respiratory disease is a frustrating problem in many shelters. Mild disease and uncontrolled infections can lead to extended shelter stays for many animals and may result in euthanasia. Numerous factors including stress, overcrowding, and ineffective cleaning protocols can contribute to increased frequency of respiratory disease. This section will discuss the common infectious causes of respiratory disease in shelters and present preventive measures to aid in control of the disease.

Canine Viral Pathogens

Canine Adenovirus-2

Agent: Canine adenovirus-2 (CAV-2) is a DNA virus that is part of the canine infectious respiratory disease complex, CIRDC (also known as kennel cough). It is common in shelter settings where there is a high density of dogs. The virus probably plays a minor role in the overall pathogenesis of the disease "complex" when compared to the other agents.

Transmission: CAV-2 is spread through direct contact with infected dogs who shed virus in their secretions. The virus enters through mucosa and affects the respiratory tract.

Clinical signs: If CAV-2 is the only agent affecting the dog, signs are limited to tonsillitis or lung consolidation. However, if there are other contributing agents to the infection, the dog can develop other signs of CIRDC. CIRDC typically presents as a harsh, paroxysmal cough often associated with retching, which may or may not produce mucus. Most affected dogs are otherwise healthy. The coughing, which is easily elicited by tracheal palpation, is often described as a honking sound. Signs may progress to include a mucopurulent nasal or ocular discharge and fever. If left untreated, the disease may progress to pneumonia. At this stage it is often difficult to distinguish the disease from canine distemper or other causes of CIRDC.

Diagnosis: In the shelter, presumptive diagnosis of CIRDC is often based on history of recent exposure to other dogs with similar signs, evidence of the aforementioned respiratory signs, or response to empirical therapy. RT-PCR can be performed on nasal or pharyngeal swabs from affected dogs to detect CAV-2. However, a recent study revealed that CAV-2 was not frequently shed by previously vaccinated adult Beagles, but was shed by most puppies for 21 days after inoculation with an intranasal (IN) modified live vaccine (Lappin and Moroff, 2010). Thus, RT-PCR assay results may not always correlate with presence of disease.

Treatment: Antibiotic therapy is of little value for the viral infection. However, since CAV-2 infection often occurs in conjunction with bacterial causes of CIRDC, antibiotics are warranted and may

help to prevent progression to pneumonia. Appropriate antibiotics include doxycycline, amoxicillin-clavulanate, or fluoroquinolones. Antitussives may be beneficial for uncomplicated cases of kennel cough to aid in the healing of laryngeal tissue.

Prevention: All dogs should be vaccinated with a modified live DA2PP (distemper, CAV-2, parainfluenza, and parvo) vaccine on intake and in keeping with shelter medicine recommendations thereafter. Alternatively, CAV-2, along with canine parainfluenza virus and *Bordetella bronchiseptica*, can be administered via an intranasal (IN) vaccination. This vaccination can be used in combination with the parenteral DA2PP vaccination to decrease clinical signs associated with CIRDC (Paul *et al*., 2006). This route of administration may also prevent the spread of CAV-2. All dogs showing clinical signs of CIRDC should be isolated from other dogs, ideally in a separate room, to decrease disease spread. Daily monitoring of dogs for clinical signs will allow for their prompt removal from the general population.

Canine Distemper Virus

Please refer to discussion of CDV in the Gastrointestinal Disease section.

Canine Influenza Virus

Agent: Canine influenza virus is a RNA virus that mutated from the H3N8 equine influenza virus and was first identified in 2004 in racing Greyhounds in Florida (Crawford *et al*., 2005). Dogs are the only known susceptible host. Currently H3N8 virus infections have been identified in over half of the United States (Cornell University, 2011). All dogs without previous exposure are susceptible to infection.

Transmission: Aerosol transmission of respiratory secretions and direct contact are the most common transmission routes. Fomites are another route of transmission.

Clinical signs: When clinical signs are present it is possible that a majority of a shelter's canine population will be affected due to the novel nature of the virus; most dogs have no immunity. Most cases present with a moist, soft cough or a dry, honking cough which can last from 10–30 days. Mucopurulent nasal discharge may be present. It is possible for dogs to develop a severe form of the disease with a high fever (105°F; 40.5°C) and secondary hemorrhagic pneumonia. Disease onset is rapid, and death may occur as quickly as 4–8 hours from onset. Mortality is usually <1%, but may be as high as 5–8%.

Diagnosis: Infection can be confirmed though acute and convalescent serologic titers. However, this test cannot be used to confirm active infection in the short term as negative results are common during the acute phase of illness. RT-PCR performed on secretions collected on pharyngeal swabs, nasal swabs, or respiratory tissue can be used to attempt to amplify H3N8 virus. If positive, these results prove current infection. However, the test is most sensitive in recently exposed dogs and false negatives are common after the onset of clinical signs.

Treatment: The mild form is typically self-limiting. Cases with severe disease manifestations like pneumonia warrant fluid therapy with IV broad-spectrum antibiotics to combat secondary infections. Ideally, a bacterial culture should be performed to determine the most appropriate therapy for these cases. If this is not feasible, empirical treatment with broad-spectrum antimicrobials is effective in the majority of cases. Controlled data concerning the efficacy and safety of human antiviral treatments, such as oseltamivir (Tamiflu), is currently not available. The use of oseltamivir in animals is controversial due to the risk of development of resistant strains of the influenza virus. This drug is a primary line of defense in treatment of human influenza and should therefore be reserved for use in humans until controlled studies are performed in canines.

Prevention: The virus is easily killed by routine disinfectants, therefore proper cleaning of facilities in conjunction with measures to limit dog to dog contact will limit virus transmission. All dogs, especially new arrivals, should be monitored for evidence of upper respiratory disease and immediately isolated if signs are evident or if exposure has occurred. A canine H3N8 vaccine was released in 2009 and has received full licensure. In experimental studies, vaccine administration lessened clinical signs of disease, histopathologic lesions in lungs, and lessened viral shedding. However, vaccination does not prevent infection, so some viral shedding and clinical disease may occur (Deshpande *et al*., 2009). Maximal immunity does not develop until after a second dose of vaccine is administered 2–3 weeks later. Thus, shelters need to decide if the vaccine will be a beneficial addition to their vaccination protocol

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based on the turnover rate of their specific canine population.

Canine Parainfluenza Virus

Agent: Canine parainfluenza is a RNA virus that can induce clinical symptoms of CIRDC.

Transmission: Parainfluenza virus is spread through aerosolization, fomites (over a moderate distance), and direct contact with infected dogs.

Clinical signs: If the infection is only caused by parainfluenza, then signs will be limited to a dry hacking cough and serous nasal discharge. However, in the shelter setting, multiagent infections are more common, and clinical signs will vary. Please refer to the Canine Adenovirus-2 section for a full description of clinical signs.

Diagnosis: In the shelter, diagnosis is often based on history of recent exposure to other dogs with similar signs, evidence of the aforementioned respiratory signs, or response to empirical therapy. RT-PCR can be performed on nasal or pharyngeal swabs from affected dogs if a definitive diagnosis is needed, such as in the case of a disease outbreak. As for CAV-2, administration of IN modified live vaccine products can result in positive RT-PCR assay results.

Treatment: Please refer to the Canine Adenovirus-2 section.

Prevention: All dogs should be vaccinated with a modified live DA2PP on intake and thereafter should follow shelter guidelines. This vaccine will help prevent the spread of parainfluenza. IN vaccines containing parainfluenza and *Bordetella* are available and recommended for dogs entering the shelter. The IN vaccine confers immunity within 2–3 days. Any dogs showing clinical signs of kennel cough should be isolated from the rest of the canine population, ideally in a separate room, to prevent spread. Daily monitoring of dogs for clinical signs will allow for their prompt removal from the general population.

Canine Respiratory Coronavirus

Agent: Canine respiratory coronavirus (CRCoV) is an RNA virus that is genetically distinct from canine enteric coronavirus. It has been isolated from dogs showing clinical signs of CIRDC (Erles and Brownlie, 2008).

Transmission: The virus is spread through aerosolization, fomites, and direct contact with infected dogs.

Clinical signs: CRCoV causes an acute respiratory infection and is part of the complex of agents which are associated with CIRDC. It can cause clinical signs alone or in combination with any of the other canine respiratory pathogens (Erles and Brownlie, 2005). The majority of clinically affected dogs will show evidence of mild disease consisting of coughing, sneezing, and nasal discharge. Disease may progress to pneumonia in a small number of cases, especially if a coinfection is present (Ellis *et al*., 2005).

Diagnosis: In the shelter, presumptive diagnosis of CIRDC is often based on a history of recent exposure to other dogs with similar signs, evidence of the aforementioned respiratory signs, or response to empirical therapy. However, diagnosis of CRCoV cannot be based on clinical signs alone. RT-PCR can be performed on nasal or pharyngeal swabs from affected dogs to detect CRCoV. It is currently unknown how many healthy dogs harbor CRCoV, so the positive predictive value of RT-PCR assay results is unknown.

Treatment: Antibiotic therapy is of no value for the viral infection. However, since CRCoV infection may occur in conjunction with bacterial causes of CIRDC, antibiotics are warranted and may help to prevent progression to pneumonia. Appropriate antibiotics include doxycycline, amoxicillin-clavulanate, or fluoroquinolones. Antitussives may be beneficial for uncomplicated cases of kennel cough to aid in the healing of laryngeal tissue.

Prevention: Currently, there is no vaccine to prevent CRCoV infection or to reduce the severity or duration of the clinical signs of disease. Since CRCoV is antigenically distinct from the enteric coronavirus, vaccines for the enteric coronavirus are not effective (Erles *et al*., 2003). All dogs showing clinical signs of CIRDC should be isolated from other dogs, ideally in a separate room, to prevent spread. Daily monitoring of dogs for clinical signs will allow for their prompt removal from the general population.

Feline Calicivirus

Agent: Feline caliciviruses are RNA viruses that primarily infect cats. Recently, a strain was isolated from a puppy, suggesting interspecies transmission, but it is currently unknown whether these viruses are significant in dogs (Di Martino *et al*., 2009). There is

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a high degree of mutagenesis of this virus, which has contributed to the emergence of new strains (Ossiboff *et al*., 2007). These mutated strains can cause severe clinical signs (Hurley *et al*., 2004).

Transmission: FCV is highly contagious and moderately environmentally stable. FCV is spread via direct contact with actively infected cats, carrier cats, fomites (including hair), or droplet (<5 feet). Most cats can shed the virus for more than 30 days post recovery, and some cats will shed it for life (carrier state). In cats housed in shelters, FCV infection rates increased from 11% to 15% in 1 week, which was lower than the infection rate increases for feline herpesvirus 1 (FHV-1) and enteric coronaviruses (Pedersen *et al*., 2004).

Clinical signs: Generally, FCV causes either no clinical signs or the combination of findings consistent with rhinitis and stomatitis. In shelter outbreaks of feline upper respiratory infection (URI), FCV and FHV-1 are often detected in conjunction. Acute disease is the most common manifestation, but signs can also be chronic and intermittent. Findings generally include a serous to mucopurulent nasal discharge, conjunctivitis (less common than for FHV-1), and oral lesions consisting of chronic stomatitis, erosions, and ulcerations. Ulceration is the most characteristic finding and can occur in the oral cavity, around the nose and claws, and rarely on the skin. Occasionally, FCV is also associated with mild interstitial pneumonia or polyarthritis, so other signs may include fever, lethargy, stiffness or lameness (due to polyarthritis), and anorexia (most likely due to the oral ulcerations). Young, immunosuppressed, or otherwise "stressed" (i.e., caged, crowded) cats are most likely to show clinical signs. These factors may also predispose carriers of the disease to have a recurrence of clinical signs. In recent years, there have been several reports of a highly pathogenic strain of feline calicivirus, termed virulent systemic calicivirus (VS-FCV) (Hurley *et al*., 2004). Affected cats develop facial and limb edema secondary to vasculitis, fever, and dyspnea. These cats often die acutely, and mortality has been documented in cats previously vaccinated for FCV.

Diagnosis: Multiple diagnostic procedures, including virus isolation, RT-PCR, and serology, are available for diagnosis of FCV but have poor positive predictive values because of the high carriage rate in normal cats. Recently, it was shown that RNA from modified live vaccine strains can be amplified from nasal and pharyngeal swabs of healthy cats, further making interpretation of diagnostic tests difficult (Ruch-Gallie *et al*., 2011).

Frequently in the shelter setting, a causative agent is not identified in individual cases of URI. Multiple agents may be present and cause overlapping clinical signs. Suspicion of FCV infection is increased when oral ulceration or limping is present. Diagnostics, including virus isolation and PCR, should be performed if there are unusual signs, severity, or frequency of disease in the feline population, or if individual cats are not responding to appropriate therapy. A presumptive diagnosis of VS-FCV can be made through a positive RT-PCR in combination with appropriate clinical signs for which other causes have been ruled out (Pesavento *et al*., 2004). However, definitive diagnosis requires identification of FCV and appropriate histopathological lesions.

Treatment: Feline calicivirus-associated URI is generally self-limiting, and the mainstay of treatment is good nursing/supportive care. This includes regular removal of any nasal or ocular discharges and/or application of an antibiotic eye ointment, offering soft food with a strong smell to encourage eating, and providing analgesics if pain from ulceration is preventing eating. Other forms of supportive care could include humidification to help break up the nasal secretions, short-term decongestants, and/or antihistamines. Reduction of stress will also aid in decreasing the incidence of URI. Stress from multiple sources in the shelter setting is one of the greatest risk factors for severe respiratory (and other) disease outbreaks. Stress reduction can be accomplished through spot cleaning of cat cages, providing hiding spaces, reducing noise, maintaining routine schedules, and minimizing handling.

Prevention: All cats should be vaccinated on intake with a modified live vaccine containing FHV and calicivirus (Richards *et al*., 2006). Revaccination of kittens is recommended every 2–3 weeks until they reach 18–20 weeks of age. There are several commercially available subcutaneous (SQ) and intranasal (IN) vaccines that are appropriate. A vaccine containing VS-FCV is available; however, there are still many unknowns, including the duration of immunity and whether the vaccine cross-protects among virulent systemic strains on challenge (AAFP, 2007). The vaccine is inactivated;

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it is unknown whether one dose of vaccine will provide protection during the time cats are housed in an animal shelter. Recently, it was shown that serum from cats vaccinated with vaccines containing two FCV strains cross-neutralize more strains than cat serum from cats vaccinated with one FCV strain (Poulet *et al*., 2008; Huang *et al*., 2010). The virus is not easily destroyed and can survive for several weeks in the environment. Of the disinfectants commonly used by shelters, FCV can be inactivated by bleach or potassium peroxymonosulfate (Trifectant®, Vétoquinol USA, Fort Worth, TX). Strict cleaning and biosecurity protocols should be in place to prevent spread and environmental contamination. This includes washing hands between handling of each cat and treating any cats under treatment in isolation last. As discussed, perhaps one of the most important aspects of prevention of FCV-associated URI is reduction of stress.

Feline Herpes Virus-1

Agent: FHV-1 is a DNA virus that only infects cats.

Transmission: The virus is shed in secretions (oral, nasal, and ocular) and is primarily transmitted among cats via direct contact. In the shelter setting, another important route of transmission is contact with contaminated fomites. Many cats are chronic carriers of FHV-1; in one recent study of shelter cats, FHV-1 DNA was amplified from conjunctival swabs of 37.7% of cats with conjunctivitis and 30% of healthy cats (Zirofsky *et al*., 2010). Acutely infected cats or those with FHV-1 infection reactivated by stress tend to shed the largest numbers of FHV-1 virions and thus likely are the biggest source of transmission within the shelter.

Clinical signs: FHV-1 is associated primarily with ocular and upper respiratory disease and is thought to be the most common cause of feline URI. Classic clinical signs include depression, sneezing, conjunctivitis, and serous to mucopurulent nasal and ocular discharge. Because of the mucopurulent quality of this discharge, crusting of the nose and eyelids can occur. FHV-1 is also commonly associated with ulcerative and interstitial keratitis, corneal sequestration, caudal stomatitis, and dermatitis (usually facial).

Diagnosis: FHV-1 shedding can be detected by virus isolation or PCR assay in nasal and oropharyngeal swabs 24 hours after infection and can persist at high levels for 1–3 weeks. Subclinically infected cats can become negative for FHV-1 in ocular and respiratory secretions, but the virus is generally maintained in a latent state in the trigeminal ganglion which is thought to be the source of reactivated infection during stress. FHV-1 infection can be documented by direct fluorescent staining of conjunctival scrapings, virus isolation, or PCR. FHV-1 DNA can be amplified from conjunctiva, nasal discharges, and from the pharynx of healthy cats, so the positive predictive value of PCR assays is low. Currently used PCR assays also detect vaccine strains of FHV-1, further lessening the positive predictive value of the assays (Maggs and Clarke, 2005). In one study, the presence of FHV-1 DNA failed to correlate to the presence or absence of stomatitis in cats (Quimby *et al*., 2008). Quantitative PCR may ultimately prove to correlate to the presence or absence of disease; however, it failed to correlate to the presence of chronic conjunctivitis in one study (Low *et al*., 2007). The negative predictive value of FHV-1 PCR assays is also in question because many cats who are likely to have FHV-1-associated disease are negative. This may relate to the clearance of FHV-1 DNA from tissues by a hypersensitivity reaction. Tissue biopsies have greater sensitivity than conjunctival swabs, but do not necessarily have greater predictive value. In summary, detection of FHV-1 by any technique does not prove a disease association, and failure to detect FHV-1 does not exclude diagnosis. Thus, it may make more fiscal sense to make a tentative diagnosis and treat appropriately rather than perform expensive diagnostic procedures.

Treatment: In a recent study of cats housed in an animal shelter who had evidence of conjunctivitis, sneezing, and nasal discharge, responses to the topical anti-FHV-1 drug cidofovir or oxytetracycline were similar, and responses could not be predicted using PCR assay results (Zirofsky *et al*., 2010). Thus, treatment of clinically ill cats suspected to have FHV-1 infections should focus on supportive care and controlling secondary bacterial infections. This includes regular cleaning and removal of any nasal or ocular discharges and/or application of an antibiotic eye ointment as needed. Other forms of supportive care include humidification to help break up the nasal secretions, short-term decongestants, and/or antihistamines. Shelter staff should be trained to avoid fomite-associated transmission

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after administration of treatments to cats with URI. There are no antiviral drugs currently licensed for the treatment of FHV-1 infections. If treatment of severe ocular disease is indicated, cidofovir can be administered twice daily and does not cause local irritation (Fontenelle *et al*., 2008). If a systemic antiviral drug is indicated, famciclovir is currently believed to have the most activity against FHV-1 with minimal side effects (Malik *et al*., 2009). If lysine is to be administered as a treatment for active FHV-1 infection, it should be administered as a dose, not mixed with food.

Prevention: All cats should be vaccinated on intake with a modified live vaccine containing FHV-1 and calicivirus (Richards *et al*., 2006) and kittens revaccinated at 2–3-week intervals until they reach 18–20 weeks of age. There are several commercially available SQ and IN vaccines that are appropriate. These vaccines will aid in preventing disease, but do *not* prevent infection or carrier state development. Administration of one of the IN vaccines was shown to lessen clinical signs of FHV-1 on challenge as early as 4 days after a single dose (Lappin *et al*., 2006).

L-lysine supplementation has been used in cats in an attempt to decrease the incidence and lessen the clinical signs of URI in the shelter setting. L-lysine works by competing with arginine, which is essential for herpesvirus replication. However, several recent studies have indicated that L-lysine supplementation is not effective in reducing the incidence of URI, but actually correlated with an increase in the severity of clinical signs when administered to cats (Rees and Lubinski, 2008; Drazenovich *et al*., 2009). FHV-1 is relatively susceptible to most disinfectants and can only survive up to 18 hours in the environment. Prudent cleaning and disinfection protocols will help to prevent dissemination of the virus in the shelter environment. This includes washing hands after handling each cat and treating any cats in isolation last.

Perhaps one of the most important aspects of prevention is reduction of stress. Stress, from multiple sources in the shelter setting, is one of the greatest risk factor for severe respiratory (and other) disease outbreaks. FHV-1 is activated by stress, therefore stress reduction is critical to controlling URI in the shelter. This can be accomplished through spot cleaning of cat cages, providing hiding spaces, and minimizing handling.

Primary Bacterial Pathogens

Bordetella bronchiseptica

Agent: *Bordetella* is an aerobic, gram-negative coccobacillus. The bacterium is part of the CIRDC and has been established as a primary pathogen in cats.

Transmission: The organism is shed in oronasal secretions; therefore, the primary route of infection is via the oronasal cavity. Transmission may occur between dogs and cats. Cats may serve as a carrier. Puppies and kittens are most susceptible (Egberink *et al*., 2009).

Clinical signs: In dogs, signs include those typical of CIRDC. Please refer to the Canine Adenovirus-2 section for a full description. Most cats are subclinical carriers, but when disease occurs, upper respiratory tract signs include sneezing, oculonasal discharge, and coughing. Coughing is less marked in cats than in dogs. Just as with dogs, the URI can lead to pneumonia and result in severe dyspnea, cyanosis, and death (Egberink *et al*., 2009).

Diagnosis: Oropharyngeal or nasal swabs and transtracheal wash specimens can be used to isolate the bacteria. PCR assays can also be used to amplify *B. bronchiseptica* DNA. Culture is superior to PCR assay results as antimicrobial susceptibility testing is included and can be used to direct therapy if an outbreak is occurring. As for other causes of feline URI or canine CIRDC, positive test results for *B. bronchiseptica* do not prove the illness is induced by the agent.

Treatment: Bordetellosis is best treated with antibiotics in both cats and dogs. Appropriate antibiotics include doxycycline, trimethoprim-sulfamethoxazole, and fluoroquinolones. Supportive care is essential; cats in particular should be encouraged to eat. In some severe cases in dogs and cats, nebulization may be necessary.

Prevention: Both parenteral and IN vaccines are available for *Bordetella*. However, IN vaccines containing *Bordetella* are recommended for dogs entering the shelter due to the shorter onset of immunity which can be obtained with only a single vaccination (Paul *et al*., 2006). One IN vaccine is available for cats and is recommended only if there is evidence of clinical *Bordetella* infection in the feline population (Richards *et al*., 2006). The IN vaccine confers immunity within 2–3 days for both species. It is important to note that mild respiratory signs may

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be evident after vaccination and that PCR will detect vaccine strains. Any animals showing clinical signs of upper respiratory disease should be isolated from the rest of the population, ideally in a separate room, to prevent spread. Daily monitoring of animals for clinical signs will allow for their prompt removal from the general population.

Chlamydophila felis

Agent: *Chlamydophila felis,* formerly known as *Chlamydia psittaci,* is an obligate, gram-negative, intracellular bacterium. It is primarily a cause of conjunctivitis in cats housed in catteries. Infection was rare in a recent study of cats housed in a shelter (Zirofsky *et al*., 2010). *C. felis* is also suspected as one of the causative agents of feline URI. However, *C. felis* DNA was rarely amplified by PCR from respiratory secretions of cats housed in shelters (Spindel *et al*., 2008; Veir *et al*., 2008). Young kittens (<6 months) are at the greatest risk of developing lower respiratory disease but this seems to be rare. There have been rare reports of conjunctivitis in humans that may have been associated with *C. felis*.

Transmission: Aerosol spread or direct contact with infected cats or fomites is the most common form of transmission. It is possible for a kitten to become infected at birth if the infection has colonized the genital tract of the queen.

Clinical signs: Infection is indistinguishable from other causes of URI by clinical signs alone. Affected cats typically have conjunctivitis, which can be unilateral or bilateral with serous to mucopurulent discharge. Fever and signs of rhinitis may occur but are likely rare in cats housed in shelters. Progression to lower respiratory infection and pneumonia are uncommon.

Diagnosis: Evaluation of conjunctival swabs occasionally shows intracytoplasmic inclusion bodies in neutrophils. Conjunctival swabs or nasal discharges can also be used for fluorescent antibody staining, culture isolates, or PCR.

Treatment: Ophthalmic ointments containing tetracycline or chloramphenicol are usually effective for treating and clearing conjunctivitis. Secondary *Chlamydophila* URIs can be treated with oral doxycycline (suspension) or chloramphenicol. Clavamox® has been used as well but is thought to be inferior to doxycycline (Sturgess *et al*., 2001). Oral antibiotics should be administered for 3 weeks in conjunction with antibiotic eye ointment. Some animals will continue to have clinical signs despite treatment, but this may be due to recurrence of the infection.

Prevention: Routine disinfection and routine biosecurity measures as discussed for other URI associated agents should help control the bacteria in the shelter setting. Special attention should be paid to medicating affected cats because fomites can easily spread the organism between cats. Cats showing evidence of URI should be isolated from other cats, or if they cannot be moved to a separate ward, cages of affected cats should be cleaned and disinfected after those of apparently healthy cats.

Mycoplasma

Agent: *Mycoplasma* spp. are cell-wall-deficient bacteria that occasionally are associated with clinical illness in dogs and cats. Some species are nonpathogenic and occur as commensals on mucous membranes of the upper respiratory tract and genital tract. Dogs and cats are commonly colonized with *Mycoplasma* spp. which makes interpretation of diagnostic tests difficult. There have been a number of *Mycoplasma* spp. isolated from clinically ill dogs or cats but *Mycoplasma cynos* is one of the most common pathogens in dogs, and *M. felis* is one of the most common pathogens in cats.

Transmission: The route of *Mycoplasma* spp. transmission is most frequently by aerosol, but can occur via direct contact.

Clinical signs: Most dogs and cats are subclinically infected. When clinical illness occurs, rhinitis and conjunctivitis occur most frequently, particularly in cats. *Mycoplasma* spp. have been isolated from the lower airways of dogs and cats with bronchitis or pneumonia, but whether they were primary pathogens versus opportunistic organisms is unknown (Chandler and Lappin, 2002). In a recent controlled study in an animal shelter, *Mycoplasma* spp. were associated with conjunctivitis more frequently than FHV-1 (Zirofsky *et al*., 2010). Infection with *Mycoplasma* spp. alone may cause few clinical signs; they are frequently chronic and low grade. However, in combination with other bacteria and viruses, severe disease may result. Stress is often a predisposing factor to developing infections. *Mycoplasma* spp. have also been associated with polyarthritis in cats and dogs and reproductive problems

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in dogs, but neither problem has been recognized as significant in shelter animals.

Diagnosis: Diagnosis of *Mycoplasma* spp. requires the use of transport media and special culture media. Most bacteriology laboratories are not capable of performing *Mycoplasma* spp. susceptibility testing. *Mycoplasma* spp. DNA can easily be amplified by PCR, but this technique is expensive, and positive results do not differentiate carrier animals from diseased animals. Thus, shelter veterinarians should keep *Mycoplasma* on the differential list for dogs and cats with respiratory disease and conjunctivitis and use drugs with anti-*Mycoplasma* activity if indicated.

Treatment: Recommended systemic antibiotics include doxycycline, clindamycin, chloramphenicol, amoxicillin-clavulanate, and quinolones. Oxytetracycline applied topically to the eyes can be effective for cats with *Mycoplasma* spp.-associated conjunctivitis. Treatment should be administered for up to 3 weeks, as response is often slower than for other bacteria. Supportive care should be used as discussed for other agents associated with URI.

Prevention: *Mycoplasma* spp. are readily killed by routine disinfectants; therefore, good sanitation protocols should be effective in controlling the bacteria in the environment. Isolating animals showing evidence of respiratory disease and reducing stress as discussed for other agents associated with URI will help to reduce the incidence in the shelter setting.

INTEGUMENTARY INFECTIONS

Sarcoptic Mange

Agent: Sarcoptic mange is caused by the mite *Sarcoptes scabei*. This highly contagious disease typically affects dogs, but can also infect cats, rabbits, and humans.

Transmission: Transmission occurs via direct contact, fomites, or through a contaminated environment.

Clinical signs: Infection leads to severe pruritus in affected animals. The typical distribution of lesions is ventral abdomen, ears, and elbows. Scratching can become so severe that animals cause self-trauma and bleeding, and develop secondary bacterial or fungal infections. Animals with severe cases of sarcoptic mange can become very debilitated if left untreated.

Diagnosis: Diagnosis can be made through a routine skin scrape. However, false negatives are very common even in animals who are heavily infested; therefore, multiple skin scrapes are recommended to increase sensitivity. Clinical signs and response to treatment are often used to make a presumptive diagnosis in the shelter setting.

Treatment: There are several treatment options available. If animals are extremely pruritic, prednisone (0.5–1 mg/kg PO daily) can be provided to improve comfort. Selamectin and fipronil spray are both labeled for treatment of scabies. Other effective whole body treatments include weekly lime-sulfur dips and amitraz every 2 weeks. Amitraz must be used with caution due to the risk from exposure to handlers. It should only be used in areas with excellent ventilation. Ivermectin is another frequently used treatment in the shelter environment. This is an off-label use, but has been found to be very effective at 0.2–0.4 PO mg/kg every 2 weeks (Curtis, 2004).

Prevention: Immediate treatment of infected animals and isolation from other shelter animals will help to reduce spread. The mite can live off the host but routine cleaning will remove it from the environment.

Demodectic Mange

Agent: Demodectic mange is caused by the mite *Demodex canis* in dogs or *D. gatoi* in cats. The mite typically causes generalized disease in immunocompromised animals, but can produce localized lesions in young animals without a fully developed immune system.

Transmission: Transmission can occur via fomites in the environment. However, most dogs carry a small number of the mites on them normally, and it is the lack of immune response which allows the mites to proliferate.

Clinical signs: Clinically affected animals may have localized or generalized lesions. Localized lesions are small patches of nonpruritic alopecia, typically occurring around the eyes or on limbs. The generalized form leads to large patches of alopecia (hair loss) that may be complicated by secondary bacterial infections. In long-standing infections, the skin may be thickened and scabbed in appearance.

Diagnosis: Diagnosis can be made through a deep-skin scrape. However, false negatives are common since the mites live deep in the hair follicle. Therefore, clinical signs and response to treatment are often used to make a presumptive diagnosis.

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Treatment: Demodicosis often requires prolonged treatment, up to 4 months and longer, and in some cases complete remission is never achieved. Generalized demodicosis in dogs can be treated with weekly amitraz dips, daily ivermectin (0.4 mg/kg PO), daily moxidectin (0.4 mg/kg PO), or daily milbemycin (0.5–2 mg/kg PO). Concurrent administration of antimicrobial therapy is often necessary due to deep pyoderma which can accompany generalized demodicosis (Mueller, 2004). Stress reduction may play an important role in improving chances for a cure. Demodicosis in cats can be treated with weekly lime-sulfur dips; however, if this is not an option, weekly fipronil spray can be used (Mueller, 2004; Newbury and Moriello, 2006).

Prevention: There is little that can be done to prevent demodectic mange. Since it is a disease primarily of immunocompromised animals, it is important to focus on maintaining the health of the animals in the shelter and minimizing stress. Routine cleaning will prevent the mite from remaining in the environment.

Dermatophytosis

Agent: There are several fungal organisms that cause infections in animals. The ones that most commonly cause disease in small animals include *Microsporum canis* and *M. gypseum*. These organisms can be carried on animals or found in the soil. The spores are highly resistant to destruction and can survive for over a year in the environment.

Transmission: Fungal spores can be transmitted most commonly via direct contact, or via fomites. Airborne transmission, including through ventilation systems, is possible but may be of less significance than was previously believed (Moriello and Newbury, 2009). Spores can be carried for long distances via fomites. Cats and especially kittens in shelters are more commonly affected than dogs. *M. canis* is zoonotic.

Clinical signs: Infection typically causes an area of alopecia with crusting. The lesions are often circular in shape, leading to the name ringworm. Lesions are typically found on the face, ears, feet, and tail. Severe infections may be generalized and resemble demodectic mange.

Diagnosis: Accurate diagnosis of ringworm can be difficult. A Woods lamp can be used to screen for bright-green fluorescence of suspect lesions caused by *M. canis*. However, only approximately 60% will fluoresce, so false negatives are common. Fungal culture is a more reliable method for detecting fungal organisms. However, a culture must be held for 2 weeks before determining it is negative. Microscopic examination of the culture growth is advised for confirmation of the diagnosis.

Treatment: Given time, many animals with mild lesions may recover without treatment, especially if placed in a stress-free environment. However, the decision of when and if to treat in the shelter environment is highly debated due to the high risk to the shelter animals and staff. Lime-sulfur dip is an effective and inexpensive treatment which appears to be well tolerated by animals. Several other topical products have been used, but have not been shown to be as effective as lime sulfur (Moriello and Newbury, 2009). Systemic antifungals can also be used in combination with lime-sulfur dips to treat and aid in decreasing the course of infection. Itraconazole can be administered at 5–10 mg/kg PO daily. It has been used extensively in shelters and has been effective when used in combination with lime-sulfur dips. Fluconazole has not been used as extensively as itraconazole; however, treatment with 10 mg/kg PO daily showed resolution of infection (Moriello and Newbury, 2009). Terbinafine has also been found to be effective at a dose of 20mg/kg once daily. Griseofulvin is another antifungal effective against dermatophytes; however, it has a narrow margin of safety and requires a longer course of therapy than itraconazole (Moriello and DeBoer, 1995). Ketaconazole is also available for treatment of dermatophytosis; however, there are some strains of *M. canis* that have shown resistance. The drug has a narrow therapeutic margin of safety in cats and therefore it should be reserved for use in dogs with dermatophytosis (Moriello and Newbury, 2009). Bleach should not be used to treat animals.

Prevention: Routine monitoring of all animals, especially at the time of intake, for suspicious lesions will allow for immediate isolation from the rest of the shelter population. Shelters must have appropriate isolation facilities if ringworm cases are to be treated appropriately. These facilities need to be easy to disinfect. While airborne transmission is a potential risk, it is of minimal significance when proper cleaning and disinfection occur on a regular basis (Moriello and Newbury, 2009). A disinfectant that is

capable of destroying fungal spores should be used, such as a 1:10 bleach dilution.

Fleas

Agent: *Ctenocephalides felis* and *Ctenocephalides canis* are the most common fleas that infest cats and dogs. Both species have higher infestation rates in regions that have a warm, humid environment, but fleas can be found year round even in climates with a distinct winter season.

Transmission: Dogs and cats acquire fleas from other infected animals or from infested environments. Fleas also bite humans and can cause skin irritation and transmit disease.

Clinical signs: Flea allergy dermatitis is the most common sequela to flea infestation and is caused by an allergy to flea saliva. It leads to alopecia and severe pruritus in susceptible animals. Typical signs include alopecia and erythema (reddening of the skin) around the tail-head (commonly known as "hot spots") and on the ventral abdomen. In animals not severely affected by flea allergy dermatitis, generalized pruritus may be the only sign. Kittens and puppies can develop blood loss anemia when heavily infested, particularly if hookworms are present concurrently. Some dogs and cats will develop clinical signs of disease from infectious agents vectored by *C. felis*. Examples include *Bartonella henselae*, the feline hemoplasmas, *Rickettsia felis*, and *Dipylidium caninum*. Fever (*B. henselae*, feline haemoplasmas, *R. felis*), uveitis (*B. henselae*), cardiac murmurs (*B. henselae*; dogs or cats), pale mucous membranes (feline haemoplasmas), and tapeworm proglottids around the anus (*D. caninum*; dogs or cats) are primary disease manifestations.

Diagnosis: Fleas or flea dirt (flea excrement that appears as small dark specks) can easily be identified on infested animals. In animals with severe flea-bite hypersensitivity, fleas may not be evident as it only requires a few flea bites to trigger the allergy.

Treatment: There are multiple choices of topical flea-control products available including fipronil, selamectin, permethrin (not to be used on cats), lufenuron, and milbemycin. Many of these products are produced in combination with other anthelmintics, and the shelter should determine which product will be the most beneficial and cost effective for their population. Nitenpyram (Capstar™) can be given orally to treat fleas also. Animals with severe infestations may benefit from a topical shampoo to help remove and kill the insects immediately; antibiotics and steroids may be needed to aid in control and healing of allergies and secondary infections.

Prevention: It is impossible to completely eliminate fleas from the local outdoor environment because they can live while off the host's body, they lay their eggs in the environment, and will be maintained in wildlife species and by domestic pets not treated with preventive products. In the shelter, it is best to focus on routine cleaning to decrease any infestation. Many of the adulticide and insect growth-regulator flea-control products used for treatment are also designed to prevent further infestation of the animal receiving treatment; this in turn will aid in preventing infestation of the shelter environment.

Ticks

Agent: There are several species of ticks that can attach to animals. The species will vary by geographical location. Distribution of the main species that feed on dogs and cats and infectious agents they potentially vector are listed in Table 18.2.

Transmission: Dogs and cats acquire ticks from tick-infested environments.

Clinical signs: Ticks can produce a local infection at the site of attachment and may predispose the area to infection. More importantly, ticks are able to transmit a variety of different, potentially zoonotic infectious agents after they have attached. These include *Borrelia burdorferi* (Lyme disease), *Erlichia canis*, *E. ewingii*, *Anaplasma phagocytophilum*, *A. platys*, *Babesia canis*, and *Rickettsia rickettsii* (Rocky Mountain Spotted Fever). Each of these agents has been associated with disease in dogs, and most also can cause illness in cats. The American College of Veterinary Internal Medicine (ACVIM) Consensus Statements on *Ehrichia* spp. and *B. burgdorferi* provide further information on these agents (Neer *et al.*, 2002). Fever, lethargy, depression, and/or anorexia are common clinical signs of disease with most tick-vectored diseases. Animals with severe tick infestations may be anemic from chronic blood loss. Occasionally, lower motor neuron disease from tick paralysis occurs.

Diagnosis: When present, ticks are usually readily visible; however, it is important to also check

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Table 18.2. Tick-borne disease agents.

Agent	Small animal host	Primary vector	Geographic distribution (United States)
Anaplasma phagocytophilum	Dog and cat	*Ixodes* spp.	Northeast, Upper Midwest and West
Anaplasma platys	Dog	*Rhipicephalus sanguineus*	Southeast
Borrelia burdorferi	Dog	*Ixodes* spp.	Northeast, Upper Midwest and West
Erlichia canis	Dog and cat	*Rhipicephalus sanguineus*	Southeast and Southwest
Erlichia ewingii	Dog	*Amblyomma americanum*	South and Lower Midwest
Rickettsia rickettsii	Dog and cat	*Dermacentor* spp. *Amblyomma americanum* *Rhipicephalus sanguineus*	Southeast

between the toes and in the ears to locate them. The nymph stage of *B. burdorferi* is the smallest and can be missed during physical examination. If an animal is heavily infested with ticks and is showing evidence of clinical disease, the appropriate tests for tick-borne diseases prevalent in the geographic location should be performed.

Treatment: Any visible ticks should be removed immediately to lessen the chance of disease transmission. Tick removal can be easily accomplished by grasping the tick with forceps at the site of attachment and gently pulling to remove the entire tick, including the head, from the animal. There are several choices of topical tick-control products available. Many of these products are produced in combination with other anthelmintics, and the shelter should determine which product will be the most beneficial for their population. It is important to make sure that species-appropriate products are used.

Prevention: It is impossible to completely eliminate ticks from the outside environment because they will be maintained by domestic pets not treated with preventive products and in wildlife species. In the shelter, it is best to focus on routine cleaning to decrease any infestation.

Ear Mites

Agent: *Otodectes cynotis* is the mite responsible for infestations commonly seen in young kittens and cats. Dogs are susceptible to the mite as well, but infestations occur much less frequently than in cats.

Transmission: The mites are transmitted by direct contact or mutual grooming between affected animals. Fomites may potentially transmit ear mites in the shelter setting.

Clinical signs: Infestation results in a typical dark brown, crusty debris evident in the external ear canal. Affected animals are usually pruritic and will shake their heads and scratch at their ears and surrounding skin, sometimes causing severe self-trauma and bleeding. In severely affected animals, the local inflammation caused by the infestation can predispose animals to otitis media.

Diagnosis: Clinical signs often lead to a presumptive diagnosis. The mites can often be seen directly on visual or otoscopic exam or through microscopic examination of the debris in the ear canal.

Treatment: Removal of ear mite debris will allow for more effective treatment. This can be accomplished by instilling a small amount of mineral oil into the ear canal prior to cleaning the ear. There are several preparations labeled to treat ear mites. These products contain ivermectin (Acarexx®), milbemycin (Milbemite® Otic), selamectin (Revolution®), or pyrethrin (Eradimite®; Mitaclear®; Otomite Plus®) products. These products should be applied according to label instructions and animals treated until the infestation has been cleared.

Prevention: There is no way to prevent ear mites since they are ubiquitous in the environment. In the

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shelter, it is important to identify affected animals and institute treatment as soon as possible to provide relief and prevent further infection.

RETROVIRUSES

Feline Immunodeficiency Virus

Agent: Feline immunodeficiency virus (FIV) is an enveloped RNA virus that infects only members of the family Felidae (Levy *et al*., 2008). It is closely related to human immunodeficiency virus (HIV), but is not zoonotic. The infection is most common in intact male cats who have access to the outdoors because these cats are more likely to come into contact with and fight with other cats.

Transmission: The virus is transmitted primarily through bites. Transmission can also occur in utero, through lactation, or during breeding.

Clinical signs: There are no specific clinical signs for FIV. However, fever is common in the primary phase of infection. Over time, FIV infection can lead to immunosuppression; at that time, weight loss is common and the clinical signs of disease often reflect the secondary infections which are present.

Diagnosis: The screening test used most frequently for FIV is the ELISA, which detects antibodies to the virus. False positives can occur; therefore, a Western blot is recommended to confirm positive results, particularly in cats with no clinical signs of disease (Levy *et al*., 2008). In addition, administration of the commercially available FIV vaccine in the United States induces antibodies that are indistinguishable from those induced by natural exposure. Maternal antibodies can obscure the results in kittens; however, kittens should be tested as soon as possible to prevent an infected kitten from serving as a source of infection to other cats. A negative result in the vast majority of kittens of any age can be used to declare the kitten free from FIV infection. PCR assay results can be used to attempt to differentiate FIV-vaccinated cats from FIV-infected cats, but the assays are expensive and sometimes falsely negative in FIV-infected cats.

Treatment: There is no specific treatment for FIV. Many cats with FIV may live for several years before developing secondary infections. If FIV cats are housed in the shelter, treatment should be aimed at the clinical signs of the secondary infections which may develop. Interferon therapy improves clinical signs of disease in some FIV-infected cats (de Mari *et al*., 2004; Pedretti *et al*., 2006).

Prevention: There is no way to prevent FIV from entering the shelter. Testing and removal or isolation of positive cats will reduce the frequency of the disease over time. If FIV-positive cats are housed in the shelter, the cats should be housed in individual cages that are clearly marked as FIV positive, and should not be housed near sick cats or kittens. It is important for shelters to consider that FIV-infected cats are more susceptible to other opportunistic infections and therefore may serve to increase the load of other infectious organisms in the shelter environment by increased shedding. There is an FIV vaccine available; however, it is unknown whether the vaccine protects against all FIV clades, and its routine use as a core vaccine is not recommended in the shelter.

Feline Leukemia Virus

Agent: Feline leukemia virus (FeLV) is a retrovirus that infects members of the family Felidae (Levy *et al*., 2008). There are multiple potential outcomes after exposure to FeLV which have been reviewed elsewhere (Levy *et al*., 2008). Progressive infection frequently is associated with neoplasia or development of immunodeficiency and resultant secondary infections.

Transmission: FeLV is shed in many body fluids, with the highest levels found in saliva. Therefore, the most common mode of transmission is through nose-to-nose contact, mutual grooming, and shared food and water bowls or litter boxes. The virus can also be transmitted through bites. FeLV can also be transmitted across the placenta and through lactation. It takes large amounts of virus to infect an adult cat, so usually prolonged close contact is necessary for transmission. There appears to be age-acquired resistance to infection; adult cats are generally more difficult to infect with FeLV than kittens.

Clinical signs: Some cats exposed to FeLV will have regressive infection or abortive exposure and clear the virus from the blood (Levy *et al*., 2008). If progressive infection occurs, it may take months to years to develop clinical manifestations of infection. Several different syndromes can develop, but the most common are leukemia and general immunosuppression. Consequently, many cats develop

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secondary infections. Focal infections in bone marrow and other tissues are thought to rarely occur.

The primary screening test for FeLV infections in healthy or ill cats is an ELISA test that detects p27 antigen. Depending on the kit used, blood or serum can be tested; however, saliva or tears should not be used as these tests are subject to errors (Levy *et al*., 2008). Using serum will reduce the possibility of obtaining a false positive test. Immunofluorescence assay (IFA) can be used to document FeLV antigens in circulating cells and can be used to confirm persistent viremia as most positive cats do not revert to negative in the future. The IFA is usually not used as a screening test as false negative results are more common than with the ELISA.

Treatment: There is no specific treatment for FeLV-infected cats. However, interferon therapy could be considered (de Mari *et al*., 2004). Stress and exposure to sick animals should be avoided; therefore, the shelter environment may not be ideal for these cats. Clinically ill FeLV cats will need to be treated according to the presenting signs of disease, and consideration should be made concerning likely opportunistic infections. Supportive care such as fluids, good nutrition, and antibiotics for secondary infections are essential.

Prevention: In order to prevent the transmission of FeLV, positive cats must be identified and removed from the general population. If FeLV-positive cats are to be housed in a shelter environment, several precautions should be taken: (1) cats should be housed in individual cages or with other healthy FeLV-positive animals and not allowed access to general cat areas; (2) they should be housed away from cats who are more likely to be shedding infectious disease; (3) strict cleaning protocols need to be in place to prevent spread of the virus, which fortunately does not survive long in the environment and is readily killed by most disinfectants.

There are multiple FeLV vaccines; however, vaccination is not recommended for use in the shelter setting since indoor cats are at low risk for contracting the disease (Richards *et al*., 2006). The decision of whether to vaccinate should be left to adopters and their veterinarians.

ZOONOSES

Zoonotic diseases are those which can be transmitted from animals to humans. There are numerous infectious agents that can be classified as zoonotic, and many of these are likely to be encountered at a higher frequency in the shelter setting than in private practice. This is due to the high turnover of animals in the shelter and the characteristics of the population of animals that enter the shelter: e.g., stray animals who may have been roaming and were therefore more likely to acquire diseases.

The shelter has a responsibility to protect the staff and volunteers working in the shelter, as well as the public, from zoonotic diseases that may originate in the shelter. Developing appropriate education for staff and volunteers will help to ensure that individuals understand what clinical signs to be aware of and what biosecurity measures need to be in place when dealing with a zoonotic disease. This includes emphasizing the importance of frequent hand washing and providing the necessary equipment to protect personnel from injury. There are several websites which offer fact sheets on various zoonotic diseases; these include the Centers for Disease Control and Prevention ((CDC) www.cdc.gov), the Iowa State Center for Food Security and Public Health (www.cfsph.iastate.edu), and the UC Davis Koret Shelter Medicine Program (www.sheltermedicine.org).

If a disease poses a risk to people, the shelter is obligated to take measures to protect both the public and staff, and to inform adopters of these risks. It is important to consider the impact zoonotic diseases can have on the public. First, many of these diseases can have severe health consequences that can lead to hospitalization or, in the case of rabies, even death. Second, there are several diseases which may pose little risk in the shelter environment, but if they are introduced into the home of an immunocompromised person, they can result in significant illness. Shelter staff should be prepared to discuss health-related issues with potential adopters in order to prevent zoonotic disease from entering the home environment, and advise them to consult with their physicians regarding personal health concerns. Lastly, it is important to realize the negative impact zoonoses can have on a shelter. If an adopted animal transmits disease, the shelter can suffer financial responsibility and negative publicity, neither of which shelters can afford. Therefore, it is imperative that shelters make sure adopters are aware of the risk of zoonotic disease relative to the animal they are adopting.

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Table 18.3 describes common zoonotic diseases that may be encountered in shelters. However, there are two diseases of specific concern which will be discussed in greater detail. Both rabies and Bartonella can have significant impact on public health and therefore warrant more discussion.

Rabies

Agent: Rabies is caused by an RNA virus of the rhabdovirus family. All warm-blooded animals are susceptible to infection.

Transmission: The virus is transmitted when it is introduced into bite wounds, open cuts, or onto mucous membranes. While human infections in the United States are extremely rare, the World Health Organization reports that 55,000 people die annually of rabies worldwide. Rabies in the United States is maintained in the wildlife population by genetic variants, most commonly in skunks, raccoons, and bats, with the epidemiology varying by geographic region.

The canine variant was eradicated from the United States in 2008; however, it is important to note that canines can still be infected with all other variants of the rabies virus and can transmit these to humans (Blanton *et al*., 2010).

Clinical signs: Infected animals may exhibit a wide range of clinical signs, although neurologic signs resulting in behavior changes are the hallmark clinical signs noted. These behavior changes are often described as the furious form—unusual aggression displayed by the animal, or the dumb form—unusual withdrawn or almost stuporous behavior. Cats are more likely to display the furious form. However, other less obvious clinical signs may also be observed. Animals may exhibit extreme pruritus at the site of the bite, and dogs may exhibit excessive salivation and pica. Early in the course of the disease, affected animals may have a moderate fever or decreased appetite, vague clinical signs which may be easily missed in a shelter environment.

Diagnosis: There is no reliable antemortem test for the diagnosis of rabies. If there is a concern of possible rabies infection, the animal should be euthanized by trained personnel and the head of the animal submitted to the appropriate laboratory for testing.

Shelters often become involved in rabies management when they quarantine animals who have bitten humans. Complete guidelines and regulations regarding rabies are available from the CDC in a regularly updated *Compendium of Animal Rabies Prevention and Control* (Brown *et al*., 2011), but briefly, any dog, cat, or ferret who bites a human should be confined and observed for a 10-day period. If an animal is shedding rabies virus at the time of the bite, he or she should show clinical signs of the disease within 10 days. If any signs suggestive of rabies develop during this time, the animal should be euthanized, and the head submitted for rabies testing. Shelters should be familiar with the local municipality's specific rabies laws and should initiate communication prior to dealing with rabies cases. Shelters are encouraged to contact the local public health department in regards to postexposure management any time there is a potential human rabies exposure.

Treatment: The management of domestic animals exposed to potentially rabid animals differs considerably from management of animals who have bitten humans. If dogs, cats, or ferrets are exposed to a potentially rabid animal, the current CDC *Compendium* has recommendations based on the animal's vaccination status (Brown *et al*., 2011). If the animal is unvaccinated, immediate euthanasia and submission of the animal's head is recommended. If this is not acceptable to the owner, the animal must be placed in isolation for 6 months. Currently vaccinated animals must be immediately revaccinated and kept under the owner's control and observed for 45 days. In either case, if signs suggestive of rabies develop during the isolation or confinement, the animal should be euthanized and the head submitted for testing.

Prevention: The most effective method for preventing rabies infection is to ensure that all pets are kept up-to-date on rabies vaccination. All cats, dogs, and ferrets should be vaccinated against rabies as mandated by local ordinances. It is also important that shelter staff are taught proper safe animal handling techniques to prevent bites and scratches that could expose them to the virus. All shelters should have clear protocols for dealing with animal bites to ensure staff receive proper treatment in the event of a potential rabies exposure.

Bartonella

Agent: *Bartonella* are gram-negative rods that live in red blood cells and are transmitted between animals via arthropod vectors. There are several species

Table 18.3. Zoonotic agents of concern in the shelter environment.

Zoonotic disease and agent	Species and route of transmission	Clinical signs in humans
Bartonellosis (Cat scratch disease) *Bartonella henselae*	Cat Bite, scratch, flea bite	Mild to severe skin rash at site of bite, lymphadenopathy, fever
Brucellosis *Brucella canis* bacteria	Dog Direct contact, ingestion, (or inhalation) of aborted materials, blood, urine	Flu-like signs, cyclic fever, arthritis; Chronic signs: neurological, endocarditis
Campylobacteriosis *Campylobacter* spp. bacteria	Dog, cat Ingestion of bacteria	Diarrhea, nausea, vomiting, abdominal pain, muscle pain
Leptospirosis *Leptospira* spp.—several serovars	Dog Via urine-direct contact, ingestion, inhalation	Biphasic illness—fever, headache, chills; jaundice, meningitis, acute renal failure, abortion
Plague *Yersinia pestis* bacteria	Cats Direct contact, inhalation of respiratory secretions, fleas	Flu-like signs, enlarged lymph nodes (buboes), rapid-onset pneumonia, respiratory failure, shock, death
Rabies Rhabdovirus	All warm-blooded mammals Direct contact (bite or scratch)	Headache, fever, abnormal behavior, paresis or paralysis, difficulty swallowing, delirium, convulsions, death
Ringworm Dermatophytosis *Microsporum canis* fungus most commonly	Cats most often Direct contact	Raised, inflamed, pruritic, circular lesion with central clearing; thick, discolored nails, hair loss at affected site
Roundworms Visceral or ocular larval migrans (ascarids) *Toxocara canis*, *Toxocara cati*	Dogs and cats Ingestion of soil contaminated with ascarid eggs	Ocular larval migrans leading to blindness, especially in young children; visceral larval migrans—fever, cough, hepatomegaly, pneumonia, vomiting, weakness
Salmonellosis Several serotypes of *Salmonella* bacteria	Dogs, cats, reptiles Contact with infected animal, environment, or fomites	Abdominal pain, fever, diarrhea, nausea, septicemia, meningitis
Scabies (mange) *Sarcoptes scabeii* mite	Direct contact with infected dog, environment, or fomites	Severe pruritis on arms, chest, abdomen, thighs; thin, red streaks in the skin at site of infection
Toxoplasmosis *Toxoplasma gondii* protozoa	Cats Ingestion of sporulated larva	Flu-like signs, fetal death, congenital abnormalities (hydrocephaly, microcephaly)

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of *Bartonella* that can infect animals, but the two species of specific public health concern are *B. henselae* and *B. clarridgeiae*. These two species can cause so-called cat scratch disease, bacillary angiomatosis, relapsing fever, and meningitis in people (Brunt *et al*., 2006).

Transmission: The cat is the reservoir for both species. Humans are infected by a cat bite or scratch or when bitten by a cat flea. The young, elderly, and immunocompromised are at greatest risk for infection.

Clinical signs: Infected cats often show few clinical signs and can be infected for months to years. When clinical signs are observed, they typically consist of a self-limiting fever of 24–48 hours duration and lymphadenopathy. Young cats under 1 year of age appear to be at highest risk for infection. Seroprevalence is typically higher in geographic regions with warmer climates and higher humidity levels that are conducive to survival of the arthropod vectors (Breitschwerdt and Greene, 1998).

Diagnosis: Infection in cats can be diagnosed with blood culture or PCR; however, specialized techniques are required to obtain a positive culture and these techniques are only offered by a limited number of laboratories. Serology can indicate animals who have been previously exposed, but does not indicate active infection.

Treatment: Infection in cats can be difficult to clear. Several antibiotics have been recommended for treatment, but none have been proven 100% effective at clearing the infection. Since cats do not usually show signs of infection, the main justification for treatment has been to prevent infection in humans. This may promote antimicrobial resistance; therefore, the use of antibiotics to treat infection should be reserved for those situations where the cat is housed with a high-risk individual, and infection in the cat has been documented. Use of flea control should also be implemented in these cases.

Prevention: Prevention consists of minimizing bite and scratch wounds and diligent use of flea-control products. In addition, careful adoption counseling is an important aspect of preventing infection in people. Adopters should be counseled on preventive measures to decrease the risk of infection. *Healthy Pets, Healthy People* is a CDC publication that provides information that would be useful in counseling those adopters at increased risk of infection for *Bartonella*, or any zoonotic disease, due to a compromised immune system (Centers for Disease Control and Prevention, 2007). Individuals with health concerns should always be advised to discuss specific concerns with their personal physicians.

CONCLUSION

Infectious diseases can have devastating consequences on individual animals and entire shelter populations if not handled appropriately. It is important for shelters to develop an overall health management plan which outlines protocols to prevent and treat diseases which may affect the animal and potentially human populations. With careful planning, shelters can prevent animal suffering and unnecessary waste of resources and save more lives.

REFERENCES

AAFP (American Association of Feline Practitioners) (2007) *Information Brief: In Response to Questions Concerning Virulent Systemic Calicivirus Infections (VS-FCV)*, http://catvets.com/professionals/guidelines/feline_friendly/index.aspx?ID=286 (accessed December 12, 2011).

Blanton, J.D., Palmer, D., Christian, K.A. *et al*. (2010) Rabies surveillance in the United States during 2009. *Journal of the American Veterinary Medical Association*, **237**, 646–657.

Bowman, D.D., Liotta, J.L., Ulrich, M. *et al*. (2009) Treatment of naturally occurring, asymptomatic *Giardia sp*. in dogs with Drontal Plus flavour tablets. *Parasitology Research*, **105**, S125–S134.

Bowman, D.D. and Lucio-Forster, A. (2010) Cryptosporidiosis and giardiasis in dogs and cats: Veterinary and public health importance. *Experimental Parasitology*, **124**, 121–127.

Breitschwerdt, E. and Greene, C. (1998) Bartonellosis, in *Infectious Diseases of the Dog and Cat*, 2nd edn (ed C. Greene), W.B. Saunders, New York City.

Brown, C.M., Conti, L., Ettestad, P. *et al*. (2011) *Compendium of Animal Rabies Prevention and Control*, National Association of State Public Health Veterinarians, Inc., http://www.nasphv.org/Documents/RabiesCompendium.pdf.

Brown, R.R., Elston, T.H., Evans, L. *et al*. (2003) Feline zoonoses guidelines from the American Association of Feline Practitioners. *Compendium on Continuing Education for the Practicing Veterinarian*, **25**, 936–965.

Brunt, J., Guptill, L., Kordick, D.L. *et al*. (2006) Association of Feline Practitioners 2006 panel report on

diagnosis, treatment, and prevention of *Bartonella* spp. infections. *Journal of Feline Medicine and Surgery*, **8**, 213–226.

Can-Sahna, K., Soydal Ataseven, V., Pinar, D. *et al*. (2007) The detection of feline coronaviruses in blood samples from cats by mRNA RT-PCR. *Journal of Feline Medicine and Surgery*, **9**, 369–372.

Centers for Disease Control and Prevention, National Center for Infectious Diseases (2007) *Healthy Pets, Healthy People*, http://www.cdc.gov/healthypets/ (accessed December 12, 2011).

Centers for Disease Control and Prevention, National Center for Infectious Diseases (2010) *Campylobacter*, www.cdc.gov/DiseasesConditions (accessed December 11, 2011).

Chandler, J.C. and Lappin, M.R. (2002) Mycoplasmal respiratory infections in small animals: 17 cases (1988–1999). *Journal of the American Animal Hospital Association*, **38**, 111–119.

Cornell University (2011) Canine influenza virus, http://ahdc.vet.cornell.edu/news/civ.cfm (accessed December 12, 2011).

Crawford, P.C., Dubovi, E.J., Castleman, W.L. *et al*. (2005) Transmission of equine influenza virus to dogs. *Science*, **310**, 482–485.

Curtis, C.F. (2004) Current trends in treatment of *Sarcoptes, Cheyletiella*, and *Otodectes* mite infestations in dogs and cats. *Veterinary Dermatology*, **16**, 108–114.

Decaro, N., Buonavoglia, D., Desario, C. *et al*. (2010) Characterisation of canine parvovirus strains isolated from cats with feline panleukopenia. *Research in Veterinary Science*, **89**, 275–278.

de Mari, K., Maynard, L., Sanquer, A. *et al*. (2004) Therapeutic effects of recombinant feline interferon-omega on feline leukemia virus (FeLV)-infected and FeLV/feline immunodeficiency virus (FIV)-coinfected symptomatic cats. *Journal of Veterinary Internal Medicine*, **18**, 477–482.

Deshpande, M.S., Jirjis, F.F., Tubbs, A.L. *et al*. (2009) Evaluation of the efficacy of a canine influenza virus (H3N8) vaccine in dogs following experimental challenge. *Veterinary Therapeutics*, **10**, 103–112.

Di Martino, B., Di Rocco, C., Ceci, C. *et al*. (2009) Characterization of a strain of feline calicivirus isolated from a dog faecal sample. *Veterinary Microbiology*, **139**, 52–57.

Drazenovich, T.L., Fascetti, A.J., Westermeyer, H.D. *et al*. (2009) Effects of dietary lysine supplementation on upper respiratory and ocular disease and detection of infectious organisms in cats within an animal shelter. *American Journal of Veterinary Research*, **70**, 1391–1400.

Egberink, H., Addie, D., Belák, S. *et al*. (2009) *Bordetella bronchiseptica* infection in cats. ABCD guidelines on prevention and management. *Journal of Feline Medicine and Surgery*, **11**, 610–614.

Ellis, J.A., McLean, N., Hupaelo, R. *et al*. (2005) Detection of coronavirus in cases of tracheobronchitis in dogs: A retrospective study from 1971 to 2003. *Canadian Veterinary Journal*, **46**, 447–448.

Erles, K., Toomey, C., Brooks, H.W. *et al*. (2003) Detection of a group 2 coronavirus in dogs with canine infectious respiratory disease. *Virology*, **310**, 216–223.

Erles, K. and Brownlie, J. (2005) Investigation into the causes of canine infectious respiratory disease: antibody responses to canine respiratory coronavirus and canine herpesvirus in two kenneled dog populations. *Archives of Virology*, **150**, 1493–1504.

Erles, K. and Brownlie, J. (2008) Canine respiratory coronavirus: An emerging pathogen in the canine infectious respiratory disease complex. *Veterinary Clinics of North America Small Animal Practice*, **38**, 815–825, viii.

Fontenelle, J.P., Powell, C.C., Veir, J.K. *et al*. (2008) Effect of topical ophthalmic application of cidofovir on experimentally induced primary ocular feline herpesvirus-1 infection in cats. *American Journal of Veterinary Research*, **69**, 289–293.

Gingrich, E.N., Scorza, A.V., Leutenegger, C.M. *et al*. (2010) Prevalence of common enteric pathogens in cats before and after placement in an animal shelter. Poster presented at ACVIM Conference, Anaheim, California.

Gookin, J.L., Breitschwerdt, E.B., Ley, M.G. *et al*. (1999) Diarrhea associated with trichomonosis in cats. *Journal of the American Veterinary Medical Association*, **215**, 1450–1454.

Gookin, J.L., Copple, C.N., Papich, M.G. *et al*. (2006) Efficacy of ronidazole for treatment of feline *Tritrichomonas foetus* infection. *Journal of Veterinary Internal Medicine*, **20**, 536–543.

Greene, C. and Appel, M. (1998) Canine distemper, in *Infectious Diseases of the Dog and Cat*, 2nd edn (ed C. Greene), Saunders, Philadelphia, Pennsylvania, pp. 9–22.

Hartmann, K., Binder, C., Hirschberger, J. *et al*. (2003) Comparison of different tests to diagnose feline infectious peritonitis. *Journal of Veterinary Internal Medicine*, **17**, 781–790.

Huang, C., Hess, J., Gill, M. *et al*. (2010) A dual-strain feline calicivirus vaccine stimulates broader cross-neutralization antibodies than a single-strain vaccine and lessens clinical signs in vaccinated cats when challenged with a homologous feline

VetBooks.ir

calicivirus strain associated with virulent systemic disease. *Journal of Feline Medicine and Surgery*, **12**, 129–137.

Hurley, K.E., Pesavento, P.A., Pedersen, N.C. *et al*. (2004) An outbreak of virulent systemic feline calicivirus disease. *Journal of the American Veterinary Medical Association*, **224**, 241–249.

Ishida, T., Shibanai, A., Tanaka, S. *et al*. (2004) Use of recombinant feline interferon and glucocorticoid in the treatment of feline infectious peritonitis. *Journal of Feline Medicine and Surgery*, **6**, 107–109.

Kapil, S., Cooper, E., Lamm, C. *et al*. (2007) Canine parvovirus types 2c and 2b circulating in North American dogs in 2006 and 2007. *Journal of Clinical Microbiology*, **45**, 4044–4047.

Lappin, M.R., Clark, M. and Scorza, A.V. (2008) Treatment of healthy *Giardia* spp. positive dogs with fenbendazole or nitazoxanide. Poster presented at the ACVIM Conference, San Antonio, Texas.

Lappin, M.R., Moroff, S. (2010) Effect of vaccination on results of real time PCR assays for Adenovirus 2, Parainfluenza, and *Bordetella bronchiseptica* in Puppies. American College of Veterinary Internal Medicine Annual Forum, Denver CO, June 16, 2011 (poster).

Lappin, M.R., Sebring, R.W., Porter, M. *et al*. (2006) Effects of a single dose of an intranasal feline herpesvirus 1, calicivirus, and panleukopenia vaccine on clinical signs and virus shedding after challenge with virulent feline herpesvirus 1. *Journal of Feline Medicine and Surgery*, **8**, 158–163.

Larson, L.J. and Schultz, R.D. (2006) Effect of vaccination with recombinant canine distemper virus vaccine immediately before exposure under shelter-like conditions. *Veterinary Therapeutics*, **7**, 113–118.

Larson, L.J. and Schultz, R.D. (2008) Do two current canine parvovirus type 2 and 2b vaccines provide protection against the new type 2c variants? *Veterinary Therapeutics*, **9**, 94–101.

Larson, L.J., Newbury, S. and Schultz, R.D. (2009) Canine and feline vaccinations and immunology, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K. Hurley), Wiley-Blackwell, Ames, Iowa, pp. 61–82.

Larson, L.J., Quesada, M., Mukhtar, E. *et al*. (2008) *Evaluation of a CPV-2 Fecal Parvovirus ELISA (SNAP Fecal Parvo Test ®) From Idexx Laboratories (Abstract 113b)*. Conference for Research Workers in Animal Diseases, Chicago, Illinois, p. 112.

Lefebvre, S.L., Reid-Smith, R.J., Waltner-Toews, D. *et al*. (2009) Incidence of acquisition of methicillin-resistant *Staphylococcus aureus, Clostridium difficile*, and other health-care-associated pathogens by dogs that participate in animal-assisted interventions. *Journal of the American Veterinary Medical Association*, **234**, 1404–1417.

Lenz, J., Joffe, D., Kauffman, M. *et al*. (2009) Perceptions, practices, and consequences associated with food borne pathogens and the feeding of raw meat to dogs. *Canadian Veterinary Journal*, **50**, 637–643.

Levy, J., Crawford, C., Hartmann, K. *et al*. (2008) American Association of Feline Practitioners' feline retrovirus management guidelines. *Journal of Feline Medicine and Surgery*, **10**, 300–316.

Lloyd, S. and Smith, J. (2001) Activity of toltrazuril and diclazuril against *Isospora* species in kittens and puppies. *Veterinary Record*, **148**, 509–511.

Low, H.C., Powell, C.C., Veir, J.K. *et al*. (2007) Prevalence of feline herpesvirus 1, *Chlamydophila felis*, and *Mycoplasma* spp DNA in conjunctival cells collected from cats with and without conjunctivitis. *American Journal of Veterinary Research*, **68**, 643–648.

Maggs, D.J. and Clarke, H.E. (2005) Relative sensitivity of polymerase chain reaction assays used for detection of feline herpesvirus type 1 DNA in clinical samples and commercial vaccines. *American Journal of Veterinary Research*, **66**, 1550–1555.

Malik, R., Lessels, N.S., Webb, S. *et al*. (2009) Treatment of feline herpesvirus-1 associated disease in cats with famciclovir and related drugs. *Journal of Feline Medicine and Surgery*, **11**, 40–48.

Mekaru, S.R., Marks, S.L., Felley, A.J. *et al*. (2007) Comparison of direct immunofluorescence, immunoassays, and fecal flotation for detection of *Cryptosporidium* spp. and *Giardia* spp. in naturally exposed cats in 4 Northern California animal shelters. *Journal of Veterinary Internal Medicine*, **21**, 959–965.

Moriello, K.A. and DeBoer, D.J. (1995) Efficacy of griseofulvin and itraconazole in the treatment of experimentally induced dermatophytosis in cats. *Journal of the American Veterinary Medical Association*, **207**, 439–444.

Moriello, K.A. and Newbury, S. (2009) Dermatophytosis, in *Infectious Disease Management in Animal Shelters*, 1st edn (eds L. Miller and K. Hurley), Wiley-Blackwell, Ames, Iowa, pp. 243–273.

Mueller, R.S. (2004) Treatment protocols for demodicosis: An evidence based review. *Veterinary Dermatology*, **15**, 75–89.

Neer, T.M., Breitschwerdt, E.B., Greene, R.T. *et al*. (2002) Consensus statement on ehrlichial disease of small animals from the infectious disease study

VetBooks.ir

group of the ACVIM. *Journal of Veterinary Internal Medicine*, **16**, 309–315.

Newbury, S. and Moriello, K.A. (2006) Skin diseases of animals in shelters: Triage strategy and treatment recommendations for common diseases. *Veterinary Clinics of North America Small Animal Practice*, **36**, 59–88.

Ossiboff, R.J., Sheh, A., Shotton, J. *et al*. (2007) Feline caliciviruses (FCVs) isolated from cats with virulent systemic disease possess in vitro phenotypes distinct from those of other FCV isolates. *Journal of General Virology*, **88**, 506–517.

Patterson, E.V., Reese, M.J., Tucker, S. *et al*. (2007) Effect of vaccination on parvovirus antigen testing in kittens. *Journal of the American Veterinary Medical Association*, **230**, 359–363.

Paul, M.A., Carmichael, L.E., Childers, H. *et al*. (2006) American Animal Hospital Association (AAHA) Canine Vaccine Task Force. *Journal of the American Animal Hospital Association*, **42**, 80–89.

Payne, P.A., Ridley, R.K., Dryden, M.W. *et al*. (2002) Efficacy of a combination febantel-praziquantel-pyrantel product, with or without vaccination with a commercial *Giardia* vaccine, for treatment of dogs with naturally occurring giardiasis. *Journal of the American Veterinary Medical Association*, **220**, 330–333.

Pedersen, N.C., Sato, R., Foley, J.E. *et al*. (2004) Common virus infections in cats, before and after being placed in shelters, with emphasis on feline enteric coronavirus. *Journal of Feline Medicine and Surgery*. **6**, 83–88.

Pedretti, E., Passeri, B., Isola, P. *et al*. (2006) Low-dose interferon-alpha treatment for feline immunodeficiency virus infection. *Veterinary Immunology and Immunopathology*, **109**, 245.

Pesavento, P.A., MacLachlan, N.J., Dillard-Telm, L. *et al*. (2004) Pathologic, immunohistochemical, and electron microscopic findings in naturally occurring virulent systemic feline calicivirus infection in cats. *Veterinary Pathology*, **41**, 257–263.

Poulet, H., Jas, D., Lemeter, C. *et al*. (2008) Efficacy of a bivalent inactivated non-adjuvanted feline calicivirus vaccine: Relation between in vitro cross-neutralization and heterologous protection in vivo. *Vaccine*, **26**, 3647–3654.

Quimby, J.M., Elston, T., Hawley, J. *et al*. (2008) Evaluation of the association of *Bartonella* species, feline herpesvirus 1, feline calicivirus, feline leukemia virus and feline immunodeficiency virus with chronic feline gingivostomatitis. *Journal of Feline Medicine & Surgery*, **10**, 66–72.

Rees, T.M. and Lubinski, J.L. (2008) Oral supplementation with L-lysine did not prevent upper respiratory infection in a shelter population of cats. *Journal of Feline Medicine and Surgery*, **10**, 510–513.

Richards, J.R., Elston, T.H., Ford, R.B. *et al*. (2006) The 2006 American Association of Feline Practitioners Feline Vaccine Advisory Panel Report. *Journal of the American Veterinary Medical Association*, **229**, 1405–1441.

Ritz, S. and Egberink, H. (2007) Effect of feline interferon-omega on the survival time and quality of life of cats with feline infectious peritonitis. *Journal of Veterinary Internal Medicine*, **21**, 1193–1197.

Ruch-Gallie, R.A., Veir, J.K., Hawley, J.R., Lappin, M.R. (2011) Results of molecular diagnostic assays targeting feline herpesvirus-1 and feline calicivirus in adult cats administered modified live vaccines. *Journal of Feline Medicine and Surgery*, **13**, 541–545.

Savigny, M.R. and Macintire, K.M. (2010) Use of oseltamivir in the treatment of canine parvoviral enteritis. *Journal of Veterinary Emergency and Critical Care*, **20**, 132–142.

Simons, F.A., Vennema, H., Rofina, J.E. *et al*. (2005) A mRNA PCR for the diagnosis of feline infectious peritonitis. *Journal of Virologic Methods*, **124**, 111–115.

Spibey, N., Greenwood, N.M., Sutton, D. *et al*. (2008) Canine parvovirus type 2 vaccine protects against virulent challenge with type 2c virus. *Veterinary Microbiology*, **128**, 48–55.

Spindel, M.E., Veir, J.K., Radecki, S.V. *et al*. (2008) Evaluation of pradofloxacin for the treatment of feline rhinitis. *Journal of Feline Medicine and Surgery*, **10**, 472–479.

Sturgess, C.P., Gruffydd-Jones, T.J., Harbour, D.A. *et al*. (2001) Controlled study of the efficacy of clavulanic acid-potentiated amoxicillin in the treatment of *Chlamydia psittaci* in cats. *Veterinary Record*, **149**, 73–76.

Tauni, M.A. and Osterlund, A. (2000) Outbreak of *Salmonella typhimurium* in cats and humans associated with infection in wild birds. *Journal of Small Animal Practice*, **41**, 339–341.

Veir, J.K., Ruch-Gallie, R., Spindel, M.E. *et al*. (2008) Prevalence of selected infectious organisms and comparison of two anatomic sampling sites in shelter cats with upper respiratory tract disease. *Journal of Feline Medicine and Surgery*, **10**, 551–557.

Vollaire, M.R., Radecki, S.V. and Lappin, M.R. (2005) Seroprevalence of *Toxoplasma gondii* antibodies in

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clinically ill cats in the United States. *American Journal of Veterinary Research*, **66**, 874–877.

Zajac, A.M., LaBranche, T.P., Donoghue, A.R. *et al*. (1998) Efficacy of fenbendazole in the treatment of experimental *Giardia* infection in dogs. *American Journal of Veterinary Research*, **59**, 61–63.

Zirofsky, D., Powell, C.C., Rekers, W. *et al*. (2010) Feline Herpesvirus-1 and *Mycoplasma* spp. Infections in Cats with Acute Conjunctivitis in an Animal Shelter. American College of Veterinary Internal Medicine Forum (abstract), Anaheim, CA, June 11, 2010 (poster).

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19
Disease Recognition and Diagnostic Testing

Kate Hurley and Patricia Pesavento

INTRODUCTION

A well-thought-out diagnostic testing strategy is a key part of protecting shelter animal health. Whether or not there is an effective treatment for a disease, there are several reasons that shelter animals will fare better if the cause of disease is known. First, identification of the cause of disease allows selection of appropriate medicine and/or supportive care. Second, accurate diagnosis prevents the use of ineffective, costly, and potentially harmful pharmaceutical or surgical interventions. Lastly, in the case of intensively housed animals, management is likely to be the single most effective way to prevent the spread of infection. Knowing the cause of disease will indicate how to care for exposed and unexposed animals, what the required steps are to decontaminate the environment, and ensure that necessary precautions are taken to protect staff, public, and community pet health. For all of these reasons it is important to be very familiar with the use, and the usefulness, of diagnostic tests. This chapter will cover general considerations for testing in shelters with an emphasis on testing for infectious conditions.

WHAT IS A DIAGNOSTIC TEST?

Any procedure used to determine whether a disease or medical condition is present can be considered a diagnostic test. This includes observation of physical symptoms; blood and fecal evaluations; cultures; skin scrapings; biopsies, necropsy and histopathological examinations. Theoretically, a "good" diagnostic test is one that takes all of the guesswork out of diagnosing disease. Unfortunately, virtually no diagnostic test can be 100% accurate, but a well-chosen and properly interpreted diagnostic test should aid in compiling a reasonable clinical picture.

TYPES OF COMMONLY USED DIAGNOSTIC TESTS

Tests for infectious disease usually involve either direct or indirect identification of an infectious agent or "pathogen." Direct identification may occur through ante- or postmortem patient examination, by biopsying, culturing and/or examining substances (such as blood and tissues) microscopically, or through identification of genetic material with methods like polymerase chain reaction (PCR) testing. "Antigens"—molecules that the immune system recognizes as foreign—are the basis for commonly utilized indirect test methods like enzyme-linked immunosorbent assays (ELISA). "Antibodies," also known as immunoglobulins, are proteins that are produced in response to infection with a particular pathogen or foreign protein and form the basis for serology testing methods. Many other useful diagnostic test methods exist, including imaging techniques (radiographs, CT (computerized tomography), and MRI (magnetic resonance imaging)) and enzymatic tests.

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Serology

Serologic tests are most often performed on serum or plasma to detect the presence of antibodies to a particular pathogen. Serology can provide information about timing of infection because it can detect either IgM antibodies, which are produced soon after exposure (infection or vaccination), or IgG antibodies, which are produced later and in some cases persist for months to years.

There are a number of serology techniques available, including virus neutralization, indirect immunofluorescent or immunoperoxidase assays, ELISA, Western blotting, hemagglutination, immunoprecipitation, and complement fixation. Although the details of these different serological techniques are beyond the scope of this chapter, the test in each case depends upon the presence of circulating antibodies. Different serological methods yield simple positive or negative results, provide an indication of "strong" versus "weak" positive, or, in the case of titers, are reported numerically. Titers require serial dilution of blood samples, with the reported titer being the highest level of dilution at which antibodies were still detected. Thus, higher titers correlate to higher levels of antibody. However, a numerical titer from one laboratory may not be the equivalent of a numerical titer at another laboratory using a different serological method. When using titers to determine likely exposure or protection, it is important to be sure that the method used by the laboratory is the same as, or validated by, the method used originally to determine reference titer levels.

Enzyme-Linked Immunosorbent Assay

ELISA is a biochemical technique used to detect the presence of an antibody or antigen in a sample. For antibody detection, for example, a known amount of antigen is affixed to a surface, and then a sample from a patient (a sample that potentially contains the antibody, such as serum) is washed over the surface so that if specific antibodies are present, they will bind to the antigen. Bound antibody is detected by a secondary antibody linked to an enzyme that causes a color change on a fluorescent probe. Thus, in this example, a color change indicates the presence of antibody in the patient's serum. ELISA tests can come in well, kit, or strip form. A significant advantage of ELISA tests is the relative ease with which "in-house testing" (testing within the shelter or clinic) can be performed. ELISA forms the basis for many of the in-house test kits used daily in shelters, such as feline leukemia virus (FeLV), feline immunodeficiency virus (FIV), heartworm, and parvovirus test kits. Accuracy of ELISA tests is highly variable, even for a particular test type made by different manufacturers. A potential limitation of ELISA tests is that each test is specific to a particular pathogen. While a few tests may be combined in a single kit (e.g., FeLV/FIV combo tests), the utility of ELISA tests lies in their ability to rule in or out particular pathogens of concern. These tests are less useful to screen for a number of pathogens when the cause of illness is unknown.

Polymerase Chain Reaction

Detection and characterization of infectious agents increasingly relies on DNA or RNA amplification techniques (PCR). Diagnostic PCR is a technique used to amplify a unique stretch of DNA or RNA belonging to a particular pathogen. Originally, 2–3 hours were needed to complete a PCR, but now advanced PCR systems can deliver a result in a matter of minutes. While the readout of conventional PCR is typically binary (yes/no), real-time polymerase chain reaction, also called quantitative real-time polymerase chain reaction (Q-PCR/qPCR), is a laboratory technique that is used to amplify and simultaneously quantify a targeted DNA molecule. It enables both detection and quantification of specific sequence or sequences in a DNA sample. A significant advantage (as well as potential drawback) of PCR is that it is a very sensitive test that is able to detect extremely small amounts of pathogen. This permits detection soon after infection, and in many cases, even before the onset of disease. In addition, in some cases PCR can distinguish harmful or zoonotic strains from harmless strains of a microbe. A potential disadvantage of PCR is that its ability to detect even trace amounts of a pathogen means that results can be positive even if the pathogen is not causative of the disease. Most laboratories that use PCR are vigilant about contamination, but there is a possibility for this to cause a positive result not related to an animal's health status. A PCR test may also be positive when a pathogen is present as normal flora, if a virus is latent (not causing illness), or if the animal was recently vaccinated with either a killed or modified live vaccine. In these cases, the result is

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a "true-positive" result, but the finding is incidental to the current disease state. False-negative results can occur in PCR as well, most often if a sample is degraded or contains inhibitors of the PCR, or if it is not collected at the appropriate time relative to timing of active disease shed. It is important, as it is with any submitted sample, to collect and transport the sample exactly as recommended by the testing laboratory. Like ELISA testing, PCR will only detect the specific pathogens for which the test is run. Although screening panels including a number of different pathogens are becoming increasingly common and comprehensive, PCR will not detect an unexpected organism. Lastly, PCR is able to detect both viable and nonviable pathogens. This means a positive test result does not necessarily indicate the presence of living virus or bacteria. While this can be an advantage with microbial pathogens that cannot be grown on culture, it can also have some drawbacks (for instance, potentially detecting the presence of killed vaccine). Interpretation of the test must be carefully done with consideration of the clinical history and clinical signs.

Culture

Culture techniques are most commonly and simply used to detect bacterial or fungal organisms, but specialized techniques are also used at laboratories to detect some viruses or protozoa as well. Cultures can be performed on any sample, whether an oropharyngeal swab, feces, or tissue. The significance of the result will depend very much on how and from where the sample was taken. For example, the oral cavity of normal dogs contains many potential pathogens of the canine respiratory complex (kennel cough). The significance of pathogens cultured from an oral or nasal swab would be unknown. However, the same bacteria cultured from the lungs (e.g., from a transtracheal wash or from necropsy specimens) would be highly significant, as bacteria are not normally found in this location. When sampling a heavily contaminated area (such as feces), it is important to specifically ask for culture of either the suspected pathogen or "microbes of significance" (e.g., *Salmonella* spp. in diarrhea). Be aware that antimicrobial therapy can skew or prevent culture of many bacteria. Any recent antimicrobial therapy should be noted in the submission form and on the report.

Necropsy/Biopsy

Necropsy or biopsy samples are often the most reliable, and sometimes the only samples that will lead to definitive diagnosis of a cause of disease. While culture can sometimes yield unexpected results, many pathogens require targeted culture techniques and thus will not be isolated unless specifically requested. For other pathogens, culture is simply not possible. When the cause of disease is truly unknown, there is great benefit in directly examining tissue samples obtained via necropsy or biopsy to detect a wide array of organisms and observe their interaction with the tissue. If an animal dies or is euthanized with a possible infectious illness and there is any concern about cause or spread, the opportunity for sample collection and evaluation should not be missed. There are a number of good resources for how to perform a necropsy (Pesavento, 2009). In the case of gastrointestinal and respiratory diseases, in particular, these include sampling methods that focus on a limited set of tissues relevant to the disease. Sample collection is one of the most important reasons to perform a necropsy. Samples can be used for many tests, including culture, cytology (impression smears), PCR, serology, as well as histological analyses. Submitting tissue to a diagnostic laboratory in 10% buffered formalin for histopathology is fairly inexpensive, and often vital in defining the cause of disease.

ACCURACY OF TESTS

With so many animals at risk, and with costly or even life-or-death decisions hinging on the results, the stakes are high for diagnostic testing in shelters. It is crucial that tests be chosen, administered, and interpreted in a way that maximizes the likelihood of correct results. This requires an understanding of the way test accuracy is described and how it can be affected by various factors.

Terminology: Sensitivity, Specificity, and Predictive Value

A diagnostic test will result in one of four outcomes: true positive, true negative, false positive, or false negative. Specialized terminology is used to characterize how likely it is that test results are accurate for a particular test in a particular population. These terms include sensitivity, specificity, and positive and negative predictive values.

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Sensitivity

The probability that an animal who *does* have the disease in question will test *positive* for the disease. A very sensitive test will give positive results for almost all animals that have the disease. For example, an FIV test that is 90% sensitive will call spacing 90/100 truly infected cats positive, but 10 will test false negative using this test. The better the sensitivity, the fewer the false negatives.

Specificity

The probability that an animal who *does not* have the disease will test *negative*. A very specific test will rarely give positive results on uninfected animals. For example, an FIV test that is 95% specific would call 95 truly uninfected cats negative, and five would test false positive. The better the specificity, the fewer the false positives.

Positive Predictive Value

The probability that a positive test result is true (the animal actually has the disease in question). Positive predictive value (PPV) is high when a test is very *specific* (few false positives) and the *disease is common* in the population being tested. Calculation of predictive value requires knowledge of test sensitivity, specificity, and disease frequency in the test population.

$$\text{PPV} = \text{true test positives/total test positives}$$

Negative Predictive Value

The probability that a negative test result is true (the animal really does not have the disease in question). Negative predictive value (NPV) is high when a test is very *sensitive* (few false negatives) and the *disease is rare* in the population being tested.

$$\text{NPV} = \text{true test negatives/total test negatives}$$

Examples 1 and 2 in Appendix 19.1 demonstrate calculation of PPV and NPV for a hypothetical FIV test. In this example, even though the sensitivity and specificity of the test are quite good, a positive test result is correct only 15% of the time, although a negative result is correct more than 99% of the time. The poor PPV of the test is mainly due to the low frequency of disease in the test population. This highlights the need to interpret the results of any one test in light of other findings, including the history, age, sex, breed, clinical signs, and other test results in a particular animal or population.

Evaluating Test Accuracy

Ideally, information about sensitivity and specificity of tests would be widely available from manufacturers and laboratories, and straightforward to interpret. Unfortunately, this is often not the case. In general, the performance of diagnostic tests for veterinary use in the United States is regulated by the Animal and Plant Health Inspection Service (APHIS) of the United States Department of Agriculture (USDA). Specifically, APHIS regulates veterinary biologics (vaccines, diagnostic kits, and other products of biological origin) for all animals. Only a small proportion of these products are made for the small animal market. For a test to be validated, it typically has been in use in experimental trials and deemed safe for use in the group of animals in which it has been tested. Not every test is validated, nor does validation ensure that the test is useful in every animal or every situation. For example, a number of companies market a validated test for the presence of antibodies in the serum of cats potentially exposed to feline coronavirus. While this test is sensitive and validated for identifying cats exposed to coronavirus, it cannot distinguish the small percentage of cats who will progress to feline infectious peritonitis (FIP) from the many cats infected with feline coronavirus. The usefulness of the test has to be considered in the context of the entire case.

Not only is validation not a guarantee of usefulness in every context, there are no regulations about minimum standards for sensitivity or specificity of a test, whether for in-house test kits or tests used by diagnostic laboratories. It is up to clinicians to gather as much of this information as possible regarding the tests that are chosen for use. Diagnostic laboratories or test manufacturers should be able to provide some information or a list of references for the specific product. Ask yourself the following questions when interpreting this information:

- Was test evaluation performed by the manufacturer or an independent source?
- How long ago was the test evaluated? Has the test, manufacturer, or pathogen changed since then?

- What was the demonstrated sensitivity and specificity?
- Was the "gold standard" against which the test was compared reliable?
- What were the test conditions? (e.g., age, species of animals, field versus laboratory infection)

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The population tested will influence the apparent accuracy of a test. A test may be more sensitive when used on animals with a high dose of infection induced in a laboratory setting, but may not perform as well in a field situation where dose levels are often lower. For instance, in a trial of heartworm test kits from four different manufacturers, sensitivity in dogs with low levels of heartworm ranged from only 52% to 76% at best (Courtney and Zeng, 2001). To further complicate matters, test kits or materials sometimes change manufacturers; test production may be altered over time or testing techniques may change at diagnostic laboratories; and one manufacturer's test may not have the same sensitivity as another's. For example, testing of two *Giardia* ELISA kits from different manufacturers showed that one had a sensitivity of a respectable 86%, while the other's sensitivity was only 56% (Marks, Melli and Kass, 2004).

Even if a test was originally found to be sensitive and specific and has not been altered since, evolution of the microbe may result in decreased accuracy for some kinds of tests as time passes. For example, as canine parvovirus has evolved, reevaluation has been required to determine whether a currently used in-house antigen test kit is still effective in detecting currently circulating strains of Parvo-2C (Larson *et al*., 2007).

Textbooks, authoritative websites, and the experience of experts and colleagues should also be considered when evaluating the reliability of a particular test. Ultimately, no matter what the manufacturer, studies, or experts say, interpretation of test results is a matter of clinical judgment. Test results that do not make sense in the context of the whole picture—such as a group of properly vaccinated, apparently healthy adult dogs testing positive for parvovirus—should be viewed with skepticism and confirmed via other testing. The reliability of any test result will be enhanced by careful selection of test population and interpretation in light of multiple methods of evaluation.

Effect of Test Strategy on Accuracy

Testing strategy and interpretation of results can be used to change the functional sensitivity and specificity of tests to some extent. *Specificity* of testing can be increased by using two tests and requiring that *both* be positive before an animal is deemed infected. For instance, one could require that a cat test positive on both ELISA and Western blot tests for FIV before being considered infected, or testing could be repeated using two different brands of in-house test kits. *Sensitivity* is increased by using two tests and calling an animal positive when testing positive on *either* test. An example would be considering a dog parvo positive if he or she tests positive on a fecal ELISA *or* if he has hemorrhagic diarrhea and decreased white blood cells on a blood smear. No matter how sensitive or specific the test, PPV is decreased when the disease is uncommon in the population being tested, and vice versa. Sometimes estimates of disease frequency are available in the literature, and true disease prevalence can also be estimated from test results by a simple formula described in Example 3 in Appendix 19.1.

Beyond Sensitivity and Specificity: Other Factors Influencing Test Accuracy

Apart from characteristics of the test itself and the frequency of disease in the test population, biological factors influence the accuracy and usefulness of tests. These factors include the natural history of the disease, the nature of the animal's immune response, and whether the test detects antibody or antigen. FIV is an example of a disease for which in-house antibody tests are often used. Parvo, panleukopenia, FeLV, and most canine heartworm in-house test kits detect antigen. Misleading results can occur with either kind of test: sometimes antibody is not present even though the animal is actually infected, and sometimes antibody is present even though the animal is free of infection. The same holds true for antigen. These are not truly "false" results, since the test is correctly reporting whether or not the antibody or antigen in question is present, but the terms "false positive" and "false negative" will be used in the discussion below for simplicity's sake, to refer to a discrepancy between the test result and the true disease state of the animal.

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Factors Influencing Accuracy of Antibody Tests

Antibodies take some time to develop, leading to false-negative results in recently infected animals. The time required for animals to mount a detectable antibody response varies greatly, from 7 to 10 days in the case of canine influenza, to 60 days or more for FIV. Antibody tests will also be negative in animals who are unable to mount an immune response, whether due to age, concurrent/overwhelming disease where antigen binds to all the antibodies, or (less commonly) a congenital inability to produce antibodies.

Vaccination is designed to stimulate the immune system to produce protective antibodies, and thus will cause "false-positive" results on antibody tests. Rising IgG antibody titers or positive IgM titers indicate either recent vaccination or infection, but in most cases there is no way to distinguish between these two scenarios. For this reason, antibody testing has little diagnostic value in recently vaccinated animals and should not be used to diagnose conditions such as canine distemper in animals recently vaccinated against this disease. Vaccination can induce antibodies that persist for years, so even in animals who have not been recently vaccinated a single positive IgG antibody test result cannot differentiate vaccination at some time in the past versus infection.

Maternal antibodies that are passed from the mother to her young soon after birth will also cause positive results on antibody tests even in uninfected animals. For example, kittens may test positive for FIV due to maternal antibodies until 4–6 months of age, and test results must be interpreted in light of this fact. Even when not attributed to vaccination, the simple presence of antibody does not necessarily indicate a current infection (except for a few conditions from which animals virtually never recover, such as FIV antibodies in an unvaccinated cat). For example, in-house test kits are commonly used to detect Lyme disease antibodies in dogs or heartworm antibodies in cats. A positive result indicates exposure but does not indicate whether the animal has cleared the infection.

Use of antibodies to test for disease is distinct from use of antibodies to test for *protection* from disease. Antibody titer testing has been used to assess the need for revaccination in pet animals (Tizard and Ni, 1998; Lappin *et al*., 2002), although this has limited application in shelters where vaccination is almost always indicated if the animal's immune status is unknown. In some situations, antibody titer testing can also be used to evaluate risk for infection in animals exposed to a serious infectious disease (Larson, Newbury and Schultz, 2009). For diseases where there is good correlation between antibodies and protection from disease (such as canine parvovirus, canine distemper, and feline panleukopenia), positive antibody titers in asymptomatic animals suggest protection, whether from prior vaccination or past exposure to field strain infection.

Factors Influencing Accuracy of Tests for Antigen

False-negative results occur with antigen tests if the antigen is not present in the sample even though the animal is truly infected. This can happen due to timing of sample collection; the antigen either is not yet present early in disease or is no longer being shed later in disease. For example, detectable levels of FeLV can take up to 4 weeks or more to develop, causing recently infected cats to test negative. Some pathogens such as canine parvovirus are shed only briefly, resulting in negative results on samples obtained after days 5–7 of disease. The peak shedding period for some infections, such as canine influenza virus, occurs even prior to development of clinical signs. For these diseases, negative test results on samples taken late in the course of disease have little value. The life stage of the organism may also influence antigen test results. For example, commonly used heartworm tests detect antigen present only in adult heartworms, which take 6 months to develop. Such tests will inevitably produce negative results on puppies less than 6 months of age and recently infected dogs.

The location and type of sample collected will also influence the likelihood of finding antigen even in infected animals. For example, FeLV (antigen) may be present in blood samples but is less likely to be detected in tests conducted on tears or saliva (Hawkins, 1991). Negative results on these samples are therefore less reliable. To improve test sensitivity, samples should be obtained from the location/specimen most likely to provide high levels of pathogen.

False-positive results occur when the test sample contains the antigen or pathogen detected by

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the test, but not because the animal is infected. For instance, modified live vaccines can cause positive results on antigen tests for as long as several weeks after vaccination. The likelihood of vaccine-induced positive test results and the length of time for which they may persist depend both on the vaccine in question and on the type of test. Very sensitive tests, such as PCR, will be more likely to detect even low levels of antigen that may be present after vaccination. Tests from different manufacturers can vary in the frequency of vaccine-induced positives. For instance, because panleukopenia, which is caused by a feline parvovirus, is so similar to canine parvovirus, canine parvo "SNAP" tests have been used to test cats for panleukopenia, and recent vaccination for panleukopenia would also be expected to potentially cause positive test results. However, a study found that one brand of test was positive for parvovirus in only 1/64 kittens recently vaccinated for panleukopenia, while another brand was positive in 13/64 of the same group of kittens.

Just as the presence of antibodies does not necessarily indicate current infection in most cases, the presence of antigen does not always equate to disease even in the absence of vaccine interference. Some acute, serious infections, such as canine parvovirus and feline panleukopenia, are rarely found in healthy animals and should be considered a likely cause of illness when identified by diagnostic testing. However, many infectious agents can also be found in healthy animals and will not necessarily cause illness. Many of the potential pathogens associated with canine and feline respiratory complex and gastrointestinal infection fall into this category. Test results for these agents must be interpreted in comparison to expected background levels of infection (as described below), clinical signs, and response to treatment.

Sample Collection

While some tests are more tolerant of errors than others, any test can be undermined by problems with sample choice, handling, or performance of the test. The success of infectious disease diagnosis depends on the quality of the specimen as much as on the test. The right choices need to be made regarding animal selection, timing of sample collection, and specimen type/location (e.g., oronasal swab versus fecal sample). If the sample is being shipped to a diagnostic laboratory, the conditions under which the specimen is transported and stored before processing are important. Because the optimum sample and conditions for stabilization during transport depend on the suspected disease agent, most laboratories at least provide instructions and suggestions for shipping, and many provide containers and courier services as well. All instructions should be followed meticulously; even something as simple as using a different swab type to collect a sample can significantly impact test accuracy (Rose *et al.*, 2004).

INDICATIONS FOR TESTING IN SHELTER ANIMALS

No single recipe for diagnostic testing is appropriate for all shelters. The testing strategy will be influenced by all the following: the risk of disease in that particular population; the cost and accuracy of available tests; whether trained staff are available to collect samples or perform the test; and whether the outcome of the test will affect what actions are taken for an individual animal or the population. Testing should only be performed when the benefits of doing so outweigh the risks.

The Risk of Testing

The risks of testing (or accepting a false-positive result) include:

- Euthanasia of an animal who is not really infected
- The stigma of "infection," which may needlessly discourage adoption
- Cost and possible complications of treatment for a disease that is not really present
- Cost and staff time required for testing

The risk of testing for diseases that are unlikely to be transmitted in a shelter, do not require immediate treatment, or are very rare in a particular population may outweigh the risk of not testing. If the decision is made to test for low-risk diseases, a test that is unlikely to give false positives is preferred (high specificity). Confirmatory testing should be performed if available. The risk of testing even for serious diseases such as parvovirus may outweigh the benefits under some circumstances. For instance, testing all puppies for parvovirus on intake is likely to

give false-positive results, since (at least in most shelters) infection is rare in newly admitted puppies who appear healthy. In general, testing healthy-appearing animals for acute infections is not recommended. Testing for acute illnesses should be focused on symptomatic animals or those from high-risk areas (e.g., puppies from a neighborhood known to be a hotbed of parvovirus).

Even for common conditions, testing may be more problematic than beneficial. With the increasing availability of "combo" test kits and panels, the value of each component needs to be considered. For example, kits are available that test for canine heartworm, and for "Lyme disease" (*Borrelia burgdorferi*) and other tick-borne infections. While the test for canine heartworm provides valid and helpful information, positive test results for Lyme disease indicate only a history of exposure, not necessarily a current infection. Results of this test in healthy dogs are unlikely to impact management decisions: treatment of asymptomatic animals is not recommended, and transmission is prevented through good tick control, which should be practiced for all animals regardless of test results. However, positive test results could cause confusion or needlessly discourage adopters.

Similarly, simple and reasonably accurate in-house test kits for *Giardia* have become available in recent years, leading to more widespread testing for this infection. However, screening of asymptomatic animals is not necessarily productive. *Giardia* can be commonly found in both pet and shelter animals when sensitive tests are used (McGlade *et al*., 2003; Sokolow *et al*., 2005). There is little evidence that animals without diarrhea pose a risk to human health, and treatment will not always eliminate carriage nor completely prevent environmental contamination (Brown *et al*., 2005). It is not realistic to suppose that *Giardia* can be eliminated from shelter environments even through rigorous testing and treatment; thus positive test results may create a significant impediment to adoption while providing little useful information. Avoid performing tests just because they are available—the focus of shelter testing should be on diseases requiring immediate treatment for the protection of animals or people or those that require special management considerations to prevent transmission or reduce environmental contamination.

The Risk of Not Testing

The risks of *not testing*, or accepting a false-negative result, include

- Failure to detect an infectious disease that can spread to animals and/or humans
- Failure to identify a condition requiring treatment
- Failure to identify a sick animal who is adopted out, causing potential heartbreak, angry phone calls, lawsuits, and other unwanted outcomes

Diseases that are common, highly infectious, potentially fatal, and/or zoonotic should be a priority for testing. The same is true for conditions where prompt intervention is key to a good prognosis. A test that is unlikely to give false-negative results (high sensitivity) is preferred when infection poses a high risk to animal or human health. Testing for parvovirus in puppies with signs of gastrointestinal disease would be an example of a situation where testing is clearly worthwhile. Even so, confirmatory testing should ideally be performed before drastic measures are taken, especially if the results of the test do not make sense in the context of clinical signs and history.

Dermatophytosis (ringworm) provides an example where both risk and benefit of testing may be substantial. Because ringworm is highly contagious and can infect humans, identification of infected animals is a high priority. However, treatment is relatively time- and labor-intensive, and at some shelters a diagnosis of ringworm may even lead to euthanasia. Either false-positive or false-negative results can thus have grave consequences. This highlights the need to ensure that testing is performed by skilled personnel using the best tools available.

WHICH ANIMALS SHOULD BE TESTED?

Before investing time and money in submitting a diagnostic test, review the types of tests available, the natural history of the disease(s) of concern, and the characteristics of the animals to be sampled. Questions to consider include the following: Is the purpose of the test screening, surveillance, or diagnosis in an individual or population? Is the goal to rule in/out a single agent, or are multiple pathogens suspected? Does more than one affected animal need to be sampled to make a decision about cause? Should

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only sick animals be sampled, or also those who have been recently exposed?

Screening Tests

Screening tests are useful to detect diseases that are commonly present without causing overt symptoms and which present a threat to shelter animal health, either because there is a risk of spread within the shelter (for instance, dermatophytosis) or because it impacts the health or prognosis for the individual (such as heartworm). FIV and FeLV are also commonly screened for in shelters. All animals may be screened or just those at particular risk. The timing of screening tests depends on the likelihood of adoption, resources of the shelter, and the risks posed by the disease in question. For animals who are very likely to be adopted, either because of shelter policy or individual animal characteristics, screening on intake is generally a good investment. Intake screening can help guide decisions about animal admission, placement, or disposition, and can identify animals in need of treatment. Screening should also take place at the time of intake for diseases that can be easily transmitted in the shelter, notably feline dermatophytosis.

For diseases that are spread only through direct contact, such as FeLV and FIV, screening can be deferred until the animal is placed for adoption or considered for group housing, foster care, or other housing situations where direct contact is likely. This strategy is often more cost-effective for shelters in which some animals are likely to be reclaimed or euthanized after an initial holding period. Likewise, testing of asymptomatic animals for a condition such as heartworm, which poses minimal risk for transmission within shelters because it is transmitted by mosquitoes, can be delayed until an animal is selected for adoption or rescue. As noted earlier, "screening" asymptomatic shelter animals for pathogens that are very rare in that particular population or have minimal clinical significance can cause more harm than benefit, and should be avoided.

Surveillance Testing

Surveillance testing is performed to detect trends in background disease levels, identify emerging threats, or document prevalent conditions in incoming animals. For example, even if fecal exams are not normally performed on all animals, a representative group of incoming animals can be periodically tested to identify which internal parasites are commonly present at admission. This can direct prophylactic treatment of all animals. For example, if coccidia is found to be common in newly admitted kittens or puppies, prophylactic treatment of all juvenile animals is indicated to prevent spread and environmental contamination (Daugschies, Mundt and Letkova, 2000). Once this has been established, it is not necessary to go to the expense and trouble of performing diagnostics for coccidia on every asymptomatic, newly admitted animal. Surveillance testing should be revisited on a routine basis to ensure that standard treatments are still a good match for the real risks in a population.

Surveillance testing on sick animals can also be valuable, even in the absence of a serious disease outbreak. For example, it may be helpful to periodically evaluate cats and dogs with "run of the mill" upper respiratory infections (URI) or to perform evaluation of fecal samples from animals with mild diarrhea. This type of testing provides a basis for comparison should an outbreak occur; results of respiratory or gastrointestinal panels taken during an outbreak can be compared to background levels from surveillance samples. Results of surveillance testing of sick animals can also help direct routine treatment and guide vaccination and management choices. For example, if feline herpes virus is identified from the majority of cats with URI, strategies aimed at stress reduction will be an important part of controlling disease levels, whereas if *Chlamydophila* spp. is revealed to be a significant component in endemic URI, an antibiotic effective against this bacterium will be required for treatment. When surveillance testing sick animals, the same considerations for timing and number of samples apply as in outbreaks as described below.

Testing in Outbreaks

While much of the discussion in this chapter has focused on testing for specific diseases, in shelters it is often necessary to diagnose illness of unknown cause affecting many animals. Investment in definitive diagnosis, while potentially expensive, may be far less costly in the long run than investing in "shotgun" treatment or undirected (and potentially ineffective) control measures. Indications for diagnostic testing in a population include

- Unusually severe or fatal disease affecting one or more animals
- Prolonged time to recovery or failure to respond to "usual" treatment (e.g., extended URI or kennel cough)
- Disease affecting multiple species or humans, or spreading to staff or adopter pets
- Suspected emergent or reportable disease

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Number of Animals to Test

It is rarely necessary to test every exposed or affected animal for surveillance or outbreak diagnosis. Generally, testing 10–30% of the population will be sufficient. At minimum, three to five animals should be tested. More animals must be tested for uncommon diseases, diseases for which available tests are relatively insensitive, or conditions for which positive test results are expected in a percentage of animals even in healthy or unexposed populations. For instance, the frequent carrier state for feline calicivirus (FCV) means it can be isolated from up to 25% of shelter cats. Positive test results from one or two cats have little significance. However, positive results from a majority of 10 cats would suggest that FCV is associated with observed disease problems. On the other hand, there is no carrier state for feline panleukopenia, and isolating this virus from even one or two cats would be significant. Likewise, in non-endemic communities, isolation of canine influenza virus from even one dog would be significant, but isolation of *Bordetella* spp. or canine coronavirus would indicate little.

Timing and Selection of Test Animals

If disease is occurring in a number of animals, one of the most important general considerations is which animals will most likely be representative of the disease outbreak, and at what point sample collection should take place. In part, this depends on the cause of the disease, so having a list of suspected agents (differentials) is very important. Age of the animal, stress, and co-pathogens might each or all be important in deciding which animals to test.

For diagnosis of an outbreak, acutely affected animals should generally be tested, ideally prior to initiation of antibiotic or antiviral treatment. However, there are exceptions to this rule. For instance, if the peak viral shedding period precedes clinical signs (e.g., canine influenza), recently exposed animals should be tested rather than only those that are symptomatic. When testing for illness using antibody, samples must be taken after sufficient time has passed for the animal to mount a detectable immune response. This can vary from a short time, for example, 7–10 days in the case of canine influenza, to a prolonged time, for example, up to 60 days for development of antibodies to FIV.

INTERPRETING TEST RESULTS

When interpreting a test result, there are two choices: the initial result can be taken at face value or further confirmatory testing can be performed. This decision depends on the likelihood that the initial result is correct (based on the test accuracy and overall clinical picture), the availability, cost, and practicality of confirmatory testing, and the ramifications of accepting an inaccurate result (as discussed earlier). Most commonly, when screening for disease in a healthy population, negative results are accepted at face value. This is generally appropriate: recall that NPV is high when the likelihood of disease is low in the test population. On the other hand, when the consequences of accepting a false negative are severe or the sensitivity of the test is low, confirmatory testing is indicated, especially in animals at high risk for disease. For example, a negative result from a careful Woods lamp screening for ringworm might be acceptable before adding a healthy adult cat to a group housing area, but the same result in a kitten with characteristic signs of ringworm infection must be viewed with suspicion.

Similarly, positive test results in animals with typical history and clinical signs of illness may be accepted but the same results in a healthy animal should be confirmed. Euthanasia of healthy-appearing animals based on test results poses a particular dilemma in shelters. If confirmatory testing requires a significant investment of resources, the current fate of healthy animals in the shelter and community must be considered. For instance, false or transient positive tests for FeLV will occur, due to the low prevalence in healthy cats and the fact that some cats will naturally recover. Various confirmatory tests are available, involving additional cost and the logistical difficulties of holding the animal while

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awaiting results. The risk of euthanizing the cat is that he or she may be perfectly healthy. However, a cat testing positive even on a test with relatively poor predictive value is still much more likely to be ill than one testing negative. Sadly, many shelters admit a larger number of healthy, FeLV negative cats than are adopted out. If some cats are going to be selected for euthanasia and the choice is between FeLV positive and FeLV negative cats who are otherwise of similar adoptability, it makes sense to choose the FeLV positive cats, leaving more resources available for the rest of the population. On the other hand, for a shelter that is choosing between euthanizing an unconfirmed FeLV positive cat and not euthanizing any cat at all, investment in additional testing is indicated. The same logic applies to a limited intake shelter in deciding whether to admit or turn away apparently healthy, test-positive animals without confirmation.

TRAINING AND DOCUMENTATION

As mentioned at the beginning of this chapter, stakes are high when performing diagnostic testing in a shelter. For in-house tests and diagnostic sample collection, staff training and consistency is critical. Ideally, testing should be performed by medical staff. If practical considerations require that nonmedical staff perform and interpret tests (and if this is permitted by local regulations), designated staff members should receive specific training from a veterinarian. This training should include direct physical observation of the staff member collecting samples and performing the test in question as well as written documentation of all necessary knowledge. New developments occur regularly in the availability and use of diagnostic tests. Staff should be provided with access to continuing education, current publications, and other resources to stay current.

Test results should be noted in each animal's permanent record (paper or electronic) along with the initials of the person performing the test. In addition, a log should be kept for each type of test used, noting date, animal identification (unique number or name), symptoms if any, and results. This makes it possible to calculate the percentage of positive, negative, and inconclusive results over time, allowing the track of patterns of increasing or decreasing disease in the tested population.

CONCLUSION

An increasing number and variety of tests are available for diagnosis of common conditions in shelter animals. The value of these tests is increased by choosing the right tests; applying these in the appropriate population; and interpreting results in light of the test characteristics as well as the natural history of the disease. Used wisely, diagnostic testing forms the foundation for treatment of individuals as well as directing preventive efforts in shelter populations.

REFERENCES

Brown, R.R., Elston, T.H., Evans, L. *et al*. (2005) Feline zoonoses guidelines from the American Association of Feline Practitioners. *Journal of Feline Medicine and Surgery*, **7**(4), 243–274.

Courtney, C.H. and Zeng, Q. (2001) Comparison of heartworm antigen test kit performance in dogs having low heartworm burdens. *Veterinary Parasitology*, **96**(4), 317–322.

Daugschies, A., Mundt, H.C., and Letkova, V. (2000) Toltrazuril treatment of cystoisosporosis in dogs under experimental and field conditions. *Parasitology Research*, **86**(10), 797–799.

Hawkins, E.C. (1991) Saliva and tear tests for feline leukemia virus. *Journal of the American Veterinary Medical Association*, **199**(10), 1382–1385.

Lappin, M.R., Andrews, J., Simpson, D., *et al*. (2002) Use of serologic tests to predict resistance to feline herpesvirus 1, feline calicivirus, and feline parvovirus infection in cats. *Journal of the American Veterinary Medical Association*, **220**(1), 38–42.

Larson, L.J., Quesada, M., Mukhtar, E. *et al*. (2007) Evaluation of a CPV-2 fecal parvovirus ELISA (SNAP Fecal Parvo Test®) from Idexx Laboratories, in *Proceedings of the Conference for Research Workers in Animal Diseases*, Chicago, Illinois.

Larson, L.J., Newbury, S., and Schultz, R.D. (2009) Canine and feline vaccinations and immunology, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K.F. Hurley), Wiley-Blackwell, Ames, Iowa.

Marks, S.L., Melli, A., and Kass, P.H. (2004) Evaluation of zinc sulfate floatation and two enzyme immunoassays for the detection of *Giardia Duodenalis* in naturally infected kittens, in *22 ACVIM Forum Proceedings*, Minneapolis, Minnesota.

McGlade, T.R., Robertson, I.D., Elliot, A.D. *et al*. (2003) High prevalence of *Giardia* detected in cats by PCR. *Veterinary Parasitology*, **110**(3–4), 197–205.

Pesavento, P.A. (2009). Necropsy techniques, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K.F. Hurley), Wiley-Blackwell, Ames, Iowa.

Rose, L., Jensen, B., Peterson, A. *et al*. (2004) Swab materials and *Bacillus anthracis* spore recovery from nonporous surfaces. *Emerging Infectious Diseases*, **10**(6), 1023–1029.

Sokolow, S.H., Rand, C., Stanley, B.S., *et al*. (2005) Epidemiologic evaluation of diarrhea in dogs in an animal shelter. *American Journal of Veterinary Research*, **66**(6), 1018–1024.

Tizard, I. and Ni, Y. (1998) Use of serologic testing to assess immune status of companion animals. *Journal of the American Veterinary Medical Association*, **213**(1), 54–60.

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Appendix 19.1
Diagnostic Testing Examples

Note: values for sensitivity, specificity, and frequency used in this and all other examples in this chapter are intended for demonstration purposes only and do not necessarily reflect actual test accuracy or disease frequency.

Example 1: Sensitivity, Specificity, Frequency, and Predictive Value

A hypothetical FIV test with a sensitivity and specificity of 90% and 95%, respectively, is applied to a test population of 1000 shelter cats of unknown disease status, with an estimated frequency of FIV infection at 1%.

Frequency of 1% means that out of 1000 cats, 10 will be infected with FIV, and 990 will be free of the disease. Sensitivity of 90% means of the 10 true positives, 90% will test positive: $0.90 \times 10 = 9$. Specificity of 95% means 95% of the truly negative cats will test negative: $0.95 \times 990 = 940.5$ (round off to 940 for simplicity). That leaves $990 - 940 = 50$ of the truly negative cats test positive. This is shown in diagrammatic form below:

	FIV(+)	FIV(−)	Total
Test(+)	9	50	59
Test(−)	1	940	941
Total	10	990	1000

PPV = true positives/total positives = 9/59 = 0.15 (15%).

NPV = true negatives/total negatives = 940/941 = 0.9989 (99.89%).

Example 2: Increasing Frequency Improves PPV

Returning to the scenario described in Example 1, but this time testing only adult, intact male cats, with an estimated disease frequency of 10% (as opposed to 1% in Example 1).

Frequency = 10% × 1000 cats = 100 infected with FIV, and 900 free of the disease.

Sensitivity = 90% × 100 truly infected = 90 true positives, and 100 − 90 = 10 false negatives.

Specificity = 95% × 900 truly uninfected = 855 true negatives, and 900 − 855 = 45 false positives. This is shown in diagrammatic form below:

	FIV(+)	FIV(−)	Total
Test(+)	90	45	135
Test(−)	10	855	865
Total	100	900	1000

PPV = true positives/total positives = 90/135 = 0.666 (66.6%).

NPV = true negatives/total negatives = 855/865 = 0.988 (98.8%)

So by choosing a test population in which disease is more likely, a positive result is more than 4 times more likely to be correct compared to the previous example, and NPV is still quite good.

Example 3: Estimating True Disease Prevalence from Apparent Prevalence

Knowing that a proportion of positive test results are inaccurate, it is sometimes helpful to be able to estimate the true frequency of disease in the test population. In order to calculate this for your shelter population, you will need to keep records of test results until you have a reasonable number of samples (the more samples the less common positive results are) and obtain an estimate of the sensitivity (SE) and specificity (SP) of the

test used. The formula to calculate true prevalence (TP, the total actually diseased out of the total population tested) from the apparent prevalence (AP, the total positive results out of the total population tested) is

$$TP = AP + (SP - 1)/(SE + SP - 1)$$

Using the same numbers as in Example 1, but assuming this time the true frequency is unknown and thus working backward from the test results:

SE = 0.9 (90%)

SP = 0.95 (95%)

AP = 59/1000 = 0.059 (total test positives out of total population tested)

TP = 0.059 + (0.95 − 1)/(0.9 + 0.95 − 1) = 0.009/0.85 = 0.01, or 1% which was the true frequency assumed when the exercise was set up. The reader is encouraged to try it on some of the shelter's test data collected over the last 6 months.

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20
Treatment Strategies

Julie D. Dinnage

INTRODUCTION

While shelters may vary greatly from one another in their mission and goals, they all share the high risk for infectious disease. This ongoing risk makes well-thought-out plans for the management and treatment of infectious diseases an important part of any shelter health program. Treatment decisions in shelters are based upon a different set of criteria than veterinary private practice. Failure to understand and acknowledge the validity of those differences can lead to misunderstandings that have a negative impact on the shelter. Furthermore, failure to appropriately manage infectious disease in a shelter can lead to poor relations with the community (due to release of affected animals to unsuspecting adopters), higher potential for transmission to humans (if the infectious disease is zoonotic), and an increased risk of disease to community animals. In addition, failure to appropriately manage infectious disease in a shelter certainly leads to unnecessary animal and human suffering. This chapter will stress the importance of establishing clear treatment and management strategies in a shelter and will outline key factors to consider in creating policies or evaluating existing strategies.

POLICY AND PROTOCOL DEVELOPMENT AND OVERSIGHT

A policy (for the purposes of this section) is defined as a predetermined method or course of action that has been developed to guide and determine present and future decisions. Carefully thought-out policies will help ensure more rapid and consistent responses to situations. In the case of infectious diseases, policies will determine what the shelter's response will be to an animal who has or is suspected to have an infectious disease. Policies should provide a general guideline as to how the organization will respond to specific infectious diseases and must take into consideration the disease agent, shelter philosophy, ease and cost of treatment, and impact upon the individual animal and the shelter population.

Predetermining a policy allows the organization time to fully research the disease(s) of concern, engage staff in discussion about possible and preferred responses, consider resources available, and understand all available options. In this way, policies help to ensure decisions are made prior to the actual occurrence, with attention to reason as well as emotion. In general, a policy is mandatory and should be adhered to uniformly and consistently. However, each policy should/can be reviewed as it relates to an individual situation, allowing for reevaluation on a regular basis.

Once a general policy has been created, a specific protocol can be developed detailing "how to" manage infectious diseases in the shelter. Protocols outline an agreed-upon method of acting in a particular situation, providing structure and ensuring "institutional memory." A protocol consists of a detailed written plan for a treatment or procedure and seeks to answer specific questions such as how to identify disease, how to ensure appropriate disinfection, who to notify, how and who to treat (if the shelter policy allows), and how/what to document. Protocols should also ensure best practices for

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prevention and control of infectious diseases. Much like policies, protocols should be looked upon as "living documents" that will undergo changes as situations and circumstances warrant. Protocols serve as fundamental guidelines of care in the face of infectious diseases.

It is critical for shelters to create and maintain written infectious disease management policies and protocols in anticipation of potential infectious diseases that commonly affect shelter residents (see the chapter on practical overview of common disease agents for more information). Having in place predetermined infectious disease policies and protocols helps ensure appropriate management of situations when stressful or emotional circumstances could potentially cloud good judgment. Written policies and protocols provide a plan for a course of action that offers structure, consistency, and cooperation. They facilitate quality care and population welfare while minimizing the risk of widespread infectious disease.

The first step in preparing infectious disease policies and protocols is to create a team of individuals who will play a key role in identification, management, and treatment of infectious diseases. Involving team members from multiple areas of shelter management empowers staff to be involved in preparing for situations that are often stressful. Enlisting input from key individuals also challenges staff to utilize past experiences to shape effective and organized responses to infectious disease outbreaks. In addition, standing policies and protocols that are well thought out ahead of time and devised from the input of those who will be following them help shelter staff avoid making last-minute and sometimes emotionally driven decisions that could result in devastating consequences for the individual animals and the shelter as a whole. Well-thought-out and prewritten policies and protocols that are agreed upon and understood by all can bring a sense of calm to stressful situations and can prevent staff from steering in an ill-advised direction at the time of a crisis. This is much like community disaster preparedness planning, where agreed-upon policies and protocols are implemented to minimize, or better yet avoid, the chaos that can ensue in an emergency and strive to clarify each individual's role in an emergency.

Ideally, development of infectious disease policies and protocols should be a team effort involving management, veterinary staff or advisors, and the shelter staff. The final review and acceptance of policies and protocols should be done by the top management and the lead veterinarian. If a shelter does not have a veterinarian or technician on staff, it is important to consult with a veterinarian experienced in managing populations of animals. Population health management in shelters is sometimes referred to as "herd health" because an individual animal's health must be evaluated in conjunction with the entire shelter and community population. Because infectious disease management in a shelter environment requires knowledge of individual animal health care alongside population health management, a veterinarian with shelter experience is an ideal partner. A qualified veterinarian will help identify disease agents of concern and can provide critical information relating to each infectious disease condition to be addressed in policies and protocols.

Once a policy or protocol is developed, successful implementation is equally important. A well-thought-out policy or protocol will only be words on paper without the necessary structure behind it to ensure it is successfully carried through.

The second step in preparing infectious disease policies and protocols involves determining which conditions the shelter may commonly encounter. Written policies and protocols should be developed for all infectious diseases recognized in the shelter, and highest priority should be given to diseases that are more common and those that are most serious (e.g., highly contagious, zoonotic, and/or likely to cause fatalities).

A third step in writing policies and protocols involves researching each infectious disease and understanding how it will potentially impact the shelter population. (More information can be found in the chapters on the epidemiology of disease and the overview of common infectious disease agents). Information to be gathered includes the incubation period, severity of disease, level of contagion, mode of transmission, zoonotic potential, and treatment options. All of these details need to be evaluated in light of the at-risk shelter population.

A fourth step in writing policies and protocols for infectious disease management involves considering the many variables of an individual shelter, such as its mission, finances, human resources (including staff and volunteers), level of staff training or

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expertise, and the physical design of the facility, to name a few.

Finally, written policies and protocols should be read and reviewed regularly by staff and frequently referred to for staff training purposes. Because shelters often experience a high employee turnover rate, written policies and protocols provide a valuable resource that will ensure consistency and structure for new trainees and reinforce the importance of following best practices with longer-term staff. Staff should be encouraged to request a review of policies and protocols if they feel improvement or clarity is needed. Written policies and protocols should be critically reviewed and updated if needed on an annual basis and/or when circumstances at the shelter change or new information is available. For example, building renovations or a large-scale law enforcement seizure may limit the space available to hold and treat infectious animals, thereby forcing a temporary change in some protocols.

Shelters may wish to develop policies and protocols that address contingency plans where appropriate depending upon anticipated changes. For example, a shelter that routinely houses animals for law enforcement must write policies and protocols applicable during times when potentially large numbers of animals are held and cared for in addition to the general shelter population. Having a plan in place to handle these situations is critical for effective infectious disease management.

Treatment Considerations

There are five key variables to consider when choosing a treatment course in the shelter: the infectious disease agent, shelter type and mission, shelter resources, shelter population, and the individual patient.

The Infectious Disease Agent

Multiple variables related to the nature of the actual disease agent must be considered when making treatment selections. Important disease agent variables to evaluate are level of contagion, virulence, mode of transmission, incubation period, severity and course of disease, pattern and length of shedding, carrier states and potential for chronicity, treatment options and costs, and zoonotic potential.

Shelter Type and Mission

Understanding a shelter's mission and overall goals is critical to appropriate selection of animals for treatment. Shelters can have unique missions, goals, organization, and structure. (See the chapter on introduction to animal sheltering for a more detailed discussion.) They will vary in terms of funding, administrative structure, programs, policies and practices related to animal intake and disposition, investigating animal cruelty cases, and so on. Key among these is a shelter's policy regarding euthanasia and the role it may play in treatment choices. Euthanasia may itself be an appropriate choice in the face of a disease outbreak; however, the shelter's philosophical guidelines along with the community's values and expectations of the shelter will directly impact when and how euthanasia will be considered.

Shelter Resources

Resources are vital to treatment selection decisions. Appropriate management of infectious diseases requires adequate, physically separate quarantine and isolation facilities. There must also be consideration for the logistics of working in these specialized areas, especially when staff must work in multiple areas of the shelter. Access to appropriate diagnostic tests or equipment and pharmaceutical therapies is also critical in making a decision whether to treat. Another crucial shelter resource to consider before making treatment decisions is staff. This includes shelter staff, volunteers, foster homes, and veterinary medical staff. Successful infectious disease treatment regimens require design and close monitoring by a veterinary professional; this may be a staff veterinarian, a technician working under the direction of a veterinarian, or other trained individual working in accordance with the state veterinary practice act. The level of staff expertise, ability, and willingness to handle infected animals and provide appropriate nursing care will be essential in determining a treatment choice. In certain cases, availability of volunteers and foster homes may expand a shelter's ability to treat infectious diseases. Financial resources are vital to the ability of a shelter to pursue treatments. Inadequate treatment of disease due to lack of financial and staff resources is ill advised and, worse yet, may lead to unnecessary suffering of affected animals.

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The Shelter Population

When selecting a treatment regime, prevention of infectious disease spread to the remaining shelter population and community's animals is of utmost importance. If a vaccine is available, its use should be evaluated and implemented quickly if appropriate protection is provided. A thorough, detailed disease surveillance program should be in place to quickly identify newly infected animals and place them in isolation. Cost of treatment can also negatively impact the shelter population; expensive, prolonged or time-consuming, labor-intensive treatments for individual animals can drain shelter resources leaving fewer resources for wellness animal care.

The Patient

Variables unique to the individual patient play a major role in treatment decisions. These include adoptability, disposition (legal case, animal status as stray or owned), overall health, and immune status. Depending upon the shelter mission and philosophy, the likelihood of adoption of that patient may determine the course of treatment or whether to treat at all. Similarly, the temperament and ease of handling of the patient is an important factor to consider, especially if treatment will require a great deal of animal handling both in the shelter and after the animal goes home.

The immune status of the affected animal should guide treatment decisions. Highly vulnerable animals such as the very young, elderly and/or immune compromised may not be the best candidates for treatment. FeLV (feline leukemia virus) and FIV (feline immunodeficiency virus) testing may be advised before initiating treatment in cats because positive animals are often in an immune-compromised state and may be less responsive to therapy. Welfare considerations should also be evaluated in each case, as treatment regimes that cause undue pain and/or stress or require intensive nursing care that cannot be provided to an animal should be avoided.

Therapeutics

Therapeutic choices may vary depending upon whether or not a veterinarian is on staff at the shelter or available to the shelter for consultation. The purchase and dispensing of certain pharmaceutical agents requires a license from the Drug Enforcement Administration. In addition, it is important to check the state veterinary practice act to determine if any diagnostic or therapeutic modalities must be administered by or under the supervision (direct or indirect) of a licensed veterinarian. Appropriate storage of all pharmaceuticals, including storage of controlled substances according to regulation, is required by law. Some medications may require refrigeration and most will list ideal storage temperatures. For example, if the shelter does not have air conditioning, some medications' efficacy may be negatively impacted if exposed to excessive heat.

When choosing therapeutic agents, frequency of dosing, delivery method, length of treatment, and cost are important considerations. Therapeutics that offer the least frequent dosing interval, shortest treatment course, greatest ease of administration, and least cost possible are advantageous; however, none of these benefits should come at the expense of a desirable outcome. The side effect profile of a drug is also an important consideration. Shelter staff must weigh the risk versus the benefit to the animal, the shelter population, the environment, and human health before determining or embarking upon a treatment protocol. For example, overuse and inappropriate use of antibiotics can lead to antibiotic drug resistance, a growing worldwide public health risk. In addition, certain infectious diseases, such as *Microsporum canis* (also known as "ringworm"), are highly contagious to the shelter population and also pose a very real zoonotic risk to staff and the public.

Careful attention must be paid to the welfare of the patient when selecting and prescribing treatment protocols. At no time should a treatment regime compromise the welfare of the animal. In addition, treatment choices must not hinder the ability to accurately monitor the patient's response to treatment. If treatment for a disease interferes with follow-up diagnostic tests, a patient may be released to the general population too early, leading to inadvertent infection of more animals. Treatment protocols will need to factor in the availability of veterinary medical staff to administer and monitor response. The skill level and expertise of staff will also weigh heavily on treatment options. As a rule, shelters should only treat those animals who can be adequately cared for given all the variables discussed.

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Management of Animals Under Treatment

The importance of maintaining written individual medical records cannot be emphasized enough. Detailed medical records not only help to assess the success of a given treatment but also provide valuable insight when diagnosing and tracking a disease outbreak in the shelter. Medical records should contain information about the animal (signalment), physical exam findings, diagnostic results, treatment instructions, daily updates and progress reports, and recommendations for follow-up care.

Animals diagnosed with infectious diseases should be removed from the general population and placed in an appropriate isolation area or facility. The goal of isolation is to protect the shelter population, so careful attention should be paid to infectious disease control measures. For more information see the chapter on outbreak management.

The care of all animals with suspected and confirmed infectious disease should be overseen by a veterinarian, technician, or other assigned staff (under the guidance of a veterinary team member). Daily rounds should be conducted to observe ill animals and inform all staff working with them of any change in status or treatment. Frequent veterinary rechecks, including diagnostic tests as needed, should be completed to assess the response to therapy. It is helpful to establish immediate, short- and long-term treatment goals in order to better assess a patient's or population's progress in overcoming an infectious disease. Treatment expectations should be clearly communicated in order to better define whether treatment is achieving a successful outcome. Adjustments to the management and treatment of a case will be based upon all information gathered and whether the treatment has met the predetermined expectations. Once again, the welfare of the animal and safety of humans should be of highest concern.

Goal Setting/Defining and Measuring Success

It may seem obvious that the ultimate goal of infectious disease treatment is to achieve resolution of the infectious condition in the individual animal, yet this is not necessarily the case. Since the health status of each animal in a shelter impacts the entire shelter population (either by contagion or use of resources, for example), multiple factors should be taken into consideration when assessing success of treatment.

A successful disease surveillance program will at best limit infectious disease to an isolated incident as opposed to allowing an outbreak situation to occur before it is identified. If multiple animals are affected by an infectious disease agent, the first treatment goal may be to successfully contain spread of disease. Successful containment can be assessed when a decreasing number of new cases are identified. Minimizing the number of animals acquiring a disease while in the shelter is an important goal to set.

The success of a treatment plan can be evaluated by tracking data on sick-animal care days. The overall cost of care can be compared to the number of sick-animal days to determine the daily cost of treatment. Compare this value to the cost of routine housing and care of shelter animals to assess whether resources are being allocated wisely. Sick-animal care-day values will also shed light upon potential animal suffering that may be the unintended consequence of treating a given infectious disease. Another critical measure of shelter health relates to shelter-acquired illness. There should be great cause for concern if the percentage of animals entering the shelter as healthy, adoptable individuals who subsequently require treatment or are euthanized (due to a shelter-acquired disease) is high. (See the chapter on population management for more information.)

The mortality and euthanasia rate as they relate to an infectious disease outbreak are additional indicators of how well a shelter is addressing infectious disease management and treatment. Death of animals in the shelter or while in foster care leads to the highest level of concern for shelter health and is an indicator of a serious problem.

The most successful programs are those that constantly evaluate these indicators and modify their policies and protocols as needed. Currently, there are several shelter management software programs that will allow for gathering of daily, weekly, monthly, and annual data. (See the chapter on introduction to animal sheltering for more information about shelter software.) Close monitoring of these types of data will assist in detecting trends early and will potentially allow swifter intervention that can minimize an infectious disease's impact upon a shelter.

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Community Considerations

The most important consideration with regard to the community is safety. Placing apparently healthy or recovering animals for adoption in the face of an outbreak greatly increases the risk of exposure to the general community population and to existing animals in the adopter's home. If the infectious disease is a potential zoonotic threat, concern for staff and public safety should be the utmost.

Community expectations may play a role in some decisions a shelter makes with regard to infectious disease management and treatment. This relates to a shelter's mission, ethics and goals, and how it communicates with the public (donors, taxpayers, and customers). Shelters should partner with the public and their local veterinary community and provide open, honest communication regarding the challenges they face related to managing infectious diseases. Shelters should also play a role in educating the public about infectious disease, making sure that adopters are well informed about an animal's risk factors (potential exposure to infectious diseases while in the shelter), signs of disease to watch for, and what to do if the adopted animal exhibits any of these signs.

A good working relationship with the local veterinary community is critical to the shelter's disease surveillance programs. A shelter that has a good working relationship with its veterinary community will welcome and encourage veterinarians to notify the shelter if an infectious disease is suspected or diagnosed in a recently adopted animal. Likewise, it is important for the shelter to communicate information about infectious disease outbreaks to local veterinarians so that they will have heightened awareness when examining recently adopted animals.

CONCLUSION

Because shelter animals are potentially exposed to a higher risk for infectious disease, establishment of clear treatment and management strategies is an important component of any shelter health program. The development and implementation of well-thought-out and prewritten policies and protocols will ensure appropriate management of situations and will encourage structure, consistency, and cooperation. For a list of shelter medicine resources, please see Appendix 20.1 and Appendix 1 at the end of the textbook.

REFERENCES

Hurley, K.F. (2006) Vaccination station: The finer points of shelter protocols. *Animal Sheltering*, **Jul/Aug**, 46–53.

Miller, L. and Hurley, K., eds. (2009) *Infectious Disease Management in Animal Shelters*, 1st edn, Blackwell Publishing, Ames, Iowa.

Miller, L. and Zawistowski, S., eds. (2004) *Shelter Medicine for Veterinarians and Staff*, 1st edn, Blackwell Publishing, Ames, Iowa.

Petersen, C., Dvorak, G. and Spickler, A. (2008) *Maddie's Infection Control Manual for Animal Shelters*, Iowa State University Center for Food Security and Public Health.

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Appendix 20.1 Shelter Medicine Resources

ASV Guidelines for Standards of Care in Animal Shelters, accessible at www.sheltervet.org/display common.cfm?an=1&subarticlenbr=29

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21
Outbreak Management

Jeanette O' Quin

INTRODUCTION

Despite precautions to manage infectious diseases, shelters remain inherently vulnerable to outbreaks. Many factors that enhance disease transmission, including the collective confinement of a highly transient population of animals in various states of health, contribute to the potential for such occurrences. In addition to impacting the health and welfare of shelter animals, infectious disease outbreaks can have far-reaching effects on both people and animals in the community (Schorr-Evans *et al*., 2003; Van Immerseel *et al*., 2004; Wright *et al*., 2005).

The agents most likely to cause outbreaks in shelters are discussed elsewhere in this textbook, as are specific prevention and control strategies for animal population settings. This chapter expands on those concepts and applies them to the recognition, investigation, and management of infectious disease outbreaks in animal shelters.

INFECTIOUS DISEASE OUTBREAKS

An outbreak is defined as a greater occurrence of cases of disease than would normally be expected at a given place and time and/or a marked increase in the severity or duration of signs. Introduction of a disease that is not endemic to a specific shelter and that results in two or more related cases would be a classic example.

Depending in large part on host resistance and the infectious dose, susceptible animals develop either a clinical infection with signs of disease or a subclinical infection with no apparent symptoms. While clinically ill animals are known to shed infectious agents at higher levels and for longer periods of time than those with subclinical infections, both situations create additional risk for spread of disease. Any increase in the incidence or severity of infectious disease in a shelter warrants careful investigation beyond the customary identification of clinically ill animals. Efforts to limit the effects not only within the shelter but also within the community require an understanding of the comprehensive measures necessary to control outbreaks.

Some pathogens such as *Streptococcus equi* subspecies *zooepidemicus* and virulent systemic feline calicivirus (VS-FCV) can cause outbreaks resulting in high morbidity and mortality with swift and sometimes devastating consequences (Hurley *et al*., 2004; Byun *et al*., 2009). Similarly, outbreaks of feline panleukopenia virus (FPV), canine parvovirus (CPV), and canine distemper virus (CDV) are documented to have widespread effects in both the shelter and the community (Lamm and Rezabek, 2008; Newbury, Larson, and Schultz, 2009; Goddard and Leisewitz, 2010). A few cases of sarcoptic mange contracted from a stray puppy, though not life threatening, would also be considered an outbreak, with the potential to spread if intervention is inadequate.

Less obvious yet equally damaging are outbreaks of ubiquitous diseases such as feline upper respiratory infections (URIs) and canine infectious respiratory disease (CIRDC) complex. Though rarely fatal, a higher than expected number of cases would constitute an outbreak, as would an expected number of cases with a greater percentage developing a

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more protracted or serious course of illness, such as pneumonia. Outbreaks such as these can continue for weeks, months, or even years, taxing a shelter's resources and threatening the public's confidence in the quality of care provided by the shelter.

OUTBREAK MANAGEMENT PLANS

Just as protocols for prevention and control of specific diseases are important, so are protocols for managing infectious disease outbreaks, which remain a threat even in ideal shelter conditions. Comprehensive outbreak management plans need to address prevention, detection, investigation, and response and are most effective when written and available to all staff. Since housing options, disease risks, and available resources are so varied, there cannot be a one-size-fits-all plan. An effective protocol for one shelter may be disastrous if implemented in another. General considerations for developing outbreak management plans are summarized in Table 21.1 and are discussed in further detail throughout this chapter.

Just as no single plan will work in all shelters, no single strategy can apply to all diseases. While many components will be effective regardless of the pathogen, others are specific to the disease-causing agent. A general policy should be developed to outline what the shelter's response will be to specific diseases with outbreak potential, based on the nature and severity of the disease as well as on the shelter's available resources (Hurley and Baldwin, 2008). This policy will facilitate decision making during an outbreak when the time is critical. The policy will also guide the development of disease-specific protocols. With the primary goals of diagnosis and interruption of disease transmission, these protocols should detail how the disease is handled in the shelter (Hurley and Baldwin, 2008). Prior to diagnosis,

Table 21.1. Considerations for disease outbreak management plans.

- Describe what constitutes an unusual health event.
- Designate persons to whom unusual health events should be reported, outline the chain of communication and authority for decision-making.
- Summarize diagnostic options and identify laboratories for recommended testing.
- Establish record keeping and data collection methods.
- Designate separate areas for isolation and quarantine and determine their capacity.
- Identify alternative options should isolation and quarantine capacity be exceeded (e.g., additional space in facility, off-site treatment, transfer, foster care, and euthanasia); options may vary based on the infectivity, virulence, pathogenicity, durability, transmission, and zoonotic potential of the disease agent.
- Consider additional staff time needed to provide proper medical care, ensure humane conditions, and perform additional cleaning and disinfection tasks.
- Establish isolation and quarantine protocols, and whenever possible coordinate schedules to prevent staff from working with at-risk populations after working with animals that are sick or exposed.
- Restrict human and animal traffic in isolation/quarantine areas to the minimum required to provide necessary care.
- Increase cleaning frequency in the entire facility and review sanitation practices; revisions may be warranted on the basis of the specific pathogen.
- Develop a system to inform and educate staff and volunteers so all understand the outbreak protocols in place.
- Set parameters for determining when it may be necessary to suspend certain functions (e.g., services for owned animals, off-site events, intake, adoptions).
- Make contact with and compile a list of animal care partners (e.g., shelters, veterinary clinics, rescues) that could provide assistance if needed.
- Determine how and when the public and/or other animal care partners in the community should be notified of an outbreak that may affect them.
- Develop a media communication plan and designate a spokesperson for the shelter.

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protocols can be based on disrupting the suspected route(s) of disease transmission, such as fecal-oral, droplet, airborne, or indirect. Creating an individual plan for every possible disease is impractical; however, it is advisable to develop protocols for select diseases that are most likely to cause shelter outbreaks. For these pathogens, consideration should be given to:

- Clinical signs and severity of illness
- Affected species and zoonotic potential
- Mode and ease of transmission
- Incubation period
- Shedding interval, pre- and postinfection
- Presence of a carrier state
- Longevity of pathogen in the environment
- Effective disinfection strategies for environmental decontamination
- Reliability of recommended screening and confirmatory diagnostic tests
- Available prevention tools (e.g., vaccination)
- Identification of at-risk groups
- Treatment options and expected recovery time

OUTBREAK PREVENTION

Outbreak prevention relies heavily on infection control strategies designed to strengthen individual resistance to disease and minimize exposure to pathogens. These strategies have been discussed in other chapters in this textbook and include vaccination at or before intake; separation by species, age, and health status; treatment of preexisting conditions; good nutrition; effective cleaning and sanitation; adequate exercise; provision of appropriate housing; and other measures that ensure physical and mental well-being. Failure to adhere to those strategies, on the other hand, can elevate disease incidence and outbreak potential.

Timely recognition and separation of potentially contagious animals will also reduce the risk of spreading disease. It is recommended that a medical staff member walk through the shelter at least once a day for the primary purpose of disease surveillance (Association of Shelter Veterinarians (ASV), 2010). Training all staff to recognize clinical and behavioral signs of disease will also minimize the chance of an outbreak, and disease reporting is improved when staff fully understand why this is essential to the continued health and welfare of sheltered animals.

There are identifiable circumstances that could present a higher risk of disease transmission to shelter populations and may warrant additional control measures. Recognition of an increased infectious disease burden in the community animal population will likely result in a higher percentage of infected animals, both stray and owner surrenders, being admitted to the shelter. Intake procedures may need to be altered accordingly. Similarly, animals entering from a high-risk source, such as an animal hoarding situation or an emergency response animal transport program, or an influx of highly susceptible animals, such as unweaned litters, may also present additional risk if not appropriately managed.

Perhaps the most insidious risk factor for shelter disease outbreaks is overcrowding. The deleterious effects resulting in a higher disease burden are well documented and cannot be overcome by even the most comprehensive healthcare program. The ideal housing capacity is not simply based on the number of cages. Among other factors, determinants of a shelter's ideal capacity include the number of animals admitted and their duration of stay; the size and condition of the facility; and staffing levels and training (ASV, 2010). Methods for determining a shelter's capacity for care are further detailed in the chapter on population management. Though housing too many animals is often done with the best of intentions, this management decision compromises the health and welfare of individual animals and the entire shelter population; overcrowding increases the likelihood of disease outbreaks and interferes with disease control strategies. Over time, this can damage an organization's standing in the community, leading to fewer adoptions and further perpetuating the vicious cycle of overcrowding, stress, and disease. Moreover, a heavy financial and emotional toll is exacted on the shelter and its staff in addition to the adopters who must often pay for the veterinary care of sick animals they have adopted.

OUTBREAK DETECTION

Early identification and quick implementation of planned interventions can reduce the duration and severity of a disease outbreak, thereby lessening its potential impact. Some outbreaks are so unexpected or severe that they are hard to miss. Others,

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however, may not be so obvious without the benefit of ongoing disease surveillance. Data collected over time on the incidence of various diseases in a shelter population can be used to determine whether the current case loads represent a departure from expected levels or merely reflect a normal fluctuation in the background disease burden. Several methods of tracking these statistics are available and can be facilitated by commercially available shelter software programs as well as by other common programs such as Microsoft® Excel®.

Unusual health events such as serious illness, uncommon signs, unexplained death, or a significant increase in the number of illnesses need to be reported. Determining in advance exactly what should be reported and to whom is highly encouraged. An animal found dead in the cage, for example, should be a rare event that is required to be reported so that the cause of death can be determined. For endemic shelter diseases, it may be useful to establish a reporting threshold so that the occurrence of a specific number of cases will trigger an investigation. This is a more objective assessment than relying on individual memories and perceptions of what "seems" like more cases. Not every event will be an outbreak or even a contagious disease; however, vigilance will ensure timely outbreak detection that helps to maintain a healthy shelter population.

OUTBREAK INVESTIGATION

When an unusual health event is confirmed to be an outbreak, the nature and cause of the illness should be determined in order to guide appropriate interventions. While the primary goals during an outbreak are to alleviate suffering and stop the transmission of disease, properly conducted investigations can also provide conclusions that assist in the prevention of future occurrences.

Many questions need to be answered during an outbreak investigation. What is the cause and how is it transmitted? How many are affected? When and where were they exposed? What are the risk factors for infection? Both clinical and epidemiologic methods are employed during an outbreak investigation. Though some key components of an investigation are described here in a seemingly logical order, in practice these often occur simultaneously rather than sequentially.

Define and Identify Cases

In order to connect a case to an outbreak under investigation, a standard set of criteria must first be defined. Identifying cases that are part of the outbreak is an essential investigatory step. There should be some focus on detection of earlier cases as well since the first case to be recognized may not have been the first to occur. Depending on the disease, canvassing community partners such as other shelters and veterinary clinics may be warranted to discover whether shelter cases are part of a much larger outbreak.

A case definition should be developed on the basis of specific clinical signs and diagnostic tests as well as on the basis of epidemiologic criteria such as time and location. Counting all dogs with diarrhea, while an effective way to detect potential outbreaks by syndromic surveillance of diarrheal illness patterns, would be too inclusive to define cases in an outbreak of CPV.

A sample CPV case definition might read something like this: all dogs housed in Shelter X between August 1, 2011, and September 15, 2011, with compatible clinical signs (e.g., fever, lethargy, inappetence, vomiting, diarrhea +/– blood), and either a known exposure or a positive diagnostic finding (e.g., fecal antigen test, pronounced leukemia, or pathognomonic necropsy lesions). If a positive fecal antigen test had been required by this case definition, the dogs with false-negative test results would have been excluded from the case count. Ideally, the case definition will be structured to include all cases related to the outbreak while excluding those that are unrelated.

No case definition is perfect, and revisions on the basis of new findings or changing investigatory needs may be warranted. Revision of the initial definition may be indicated, for example, when a diagnosis is confirmed or when investigators wish to differentiate between cases acquired in the community and those acquired in the shelter. As an investigation progresses, modifications may be made to expand or narrow the case definition so long as all cases in the outbreak are included on the basis of the same criteria.

Diagnosis

Another critical step in outbreak investigation is identifying the causative agent. An initial list of differential diagnoses or a tentative diagnosis may be based on the clinical presentation including the type

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and severity of signs, course of illness, morbidity, mortality, and other associated factors. This can be used to guide the selection of appropriate diagnostics and the implementation of initial control measures. Diseases most likely to be found in shelter animals should be considered before exploring those that are considered rare or unusual. Also, keep in mind that comorbidity, or the simultaneous infection by more than one pathogen, can complicate the situation and make diagnosis and outbreak management more difficult.

Even if the diagnosis seems obvious on the basis of clinical signs, verification is necessary. Atypical disease presentations are more common in a shelter environment (Greene, 2006), and some of the more virulent pathogens have nonspecific signs that can be easily confused with other more common diseases. For example, initial assumptions that an outbreak of unusually severe CIRDC is canine influenza may be proven incorrect when testing reveals other respiratory pathogen(s) at fault. Similarly, the assumption that a sudden increase in cases of canine respiratory disease represents an outbreak of endemic CIRDC may be proven incorrect when testing confirms CDV. Without a proper diagnosis, these two situations could result in treatment and control measures that were unnecessary or inadequate, respectively.

In addition to identifying the agent at fault for an outbreak, various diagnostic tools may link seemingly unrelated cases to the outbreak, confirm new cases, identify a common source, detect at-risk animals, assess environmental contamination, and evaluate the effectiveness of treatment and prevention measures.

Data Collection

Systematic data collection and analysis are the foundation of outbreak investigation and should include both time and location of disease occurrence, as well as descriptive information about each diseased animal. When coupled with a comparison of affected versus unaffected animals, factors associated with infection and populations at risk can be identified. While a diagnosis is being sought, this information can guide initial control measures and even assist in determining the cause of an outbreak. Ongoing monitoring can be used to evaluate the effectiveness of intervention strategies and keep decision makers and community partners, including the media if needed, apprised of the status of an outbreak.

Data collection starts with comprehensive shelter records that document an animal's health, medical care, and location from intake to final disposition. Creating a chart of cases associated with the outbreak that includes pertinent information about each case, commonly called a line list, facilitates investigation and will assist in the epidemiologic analysis of temporal and spatial distribution patterns. Each row represents a single case and each column represents an important variable. The information included in a line list may vary based on the disease being investigated, but in general should include the animal's identification (ID) number, sex, age, intake date, vaccine type and date if relevant, date of disease onset, signs observed, method of diagnosis, location at time of diagnosis, and final outcome. Some shelters may also want to record the length of time to recovery in order to examine the impact of extended stays on housing capacity. Examples of disease outbreak tracking forms can be found in Appendix 21.1.

OUTBREAK EPIDEMIOLOGY

Epidemiology is the study of the distribution and determinants of health-related events in a population and the application of this study to the control of health problems (WHO, 2010). It is largely based on the understanding that most diseases do not occur randomly but are related to complex interactions of environmental and individual host factors that vary by location, time, and subgroup of a population.

While clinical assessment and diagnostics can identify the causative agent, epidemiology can be used to detect patterns and examine causal relationships between potential risk factors and outcomes. Who is affected, why them, and why not others? Even in the absence of a known cause, epidemiology can help identify variables that increase or decrease the individual risk of disease.

Infectious disease data can be summarized in numerous ways. Descriptive epidemiology organizes the data with respect to animal, place, and time in an effort to answer the questions *who*, *what*, *where*, and *when*. Animal data such as species, breed, age, sex, use of medications, and vaccination status at time of exposure may be used to describe the affected population. Place is often related to disease exposure; stratifying cases by location or creating a spot map

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of case distribution within a facility or room may provide information on the geographic extent and origin of the outbreak. Graphs, such as those described in the section on epidemic curves that follows, are commonly used to depict frequency trends over time and to compare disease incidence in subpopulations.

Statistics commonly used to describe and quantify disease occurrence include morbidity, mortality, incidence, prevalence, species, and age distribution. When investigating an outbreak, the importance of comparing unaffected to affected individuals should not be overlooked. Analytic epidemiology compares subgroups on the basis of various outcomes and risk factors in an effort to answer the questions *why* and *how*. Measures of association such as relative risk and odds ratios, and measures of potential impact, such as risk ratio and attributable fraction, can be calculated to further characterize the relationship between disease determinants and illness. Since shelters are typically dealing with a defined population of animals, calculation of attack rates can be a useful way to analyze possible contributing factors.

Attack Rates

As mentioned in the previous paragraph, comparisons between affected and unaffected groups on the basis of specific known exposure criteria can provide information vital to the identification of potential disease contributors. First, construct a table with a row for each suspected source or contributing factor and with columns for ill, well, sum of ill and well, and attack rate. Repeat the columns under the headings of *exposed* and *unexposed* (Table 21.2). Attack rates, which are actually proportions, can then be calculated by dividing the number of ill animals by the sum of ill and well for each column. The factors that have most likely played a role in the outbreak will have the greatest difference in attack rates between exposed and unexposed groups.

As an illustrative example, consider a shelter experiencing an outbreak of FPV. Nineteen cats met the outbreak case definition between August 1 and August 10, 2011. During this same time period, 72 cats were housed in the shelter's two-cat wards, A and B. This shelter does not receive animals from the public as all animals are transferred from other sheltering organizations. In this example, 40% have been vaccinated with a modified live FPV vaccine prior to arrival; the other 60% are vaccinated between 16 and 36 hours following arrival. On the basis of the available information, the investigators select a few risk factors they believe might be contributing to the outbreak and calculate attack rates to test their hypotheses.

As presented in Table 21.2, vaccination prior to arrival at the shelter shows a substantial difference in attack rates (42%, 3%), suggesting that animals with unknown vaccination histories are at higher risk for developing this disease compared to those that are known to be vaccinated. Being housed in Ward B shows little difference in attack rates (31%, 22%). Arrival in Van H also demonstrates a substantial difference (36%, 1%), not unlike that seen with vaccination prior to arrival. Additionally, the table shows that all but one of the infected cats arrived in Van H. The one case that did not travel in Van H could represent a community-acquired case or, perhaps more worrisome, secondary transmission of panleukopenia within the shelter. Examining the time interval between the arrival and onset of disease may aid in differentiation. If this outbreak were to progress with secondary and tertiary cases, the link to Van H would

Table 21.2. Panleukopenia attack rates for 72 shelter cats.

	Exposed				Unexposed			
Risk factor	Ill	Well	Total	AR%	Ill	Well	Total	AR%
Example	a	b	a + b	(a*100)/(a + b)	d	e	d + e	(d*100)/(d + e)
Housed in Ward B	11	25	36	31%	8	28	36	22%
Arrived in Van H	19	34	53	36%	1	18	19	1%
Vaccinated prior to arrival	1	28	29	3%	18	25	43	42%

Table 21.3. Panleukopenia attack rate for 43 shelter cats.[a]

	Exposed				Unexposed			
Risk factor	Ill	Well	Total	AR%	Ill	Well	Total	AR%
Arrived in Van H	18	3	21	86%	1	21	22	0.5%

[a]Not vaccinated prior to arrival.

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likely not be as apparent in an analysis of the entire outbreak. At times, examining the onset of the outbreak separately may provide information that would otherwise be obscured by disease propagation within the shelter.

As is often the case, multiple factors are interacting. The data summarized in Table 21.2 suggest that Van H is the likely source of exposure; however, the difference in attack rates was likely tempered by the highly protective nature of vaccination. To look closer at this interaction, calculate another attack rate for Van H exposure using only the subpopulation of cats who were not vaccinated prior to arrival (Table 21.3). Without this confounder, the difference in attack rates is rather dramatic (86%, 0.5%). At least two significant recommendations can follow from this epidemiologic analysis—Van H needs to be thoroughly cleaned and disinfected and efforts should be made to facilitate vaccination at the source agencies.

As a final note, attack rate comparisons can provide valuable information, but they do not necessarily represent a causal relationship. Results must be interpreted within the context of the known body of knowledge. A significant difference in attack rates, for example, may be found if patterned versus solid coat color were to be listed as a possible exposure.

Epidemic Curves

One of the simplest tools for describing an outbreak is a simple plot of the number of affected animals in a population over time. This frequency distribution, commonly referred to as an epi curve, is made by placing the time interval (usually a single day) on the x-axis and the number of new cases on the y-axis. Despite the name, epi curves are useful for studying any type of disease outbreak. In addition to depicting the presence and magnitude of an outbreak, epi curves can be used to better understand the pattern of disease spread within a population, estimate the incubation period, characterize at-risk populations, and assess the effectiveness of control strategies. Typically, epi curves fall into three different classifications—point source, continuous, and propagated.

A *point source pattern* is observed when a cluster of cases occur following exposure to a common source for a brief period of time. The curve rises swiftly to a peak and gradually declines as shown in Figure 21.1. Cases typically occur within one incubation period, which can provide valuable information if the infectious agent is not yet known. An example of this pattern might be seen if a puppy was diagnosed with CPV; susceptible animals receiving an infective dose as a result of that exposure would develop illness approximately one incubation period from the index case. Ideally, the infected and exposed animals would be separated from the population and environmental decontamination would prevent additional cases.

A *continuous pattern* results from exposure to a common source that is present for an extended period of time. The curve rises sharply but instead of peaking and declining, it tends to plateau as shown in Figure 21.2. A classic example of this is the introduction of a contaminated food or water source. The exposure would continue until the source was identified and removed. Play yards that are heavily contaminated with roundworm and hookworm eggs could provide a continuous source of exposure for parasitic infections in shelter animals.

A *propagated pattern* is more commonly seen in contagious disease outbreaks and indicates ongoing disease transmission within the shelter. Rather than being exposed to a common source, new cases result from exposure to one or more animals actively shedding the pathogen. As shown in Figure 21.3, the curve rises quickly and typically displays a series

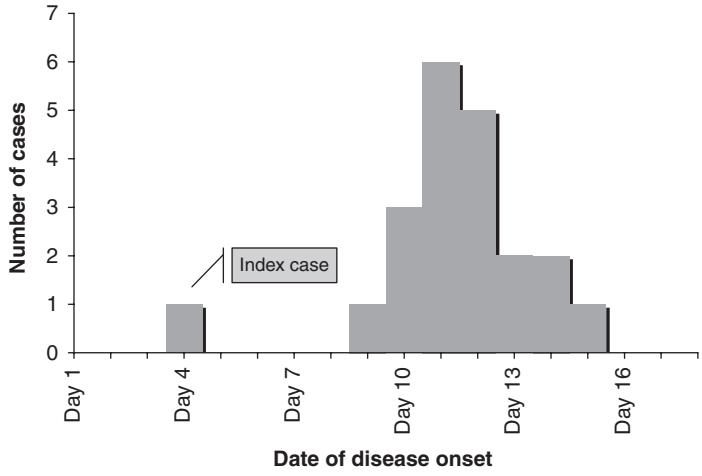


Figure 21.1. Point source outbreak.

of successively higher peaks until adequate control measures are implemented, or until all susceptible animals have been exposed and develop immunity. A steady influx of naive animals into animal shelters, however, can perpetuate this outbreak pattern indefinitely. An outbreak is usually considered to be over when two incubation periods have passed with no new associated cases. In extended outbreaks, sometimes lasting months to years, the curve will reach a steady state, with periodic fluctuations reflecting the presence or absence of other contributors to disease burden. It is imperative that those reviewing disease trends in a shelter do not mistake this relatively flat part of the curve as a normal or expected background level of endemic disease. Consistently elevated levels of shelter-acquired diseases indicate a serious problem in shelter operations, which compromises animal health and welfare.

Outbreak progression may change the pattern of an epi curve, providing additional information for investigators. If a diagnosed case of CPV, as mentioned above in the point source exposure, was isolated, but susceptible exposed dogs were removed only as they became clinically ill, then clusters of new cases might create peaks at subsequent intervals roughly consistent with the incubation period.

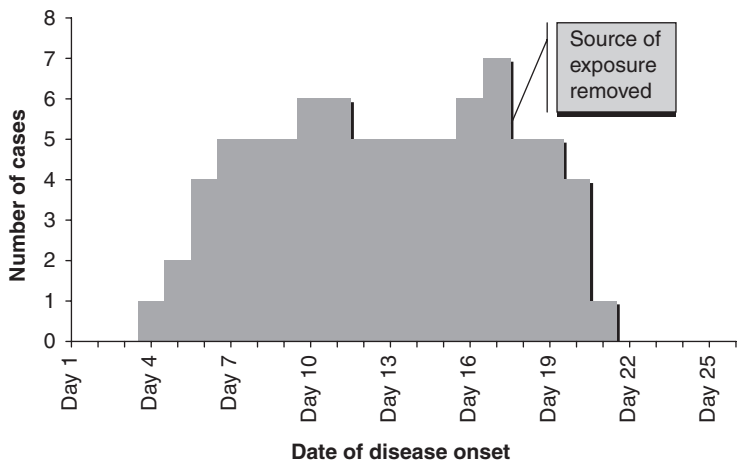


Figure 21.2. Continuous source outbreak.

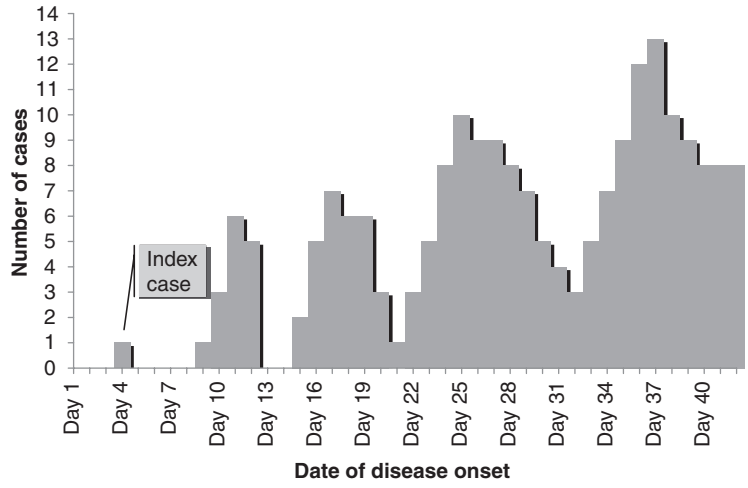


Figure 21.3. Propagated outbreak.

Though part of the same outbreak, these may initially look like unrelated events. The curve would take on a typical propagated pattern if ongoing transmission was not prevented. If the pattern becomes more sporadic with several peaks no longer separated by incubation period time intervals, or if it forms a plateau, this could indicate that there is an ongoing source of exposure in the shelter, perhaps from insufficient cleaning and disinfection or, if cases are being treated in-house, from inadequate isolation protocols.

In addition to mapping absolute frequency patterns, epi curves can be used to compare subpopulations. Case counts can be stratified on the basis of specific parameters such as age, location, or vaccination status to help determine which animals are most at risk. As shown in Figure 21.4, the total outbreak curve demonstrates the magnitude and frequency of

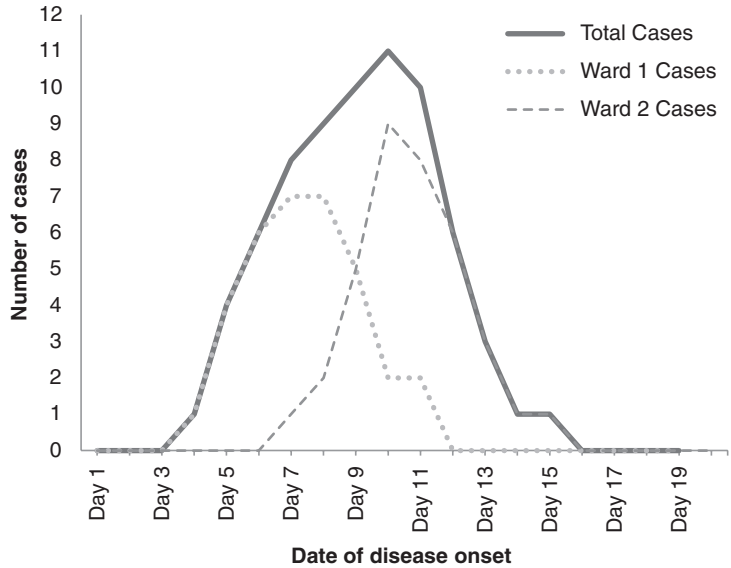


Figure 21.4. Epidemic curve stratified by location.

cases, while the location curves suggest that the outbreak started in Ward 1 and spread to Ward 2. Cage transfer, cleaning, disinfection, and fomite prevention procedures may need to be reviewed.

CONTROL MEASURES

Outbreak control measures are intended to prevent the transmission of the pathogen to susceptible animals, both in the shelter and in the community. In outbreaks of zoonotic disease, focus must also be placed on protecting people from infection. Ideally, control measures will be based on a presumptive or known etiology, but in some cases mitigation efforts are instituted while the search for an identifiable cause continues.

Implementation of control measures is greatly facilitated when general and disease-specific protocols are detailed in a written outbreak management plan (Table 21.1). An outbreak situation report and refresher training for all staff should be provided as soon as possible to ensure that everyone knows exactly what is expected of them. Some additional time spent explaining why things should be done a certain way will likely increase staff compliance.

The efficacy of specific control measures such as the ones described in this section should be continuously evaluated during an outbreak and modified as needed. Collecting and analyzing epidemiologic data as described earlier in this section on outbreak epidemiology can assist with this assessment and also provide useful information for avoiding similar outbreaks in the future.

Enhance Disease Surveillance

Disease surveillance should be enhanced in order to quickly identify and respond to new cases. This can be accomplished by increasing the number of times trained staff do a medical walk-through to two or more times per day and encouraging all staff to observe for signs of illness. Animals should be observed before being removed from a cage or run for routine care or handling. If illness is suspected, it should be reported, and the animal should be left in his or her enclosure until he or she can be managed as per established protocols. Disease can easily be spread to susceptible animals after contact with sick animals or their contaminated environs unless additional precautions are taken. This is especially important for cleaning staff who may otherwise transmit infection during routine activities.

Isolation, Quarantine, and Other Alternatives

Removing contagious animals from the general population is an essential component of outbreak management. Failing to remove these potential sources of infection only serves to perpetuate disease transmission.

Isolation refers to the physical separation of infected animals from the rest of the population. In addition to protecting susceptible animals, isolation can improve the delivery of specialized care to those who are ill. Quarantine refers to the physical separation of animals that have been exposed to a contagious disease and therefore may become infectious themselves. Isolation and quarantine are often provided in the shelter.

Alternatively, animals may be removed from the facility through transfer, foster care, or medical care programs. When effective treatment, isolation, or quarantine cannot be provided in the shelter and other options are not available, euthanasia should be considered as a last resort to alleviate suffering and protect the health and welfare of the shelter population.

Some shelters are designed with dedicated isolation and quarantine wards, which ideally possess an independent air supply. Other shelters must create space, for temporary or permanent use, by repurposing areas originally intended for other functions. Regardless, these areas should be constructed of easily disinfectable materials and preferably be located outside of the main traffic flow.

Protocols for maintaining the integrity of isolation and quarantine wards should be standardized and enforced. Additional details on cleaning and disinfection, fomite control, dedicated animal care supplies, and protective outer garments are provided in the chapter on sanitation. Contact with the animals while they are potentially contagious should be limited to that which is necessary to ensure adequate and humane care.

Regardless of the available isolation and quarantine space, some outbreaks may surpass the ability to provide necessary medical care while also ensuring that living conditions are humane. Overcrowding in these areas increases stress and delays

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recovery, thereby causing avoidable suffering. In addition, cleaning and disinfection become more difficult, increasing the chances that disease will spread to the general population. Exceeding capacity in this manner is not acceptable, and alternatives for appropriate housing must be sought.

Reducing the potential spread of disease into the community is a priority. Anyone receiving sick or quarantined animals from a shelter should be fully informed of the risks, be capable of preventing disease transmission, and have a clear understanding of who is responsible for medical care costs, including those incurred by their resident pets should they become infected. Exposed animals do not always develop disease, so giving them priority for placement over those who are already infected may have several financial and emotional advantages.

Planning in advance can allow cultivation of alternative choices such as off-site treatment through foster care programs, conditional adoptions, veterinary clinics, and transfer to suitable sheltering facilities or rescue organizations. Viable options will be largely dependent on the diagnosis; factors such as pathogenicity, transmission, severity of disease, and zoonotic potential may eliminate some choices as they may pose a significant threat to human or animal health. Assessing available resources and predetermining realistic limits for in-house care with respect to specific disease conditions will minimize the need for euthanasia and maximize the use of preferred alternatives.

Separate Infected and Exposed Animals

Infected animals should be separated from the general population and from animals that are isolated for other, unrelated diseases. When a diagnosis has not yet been determined or when a reliable diagnostic for confirming disease in individuals is not readily available, it is best to assume that all animals displaying similar signs are affected and treat them accordingly, regardless of the apparent extent of illness. Severity of clinical signs is an ineffective and dangerous way to estimate the likelihood of disease transmission. With most diseases, mildly affected and recovering animals are still contagious.

Exposed animals should be identified and evaluated individually for their risk of infection as described later in Risk and Exposure Assessment. Those at meaningful risk (exposed and at greater risk for infection as a result of that exposure) should be removed from the general population (Miller and Hurley, 2009). They should also remain separated from sick animals and from those who may be quarantined for other reasons. For instance, puppies exposed to CPV should not be moved to the isolation area for CIRDC. This may maximize the use of limited space, but it presents a significant threat to the CIRDC dogs that already have a compromised health status and may be at greater risk for infection if exposed.

Animals that are quarantined should not be returned to the general population until the maximum incubation period of the disease has passed with no signs of infection. If a case develops in a quarantined animal, he or she should be removed and handled as any other new case. A new exposure risk assessment should also be conducted at that time, with the possible outcome of extending the quarantine.

Risk and Exposure Assessment

After removing and isolating those animals that are ill, decisions must be made as to which animals, if any, should be quarantined. Infection is dependent on both the level of exposure (dose) and the susceptibility of the animal. Rather than quarantining all animals that might have been exposed, each animal can be evaluated to assess their relative risk of developing disease. Only those at meaningful risk need to be quarantined, maximizing the use of resources and minimizing disruption to other shelter functions.

Pathogen-Related Factors

Considerations for assessing exposure dose include the distance pathogens can travel, the mode of transmission, infectivity, durability of the infectious agent, shedding interval prior to the development of clinical signs, and the frequency of carrier animals. It makes intuitive sense that those closest to a source of infection will have the highest dose of exposure. Littermates, cohoused animals, and playgroup partners will have had closest contact and should be assessed as having a high level of exposure. Depending on the disease, contacts may need to be traced back a few days in consideration of the preclinical shedding period.

The primary method of disease transmission helps determine the safe distance from a source. Common feline respiratory pathogens are spread by airborne

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droplets, with the highest pathogen loads within 5 feet of the cat and common canine respiratory pathogens are spread by aerosols that can travel much farther, sometimes in excess of 25 feet (Gaskell and Povey, 1982). Physical barriers such as walls significantly reduce the risk of exposure. However, fomite transmission must also be considered; the movement of staff and shared animal care items play a significant role in disease transmission.

While somewhat dependent on the immune system of the host, infectivity refers to the dose or amount of pathogen required to cause disease. For example, Giardiasis, a disease caused by protozoa, requires a very low number of oocysts to cause infection. These oocysts are also very durable, surviving typical shelter-cleaning protocols and persisting in the environment for weeks. The combination of high infectivity and durability in the environment makes Giardia highly communicable.

Environment-Related Factors

Room size and layout, ventilation, housing, sanitation, and husbandry practices can contribute to exposure levels. Walls present a barrier to a large extent, keeping pathogens in or out. Smaller rooms have the advantage of housing and therefore exposing fewer animals. Air flow patterns and recycling of air should also be taken into consideration depending on the pathogen. It is less than ideal, for instance, to have air flow from a room with cases of CDV into a room with unvaccinated puppies.

Cage design and cleaning processes can increase or decrease the risk of exposure. Stacked cages that allow feces and urine to enter the cages below, or runs that receive "dirty" water from neighboring runs during the cleaning process, are conducive to the spread of enteric parasites and other pathogens. The use of high-pressure hoses to clean and remove animal waste can blast tiny particles into the air. These may carry along a number of infectious agents, effectively showering the room and its occupants.

Allowing puppies or cats to play on the floor while their cages are being cleaned may provide them with some exercise, but it also creates greater opportunity to have direct contact with animals in other cages as well as with any contaminants that are on the floor. Similarly, tying dogs to or near neighboring cages provides opportunity for close contact between occupants. These actions can lead to significant exposures and should be considered when assessing at-risk status.

Host-Related Factors

As previously mentioned, exposure does not always lead to disease. Animals possess both innate and acquired immunity that can reduce or eliminate their vulnerability. Other factors such as species, age, health status, and medication usage can impact susceptibility.

The species barrier is effective against diseases with a narrow host range. For example, cats do not need to be quarantined if exposed to CDV and dogs do not need to be quarantined during an outbreak of FPV. However, it should be noted that cats are susceptible to both FPV and CPV (Ikeda, Nakamura, and Miyazawa, 2002).

Young animals under 4 months are at highest risk as they may not yet have acquired immunity to most infectious agents. Regardless of age, host-specific factors such as stress, malnutrition, and preexisting disease conditions, including those known to attack the immune system (e.g., FeLV, FIV), are known to reduce resistance and should be taken into consideration when determining at-risk status.

Certain drugs are also known to reduce disease resistance. Chemotherapeutic agents and long-term use of steroids, for instance, are known to compromise immunity. Antibiotics can increase susceptibility to some infections, such as *Salmonella*, because their use alters the normal balance of protective bacteria.

For some infectious diseases such as CDV, CPV, and FPV, vaccination is highly protective, and properly vaccinated adults are typically immune. When exposed, quarantine is rarely indicated. Positive serology results for those viruses are also suggestive of protection and may be worth the cost in the face of an outbreak, especially when prior vaccination history is not known (Lappin, Jensen, and Andrews, 2000). For other diseases, such as canine influenza, vaccines provide only partial immunity. This reduces the likelihood and the severity of disease but may not prevent infection and subsequent shedding. Quarantine should be considered even for vaccinated dogs if they are exposed.

Other Related Factors

Risk and exposure assessments are unavoidably subjective; risk will never be zero, even in the absence of

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an outbreak. Every animal intake has the potential to introduce infectious disease. The goal then becomes the identification of those that were exposed to an infectious dose and have a higher than normal risk of infection as a result.

In addition to meaningful risk, shelters must also consider the expected length of quarantine, the number of animals needing quarantine, and the potential impact to the shelter and the community should outbreak control measures fail. Risk assessments will naturally be more conservative for some diseases than others on the basis of the known infectivity, virulence, pathogenicity, durability, transmission, and zoonotic potential.

Clean and Disinfect

Once infected and exposed animals have been moved, the environment can be thoroughly decontaminated. Sanitation products and usage protocols should be reviewed (see the chapter on sanitation) and altered if needed to ensure they are effective for the current outbreak. It is also important to verify that all procedures are being performed correctly and in a manner that will not inadvertently contribute to disease spread. Methods such as progressing from clean areas to contaminated areas, wearing protective outer garments, and eliminating fomites are important outbreak control measures. The importance of staff hygiene should be stressed, including proper use of protective outer garments and frequent hand washing.

While disinfectant chemicals should be used at appropriate strengths and contact times, they are not a replacement for good mechanical cleaning, which remains a very effective method of reducing environmental contamination. Cleaning frequency may need to be increased, and for nonlocalized outbreaks, the entire facility should be cleaned, including the areas where no animals are housed and the items that are not typically part of the daily routine (e.g., doors, ledges, and cage tops). Contamination of lawns and play yards should also be taken into consideration.

Protect At-Risk Animals

Efforts to identify animals that may be most susceptible to infection and provide them additional protection are also important. These protections may include restricting animal movement, avoiding potentially contaminated areas such as play yards, reducing animal contact, increasing the use of disposable items, and enhancing general health and wellness as described in various chapters in this textbook. Administering an appropriate vaccine, provided it had not been given within the last 2 weeks, might increase immunity, especially in animals less than 16 weeks of age (Davis-Wurzler, 2006).

Protect At-Risk People

During zoonotic disease outbreaks, the visitors, staff, and volunteers are also at risk, and additional precautions should be taken to prevent disease transmission to humans. Some protective measures may include prominent signage, restricted access, use of appropriate personal protective equipment (PPE), and frequent hand hygiene. Disease-specific prevention education for personnel is highly recommended, as is a review of shelter policies regarding when and how staff with signs of illness should notify supervisors and seek medical care. The shelter should report suspected and confirmed cases of zoonotic disease in humans to the local public health officials.

Depending on the circumstances, staff who are infected with a zoonotic disease should not report to work until they are no longer contagious. However, with some diseases such as ringworm, the spread of disease can be effectively prevented by reducing the risk of exposure (e.g., covering ringworm lesions), using additional PPE, and restricting activities to reduce contact with susceptible animals and people. Decisions should be made in consultation with a human healthcare provider or a public health official.

Protect Incoming Animals

Additional disease-prevention measures should be provided to those entering the shelter during an outbreak. A risk assessment should be performed at or prior to intake. For animals that have been identified as susceptible, shelters must be able to provide a suitable, uncontaminated environment, or they should temporarily refuse entry. Medical care, including appropriate vaccination, should be administered upon or immediately following arrival. The same precautions taken to protect the at-risk resident animals should be provided to the newly arrived animals. Ideally, incoming animals will be housed apart from the resident animals to further reduce the risk of contracting disease from subclinical shedding of infectious agents.

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Treatments that reduce individual susceptibility may also be available. For example, cats entering a shelter during a ringworm outbreak can be given a prophylactic lime-sulfur dip (Newbury and Moriello, 2006). However, prophylactic use of antibiotics for all animals entering a shelter is inappropriate and ill advised. For example, most pathogens involved in URI are viral and antibiotics will not be effective. Their use, even when indicated, can alter normal, protective flora, making animals more susceptible to some infections such as *Salmonella*. Additionally, indiscriminant use of antimicrobials can lead to the development of resistance that poses a risk to both human and animal health.

DECISION MAKING

When an infectious disease outbreak is suspected, there are many decisions that need to be made. Initially, the information available may be far from complete, but general outbreak control measures can begin immediately, even if the cause is yet to be determined. Regardless of the disease, separation of the sick, enhanced surveillance, careful sanitation, and protection of at-risk and incoming animals as described above will reduce disease transmission. Veterinary direction of clinical assessment, diagnosis, and treatment is essential, and consultation should be requested if not readily available from a staff veterinarian.

Animals in the Community

As the outbreak investigation gathers data for review, more informed decisions can be made to address specific concerns. One concern is contact with and disease transmission to animals in the community. Evaluate whether or not the services to privately owned animals (e.g., sterilization, outpatient medical care, day care, and obedience classes) can be safely provided, and what additional precautions may be needed to ensure their protection. Similar consideration should be given to programs that take shelter animals into the community, such as off-site adoption events, publicity spots, and humane education outreach.

If disease transmission to the public or their pets cannot be prevented, then that activity should be temporarily suspended. In many cases, depending on the severity of the outbreak, medical services can still be provided, especially if facilities and equipment are not shared with shelter animals. Alternatives for other events may also be found such as temporarily moving obedience classes or surgical services to an off-site location, or taking unexposed foster animals to scheduled public relations activities.

Shelters involved in animal transfer activities with rescues and other sheltering organizations should carefully examine the risk of spreading the outbreak to another population of animals. Animals should never be transferred without full disclosure of disease activity. Some receiving organizations may be willing and able to appropriately care for infected and exposed animals, providing assistance to affected shelters in outbreak relief efforts.

Animals Entering the Shelter

Similar consideration should be given for the well-being of animals that enter a shelter during a disease outbreak. Depending on the causative agent, disease severity, and magnitude of the outbreak, temporary restriction of intake may be indicated and should definitely occur if incoming animals cannot be adequately protected from the possibility of acquiring infection. Like adding fuel to a fire, the addition of susceptible animals merely propagates an outbreak, ultimately causing greater suffering and potential loss of life. That said, there are many measures that can be adopted to shorten the duration of intake restrictions, lessen the impact, or even prevent the need for them altogether.

Some shelters already have the necessary space and animal flow policies to adequately provide an uncontaminated environment in which to safely house incoming animals. This is facilitated when animals are routinely separated on intake on the basis of species, age, and apparent health and when animals are maintained in cohorts on the basis of arrival dates. Other shelters may need to create this space by relocating some resident animals and thoroughly disinfecting the newly available space. Intake restrictions, if necessary, may only need to be in place for the time it takes to assess the situation, isolate the sick animals, and disinfect a suitable area for receiving new arrivals.

Assessments for disease susceptibility, like those previously described for resident animals, can also be used to determine the disease risk to incoming animals. Species, age, and vaccination status are important determinants, with obvious implications in specific disease events. In most cases, animals that are not at risk for infection as a result of the outbreak

can be handled following usual protocols. Entry for at-risk animals can be refused, diverted, delayed, or allowed, provided they can be housed in a manner sufficient to protect them from disease.

Suspending Intake

If "clean" areas cannot be created and maintained for incoming animals, it will be necessary to restrict intake. At-risk animals can simply be refused entry with a full explanation of the risks to the animal's life, offering assistance to the owner to explore other options. Arrangements may be made with other shelters or rescues to accept animals that need to be refused entry in order to protect their health and control the outbreak. For highly vaccine-preventable diseases such as CPV, FPV, and CDV, shelters can offer to vaccinate at-risk animals and send them to foster care or home with their owners until enough time has passed for sufficient immunity to develop, or until outbreak control measures are no longer needed.

Suspending or restricting intake can be a challenge, especially for open admission facilities. Planning in advance can help reduce both the need and the potential impact. Consider developing relationships with other local animal agencies and rescue groups who may be willing to receive diverted animals, thus providing your shelter time to effectively contain the outbreak.

Quarantining a Shelter

Though rare, there are times when an entire facility should be quarantined, with no animals entering or leaving. This might be recommended during a widespread outbreak affecting large areas of a shelter to facilitate cleaning and allow more control of risk factors. Ringworm and CDV have caused several outbreaks that resulted in voluntary shelter closures. Multiple concurrent disease outbreaks are a strong indication that a shelter should be closed, permitting the staff and management to focus on the extensive changes necessary to contain and control rampant disease.

Shelter closure may be indicated when the disease is known to be severe and highly contagious, or when disease presents a significant zoonotic risk. A 2002 outbreak of VS-FCV in a shelter quickly spread to four veterinary clinics and several homes resulting in the deaths of nearly all exposed cats (Hurley *et al*., 2004). A few outbreaks of canine influenza virus (CIV) and *Streptococcus equi* subspecies *zooepidemicus* have also resulted in this measure as the majority of animals lack immunity to these pathogens, creating risk not only to the animals housed in the shelter but also to those in the community (Holt, Mover, and Brown, 2010; Pesavento *et al*., 2008). Reportable animal diseases may require similar action, as is the case in Rhode Island where CPV in shelters and pet stores is required to be reported to the state veterinarian who has the authority to investigate and quarantine the entire facility if indicated. In some cases, shelter activities with unaffected species can continue, but in other cases there is not enough separation of space to ensure that visitors would not inadvertently carry the infectious agent to pets outside the shelter.

Requesting Assistance from Shelter Medicine Experts

Infectious disease management in animal populations can be quite complex. Outbreak management in animal shelter populations is even more of a challenge. Nobody is expected to be skilled in all aspects of shelter management and shelter medicine. Just as some veterinarians specialize in cardiology, surgery, or equine orthopedics, other veterinarians specialize in shelter medicine. Several universities have shelter medicine programs; national shelter outreach agencies and large sheltering organizations also employ experienced shelter veterinarians who may be able to provide guidance. Many options are now available—from phone consultations to comprehensive onsite investigations. Shelters considering wide-scale euthanasia or mass depopulation are strongly encouraged to consult with a shelter medicine expert prior to making that decision. Knowing when and who to call for assistance is an important step in outbreak planning and response.

Requesting Assistance from Public Health Authorities

Many diseases affect humans as well as animals, and zoonotic disease outbreaks should be reported to the local health department, whether or not human cases are known to have occurred. With some diseases reporting may be mandatory; shelters are encouraged to include specific reporting requirements in their outbreak management plans. Health departments can also provide PPE recommendations, diagnostic services, and assistance with disease and

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exposure investigations, making them a valuable resource for shelters. On more than one occasion, a confirmed case of rabies in an animal shelter has sparked a public search for visitors and volunteers who may have been exposed (CDC, 2011). Shelters are then flooded with calls and could easily be overwhelmed without the support of health officials to screen the dozens or hundreds of persons needing a risk assessment to determine the need for prophylactic antirabies treatment.

WORKING WITH THE MEDIA

While most disease outbreaks escape the notice of the public and the press, some may attract the attention of the media. This is most likely to occur when there are large numbers of sick animals being adopted, there is an increase in animal deaths, there is disease transmission to humans, or someone makes a complaint. It is recommended that shelters appoint a spokesperson to respond to media questions, thus ensuring the quality, accuracy, and continuity of the information being shared with the public. When dealing with the media, it is best to be honest and forthcoming. If it is too early to know exactly what the cause is, provide the information that is available and let reporters know what steps are being taken to address the situation.

While newspaper and television reports can at times be inaccurate, overall they represent a powerful means of sharing information about an investigation with the public and other interested parties. An Idaho shelter outbreak of multidrug-resistant *Salmonella typhimurium* affected dozens of cats and sickened 49 people, resulting in 10 hospitalizations (Dunn *et al*., 2004). The shelter and the department of health released joint statements and kept the community apprised of outbreak status and response efforts. This was a significant investigation involving both state and federal health officials. Despite the well-publicized threat to public health, the shelter's executive director later reported that the adoption areas were busy as soon as the shelter reopened to the public (Hurley, 2004a).

Taking a proactive approach by reaching out to the media provides an opportunity to educate the public on the importance of relevant disease-preventive measures. For example, announcing a confirmed case of rabies in the shelter provides an excellent opportunity to discuss the importance of keeping pets current on their rabies vaccinations, further demonstrating both compassion and a commitment to serve as a community resource for animal health and welfare issues.

COMMUNITY CONSIDERATIONS

Sheltered animals are not an isolated population; instead, they represent a subgroup of the larger community population. Often the shelter becomes a place where various subgroups, such as stray, feral, and owned animals converge, having direct or indirect contact with each other. Some shelters are artificially expanding the borders of their source population by transferring animals in from other communities, states, and countries. Just as the growth of travel and commerce has impacted human disease risks, so too have animal disease risks been increased by the ease with which animals move across large distances (O'Shea, 2010). Whether for disaster relief, animal rescue efforts, the importation of surplus animals, or other reasons, these animals may introduce rare or foreign diseases not typically found in that area.

As previously discussed, sheltered animals can become a source of disease exposure to animals outside the shelter. In addition to those who are clinically ill, consideration must be given to the prevention of the introduction of subclinical and carrier animals into the community. These animals appear healthy and are more likely than sick animals to be taken to puppy or kitten classes, animal parks, or other public venues. Thus minimizing infectious disease levels in animal shelters not only reduces the risk of outbreaks but can reduce the disease burden for the rest of the community as well.

Shelter animals are an important sentinel for local disease trends. Intake often mirrors disease prevalence in the community, and the comparatively large numbers of animals received by a shelter make significant fluctuations more likely to be detected. Shelters also may detect the emergence of new pathogens such as CIV, which was first confirmed to have spread from racing greyhounds to companion dog populations by a Florida shelter (Crawford *et al*., 2005).

Emerging pathogens may enter and spread through a shelter, or they may actually mutate within a shelter. Many factors, including housing concentrated populations of animals in various states of health, from a wide geographic area and in a highly transient status, make this environment highly

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conducive to the emergence and spread of novel disease agents. The potential development of antimicrobial drug-resistant organisms is of particular concern. Active disease surveillance and monitoring of population health provide for early event detection, protecting both the community and the shelter from disease outbreaks. Reports of a sudden influx of dogs diagnosed with Lyme disease, for instance, may prompt investigation and public health alerts that reduce the risk to both humans and animals through increased awareness and vector control. Shelters should strive to work with community partners involved in animal health and well-being. Maintaining good communications with veterinarians, local and state health officials, animal placement agencies, and other animal care professionals in the community can aid in detection and response to unusual disease events.

Zoonotic Disease Concerns

Approximately 75% of recently emerging infectious diseases affecting humans are of animal origin; approximately 60% of all human pathogens are zoonotic (Taylor and Woolhouse, 2000). The majority of zoonotic diseases acquired from contact with shelter animals or their environs are not reported to public health agencies, so the frequency of their occurrence is unknown. Typically, only incidents with poor outcomes, law suits, or large numbers of exposures are documented. Despite the paucity of shelter reporting, the health risks to humans from companion animals are well documented. Zoonotic disease transmission, though relatively uncommon, is a risk associated with contact with all animals. However, the sheer number of animals and the number of animal contact hours accumulated through the provision of care and rehoming efforts of shelters mean that zoonotic disease outbreaks have the potential to affect a larger number of individuals.

Several years ago, a California shelter removed goats infected with *Coxiella burnetii* from a hoarding situation, exposing more than 245 persons who provided care for the goats and resulting in 30 confirmed cases of Q fever (Hurley, 2004b). Shelters have a responsibility to protect the public by implementing zoonotic disease-prevention measures and providing education to staff and adopters as needed. Many shelters owe their origins to animal control efforts aimed at protecting the public from animal bites and rabies. Shelters still play an important role in community health and have an obligation to protect both public health and safety.

CONCLUSION

Though developing an outbreak management plan can seem like a daunting task, the benefits of having one in place during an outbreak are innumerable. The development process itself can also lead to improvements in general disease-prevention strategies. Ongoing surveillance and early detection afford the opportunity to minimize potential impacts on a shelter and the surrounding community when an outbreak cannot be avoided. An epidemiologic approach to outbreak investigation is very advantageous, providing input into both the selection of appropriate control measures and the evaluation of their efficacy. Outbreak prevention is clearly preferred; however, shelters that are prepared to implement a swift and effective response are better able to protect the health and wellness of the animals in their care.

REFERENCES

Association of Shelter Veterinarians (ASV) (2010) *Guidelines for Standards of Care in Animal Shelters*. Available online at http://oacu.od.nih.gov/disaster/ShelterGuide.pdf (accessed December 19, 2011).

Byun, J.W., Yoon, S.S., Woo, G.H. *et al*. (2009) An outbreak of fatal hemorrhagic pneumonia caused by *Streptococcus equi* subsp. *zooepidemicus* in shelter dogs. *Journal of Veterinary Science*, **10**, 269–271.

CDC (2011) Public health response to a rabid dog in an animal helter–North Dakota and Minnesota, 2010. *Morbidity and Mortality Weekly Report*, **59**, 1678–1680.

Crawford, P.C., Dubovi, E.J., Castleman, W.L. *et al*. (2005) Transmission of equine influenza virus to dogs. *Science*, **310**, 482–485.

Davis-Wurzler, G.M. (2006) Current vaccination strategies in puppies and kittens. *Veterinary Clinics of North America Small Animal Practice*, **36**, 607–640, vii.

Dunn, J., Carter, K., Tengelsen, L. *et al*. (2004), in *America*, I.D.S.O., ed. 42nd Annual Meeting of the Infectious Disease Society of America, 2004, Boston, Massachusetts. Abstract 552; p.148.

Gaskell, R.M. and Povey, R.C. (1982) Transmission of feline viral rhinotracheitis. *The Veterinary Record*, **111**, 359–362.

Goddard, A. and Leisewitz, A.L. (2010) Canine parvovirus. *Veterinary Clinics of North America, Small Animal Practice*, **40**, 1041–1053.

Greene, C.E. (2006) *Infectious Diseases of the Dog and Cat*, W.B. Saunders, Philadelphia, PA.

Holt, D.E., Mover, M.R., and Brown, D.C. (2010) Serologic prevalence of antibodies against canine influenza virus (H3N8) in dogs in a metropolitan animal shelter. *Journal of the American Veterinary Medical Association*, **237**, 71–73.

Hurley, K.F. (2004a) Outbreak of drug resistant *Salmonella* at an animal shelter. *Animal Sheltering*, Nov–Dec, 2004. Available online at http://www.animalsheltering.org/resources/magazine/nov_dec_2004/outbreak_of_drug-resistant_salmonella.html (accessed June 19, 2012).

Hurley, K.F. (2004b) *Zoonotic Disease: The Enemy in Our Midst*. Animal Sheltering. July 1.

Hurley, K.F. and Baldwin, C.J. (2008) Developing infectious disease policies and procedures in an animal shelter, in *Maddie's Infection Control Manual for Animal Shelters* (eds. C.A. Peterson, G. Dvorak, and A.R. Spickler), Iowa State University Center for Food Security and Public Health, Des Moines, Iowa.

Hurley, K.F., Pesavento, P.A., Pedersen, N.C. *et al.* (2004) An outbreak of virulent systemic feline calicivirus disease. *Journal of the American Veterinary Medical Association*, **224**, 241–249.

Ikeda, Y., Nakamura, K., and Miyazawa, T. (2002) Feline host range of canine parvovirus: Recent emergence of new antigenic types in cats. *Emerging Infectious Diseases*, **8**, 341–346.

Lamm, C.G. and Rezabek, G.B. (2008) Parvovirus infection in domestic companion animals. *Veterinary Clinics of North America, Small Animal Practice*, **38**, 837–850, viii–ix.

Lappin, M.R., Jensen, W., and Andrews, J. (2000) Prediction of resistance to panleukopenia, herpesvirus 1 and calicivirus utilizing serology. *Journal of Veterinary Internal Medicine*, **14**, 364.

Miller, L. and Hurley, K.F. (eds). (2009) *Infectious Disease Management in Animal Shelters*, Wiley-Blackwell, Ames, Iowa.

Newbury, S., Larson, L.J., and Schultz, R.D. (2009) Canine distemper, in *Infectious Disease Management in Animal Shelters* (eds L. Miller and K.F. Hurley), Wiley-Blackwell, Ames, Iowa.

Newbury, S. and Moriello, K.A. (2006) Dermatophyte treatment in a nutshell–Dane County Humane Society. Available online at http://www.giveshelter.org/ringworm-treatment-program.html (accessed December 19, 2011).

O'Shea, P.L. (2010) Shelter-animal relocation raises infectious disease concerns. *DVM Newsmagazine*. Advanstar Communications Inc. Available online at http://veterinarynews.dvm360.com/dvm/Article Standard/Article/detail/694080 (accessed December 20, 2011).

Pesavento, P.A., Hurley, K.F., Bannasch, M.J. *et al.* (2008) A clonal outbreak of acute fatal hemorrhagic pneumonia in intensively housed (shelter) dogs caused by *Streptococcus equi* subsp. *zooepidemicus*. *Veterinary Pathology*, **45**, 51–53.

San Mateo County Disease Control and Prevention Unit (2004) *Epidemiological Bulletin*, San Mateo, California.

Schorr-Evans, E.M., Poland, A., Johnson, W.E. *et al.* (2003) An epizootic of highly virulent feline calicivirus disease in a hospital setting in New England. *Journal of Feline Medicine and Surgery*, **5**, 217–226.

Taylor, L.H. and Woolhouse, M.E.J. (2000) *Zoonoses and the Risk of Disease Emergence*, International Conference of Emerging Infectious Diseases. Centers for Disease Control and Prevention, Atlanta, Georgia.

Van Immerseel, F., Pasmans, F., DeBuck, J. *et al.* (2004) Cats as a risk for transmission of antimicrobial drug-resistant *Salmonella*. *Emerging Infectious Diseases*, **10**, 2169–2174.

WHO (World Health Organization) (2010) *Epidemiology*, Available online at http://www.who.int/topics/epidemiology/en/.

Wright, J.G., Tengelsen, L.A., Smith, K.E. *et al.* (2005) Multidrug-resistant *Salmonella typhimurium* in four animal facilities. *Emerging Infectious Diseases*, **11**, 1235–1241.

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Appendix 21.1

Sample Disease Outbreak Tracking Form

Animal ID	Sex	Age	Date Entered Shelter	Date and Type of Vaccine	Date of Disease Onset	Signs Seen	Location at the Time of Diagnosis (Room or Cage Number)	Method of Diagnosis (Clinical Signs, Culture, SNAP Test, Necropsy, etc.)	Outcome (R, Recovered; D, Died; E = Euthanized)

Case Definition: _____

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Section 4
Animal Cruelty

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22
Overview of Animal Cruelty Laws

Stacy Wolf

INTRODUCTION

The field of animal welfare law has advanced in many ways since the publication of the first edition of *Shelter Medicine for Veterinarians and Staff* in 2004. State and federal dogfighting laws were strengthened in the wake of former National Football League star Michael Vick's conviction on federal dogfighting charges. Louisiana and New Mexico joined the rest of the country in criminalizing cockfighting. The connection between the most heinous acts of animal cruelty and potential violence against humans became widely enough recognized that many states enacted laws authorizing protective orders in favor of family pets. Consumer and animal welfare interests aligned to foster stronger protections for dogs sold by large-scale breeders—so-called "puppy mills"—a term used to describe commercial breeding operations that emphasize profit at the expense of the physical and emotional welfare of the animals involved and that are overwhelmingly the source of purebred puppies sold in pet stores in the United States. Advances in veterinary scientific knowledge prompted revision of state euthanasia laws to ban antiquated and inhumane methods of euthanasia, particularly for shelter animals.

Notably, most of the progress made on the legal front has been to the benefit of companion animals. Farmed animals still suffer from lesser protection under the law, though there have been bright spots in the form of legislative, legal, and ballot initiatives aimed at improving the lives of animals bred and raised for human consumption.

ANIMAL CRUELTY LAWS

Felony and Misdemeanor Cruelty

In 2011, 47 states had some form of felony animal cruelty law. Five states enacted new felony cruelty laws since 2004: Alaska, Arkansas, Hawaii, Kansas, and Utah. Others strengthened the penalties for existing felony provisions, including Florida[1] in 2010 and Michigan in 2008.[2] Two states—North, and South Dakota—remain without felony animal cruelty laws.

Even in states with felony cruelty provisions, the species of animal, range of behavior, and applicable penalties vary considerably from one jurisdiction to another. For example, New York limits its felony cruelty law to the most serious types of injury or death to "companion animals," a term that includes dogs, cats, and other species if they are kept primarily as household pets. Pennsylvania's felony law covers only captive zoo animals. Still other states apply their felony provisions to livestock, animals acting in official capacities such as law enforcement and service animals, search and rescue dogs, and dogs used by peace officers.

The difference between a felony and a misdemeanor cruelty charge often hinges on the nature and severity of the injury inflicted and the state of mind of the perpetrator. Some state felony laws require proof that an animal was tortured and suffered

1. Florida Statutes, § 828.02 (2010).
2. Michigan CLA, § 750.50b (2008).

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prolonged or severe pain or permanent impairment of a bodily function. These evidentiary determinations are within the purview of the veterinarian whose expert opinion often helps the prosecutor decide which charges are appropriate. The veterinarian's courtroom testimony in postarrest proceedings regarding the cause and severity of an animal's injuries is frequently the linchpin of a successful prosecution (Wolf, 2007b).

Neglect: Failure to Provide Necessary Veterinary Care

While many felony animal cruelty laws focus on affirmative acts that cause severe harm or death (beating, shooting, stabbing, etc.), most misdemeanor cruelty laws address the all-too-frequent incidence of animal neglect: failing to provide an animal in one's care or custody (whether temporary or permanent) with necessary food, water, shelter, or veterinary care. Criminal charges based on failure to provide necessary veterinary care often require the opinion of a veterinarian to determine what medical procedures were necessary, the likely consequences of not providing them, and the likely prognosis had the needed services been administered. Since the law is disinclined to compel pet owners to provide their animals with medical treatment beyond their financial means, a distinction is often drawn between routine pet care (vaccinations, treatment for parasites, skin conditions, grooming, nail trimming, etc.) and extraordinary measures such as orthopedic surgery and cancer treatment. Failure to provide the former commonly results in cruelty charges, whereas failure to provide the latter may or may not depending upon the circumstances, including whether the owner knew what was wrong and how to treat it, whether the animal suffered pain due to lack of treatment, and how long the situation was allowed to persist.

Although many pet owners cannot afford extraordinary albeit life-saving veterinary care for their animals, failure to euthanize an animal who is terminally ill or who is suffering greatly due to untreated illness or injury may also form the basis for a cruelty charge. In Worcester County, Massachusetts, a horse cruelty case proceeded based on the owner's failure to heed the advice of several veterinarians who counseled him to have his frail, elderly horse euthanized for humane reasons (Szaniszlo, 2008; Pet-Abuse.com, 2011).

However, while the language of most state cruelty law schemes appears to cover failure to euthanize in much the same way it covers failure to provide other means of alleviating suffering, there is considerable reticence among law enforcement and prosecutors to pursue these cases except in the most extreme circumstances.

Neglect By Animal Shelters, Sanctuaries, And Rescue Groups

Government and private entities organized for the purpose of caring for homeless, sick, and abused animals are not exempt from the coverage of state cruelty laws. In fact, in recent years, animal neglect and abuse at shelters, sanctuaries, and rescue groups have spurred lawsuits and legislation aimed at better oversight of these animal care facilities. The risk that animals will not be properly cared for at animal care facilities undoubtedly increases as funding for services is cut or drastically reduced due to a downturn in charitable donations. In some areas, reduction in funding is so drastic as to make provision of basic, humane care difficult to sustain.

Deplorable living conditions, dead and dying animals at shelters, and self-proclaimed "sanctuaries" have prompted large-scale rescue operations, arrests, and criminal charges in diverse locales including Clarksdale, Mississippi; Elk County, Pennsylvania; Memphis, Tennessee; and Clay County, Kentucky. In late 2010, in the Clay County case, a concerned resident brought a civil suit against the county, alleging that it was responsible for numerous violations of Kentucky's humane shelter law (ALDF, 2010). The suit included claims of filthy living conditions, inadequate shelter from the elements, contagious diseases spread through the shelter population, "warehousing" of animals for lengthy periods without reasonable efforts to adopt them out, and failure to provide necessary veterinary care. In the Elk County case, the executive director of the so-called sanctuary was the target of cruelty charges since she was aware of and allowed neglect of more than 400 cats that lived in a filthy, cramped, and disease-ridden, single-story commercial building.

In addition to civil and criminal actions brought in individual cases, state legislatures are considering measures to tighten their laws to better define and distinguish between "shelters," "sanctuaries," and "rescue groups" and to establish workable standards

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of humane care, housing, and veterinary care for animals housed at these facilities. While some states are just considering the concept of regulating shelters, many others have long had some form of shelter regulation in place. Meaningful enforcement of existing standards remains a challenge, however, since reduction in funding is a growing problem, and government agencies are often disinclined to make animal control and welfare matters a high fiscal priority. (The Association of Shelter Veterinarians created a set of guidelines for care to help shelters self-improve and formulate realistic standards for possible future shelter regulation.) (Association of Shelter Veterinarians, 2010).

Hoarding

Hoarding is perhaps the most invidious form of animal neglect since it results in grievous harm to often very large numbers of animals, yet is so resistant to effective resolution. The Hoarding of Animals Research Consortium (HARC) identifies characteristics associated with hoarding, which include:

- Accumulation of a large number of animals–more than the hoarder is able to provide with basic care including food, veterinary care, and a clean and safe living environment;
- Failure to recognize the deteriorating nature of the animals (disease, sickness, and starvation) and the living environment (extremely unsanitary and overcrowded conditions); and
- Failure to recognize the deleterious effect of hoarding on his or her own health and well-being and that of family or household members (Patronek, 2001).

While hoarding often falls within the coverage of state cruelty laws, pursuit of criminal charges is not always realistic or possible due to the advanced age or mental health status of the hoarder (sometimes rendering him or her legally incompetent to stand trial or causing the prosecutor to have reservations about pursuing criminal sanctions). This legal Catch-22 can leave law enforcement and animal welfare authorities frustrated and hoarded animals without the help they so urgently need. In some jurisdictions, including New York City, innovative programs are emerging, aimed at curtailing hoarding by assisting hoarders in obtaining the needed services for both themselves and the animals and securing voluntary surrender of animals that cannot be properly cared for in the hoarder's home. Follow-up and monitoring of hoarders who agree to surrender animals are essential since recidivism is so high. Working closely with law enforcement is also vital to the effectiveness of these programs since criminal prosecution may become necessary when hoarders refuse assistance and conditions in their homes deteriorate further.

Legislation to make hoarding a separate crime, distinct from state cruelty law, has been under consideration in several states in recent years. In 2008, Hawaii passed a hoarding law[3] that makes it a misdemeanor for a person who possesses 20 or more dogs, cats, or a combination thereof to intentionally, knowingly, or recklessly fail to provide the animals with the necessary sustenance and to fail to correct dangerous living conditions that result from that failure. Illinois expressly addresses hoarding in its cruelty law[4] by authorizing psychiatric evaluation and treatment for convicted abusers who are deemed to also be hoarders. (For more information, see the chapter on animal hoarding.)

Animal "Endangerment"

On its face, the language of many state cruelty laws appears to criminalize not just behavior that causes injury to an animal but also conduct that endangers the welfare of an animal even when no injury occurs. States differ considerably as to whether their cruelty provisions can be invoked in situations that fall short of actual harm. Indeed even within the same state, different courts have reached differing conclusions on the issue. In one Pennsylvania case, the court upheld a conviction for cruelty where 14 huskies were in good health but had been kept in filthy, unsanitary living conditions that the court found posed a threat to their well-being and were therefore "wanton" within the meaning of the applicable provision.[5] Another Pennsylvania court found a violation of the cruelty law where a dog was tied to a chair with a leash too short to allow the animal to

3. Hawaii Revised Statutes, § 711-1109.6 (2008).

4. Illinois Criminal Statutes, 510 ILCS 70/1.01, 2.10, 3.02.

5. Commonwealth. v. Tomey, 884 A2d. 291 Pa. Super (2005).

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safely reach food and water, even though the dog was not harmed.[6] Yet another Pennsylvania case reversed a cruelty conviction where chickens were confined in glass bottles but were otherwise healthy.[7]

While interpretations of state cruelty laws to include "endangering" behavior differ considerably, the favored approach seems to err on the side of requiring an injury or at minimum quantifiable pain and suffering.

While not universally embraced under the umbrella of state cruelty laws, the "endangerment" concept commonly appears in the form of independent state and local provisions that require adequate shelter for dogs kept outdoors and that prohibit abandonment, dog chaining or tethering, and confinement in vehicles in extreme temperatures. These statutory schemes share the common thread of making behaviors that place animals in danger of harm illegal without requiring proof that harm actually resulted.

Dog Tethering/Chaining Laws

As dog bite studies have associated both reproductive status and chaining or tethering with dog aggression (Gershman, Sacks, and Wright, 1993; Delise, 2002), lawmakers have responded by banning or restricting chaining or tethering dogs as a principal means of restraint. In addition to posing a public safety threat, lengthy periods of chaining or tethering are considered inhumane since dogs are by nature pack animals that thrive on social interaction with both humans and others of their own species. Chaining prevents this natural behavior and can make a dog depressed, frustrated, and bored. Dogs are also territorial animals, and experts agree that limiting their space tends to heighten their tendency to protect that space, increasing the danger to people and other animals (Delise, 2002). A dog that is tied cannot choose the "flight" rather than "fight" response when confronted by potential danger, and hence may resort to aggressive lunging, barking, and biting in an effort at self-preservation. These consequences contribute to potential threats to public safety, which can generally be averted by affording dogs adequate exercise and socialization and by employing more humane means of restraint for limited periods of time such as a secure fenced yard or a safely configured pulley or run system with close human supervision to ensure the dog's safety from accidental entanglement, harassment, or attack by other animals or people.

Chained dogs who are aggressive or undersocialized are often turned into shelters or arrive there as victims of cruelty or neglect. Considerable behavioral expertise—not always readily accessible to shelters and humane societies—can be required to successfully rehabilitate these dogs.

Laws are increasingly aimed at combating inhumane and dangerous chaining practices (Dogs Deserve Better, 2010). Connecticut[8] and Louisiana[9] recently enacted state antichaining laws while other states, including California, Hawaii, Texas, Virginia, and Nevada, address chaining in their anticruelty provisions. Numerous localities around the country (including New York City that enacted its law in 2011) also have antichaining ordinances.[10] These laws typically prohibit tying dogs to stationary objects by means of a choke, pinch, or prong collar and tethers that allow a dog to reach objects or areas, such as windowsills, edges of pools, and roofs that pose a substantial risk of injury or strangulation. Some laws allow the use of pulley or run systems as long as they are attached by means of a proper collar that does not endanger the dog. Many laws restrict the number of consecutive hours during which a dog may be tethered or attached to a pulley or run. Exceptions to antichaining laws are also common and include tethering associated with veterinary practices, exhibitions, shows and contests, or other events where stamina, skill, or breeding is judged, dogs at grooming facilities in the course of the grooming process, tethering associated with shepherding or herding cattle or livestock, restraint of dogs for their own safety while the owner is engaged in agricultural activities, and dogs restrained by the use of a handheld leash.[11]

6. Commonwealth v. Askins, 761 A2d 601 Pa. Super (2000).

7. Commonwealth v. Anspach, 124 Pa.Super 100 (1936).

8. Connecticut General Statutes, §22-350-a (2010).

9. Louisiana Revised Statutes, §14:102.24 (2010).

10. http://www.municode.com.

11. http://www.DogsDeserveBetter.com.

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"Crush Video" Law

A disturbing market in videos depicting extreme acts of animal cruelty that appeal to certain sexual fetishists prompted Congress to enact the "Animal Crush Video Prohibition Act of 2010" (18 USC 48). "Animal crush videos" are defined as photographs, motion pictures, video or digital recordings, or electronic images that depict actual conduct where one or more living animals (nonhuman mammals, birds, reptiles, or amphibians) are intentionally crushed, burned, drowned, suffocated, impaled, or otherwise subjected to serious bodily injury. The act prohibits the knowing creation of the so-called crush videos where the person intends or has reason to know that the video will be distributed in interstate or foreign commerce, or the video is actually distributed in this manner. The act also criminalizes the knowing sale, marketing, advertising, exchange, or distribution of a crush video using a means of interstate or foreign commerce. Exceptions to the law include "customary and normal veterinary or agricultural husbandry practices," slaughter for food, hunting, trapping, and fishing. Violations carry penalties including fines and/or up to 7 years in prison. President Obama signed the act into law on December 9, 2010.

Cosmetic Surgery and Microchipping

The reach of anticruelty laws has extended in some jurisdictions to criminalize the debarking or devocalizing of dogs for nonmedical reasons and on the local level in California the declawing of cats for nonmedical reasons. The California Veterinary Medical Society lost a lawsuit in which it sought to have local laws that ban declawing invalidated based on the claim that they conflicted with the state's regulation of veterinary medicine (Viegas, 2009).[12] Ohio is among the states that prohibit devocalization of a dog known to be vicious. These procedures are already unlawful in most states unless performed with appropriate pain management by a licensed veterinarian. Expansion of the law to outlaw them entirely highlights the focus on broader humane considerations: namely the balance between surgery for primarily medical reasons and surgery for purely cosmetic or other nonessential reasons.[13]

The growing popularity of microchips as the companion animal identification method of choice has prompted changes in several state veterinary practice acts, including those of New York, Pennsylvania, Maine, Utah, and Washington, to prohibit insertion of microchips by anyone other than a licensed veterinarian (AVMA, 2010). Interestingly, although New York State defines the subcutaneous insertion of a microchip as the practice of veterinary medicine, the state has also created an exemption that allows any employee of a not-for-profit pound, shelter, duly incorporated society for the prevention of cruelty to animals, humane society, or dog or cat protective association to insert a microchip for the purpose of identification of any animal being held for adoption by such organization (New York State Ag & Markets, 2008).

Shelter veterinarians and management should be mindful of the applicable practice act and laws in their state to ensure that medical and attendant procedures performed on shelter animals comply with controlling law and anti-cruelty and practice act provisions.

Animal Fighting

National Football League star Michael Vick's fall from grace and conviction on federal dogfighting charges served as the impetus for stronger laws on state and federal levels. Dogfighting is now a felony in every state and the District of Columbia (American Society for the Prevention of Cruelty to Animals, 2010; Animal Legal and Historical Center, 2010). Spectators at dogfights are subject to prosecution for felonies in 23 states and for misdemeanor or lesser offenses in the remaining 27. Most recently, federal law was strengthened to include the knowing sale, purchase, possession, training, transport, delivery, or receipt for purposes of transportation any dog or other animal or their offspring, for the purposes of having the dog, other animal, or their offspring participate in a dogfighting venture.[14] The

12. California Veterinary Medical Association vs. City of West Hollywood, 61 Cal. Rptr, 3d 318 (Ct of Appeals, Second App. District, Division 7, 2007).

13. Ohio Revised Code Annotated, § 955.22 (2010); New Jersey Statute, §4:19-39 (2010); Massachusetts HB 344 (approved 4/2010).

14. 7 United States Code 2156, § 26 (2007).

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applicable penalty was increased from 3 to 5 years. Several states, including Idaho, Indiana, and New York, increased penalties for being a spectator at a dogfight.[15] Other states created criminal penalties for possession of paraphernalia commonly associated with dogfighting. Still others enhanced penalties for violation of existing dogfighting laws. Louisiana and New Mexico joined the rest of the country by adding bans on cockfighting to their animal-fighting laws. Texas expanded the coverage of its cockfighting law, making it more consistent with the state's dogfighting provisions.

As law enforcement focuses more attention on dogfighting, the role of the veterinarian becomes even more vital. Notably, some states, including Arizona and Wisconsin, specifically mandate veterinarians to report suspected animal fighting. Successful prosecution of a dogfighting case, whether of the street, hobbyist, or professional variety, often depends upon circumstantial evidence that cannot be established without veterinary expertise. Injuries suffered by dogs used for fighting differ from injuries incurred in other ways. The defense may offer alternative theories of causation for injuries, which can only be effectively countered with medical testimony establishing the true nature and derivation of the wounds. The opinion of a veterinarian familiar with the medical indicia of fighting and its aftermath is therefore often crucial to the successful prosecution of these cases (Lockwood, 2006; Sinclair, Merck, and Lockwood, 2006; Merck, 2007). The determination of whether dogs have been used for fighting can have legal consequences for shelter veterinarians and staff where state laws authorize euthanasia immediately following seizure of dogs believed to be used for fighting.[16] Note that these types of euthanasia laws have been and will likely continue to be challenged on constitutional due-process grounds and therefore can implicate liability issues for shelters involved in housing, care, and disposition of fighting dogs. For more information, see the chapters on animal fighting and animal behavior forensics in this textbook.

15. New York State Agriculture and Markets Law, § 351 (2008, 2010); Indiana Code, § 35-46-10 (2010); Idaho Code § 25-3507 (2010).

16. Louisiana, R.S. 14:102.6 (A)(2).

"Puppy Mill," Pet Store, and Breeder Laws

Animal welfare abuses associated with large-scale dog breeding operations have increasingly garnered media and political attention in the past decade, fueling laws aimed at heightening protection for "puppy-mill" dogs and increasing protection for the consumers who spend substantially to purchase them.

In 2008, Pennsylvania substantially overhauled its "Dog Law"[17] to implement heightened protection for dogs held or sold by commercial kennels—defined as establishments that breed or whelp dogs and either sell or transfer any dog to a dealer or pet shop kennel or sell or transfer more than 60 dogs in a calendar year. The Pennsylvania law, which took effect in 2009, requires that puppy-mill dogs receive clean, potable water, veterinary care, and access to outdoor exercise areas attached to their kennel enclosures. Housing for dogs must meet temperature regulations for hot and cold weather, provide access to natural lighting, adhere to improved sanitation standards, and include fire prevention and sprinkler systems. Euthanasia may only be performed by licensed veterinarians.

Several other states, including Iowa and Oklahoma (the second and third largest puppy-mill states), followed suit, enacting laws to better protect dogs bred and sold at large-scale breeding facilities. In 2010, a ballot initiative in Missouri, widely considered the "puppy-mill capital" of the country, would have substantially enhanced protections for puppy-mill dogs had it taken effect as voted on and approved by voters. Proposition B (the "Puppy Mill Cruelty Prevention Act") would have amended Missouri law to strengthen requirements for large-scale breeding operations regarding sufficient food, water, housing, space, veterinary care, exercise, and rest between breeding cycles. The law would have prohibited breeders from holding more than 50 breeding dogs for the purpose of selling puppies as pets and sought to create the crime of "puppy-mill cruelty," a misdemeanor independent of the state's existing cruelty provision (Puppy Mill Cruelty Prevention Act, 2010).

Unfortunately, a legislative effort to repeal Proposition B in its entirety resulted in compromise

17. 3 P.S. 459 206 218.

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legislation that severely undermined (and in some instances completely removed) many of the strongest provisions of the measure. Specifically, the compromise legislation weakened the access to outdoor exercise requirement by dictating no minimum space requirement for exercise areas, permitting the Agriculture Department to eliminate the requirement via regulation and by reverting to the prior law's approval of any exercise plan that is approved by a veterinarian. The limits on the number of breeding animals and the requirement of spacing between breeding cycles were entirely eliminated. In addition, the requirements for more humane flooring, expanded housing enclosure space, and veterinary examinations were substantially weakened. Misdemeanor penalties remained intact but only for repeat offenses.

Notwithstanding mixed results in Missouri, the trend toward enhancing consumer and puppy-mill dog protections continues, with numerous bills pending in legislatures around the country.

Irresponsible breeding and sale practices are also being attacked on the legal and administrative fronts. In New York, the State Attorney General's office issued a permanent injunction barring a Queens pet dealer from "selling, breeding, training, or advertising or soliciting to sell, breed or train dogs" in the state after a lengthy investigation and administrative hearing by the state Agriculture and Markets Department revealed a persistent pattern of consumer fraud, false advertising, and sale of puppies with a vast array of serious and sometimes fatal maladies, failure to reimburse purchasers for medical costs associated with treating the sick puppies, and failure to maintain proper documentation.[18]

Veterinarians continue to play an important role in safeguarding puppies purchased from breeders and consumers from potentially fraudulent or careless breeding practices. Many pet dealer or pet "lemon" laws require reimbursement of consumers who buy puppies that are deemed "unfit for sale"—a designation made by a veterinarian who examines the dogs and documents his or her findings. Discovery of severe illness, injury, or hereditary conditions that render puppies inappropriate for sale can trigger veterinary reporting requirements since a pattern of similar maladies in puppies sold by a single dealer (such as mange, ringworm, distemper, and hip dysplasia) can implicate crimes independent of the state puppy mill or cruelty law, such as sale of diseased animals or consumer fraud. The risk of disease transmission to other animals or human family members may also trigger criminal liability for violation of child endangerment or health and safety laws.

"Unfit Owner" Laws

Some states have in place civil "unfit owner" laws that essentially allow a civil proceeding parallel or even completely independent of a criminal prosecution at which testimony focuses on the owner's fitness to care for animals in the future rather than the likelihood of success in criminal proceedings that focus on unlawful activity that has already occurred. Evidence such as prior cruelty charges or convictions and veterinary opinions regarding future care required for the seized animals is generally permitted. If the court finds the accused "unfit," the animals can be forfeited and placed with a humane society or SPCA even though there has not been a criminal conviction, and indeed criminal charges may not even be pursued.

A preconviction forfeiture law was successfully challenged in one Kentucky court based on the grounds that it was unconstitutional since it deprived the accused of property without a criminal finding of guilt.[19] Note, however, that even where there is no preconviction mechanism for ordering relinquishment of animals, forfeiture is still often available under state law since the court can order forfeiture of animals as part of the abuser's sentence following a conviction.

A strategy related to the unfit owner concept is one taken recently by animal welfare groups in

18. People of the State of New York vs. Imported Quality Guard Dogs, Inc., The Animal Rescue Unit, Inc., Robin Schulder and Perry Reich (Supreme Court, Nassau County, 5/13/10) Judge Thomas A. Adams.

19. The Louisville Kennel Club, Inc. *et al*., v. Louisville/Jefferson County Metro Government, Civil Action Number3-07-CV-230-S (U.S. Dist Court, Western Dist of Kentucky at Louisville. 10/2/09).

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bringing civil actions seeking removal and forfeiture of abused animals independent of (and not dependent upon) criminal charges. In 2007, the Animal Legal Defense Fund (ALDF, 2007) succeeded in obtaining a permanent injunction and temporary custody of a large number of dogs and birds under the North Carolina Civil Remedy for Protection of Animals Statute[20] (2005). As plaintiffs succeed in these suits, civil remedies that provide the same or similar results as criminal prosecution are likely to be used more frequently as alternative means to ensure protection of animals in jeopardy.

Orders of restitution in favor of private entities such as shelters that incur expenses in caring for abused animals have been issued based on the theory that the shelter or humane society is a "victim" under applicable state law.[21] Conversely, restitution orders to humane societies have been stricken on appeal where state law does not include them within the crime victim definition.[22]

"No-Animal" and Restraining Orders

Courts are increasingly making use of sentencing tools aimed at preventing future acts of cruelty by convicted abusers. "No-animal" orders, expressly authorized by statute in several states, allow courts to order defendants convicted of animal cruelty, animal fighting, and other crimes against animals to refrain from owning, living with, and sometimes even having any contact with animals for a period of time dictated by the law. Even in states without express no-animal laws, courts are authorized to impose conditions of probation that are reasonably related to the offense committed and to the rehabilitation of the offender, thereby leaving the door open for "no-animal" orders in appropriate cases. Some states limit no-animal orders to specific categories of animals. New York's law, for instance, applies only to companion animals. Most laws designate the length of the order as one that the court deems "reasonable." Generally this period runs parallel to or as a condition of a period of probation, during which the court has continuing jurisdiction over the defendant even though he or she is not in prison. However, there have been no-animal orders issued for periods of time that last many years beyond the period of probation. Some courts have even issued lifetime bans on ownership or contact with animals.

Courts are, however, beginning to look at these lengthier orders with a more critical eye, measuring their appropriateness in light of the likely risk of the particular defendant committing future crimes against animals.

The connection between the most heinous acts of cruelty toward animals and potential violence against human victims has become firmly enough established that legislatures across the country have enacted laws expressly authorizing temporary and permanent restraining or protective orders in favor of the family pet in a variety of legal proceedings including domestic violence, family offense, juvenile delinquency, and criminal cases. Twenty states have restraining order laws in favor of family pets, with Arizona, West Virginia, Oklahoma, Minnesota, Arkansas, and Texas most recently (in 2011) passing pet-protective measures. Like no-animal orders, restraining or protective orders increase the length of time during which the court has jurisdiction, and hence some measure of control over the behavior of the abuser. Violations of these laws trigger violation of probation and contempt-of-court proceedings—both of which carry the potential for additional prison time.

Animal Abuse Registries

The concept of the "animal abuse registry," modeled after sex-offender registries, entered the popular lexicon with legislation passed in Suffolk County, New York, and bills introduced in several states including New York, California, Tennessee, and Louisiana, aimed at establishing a centralized repository for information about individuals convicted of offenses against animals. The potential effectiveness of these registries is unknown, and there exists the potential for unintended consequences. For example, the existence of sex-offender registries can increase the

20. Animal Legal Defense Fund v. Barbara Woodley and Robert Woodley (181 N.C. App. 594 (Court of Appeals, N.C. 2007).

21. Brown v. State of Arkansas, 375 Ark. 499 (Sup. Ct of Arkansas 2009).

22. State of Ohio v. Ham (2009); Ohio 3822 (3rd App. District, Wyandot Co 2009).

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tendency to plea-bargain down to a lesser (and non-registrable) offense. The same consequence could occur with the advent of animal-abuse registries, and unlike sex-offense penalties, applicable sentences for many animal cruelty offenses are already quite minimal.

Time will tell if animal-abuse registries can accomplish their intended goal of reducing the incidence of crime against animals. At minimum registry, laws need to be supported by consistent, statewide cruelty reporting systems accessible to appropriate law enforcement and sufficient fiscal commitment so that registry data are monitored and kept updated. Laws also need to be crafted with adequate safeguards to help ensure that they do not inadvertently fuel vigilante behavior against those convicted of animal-related crimes.

SHELTER EUTHANASIA LAW AND POLICIES

Euthanasia in Shelters

Heightened attention to shelter release and euthanasia decisions has prompted legislation to require shelters to be more transparent in their procedures, including making public information about animals available for adoption, working with rescue groups to rehome animals in danger of euthanasia, and documenting euthanasia statistics in a more formal, public way.

Permissible euthanasia methods at shelters are also in the spotlight for legislatures around the country. Several states, including New York, have revised their shelter euthanasia laws to require the use of injection with sodium pentobarbital or sodium pentobarbital solution administered by a licensed veterinarian, veterinary technician, or certified euthanasia technician.[23] Several states have also expressly outlawed use of the decompression chamber as well as other outdated modes of euthanasia not approved by the American Veterinary Medical Association (AVMA) including gunshot (except in emergency situations) and drowning (except for nuisance wildlife in some jurisdictions) (AVMA, 2007). To bring humane care laws further into step with modern veterinary thinking, several states, including New York and California, have also recently revised their shelter laws to permit intracardiac (IC) injection for euthanasia only on an animal that is anesthetized, heavily sedated, or comatose.[24]

Changes to shelter euthanasia laws impact veterinarians and technicians working in the shelter environment who should be familiar with the applicable regulations in their state. Running afoul of these provisions can have severe consequences—ranging from professional censure or discipline to criminal charges—since the use of unauthorized euthanasia methods can violate state cruelty laws.

The Cost of Caring for Abused Animals

Bearing the substantial cost associated with caring for sick and injured animals—often many of them—while criminal charges wend their laborious way through the court system, remains one of the biggest obstacles to successful prosecution of animal cruelty cases (Wolf, 2007a).

Security posting, bonding, and forfeiture laws, designed to help defray the cost that is typically borne by private shelters and human societies, vary considerably from state to state and are at best an imperfect solution to a daunting problem. The laws either mandate or permit the court to order the defendant to post a bond to cover the cost of caring for the animals. Some laws provide more help to the impounding organization than others, essentially requiring the accused to post the bond or suffer mandated forfeiture of the animals. Other states, like New York, make the process considerably more uncertain. There, the shelter or humane society bears a substantial burden of proof at an evidentiary hearing after which the court may, but is not required to, order the accused to post a bond. Even failure to post does not guarantee a forfeiture order, which in New York is also within the judge's discretion.

23. New York State Agriculture and Markets Law, § 374 (3) (a) (2009).

24. New York State Agriculture and Markets Law, § 374 (3) (a) (2009); California Civil Code, Penal Code 597u: Prohibited methods of killing animals.

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THE VETERINARY ROLE IN HANDLING ANIMAL CRUELTY

Mandated Reporting of Suspected Animal Cruelty

As of 2011, veterinary reporting of animal cruelty is either mandated or expressly permitted by law in Alabama, Arizona, California, Colorado, Georgia, Illinois, Kansas, Maryland, Minnesota, New York, North Carolina, Oklahoma, Oregon, West Virginia, and Wisconsin. Some state reporting laws apply to veterinary technicians as well as to veterinarians. Many states grant veterinarians immunity from civil and/or criminal liability for reports made in good faith to the appropriate authorities. Many of these laws also expressly allow veterinarians to share medical treatment records with law enforcement investigating allegations of cruelty or animal fighting (Wolf, personal communications). Whether reporting laws result in more frequent reporting of suspected cruelty is still an open question. Many veterinarians routinely report cruelty notwithstanding the law in their respective jurisdictions, while others are reluctant to do so even though they are mandated to do so and/or shielded from legal liability.

Because veterinarians are often the first line of defense for an animal in trouble, voluntary disclosure of suspected abuse is of course preferable. However, even where veterinarians do not voluntarily report suspected cruelty, treatment records and testimony may still be obtained via a court-ordered subpoena. Law enforcement is increasingly reliant on veterinary expertise not just in the treatment room but in the field. Engaging a veterinary expert to accompany police or cruelty investigators to a suspected crime scene involving animal victims can clarify whether it is appropriate to pursue criminal charges. Veterinary expertise is apt to become even more integral to cruelty cases as the "CSI (crime scene investigation) effect" influences investigation depth and strategy, prompting more thorough and sophisticated veterinary involvement at an earlier stage of the case (during the investigation rather than just during or after the treatment of the animal victim or during postmortem examinations).

Testifying in Court and the "CSI Effect"

Veterinarians are increasingly integral to the successful prosecution of animal cruelty cases since the nature, severity, and cause of an animal's injury or death are often the linchpin of the prosecution case. While forensic veterinary medicine has become a sophisticated specialty unto itself, many animal-cruelty cases still hinge on good old-fashioned police work and do not require complex medical testing and findings to achieve the desired goal of a conviction. Credible veterinary findings establishing that the accused caused the injury or death of the animal, or that the injury or suffering persisted over a period of time without medical treatment, coupled with evidence concerning the nature and degree of that injury, are often adequate to secure the desired result.

Still, if a case proceeds beyond the plea-negotiation stage to trial, grand expectations sometimes unwittingly created by pretrial publicity can jeopardize an otherwise strong prosecution. Media accounts that highlight the use of forensic technology like DNA testing as an integral part of a cruelty or fighting investigation can backfire when, for example, a DNA sample does not yield evidence connecting the accused to the crime—even though there is considerable other evidence that convincingly does so. Skilled defense counsel knows only too well how to create the requisite "reasonable doubt" that results in a not-guilty verdict. Therefore law enforcement and animal welfare professionals must affect a delicate balance between the desire to publically promote their successes and the need to safeguard the integrity of the criminal prosecution. As veterinary forensics continues to grow as a field of expertise, so too, undoubtedly, will the sophistication of defense challenges.

CRUELTY EXCEPTIONS: COMMON HUSBANDRY OR AGRICULTURAL PRACTICES

While the law has expanded to afford added protection to companion animals, the majority of state cruelty laws (28 in 2011) still exempt from their coverage commonly accepted "agricultural" or "husbandry" practices—terms that are often not fully defined by statute and therefore left to the interpretative prerogative of law enforcement officials and judges who may be resistant to treating as criminal practices that have long been accepted in their own rural, agricultural communities.

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Despite the gloomy outlook for farmed animals on the legal protection front, there have been notable successes in curtailing some inhumane agricultural practices. Several states including California, Colorado, Maine, Michigan, and Oregon have enacted laws to prohibit cruel farm animal confinement practices. Successful ballot initiatives in Florida, Arizona, and most recently California banned gestation crates for sows, veal crates, and battery cages for chickens. California went a step further by banning tail-docking of cows and prohibiting the sale of battery cage eggs brought in from out of the state. The production of foie gras—a delicacy derived from the force-feeding of ducks so that their livers become abnormally enlarged—will be phased out in California by 2012 as the result of legislation banning the practice,[25] which is considered especially inhumane since force-feeding can cause extreme suffering and death to the ducks subjected to it.

In 2010, a federal court in New York ruled in favor of the Humane Society of the United States (HSUS) in its federal lawsuit against the country's largest producer of foie gras based on violation of the federal Clean Water Act. The court issued an injunction against the facility, prohibiting further violations, imposing substantial fines if violations do occur, and requiring remedial action (HSUS, 2010).

CONCLUSION

While change in the field of animal welfare law seems at times glacially slow, the last decade has been a time of considerable improvement in legal protections afforded to animals—particularly those kept as companions or pets. Much still remains to be done, especially on behalf of noncompanion animals such as those bred and raised for consumption by humans. But a growing consensus that nonhuman animals should be granted the right to live in comfort and safety—free from pain, fear, and ill treatment—is one that has taken hold in many communities, state houses, and courtrooms alike. Animal protection laws will inevitably continue to change to meet this compelling, humane directive.

25. Cal Health and Safety Code, § 2580-25984 (2004) (effective July 1, 2012).

REFERENCES

American Society for the Prevention of Cruelty to Animals (2010) *Dog fighting FAQ*. Available online at http://www.aspca.org/fight-animal-cruelty/dog-fighting/dog-fighting-faq.aspx (accessed June 20, 2012).

Animal Crush Video Prohibition Act of 2010 (H.R. 5566) (2010) Available online at http://thomas.loc.gov/cgi-bin/query/z?c111:H.R.5566 (accessed August 19, 2011).

Animal Legal and Historical Center, Michigan State University College of Law (2010) *Chart of State Dogfighting Laws*. Available online at http://animallaw.info/articles/ovusstatedogfightingchart.htm (accessed June 20, 2012).

Animal Legal Defense Fund (2007) *Animal Legal Def Fund v. Woodley*, 181 N.C. App. 594 (N.C. Ct. App. 2007). Available online at http://www.ALDF.org//article.php?id=284 (accessed August 19, 2011).

Animal Legal Defense Fund (2010) Suit filed over extreme animal neglect by officials in Clay County, Kentucky (Press release, Nov. 10, 2010). Available online at http://www.aldf.org/article.php?id=1522 (accessed August 16, 2011).

Association of Shelter Veterinarians (ASV) (2010) *ASV Guidelines for Standards of Care in Animal Shelters*. Available online at http://www.sheltervet.org (accessed August 12, 2011).

AVMA (2007) *AVMA Guidelines on Euthanasia*. Available online at http://www.avma.org/issues/animal_welfare/euthanasia.pdf (accessed August 19, 2011).

AVMA (2010) *Scope of Practice: Complementary and Alternative Veterinary Medicine (CAVM) and Other Practice Act Exemptions*. Available online at http://www.avma.org/advocacy/state/issues/sr_cavm_exemptions.asp (accessed August 19, 2011).

Delise, K. (2002) *Fatal Dog Attacks: The Stories Behind the Statistics*, Anubis Press.

Dogs Deserve Better, Inc. (2010) *Get laws!* Available online at dogsdeservebetter.com/index.html (accessed August 20, 2011).

Gershman, K., Sacks, J., and Wright, J. (1993) Which dogs bite? A case control study of risk factors. *Pediatrics*, **93**(6), 913–917.

HSUS (2010) *The HSUS Wins Water Pollution Case Against Hudson Valley Foie Gras* (Press release, May 12, 2010). Available online at http://www.humanesociety.org/news/press_releases/2010/05/HVFG_050610.html (accessed June 20, 2012).

Lockwood, R. (2006) *Animal Cruelty Prosecution: Opportunities for Early Response to Crime and Interpersonal Violence*. American Prosecutors Research Institute: Alexandria, Virginia.

Merck, M. (ed) (2007) *Veterinary Forensics: Animal Cruelty Investigations*, Blackwell Publishing, Ames, Iowa.

New York State Ag & Markets § 6705.10 (2008) Available online at http://www.animallaw.info/statutes/stusnyeduc6700_6714.htm#s1 (accessed June 20, 2012).

North Carolina Civil Remedy for Protection of Animals Statute (2005) N.C. Gen. Stat. Sec. 19A-1, et seq. Available online at http://www.ncga.state.nc.us/EnactedLegislation/Statutes/PDF/ByArticle/Chapter_19A/Article_1.pdf (accessed August 22, 2011).

Patronek, G. (2001) The problem of animal hoarding. *Municipal Lawyer*, **May**/**June**, 6–9, 19.

Pet-Abuse.com (2011) *Horse Owner Charged, Milford, MA (US)* (Feb. 6, 2009). Available online at http://www.pet-abuse.com/cases/13187/MA/US/ (accessed August 22, 2011).

Puppy Mill Cruelty Prevention Act (2010) *Statutory Amendment to Chapter 273, Relating to Dog Breeders, 273.345*. Available online at http://www.sos.mo.gov/elections/2010petitions/2010-085.asp (accessed August 22, 2011).

Sinclair, L., Merck, M., and Lockwood, R. (2006) *Forensic Investigation of Animal Cruelty: A Guide for Veterinary and Law Enforcement Professionals*, Humane Society Press, Washington, D.C.

Szaniszlo, M. (2008) *Neigh Sayer: Owner Refuses to Have Ailing Horse Euthanized, Faces Cruelty Charges, April 11, 2008*. Available online at http://www.BostonHerald.com (accessed June 20, 2012).

Viegas, J. (2009) *California Cities Ban Cat Declawing*. Discovery News. Available online at http://news.discovery.com/animals/california-cities-ban-cat-declawing.html (accessed August 22, 2011).

Wolf, S. (2007a) *The Costs of Caring for Seized Animals*. ASPCA Professional. Available online at http://www.aspcapro.org/costs-of-caring-for-seized-animals.php (accessed August 22, 2011).

Wolf, S. (2007b) *The Veterinarian's Legal Role in Animal Cruelty Cases*. ASPCA Professional. Available online at http://www.aspcapro.org/the-veterinarians-legal-role-in-animal-c.php (accessed August 22, 2011).

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23
Veterinary Forensics: Medical Evaluation of Abused Live Animals

Robert W. Reisman

INTRODUCTION

The word "forensic" comes from the Latin adjective *forensis*, meaning *of* or *before the forum*. In modern use, forensic is effectively a synonym for "legal" or "related to courts." Forensic veterinary medicine is the use of veterinary scientific information to answer questions raised in a public forum–a court of law. Depending on the case, veterinary forensic evidence may be a weekly weight chart showing an emaciated dog gaining weight with no medical intervention (indicating starvation as the likely cause), a microchip that may help to establish animal "ownership," or DNA from an object used to physically injure an animal, thus identifying the weapon and linking it to the animal. The information that is described as forensic evidence is not determined by the type of information, but the fact that the information is used to explain an animal's health in a court of law.

Forensic veterinary medicine is a new field that in some form or another has been practiced for a long time. It is only recently, however, that there has been a focused effort by a critical mass of veterinarians and other experts to work in and advance the field. A forensic veterinary evaluation of a live animal victim of cruelty must be approached in the context of a potential criminal prosecution for animal cruelty; questions must be considered and answers sought in this context. Consideration of clinical signs and choice of diagnostic tools must also be made in this context. There are some key elements of the forensic medical investigation that must be considered in all cases. Foremost is the determination of whether an animal has been injured and is suffering as a result of human neglect and/or abuse. This is especially true in states where there is no endangerment clause in the animal cruelty statute.

ANTICRUELTY LAW

In the United States, the laws that define unacceptable care or treatment of animals vary from state to state. Every state has an anticruelty statute and for the most part, animal cruelty is prosecuted under state law, not federal law. Neglect, abuse, and cruelty are legal terms for which there is no uniform set of definitions. Animal cruelty is a legal, not a medical determination. Law enforcement and the district attorney's office determine whether the evidence collected supports arrest and a criminal prosecution for animal cruelty. Cases are prosecuted differently in different states. The Michigan State University College of Law, Animal Legal & Historical Center (http://www.animallaw.info), is an excellent resource for animal law.

VETERINARY PARTICIPATION IN ANIMAL CRUELTY CASES

Veterinarians may become involved in animal cruelty cases in a variety of ways. The animals may be alive or deceased. Abused animals may be presented

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directly to a veterinarian in an exam room in a private clinic or at a shelter or humane society. In these cases, suspected abuse cases should be referred to law enforcement for further investigation.

Law enforcement may request veterinary participation in a case. The animals may be brought to the veterinarian or the veterinarian may travel to a location to evaluate the animal(s) (e.g., animals on farms, dogfighting or puppy-mill raids, animals being hoarded, etc.) and/or participate in crime scene investigation (popularly referred to as "CSI"). The latter requires knowledge above and beyond that required to conduct a forensic evaluation of an animal or animals. (See the chapter on the handling of deceased victims of animal abuse for more information about CSI.)

Types of Cases

There are two general types of cases where veterinarians perform forensic evaluations: (1) cases where there is one or a relatively small group of animals and (2) cases where there are a large number of animals (puppy mills, hoarding situations, dogfighting raids). The latter are called large-scale cases (Merck, 2010). These two types of cases are approached differently. In cases where there are one or a few animals, the animal's or animals' health status may be understood to a very fine level of detail. This is usually not possible in a case where there are hundreds of animals, due to insufficient time and resources. In these cases, an organized approach is necessary, and a minimum database of information to gather about each animal's health must be decided upon.

With even a small group of animals, similarities in the animals' presenting health conditions allow some assumptions to be made. If there are three emaciated dogs in a backyard, and there are no overt signs of disease (i.e., sneezing, coughing, vomiting, diarrhea), it is more likely that the animals are emaciated because they have been starved rather than because they all have cancer. In other words, similarities in clinical presentation of a group of animals tend to rule out certain problems as the cause, and rule in others.

Reasons a Veterinarian May Suspect Animal Abuse

- Animals who are brought to the exam room are suspected to have been abused because of information gathered during history taking, disparities between medical history and examination findings, or inadequate explanation of examination findings. History taking includes statements made in person or on the telephone to staff and statements made to staff or other clients in the reception area. Accurate documentation of all statements is essential.
- In human medicine, "a marked discrepancy between clinical findings and historical data as supplied by the parents is a major diagnostic feature of the battered child syndrome" (Kempe *et al*., 1962). It is this same discrepancy between the "story" and the clinical findings that may lead a veterinarian to suspect animal abuse.

  Helen Munro first identified these discrepancies as part of the "Battered Pet Syndrome" (Munro, 1998):

  1. The account of the accident does not fit with the injuries observed.
  2. The owner refuses to comment on how the injury occurred.
  3. The owner shows a lack of concern for the animal's injuries.
  4. There is a delay in seeking veterinary treatment.

  An additional reason to suspect animal abuse is when a review of the medical records uncovers a history of trauma involving one or multiple animals in a household

The case history that follows illustrates the first scenario, i.e., when the account of the accident does not fit with the injuries observed.

Case History 1

A man brought an injured, 5-month-old Dachshund puppy to a veterinary emergency hospital at 11:30 PM. He explained that the puppy "fell while being bathed." The veterinarian identified multiple serious injuries that could not have occurred as the result of an accidental fall in a bathtub. Humane Law Enforcement was called to investigate a complaint of suspected animal cruelty. The puppy died in the animal hospital the next day. A necropsy was performed to identify the full extent of the puppy's injuries. The puppy had fractures to left ribs 11 and 12 and right ribs 3, 4, 5, and 6; extensive lung contusions; a hemothorax; a hemoabdomen; and liver lacerations

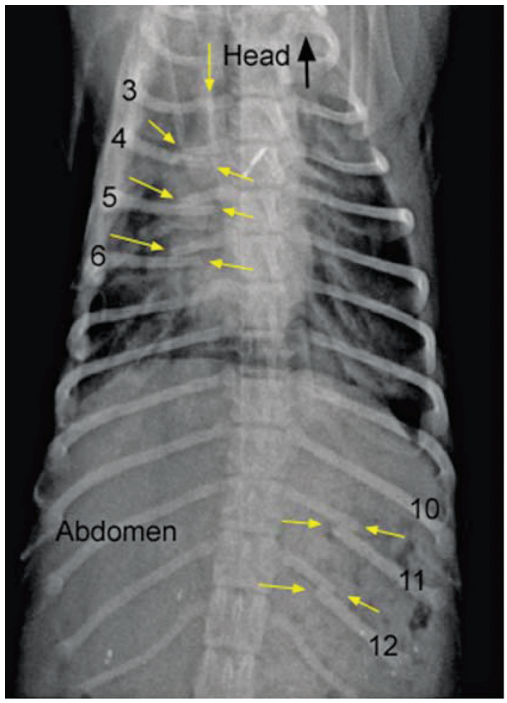


Figure 23.1. Chest radiograph showing six rib fractures in Dachshund puppy.

(the source of the abdominal bleeding). See Figure 23.1. These are all blunt force trauma injuries. People who abuse animals usually have a "story" to explain how the animal was injured; yet in this case these injuries clearly were not caused by a fall while being bathed. The perpetrator was found guilty of aggravated felony animal cruelty.

Making a Good-Faith Report of Suspected Animal Abuse

As of 2011, 28 states have some law related to veterinary reporting of animal cruelty (Wisch, 2011). In many of the states with a veterinary reporting law, there is also an immunity provision. Immunity statutes protect the veterinarian (and sometimes veterinary technicians) from civil and/or criminal liability as a result of making a good-faith report. In a personal communication in 2010, Randall Lockwood, ASPCA senior vice-president of Anticruelty Initiatives and Training advised that Alabama, Arizona, California, Colorado, Illinois, Maryland, Minnesota, Nebraska, Oklahoma, and West Virginia mandate veterinarians to report animal cruelty, while in Arizona, California, Georgia, Illinois, Minnesota, West Virginia, and Wisconsin, veterinarians are mandated to report dogfighting (legally considered a different offense than animal cruelty). In Oregon, veterinarians are mandated to report aggravated animal cruelty, which is a felony (Wisch, 2011).

ANIMAL CRUELTY AND FAMILY VIOLENCE

Every veterinarian should understand the link between animal abuse and other types of family violence. Animals, children, domestic partners, the elderly, and individuals who are mentally or physically challenged are all potential victims of a violent individual. A report of suspected animal abuse by a veterinarian may lead to an investigation that may ultimately benefit multiple potential victims.

A survey of 53 families with companion animals in New Jersey who met state criteria for child abuse/neglect revealed that 60% of these families' animals were abused. Animal abuse occurred in 88% of the households where there was documented physical child abuse (Deviney, Dicker, and Lockwood, 1983). In another study, 71% of women (with companion animals) in a battered women's shelter said that their companion animals were threatened, hurt, or killed by the batterer (Ascione, 1998).

Case History 2

In a case that occurred a number of years ago, a married physician beat the family dog, a King Charles Spaniel, to death. This individual also abused his wife. There were no children involved. The perpetrator made a phone call to his wife to tell her what he had done. She insisted that he go with her to take the deceased dog to their veterinarian. In front of his wife and the veterinarian, the man confessed to killing the dog. During this fatal beating, he was bitten by the dog. The man claimed that the fatal beating was in response to being bitten by this small 15-pound dog.

Violent individuals who physically abuse animals frequently claim that the animal's injuries are the result of an accident or the abuser claims self-defense. It is important to consider that, in reality, it may be the animal who is acting in self-defense and that the physical abuse came first. Animals should not automatically be considered the aggressor.

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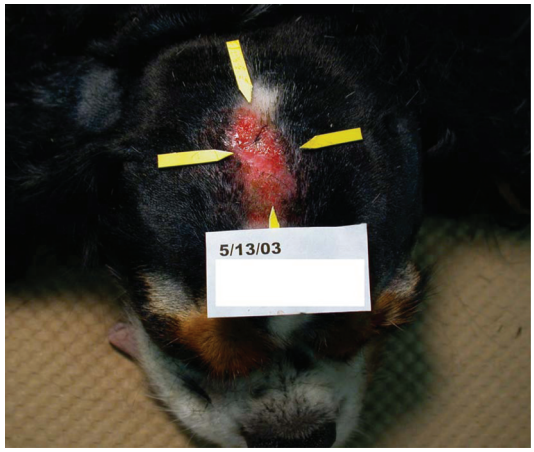


Figure 23.2. The skin abrasion on the top of the King Charles Spaniel's head represents a blunt force trauma injury.

The veterinarian's only action in this case was to call the department of health to report a dog bite. Although the dog was properly vaccinated against rabies, and there were no cases of the disease in the area for over 40 years, the department asked the veterinarian to refrigerate the dog's body so it could perform rabies testing. However, Humane Law Enforcement was alerted about the dog's death and seized his body. A necropsy was performed, and the cause of death was confirmed to be severe blunt force trauma. The dog had extensive subcutaneous and muscular hemorrhage, several broken ribs, severe lung contusions, a hemothorax, and a brain injury. But, just as importantly, histopathology showed fibrosis of the liver and kidney, and the presence of hemosiderin in the lungs, liver, and kidney, which is evidence of previous physical abuse. The claim of self-defense no longer applied.

When the husband was out of the room, the wife asked the veterinarian if he thought that the dog had been beaten previously. She had some sense of what was happening to the dog because it was happening to her as well. On the basis of the evidence gathered by the veterinarian and the other facts of the case gathered by investigators, the husband pled guilty to misdemeanor animal cruelty.

Five years after the dog's death, the wife requested a copy of the necropsy report. She was finally divorcing her spouse, and she wanted to document his abusive nature. This case is illustrative of many aspects of an animal cruelty case. A complete veterinary forensic evaluation provided evidence that the dog had been physically abused over a period of time; the fact that the woman was also abused by her husband helps demonstrate the link between animal abuse and domestic violence. The veterinarian who was first presented with the dog, even with knowledge of the animal abuse via the perpetrator's own admission, failed to make a report. In some states where veterinarians are mandated to report suspected animal abuse, there could be potential penalties associated with the failure to report a case of this nature.

THE VETERINARY ROLE IN ANIMAL CRUELTY CASES

The role of the veterinarian in handling animal cruelty cases includes (1) forensic medical evaluation of the animal, (2) development of a treatment plan, (3) documentation of medical findings and procedures, (4) a statement of medical findings, (5) preparation of animals for adoption to a new home when appropriate, and (6) testimony in court as an expert in veterinary medicine.

It is important that the veterinarian and staff handling an animal cruelty case understand that from the very beginning everything associated with the case, including the animal, constitutes evidence that must be properly handled, gathered, processed, and preserved. The chain of custody of the evidence, which must be maintained in every cruelty case, requires accountability of the location of all evidence for the duration of the case. For more information, see the chapter on examination of the deceased victim.

Forensic Veterinary Medical Evaluation of Suspected Victims of Animal Cruelty

The forensic veterinary medical examination of suspected victims of animal cruelty includes documenting everything that happens from the time a veterinarian is first asked to evaluate an animal. This includes:

1. Medical history taking, which may involve speaking directly to the animal abuser or the investigator on the case
2. The physical exam

3. Clinical pathology
4. Imaging (photography, radiography, ultrasound, etc.)

Forensic Veterinary Medical Evaluation: Medical History

In situations where abuse victims are presented in the exam room or shelter, the veterinarian should be aware that he or she may be speaking directly with the abuser or someone who knows the abuser. The importance of obtaining a thorough history and of following up with an investigator when suspicions arise regarding the veracity of the client's account of the circumstances is illustrated by case history number 3.

Case History 3

A woman with a young child brought a neglected Cocker Spaniel to a veterinary hospital. The dog's highly objectionable odor could still be detected in the hospital the next day. The dog's hair coat was very badly matted. The hair mats on the ears were soiled with blood and feces. Sarcophagid fly larvae were feeding on ulcerated and necrotic tissue at the base of the right ear. See Figures 23.3a and b. This dog was the victim of severe neglect.

The woman's story at presentation was that she had left the animal with a friend for a period of months and had returned to find the animal in a severe state of neglect. She expressed outrage at the animal's condition. In addition to the hair and skin problems, the dog had an oral tumor, severe dental disease, and chronic cystitis. Humane law enforcement was notified of the case. The investigation into the whereabouts of the "friend" proved fruitless. The woman was re-interviewed, and this time confessed that she was the person solely responsible for the dog's health and welfare. The dog was legally seized, a criminal summons was served, and child welfare was notified of the case. The woman was found guilty of misdemeanor animal cruelty at trial. This case history shows that (1) contrary to what many veterinary professionals may believe, animal abusers do bring their animals to veterinarians for care and (2) the fact that they do does not necessarily protect them from being charged with animal abuse. This also applies to owners who relinquish animals to shelters for rehoming or euthanasia.

Case history number 4 further illustrates the importance of careful history taking and documentation.

Case History 4

In 2008, an individual called a local veterinary hospital and said that after his dog urinated in his apartment, he "slammed the dog to the ground." He proceeded to say that the dog was unable to use one leg, which was now very swollen. The veterinarian who took the call documented it in the medical record by putting quotations around the phrase "slammed the

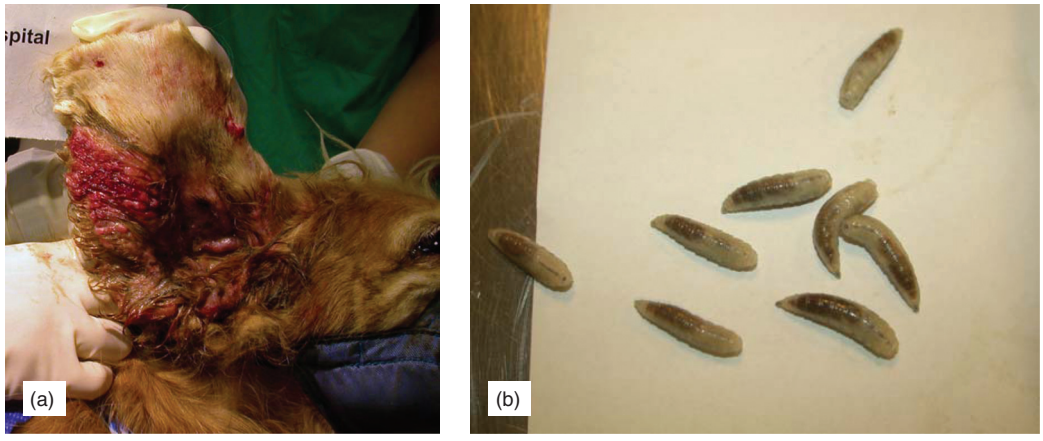


Figure 23.3. (a and b) A Cocker Spaniel's severely compromised right ear and the sarcophagid larvae found under the right ear mat.

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dog to the ground." This part of the medical record was read at the trial and provided powerful evidence of animal abuse. The owner was convicted of misdemeanor animal cruelty. This case demonstrates the importance of carefully documenting historical data obtained from a client.

The third scenario Dr. Munro identified in her Battered Dog Syndrome is illustrated in case history number 5.

Case History 5

A veterinarian was presented with a young adult indoor-only cat with a broken leg. The veterinarian was uncomfortable with the client's lack of interest in the circumstances that resulted in the injury. The staff grief counselor, who is also a psychologist, was asked to speak with the client, a young woman who 2 years previously had relocated from the Midwest to the New York City. The woman revealed that she had turned to prostitution to support herself. A man in her apartment injured the cat. As a result of the veterinarian's observations and actions, stemming from her discomfort with the client's attitude, the woman reestablished her relationship with her family and moved back home. Interventions in animal abuse cases should not be viewed as being only punitive; potentially they can save both human and animal lives.

Behavior Factors

Questions about behaviors that put an animal at risk in the presence of an abusive individual may provide information about the circumstances of the animal's condition. It is recommended that veterinarians incorporate questions about these behaviors into their routine history taking and not just in instances of suspected abuse. Routinely asking these questions will make it easier to ask the questions in the difficult circumstance of suspected abuse and may also make it easier to interpret responses. In cases where there is no abuse, the veterinarian may learn about problems that otherwise would have been missed.

Behaviors that may put an animal at risk include:

1. The need for constant supervision
2. Urination and defecation in the house
3. Chronic illnesses that may result in diarrhea and/or vomiting or result in a significant financial burden
4. Resistant or destructive behavior
5. Aggressive behavior
6. Excessive noise

Note that these same behaviors put children, the elderly, and disabled persons at risk. "Problems stem from the limitations of the parents or other caregivers in meeting these demands" (Loar, 1999).

In addition to questions about animal behavior, the veterinarian should try to ascertain the person's relationship with the animal: are they the animal's primary companion? How long have they been with the animal? Are there other animals at home?

Evaluation of the Medical Record(s)

A careful review of an animal's medical record is essential to determine if there is a history of abuse. Medical records of other animals in the family should also be reviewed to determine whether there is evidence of abuse of different animals.

Veterinarians may be uncomfortable handling their suspicions that a client may have abused an animal and be unsure what steps to take next in handling their suspicions. Former legal counsel for the ASPCA's Humane Law Enforcement department recommended that veterinarians not alert a suspected abuser to their suspicions or accuse a person of any criminal wrongdoing (Melissa Rubin JD, personal communication). However, failure to take any action can result in continued abuse and endangerment to an animal or human.

Case History 6

In a 2011 high-profile case in New York City, a video recording was made of a woman beating an 11-month-old Bulldog with a snow shovel. A neighbor who had previously heard the dog's cries made a recording with his cell phone's video camera. Humane law enforcement agents responded to the complaint, and the dog was surrendered. During the forensic evaluation, review of this young dog's medical records showed that he had been taken nine times to a local veterinary hospital for two leg fractures, two aural hematomas, an eye injury, and broken teeth. No report was made by the veterinarian of suspected animal abuse. This case illustrates the importance of reviewing all medical records when building a case to look for past evidence of abuse that may have been overlooked.

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Histories Obtained From Law Enforcement

If law enforcement or a humane investigator requests a veterinary evaluation of a live animal, a medical history should be obtained that is similar to any other medical history. Veterinarians are trained in medical history taking and should use their experience. There are two parts to the history given by law enforcement: (1) The investigator's observations and (2) the information that was provided by the person or persons the investigator interviewed. The veterinarian should try to differentiate between the information provided by the investigator as a result of direct observation and information obtained from witnesses. If the veterinary evaluation is performed early in the case, the law enforcement investigation is generally incomplete and the initial historical information that law enforcement provides may also be incomplete or inaccurate.

The forensic veterinary medical investigation is separate from and independent of law enforcement's investigation. To establish an accurate and truthful determination of the animal's health status, the information the veterinarian needs from law enforcement should be limited to details that may have impacted the animal's health. It may be necessary for the veterinarian to ask the investigators to try to clarify or gather additional information to that end.

Law enforcement does not have the same understanding of clinical signs of disease as do veterinarians. Law enforcement and the prosecuting attorney rely upon veterinarians to provide an accurate assessment of the animal's medical condition. It is the veterinarian's responsibility to accurately evaluate the animal and draw his or her own conclusions in a neutral and objective manner. There will be instances when the medical determination supports a finding of abuse, but there will also be instances when it does not. The forensic veterinary medical evaluation is a search for the truth.

Forensic Veterinary Medical Evaluation: The Physical Exam

Animal Identification

The first part of the forensic examination involves accurate animal identification. The animal victim should be identified by species, breed type, color, reproductive status (intact or spayed/neutered), and age. It is not unusual for the client, receptionist, and/or the investigator to inaccurately identify an animal. The veterinarian must take responsibility for complete and accurate identification of the victim. In some cases, it is as simple as correcting an input entry error. A defense attorney questions a witness with the goal to call into question the witness's integrity and knowledge. Animal misidentification or incomplete identification is grist for the criminal defense lawyer's mill.

Animal Identification: Age Estimation

The age of an animal frequently has to be estimated. A variety of clinical findings can be used to estimate age. In young animals, tooth eruption and bone development can be used to estimate age with reasonable accuracy. In a growing animal less than 1 year of age, accurate age estimation is necessary in order to compare the growth of a starved animal to the growth of a normal animal (growth curve).

Clinical findings that help with age estimation include:

1. *Dentition*. Eruption of deciduous and adult teeth and the pulp cavity width can help with age estimation (see Table 23.1).
2. *Bone development*. Radiographs provide information about bone development in young animals under the age of 2 years. Appearance and closure of ossification centers and epiphyseal plates occur at specific ages (Ticer, 1975; Schebitz and Wilkens, 1986). It is ideal to take radiographs 1 month apart so that changes in bone development can be identified. See Figure 23.4. A board certified radiologist can also be consulted to help provide this estimate.
3. *Nuclear sclerosis* indicates an animal is over 5 years of age.
4. *Benign prostatic hypertrophy* usually occurs in intact males over 5 years of age.
5. *Heart valve appearance* on an echocardiogram can suggest approximate age to a cardiologist.

Animal Identification: Forensic Science Identification

Almost everybody is familiar with a process called forensic science identification. After all, fingerprints and DNA are part of almost every crime story in print, on television, and in the movies. Veterinarians now also have the opportunity to perform DNA

Table 23.1. Age estimate based on tooth patterns: a composite of information from five veterinary dental texts.[a]

Dog Dental Formula (upper/lower)
Deciduous 2 × (I 3/3 C 1/1 P 3/3) = 28
Permanent 2 × (I 3/3 C 1/1 P 4/4 M 2/3) = 42

Eruption of Teeth in Dogs

	Deciduous Teeth (Age in weeks)	Permanent Teeth (Age in weeks)
Incisors (I)	3–6	12–20
Canine (C)	3–5	12–24
Premolars (P)	4–12	16–24
Molars (M)	Not applicable	16–28

Cat Dental Formula (upper/lower)
Deciduous 2 × (I 3/3 C 1/1 P 3/2) = 26
Permanent 2 × (I 3/3 C 1/1 P 3/2 M1/1) = 30

Eruption of Teeth in Cats

	Deciduous Teeth (Age in weeks)	Permanent Teeth (Age in weeks)
Incisors	2–4	11–16
Canines	3–4	12–20
Premolars	3–6	16–24
Molars	Not applicable	16–24

[a]Bojrab and Tholen (1990), Emily and Penman (1990), Harvey (1985), Kertesz (1993), and Mulligan, Aller, and Williams (1998).

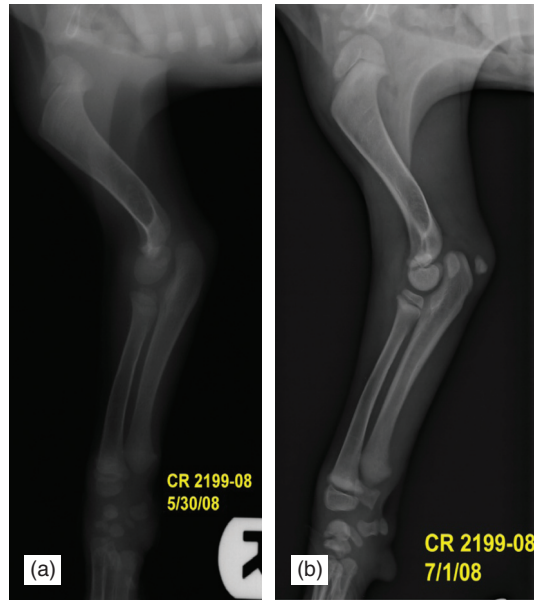


Figure 23.4. (a and b) Radiographs of the same puppy taken 1 month apart. Most obvious is the appearance of the olecranon ossification center. This ages the puppy at 8–10 weeks.[1,2] This information, in combination with the puppy's dental formula, allows relatively an accurate estimation of age. Information on aging growing dogs can be found in the following references:
1. Ticer, T. (1975) *Radiographic Technique in Small Animal Practice,* W.B. Saunders, Philadelphia, P.A, p. 101.
(Ticer in turn credits Chapman, W.L. (1963) Appearance of ossification centers and epiphysial closures as determined by radiographic techniques. Thesis. Colorado State University, Fort Collins, Colorado.)
2. Schebitz, H. and Wilkens, H. (1986) *Atlas of Radiographic Anatomy of the Dog and Cat*, Verlag Paul Parey, Berlin.

analysis. This might help identify the weapon used in the commission of a crime, if, for instance, the animal's saliva, blood, and/or tissue have been left on the weapon. DNA analysis can help identify a crime scene, if during the abusive event, animal blood or tissue is left at the location.

Veterinary medicine has its own special type of forensic science identification: the microchip. Identification of a microchip in a cruelty victim can provide a wealth of information that can be used in the case prosecution. Microchips are used to identify an animal, obtain information about the animal's owner, the length of time an individual has had an animal (from the date when the chip was implanted), and the animal's previous health status. If for instance an animal was microchipped at a shelter, the shelter medical records will be informative about the animal's previous health status. The benefit to prosecution of a cruelty case may be enormous. It may, for instance, become immediately clear that an animal has lost significant weight since adoption.

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The length of time an animal has lived with a particular person may be deemed long enough for the person to be responsible for the animal's current state of health.

Even if an owner has not registered a microchip, the microchip manufacturer can generally ascertain whether the microchip was purchased by an animal shelter, humane society, veterinary clinic, etc., and if the purchaser has kept records, it becomes possible to determine the identity of the animal in whom the microchip was implanted.

There are instances in which an implanted microchip cannot be identified. This may be due to improper scanning technique. (See the chapter on introduction to animal sheltering for more information on proper microchip scanning.)

Forensic Medical Evaluation: Physical Exam

A complete physical examination is the basis for all forensic veterinary medical evaluations. This must be performed regardless of how many animals are being evaluated. Information about the animal's weight, body condition, wounds and other injuries, systems health, and the animal's state of comfort are determined with a complete physical exam.

Abuse takes the form of neglect and/or nonaccidental injury. The animal is evidence, and in the case of a live animal, the evidence changes: animals gain weight, hair mats are removed, wounds and injuries are treated and heal. It is essential that the animal's presenting health be completely and thoroughly evaluated and documented.

While some state laws criminalize behavior that endangers and/or injures animals, many cruelty prosecutions hinge on proof of physical injury and/or the presence of pain and suffering. In states where there is no endangerment clause, the central medical questions in animal cruelty cases are always: (1) was the animal injured and (2) did the animal experience pain as a result of human action or inaction?

The length of time an animal's health has been compromised is also central to a criminal prosecution for animal cruelty. This can be a difficult determination. It is, however, the type of information that differentiates forensic veterinary medicine from general veterinary practice. The longer an animal lives with compromised health, the stronger the evidence for criminal prosecution.

In a recent case, a puppy was alleged to have been physically abused (i.e., kicked multiple times). A complete medical evaluation was required to establish the evidence in the case. The physical exam only identified a broken tooth. Identification of the full extent of the puppy's injuries involved the use of a variety of diagnostic tools. Radiography identified a broken rib. Blood tests identified liver and muscle injury in that ALT (alanine aminotransferase), AST (aspartate aminotransferase), and CPK (creatine) were elevated. Abdominal ultrasound identified perirenal hemorrhage, and hematuria was identified by urinalysis.

Physical Exam—Behavior

The animal's behavior at presentation and afterward should be documented. An abused animal's behavior during handling may provide information about his or her deviation from a so-called state of comfort (i.e., distress and/or pain). Behavior frequently changes as an animal's health improves. The change is not predictable; progressions both toward and away from socially acceptable behavior can be observed. Behavioral rehabilitation is sometimes a more difficult task than medical rehabilitation, especially in instances where the animal was not socialized at a young age—an occurrence that is not unusual in a neglected animal. Although unacceptable behavior cannot generally be directly associated with abuse (and thus does not provide support to the criminal prosecution), it is frequently the reason an abused animal cannot be successfully placed in a new home.

Deviation from a State of Comfort

Because animal abuse causes pain and distress, in addition to identifying injuries, the veterinarian must attempt to describe the animal's deviation from a state of comfort. A variety of terms can be used to describe the negative consequences of neglect and abuse on an animal's state of comfort. The word "pain" is certainly most identified with deviation from a state of comfort. The Institute of Laboratory Animal Research of the National Research Council (NRC) has chosen the terms pain and distress to describe negative effects of research on animals. The NRC describes an animal's state of comfort across a continuum from comfort through discomfort to distress and pain (NRC, 1992). While discomfort and

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distress are identified primarily by observation of an animal's behavior at rest and during activity, pain is frequently identified by an animal's response to handling, i.e., behavior during human interaction, or use of analgesics. Consequently, the interpretation of an animal's deviation from a state of comfort involves a combination of different types of observations, such as behavior in the kennel, mobility, response to handling, and response to analgesics. It is possible to identify an animal both in distress and in pain. The continuum from comfort through discomfort, distress, and pain is not nice and neat, but the language is very good and allows a reasonable description of an animal's deviation from a state of comfort. Describing the deviation is complicated but often necessary in cruelty cases.

Terms Used to Describe Deviation from a State of Comfort

Deviation from a state of comfort can be characterized as discomfort, distress, and pain. Pain can be further characterized as acute or chronic, and as mild, moderate, severe, or excruciating. One goal of assessing an animal's physical and psychological state is to provide care that results in the animal approaching or achieving a physical and psychological state of comfort (NRC, 2000). In a veterinary evaluation of a victim of animal cruelty, the assessment of an animal's physical and mental health and his or her deviation from a state of comfort is central to the criminal case. Indeed, where there is no endangerment clause in the state's animal cruelty law, this assessment may significantly influence the decision to proceed with a criminal prosecution or the decision not to prosecute.

Comfort is a state of equilibrium in which an animal is in good health, accustomed to his or her environment, and engages in normal activities such as eating, drinking, grooming, social interaction, sleeping–waking cycles, and reproduction.

Stress negatively affects an animal's comfort and may result in discomfort, distress, and/or pain. Injury, disease, starvation, and surgery are some causes of physiologic stress. These in turn may result in pain and dehydration, which are also stressors. Fear, anxiety, boredom, loneliness, and separation cause psychological stress. Environmental stressors can result from restraint, overcrowding, noise, odors, habitat, people, other species, chemicals, and pheromones.

Discomfort describes a minimal change in an animal's comfort as a result of stress from environmental changes or alterations in his or her physical or psychological state. Physiologic or behavioral changes that indicate a state of stress may or may not be observable.

Distress is a state in which an animal cannot escape from or adapt to external or internal stressors that result in negative effects on well-being (NRC, 2000). This aversive state may result in an animal showing maladaptive behaviors or illness. It can be evident as abnormal eating, absence of or reduced postprandial grooming, inappropriate social interaction (e.g., aggression, passivity, or withdrawal) with others of the same species or human handlers, and reproductive problems. Distress may result in pathologic conditions such as gastric and intestinal lesions, hypertension, and immunosuppression. Maladaptive responses that briefly reduce an animal's distress can become permanent parts of the animal's behavior and threaten their well-being. Generally, any behavior that relieves the intensity of distress is likely to become habitual, regardless of its long-term negative effects. Examples of such behaviors are coprophagy, hair pulling, self-biting, and repetitive stereotyped movements.

Pain is a complex experience that results from mechanical, chemical, or thermal stimuli that damage tissue or have the potential to damage tissue (NRC, 1996; Lamont, Tranquilli, and Grimm, 2000). Physiologic pain occurs when a nociceptive or noxious, i.e., painful or injurious, stimulus threatens tissue health. Physiologic pain is a defense mechanism that warns of potential injury and initiates reflexes to avoid injury. It is transient and distinctive from pain that occurs from tissue injury.

Tissue pathology or recent injury results in pathologic or clinical pain. Acute pathologic pain facilitates undisturbed healing by causing the animal to avoid external stimuli, thus serving a useful biologic function. Chronic pain, however, persists for many months. There may or may not be an ongoing noxious stimulus such as inflammation present. Chronic pain offers no useful biologic or protective function. Chronic pain implies more than just duration; it is debilitating and has a significant negative impact on a patient's well-being. Chronic pain is

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often characterized by poor response to analgesic therapy.

Assessment of an Animal's Deviation from a State of Comfort

This assessment, frequently called a "pain assessment," is essential to medical evaluation and treatment of neglected or abused animals. In people, the "gold standard" for pain assessment is verbal communication between doctor and patient about the patient's experience. Since animals are unable to verbally communicate what they have experienced, it is the responsibility of the veterinarian to first observe and then interpret the animal's behavior. This assessment aids treatment and supports the prosecution of the individual who has abused an animal. In general veterinary practice, the goal is to ameliorate or resolve pain. Pain does not have to be accurately described to prescribe treatment. It is reasonable to guess at the presence of pain. In forensic veterinary medicine, however, pain must be defined because it is evidence of abuse.

A form to assess pain postsurgically that utilizes some of the language from the Glasgow pain questionnaire (Glasgow Short Form Pain Questionnaire, 2010) can be found in Appendix 23.1. Other pain assessment forms are available from Colorado State University (Canine and Feline Acute Pain Scales, 2006).

Body Condition Scoring

All states have laws requiring that animals be provided with food, water, and shelter. As a result, starvation cases are among the most straightforward abuse cases to prosecute. The hallmark of starvation is weight loss manifested as poor body condition, i.e., a reduction in body fat and/or muscle mass. Body condition scores (BCSs) are subjective observations of the consequences of weight loss. There are many ways to verbally describe an underweight animal. One benefit of body condition scoring is that it uses consistent, clearly defined terms to describe an animal's diminished body condition due to weight loss.

The ASPCA uses a modified version of the Purina Body Condition System to score underweight dogs and cats (Purina, 2011). It is a nine-point scale that has become the standard for body condition scoring. The scale ranges from 1 for emaciated to 9 for grossly obese, with an ideal body condition being 5. Each point on the scale from 9 to 1 represents an approximate 5% loss in body weight (Lusby and Kirk, 2009). Going from ideal (5) to thin (3) represents primarily a loss of body fat (~10% weight loss). From thin (3) to very thin (2), the body loses muscle as well as fat (an additional 5% weight loss). Using muscle as well as fat for energy means the animal has a starvation metabolism and should be noted as such in the veterinary statement. The use of muscle for energy needs is abnormal, but is necessary for starved animals to survive. A change from very thin (2) to emaciated (1) involves continued loss of muscle and fat (an additional 5% weight loss). The animal takes on a skeletal appearance.

Another BCS less commonly used, the Tufts Care and Condition Scales (TACC), use slightly different terms, reflect only underweight conditions, and were largely based on the original Purina canine scales (Patronek, 1998). TACC also contains weather and neglect scales. See Table 23.2 for a comparison of the two scales.

All weight gain is compared to the animal's entry weight. It is thus very important to accurately weigh the animal at intake. It is recommended to weigh the animal three times to ensure an accurate entry weight is recorded. Keep in mind that an underweight animal may also be dehydrated, and part of the animal's increase in weight subsequent to hospitalization may be due to rehydration. Body condition scales do not account for changes in water weight. If an animal is 5% dehydrated at intake, a final weight increase of 30% represents a 25% increase in fat and muscle weight.

Because it is generally not possible to know an underweight animal's ideal body type, it is better not to commit to a specific BCS when the animal first presents that might underestimate the animal's weight loss, as this could create problems in testimony. On entry, two adjacent BCSs (e.g., thin and very underweight, or lean and thin) should be circled. It isn't difficult to imagine the defense attorney saying, "If a veterinarian (expert) underestimates the BCS, how can my client be expected to know an animal's correct body condition?" Of course if it is clear at intake that the animal is emaciated, it is appropriate to circle only that term. In the end, the real evidence of starvation is weight gain without significant medical intervention.

Table 23.2. Comparison of Purina and Tufts Body Condition Scales for underweight body scores.

Purina nine-point scale	Tufts care and condition scale	% Body fat	% Decrease body fat	% Decrease body weight	Ideal weight = 100#
1. Emaciated	5 Emaciated	≤5	>15%	>20%	<80#
2. Very Thin	4 Very Underweight	6–9	14%	15%	85#
3. Thin	3 Thin	10–14	10%	10%	90#
4. Lean	2 Underweight Lean	15–19	5%	5%	95#
5. Ideal	1 Ideal	20–24			100#

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There are two times when a body condition determination is made in an animal cruelty case: (1) at intake, when the determination should be "vague" and two terms should be circled, and (2) when the animal has reached his or her ideal weight. At this time, the animal's weight gain can be calculated. If weight gain is sufficient to support a change from an emaciated body condition to an ideal body condition, the final veterinary statement can, for instance, definitively state that the animal presented with an emaciated body condition, i.e., the animal had lost at least 20% of his or her body weight to proceed from an ideal BCS to emaciation.

There are two ways to calculate the difference between an animal's presenting underweight body condition and his or her ideal body condition. First, after a dog gains enough weight to reach an ideal BCS, it is possible to calculate the percent weight loss the animal experienced to end up with his or her presenting weight and body condition (weight gain divided by the ideal weight).

In the second method, the percent weight gain back to ideal (weight gain divided by presenting weight) can be calculated. This will be a larger number than calculating loss because the denominator is smaller, i.e., the underweight BCS as opposed to the ideal BCS. Weight gain of course does represent the actual observed change in the dog. A 33% weight gain from the presenting underweight BCS is equivalent to a calculated weight loss from ideal of 25%. Either calculation allows for a definitive statement of the animal's presenting BCS to be made.

The average body fat content for a dog is 20–24%. (See Table 23.2.) An emaciated dog has a body weight loss of at least 20–25% from ideal. Any weight loss of 20% or more must include significant muscle mass loss as well as fat loss.

Clinical Pathology

Regardless of the type of cruelty case, a standard set of laboratory tests (chemistry and complete blood count, urinalysis, and fecal evaluation) adds another essential level of information about the animal's health that is very valuable. It is, for example, common to see thrombocytosis, hypoalbuminemia, and anemia as part of the clinical picture of a starved animal. Weight loss due to starvation in an animal with an initial normal body condition proceeds to emaciation over a minimum of 4 to 6 weeks. Emaciation (the loss of fat and muscle), regardless of the cause, is a chronic process. Hypoalbuminemia and anemia result from chronic compromise of the animal's health and are additional evidence of chronicity. In trauma cases, elevations of CPK and AST indicating muscle injury or elevations of (ALT) and AST indicating liver injury may be seen.

Imaging

Radiography

Radiographs are a vital diagnostic tool in all cases of animal abuse. Skull, chest, and abdomen studies provide essential information. In emaciated animals, it is common to identify "garbage" in the animal's gastrointestinal tract. The ventrodorsal (VD) abdominal view is an excellent way to show a narrow waist in an emaciated dog (the dog's waist is literally the width of his vertebral column). Nor is it uncommon to find various healed rib fractures on neglected and abused animals. This is a hallmark of the

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"Battered Pet Syndrome" (Munro, 1998). All swellings and wounds should be radiographed. Stab wounds may leave notches in the underlying bone. Swellings may be associated with underlying bone fractures. All trauma and suspected abuse cases should have a complete set of radiographs of the whole body so that all fractures, old and new, are identified. Digital radiography allows easy incorporation of the radiographic image into the veterinary statement.

Photography

There is no substitute for photographic documentation of a crime scene and the crime victim because it provides a permanent and accurate visual documentation of the original appearance of the evidence. It also provides an opportunity to document the animal's recovery step by step. The importance of the different aspects of the physical evidence may not be evident during the initial investigation. Photography allows a later review of evidence by investigators.

A digital single lens reflex (SLR) camera provides the best-quality photographs. The camera should always be perpendicular to the subject/object to avoid shape distortion. There are three standard views used in forensic photography (Wolf, 2009):

1. *Overalls*—Photographs of the entire body/crime scene.
2. *Orientation*—Photographs that record a specific point of interest in proximity to a recognizable physical feature or anatomic landmark. This view is essential. It provides "orientation" for the close-ups. Without the orientation photographs, it may not be possible to identify the location of a close-up view of a wound or other area of interest.
3. *Close-up/macro*—Photograph of a specific point of interest. This view may exclude any recognizable landmarks.

An important point is that no images should ever be deleted from a series of digital images.

TYPES OF ANIMAL ABUSE

Animal abuse is classified as neglect or nonaccidental injury (Merck, 2007). Both neglect and nonaccidental injury can be intentional. Nonaccidental in this context is not a synonym for intentional.

Types of Abuse: Neglect

The most common types of neglect encountered by the author are:

1. Collars embedded in the neck
2. Hair coat matting (complete matting; strangulating mats)
3. Medical neglect (bite wounds; chronic parasitism, both internal and external; physical injury)
4. Starvation (adult animal; growing animal)

Embedded Collars

Embedded collars generally occur in young, growing animals. The problem develops because a collar (or chain) is placed on the puppy or kitten and as the animal grows, the collar doesn't accommodate the change in the animal's neck size and becomes embedded. The length of the embedded part of the collar and the circumference of the neck where the collar is embedded (which is greater than the collar length) should be recorded. Photographs of the collar with blood and tissue attached are particularly helpful in documenting the severity of the problem (see Figure 23.5). In cases where a very heavy chain

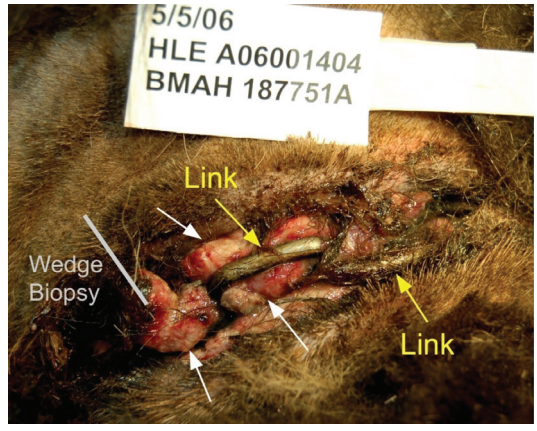


Figure 23.5. A chain is embedded in the dog's neck. The scar tissue has grown through the chain links. The chain has to be surgically removed. A wedge biopsy is taken from the haired skin through scar tissue down to healthy. The thickness of the scar tissue allows an estimate of the age of the wound.

is attached to the collar, the length and weight of the chain should be recorded. The wounds from an embedded collar are generally on the ventral surface of the neck because the animal pulls against his restraint.

According to Sean McDonough, Diplomate of the American College of Veterinary Pathologists and a professor in anatomic pathology at the New York State College of Veterinary Medicine at Cornell University, the length of time that a wound has existed can be estimated on the basis of the principle that it takes approximately 1 week for a granulation bed to form. Granulation tissue then grows at a rate of about 1 mm per day and 1 cm per month, i.e., the rate of growth slows as the lesion ages (personal communication, 2002). A wedge biopsy from the haired surface through the entire thickness of scar tissue to healthy underlying tissue allows the determination of the full thickness of scar tissue.

Hair Coat Matting

Extreme hair matting is a serious form of neglect that should not be regarded simply as a matter of mere esthetics or appearance. Animals experience pain as movement becomes compromised and severe skin disease occurs. In addition, severe matting interferes with the animals' ability to scratch, thermoregulate, and groom themselves, and feces and urine can accumulate in their fur, contributing to pain and discomfort. In some of the most severe cases, there can be strangulation of lower extremity blood supply and loss of a limb. (See Figure 23.6.)

Figure 23.7 provides a form that serves as a checklist for the variety of findings associated with severe matting. Some of this language was taken from the Tufts Animal Care and Condition Scales (TACC) (Patronek, 1998). Severe matting should be carefully documented in the medical record, and a photograph of the mats should be taken after their removal. Photographs of the animal with the mats, after their removal, and when the animal has been properly groomed should be taken and entered into the medical record.

Medical Neglect ("Failure to Treat")

Some state anticruelty statutes mandate veterinary care; most, however, do not. This makes criminal prosecution for medical neglect somewhat more



Figure 23.6. (a and b) A matted paw with strangulation of the blood supply below the tarsus. There is resulting soft tissue and bone necrosis. (c) Radiograph of the affected limb. These wounds in the author's experience have always occurred below the carpus or tarsus where the blood supply is vulnerable to strangulation.

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Label

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Haircoat and Nails - Long Haired: Dog ☐ Cat ☐

Choose 1, 2, 3 or 4 to describe matting

1. Haircoat a single mat that prevents normal movement and interferes with vision. A complete clipdown required. Yes No

2. Substantial matting of haircoat. Large sections of hair matted together. A complete clipdown required. Yes No

3. Numerous mats, but animal can still be groomed without a total clip down. Yes No

4. Hair coat is dirty and/or has a few mats. Yes No

Foreign material embedded in mats. Yes No

Visible feces on coat Yes No

Fecal / urine staining of hair coat; Yes No
of legs Yes No
of ventrum Yes No
of hind end Yes No
other _____ Yes No

Strong offensive odor from coat. Will require one or more baths to resolve odor. Yes No

Pododermatitis. Yes No

Choose 1 or 2 to describe toe nails

1. Nails extremely overgrown Yes No

2. Nails long Yes No

Nails penetrate pads (Describe; inflammation, pain?)

Nails interfering with normal gait. Yes No

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Figure 23.7. Checklist used for long-haired dogs and cats with poor physical care. This form is used in conjunction with a diagram of the dog or cat.

difficult, in most states, than, say, prosecution for starvation or physical abuse. However, according to Dr. Lila Miller, the vice-president of Veterinary Outreach for the ASPCA and editor of this textbook, in some cases where the law requires the provision of proper sustenance, this has been interpreted to include veterinary care to prevent needless suffering. In these cases, the veterinarian may be asked about the standard of veterinary care for the region and what treatment a reasonably prudent person would provide given the same set of circumstances (personal communication, 2011).

Starvation

Not every emaciated animal has been starved. Starvation in adult animals is proved by weight gain without significant medical intervention. Animals should be weighed and photographed at the beginning of the case and when the animal has attained his or her ideal body condition, or even weekly if possible. Clinical signs of a starved animal are:

1. Very underweight or emaciated BCS—loss of fat and muscle

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2. Degenerative myopathy secondary to severe muscle catabolism. Loss of musculature is often very pronounced around the temporal muscles on the head. Dogs are weak and have a hunched posture.
3. Atrophy of other tissues (e.g., liver, kidney, pancreas, lymph nodes, and fat), especially in animals who have starved to death.
4. Gaining weight primarily from eating, without significant medical intervention.
5. Thrombocytosis, hypoalbuminemia, anemia due to a chronic disease process (e.g., starvation).
6. Reduced protein/nitrogen metabolism because of extreme muscle catabolism. As a result, blood urea nitrogen (BUN), creatinine, and urine specific gravity values tend not to be accurate.
7. Consumption of objects/substances with no nutritional value.
8. Gastric ulcers—melena. This tends to occur when the animal is near death and is a relatively common finding in dogs who have starved to death (personal observation of the author). Histopathology indicates the ulcer is generally an acute event.
9. Pressure sores/decubital erosions/ulcers.
10. "Red coat" in cats due to the absence/reduction of melanin deposition (Anderson, Rogers, and Morris, 2002).
11. Bite wounds in a starved group of dogs. Starving dogs fight over every scrap of food. The bite wounds are generally although not always superficial.

A good estimate of the animal's ideal mature body weight can be made between 4 and 6 weeks posthospitalization. If the standard work-up does not demonstrate any significant underlying disease process, and treatment is basically supportive, a weight gain of 25% or more is proof of starvation and neglect. In some cases, the author has personally observed animals' weight increase 90% from their presenting weight.

A question frequently asked in court is how long it took for the animal to become emaciated. Although it is usually not possible to know the exact circumstances the starving animal experienced (Was the dog being fed once or twice per week? Was the amount or quality of the food inadequate? Was the neighbor throwing food over the fence?), what is known is that it takes between 4 and 6 weeks for a dog to gain from an emaciated BCS to an ideal BCS. In a study at Colorado State University from the 1970s, dogs were starved (total caloric restriction) as a treatment for obesity. In this study, it took 5–6 weeks for the dogs to lose 25% of their body weight (Anderson and Lewis, 1980).

Feeding a Starved Animal (Refeeding Syndrome)

Starved animals develop a "starvation" metabolism in order to stay alive. They use fat, muscle, and even organ tissue for energy needs. When they are rescued and fed, it takes weeks for them to transition back to a normal metabolism. They must be given time to adjust to a regular feeding schedule. In people, a problem called "refeeding syndrome" has been observed. It occurs when starved individuals are provided with too much food too quickly and is characterized by abnormalities in blood values of electrolytes (Miller and Bartges, 1999). This is believed to occur in companion animals but has not been well documented and is thought to be rare. There is more information on the refeeding syndrome in the equine chapter of this book.

In the author's experience, a number of starved animals have been observed over the years who, within 1 week of being fed twice per day, have exhibited elevations in liver enzyme values (ALT, ALP, AST, and bilirubin). The liver is affected two ways when a starved animal is fed: (1) nutrients enter through the hepatoportal circulation and (2) protein/nitrogen metabolism is reinitiated and NH_3 is presented to the liver for conversion to urea. It is possible that the changes observed in liver enzymes are due to one or both of these processes. Success in limiting these liver enzyme changes has been achieved by reducing food amounts and thus the energy content of meals.

Starved animals should be fed at a level that results in only minimal weight gain for the first 10 to 14 days of treatment. They should be fed a bland commercial diet. The feeding amount is determined by calculating the resting energy rate (RER) using the formula

Table 23.3. DER calculation.

DER calculation	Canine	Feline
Up to 4 mo of age	RER × 3	RER × 2.5
Over 4 mo of age	RER × 2	RER × 2.5
Average neutered healthy adult	RER × 1.6	RER × 1.2
Intact adult	RER × 1.8	RER × 1.4

$70 \times (Wt_{kg}^{3/4})$. This value is then multiplied by a factor (to account for specific physiology of the animal: intact adult, neutered adult, pregnant, lactating, etc.) to give the daily energy requirement (DER) (Hand *et al*., 2000). (See Table 23.3.)

Example: The RER of a 5 kg puppy is calculated as follows; $70 \times (5_{kg}^{3/4})$

To calculate the Wt_{kg} to the $^3/_4$ power (also called the metabolic weight), cube the Wt_{kg} and then take the square root twice.

RER calculation for 5 kg puppy:

1. $5 \times 5 \times 5 = 125$.
2. Square root of $125 = 11.18$
3. Square root of $11.18 = 3.34$
4. $\times 70 = 233.8$ kcal/day

A 6-month-old puppy who weighs 5 kg has a DER of 233.8 kcal/day.

Starvation: Growing Dogs

Weights of starved growing animals going through compensatory growth spurts can and should be compared to expected growth increases in normal growing dogs. The first step in making this determination is to accurately age the animal. The next step is to compare the 1-month weight change in the starved dog to that of a dog of similar age and size/breed during the same length of time. The growth of a medium-sized breed or breed mix of dog can be compared to the growth rate for five common medium-sized dog breeds: Bulldog, Chow, Poodle, Collie, and Setter (Normal Growth Rate Curves, 1971). (See Table 23.4.)

Types of Abuse: Nonaccidental Injury

A few types of nonaccidental injuries that will be covered briefly here include wounds in general, binding linear wounds (extremities, muzzle), burns, dog-bite wounds, blunt force trauma (physical abuse), head trauma, chronic physical abuse, large-scale animal abuse, and poisoning.

Wounds in General

The extent of skin pathology associated with a wound can only be determined if the hair coat is shaved. Also, skin wounds change over time, and the extent of injury may not be apparent at initial presentation. This is especially true of burns. Documentation by description, diagrams, and photographs should be done for all hair coat and skin abnormalities. Photographs should be taken before and after the hair coat is shaved and wounds are cleaned. Photography should continue during the treatment and healing process. All photographs should be taken with a

Table 23.4. Average monthly weights for five medium-sized dog breeds.

	2 mo	3 mo	4 mo	5 mo	6 mo
Bulldog	7	13 *(88)*	19 *(46)*	24 *(26)*	28 *(16)*
Chow Chow	9	15 *(66)*	22 *(46)*	28 *(27)*	32 *(14)*
Poodle	10	18 *(80)*	26 *(44)*	31 *(19)*	35 *(13)*
Collie	11	20 *(81)*	29 *(45)*	35 *(21)*	40 *(14)*
Setter	12	24 *(100)*	32 *(33)*	39 *(22)*	44 *(13)*

The percent weight increase relative to the previous month is in italics. The monthly weights are taken from the standard growth curve Current Veterinary Therapy VI.

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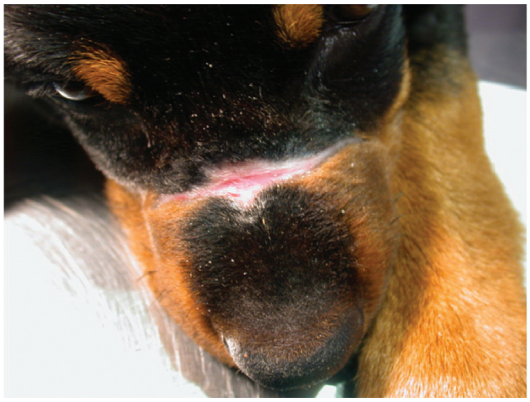


Figure 23.8. A 3-month-old, male Rottweiler puppy with a linear wound over his muzzle. The dog represents no physical threat, so it is plausible to think that his muzzle was bound to keep him quiet. He was also starved and beaten (scapula fracture).

date and case identification number included in the picture.

Binding Linear Wounds

These wounds, with a linear appearance, are most common on a dog's muzzle and extremities. (See Figure 23.8.) These wounds occur when a particular area is bound with twine, for example.

Burns

Burns can be thermal (heating pads, hot liquids, microwaves, heaters, cigarettes), chemical (acids, alkalis, household disinfectants, and other products), or electrical (electric cords, stun guns, lightning) in origin. The cause cannot always be distinguished by visual examination of the injury. Victims of fires may have the odor of smoke on their fur, suffer from laryngospasm, and have burns around the face, oral cavity, and upper and lower airways (Merck, 2007).

Burns should be classified. This may require a skin biopsy. Burn histopathology will benefit both treatment and the legal case. Two burn classification methods are in use. The older classification system refers to first-, second-, and third-degree burns (Di Maio and Dana, 1998). A newer classification uses the terms "superficial," "partial superficial," "partial deep," and "deep" (Saxon and Kirby, 1992). An estimate should be made of the body surface area involved in the burn lesion. If an accelerant was used on the animal, or suspected, samples of fur and skin can be tested for residue; the burn and adjacent tissue should be swabbed and samples submitted for confirmatory tests (Merck, 2007). Any unusual odors should also be noted.

Dog-Bite Wounds

It is important to carefully photograph and document (location, size, number) all the bite wounds and other injuries that might be encountered in a dogfighting case or other case where dog-bite wounds are encountered. The following bite wound classification provides useful terminology for describing dog-bite wounds (Griffin and Holt, 2001):

1. Class 1—partial-thickness laceration (without penetration of the dermis)
2. Class 2—full-thickness laceration (with penetration of the dermis)
3. Class 3—full-thickness puncture wound
4. Class 4—full-thickness puncture or laceration with avulsion of underlying tissues and dead space

(See the chapters on animal fighting and examination of the deceased patient for more information on dog-bite wounds.)

Blunt Force Trauma

Blunt force impact is a common cause of traumatic injuries. Blunt force trauma occurs when there is an impact on living tissue by a hard object with a blunt surface. The object has to be of sufficient molecular density to injure the tissue. In addition, either the object or the living tissue (i.e., an animal or a person) has to be moving so there is an energy transfer (Spreng, 2004). The combination of the impact on living tissue of a "hard" object and sufficient energy results in a variety of blunt force injuries. Appropriate language as provided below should be used to describe the injuries.

1. Contusion (bruise)—blunt force ruptures small blood vessels in soft tissue, resulting in red blood

cells moving from the injured blood vessel into the surrounding tissue.

2. Abrasion—blunt force causes the superficial (epithelial) layer of skin to be scraped away, typically in an irregular fashion. (See Figure 23.2.)
3. Laceration—blunt force causes the skin surface to break or tear, such that the tissue is stretched, sheared, or avulsed. In comparison to an incised (sharp force) wound, a laceration is irregular, bleeds less, has surrounding contused tissue, and may have tissue bridging the broken skin surface. Laceration is also the term used to describe a break or tear in an internal organ (e.g., lung or liver).
4. Hemorrhage—a large discharge of blood from broken blood vessels. If blood loss volume is large enough and the loss is relatively acute, hemorrhage may be fatal. A dog's total blood volume is estimated to be 8–9% of body weight (80–90 mL/kg). A cat's total blood volume is estimated to be 5–6% of body weight (50–60 mL/kg) (Kirk and Bistner, 1992).
5. Fractures—the term is generally used to describe a catastrophic failure of bone or tooth structure.

Head Trauma

There are multiple signs of head trauma, including sedate behavior due to brain injury, anisocoria (unequal size of the pupils), episcleral hemorrhage, zygomatic bone and other skull fractures, tooth fractures, pulpal hemorrhage, and gingival lacerations. Multiple radiographs of the head should be taken from all views and all injuries carefully documented in the record.

Chronic Physical Abuse (Battered Animals)

The hallmark of chronic physical abuse is multiple injuries (wounds, fractures) at different stages of healing. The examination should begin with a chest radiograph to look for rib fractures and proceed from there. As discussed previously, a complete set of radiographs of the whole body should be taken in all suspected animal abuse cases. These radiographs provide strong evidence that abuse has been ongoing and help confirm abuse suspicions and the need for further investigation.

Large-Scale Animal Abuse

This is an area that is receiving increased attention by law enforcement, humane organizations, and forensic veterinarians. There are situations where many animals, sometimes numbering in the hundreds, are abused at the same location. This is called "large-scale animal abuse" and includes hoarding situations, puppy mills, and dogfighting operations. A hoarding situation may involve one or more individuals and/or may be publicly presented as a "sanctuary," "rescue group," "shelter," or "farm." Large groups of animals suffer from extreme neglect that involves starvation and rampant infectious disease. Mortality rates are very high and mass graves are common. (See the chapter in this textbook on animal hoarding.)

Puppy mills present another type of large-scale abuse, and similar to the hoarding situation, extreme neglect and high mortality are common. (For more information about puppy mills, see the chapter on an overview of animal cruelty laws.)

Dogfighting is an especially abhorrent example of large-scale animal abuse because of the extreme neglect and deliberate brutality that these dogs experience. In all of these cases, it is essential that the physical and behavioral health of each animal be evaluated by a licensed veterinarian and carefully documented in a separate medical record (Merck, 2010).

Poisoning (Toxicology)

Toxicology is another important, growing area of forensic medicine. As with any clinical case, a good history, along with the results of a complete physical examination, is critical for diagnosis of poisoning cases. A list of samples recommended for evaluation by the ASPCA National Animal Poison Control Center can be found in the American Humane Association Guide *Recognizing and Reporting Animal Abuse: A Veterinarian's Guide* (Miller and Zawistowski, 1998). (For more information on handling these cases, see the chapter on forensic toxicology in this textbook.)

Documentation of Medical Findings

A forensic medical evaluation necessitates that all findings, normal and abnormal, be documented. The medical record and all additional case

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documentation, such as radiographs and other imaging reports, laboratory reports, and photographs, are legal documents. This is true of all medical records, but in a forensic veterinary medical evaluation, records are part of a legal proceeding. If multiple animals are involved in the case, each animal should have a separate medical record. Records, whether digital or paper, should be accurate, thorough, and legible; avoid deletions and erasures; and utilize professional language.

The ASPCA has a series of forms created in Microsoft Word and Excel on which to document findings. These forms can be easily customized for use at other facilities and are available from the ASPCA at http://aspcapro.org/sample-forms.php. The forms are valuable aids for forensic examinations. They prompt veterinarians to look at all aspects of the animal's health and thus perform a thorough and complete examination.

When the medical aspects of the abuse case are resolved, the original medical record should be photocopied. The original record should be stored securely for use in future legal proceedings, and the photocopy should be made available upon appropriate request. All abuse case documentation should be stored separately from other medical records. This includes the medical record, radiographs, photographs, notes and even emails, etc. Losing or misplacing medical records is an unacceptable response to a subpoena in a criminal case.

Veterinary Statement of Findings

The veterinarian evaluating the alleged victim of abuse will be asked to write a statement of his or her findings. Veterinary medical evidence is one part of a body of evidence. A veterinary statement of findings must be produced in a timely fashion so that the legal case can proceed. The medical findings and evidence the law enforcement officer has gathered during the investigation are presented to the district attorney's office. The veterinarian is generally not aware of all aspects of the investigation and should not feel that the case depends solely on his or her findings; it does not. It may be worthwhile to sit through a criminal trial to gain some perspective on how evidence is presented by different witnesses and how a verdict is obtained.

The veterinary statement will be read by humane law enforcement agents, police, district attorneys, defense attorneys, judges, psychologists, social workers, as well as other veterinarians. It must be written in detail, but in a way that persons not trained in medical terminology can understand. The statement should be typed and if possible printed on letterhead stationery. The typed statement should be dated, identified by case number, and signed. This is a statement of medical evidence that supports a prosecution of animal neglect or abuse. It is not necessary to state normal findings unless they contribute to the overall clinical picture, for example, "No underlying disease process was identified. There is no explanation for the poor body condition other than starvation." (See Appendix 23.2 for a sample veterinary statement.)

It may be necessary to write more than one statement for a case. A preliminary statement is written because law enforcement needs a veterinary statement to make an arrest and/or submit the case to the district attorney's office. This may have to be written within days of the case being presented to the veterinarian. It is recommended that clinical laboratory results be available before the statement is written. A final veterinary statement is written when all medical issues are resolved. It is in this final statement that weight gains that result in improvement or ideal body condition are included to support neglect cases.

Finally, the medical record or veterinary statement should not include any speculation (i.e., guesses about the age of a fracture) because final, definitive conclusions that contradict speculations can be used in court to cast doubt on the veterinarian's expertise.

Medical Record Certification

All medical records that are submitted as evidence in a court case must be certified as accurate records of the medical management of the case. A hospital owner or director, or office manager, can certify the records. The text for the ASPCA's certification form can be found in Appendix 23.2.

Testimony as Expert

The majority of prosecuted cases of animal abuse do not actually go to trial. For a variety of reasons, plea agreements are often made. In cases that do go to trial, the trial does not typically occur for many months, frequently 12 or more from the time that the criminal case is initiated. This is why it is essential that the case be thoroughly and accurately

documented and photographed at the time the work is being done.

As a witness for the prosecution, the veterinarian will be assisted by the prosecutor to prepare the narrative for trial. As the medical expert, the veterinarian has much to contribute to the prosecutor's understanding of the animal's health. The prosecutor will help the veterinarian understand what points will be emphasized at trial. Defense counsel will be working very hard to tell a different story. Veterinarians should use their skills as effective communicators to find a way to speak for the victim regardless of the questions asked.

CONCLUSION

Attention to detail, organized and thorough documentation of abuse victims' medical status, and strong working relationships with others on the team to manage animal abuse cases will help result in successful prosecutions of those responsible for cruel treatment of animals. In the process, because of the link between animal abuse and other forms of family violence, many lives can be saved.

REFERENCES

Anderson, G.L. and Lewis, L.D. (1980) Obesity, in *Current Veterinary Therapy VII* (ed R.W. Kirk), W.B Saunders, Philadelphia, Pennsylvania, pp. 1034–1039.

Anderson, P.J.B., Rogers, Q.R., and Morris, J.G. (2002) Cats require more dietary phenylalanine or tyrosine for melanin deposition in hair than for maximal growth. *Journal of Nutrition*, **132**(7), 2037–2042.

Ascione, F.R. (1998) Battered women's reports of their partners and their children's cruelty to animals. *Journal of Emotional Abuse*, **1**(1), 119–133.

Bojrab, M.J. and Tholen, M.A. (1990) *Small Animal Oral Medicine and Surgery*, 3rd edn, Lea & Febiger, Philadelphia, Pennsylvania.

Canine and Feline Acute Pain Scales (2006) Colorado State University. Available online at http://www.ivapm.evetsites.net/refId,20471/refDownload.pml http://www.ivapm.evetsites.net/refId,20467/refDownload.pml

Deviney, E., Dicker, J., and Lockwood, R. (1983) The care of pets within child abusing families. *International Journal for the Study of Animal Problems*, **4**, 321–329.

Di Maio, V.J.M. and Dana, S.E. (1998) *Handbook of Forensic Pathology*, Landes Bioscience, Austin, Texas, pp. 161–173.

Emily, P. and Penman, S. (1990) *Handbook of Small Animal Dentistry*, 2nd edn, Pergamon Press, Tarrytown, New York.

Glasgow Short Form Pain Questionnaire (2010) Available online at http://www.gla.ac.uk/media/media_233876_en.pdf

Griffin, G.M. and Holt, D.E. (2001) Dog-bite wounds: Bacteriology and treatment outcome in 37 cases. *Journal of the American Animal Hospital Association*, **37**(5), 453–460.

Hand, M.S., Thatcher, C.D., Remillard, R., and Roudebush, P. (eds) (2000) Calculation of energy requirements, in *Small Animal Clinical Nutrition*, 4th edn, Mark Morris Institute, Topeka, Kansas, p. 33.

Harvey, C.E. (1985) *Veterinary Dentistry*, W.B. Saunders, Philadelphia, Pennsylvania.

Institute for Laboratory Animal Research, National Research Council (NRC) (1992) *Recognition and Alleviation of Pain and Distress in Laboratory Animals*, National Academy Press, Washington, DC. Available online at http://www.nap.edu/catalog/1542.html.

NRC (1996) *Guide for the Care and Use of Laboratory Animals*, National Academy Press, Washington, DC. Available online at http://www.nap.edu/catalog/5140.html.

NRC (2000) Definition of pain and distress and reporting requirements for laboratory animals, in *Proceedings of the Workshop*, National Academy Press, Washington, DC. Available online at http://www.nap.edu/books/0309072913/html/.

Kempe, C.H., Silverman, F.N., Steele, B.F. *et al*. (1962) The battered child syndrome. *Journal of the American Medical Association*, **181**, 17–24.

Kertesz, P. (1993) *A Colour Atlas of Veterinary Dentistry and Oral Surgery*, Wolfe Publishing, London, UK.

Kirk, R. and Bistner, S. (1992) *Handbook of Veterinary Procedures and Emergency Treatment*, W.B. Saunders, Philadelphia, Pennsylvania, p. 575.

Lamont, L.A., Tranquilli, W.J., and Grimm, K.A. (2000) Management of pain, in *Veterinary Clinics of North America: Small Animal Practice*, Elsevier, Philadelphia, Pennsylvania, pp. 703–728.

Loar, L. (1999) "I'll only help you if you have two legs," or Why human services professionals should pay attention to cases involving cruelty to animals, in *Child Abuse, Domestic Violence, and Animal Abuse: Linking the Circles of Compassion for Prevention and Intervention* (eds F.R. Ascione & P. Arkow), Purdue University Press, West Lafayette, Indiana, pp. 120–136.

VetBooks.ir

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Lusby, A.L. and Kirk, C.A. (2009) Obesity, in *Current Veterinary Therapy XIV*, Elsevier-Saunders, St. Louis, Missouri, pp. 191–195.

Merck, M. (2007) *Veterinary Forensics: Animal Cruelty Investigations*, Blackwell Publishing, Ames, Iowa, pp. 116–117.

Merck, M. (2010) Criminal disasters: Handling large-scale cruelty cases. *North American Veterinary Conference Proceedings, North American Veterinary Conference*, Gainesville, Florida.

Miller, C. and Bartges, J.W. (1999) Refeeding syndrome, in *Current Veterinary Therapy XIII*, W.B Saunders, Philadelphia, Pennsylvania, pp. 87–89.

Miller, G. (2010) The veterinarian's role in child abuse reporting. California Veterinary Medical Association. Available online for members only at http://www.cvma.net/doc.asp?id=3021&pid=1258.

Miller, L. and Zawistowski, S. (1998) A call for veterinary forensics: The preparation and interpretation of physical evidence for cruelty investigation and prosecution, in *Recognizing & Reporting Animal Abuse: A Veterinarian's Guide*, American Humane Association, Englewood, Colorado, pp. 63–67.

Mulligan, T.W., Aller, M.S., and Williams, C.A. (1998) *Atlas of Canine and Feline Dental Radiography*, Veterinary Learning Systems Co., Yardley, Pennsylvania.

Munro, H. (1998) The battered pet: Signs and symptoms, in *Recognizing & Reporting Animal Abuse: A Veterinarian's Guide*, American Humane Association, Englewood, Colorado.

Normal Growth Rate Curves (1971) Normal growth-rate curves: Tables of normal physiological data, in *Current Veterinary Therapy VI* (ed R.W. Kirk), W.B Saunders, Philadelphia, Pennsylvania, p. 1366. Also available on Veterinary Information Network (VIN) as "Growth Rate Curves."

Patronek, G. (1998) Issues and guidelines for veterinarians in recognizing, reporting, and assessing animal neglect and abuse, in *Recognizing & Reporting Animal Abuse: A Veterinarian's Guide*, American Humane Association, Englewood, Colorado. Also available at http://www.tufts.edu/vet/cfa/hoarding/pubs/tacc.pdf.

Purina Body Condition Scoring. Available online at http://www.purina.com/dogs/health/bodycondition.aspx.

Saxon, W.D. and Kirby, R. (1992) Treatment of acute burn injury and smoke inhalation, in *Current Veterinary Therapy XI*, W.B. Saunders, Philadelphia, Pennsylvania, pp. 145–154.

Spreng, D. (2004) Kinetic and biochemical effects of trauma: The impact of impact. *Proceedings, 9th VECCS Symposium*, San Diego, California.

Wisch, R.F. (2011) Table of veterinary reporting requirement and immunity laws. Animal Legal & Historical Center. Michigan State University College of Law. Available online at http://www.animallaw.info/articlesddusvetreporttable.htm.

Wolf, L. (2009) Miami-Dade County Medical Examiner Department, Forensic Imaging Bureau Forensic Photography, 2nd International Veterinary Forensic Science Conference, Orlando, Florida.

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Appendix 23.1
Pain Assessment Form

The assessment of an animal's health and state of comfort involves assessment of:

1. Observable common behaviors,
2. The animal's mobility,
3. The animal's response to handling during a physical examination
4. The animal's behavior (vocalization and activity) in a kennel.
5. The animal's response to the use of analgesics.

1. Common observable behaviors—There are certain common behaviors that may provide information about the presence of a compromised state of health. This information may be historical or observable:
   a. Appetite for food (Must be assessed in terms of a medical problem. For example, is there a primary gastrointestinal (GI) problem? Are there medicines being given that can cause inappetence, etc.?)
   b. Drinking
   c. Grooming (postprandial grooming)
   d. Social interaction (that is considered normal for a particular animal) with other animals (same species, different species) and people.
   e. Sleeping–waking cycles
   f. Reproduction
2. Mobility (will be dependent on the location of the injury or disease process). Mobility can be characterized as: (Glasgow Pain Scale)
   Normal, Lame, Slow or Reluctant, Stiff, Refusal to move
3. Response to handling during a physical examination
   The animal's response may be a combination of a physical response and vocalization. This may identify overt pain, hyperalgesia, and/or hypersensitization to non-noxious stimuli (allodynia).
   a. Physical response to handling (Glasgow Pain Scale)
      Do nothing, Flinch, Guard area, Snap
   b. Vocal Response to handling (Glasgow Pain Scale)
      Quiet, Cry or Whimper, Groan, Growl, Scream
4. Observation of the animal in the kennel (Glasgow Pain Scale)
   a. Vocalization (same as vocal responses above)
      Quiet, Crying or Whimpering, Groaning, Screaming
   b. Attention to a specific known injured area
      - Ignoring injured area
      - Looking at injured area
      - Licking injured area
      - Rubbing injured area
      - Biting injured area
   c. Posture/Activity in kennel (Mathews, NAVC, 2003)
      - Cannot get comfortable: Restless
      - May tremble or shake
5. Response to use of analgesics and treatment
   List changes in behavior, clinical signs, etc.

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Appendix 23.2
Sample Veterinary Statement and Medical Record Certification

SAMPLE VETERINARY STATEMENT

The dog's prominent abnormality at presentation was an emaciated body condition Purina Body Condition Score number 1. An ideal body condition has a score of 5. The scale is from 1 to 9, with 1 being the worst score.The definition for emaciation is:

1. Visual prominence of skeletal structures (ribs, vertebral spines, pelvic bones, spine of scapula, and femur) from a distance
2. Obvious loss of muscle mass
3. No discernible body fat, and
4. Severe abdominal tuck and extreme hourglass shape.

Skeletal structures are prominent because of the loss of fat and muscle. Fat is stored energy and muscle is not. Muscle is a structural tissue. When weight loss proceeds to the point of muscle tissue being used as an energy source, an extreme, abnormal state of metabolism exists.

THE ASSOCIATED STATEMENT OF WEIGHT GAIN

At presentation (7/14/11), the dog's weight was 23 lb. As of the writing of this statement (8/2/11), the dog's weight has increased to 38.2 lb. This is a 15-pound weight gain in 19 days. This is a 66% increase in weight in less than 3 weeks (weight gain/intake weight = % increase in weight gain).

THE ASSOCIATED STATEMENT OF TREATMENT

There has been no treatment other than feeding a balanced diet and a vitamin supplement.

THE ASSOCIATED STATEMENT OF ANEMIA

A complete blood count performed at admission showed that the dog was anemic (i.e., too few red blood cells). On 7/14/11, the dog's packed cell volume (a measure of red blood cell number) was 27%. Normal packed cell volume is 36–60%. As of the writing of this statement, the dog's packed cell volume has increased to 40%. The anemia is evidence of a chronic medical problem. In this case, the problem is starvation. The increase of the packed cell volume to 40% has resulted solely from feeding a balanced diet. (There was a negative fecal exam in this case and this was included in the statement.)

MEDICAL RECORD CERTIFICATION

I, Dr. Robert Reisman, the Medical Coordinator of Abuse Cases, at the Henry Bergh Memorial Animal Hospital of the American Society for the Prevention of Cruelty to Animals, 424 East 92nd Street, New York, New York, 10128, certify that the attached document is a true and accurate copy of the medical record of:

ANIMAL IDENTIFICATION
Humane Law Enforcement case I.D. _____
Bergh Memorial Animal Hospital patient I.D. _____

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24
Examination of the Deceased Victim

Melinda Merck

INTRODUCTION

The difference between a necropsy and a forensic necropsy is in its objectives and relevance. A complete necropsy should be performed in cases where there are suspicious circumstances surrounding the death or prior medical history, or when the cause of death is not known. In addition to determining the cause of death, the goal is to establish the manner of death (nonaccidental, accidental, natural, undetermined), any contributory causes, and the time of death.

Because of the medicolegal implications of the forensic necropsy, all findings and lack of findings must be thoroughly documented. It is the lack of findings that can aid in the determination of the causes of injury. The forensic necropsy exam is a process of documenting all injuries and the unremarkable findings, interpreting how the injuries occurred, and determining or excluding other contributory or causative factors. In order to fully integrate and properly interpret all the findings, consideration must be given to information provided by investigators about the scene and all test results. It is important that the veterinarian be apprised of all the circumstances leading up to and surrounding the death prior to performing a necropsy. Therefore, all case information, photographs, video, officer reports, and statements should be provided to the veterinarian.

The forensic necropsy actually begins at the scene. There should be a diagram or photographic documentation of the scene, preferably both. At the scene, the body should be touched and moved as little as possible to prevent destroying evidence and to avoid contamination. Paper bags should be placed on the feet and the body preferably wrapped in a clean white sheet and then placed in a clean body bag or plastic bag for transport. The body should be refrigerated but never frozen. Freezing can destroy the microscopic architecture of the tissue, making the histopathology examination difficult.

Full-body radiographs should be performed on the animal prior to necropsy (Munro and Munro, 2008). They should encompass the head, legs, and tail to look for fractures, abnormal internal findings, and other hidden evidence of injury. This is especially important in penetrating injuries and gunshot cases to determine the location of any retained evidence. Multiple fractures in various bones in different stages of healing may be indicative of chronic abuse and is included as part of the "Battered Pet Syndrome" described by Munro (Munro and Munro, 2008).

DETERMINING NONACCIDENTAL INJURY

Determining accidental vs. nonaccidental injury, that is, abuse, begins with an index of suspicion when the exam findings do not support the initial history. All aspects of the case must be considered—the circumstances surrounding the injury or death, any explanation by the owner, the environmental conditions, and the medical history—in order to determine whether the injury or death could have been accidental or was nonaccidental. A conclusive determination may not be possible until the history and/or the environment are further investigated and compared to the

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examination findings. Regardless of the information provided, the veterinarian must remain objective and consider all plausible scenarios.

The most pathognomonic feature of abuse in animals is repetitive injuries. This may present as multiple injuries in different stages of healing, indicating that they occurred at different times, or the animal may have a medical history of repeat injuries. Munro and Thrusfield (2001) discovered repetitive injury in 16 dogs out of 243 reported cases of nonaccidental injury; and in 13 cats out of 182 cases.

EVIDENCE COLLECTION

Evidence collection from the animal follows the same protocols as in crime scene investigation (CSI). All evidence should be photographed *in situ* prior to collection and packaging. Any single piece of evidence may become significant as the investigation progresses. Evidence tape is needed to seal all evidence whether it is contained in bags, boxes, or envelopes. Evidence labels and tags are used on the outside of the containers and on body bags. All evidence bags and envelopes should be paper rather than plastic; moisture can build up in plastic bags, possibly damaging the evidence inside. If the evidence already is wet, it may be transported in a plastic bag up to a maximum of 2 hours, removed, allowed to dry in a clean area, and then placed in a paper evidence bag.

When taking swabs of evidence, only sterile swabs should be used. If the area of interest is dried fluid, a wet-dry technique may be used. First, swab the area with a sterile swab that has been moistened with distilled water, which will rehydrate the dried cells. Then roll a dry sterile swab on the moistened area, which will absorb the rehydrated fluid. When taking samples, a control swab should be collected adjacent to the area of interest and labeled as "control swab." All swabs should be individually placed in a swab box or in a paper envelope after drying.

Chain of Custody of the Evidence

A chain of custody must follow any evidence related to a crime. This refers to a process of documentation so that the evidence is accounted for at all times. "Evidence" is anything collected from the crime scene, including the animal, all samples, all photographs taken, the photo card or negatives, etc. All evidence must be labeled with date, time, and a description of the item; the person who collected it should initial or sign across the seal. An evidence log must be maintained, showing the same information plus the location where the item is stored. All evidence should be kept in a locked area with an access log. If the evidence is transferred to another person, location, or laboratory, this must be noted in the evidence log with the time, date, and signatures of the sender and recipient. It is important to make sure that any laboratory used has a chain of custody procedure in place. When shipping samples, courier services with tracking capabilities should be utilized.

PHOTOGRAPHY

With all suspected victims of animal cruelty, there should be photographic documentation of the entire exam. It is preferable to use digital cameras because the quality of the photograph is known immediately. All photographs must be authenticated in court. With digital images, the memory cards or sticks may be copied onto a CD and the CD used to authenticate the photographs in court, allowing the memory cards or sticks to be reused. A photograph must never be deleted, regardless of quality. Photographs may be enhanced as long as the original is retained for authentication and the enhancement process is explained in court.

When taking photos, the series should start with general shots of the animal including the case and animal ID number. If the body arrived in a container or bag, there should be photo documentation of the container and of the removal of the body. Photos should be taken from a sufficient distance to show the entire body of the animal: right and left side, front, rear, and dorsal views. Photographs should always be taken at a 90-degree angle to the area of interest. A photographic scale, such as ABFO No. 2, should be included in the photo to show measurements. A photo should be taken with and without the scale. It is important to photograph any evidence before retrieval and to document its description and location. Once removed from its original location, it can never be put back exactly where it was. Clear close-up views should be taken of any pertinent findings. These photographs may need to be enlarged to $8'' \times 10''$ for the court, so the resolution of the photographs should be high enough that details will not be lost with this degree of enlargement.

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GROSS NECROPSY: THE EXTERNAL EXAM

The body should be wrapped in a clean white sheet and placed in a body bag for transport. If radiographs are to be taken, they may be done while the animal is still in the body bag. Any bags or material that the body was wrapped in should be examined for evidence and saved. The feet should have been covered with bags and the bags secured to prevent loss and/or contamination of evidence. These bags should be removed for examination of the feet. Each bag should be labeled with the foot it was removed from, by whom, the date, and time. Each bag should be placed in a separate evidence bag and saved for laboratory analysis.

The external examination of the body should include careful examination for trace evidence, fluids, and evidence of injury. The body should have measurements taken from the muzzle to rear; height to the head, shoulders, and pelvis; and the width and length of the muzzle and head. The general body condition should be documented and a body condition score (BCS) assigned. The presence and location of rigor (stiffness) and lividity (blood pooling) should be noted. The temperature of the body should be recorded. If the body was previously frozen, this should be noted in the record. The hair coat condition, including ectoparasites, should be recorded. Any detectable odors on or from the body (decomposition, motor oil, insecticides, feces, etc.) should be described. Otoscopic and ophthalmoscopic exams should be conducted to look for evidence of trauma. Discharges from the mouth, nose, rectum, prepuce, vagina, eyes, and ears should be examined and cultured. Mucous membranes, mouth, ears, genitalia, rectum, and vulva should be examined for normal or abnormal color, ulcerations, prolapses, foreign objects, etc. Penetrating wounds should be probed and the extent or depth noted. Bones and extremities should be palpated for fractures or masses. Feet and nails should be examined for damage and particles of evidence collected. Any entomological evidence should be collected and preserved.

Trace Evidence

The Locard exchange principle is based on the theory that any time two or more surfaces come in contact with each other, there is a mutual exchange of trace matter between the surfaces. Trace evidence can be found in a variety of forms that is virtually limitless and requires microscopic examination. Trace evidence may be linked to a suspect, a victim, a scene, a location, a tool, a weapon, or some other element of the crime. The basis for trace evidence analysis is that neither persons nor animals can visit a crime scene without leaving something of themselves behind or taking something with them. When examining an animal or the crime scene, the veterinarian and investigators are looking for evidence that can help recreate the event and link a suspect to the victim, the victim to the scene, or a suspect to the scene.

Trace Evidence on The Animal

There are some positive and negative attributes of an animal's body and behavior versus a human's with regard to retention and retrieval of trace evidence. With animals, there are different considerations when looking for trace evidence, and certain precautions should be taken to preserve any potential trace evidence on them. For instance, an animal's fur can hold embedded trace in the same manner as human hair, and there is an entire body to which trace evidence can adhere. But depending on the density and length of the fur, the trace may be more easily dislodged and lost. The human nail has a pocket under which trace evidence may become trapped. In animals, this is less likely unless the nail is frayed and the evidence is caught in the nail, the fur between the toes, or around the foot pads. Evidence on the feet can be easily lost, especially if the animal was mobile or licked the feet afterward.

Collection and Analysis of Trace Evidence

It is important to have all the information from the case prior to examining the animal. This includes what the suspect was wearing (if the information is available), any wounds on the suspect, what was present at the scene, and the different environments the animal may have been kept in prior to the examination.

Proper steps should be taken to avoid contamination of evidence on the victim and at the crime scene. When examining the animal, the veterinarian should wear a surgical cap, gown, mask, and gloves. The examining table should be cleaned thoroughly first and a clean sheet or white roll paper placed underneath the animal.

The veterinarian must carefully examine the face, lips, teeth, legs, and feet for any obvious trace

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evidence. The body should be examined using an alternate light source (ALS). ALS can cause certain types of evidence, such as body fluids and fibers, to fluoresce. An indirect light source, such as a flashlight held at an angle, can help identify especially small pieces of trace evidence. A magnifying device is useful to detect and collect evidence. The physical context of the trace evidence is paramount to the value of the results. As with all evidence, trace evidence should be photographed *in situ* prior to collection and packaging. To collect trace evidence, it is best to have special tools. Evidence collection tweezers are best to retrieve hair and fibers. These plastic tweezers have ridges on the tips that increase contact with applied pressure, thus allowing a more secure grip on fine objects. There are specially made evidence collection "lifters" with protective backers that can be used to pick up hair, fibers, dust, pollen, and similar trace evidence. The lifter is similar to clear tape with an adhesive side, which is pressed onto the evidence and then placed on a vinyl cover (the backer). If lifters are not available, regular tape may be used and then placed on wax paper or another paper with a similar slick surface. Hair or fiber should be placed in the center of a "pharmacist's fold" paper (triple folded top to bottom, then triple folded left to right) and then placed inside a paper envelope.

An animal has a large area of fur in which trace evidence may become embedded. First, the body should be inspected for any obvious evidence. Then the animal, live or deceased, should be placed on white roll paper that has been taped to the table. The animal should be combed in sections with a fine-tooth comb or brush. Any obvious trace evidence should be collected and placed in a paper envelope. Then, all remaining debris on the paper should be collected and saved for laboratory analysis. A control sample of the victim's fur should always be taken, one of each color in the coat and with the root intact, for potential comparison to other evidence related to the crime. The nails on the animal's feet should be scraped with a scalpel or special evidence scraper over a paper tissue or jar to collect any potential trace evidence. In deceased animals, it is best to remove the entire nail by disarticulation or cutting the nail off at the base.

In addition to fur, trace evidence may be found on collars and leashes, bowls, toys, dog house, carriers, and anything else that can be linked to the animal, the suspect, or the crime. Any collar, leash, or tie-out should be inspected for obvious trace evidence, and then the item should be saved for further laboratory analysis.

When collecting tape evidence or other sticky material, it should be placed in a box lined with wax paper. Accelerants are frequently found by veterinarians examining a burn victim. Samples of the accelerant may be taken by swabbing the area or by cutting off the fur. As with all swab samples, a control sample should be taken adjacent to the area of interest. Since accelerants evaporate quickly and are flammable, the sample should be placed in air-tight, nonporous containers such as noncoated paint cans or glass jars with nonplastic lids.

Gunshot residue (GSR) is an important piece of evidence for a crime lab to process. The GSR particles may be collected using lifting tape in order to determine their concentration and pattern and for the analysis of the particles.

Collection of DNA Evidence

Samples of DNA should be collected by veterinarians, law enforcement, or other authorities who can testify to the collection procedures. The DNA laboratory should be contacted prior to collection and shipment of any samples to determine what tests will be needed and the priority of testing and to ensure that collection and submission procedures are followed. It is preferable to submit the original item of evidence for testing. When that is not possible, swabs of the item may be taken. Clean latex or nitrile gloves should be worn during collection of DNA samples to avoid contamination.

Each source of DNA requires special collection and submission procedures. Sources of DNA include fresh collected blood, dried blood stains, wet blood stains, buccal (cheek) swabs, bones, teeth, hair, feces, muscle, organs, hide, saliva, semen, and urine. In general, dry samples should be collected in a paper or manila envelope, sealed and labeled according to proper chain-of-custody procedures. They should be stored at room temperature away from direct sunlight. Moist samples should be tightly sealed, labeled, and frozen.

Buccal Swabs

Buccal swabs are noninvasively collected DNA samples. Food and water should be withheld for

20 minutes prior to sampling. The swab is placed inside the cheek and swirled 10 times; two swabs should be collected from each animal. The swab should be air dried briefly and placed in a paper envelope or swab box.

Teeth and Bone

Teeth are useful sources of DNA when soft tissues are too degraded. The pulp of a tooth is well protected from decomposition. It is preferable to submit at least two molars in good condition without any cracks or chips. If no teeth are available, then a 3- to 4-inch piece of long bone may be submitted. Do not clean or bleach tooth or bone samples.

Muscle, Organs, Hide, Fixed Tissue

Muscle, organs, and hide samples may be used for DNA unless it has been over 72 hours postmortem and/or the body has been significantly decomposed. Spleen, muscle, and liver are good sources for DNA. The fresh tissue should be frozen in an airtight container and shipped overnight to the laboratory with a cold pack. Paraffin-embedded tissue also can be used for DNA. A 1-inch square piece of tissue should be submitted in a sealed container. Formalin-fixed tissues can possibly be used if the tissues have fixed for up to 10 days.

Saliva, Semen, Feces, and Urine

Dried saliva, semen, and urine evidence may be swabbed, but it is preferred that the entire item be submitted. Fresh semen or urine should be placed in a leak-proof container and frozen. A minimum amount of urine may be needed. Feces can also be used for DNA testing. Dried feces should be placed in a paper container. Wet feces should be collected in a leak-proof container and immediately frozen.

DETERMINING THE POSTMORTEM INTERVAL (PMI): FORENSIC ENTOMOLOGY

Forensic entomology involves the analysis of insects for legal cases, primarily to help determine the postmortem interval or time of death. With appropriate collection and documentation, forensic entomology can provide the most accurate time of death. The foundation for the use of forensic entomology is that the time of colonization, the rate of growth, and the stages of insect succession can be determined by analyzing climate data. Since blowflies, with rare exception, only colonize a body after death, the time of death would have occurred on or before the date and time of initial colonization. This represents the minimum postmortem interval.

Insects have additional forensic value based on what they feed on. They may be analyzed for drugs that were present in the body at the time of death. Certain drugs can affect the rate of larval development, so the presence of any known drugs should be documented for the entomologist's consideration. It is possible to assay the gut contents of maggots for DNA from the body they were feeding on. Maggots can help determine the presence of wounds and whether or not a body has been moved or disturbed postmortem.

The veterinarian, as part of the death investigation team, must become knowledgeable in forensic entomology in order to properly recognize evidence and collect, preserve, and ship the entomological samples. The analysis of insects found on a deceased animal victim or anywhere in the crime scene should be conducted by a forensic entomologist. All samples collected should be shipped immediately to the entomologist. It is recommended to always contact the entomologist prior to shipment to discuss the case and to verify that someone will be able to receive the samples and handle them appropriately.

Documentation and Collection of Entomological Evidence

Climate and Weather Documentation

Climatological data should be recorded at the scene. These data are critical to determine the time of colonization using forensic entomology and for analysis of other postmortem findings. The time of colonization and lifecycle development is largely dependent on temperatures and may be influenced by other factors such as rainfall, sun exposure, and snow (Merck, 2007). In addition to the data collected at the scene, data must be obtained from the weather station nearest to the scene and for the previous 1 to 2 weeks or longer in cases handling severely decomposed remains. This information will be used to evaluate temperatures prior to the discovery of the body. Climatological information usually is available from the

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nearest National Weather Service station, through a local university, from a qualified climatologist or a meteorologist.

Every effort should be made to collect entomological evidence at the scene. If this is impossible, temperature data must be documented every time the animal's body changes environment and/or location: at the scene, during transport, and in the holding area. This documentation protocol is continued until the entomology samples are collected.

Collection from the Body

Collection of entomological samples from the body during examination requires that the time, temperature, and location be documented for each sample, keeping each location separate. The areas of insect activity on a deceased body start preferentially around the head, followed by the urogenital-anal area, then around any wounds. The presence of unhatched eggs may be significant and should be documented.

Blowfly egg masses should first be photographed and their location documented. Using forceps, break off a small piece of egg mass approximately the size of a dime, taking care to collect from the center as the eggs at the edge may be desiccated and no longer viable. Each egg mass collected from each location on the body should be kept separate. The mass collected should be broken in half and one half placed in 75% ethyl alcohol. The other half should be placed in a larval-rearing pouch. These pouches are made by taking a piece of aluminum foil and folding it to create a three-dimensional rectangular pouch, crimping the corners together. A small piece of beef or pork liver should be placed inside as a feeding substrate should the larvae hatch. The top should be crimped together sealing the sample. This pouch should then be placed inside a plastic container for shipment, with approximately 1 inch of soil or vermiculite in the bottom and small air holes punched into the plastic top. This substrate absorbs any fluids that leak from the pouch and, for late-stage larval samples, provides a burrowing substrate.

Two labels should be created for the larval feeding pouch with the date and time, case number, location of the sample collected, and the sample number. These should be filled out in pencil or waterproof ink to avoid possible destruction of the writing. There should always be a double-labeling system used whereby one label is placed inside the plastic container and the other affixed to the outside. For all samples, the times they were placed in the container and when they were shipped should be noted.

When collecting maggots for analysis, it is important to look for the oldest (largest) larvae because they are the ones that first hatched and therefore were the first eggs laid. At first, the body and the surrounding area should be examined for prepupal maggots (postfeeding). These will most likely be found off the body but may be found in the fur, carpet, the first 3–5 cm of soil, or up to 50 m from the body. If none are found, then samples of the largest instar larvae should be collected, noting their location on the body. Temperature recordings and time of collection should be documented as described in Climate and Weather Documentation.

A sample of the collected maggots should be preserved at the scene. Place a sample of the largest maggots and some of the next size down into hot or boiling water for 5 minutes to kill and blanch them, documenting the time of blanching. They should then be transferred to a vial of 70–85% isopropyl alcohol. They may be placed in 70–85% isopropyl alcohol at the scene if hot water is not available for blanching. The vial should be double labeled as described with egg masses, with one label in the liquid and another affixed to the outside. Another sample of the live maggots should be preserved for examination using the larval-rearing pouches. Do not put too many maggots in the pouch because they need air and too many could cause the majority or all of them to die. Fold over the foil leaving air above and seal the edges well.

The presence of empty pupa cases indicates that a complete blowfly life cycle has taken place on the body and indicates a minimum elapsed time since death. These casings are often mistaken for rat droppings. They may be found in the same areas as the prepupal maggots and the pupae. It is important to look for the ecdysial caps to assist with species identification. These caps are tiny, delicate, and easily missed. They may be found separate from the pupa cases or still attached. The pupa cases and caps should be placed in a dry vial with tissue paper for cushion. Newly emerged adult flies should be collected in dry vials and their appearance described,

as it will change by the time it reaches the forensic entomologist.

POSTMORTEM CHANGES

After an animal dies, the body undergoes a variety of changes. These postmortem changes include livor mortis, rigor mortis, algor mortis, and decomposition. It is important to document these changes carefully as they may provide important information about the time and cause of death of the animal.

Livor Mortis

Livor mortis, also referred to as hypostasis or lividity, is the pooling of blood due to gravity in dependent body sites after the heart stops beating. Lividity is most useful in determining the body position at time of death and if the body was moved. It is usually visible in light-colored skin, the buccal mucosa, and the sclera. It is also found on the internal body surfaces and internal organs where it is most noticeable on the surface of the lungs. Lividity on internal organs can be mistaken for congestion. The color of lividity is usually reddish purple to violet but may vary due to blood oxygen content or certain poisonings. The presence and interpretation of lividity may be obscured by the color changes caused by decomposition.

In humans, lividity may be visible from 30 minutes to 2 hours after death, becoming fixed in 8–12 hours. If the body is moved prior to the fixation, livor will shift responding to gravity (Di Maio and Di Maio, 2001). There will be slight discoloration from lividity in the new dependent areas, which are areas below the heart that are not exposed to the direct effects of gravity. Livor mortis can speed up with accelerated decomposition or slow down with cool ambient temperatures, becoming fixed in 24–36 hours postmortem in humans (Di Maio and Di Maio, 2001). Lividity is considered fixed when blood shifting and drainage no longer occur because the blood has leaked out of the blood vessels due to hemolysis and breakdown of the blood vessel walls from decomposition. To determine if hypostasis has become fixed, apply pressure to the area. It will not blanch when fixation has occurred. The presence of fixed lividity in nondependent areas indicates the body was moved after death. The areas that are pressed against a firm surface will not have lividity because compression of the blood vessels will not allow the blood to pool there. This fact allows the veterinarian to determine if the body was moved and to reconstruct the body's position after death. The same applies for any constricting material or device on the body. These constricted areas may reveal a pattern related to the item that was used on the body. Lividity may be mistaken for bruising. When pressure is applied to the area, there will not be any blanching. To differentiate between bruising and lividity, incise the area in question. A bruised area will have diffuse hemorrhage into the soft tissues, whereas lividity is characterized by blood confined within the blood vessels (Di Maio and Di Maio, 2001).

The pooling of blood can overwhelm the blood vessels and leak out, causing postmortem petechiae, called "Tardieu" spots, or larger purpura. In humans, this can take 18–24 hours and indicates rapidly approaching decomposition. However, it may occur in as little as 2–4 hours in cases where the limbs are hanging over something or where the body is suspended (Di Maio and Di Maio, 2001).

As decomposition progresses, the blood vessels will break down and the blood hemolyzes, leaking into the surrounding tissue (imbibitions). This can be mistaken for antemortem bruising, so careful examination of lividity and concurrent injuries must be performed to differentiate the two (Di Maio and Di Maio, 2001). Microscopically, this is represented by hemolysis of erythrocytes in the blood vessels, whereas the hemorrhage from antemortem bruising is represented by erythrocytes outside the vessels in the surrounding tissues. Lividity in the region of the head can make evaluation of injuries difficult. As decomposition progresses, hemolyzed blood can leak from the blood vessels into the soft tissues of the scalp and be mistaken for bruising from head trauma, which can occur without abrasions or lacerations. This leakage of blood below the scalp can be difficult to distinguish from antemortem bruising (Di Maio and Di Maio, 2001). Leakage can also occur inside the brain into subarachnoid or subdural spaces, creating a very thin, localized blood film coating the surface. The brain needs to be examined closely for other signs of hemorrhage to rule out postmortem changes.

Rigor Mortis

Rigor mortis is postmortem muscle contraction that immobilizes the joints of the body. Rigor

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mortis occurs due to the depletion of ATP (adenosine triphosphate), causing the muscle proteins actin and myosin to stay locked together until decomposition breaks them down. Rigor sets in faster, sometimes in minutes, if prior to death there was exercise, violent struggle, convulsions, or high body temperature as seen with sepsis. Rigor occurs in all muscles at the same time but is noticeable in the smaller muscle groups first, primarily the jaw. Rigor may be forcibly broken by stretching the limbs and will not reform if it was fully developed. If broken prior to full development, there will be recurrence of the rigor though it will be less than the expected stiffness. For accurate assessment of rigor, it is important to know how the body was handled and transported prior to examination. Once rigor has occurred, it will then dissipate in the same apparent order of formation. In rare cases, rigor is instantaneous at the time of death called cadaveric spasm. This can also be seen with cases of electrocution (Dix and Graham, 2000). The body's position frozen in rigidity can also help determine if the body was moved.

Rigor mortis disappears with decomposition, although it is possible for both decomposition and rigor to still be present in cold drowning cases (Di Maio and Di Maio, 2001). Cold body or ambient temperatures slow down and may stop the formation and disappearance of rigor, whereas high temperatures speed it up. If a body is placed in refrigeration prior to the development of rigor, the process may slow down or stop. Rigor may be difficult to evaluate in cases where the body was frozen in cold weather. In humans, rigor may appear 2–4 hours after death and reach full formation in 6–12 hours, depending on perimortem factors, cause of death, and temperature conditions. It may disappear in 36 hours in temperate conditions but may last up to 6 days. In hotter conditions, rigor may come and go in 24 hours or less (Di Maio and Di Maio, 2001). Poisons that cause convulsions or any antemortem condition that causes increased body temperature will speed up rigor. It is important to consider if there was a violent struggle prior to death, as one would expect in drowning victims, which would speed up the formation of rigor mortis. Rigor may be delayed or be very mild in emaciated bodies (Di Maio and Di Maio, 2001). The onset of rigor is faster and of shorter duration in animals who have decreased glycogen levels as seen with starvation and exhaustion.

Algor Mortis

Algor mortis refers to the cooling of the body after death. It will cool from the normal internal temperature to the surrounding environmental temperature. It may also increase if the environment is hotter than the internal temperature at death or if the body is exposed to direct sunlight. Algor mortis is much more accurate in the first 24 hours after death but is affected by numerous variables. Because of these variables, it is at best an estimate and must be placed in the context of other findings that can further refine the time of death.

The animal's temperature may be taken rectally or in the liver. A special thermometer is needed to register extremely high and low temperatures. To take the liver temperature, a small incision is made in the skin and the thermometer inserted into the liver or under a lobe to avoid iatrogenic damage.

In order to estimate the time of death, the temperature at the time of death and the rate of cooling must be estimated. It is important to keep in mind that "normal" body temperature is an average for that species. Similarly, if death does not occur immediately following the precipitating injury or event, the effect that would have on body temperature prior to death must be considered. All factors that would affect body temperature at the time of death warrant consideration. For example, if the thermoregulatory center of the brain is affected by trauma or disease, body temperature can be either raised or lowered.

Body heat is lost in several ways: by conduction, which is the loss of heat through transfer to objects in contact with the body; by convection, which is the movement of air across the body causing cooling; and by radiation, which is the loss of heat from the body through infrared heat rays. In addition to ambient temperature, the rate of cooling is affected by the BCS in that fat acts as an insulator and will slow down heat loss. The position of the body also can affect the rate of heat loss (e.g., a curled body position slows down heat loss). Other factors affecting heat loss are the type and temperature of the surface the body is laying on, the presence of any covering; whether or not the body becomes wet; and weather conditions such as dry, humid, and windy. Smaller animals will cool faster because they have a larger surface area compared to mass. The density of the hair coat as an insulator must be considered. To complicate matters further, the conditions found

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at the scene may well have varied since the time of death: ambient temperatures rise and fall in a 24-hour period, weather conditions may change, and the cover over the animal may change with the movement of the sun.

The animal's temperature should be taken at the scene. If sexual assault is suspected, take rectal swabs prior to taking rectal temperature. This should be done multiple times over a 3- to 6-hour period to establish the rate of cooling. The body temperature will keep cooling until it reaches ambient temperature or, if on a cooler surface, until it reaches the temperature of the surface it is laying on. In humans, the average rate of heat loss is 1.5 degrees Fahrenheit loss per hour with 70- to 75-degree Fahrenheit environmental temperatures. There is the possibility of an initial temperature plateau during the early postmortem period that does not take into account changing environmental conditions. This is possibly due to the time it takes to establish a temperature gradient. Therefore, a plateau is more likely to occur if the environmental temperature is relatively high, if there is body and/or surface insulation that slows down conduction and convection heat loss, and/or if the body is large with a large amount of external body fat (Henssge, Krompecher, and Madea, 1995). It is recommended to add 1–2 hours to the postmortem interval estimate in cases where the plateau was likely to have occurred (Henssge, Krompecher, and Madea, 1995). It makes sense to apply this rule to animal cases as well.

Decomposition

Decomposition involves the two processes of putrefaction and autolysis. Autolysis is a chemical process by the intracellular enzymes that causes the breakdown of tissue and organs. Heat accelerates autolysis while cold slows it down. Freezing can stop the process, and in some cases significant heat can inactivate the intracellular enzymes. Organs that have high enzyme levels will undergo autolysis faster, such as the liver and pancreas. Decomposition usually occurs in from 6 to 36 hours depending upon the condition of the animal and the environmental conditions of the exposed body. Microscopic exam may reveal autolysis of the tissues with no immune or inflammatory reaction.

Putrefaction involves bacteria and fermentation and is often used interchangeably with the term decomposition. After death, the bacteria from the gastrointestinal tract spread throughout the body. Putrefaction is accelerated in animals who are septic prior to death, and this process may continue even with refrigeration of the body. The development of putrefaction is also dependent on the environment. In high temperatures, the rate of decomposition is accelerated and the body can reach an advanced state of putrefaction within 24 hours (Di Maio and Di Maio, 2001). In cold temperatures, the rate slows down and may even stop in extreme cold. Even under refrigeration, a nonseptic body may still continue to decompose. If the body is constricted in any way, decomposition may be delayed. If the animal is overweight, has a heavy fur coat, or is wrapped in something to retain heat, putrefaction may be accelerated. Decomposition may be asymmetric, occurring more rapidly in areas of injury. Decomposition may progress to skeletonization in only one part of the body due to insect feeding in areas of injury (Dix and Calaluce, 1999).

Sequence of Decomposition Changes

The sequence of decomposition in humans begins with a greenish discoloration of the abdomen usually in the first 24–36 hours. This discoloration then develops on the head, neck, and shoulders along with bacterial gas formation, causing bloating of the face. Marbling occurs in these areas due to hemolysis of the blood within the vessels and the hemoglobin reacting to hydrogen sulfide, developing a greenish-black discoloration along the blood vessels at the surface of the skin. Decomposition also causes hemolyzed blood to leak out of the broken-down blood vessels into the surrounding tissue (imbibition), usually within 12–24 hours after death (see section on Livor Mortis).

In 60–72 hours, the body develops generalized bloating where the eyes may bulge and the tongue protrudes from the mouth. This is followed by the development of vesicles on the skin, skin and hair slippage, and the color of the body is pale green to greenish-black. The weight of the internal organs actually decreases with decomposition. A red-colored decomposition fluid, known as purge fluid, will drain from the mouth and nose and may be found in the body cavities. This may be mistaken as secondary to an injury, but the amount of fluid is usually small in the body cavities.

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Changes in the eyes are difficult to interpret and depend on whether the eyes are open or closed. In humans with closed eyes, a white scummy deposit develops on the cornea, making it cloudy by 24 hours postmortem. If the eyes are open and exposed to the air, occasionally a brown to black band called *tache noire* may form on the exposed cornea and sclera due to drying.

Following the wet decomposition, the surface tissues begin to dry, collapse, and darken, developing a leathery texture. The organs and tissues will become desiccated and shrink. Then the body may become mummified or skeletonized. The time frame for skeletonization of the body depends on environmental conditions, insect activity, and scavengers. The last two organs to decompose in humans are the uterus and prostate (Di Maio and Di Maio, 2001).

Mummification can occur in hot, dry conditions when the body rapidly dehydrates. The skin will appear brown or black and leathery. Decomposition continues with the internal organs, turning them blackish brown with a putty-like consistency (Di Maio and Di Maio, 2001).

Adipocere is a grayish-white to brown, firm, waxlike material made up of oleic, palmitic, and stearic fatty acids. It is found primarily in subcutaneous tissue and other areas of fatty deposits. When a body is immersed in water or in a damp, warm environment, adipocere formation may occur. It may also be seen in bodies that have been placed in bags. In these warm, moist environments, fat undergoes hydrolysis by endogenous lipases and bacterial enzymes to free fatty acids. These are then converted to hydroxyl fatty acids by bacterial enzymes, primarily *Clostridium perfringens*. Adipocere formation can take weeks to several months to develop and is resistant to chemical bacterial destruction.

NECROPSY TECHNIQUE: THE INTERNAL EXAM

The approach to the internal exam in a legal case depends on the injuries or allegations of injury to the animal. It is important to document both the normal and the abnormal findings. Sample collection is needed to document any abuse but also to document any underlying conditions such as heartworms, intestinal parasites, or diseases. The necropsy should include an examination of all the internal organs with collection of samples for histopathology, microbiology, virology [fluorescent antibody (FA) testing], parasitology, clinical pathology, and toxicology.

The necropsy may be performed with the body in lateral or dorsal recumbency. After scanning for a microchip, the skin must be reflected along the entire body and limbs. The incision is usually made through the skin on the ventral midline from the tip of the chin to the rectum, avoiding any wounds, obvious sites of injury, or cutting any major blood vessels. Depending on the case, the incision may be made on the dorsal midline and the skin reflected. The skin is dissected away from the body exposing the underlying subcutaneous tissue and muscle. The body should be examined for hemorrhages, fractures, body condition, subcutaneous fat, fat atrophy, and the amount of autolysis. Fractures, lacerations, puncture wounds, and any lesions should be measured and photographed.

A routine necropsy procedure should be followed. To open the abdomen, make a shallow incision through the abdominal muscles and peritoneum adjacent to the last rib. Lift the opening and continue to enlarge it to the xiphoid cartilage of the sternum. Continue to enlarge the opening dorsally and then caudally. Note any fluid, blood, or foreign objects in the abdomen. Examine the abdominal cavity for any abnormalities such as organ displacements or torsions; note the color and size of internal organs. Note if the diaphragm is intact. Puncture the diaphragm and listen for the presence of negative pressure.

Next, cut deeply into the submandibular muscles close to the inner rims of the mandibles. Dissect around the tongue and retract the tongue and disarticulate the hyoid bones. Examine the tonsils, palate, and mouth. Lift the tongue backward toward the chest and dissect the trachea and esophagus back to the thoracic inlet. In cases of suspected trauma to the neck, the tissue around the esophagus, trachea, and neck in general is examined thoroughly prior to removal of these tissues. The tongue/trachea/esophagus will be removed attached to the thoracic organs and examined together.

To remove the ribs, use pruning shears or rib cutters by cutting along the costochondral junctions from the last to the first rib. Detach the wall of the rib cage by cutting along the neck of ribs to expose the internal thoracic organs. Note the position, color, texture, and size of the lungs and thoracic tissues. Palpate the lungs for any nodules or

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firmness. At this time, samples can be taken or the organs can be removed to a necropsy table for individual examination. The esophagus and trachea should be opened and the mucosal surface examined. White foam (edema fluid), fluid, or aspirated food should be documented and sampled. Samples of all organs (trachea, esophagus, thyroids, lungs, heart, lymph nodes, stomach, pancreas, duodenum, ileum, jejunum, colon, adrenals, kidneys, urinary bladder, liver, ovaries/uterus/testicles, spleen, muscle, bone marrow, skin, and brain) should be placed in 10% buffered formalin. Remember to section completely through the tissue. For example, the kidney samples should include from the cortex down through the renal pelvis. The intestines should be opened to examine the contents and the mucosal surface. Abnormal areas of any organ should be sampled in addition to more normal adjacent areas. In order to ensure adequate preservation of the tissue, be sure there is sufficient formalin in the containers (one part tissue to 10 parts liquid).

The skin of the head should be dissected and reflected to examine for any evidence of trauma or wounds. The head can be disarticulated from the spinal column, thus allowing for removal of the dorsal portion of the skull prior to removal of the brain. It is usually best for a university necropsy service to perform the internal cranial exams. The laboratory should be contacted regarding submission of the head and/or brain.

Additional samples from any wounds, injection sites, lungs, trachea, intestines, kidneys, liver, spleen, skin with fur attached, feces, and one-half the brain should be placed in individual containers to be held for cultures, toxicology, or further testing. Stomach contents and urine should be saved in glass or leakproof containers for toxicology. The femur can be cracked to allow the formalin to penetrate the tissues for proper fixation. Remember to save enough intact bone for possible bone marrow fat analysis, which is useful for determining if an animal was suffering from the final stages of starvation.

The history provided with the case may indicate that additional tissues should be taken. For example, if death were thought to be due to strangulation, then tongue, larynx, neck muscle, and surrounding tissues should be saved in formalin after photographing. Additional samples of areas of possible bruising or imbibition should be placed into formalin to help distinguish between the two and help document evidence of trauma or healing, if present. Evidence of previous fractures noted by callus formations, or more recent fractures, should be examined and preserved for microscopic examination. Fractures should be examined to determine whether they were antemortem versus postmortem. This involves examination for tissue damage, hemorrhage, and trauma to the area. If adult heartworms are present, their numbers should be counted or estimated if too numerous to count (Merck, 2007).

NONTISSUE SAMPLE COLLECTION

In humans, there is an autopsy protocol for collection of fluid specimens from the body. Always use a clean needle and syringe. Place blood, stomach contents, urine, bile, and vitreous in glass containers. Plastic polymers can be leached out by these fluids, which can cause interference on gas chromatography; their peaks can mask certain compounds. An attempt should be made to collect blood from peripheral vessels for toxicology testing due to redistribution artifacts that are possible when taking blood from near the heart (Di Maio and Di Maio, 2001). In descending order of preference, the locations are the femoral vessels, subclavian, root of the aorta, pulmonary artery, superior vena cava, and heart. The blood should be placed in a red or purple top glass tube and the location(s) marked.

Additional sampling: all the vitreous should be collected for testing (see Vitreous); all the urine should be collected, keeping in mind large quantities may be needed to test for certain drugs such as anabolic steroids—10–20 ml of bile (Di Maio and Di Maio, 2001). Consider testing samples for viruses; for example, test bone marrow for feline leukemia, the spleen and the small intestine for parvovirus.

VITREOUS

In humans, the vitreous of the eye may be analyzed for antemortem toxicology and certain disorders. The aqueous is commonly used in large animals. The vitreous is acellular, less susceptible to biochemical changes, and more resistant to decomposition than blood. In humans and dogs, the vitreous can be analyzed for electrolytes postmortem. The postmortem blood concentrations change due to cellular breakdown. Most antemortem electrolyte abnormalities will be reflected in the vitreous. Elevated sodium

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and chloride may be seen with dehydration. The potassium levels are inaccurate for hyperkalemia because of the potassium released postmortem. It is the measurement of this potassium release that is sometimes helpful in determining the time of death. Hypokalemia may be reflected in the vitreous, but this is uncommon because of the postmortem rise of potassium masking the antemortem hypokalemia. In addition, decomposition can lower the sodium and chloride levels. If the potassium level is 15 meq/L or higher, then the concurrent sodium and chloride levels are of questionable value (Di Maio and Di Maio, 2001).

The blood urea nitrogen and creatinine levels are reflected in the vitreous of humans. With normal renal function, elevated urea nitrogen, along with increased sodium and chloride, is indicative of antemortem dehydration. In uremia, the vitreous urea will also be elevated (Di Maio and Di Maio, 2001).

The vitreous glucose levels of humans have a wide range (0–180 mg/dl in humans) and are significant if elevated. Vitreous bilirubin, alkaline phosphatase, glutamic oxaloacetic transaminase (SGOT), and calcium are of no value diagnostically (Di Maio and Di Maio, 2001).

The vitreous is also useful for toxicological analysis in humans. The vitreous can be tested for a variety of drugs including cocaine, morphine, propoxyphene, and tricyclic antidepressants (Di Maio and Di Maio, 2001).

Mulla *et al*. showed that in humans, there is no significant difference for potassium, sodium, chloride, or calcium levels between the same pair of eyes at the identical postmortem intervals for different subjects (Mulla, Massey, and Kalra, 2005). It is recommended to analyze the vitreous as soon as possible because prolonged storage, either refrigerated or frozen, can affect the concentration of electrolytes. To collect the vitreous, use a 12 ml syringe and needle; perform a scleral puncture on the lateral canthus; aspirate gently, avoiding tearing loose tissue fragments surrounding the vitreous chamber. Only use clear fluid for analysis and test within 1 hour for the most accurate results.

ANTEMORTEM VS. POSTMORTEM INJURY = DATING INJURIES

To determine whether a wound was antemortem or postmortem requires gross and/or microscopic exam. Traditionally, the presence of hemorrhage is indicative that the heart was still beating when the injury occurred, thus signifying antemortem injury. However, there is the possibility of postmortem hemorrhage associated with postmortem trauma. In humans, this may be observed when the vitreous is withdrawn from the eye using a syringe and needle. If there is a sufficient survival time between the injury and death, it is possible with histopathology examination to see evidence of an inflammatory response in the injured area. In humans, this may take several hours (Di Maio and Di Maio, 2001).

The presence or absence of an inflammatory reaction to an area of injury can help determine a time interval between injury and death. Depending on the cause of death or the type of injury, hemorrhage, neutrophils, and/or edema fluid may be present within hours of the injury. The inflammatory responses may be affected by the age of the animal, the tissues affected, medications, and the health of the animal. An injury without an inflammatory response is indicative that it occurred in close proximity to death. The nature of any inflammatory response may also determine a time interval such as in a case of peritonitis resulting from intestinal rupture caused by blunt force trauma. The microscopic examination may have evidence of chronic inflammation including fibroblasts and hemosiderin (Dix and Graham, 2000).

Histopathology of the wounds may reveal if there was vital reaction to the wounds indicating antemortem trauma. The precise timing of the repair process is variable depending on the size of the wound and if it becomes secondarily infected. However, usually within 24 hours, neutrophils appear at the margins of the wound and fibrin clot. Within 24–48 hours, there is proliferation and migration of epithelial cells to begin to fuse the incision. By day 3, the neutrophils have generally disappeared and been replaced by macrophages. Granulation tissue invades the wound and by day 5 has filled the wound. The surface epithelium is back to its normal thickness with a mature epidermal architecture including surface keratinization. During the second week, there is continued proliferation of fibroblasts and collagen.

The analysis of enzyme activity at the wound site using histochemistry, enzymology, and biochemistry can help differentiate ante- vs. postmortem injury in humans. Enzyme activity can be detected

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up to 5 days postmortem and can also be used to date the injury. In antemortem wounds, there is a zone of increased enzyme activity at the periphery, which occurs over a set time interval for different enzymes. Other markers such as DNA, C3 factor, catecholamines, and vasoactive amines have been used, with histamine and serotonin being elevated in antemortem wounds (Di Maio and Di Maio, 2001).

CONTUSIONS

Postmortem examination can reveal the true extent of the bruising, which is usually quite a bit larger than what was apparent on the surface. The fur may need to be shaved to look for bruising. It is possible to see bruising even in dark pigmented skin. Bruising may take minutes to several hours to form in animals and may fade quickly depending on the extent of damage. Photographs must be taken of the bruising pattern hourly as it forms in order to capture the full representation of the injury. It is possible that early on, the bruise may be more reflective of what caused it, but as bleeding continues, especially from deeper tissue, the pattern may become obscured. The skin should be reflected over the entire body to look for subcutaneous or deeper tissue bruising.

At first appearance, contusions may be grossly difficult to differentiate from postmortem lividity. A contusion involves hemorrhage into the soft tissue and, when incised, the blood cannot be wiped or squeezed out. This is not the case in areas of lividity (Di Maio and Di Maio, 2001). Over time, decomposition can make it very difficult to differentiate antemortem bruising and lividity. Hemolysis of the red blood cells creates diffuse discoloration of the soft tissue. The blood within the vessels and the erythrocyte leakage due to the breakdown of the blood vessels from decomposition will hemolyze. The erythrocytes in the soft tissue from antemortem bruising will also hemolyze, making it impossible to distinguish from an area of livor mortis.

RECORDING THE INJURIES

All wounds need to be photographed and recorded with written and diagram documentation. In the report, it is best to summarize the injuries under an "Evidence of Injury" section. A number should be assigned to each wound. The wound's location should be described using measurements from a physical landmark, such as a nipple; from the ventral or dorsal midline; and from the head or rear as a cranial or caudal reference. The appearance of the wound, measurements of the wound, and any noted patterns should also be described. When there are several wounds together, they may be best handled in groups. For circular groupings, measurements can be taken using a clock reference, making the midline of the body 12 o'clock.

THERAPEUTIC OR DIAGNOSTIC WOUNDS

When an animal has been treated at a hospital prior to death, it is vital to get a complete history of all procedures that were performed, including any resuscitative measures. Wounds that are due to hospital procedures may be misinterpreted as injuries. The original wounds may have been obscured or obliterated by surgical procedures, they may have been used for chest tubes, or resuscitation attempts may have caused additional injuries. It is important to find out if the animal was euthanized and the route used to administer the solution as it could affect the necropsy finding. A full medical history is needed including all medications administered and the time they were given. No tubes, intravenous lines, and drains should be removed upon death of the animal until after a necropsy is performed.

HANDLING THE BODY AFTER EXAMINATION

Before disposing of the body, remove any collar(s) and hold as evidence even though pictures were taken. One never knows if further testing of the collar will be needed, or if an issue of identification may rise for which the collar may be needed. Refrigerate but do not freeze the body until all samples are taken, and results are in to make sure there is no need to examine the body further. Do not dispose of the body until the lead investigator or prosecutor so authorizes or the investigation/case is officially closed.

CONCLUSION

It is clear that interest in veterinary forensic medicine is rising. Proper handling and analysis of victims of animal abuse and neglect are vital for the successful prosecution of animal cruelty. Judges and juries have the expectation that this examination will be conducted in a professional and comprehensive way.

The management of the forensics in an animal abuse case is a challenge. Veterinarians may be asked to draw conclusions on the basis of science that is extrapolated from the human literature because veterinary forensics is still in its infancy as a specialty. It is beyond the scope of this chapter to provide detailed guidelines for distinguishing the many types of nonaccidental injuries that may be inflicted upon animals, that is, drowning, burning, asphyxiation, blunt force trauma, gunshot, and knife wounds. For detailed guidelines and references to help with forensic investigations, see Appendix 24.1.

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REFERENCES

Di Maio, V.J. and Di Maio, D. (2001) *Forensic Pathology*, 2nd edn, CRC Press, Boca Raton, Florida.

Dix, J. and Calaluce, R. (1999) *Guide to Forensic Pathology*, CRC Press, Boca Raton, Florida.

Dix, J. and Graham, M. (2000) *Time of Death, Decomposition and Identification: An Atlas*, CRC Press, Boca Raton, Florida.

Henssge, C., Krompecher, T., Madea, B. *et al*. (1995) *The Estimation of the Time Since Death in the Early Postmortem Period* (ed B. Knight), Hodder Arnold Publishers, London.

Merck, M. (2007) *Veterinary Forensics: Animal Cruelty Investigations*, Blackwell Publishing, Ames, Iowa.

Mulla, A., Massey, K.L., and Kalra, J. (2005) Vitreous humor biochemical constituents: Evaluation of between—eye differences. *The American Journal of Forensic Medicine and Pathology*, **26**(2), 146–149.

Munro, R. and Munro, H.M.C. (2008) Animal abuse and unlawful killing, in *Forensic Veterinary Pathology*, Elsevier, Philadelphia, Pennsylvania, pp. 7, 12.

Munro, H.M.C. and Thrusfield, M.V. (2001) 'Battered pets': Non-accidental physical injuries found in dogs and cats. *Journal of Small Animal Practice*, **42**, 279–290.

Appendix 24.1
Veterinary Forensic Resources

1. Melinda Merck (2006). Veterinary Forensics: Animal Cruelty Investigations (2006) Blackwell Publishing, Ames, Iowa.
2. Leslie Sinclair, Randall Lockwood, and Melinda Merck (2006) *Forensic Investigation of Animal Cruelty: A Guide for Veterinarians and Law Enforcement Professionals*, Humane Society Press, Washington, D.C.
3. *Recognizing and Reporting Animal Abuse: A Veterinarian's Guide*. (1998) American Humane Association, Denver, Colorado.
4. Ranald Munro and Helen M.C. Munro (2008) *Animal Abuse and Unlawful Killing: Forensic Veterinary Pathology*, Elsevier, Philadelphia, Pennsylvania.
5. Ed Leonard (2004) Veterinary forensics, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski), Blackwell Publishing, Ames, Iowa.
6. John E. Cooper and Margaret E. Cooper (2007) *Introduction to Veterinary and Comparative Forensic Medicine*, Blackwell Publishing, Ames, Iowa.
7. http://canadianveterinarians.net/animal-abuse.aspx
8. http://www.ivfsa.org (International Veterinary Forensic Sciences Association)
9. http://www.nationallinkcoalition.org/assets/docs/guidance-for-veterinarians.pdf

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25
Forensic Toxicology

Sharon Gwaltney-Brant

INTRODUCTION

Identifying an intentional poisoning case, whether human or animal, can be a challenge as poisons are often quite insidious in nature, and in a "successful" poisoning case, the cause of illness or death will be attributed to something other than a toxicosis or poisoning (Trestrail, 2000). The actual incidence of intentional animal poisonings cannot be accurately determined for a variety of reasons, including the lack of human witnesses to the event (excluding perhaps the poisoner), the mistaking of other disease process for a poisoning (or vice versa), the assumption that an accidental poisoning was intentional, the lack of a nationwide system to report intentional poisonings of animals, and, in some cases, reluctance on the part of law enforcement to investigate and/or prosecute people who poison animals. According to information received by animal and human poison control centers in the United States, the incidence of intentional exposures account for less than 1% of all exposures of animals to potentially toxic agents, and the incidence of malicious poisonings account for less than 0.5% of all reported poisonings (Hornfeldt and Murphy, 1998; Gwaltney-Brant, 2007a). However, it is likely that the actual incidence of animal poisonings is much higher than reported by poison control centers for the reasons stated earlier.

Unlike other types of criminals, such as serial murderers, very little is known about the psychology of poisoners (Trestrail, 2000), especially those who intentionally poison animals. Intentional poisonings may result from abuse or misuse of potentially toxic agents without intent to cause harm, for example, administering acetaminophen to a cat or feeding an illicit drug to a dog "just to see what happens" (Schwartz and Riddle, 1985). Conversely, intentional poisonings may be malicious in nature, with deliberate intent to harm or kill. Motives for malicious animal poisonings may include elimination of what the poisoner considers pests (e.g., wildlife, stray cats), retaliation against the animal (e.g., neighbors' barking/biting dogs), retaliation against the animal owner (e.g., disgruntled individual poisons dairy herd owned by former employer), or, rarely, for the sadistic pleasure experienced at seeing an animal die or an animal owner's grief over a lost pet.

Demographics and Index of Suspicion

On the basis of the reports to the ASPCA Animal Poison Control Center, in the United States, dogs account for more than 75% of reported malicious animal poisoning cases, cats account for approximately 15%, with the remainder comprised of other species, including livestock and wildlife (Gwaltney-Brant, 2007a). With dogs, large breeds appear more likely to be the victims of malicious poisonings, with a few breeds (German Shepherds, American Pit Bull Terriers, Great Danes, and Great Pyrenees) appearing to be overrepresented when compared to breed popularity (Gwaltney-Brant, 2007a).

Factors that may increase the index of suspicion that an animal illness or death is related to poisoning include rapid onset of severe clinical effects or death in a previously healthy animal, multiple previously

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healthy animals in the same environment (household, farm, neighborhood, etc.) displaying similar clinical effects, a history of threats against the animal and/or owner, presence of unexpected food or empty containers in the animal's environment, adulterated appearance of the animal's food or water source, or identification (in vomitus, stomach contents, feces) of food or other items foreign to the animal's environment (Gwaltney-Brant, 2007b).

Clinical Findings

Very few poisons produce pathognomonic clinical findings or lesions, making it easy to confuse a poisoning case with some other disease process (Trestrail, 2000). The reverse is also true, in that conditions such as infectious or metabolic disease may be mistaken as a poisoning case, often due to the rapidity of onset of clinical signs and/or death. For these reasons, unless there is direct evidence that the animal was exposed to a toxicant, investigation of a potential poisoning case entails ruling out other potential causes for the clinical signs the animal displays. See Table 25.1 for a list of common toxins and some of the clinical signs associated with them.

On initial examination of the living patient, assessment and management of any immediately life-threatening problems (cardiac arrhythmias, seizures, hemorrhage, etc.) should be performed prior to further diagnostics. Once the animal is stabilized, a thorough physical examination should be performed, and blood should be drawn for baseline clinical chemistry and hematology. Additional diagnostics such as radiography, endoscopy, or specialized laboratory tests may be indicated on the basis of the results of the physical examination. During this time, samples that should be collected include additional blood, any foreign material present on the skin or in the hair coat, foreign material lodged in the teeth, vomitus or stomach contents (if gastric lavage performed), urine, and fecal material. Care should be taken to evaluate and document the presence of any foreign or unusual odors, as they can provide clues to certain toxicants; for example, a garlic-like or rotten fish odor has been attributed to the phosphene gas produced by zinc phosphide (Casteel and Bailey, 1986).

Necropsy

Evaluation of dead animals suspected of being poisoned should entail performance of a thorough necropsy examination. A detailed external examination of the body should be made and trace evidence, for example, anything found on the body such as bits of leaves or glass in the fur, collected as it is found. Special notice should be given to evidence of antemortem clinical signs, such as the presence of vomitus or fecal staining on the animal, which suggests antemortem gastrointestinal (GI) dysfunction, or the rapid onset of rigor mortis, which can suggest antemortem seizure activity or hyperthermia (See the chapter on examination of the deceased victim).

History

Historical information in an intentional poisoning case may be sparse, as many malicious poisonings occur with no witnesses other than the animal and possibly the perpetrator. However, historical information is still important in detailing a timeline of events leading up to the poisoning. Important historical questions include the animal's prior health history, the location(s) of the animal in the 24 hours prior to onset of signs, the number and status of any other animals in the environment, the type of environment in which the animal lives (rural vs. suburban, confined vs. free-roaming), the rapidity of onset of clinical signs, and any clinical signs that resolved prior to presentation.

Evaluation of the animal's normal environment may aid in determining any potential sources of poisonings (Gwaltney-Brant, 2009). Any potential toxicants that exist in the animal's normal environment should be identified so that they can be ruled out as causing the animal's condition. These would include plants, drugs (human, veterinary, over-the-counter, prescription, illicit), household cleaners and other products, pesticides, lawn-care products, automotive materials, swimming pool products, mushrooms, poisonous/venomous animals, carrion, waterborne toxicants, garbage containers, mulches, and compost piles. Walking through the animal's habitat may reveal evidence such as unexplained food products, empty containers, foreign materials (granules, pellets, etc.), open gates or doors to storage areas, changes in color or consistency of food, adulterated water, and so on. It is often beneficial to sketch out the area, indicating any suspicious items and their proximity to the animal's habitat. Samples of the animal's food and water should be obtained while on-site; samples should be taken from both the food

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Table 25.1. Some common toxins used to poison animals.

Agent	Target organ	Clinical effects	Lesions	Best samples
Ethylene glycol (antifreeze)	Kidney	Inebriation, acidosis, renal failure	Crystals in kidney	Blood (early) Urine (late, crystals not always present) Kidney
Anticoagulant rodenticides (e.g., brodifacoum, bromadiolone, diphacinone)	Blood	Hemorrhage	Hemorrhage	Blood (prothrombin time) Liver
Organophosphorous insecticides (OP) (e.g., disulfoton, parathion, acephate)	Nervous system	Salivation, vomiting, diarrhea, increased bronchial secretions, bradycardia, seizures, respiratory paralysis	No specific lesions	Blood, retina and brain (cholinesterase) Stomach contents, vomitus (OP screen)
Carbamates (e.g., methomyl, aldicarb, carbofuran)	Nervous system	As for OP, but shorter acting; "hot" carbamates can cause seizures and death within 10 minutes	No specific lesions	Stomach contents (carbamate screen) Cholinesterase less reliable
Paraquat	Lung, GI tract, kidney	GI ulcerations, chronic progressive respiratory failure, renal failure, liver failure	GI ulcers, pulmonary fibrosis, renal tubular degeneration, midzonal hepatocellular degeneration	Stomach contents, vomitus Urine (within 48 hours of exposure) Lung (histopath and tox) Kidney (tox)
Strychnine	Nervous system	Clonic, tonic convulsions	No specific lesions	Stomach contents, vomitus, urine, serum
Zinc phosphide	GI tract, nervous system, liver, kidney	Vomiting, depression, GI corrosive injury, seizures, collapse, coma, hypotension, cardiac arrhythmias; garlic or rotten fish-like odor	GI corrosive injury, pulmonary edema	Stomach contents, vomitus (must be stored in airtight container and frozen promptly)
Metaldehyde	Nervous system	Agitation, hyperthermia, muscle rigidity, seizures; formaldehyde	No specific lesions	Stomach contents, vomitus, urine, serum, kidney, liver (freeze any samples)

(*continued*)

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Table 25.1. (*Continued*)

Agent	Target organ	Clinical effects	Lesions	Best samples
Acetaminophen	Blood, liver	Cats: methemoglobinemia, facial/paw edema, dyspnea Dogs: liver injury, methemoglobinemia (high doses)	Methemoglobinemia, hepatocellular necrosis	Serum, urine, plasma (can run at human hospital on STAT basis)
Caffeine	Nervous system, cardiovascular system	Agitation, hyperactivity, vomiting, panting, tachycardia, cardiac arrhythmias, tremors, seizures	No specific lesions	Stomach contents, serum, urine, liver (may be detectable up to 3 days postexposure)
Bromethalin	Nervous system	Low doses: delayed (3–6 days) onset, progressive paresis, paralysis, then disorientation, head pressing, opisthotonos, abdominal distention (cats), seizures High doses: tremors, hyperexcitability, hyperesthesia, seizures, hyperthermia	Vacuolation of white matter in CNS	Fat, liver, kidney, brain (tox) Brain (histopathology)
Cholecalciferol rodenticides	Blood	Rise in serum Ca and P results in mineralization of many organs; renal failure most common	Metastatic mineralization in kidney, heart, large arteries	Serum, bile, kidney (25-hydroxycalciferol levels)
Amphetamine	Nervous system, cardiovascular system	Agitation, hyperactivity, pacing, panting, tachycardia, hypertension, tremors, seizures	No specific lesions	Blood, urine, saliva
Marijuana	Nervous system	Depression, disorientation, mydriasis, weakness, bradycardia, hyperesthesia	No specific lesions	Stomach contents, vomitus, urine
Alcohol	Nervous system	Vomiting, disorientation, depression, coma, hypothermia	No specific lesions	Blood
Cocaine	Nervous system	Vomiting, hyperactivity, ataxia, mydriasis, tachycardia, tremors, seizures	No specific lesions	Serum, plasma, stomach contents, vomitus, urine

and water bowl/trough as well as the food storage area and water source. Samples of soil should be taken if there is evidence of some type of spill on the soil or if evidence of the soil being disturbed by the animal is present.

Diagnosis

With the information gathered through physical examination, clinical pathology and ancillary tests, history, and evaluation of the animal's environment, the investigating veterinarian is now faced with the daunting dilemma of trying to identify which toxicant out of potentially thousands was involved in the poisoning. If it has become clear that the case is one of intentional poisoning, the appropriate law enforcement officials should be contacted in order to assist in collection and securing of the evidence that will be needed to prosecute the case. In addition, the veterinarian should work closely with toxicologists at diagnostic laboratories, universities, or animal poison control centers in order to determine the most appropriate confirmatory testing that should be done on samples that have been collected.

Sample Collection

Collecting samples in poisoning cases is vital in order to confirm that a poisoning took place. When collecting samples for toxicology testing, it is safest to take as many and as much of each sample as possible. Any unneeded samples can be discarded later, but resurrecting discarded samples is usually not possible. It is recommended that standard samples be taken in every case, even in situations where the identity of the toxicant used in the poisoning is thought to be known. (For recommended samples from live and dead animals, see Table 25.2.)

It is not uncommon for those intent on poisoning animals to put out more than one type of poison, and the detection of more than one type of toxicant in samples taken may aid in establishing malicious intent. For instance, identification of brodifacoum (an anticoagulant rodenticide) in the liver of a cat who died from ethylene glycol indicates that the cat was exposed to two toxicants; collecting only kidney tissue (the target of ethylene glycol) would result in the rodenticide exposure being overlooked.

Table 25.2. Samples for toxicologic analysis.

Live animal	Deceased animal
Blood	Stomach/intestinal contents
Serum or plasma	Feces
Stomach contents/ vomitus	Urine
Urine	Liver
Feces	Kidney
Hair	Vitreous humor (submit entire eyeball)
	Brain
	Fat
	Skin and subcutis around injection sites
	Blood (from heart)

Sample Selection

When evaluating the "best" samples to analyze for a toxicant, the toxicologist will benefit from as much history as possible, including the rapidity of onset and the duration of signs. Toxicants that cause peracute signs/death (within a few minutes to 2 hours following ingestion) may only be detectable in the gastric contents/vomitus and blood. As the toxicant is metabolized and excreted, the parent compound and its metabolites will become detectable in the urine (if primarily eliminated via kidney), feces, liver (if hepatic metabolism), and vitreous humor (if toxicant is water soluble). Depending on the half-life of the toxicant, blood levels will gradually drop, at which point urine, feces, kidney, and/or liver may be the best samples for detection. Hair can be useful to detect topical exposures or long-term oral exposure to toxicants, but is generally unrewarding for acute oral exposures.

Sample Storage

Blood (whole blood and serum or plasma), urine, water, and other liquid samples are best stored in glass, as plastics can leach out contaminants that may interfere with analysis (Jain, 2007). If plastic containers must be used, harder plastic containers are thought to have lower risk of leachate contamination. Syringes should never be used to store/ship samples, as they can leak and the needles pose a

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hazard to laboratory personnel. Whole blood should be shipped refrigerated, but plasma, serum, and urine may be frozen before shipping. Stomach contents, vomitus, perishable feed, carrion, and feces should be stored in hard plastic or glass and shipped frozen. Hair samples may be stored in plain paper envelopes or, if completely dry, in plastic or glass containers. Solid materials such as pelleted feed, hay, soil, mushrooms, and so on should be stored in plain brown paper bags; placing these items in airtight containers may result in the development of mold, or in the case of mushrooms, liquefaction.

Chain of Custody

Maintaining chain of custody of evidence is crucial in order that the evidence be admissible at trial (Gwaltney-Brant, 2007b). Sample collection must be documented thoroughly, and the names of those responsible for the samples at all stages of collection, storage, and transit must be recorded. When shipping samples, courier services with tracking capabilities should be utilized.

Analytical Testing

Because there is no one magic machine that can test for all toxicants, the toxicologist will attempt to use the history, clinical signs, and other diagnostic information to determine the most likely toxicant(s) involved and will then perform the appropriate analyses (Jain, 2007). This approach will help to keep the time and cost requirements to a minimum. It is important to remember that just because a toxicant is detected in tissue does not necessarily mean that a toxicosis occurred. Many of the analytical tests used in diagnostic laboratories can detect compounds to levels below one part per billion, which for most compounds is insignificant. For many agents that can be considered toxicants, there are "background" levels that are not associated with toxicosis. Consulting with the toxicologist at the laboratory can aid the investigating veterinarian in interpretation of the results of toxicological tests.

Agents Used in Poisonings

When choosing an agent to maliciously poison an animal, people tend to use what they know. Most people know that ethylene glycol is very toxic to animals, so it is not surprising that ethylene glycol is one of the most frequently used agents in malicious animal poisoning cases (Gwaltney-Brant, 2007b). Another commonly used poison is actually a class of poisons: the anticoagulant rodenticides. In rural areas, especially in the Southeastern United States, organophosphate and carbamate insecticides are frequently used. Commonly used malicious poisoning agents, along with their clinical effects, are listed in Table 25.1.

DEALING WITH ANIMALS FOUND IN METHAMPHETAMINE LABORATORIES

Background Information

Methamphetamine, also known as meth, speed, ice, crystal, chalk, crank, tweak, uppers, black beauties, glass, bikers' coffee, methlies quick, poor man's cocaine, chicken feed, shabu, crystal meth, stove top, trash, go-fast, yaba, and yellow bam, is a highly addictive and powerful stimulant drug. Methamphetamine ranks third, behind alcohol and marijuana, in terms of abused drugs in the United States, particularly in the Midwestern and Western States.

One factor that may be involved in the popularity of methamphetamine use, besides its highly addictive nature, is the ease of manufacture. While large laboratories (super labs) in Mexico are considered to be the source of much of the methamphetamine on the West Coast, the majority of methamphetamine is "home grown," produced either in super labs or in relatively small clandestine laboratories (box labs) throughout the United States. These laboratories can be found in virtually any location, including rural areas, residential neighborhoods, commercial properties, and industrial districts. Clandestine laboratories have been found in private residences, hotels, motels, barns, farm outbuildings, outdoors, and in automobile trunks, boats, and luggage.

Although the term "laboratory" may lead one to imagine a sterile, highly controlled environment, clandestine methamphetamine laboratories are more commonly disorganized, dirty, and highly contaminated by the large number of potentially toxic compounds that are used to produce the end product (see Table 25.3). The manufacture of methamphetamine is a relatively simple process, involving the use of readily available ingredients and equipment. Many of the chemicals used to produce methamphetamine are extremely hazardous, and

Table 25.3. Hazardous chemicals associated with methamphetamine production.

Hazard	Compounds included	Effects
Corrosive agents	Anhydrous ammonia, acids, alkaline corrosives, Freon, iodine, lithium, red phosphorous	Irritation or ulceration of tissues of skin, eyes, mouth, throat, lungs, and digestive tract Anhydrous ammonia can cause freeze injury Lithium metal poses explosion hazard; reacts violently with water Red phosphorus is highly flammable and can form deadly phosphine gas
Solvents	Acetone, ether, ethyl alcohol, methanol, toluene, trichloroethane	Flammable Can cause inebriation, stomach irritation, coma In dogs and cats, alcohols can cause skin irritation and be absorbed across skin
Stimulants	Pseudoephedrine, ephedrine, phenylpropanolamine	Cause stimulation of heart and nervous system Can cause tremors, seizures, fatal increases in body temperature, heart irregularities

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approximately 5–7 pounds of toxic waste is generated for each pound of methamphetamine produced (IAFF, 2005).

Methamphetamine laboratories are generally dangerous places, not only to those who produce the compound but also to others who may be living nearby as well as to law enforcement, firemen, or other individuals who may enter the area.

Very much like children of individuals who manufacture (and generally use) methamphetamines, animals in these environments are at risk for a variety of potential hazards. The health risks posed by chemicals used in the manufacture of methamphetamine include burns and injuries due to explosions and fires from highly volatile agents, breathing problems due to the inhalation of toxic vapors or gases, systemic effects of ingesting the precursor chemicals or the end product, and irritation or burns of the skin due to contact with corrosive chemicals such as acids. Chemical spills onto flooring or the ground pose a particular hazard to free-roaming pets, as they may walk through, lie in, and/or ingest the spilled materials. Mechanical injury from discarded syringes, razor blades, or other hazards is also possible. Because many methamphetamine manufacturers are often addicted users, animals in the area may also be malnourished due to neglect and/or have evidence of physical abuse.

The types of animals that might be present in a clandestine laboratory during a raid by law enforcement include household pets, livestock, and captive-kept wild animals. Guard dogs are commonly utilized by methamphetamine manufacturers. Animal control officers responding to these calls should be ready for anything: at a Massachusetts methamphetamine laboratory raid, police found alligators guarding the residence!

Initial Response

The seizure of animals during a methamphetamine laboratory raid must be done with care, as the animals themselves may be contaminated and pose a health hazard to those who handle them. In an ideal situation, entry into the "hot zone" will be restricted to those specially trained and equipped to handle hazardous materials, and the animals who are seized will be brought out to an area designated for initial decontamination. However, there will be times when animal control officers will be requested to enter the hot zone to remove animals. In these situations, personal safety becomes paramount, as assistance cannot be provided for the animals if the respondents become injured or ill due to exposure to hazardous chemicals. At the very least, protective eye, hand, and foot covering should be used. If available, protective jumpsuits (e.g., Tyvek®,

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DuPont, Wilmington, DE) should also be worn. If toxic fumes are suspected or detected, only professionals possessing suitable respirators should enter the area.

Upon entering the hot zone, officers should not touch anything unless absolutely necessary and should try to avoid stepping into pools, puddles, or solid materials (including syringes) on the ground. To avoid contaminating other areas outside the hot zone, leashes, carriers, and cages should be brought into the area rather than using the contaminated items in the laboratory; if possible, even collars and halters should be removed before removing the animal from the hot zone.

Upon leaving the hot zone, animals should be taken to an area designated for initial decontamination and triage; ideally, a veterinary professional would be available to assist in triage. Animals leaving an environment where methamphetamine was being manufactured should be considered to be contaminated with potentially hazardous materials, and they will need to be decontaminated in order to minimize the contamination of the animal control vehicle and facilities. Animals judged to be in immediate need of veterinary care due to life-threatening injury or illness should be placed in a carrier (not one that has been in the hot zone) and transported to a veterinary hospital immediately for decontamination and treatment. The veterinary staff receiving the animal should be warned that the animal may be contaminated so that they are able to take appropriate precautions. Personnel handling the carrier and animal should remain in protective gear until such time that the animal can be adequately decontaminated, and any carrier used to transport the animal should be washed thoroughly several times with soap and hot water.

Decontamination

Animals judged to not be in need of immediate veterinary care should be decontaminated by bathing with liquid dish soap (e.g., Dawn®, Proctor & Gamble, Cincinnati, OH) and warm water. Animals who are difficult or dangerous to handle may require sedation. Prior to decontamination, it would be prudent to inquire of law enforcement officials if they desire any samples (e.g., hair swabs) be taken from the animals for later analysis. Besides the water supply and dish soap, supplies that come in handy include four wading pools: to make a decontamination line away from the hot zone (bath 1, rinse 1, bath 2, rinse 2), sterile saline (eye rinse), cloth towels, and paper towels; ideally some type of riser or pallet that can keep the animals' feet from sitting in the wash water would be desirable. The first bather—in full personal protective equipment (PPE) as needed—wets and washes the animal with liquid dish soap, then transfers the animal to the first rinser (in full PPE as needed) who rinses the animal thoroughly. The animal is then transferred to the third decontamination pool and rewashed, then transferred to the final rinse pool. The animal is then toweled dry and placed in a clean carrier for transport.

Animals who may become overtly stressed by aggressive bathing (e.g., birds, pocket pets) should be spritized with a mixture of warm water and dish soap (with care taken around eyes) from a spray bottle followed by a rinse in clean water from a different spray bottle. Following bathing, animals should be toweled off, placed in clean carriers, and transported to an area (animal control facility, veterinary clinic) where they can be evaluated by a veterinarian. Animals should be kept warm to prevent chilling.

Examination of the Patient

The veterinarian should evaluate the animals for evidence of exposure to methamphetamine or compounds used in its manufacture. Acute effects expected from exposure to methamphetamine include agitation, dilated pupils, increased heart rate, increased blood pressure, increased body temperature, disorientation, tremors, or seizures. Unfortunately, many of these findings may occur in animals due to the stress of being seized, decontaminated, and transported; in these situations, one would expect the majority of these signs to subside quickly as the animal is placed in a quiet environment. Animals should also be evaluated for the presence of respiratory, skin, or eye injury from inhalation of toxic compounds as well as have a general physical examination to document body condition, parasite burden, physical injuries, and so on. Appropriate treatment should be initiated as needed.

If requested by law enforcement, urine and/or blood may be taken for methamphetamine testing, but it must be kept in mind that these tests can become negative very quickly following removal from the

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methamphetamine source. Blood should be collected within 6–12 hours and urine within 48 hours for the most accurate results. Over-the-counter urine tests are readily available at most drug stores/pharmacies and may prove helpful in quick identification of animals who have been exposed to methamphetamine. Alternately, blood or urine samples can be sent to human hospital or veterinary diagnostic laboratories for evaluation. A negative methamphetamine test does not rule out the possibility that the animal was exposed to toxic precursor chemicals rather than the end product.

Effects of amphetamines on animal behavior in general relate to nervous system stimulation and include agitation, hyperactivity, aggression, irritability, and apprehension. On the basis of experimental studies in rats, chronic methamphetamine administration could conversely result in decreased activity and decreased memory and learning ability. Behavioral evaluations on animals seized from methamphetamine laboratories are best delayed for at least 1 week following their removal from the methamphetamine laboratory. This time frame should allow for elimination of any methamphetamine from the body as well as allow some time for the animal to adapt to their environment and show more of their normal character. In general, any behavioral "quirks" caused by the methamphetamine exposure should be present at the time of the rescue and would either be expected to resolve over several days or perhaps become permanent. What would not be generally expected is for the animal to develop further neurologic dysfunction after exposure to the methamphetamine has ceased.

Long-Term Effects

Although long-term use of methamphetamine in humans can cause significant health issues, there is little information about the overall effects of chronic methamphetamine exposure in domestic animals. Questions such as potential for development of chronic lung disease (secondary to inhalation of irritants) or cancer several years following exposure are not answerable at this time. It is known that many dogs and cats seized from methamphetamine laboratories have been successfully placed in homes and have lived normal life spans, so the prognosis is generally considered good for those animals who are able to be rehabilitated.

CONCLUSION

As the field of veterinary forensics grows, it is important to acknowledge the special role that veterinary toxicology plays in the investigation and prosecution of animal poisoning. Although these cases are challenging and often frustrating to manage, shelter veterinarians should work closely with law enforcement and animal cruelty investigators, poison control centers, and veterinary toxicologists to ensure all evidence has been properly collected and processed in order to successfully prosecute these cases of animal cruelty.

REFERENCES

Casteel, S.W. and Bailey E.M. Jr (1986) A review of zinc phosphide poisoning. *Veterinary and Human Toxicology*, **28**, 151–154.

Gwaltney-Brant, S.M. (2007a) Epidemiology of animal poisonings, in *Veterinary Toxicology: Basic and Clinical Principles* (ed R.C. Gupta), Academic Press, New York, pp. 67–73.

Gwaltney-Brant, S.M. (2007b) Patterns of nonaccidental injury: Poisoning, in *Veterinary Forensics: Animal Cruelty Investigations* (ed M. Merck), Blackwell Publishing, Ames, Iowa, pp. 169–198.

Gwaltney-Brant, S.M. (2009) Field investigations in toxicology: Veterinary CSI, in *Proceedings of the 3rd Keystone Veterinary Conference*, Pennsylvania Veterinary Medical Association, Hershey, Pennsylvania.

Hornfeldt, C.S. and Murphy, M.J. (1998) American Association of Poison Control Centers report on poisonings of animals, 1993–1994. *Journal of the American Veterinary Medical Association*, **212**(3), 358–361.

International Association of Fire Fighters [IAFF] (2005) The methamphetamine problem: A health & safety overview for fire fighters. Available online at www.iaff.org/HS/Resi/Methamphetamine%20final.htm (accessed November 27, 2011).

Jain, A.V. (2007) Sample submission for toxicological analysis, in *Veterinary Toxicology: Basic and Clinical Principles* (ed R.C. Gupta), Academic Press, New York, pp. 1077–1082.

Schwartz, R.H. and Riddle, M. (1985) Marijuana intoxication in pets. *Journal of the American Veterinary Medical Association*, **187**(3), 206.

Trestrail, J.H. (2000) *Criminal Poisoning: Investigation Guide for Law Enforcement, Toxicologists, Forensic Scientists, and Attorneys*, Humana Press, Totowa, New Jersey.

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Animal Hoarding

Gary Patronek

INTRODUCTION

The primary features of animal hoarding (e.g., the inability to provide minimal care, lack of insight, denial, and a compulsive need to acquire and maintain control) were first defined in 1999 (Patronek, 1999) and first referenced in a law 2 years later (Illinois Public Act 92-0454, 2001).

Animal hoarding is unlike many other forms of cruelty because significant animal suffering occurs in the absence of intent to harm, often with considerable compromise of the welfare of the perpetrator, who lacks insight as to the true nature of the situation (Vermeulen and Odendaal, 1993; Patronek, 2008). Animal hoarding may also be facilitated by a broad network of active or passive enablers.

The scope of the psychopathology underlying animal hoarding is only beginning to be understood. An appreciation for the complexity of these cases, as well as the underlying motivations driving the behavior, is essential for anyone involved in a hoarding situation. This chapter will highlight key issues.

What Does Hoarding Look Like?

In a typical case, dozens to hundreds of animals are discovered living in squalid conditions. Living spaces are filled with clutter and animal waste and are often compromised to the extent that they no longer serve the function for which they were intended. Floors and stairs may be weakened from being soaked with urine and feces. The air may be difficult to breathe. Appliances and basic utilities (heat, plumbing, and electricity) frequently are inoperative. Thus, the provision of sufficient fresh, clean water and maintaining basic sanitation may be difficult if not impossible. Rodent and insect infestations as well as odors can create a neighborhood nuisance. Some or many animals may be dead, either stored in refrigerators or freezers, or left to decompose where they died.

Cats and dogs are the most commonly hoarded species, but domestic wildlife, birds, nonnative wildlife, and farm animals all have been victimized. Animals are frequently ill and chronically malnourished. Food can be absent, spoiled, contaminated, inaccessible, or of such poor quality that the animals cannot maintain normal body weight. This can lead to starvation or cannibalism. Furthermore, the hoarder and sometimes other people may share this living space with the animals. The willingness of a hoarder to live, and allow other people to live in such squalor is a major barrier to convincing them that the animals' living situation does not meet their basic needs.

Who Are Animal Hoarders?

The stereotype of a hoarder is an older, socioeconomically disadvantaged female living alone, that is, the neighborhood "cat lady." The roughly 70% female prevalence among animal hoarders supports this profile (Patronek, 1999; HARC, 2002; PetAbuse.com). However, hoarding crosses demographic and socioeconomic boundaries and can involve any species of animal. Animal hoarding has

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been identified in men and women, in married or partnered couples, in multi-generational families, and in successful professionals and public officials. It has also been discovered among people working in animal shelters/rescue/animal control settings or veterinary practices. Sometimes hoarding occurs under the pretext of being a legitimate activity (e.g., shelter or rescue group, hobby breeder, hospice, or sanctuary). Shelters that utilize foster care and rescue groups should screen appropriately to ensure that they do not inadvertently enable a hoarder masquerading as a legitimate entity by providing them with a steady supply of animals.

Animal hoarding is a heterogeneous syndrome, and different types of animal hoarding exist. Three preliminary working classifications are described in Table 26.1. These distinctions are important because the categories lend themselves to different kinds of interventions. For example, the overwhelmed caregiver hoarder is more likely to respond to offers of help and a therapeutic or counseling approach, whereas the exploiter hoarder is likely to harbor true sociopathic tendencies, and aggressive prosecution will be required to inhibit their behavior. For all types, the risk of recidivism after intervention remains high.

Table 26.1. Proposed classifications of hoarders.

Overwhelmed caregiver hoarder	Rescuer hoarder	Exploiter
Exhibits some awareness of problems with animal care	Tendency to vigorously deny problems with care	Most difficult type of hoarder to deal with; complete denial of problems or legitimacy of others' concern
Problems often triggered by change in circumstances (health, income, relationship)	Overwhelming compulsion to save animals overrides ability to care	Lacks empathy for people or animals and is indifferent to the harm caused
Begins with initial effort to deliver proper care, but gets overwhelmed	Starts with adequate resources for care but care decline is more rapid because of volume	May have sociopathic characteristics and greater tendency to Axis II disorders (e.g., personality disorder)
Decline in caretaking is quite gradual	Strong mission to save animals and fear of death or euthanasia drives compulsion to acquire	Self-absorbed and narcissistic
Strong attachment to animals as family members	Avoids authorities or impedes access	Manipulative and cunning, often quite charismatic
Fewer issues with authorities and lesser need to control	May work with a network of enablers and be more engaged with other people	Lacks guilt or remorse for actions
Tends to be withdrawn and isolated		
Acquires animals passively	Tends to acquire animals more actively	Acquires animals actively
Self-esteem linked to role as caregiver		
Greater tendency toward Axis I disorders		

Source: Modified from Patronek, G.J., Loar, L., Nathanson, J.N. (eds) (2006) Animal hoarding: Strategies for interdisciplinary interventions to help people, animals, and communities at risk, in *Hoarding of Animals Research Consortium (HARC)*, Boston, Maryland.

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Why Hoarders Hoard Animals?

Understanding the forces driving hoarding behavior and the role animals play in hoarders' lives is critical for successful intervention and prevention. Histories of abuse, neglect, and inconsistent parenting are common in interviews of animal hoarders (Patronek, Loar and Nathanson, 2006; Patronek and Nathanson, 2009). Attachment theory and the literature on trauma, abuse, and addiction is beginning to provide insight into how and why these experiences may predispose to hoarding (Patronek and Nathanson, 2009).

Well-established attachment theory holds that humans (as well as many other mammals) have a natural instinct and critical need to seek out secure attachments with others, particularly with parents or caregivers during development (Bowlby, 1980). Secure attachment and predictable caregiver availability are essential for healthy psychological and emotional development throughout childhood and adolescence. When secure attachment does not occur, or there is neglect or abuse by the caregiver, the child develops psychological strategies to cope with the resulting lack of affirmation and security. When children in these circumstances have pets, some may find refuge in the unconditional love and constancy provided by them. This compensation strategy may shape their future relationship with animals, and in adulthood, further complicate any attempt at intervention.

Much has been written about how a dysfunctional or abusive childhood leads to what is termed a disordered attachment style, and how this, in turn, predisposes to a plethora of self-destructive addictive behaviors such as substance abuse, compulsive gambling, and promiscuity later in life (Cassidy and Mohr, 2001; Page, 2001; Flores, 2004; Levy, 2005; Young, 2005; Lee, 2006; Lyons-Ruth *et al*., 2006). Thus, it is no surprise that in adulthood some people who have difficulty establishing interpersonal relationships for support would also find refuge in animals (Patronek and Nathanson, 2009).

The compulsive caregiving that is the hallmark of animal hoarding may, for a time, benefit some animals. Compulsive caregiving ceases to be altruistic or benign when the focus of the activity becomes meeting the needs of the person (e.g., for identity, self-esteem, and safety) instead of meeting the needs of animals. Inevitably, in order to preserve and protect these key functions, compulsive caregiving becomes accompanied by intense dependency and an overwhelming need for control. Any suggestion of adopting out animals or downsizing is extremely threatening because it provokes feelings of intense grief and loss. Indeed, the need to maintain the illusion of control is so powerful that it fosters a pattern of denial sufficient to ignore obvious suffering and death.

Mental Health Issues in Animal Hoarding

Mental health issues play an important contributing role in animal hoarding. Animal hoarding, like the hoarding of inanimate objects (Frost, Krause and Steketee, 1996; Damecour and Charron, 1998), is believed to be associated with a wide variety of psychological disorders (Patronek and Nathanson, 2009). The number and severity of comorbid mental health problems, and Axis II personality disorders in particular, not only contribute to the expression of animal hoarding but also become a major barrier to successful intervention and prevention of recidivism.

Axis II personality disorders as they are currently viewed first emerged with publication of the Diagnostic and Statistical Manual of Mental Disorders (DSM-III) in 1980. They have been described as early onset, inflexible, lifelong, stable, maladaptive variants of normal personality traits that may be present to a lesser degree in many people (Kendell, 2002; Trull and Durrett, 2005). This is in contrast to Axis I disorders (depression, anxiety, bipolar disorder), which are assumed to arise from a morbid process with a recognizable onset and course (Kendell, 2002). Mental health professionals consider the deeply ingrained behaviors seen in personality disorders to be very resistant to treatment (Kendell, 2002) although there is some evidence that perspective may be changing.

As has been noted, the 10 personality disorders listed in DSM-IV-TR (Trull and Durrett, 2005; Krueger *et al*., 2007) may merge imperceptibly into normality and one another. Borderline personality disorder (BPD), one of the more serious and more prevalent of the group, affects about 2% of the general population. BPD may be viewed as a way to describe patients whose condition is more severe than neurosis but does not quite reach the level to be diagnosed as psychosis (Bjorklund, 2006). It is strongly associated with childhood trauma (Ball and

Links, 2009) and is diagnosed approximately three times more frequently in women (Skodol and Bender, 2003).

Although formal diagnostic studies have not been published for animal hoarders, clinical hallmarks of BPD are striking in their similarity to traits observed in animal hoarders. These include difficulties with insight, judgement, impulsivity, and regulation of emotions; chaotic internal and external lives; and inaccurate perceptions and rationalizations. This may help explain why the criminal justice system is so poorly equipped to deal with these persons when they commit crimes against animals.

It is important to note that animal hoarding is not yet recognized as diagnostic of any specific psychological disorder listed in DSM-IV-TR (2000). Furthermore, the diagnostic classification of object hoarding as well as the distinction between Axis II versus Axis I disorders is under vigorous debate among psychologists and may be revised in DSM-V (Widiger, 2003; Trull and Durrett, 2005; Krueger *et al*., 2007; Saxena, 2007; Zohar *et al*., 2007). Currently, it seems that animal hoarding is best understood as a behavior that represents the final common pathway for expression of a variety of comorbid disorders and for coping with significant psychological trauma and distress.

It is worth noting that several theories of viral- or protozoal (e.g., *Toxoplasma*)-induced mental health conditions have been proposed in association with cats (Torrey and Yolken, 1995, 2003; Mihm, 2001). Currently, there seems to be little empirical support for this notion as a causative factor for animal hoarding; it would certainly not explain the hoarding of non-feline species.

Responding to an Animal Hoarding Case

Ideally, veterinary involvement should begin when an intervention is being contemplated. Preparation for a large-scale rescue is not unlike disaster planning in its complexity and scope, so a formal command structure has been recommended (Figure 26.1). The most effective approach is to identify and coordinate with all relevant agencies and officials prior to an intervention. These include the police and/or district attorney, health department, state veterinarian, state public health veterinarian, state wildlife agency, department of aging or adult protective services, child protection, mental health, sanitation, and code enforcement.

Issues to Consider When Formulating an Intervention

Identify Species and Jurisdiction

Animals ranging from a single species to a diverse menagerie may be present. Accurate identification of species is important for providing proper husbandry as well as to determine the legal status of the animal, and whether animals are specifically permitted, exempted, or otherwise regulated at the state or federal level.

Establish Husbandry Requirements

It is essential to be familiar with the normal husbandry, behavior, and temperament of each species suspected to be present. Some species (or individuals) may be inherently difficult to capture, examine, transport, house, and treat. Special accommodations may also be required if nursing mothers, sexually intact males, females in heat, neonatal animals, or geriatric animals are present.

The typical dog or cat shelter may not be suitable for housing exotic species, farm animals, or birds. In some cases, temporary MASH-type housing using portable cages or fencing may be an option. In other cases, it may be preferable to house the animals on-site to provide temporary care. In either of these situations, it is important to be sure that the site can be adequately secured to protect the health and safety of the animals and staff throughout the period when intervention is required.

When animals are severely debilitated or ill but treatable, saving lives may be technically possible but challenging because of the severity of illness and sheer numbers of animals requiring treatment. Planning should take into account options such as foster homes, rescue groups, or some form of temporary accommodation that would allow rehabilitatable animals to be saved.

Anticipate Contagious and Zoonotic Diseases

Large populations of randomly mixed animals kept under substandard conditions create ideal conditions for the incubation and transmission of infectious diseases. This will have implications for isolation

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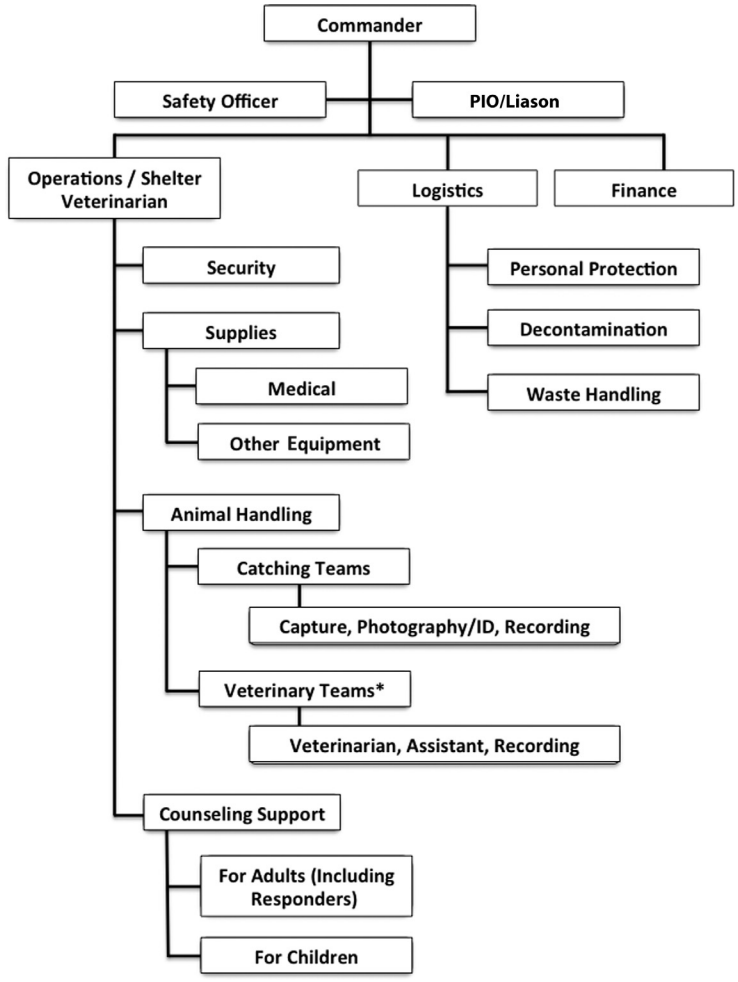


Figure 26.1. Recommended command structure. PIO, public information officer. (Modified from a diagram from the Lewis County Health Department).
*Veterinary triage may be done on- or off-site, depending on circumstances.

and housing at the shelter and for veterinary treatment. Prompt physical examination of each animal is important so that obviously sick or exposed animals are isolated from healthy or unexposed animals.

If contagious or reportable diseases are present or suspected, the state veterinarian may be able to add some regulatory leverage to rescue efforts by imposing and enforcing a quarantine of the premises. This may discourage either further additions or clandestine removal of animals by the hoarder or enablers.

If zoonotic diseases are believed to be present or can be anticipated, precautions may be necessary to protect the safety of staff and other animals. This can include using disposable equipment or supplies, protective clothing, designation of quarantine or isolation areas, implementation of special disinfection protocols, and providing staff training and education to understand and minimize disease transmission.

Plan Animal Confinement and Capture

It is important to have a detailed plan in order to ensure humane capture and transport that ensures safety of both staff and animals. This requires careful assessment of the skill level of personnel and number of staff needed, the expected time frame required for access to the premises, the type of primary enclosures needed, and the number and type of vehicles required for transport. Secondary barriers such as portable fencing or gates may be needed to prevent escape from the dwelling during removal.

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Animals may be either free roaming or confined in some manner. In the latter situation, consider whether certain animals may be in specific areas for some reason, or whether there may be an order or social relationships that must be preserved. For example, there may be animals who will panic if separated from a cage- or stall-mate, or animals who cannot tolerate being near others.

Environmental conditions such as excessive clutter, structural weakness of floors, stairs, or ceilings, obstructed exits, and lack of electricity for lighting may hamper animal capture. Fearful animals may need to be removed from inaccessible spaces such as inside walls, ceilings, or furniture where they have sought refuge. This may require access to the premises over several days in order to ensure all animals are removed. This should be anticipated and planned for in discussions with law enforcement.

Basic equipment for capture and removal includes leashes, collars, ID tags and indelible markers, humane traps and food bait, wire transfer cages, protective gloves, catch poles, and nets. Controlled substances and associated delivery systems may be required to sedate unruly, frightened, or dangerous animals who cannot be humanely handled otherwise.

All equipment should be inventoried and inspected prior to the intervention to be sure it is in good working order. For example, the fasteners holding an airline crate together frequently corrode through age and use, making it nearly impossible to separate the top and bottom. Ability to remove the top is essential; extracting a fractious cat through the crate door by pulling with a catch pole or by shaking the animal out is unduly rough and frightening, and unacceptable from a humane standpoint.

Assume that nothing will be available on-site. An external power source and lighting may be required, as well as a water supply. Hand sanitizers and first aid kits are necessary. Portable tables are often helpful for veterinary examinations and managing other logistics.

Arrange for Veterinary Examination of Animals

It is important to carefully examine each animal and document their condition in individual medical records. The same standards apply in assessing a hoarding case as in a case of single animal abuse. Medical records may end up as evidence in a criminal prosecution or a civil proceeding, and must be legible, in good order, and maintained securely. (See the chapters on how to perform a veterinary forensic examination on both live and deceased animals for more detailed information.) A thorough physical examination should be supported by accurately labeled photographs containing unambiguous identification of the animals pictured. Therefore, each animal should have a unique identification number. It is important that if at all possible, the veterinary examination be performed prior to any treatment that would alleviate or mitigate the conditions present, thereby destroying important evidence. Particularly when large number of animals and/or multiple veterinarians are involved, triage may be more easily accomplished using an easily scored instrument like the TACC scale (Patronek, 2004).

The specific location of each of the animals in the dwelling or on the premises should also be noted if possible. If dead animals are present, the bodies should be saved for a forensic necropsy to establish cause and approximate time of death. Note any unusual placement, ordering, or attempts to conceal bodies.

Follow an Established Communication Plan

Discussions about animal health or conditions onsite should be conducted with the same confidentiality as a veterinarian-client communication. Extraneous comments should be avoided. This can be a difficult standard to achieve in a hoarding case simply because of the large number of staff and volunteers potentially involved. Nevertheless, failure to adhere to proper procedures can seriously compromise successful prosecution, as inappropriate communication may be construed as violating a defendant's constitutional rights. Discussion of the case with staff not involved in it should be avoided, and it goes without saying that nothing should be posted on social media sites. The best policy is to have all communication handled through a designated spokesperson. Consulting with the district attorney's office or police about communication policy is advisable. Because of the widespread availability of digital cameras and cell phones, it is not unusual for onlookers to attempt to film and post online videos of the intervention. It is vital that all personnel conduct themselves in a manner consistent with this possibility.

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Anticipate the Need for Euthanasia

When animals are seized under a warrant, they are part of the evidence in the case. It is advisable to consult with the police or district attorney's office ahead of time to develop mutually agreed upon guidelines about how to handle and document the need for euthanasia should it be deemed necessary.

Euthanasia should always be performed in a manner that is at minimum consistent with the AVMA panel guidelines (AVMA, 2007). This includes a quiet, private setting so that animals are not stressed and not in view of each other or onlookers. The veterinarian must be familiar with proper techniques for whatever species are present, including birds, reptiles, or exotic species, and ensure that appropriate drugs are available in sufficient quantities. Finally, provision must be made for carcass transport and disposal.

Thoroughly Examine the Environment

The growing field of veterinary forensics highlights the value of involvement of a veterinarian in inspecting the entire crime scene in terms of sanitation; water and air quality; nutrition; protection from the elements; provision for enrichment and psychological well-being; and adequacy of general husbandry. It is important to be sure that the search warrant covers controlled substances, prescription medications, or over-the-counter medications suspected of being administered to animals, as well as any records of veterinary care or animal acquisition.

Since starvation is such a prominent feature of many hoarding cases, it is essential to carefully document the type, quantity, quality, and availability of all food on the premises for each species kept. This includes whether it is possible for animals to gain access to whatever food might be present. Empty containers of food should be counted and described. If possible, document receipts that may establish the time lapsed since purchase of food.

There may be a temptation to view the household conditions and clutter in a hoarding situation as a secondary concern to the health of the animals. Nevertheless, it is important to note these conditions. The fact that a person is willing to tolerate living in squalor does not mean that those conditions are safe or meet the needs of animals. Clutter can pose a fire hazard, especially if utilities are not working and fireplaces or kerosene heaters are used for heat. Obstructed electrical outlets, heating ducts, and exits to the building also violate most, if not all, municipal housing codes and pose a danger to human and nonhuman occupants.

Protect First Responders

Detailed safety concerns for first responders to animal hoarding cases have been described (NASPHV, 2010). Substantial accumulation of feces and urine will increase levels of ammonia, hydrogen sulfide, carbon dioxide, and other malodorous vapors. These gases, combined with dust and bioreactive particles such as endotoxin and fungal cell wall components, will make the air irritating and difficult to breathe. Ventilation of the premises may not be possible if opening doors and windows increases risk of animals escaping. Respirator protection is important because these bioaerosols have been shown in other situations to have pro-inflammatory effects in the respiratory tract and in the body as a whole (Donham, Cumro and Reynolds, 2002; Rylander, 2006, 2007) and lead to airway disease (Heederik *et al*., 2007). Properly fitting respirators provide the best protection, and it is best to consult an industrial hygienist or other professional trained in using this equipment to ensure a proper fit. A surgical mask is not effective.

Ammonia levels can exceed 150 parts per million (ppm) in severe hoarding. This is in contrast to ammonia levels in animal shelters, which in the author's experience are <1–2 ppm, even before morning cleaning. Measurable ammonia levels consistently above this are likely indicative of long-standing failure to maintain proper sanitation. Ammonia measurements should be taken prior to any significant ventilation of the premises, because ammonia levels can decrease markedly simply through opening doors and windows. Measuring environmental ammonia is not technically difficult and could be a valuable tool for supporting the need for intervention in a hoarding situation. Handheld self-contained measuring devices are commercially available.

The precise adverse human health effects of ammonia at concentrations present in a hoarding environment are unknown. Most reports in the literature address exponentially greater levels during large-scale industrial accidents or much smaller levels from chronic occupational exposures (Brautbar

and Richter, 2003). The US Occupational Safety and Health Administration (OSHA) lists 50 ppm as the maximum allowable workplace exposure, and further defines a concentration of 300 ppm as a concentration "immediately dangerous to life or health" (NIOSH, 1994). However, ammonia levels below industrial thresholds (e.g., <25–50 ppm) (NIOSH, 1989; 1994; OSHA, 2002) should not be used as indicators of adequate sanitation. As mentioned earlier, properly maintained animal shelters, catteries, and kennels will have levels <1–2 ppm.

Identify Human Victims

Careful documentation of the human living circumstances can make a strong contribution to eventually helping the animal victims. When minor children, dependent elderly, or disabled adults are present (HARC, 2002), the conditions may well meet criteria for adult self-neglect, child neglect, or elder abuse (Patronek, Loar and Nathanson, 2006; Nathanson, 2009). In one state (Illinois), veterinarians are among the mandated reporters of elder abuse and have a legal duty to report these situations (Elder Abuse and Neglect Act, 2009).

Account for the Full Scope of Animal Suffering

Cruelty statutes were not developed with animal hoarding cases in mind, and often fail to address the considerable suffering that can occur from chronic neglect, crowding, squalor, and lack of socialization. The cumulative nature of this type of chronic deprivation and how it corresponds to a lack of care and concern for the animals' welfare must be established and communicated to prosecutors, judges, juries, and the media.

CONCLUSION

Animal hoarding cases pose significant challenges for investigation, assessment, evidence collection and preservation, animal care and placement, prosecution, and prevention. They also impose enormous burdens on communities and the shelters that must care for large number of animals, many of whom may be in poor medical or behavioral health. Familiarity with the problem, building a network of supporting agencies and individuals, and careful planning are key to addressing these cases as effectively as possible. For additional resources, see the Hoarding and Animals Research Consortium (HARC) website.

REFERENCES

American Veterinary Medical Association [AVMA] (2007) AVMA guidelines on euthanasia. Available online at http://www.avma.org/issues/animal_welfare/euthanasia.pdf (accessed June 21, 2012).

Ball, J.S. and Links, P.S. (2009) Borderline personality disorder and childhood trauma: Evidence for a causal relationship. *Current Psychiatry Reports*, **11**, 63–68.

Bjorklund, P. (2006) No man's land: Gender bias and social constructivism in the diagnosis of borderline personality disorder. *Issues in Mental Health Nursing*, **27**, 3–26.

Bowlby, J. (1980) *Loss: Sadness and Depression*, Basic Books, New York, pp. 156–157.

Brautbar, N. and Richter, E.D. (2003) Chronic ammonia inhalation and interstitial pulmonary fibrosis: A case report and review of the literature. *Archives of Environmental Health*, **58**, 592–596.

Cassidy, J. and Mohr, J.J. (2001) Unsolvable fear, trauma, psychopathology: Theory, research, and clinical considerations related to disorganized attachment across the lifespan. *Clinical Psychology: Science and Practice*, **8**, 275–298.

Damecour, C.L. and Charron, M. (1998) Hoarding: A symptom, not a syndrome. *Journal of Clinical Psychiatry*, **59**, 267–272.

Donham, K.J., Cumro, D., and Reynolds, S. (2002) Synergistic effects of dust and ammonia on the occupational health of poultry production workers. *Journal of Agromedicine*, **8**, 57–76.

Flores, P.J. (2004) *Addiction as an Attachment Disorder*, Jason Aronson, Lanham, Maryland.

Frost, R.O., Krause, M.S., and Steketee, G. (1996) Hoarding and obsessive-compulsive symptoms. *Behaviour Modification and Therapy*, **20**, 166–132.

Heederik, D., Sigsgaard, T., Thorne, P.S., *et al.* (2007) Health effects of airborne exposures from concentrated animal feeding operations. *Environmental Health Perspectives*, **115**, 298–302.

Hoarding of Animals Research Consortium [HARC] (2002) Health implications of animal hoarding. *Health & Social Work*, **26**, 125–136.

Illinois Elder Abuse and Neglect Act, 320 ILCS Sec 2 f-5.

Illinois Public Act 92-0454: An act concerning cruelty to animals, 510 ILCS 70/2.10.

Kendell, R.E. (2002) The distinction between personality disorder and mental illness. *British Journal of Psychiatry*, **180**, 110–115.

Krueger, R.F., Skodol, A., Livesley, W.J., *et al.* (2007) Synthesizing dimensional and categorical approaches to personality disorders: Refining the research agenda for DSM-V Axis II. *International*

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Journal of Methods in Psychiatric Research, **16**(S1), S65–S73.

Lee, R. (2006) Childhood trauma and personality disorder: Toward a biological model. *Current Psychiatry Reports*, **8**, 43–52.

Levy, K.N. (2005) The implications of attachment theory and research for understanding borderline personality disorder. *Development and Psychopathology*, **17**, 959–986.

Lyons-Ruth, K., Dutra, L., Schuder, M.R., *et al*. (2006) From infant attachment disorganization to adult dissociation: Relational adaptations or traumatic experiences? *Psychiatric Clinics of North America*, **29**, 63–86.

Mihm, S. (2001) Pet theory; do cats cause schizophrenia? *Linguafranca*, **10**, 32–40. Available online at http://cogweb.ucla.edu/ep/Schizovirus.html (accessed June 21, 2012).

Nathanson, J. (2009) Animal hoarding: Slipping into the darkness of comorbid animal and self-neglect. *Journal of Elder Abuse and Neglect*, **21**, 307–324.

National Association of Public Health Veterinarians [NASPHV] (2010) General public health recommendations for responding to animal hoarding cases. *Journal of Environmental Health*, **72**, 14–18.

National Institute for Occupational Safety and Health [NIOSH] (1989) Ammonia. Available online at http://www.cdc.gov/niosh/pel88/7664-41.html (accessed June 21, 2012).

National Institute for Occupational Safety and Health [NIOSH] (1994) Documentation for immediately dangerous to life or health concentrations (IDLHs). Available online at http://www.cdc.gov/niosh/idlh/intridl4.html (accessed June 21, 2012).

Occupational Safety and Health Administration [OSHA] (2002) Chemical sampling information: Ammonia. Available online at http://www.osha-slc.gov/dts/chemicalsampling/data/CH_218300.html (accessed June 21, 2012).

Page, T.F. (2001) Attachment and personality disorders: Exploring maladaptive developmental pathways. *Child and Adolescent Social Work Journal*, **18**, 313–334.

Patronek, G.J. (1999) Hoarding of animals: An underrecognized public health problem in a difficult to study population. *Public Health Reports*, **114**, 82–87.

Patronek, G.J. (2004) Animal cruelty, abuse, and neglect, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski), Blackwell Publishing, Ames, Iowa, pp. 427–452.

Patronek, G.J. (2008) Animal hoarding: A third dimension of animal abuse, in *International Handbook of Theory and Research on Animal Abuse and Cruelty* (ed F.R. Ascione), Purdue University Press, West Lafayette, Indiana.

Patronek, G.J., Loar, L., Nathanson, J.N. (eds). (2006) Animal hoarding: Strategies for interdisciplinary interventions to help people, animals, and communities at risk, in *Hoarding of Animals Research Consortium (HARC)*, Boston, Maryland. Available online at http://vet.tufts.edu/hoarding/pubs/AngellReport.pdf (accessed June 21, 2012).

Patronek, G.J. and Nathanson, J.N. (2009) A theoretical perspective to inform assessment and treatment strategies for animal hoarders. *Clinical Psychology Reviews*, **29**, 274–281.

Pet-Abuse.Com. Available online at http://www.pet-abuse.com/pages/cruelty_database.php (accessed June 21, 2012).

Rylander, R. (2006) Endotoxin and occupational airway disease. *Current Opinion in Allergy and Clinical Immunology*, **6**, 62–66.

Rylander, R. (2007) Endotoxin in the air: Good or bad for you? *Clinical Pulmonary Medicine*, **14**, 140–147.

Saxena, S. (2007) Is compulsive hoarding a genetically and neurobiologically distinct syndrome? Implications for diagnostic classification. *American Journal of Psychiatry*, **164**, 380–384.

Skodol, A.E. and Bender, D.S. (2003) Why are women diagnosed borderline more than men? *Psychiatric Quarterly*, **74**, 349–360.

Torrey, E.F. and Yolken, R.H. (1995) Could schizophrenia be a viral zoonosis transmitted from house cats? *Schizophrenia Bulletin*, **21**, 167–171.

Torrey, E.F. and Yolken, R.H. (2003) *Toxoplasma gondii* and schizophrenia. *Emerging Infectious Disease*, **11**, 1375–1380.

Trull, T.J. and Durrett, C.A. (2005) Categorical and dimensional models of personality disorders. *Annual Review of Clinical Psychology*, **1**, 355–380.

Widiger, T.A. (2003) Personality disorder and Axis I psychopathology: The problematic boundary of Axis I and Axis II. *Journal of Personality Disorders*, **17**, 90–108.

Vermeulen, H. and Odendaal, J.S.J. (1993) Proposed typology of companion animal abuse. *Anthrozoos*, **6**, 248–257.

Young, M.E. (2005) Attachment disorder: A distortion of self and its effects on relationships. *Psychology and Education*, **42**, 10–13.

Zohar, J., Hollander, E., Stein, D.J., *et al*. (2007) Consensus statement. *CNS Spectrum*, **12** (Suppl 3), 9–63.

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27
Animal Fighting

Randall Lockwood

INTRODUCTION

Humans have been pitting animals against one another for profit, "entertainment," or sadistic enjoyment throughout recorded history. Species that continue to be fought today include fish, crickets, spiders, canaries, horses, dogs, and chickens. We focus primarily on dogfighting and, to a lesser extent, cockfighting since these are the situations most likely to be encountered in shelter medicine.

Dogfighting is the "blood sport" of greatest concern to animal protection, veterinary, and law enforcement professionals—as well as to the general public. To many in these fields, it represents the greatest betrayal of the special human–canine relationship. Cockfighting has also become a growing concern, not only for the cruelty inherent in the activity, but also for its close association with other crimes and its implication in the spread of diseases such as exotic Newcastle disease (Dinnage, Bollen, and Giacoppo, 2004).

Dogfighting has presented a challenge to law enforcement for nearly 150 years. Until recently, laws addressing animal cruelty in general and dogfighting in particular were usually weak and/or poorly enforced. Veterinarians rarely encountered dogs associated with dogfighting. In the last decade, that has changed dramatically. Today, dogfighting is recognized as being almost inseparable from drugs, illegal weapons, illegal gambling, and many other activities that the public demands be addressed by police. As of 2009, dogfighting is a felony in all states, and the interstate traffic of dogs for fighting purposes is a federal felony. In most states, the possession of dogs for the purpose of fighting is also a felony. Being a spectator at a dogfight is currently a felony in a growing number of states. Animal cruelty, *always* a component of dogfight enterprises, can also result in felony penalties in nearly every state.

A major factor in raising awareness of dogfighting was the arrest and conviction of NFL quarterback Michael Vick on federal charges related to dogfighting in 2007 (Gorant, 2010). The worldwide publicity surrounding the activities of this celebrity, as well as other dogfighting cases involving high-profile individuals in the sports and entertainment industries, created growing public pressure on law enforcement to respond. The key role of humane investigators and veterinary professionals in responding to dogfighting was highlighted in 2009 by the largest dogfight raid in U.S. history. Nearly 400 dogs, including many pregnant females, were seized during simultaneous operations at more than 20 locations in eight states, resulting in 26 arrests. The raids combined the resources of federal and state law enforcement agencies and local and national animal protection groups. Most of the dogs were housed in a converted warehouse for more than 5 months while undergoing medical evaluation, treatment, and behavioral assessment.

WHAT IS DOGFIGHTING?

Every state, and the federal government, has its own definition of the crime of dogfighting. In general, the crime consists of owning, possessing, keeping, or training dogs, with the intent that they engage in an exhibition of fighting with another animal

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for amusement or gain, or permitting such acts on premises under one's control. In most states, dogfighting is a unique offense, separate from cockfighting or other illegal activities involving dogs including bear-baiting, bull-baiting, badger-baiting, or other combat.

A Brief History of Dogfighting

The history of any illegal activity involving any long-established breed is subject to controversy. Dogfighting and fighting dogs, particularly the so-called pit bulls, have an uncertain history that continues to be debated (Hoff, 1981). A basic understanding of the origins of the practice can aid in understanding the physical and psychological issues that might be faced by those caring for the animals that have been used in fighting.

The use of dogs against lions, wild boar, bulls, and humans dates back more than 3000 years. Large bulldogs were widely used in the Middle Ages to assist butchers in bringing bulls to market, catching and bringing down animals on command. Bull-baiting as "entertainment" traces its origins to thirteenth-century England. Another fashionable pastime was bear-baiting, in which dogs related to the bulldogs were pitted against tethered bears, with prizes and fame awarded to the most persistent or "game" dogs.

Although dogs of various breeds had been fought against each other for decades, the true beginning of popular dogfighting coincides with the prohibition of bull-baiting and bear-baiting in England under the Cruelty to Animals Act of 1835. That year, London also outlawed dogfighting within a 5-mile radius, but it remained legal elsewhere. Those who took pleasure in bull-and bear-baiting quickly found dogfighting to be a suitable alternative, especially since dogfighting was adaptable to a surreptitious existence. It is worth note that modern dogfighting rules are virtually the same as those used from the beginning of the "sport's" popularity.

Dogfighting Comes to America

Although there are historical accounts of dogfights involving mastiffs or other larger breeds going back to the 1750s, widespread activity emerged after the Civil War, with professional pits proliferating in the 1860s, mainly in the Northeast. Many of the animals were brought from England and Ireland, where dogfighting had expanded in the 1830s. One of the most notorious dogfighting operations was Kit Burns's Sportsman's Hall in New York City, scene of dogfights, cockfights, ratting, and other events. In 1868 Burns's establishment was raided by officers of the newly chartered American Society for the Prevention of Cruelty to Animals (ASPCA), the first law enforcement action against dogfighters in America. Burns was fined $800, but criminal charges were dismissed. Dogfighting continued to proliferate in several major cities, including Philadelphia, Boston, and Chicago.

In 1898, the United Kennel Club (UKC) was established as a registry exclusively for pit bulls, designated "American Pit Bull Terriers" (APBT) to keep track of bloodlines. It established standard rules for fights in order to reduce feuds and foul play. It eventually began registering a variety of other "working" dogs. Facing pressure from the American Kennel Club (AKC), which has always opposed dogfighting, the UKC adopted policies against dogfighting in the 1940s. The AKC refused to recognize the breed until 1936, when it established conformation standards for what was eventually designated as the American Staffordshire Terrier. Dogfighters and others more concerned about performance than appearance avoided the registry, although some fighters today refer to their dogs as American Staffordshires when seeking to avoid suspicion. An additional registry, the American Dog Breeders Association (ADBA), was established in 1909 exclusively as a registry for pit bulls to preserve the original gameness of the breed, with many of the studbooks provided by breeders of famous fighting dogs. Like UKC, the ADBA adopted a policy statement (2006) that "does not condone or encourage the use of dogs for any illegal activity including dogfighting." They continue to sponsor weight-pulling competitions that emphasize strength and stamina.

Although many laws were passed outlawing dogfighting, the activity continued to expand throughout the twentieth century. The nation's largest animal protection groups, including the ASPCA and The Humane Society of the United States (HSUS), worked closely with police to investigate and prosecute dogfighting, but arrests were relatively infrequent. In the last decade, increased attention from law enforcement and animal protection groups has exposed the brutality and extent of dogfighting to a much wider audience, leading to stronger laws

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at the state and federal level and a growing number of arrests (Dantzler *et al*., 1997). However, the practice of dogfighting has continued and changed, with much of the expansion due to the proliferation of smaller scale activities that are more difficult to investigate and respond to without widespread cooperation of many agencies, community groups, and veterinary professionals.

DOGFIGHTING TODAY

Reasons for Involvement in Dogfighting

There are many reasons people are attracted to dogfighting. The most basic is greed. Major dogfight raids have resulted in seizures of more than $500 000, and it is not unusual for $20 000–$30 000 to change hands in a single fight. Stud fees and the sale of pups from promising bloodlines can also bring in thousands of dollars. Young participants often are convinced that they can breed and sell a few fighting dogs and make a lot of money, yet very few succeed. The sales of publications and training tools such as treadmills and other paraphernalia can be an additional source of income. For some, involvement in dogfighting helps define their "outlaw" status and their rejection of the values of mainstream society, giving them credibility with a community that shares the same values. For others, the attraction lies in using the animals as an extension of themselves to fight their battles.

The People

Just as dogfighting is found in many regions of the country, participants and spectators at dogfights are a diverse group. While some might typify dogfighting as a symptom of urban decay, not every dogfighter is economically disadvantaged. There are people who promote or participate in dogfighting from every community and background. Audiences and participants have been known to include lawyers, judges, police, and teachers drawn in by the excitement and thrill of the blood sport.

Although many people associate dogfighting themes and images with "hip-hop" or "rap" culture, this is a recent addition to an enterprise that has been active in America for more than a century and a half. Ironically, some of this change is related to attempts to ban pit bulls. Whenever pit bulls are outlawed, the ownership of the breed and association with dogfighting can become an "outlaw" status symbol. For this and other reasons, most animal protection, animal control, and veterinary organizations oppose breed-specific legislation as a solution to dog bite and dogfighting concerns (AVMA Task Force, 2001).

Types of Dogfighters

Most law enforcement experts divide dogfight activity into three main categories: "street" fighting, "hobbyist" fighting, and "professional" activity.

Street fighters

Street fighters engage in dogfights that are often conducted in informal settings such as street corners, back alleys, and abandoned buildings. Street fighters are often in violation of local ordinances related to licensing, vaccination, and basic care of dogs. Street fights are frequently associated with gang activities. The fights may be conducted with money, drugs, or bragging rights as the primary payoff. There is often no attempt to care for animals injured in the fight, and police or animal control officers frequently encounter dead or dying animals abandoned in the aftermath of such fights.

Hobbyist fighters

Hobbyist fighters is a term sometimes applied to those who are more organized, with one or more dogs participating in several organized fights a year as a sideline for both "entertainment" and to attempt to supplement income. They pay more attention to care and breeding of the dogs and are more likely to be traveling across state lines for events.

Professional Dogfighters

Professional dogfighters may have any size "yard" of fighting dogs, but often have large numbers of animals (often 50 or more). They earn money from breeding, selling, and fighting dogs at a central location or at fights or even via the Internet. They often pay particular attention to promoting established winning bloodlines and to long-term conditioning of animals. They regularly dispose of animals who are not successful fighters or breeders, using a variety of methods that include shooting and blunt force trauma. Unlike professional dogfighters of the past, both professionals and hobbyists of today may dispose of dogs who are too human aggressive for the pit by selling them to street fighters or others who are

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simply looking for an aggressive dog, thus contributing to the dog-bite problem and impacting the pit bull's previous reputation as a highly people-friendly dog.

Professionals are well connected with one another, increasingly by way of the Internet. They also pride themselves in having expert knowledge of animal nutrition, genetics, and veterinary care and may try to profit by selling this expertise to others, often reaching out to hobbyist fighters to induce them into a higher degree of involvement in this activity.

Professional/Street Dogfighters

Professional/street dogfighters represent a fourth category of dogfighters that seems to be emerging, with some wealthier individuals from the sports and entertainment worlds using their financial resources to promote large-scale professional dogfighting enterprises, which often use the philosophy and training techniques usually associated with street fighting. The prosecution of Michael Vick, the rapper DMX, and others for dogfighting-related activities has revealed the prevalence of this new category.

The Dogs

It is important for veterinary and law enforcement professionals to have a basic understanding of the history, breeding, care, handling, and training of animals used in dogfighting to better understand the kinds of injuries and evidence that are likely to be found in association with this crime.

In the early days of dogfighting in England, the Bull Terrier was reportedly the dog of choice for this blood sport, but it was eclipsed in the late nineteenth and early twentieth centuries by the American Pit Bull Terrier. One of the most popular breeds of the time, the American Pit Bull Terrier was noted for its strength, intelligence, and devotion to its human family. Responsible breeders who breed pit bulls as pets have generally selected *against* the high degree of aggression to other animals seen in fighting lines while preserving the many desirable qualities of the breed. Dogfighters, on the other hand, have exploited these good qualities while placing the emphasis on "gameness," or the willingness to engage in prolonged combat.

In addition to being used for dog fighting, most of the pit bull-type dogs who arrived in America prior to 1900 were used as family protectors or "catch dogs" for stray cattle and hogs. They tended to be smaller than today's American Pit Bull Terriers, usually under 25 pounds. There was a gradual increase in size over the next 100 years or so, with males generally weighing between 35 and 60 pounds and females between 30 and 50 pounds. Almost all dogs encountered in professional and hobbyist fight situations are American Pit Bull Terriers.

Street fighters are more likely to attempt to produce larger and more aggressive animals through breeding with other guarding and fighting breeds such as Mastiffs, Fila Brasilieros, and Presa Canarios. Occasionally, Doberman Pinschers, Rottweilers, Mastiffs, German Shepherds, or other breeds are reportedly used in street fights, or as "bait dogs," to train fighting dogs. Professional fighters and most hobby fighters seek dogs from known and proven fighting bloodlines, often seeking out animals descended from champions (three-time winners), grand champions (five-time winners), or "registry of merit" dogs who are the parents of champions. Both males and females may be fought, although the majority of recorded fights involve males. Fights involving males against females are not part of traditional dogfighting, but may occur in street fights.

Although many of the dogs seized in dogfight raids come from established fighting lineages, fighters today, particularly street fighters, have a readily available supply of pit bulls of unknown origins and experience. Another trend since the early twentieth century has been the selection for specific fighting styles, with certain lineages specialized for attacks on the legs, face, and abdomen. Investigators may see reference to "leg dogs" or "face dogs" in underground fighting literature or advertisements.

Breeding, Raising, and Training Fighting Dogs

Not just any dog, or even any pit bull, can be trained and conditioned to fight. Much like hunting dogs, herding dogs, trailing dogs, and other breeds selected for particular roles, fighting dogs are bred to be predisposed to benefit from the training that will prepare them to succeed in the pit, but even champion bloodlines do not guarantee success, and fighters kill or otherwise dispose of many dogs who do not perform well.

"Gameness"—a dog's willingness or desire to fight and continue despite injury or fatigue—is the most admired trait in fighting dogs. Fighters

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themselves disagree about the importance of genetics in determining gameness, but it clearly is not a single trait that is reliably passed on from one generation to the next. Great attention is paid to sires and dams who are game and, more importantly, are able to pass this quality on to their progeny. But even champion fighting dogs may produce only a small percentage of offspring who will be winning fighters (Lockwood, 1995).

Housing

Fighting dogs must be kept isolated from other dogs, so they spend most of their lives on short heavy chains, often just out of reach of other dogs. Many communities have outlawed continuous chaining, so this practice alone may be a violation of local laws. The presence of deeply worn paths along the circumference of the chain area and chaffing at the collar can be evidence of prolonged chaining. The dogs often have inadequate shelter from the elements, sometimes in the form of old oil drums or other materials that do not provide the kind of protection required under most state laws. As a result of their isolation from friendly dogs, fighting dogs are usually poorly socialized to other dogs.

Diet

Many professional and hobbyist fighters invest much time and money in conditioning their animals. They are often given quality nutrition, basic veterinary care, and supplements, including vitamins and protein supplements. When preparing for a scheduled match, serious dogfighters often employ a strict regimen of diet and conditioning exercise that may begin 4 to 6 weeks prior to the fight (see conditioning section).

Breeding

Because of the potential for a high degree of dog-to-dog aggression in fighting dogs, it can be difficult to have them mate without incident. Many breeders employ an apparatus to restrain the female during mating to prevent injury to either dog. This is commonly referred to as a "rape stand," which is a stand used to strap and immobilize female dogs for breeding purposes (see Figure 27.1). Breeders of pit bulls for conformation, weight pull, or other uses that do not encourage aggression to other animals rarely have the need of such apparatus.



Figure 27.1. Rape stand. Photo by Mark MacDonald.

Veterinary Care

Most dogfighters try to avoid drawing attention to their activities by avoiding the use of veterinarians. They will usually obtain vaccines, drugs, and supplies through mail order, third parties, veterinary technicians, or, occasionally, an unscrupulous veterinarian. They may have a large assortment of drugs, surgical supplies, and other veterinary equipment on hand for use in conditioning and for the treatment of animals injured in fights.

Raising And Testing Puppies

Professionals and hobbyists usually subject pups to a careful screening process, culling those who show little or no aggression to other dogs at an early age. At about a year, fighters often begin testing the dogs' enthusiasm and stamina through short, carefully controlled "rolls" or "bumps" with other dogs. In early tests, the dogs may be muzzled to prevent injury.

At about 2 years of age, if a dog has shown promise in initial rolls, he may be subjected to one or more serious "game tests" in which he is pitted against an older, more experienced, and sometimes larger animal. The objective is not simply to see how skilled the dog is, but how willing to continue to restart an interrupted fight. Street fighters and less experienced hobbyists often try to take shortcuts in encouraging or evaluating gameness. They may subject dogs to game tests or serious rolls at an earlier age. They may use fights against stolen dogs or animals who are not sufficiently game for competition, or they may

repeatedly fight their animals against opponents who have had their teeth removed or filed down to prevent injury to the dog being trained. Professionals criticize this approach, claiming that nothing useful is learned from pitting a dog against a weak opponent.

Conditioning

If a dog has been deemed suitable for use in matches, he will be subjected to a period of conditioning of 4–6 weeks referred to as a "keep." Specific procedures of diet, medication, vitamins, and exercise vary from fighter to fighter, and details are often kept secret or sold to other fighters in the form of a manual or video; such materials can be important evidence in documenting involvement in fighting. The main objectives of the keep are to bring the animal to an agreed-upon fighting weight, and develop strength, endurance, and cardiovascular fitness. Most fighters keep careful records of these procedures so they can later evaluate what might have worked or failed in their preparations. Such logs can constitute strong evidence of the intent to fight the dog.

Fighters use a variety of tools and techniques for developing strength and stamina. The emphasis is on vigorous workouts, interspersed with periods of rest and recovery. Tools and techniques most commonly found in association with training dogs for fighting include

- Treadmills—usually with a running surface of wooden slats or carpeting
- Jenny or catmill—a rotating shaft with a long spoke to which the dog is harnessed, similar in design to a horse-walker
- Spring poles and flirt poles—flexible poles that have an animal hide, inner tube, or piece of canvass attached; dogs attempt to catch, bite, and hang on to the "bait"
- Road work—having the dog run alongside a car, motorcycle, or ATV, usually on a remote road; the dog may be weighted with chains or other source of added weight, even cinder blocks
- Water work—fighters may also condition animals by forcing them to tread water in a swimming pool or water tank, or by exercising them in rivers, lakes, or the ocean

The conditioning of fighting dogs may also make use of a variety of legal and illegal drugs, often including anabolic steroids to enhance muscle mass and encourage aggressiveness. Narcotic drugs may also be used to increase the dogs' aggression and mask pain during a fight. Street fighters may also expose their dogs to substances such as gunpowder, hot sauce, or other damaging irritants in attempts to increase aggression.

THE ROLE OF VETERINARY PROFESSIONALS IN RESPONDING TO DOGFIGHTING

Veterinarians and veterinary technicians may encounter fighting dogs in several ways. They may see individual dogs presented by clients. They may be asked to assist humane agents and law enforcement on site in a raid on a suspected dogfighting operation, or they may be involved in the treatment and longer-term care of dogs brought to the shelter/clinic in the aftermath of such a raid.

Most dogfighters attempt to provide almost all veterinary care themselves to avoid detection. Some dogfighters have obtained training as veterinary technicians in order to develop basic skills in caring for injured dogs while avoiding taking them to a veterinarian. In the case of animals seen as patients, several states specifically mandate that veterinarians report reasonable suspicion to law enforcement authorities that an animal in their care has been injured in a dogfight. (See the chapters on overview of animal cruelty laws and examination of the live abuse victim for more information.) Other states mandate veterinary reporting of animal cruelty, which includes reporting animal fighting. Check with your state veterinary medical association or state board for the current status of such regulations. Even without a legal mandate to report, veterinarians who knowingly assist clients who are suspected of dogfighting activity may be subject to criminal charges as accessories if they fail to report. In many states, veterinarians are protected from liability for any such reports that are made in good faith.

The Veterinary Role in a Dogfight Raid/Rescue

Once a suspected dogfighting crime scene has been secured by law enforcement and evidence (other than the animals) has been collected, veterinarians may be called upon to assist with triage and identification of animals needing special care. In some cases, investigators and/or animal behaviorists will have identified

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any animals who are potentially unsafe for immediate medical examination. Such dogs may need to be sedated prior to assessment and treatment. Most seized fighting dogs show little or no aggression to people, but extra care must be taken in moving them close to other dogs. Uninjured animals should be removed one at a time and given a complete examination either on site or at a veterinary staging area prior to transfer to housing.

Any seriously injured animals should be stabilized on site and sent for emergency veterinary care. Any dogs found dead or that die at the scene or after removal should be sent for necropsy. If immediate necropsy is not feasible, bodies should be refrigerated, not frozen. If buried or burned remains are found on the property, such evidence should be removed by a team familiar with grave excavation, forensic entomology, and forensic botany. A veterinarian should be part of the team to help with the identification of remains, especially if multiple bodies or species are present.

Medical Assessment and Treatment

Veterinarians caring for fighting dogs have two responsibilities. They must deal with the animals' medical needs, and they must also gather information that may become evidence in a criminal proceeding. The extent of care that can be rendered will be affected by the number of animals seized and available staff and other resources. The physical condition of animals rescued on site or examined after removal will often provide significant evidence for the prosecution of a dogfighting/animal cruelty case. It will also be important to document changes in the animal's condition with care and treatment. It is essential that complete written and photographic documentation be kept and that the chain of evidence for each animal be maintained (Sinclair, Merck, and Lockwood, 2006; Merck, 2007).

Prior to their removal from the scene, investigators should have photographed every dog in place, mapped their location on the property, and provided them with a collar bearing both case and individual identification information.

Examination

Consistent records for each animal seen in the context of a dogfight investigation must be maintained. Sample forms are available at ASPCAPro.org. Records should include a live exam form, a scar chart, a daily care form, a weight change form, copies of any laboratory test results, and records of treatment or other care. All records should be dated and signed.

Examination should begin with a series of photographs of each animal. A general photo of the animal with the animal ID, case number, location, and date should be the first picture in the series for each record. Photographs of the face, sides, rear and top of the body, as well as close-ups of any significant findings should be taken. All animals should be scanned for microchips and examined for tattoos, particularly animals who might have been stolen to be used as bait dogs.

A separate scar/wound chart should be completed for each dog, and photographs of all scars/wounds should be taken both from middle distance to show location on the body and close-up (with a photo scale in place to indicate size) to show the characteristics of the injury. Wounds encircling the legs should be photographed from all sides to demonstrate the unique characteristics of such injuries.

Dogs who have been recently fought may have multiple puncture wounds, crushing injuries, and fractured bones and teeth. Recently, fought dogs may show elevated creatine phosphokinase (CPK) as a result of extreme exercise and stress. They may also be suffering from blood loss, dehydration, and shock. Fighting dogs have also been reported to have a high incidence of *Babesia* (*B. gibsoni* and *B. canis*) (Birkenheuer *et al*., 2005; Jeffries *et al*., 2007; Yeagley *et al*., 2009). They are also highly susceptible to parvovirus. Veterinary reports from examination of fighting dogs indicate that parasites are common, including heartworms, tapeworms, hookworms, roundworms, coccidia, Giardia, and demodectic mange. These dogs may also have conditions to which pit bull-type dogs are susceptible, including acral lick granulomas, pyodermas, pressure sores, and anterior cruciate ligament (ACL) ruptures.

If possible, the examination should include radiographs to look for healed or partially healed fractures of the legs and jaw. Full-body radiographs may reveal other healed fractures or embedded bullets. Necropsy of deceased animals may reveal widespread internal injuries, penetrating wounds (including to the skull and hard palate), deep scoring of leg bones, and other indications of severe fight injuries.

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Attention should be given to dental condition, since some fighting dogs may have teeth filed or extracted. In addition, they may have sustained injuries to teeth and gums when "break sticks" were used to pry jaws open in order to separate animals during a fight.

A buccal swab should be taken of each examined dog. This can prove useful in using DNA evidence in linking together animals seized from various locations or in associating blood stains on other evidence (fight pits, treadmills, breaking sticks, etc.) with specific animals to strengthen the association between injured animals and other evidence. Information on submission of such evidence to the Canine CODIS (Combined DNA Identification System) database is available at http://www.vgl.ucdavis.edu/forensics/CANINECODIS.php.

Complete blood work should be performed on all adult animals (6 months and older), regardless of their health status determination, and complete blood work on all sick/thin animals regardless of age, unless exam findings determine blood work is unnecessary. Recommended tests to run include complete blood count (CBC), complete blood chemistries including thyroid screening, heartworm antigen, urinalysis, fecal tests for ova and parasites using zinc sulfate, *Giardia* ELISA, parvo canine antigen, and *Babesia*. Law enforcement may also request collection of samples that can be used to screen for anabolic steroids, stimulants, and other drugs commonly used in fighting dogs.

Treatment

The provision of treatment beyond emergency care may depend on the legal status of the animals. If they have not been surrendered or deemed abandoned, more extensive care may not be permitted without a court order. The case manager or primary law enforcement should be consulted to confirm what is permitted. Euthanasia decisions may be challenged in court. If such decisions are to be made, a detailed medical and behavioral description that supports the decision should be provided, and ideally at least two veterinarians should sign off on the decision with the approval of the case manager.

If longer-term treatment is permitted, it may include ectoparasite treatment, deworming, wound treatment and dental care, antibiotics, eye medications, fluids, ear cleaning and treatment, shaving of matted fur, and/or bathing if needed for medical reasons. Dogs who are to be held for any length of time should receive preventive vaccination for distemper, hepatitis, leptospirosis, parainfluenza, and parvovirus. They may be unvaccinated or may have been vaccinated incorrectly or with improper or expired vaccines. Fighting dogs may show antibiotic resistance due to overuse or misuse of such drugs by fighters.

Long-Term Care

Prior to the Vick case, most seized fighting dogs were held only as long as necessary as "evidence" and were usually euthanized at the conclusion of legal proceedings. Animal protection, animal care and control organizations, and law enforcement have now recognized that fighting dogs should be viewed as individual *victims* of the crime of dogfighting, rather than as contraband or *implements* of the crime. The housing, assessment, and placement of such animals are reviewed in the behavior forensics chapter of this textbook. From a medical perspective, the challenges associated with longer-term housing include the need for caution with animals who may become more aggressive as their health improves, the need to monitor weight gain in animals that may have been accustomed to rigorous exercise, and working with behaviorists to monitor behavioral changes associated with long-term confinement.

The Veterinarian's Role in Dogfighting Prosecution

Most dogfighting prosecutions are based on an accumulation of circumstantial evidence, rather than fighters having been "caught in the act." The medical condition of dogs at the time of their rescue is often central to the case. Attending veterinarians should be prepared to present records and testimony in the following areas:

1. The overall condition of the dogs (body score, parasites, etc.). This is particularly important if there is evidence of criminal abuse or neglect, as well as injuries associated with preparation for fighting such as ear cropping, tail docking, or debarking that do not appear to have been performed by a veterinarian.

2. Any life-threatening or untreated injuries and illnesses that rise to the level of animal cruelty.
3. Wounds characteristic of participation in fighting.

   Veterinary testimony in dogfight cases must often focus on challenging the defense arguments that the wounds seen on the dogs are the result of attempted escape, "yard accident" injuries from a single fight with another dog, or injuries acquired during legal activities such as pig and bear hunting.

   Wounds acquired in the course of one or more dogfights differ significantly from each of the above injuries in their number, pattern, location, age, and wound characteristics. There will often be multiple bite wounds of different ages, including fresh wounds, pink wounds several weeks old, and older, white, scar tissue. Scars associated with pit fights are usually located on the chest, face, and forelegs (see Figures 27.2–27.5).



Figure 27.2. Typical bite wounds on chest, neck, and legs of pit bull. (Photo by Scott Giacoppo. From Dinnage, Bollen, and Giacoppo, 2004, Figure 30.3, with permission from the publisher.)



Figure 27.3. Bite wounds on medial left foreleg of pitbull. (Photo by Scott Giacoppo. From Dinnage, Bollen, and Giacoppo, 2004, Figure 30.4.)



Figure 27.4. Bite wounds on the lateral side of same leg shown in figure 27.3. (Photo by Scott Giacoppo. From Dinnage, Bollen, and Giacoppo, 2004, Figure 30.5.)

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Figure 27.5. Upper and lower arcade bite wound pattern on chest of pit bull. (Photo by Scott Giacoppo. From Dinnage, Bollen, and Giacoppo, 2004, Figure 30.6.)

Fights often involve tugging at the forelegs, resulting in "ring" wounds encircling the leg or matched bite marks on opposite sides of the leg. Dogs in very poor condition with multiple bite wounds who do not seem to show aggression to other dogs may have been used as "bait" dogs in training and may be stolen pets.

Wounds inflicted by animals other than dogs, including wild boar and bears, differ greatly from the multiple puncture wounds associated with dogfighting. In some cases, it may be useful to consult with wildlife veterinarians to document these differences. The primary role of veterinary expert testimony will not be to prove that the injuries were the result of dogfighting, but only that they are consistent with such activities and medically inconsistent with the explanation being offered by the defense.

4. Significance of veterinary medical supplies and equipment that were seized.
   - Since dogfighters generally avoid making use of licensed veterinarians, they often possess materials that are inconsistent with what would be expected in a legitimate dog-breeding or kennel facility or for care of dogs being kept for legal activities such as weight pulling and hunting. This would include supplies for wound treatment and shock (sutures, intravenous fluid kits, and electrolytes), anabolic steroids (e.g., testosterone propionate), stimulants (ephedrine and methamphetamine), pain killers (Talivin, Dilaudid, and codeine), antibiotics, anti-inflammatory agents, and bronchodilators (clenbuterol).

COCKFIGHTING

Cockfighting has a lengthier recorded history than dogfighting, dating from more than 3000 years ago in Persia, India, and China. The use of artificial spurs or gaffs is described in Greek writings from 400 B.C., and artificial spurs of iron, copper, and silver have been found associated with the Roman occupation of Britain, AD 43–410 (Scott, 1983).

Cockfighting was introduced to American colonies soon after their establishment and grew in popularity alongside dogfighting. In the United States, cockfighting is now illegal in all 50 states and the District of Columbia. The last state to ban cockfighting was Louisiana, with legislation that took effect in August 2008. As of this writing, 33 states and the District of Columbia have made cockfighting a felony, and it is illegal in 40 states and the District of Columbia to be a spectator at cockfights. As of 2011, cockfighting remains legal in the US territories of Puerto Rico, the US Virgin Islands, the Northern Mariana Islands, and Guam. In 2006, the Virgin Islands adopted a law banning the use of artificial spurs.

The Animal Fighting Prohibition Enforcement Act (2007) made it a federal crime to transfer cockfighting implements across state or national borders and increased the penalty for violations of federal animal fighting laws to 3 years in prison. Cockfighting remains legal throughout much of Latin America, Southeast Asia, and elsewhere. Even where prohibited by law, as in Brazil, enforcement is weak.

The Animals

A wide variety of breeds of fowl was developed from red jungle fowl for fighting and showing. The two interests can overlap, and cockfighters usually maintain that the animals they have are kept only for

show, although animals in their possession may not fit the standards for any recognized show breed and also may lack the leg bands and documentation of disease testing required of show birds by most states.

A gamecock who is to be fought usually has his comb (the red tissue on top of the head) and wattles (red tissue under the beak) trimmed or "dubbed" at around a year of age. The sickle feathers of the tail may be trimmed along with any long feathers that a cock might trip on during a fight. In some cultures, the feather trimming is much more extensive. The feathers of the chest and the back are sometimes shorn completely off to help prevent a bird from overheating during a longer match (see Figure 27.6). Fighting cocks also have their natural spurs removed so that gaffs or knives can be attached. Gamefowl breeders contend that such surgical manipulation of birds is *not* evidence that they are being fought. They argue that dubbing is good husbandry that prevents frostbite and cage injuries. They claim that spurs are trimmed to prevent injury to handlers or to hens while mating and that the absence of feathers is simply a sign of molting.



Figure 27.6. Typical fighting bird shaved by the owner to better detect points or injuries and to keep cool during the fight. (Photo by Mary Bloom. From Dinnage, Bollen, and Giacoppo, 2004, Figure 30.8, with permission from the publisher.)



Figure 27.7. Gaffs. (Photo by Mark MacDonald.)

The Fight

Cockfights are usually of much shorter duration than dogfights, often with a maximum time limit of 15 minutes. In almost all cases, the birds are fought with steel gaffs, short knives, or long knives attached to their legs (see Figure 27.7). The use of such implements increases the lethality of the attacks. Fights end either with the death of one of the birds, concession by one of the handlers, or when one bird fails to attack after several successive quits. Birds who lose are usually simply discarded and cockfight raids commonly yield a significant number of dead or dying animals.

The Role of the Veterinarian

The condition of animals seized in connection with a cockfight raid is usually not as significant a factor as in the prosecution of dogfighting. Charges are often based on evidence of gambling, drugs, weapons, possession of fighting paraphernalia, or undercover witnessing of a fight. However, careful written and photographic documentation of the condition of animals who are recovered during a raid can add strength to the other evidence. Wounds seen in surviving animals are most common to the head and eyes, which may be pierced by gaffs. Many birds sustain punctures to the lungs or broken legs or wings. These injuries may also result in a large accumulation of blood in the nostrils.

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Shelter veterinarians may be involved in overseeing housing and care for large numbers of birds being held as evidence. Birds need to be housed individually, with visual barriers preventing them from seeing each other. Since fighting cocks have been implicated in the spread of avian influenza, *Salmonella*, and exotic Newcastle disease, many states will require testing of birds upon arrival at the shelter (Hollis, 2003).

As in dogfighting cases, veterinarians may be asked to provide expert testimony regarding the purpose of drugs and veterinary supplies found at a cockfight scene, and how such supplies may not be consistent with the keeping of birds for show purposes. As in dogfighting, these supplies might include hormones, stimulants (including strychnine), clotting agents, and wound treatment materials.

The aggressive nature of fighting birds and concerns about disease transmission to other birds means that rehoming or sanctuary placement is not an option. In some cases, animals proven to be owned by individuals against whom there is insufficient evidence of criminal activity will be ordered returned to their owners. In most other cases where there is a conviction or surrender of animals, euthanasia by injection of sodium pentobarbital is (usually) the only option.

CONCLUSION

The last decade has seen growing concern about animal fighting ventures and the criminals involved in such enterprise. The ASPCA and the Department of Justice's Office of Community Policing Services (COPS) released an excellent, comprehensive guide in 2011, Dogfighting Toolkit for Law Enforcement, that is highly recommended for all professionals involved in fighting this crime. It is available at http://www.aspcapro.org/dogfighting-toolkit-for-law-enforcement.php or http://cops.usdoj.gov/RIC/ResourceDetail.aspx?RID=630. Public and law enforcement interest in bringing such individuals to justice will place increasing demands on shelters and veterinary professionals to use their skills to provide for the animals who are now recognized as victims of these crimes rather than instruments of the crimes and to use their knowledge to hold the perpetrators accountable.

REFERENCES

AVMA Task Force on Canine Aggression and Human-Canine Interactions (2001) A community approach to dog bite prevention. *Journal of the American Veterinary Medical Association*, **218**(11), 1732–1749.

Birkenheuer, A.J., Correa, M.T., Levy, M.G. *et al.* (2005) Geographic distribution of babesiosis among dogs in the United States and association with dog bites: 150 cases (2000–2003). *Journal of the American Veterinary Medical Association*, **227**, 942–947.

Dantzler, F., Johnson, K., Lockwood, R. *et al.* (1997) *Illegal Animal Fighting Ventures: A Law Enforcement Primer for the Investigation of Cockfighting and Dogfighting*, The Humane Society of the United States, Washington, DC.

Dinnage, J., Bollen, K., and Giacoppo, S. (2004) Animal fighting, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski), Blackwell Publishing, Ames, Iowa, pp. 511–521.

Jeffries, R., Ryan, U.M., Jardine, J. *et al.* (2007) Blood, bull terriers and babesiosis: Further evidence for direct transmission of *Babesia gibsoni* in dogs. *Australian Veterinary Journal* **85**, 459.

Gorant, J. (2010) *The Lost Dogs*, Gotham Books, New York.

Hoff, C.P. (1981) *Dogfighting in America: A National Overview*, American Society for the Prevention of Cruelty to Animals, New York.

Hollis, L.C. (2003) Barnyard flocks may increase risk of exotic Newcastle disease. *Kansas Veterinary Quarterly* **6**, 6.

Lockwood, R. (1995) The ethology and epidemiology of canine aggression, in *The Domestic Dog: Its Evolution, Behaviour & Interactions with People* (ed J. Serpell), Cambridge University Press, New York, pp. 132–138.

Merck, M. (2007) *Veterinary Forensics: Animal Cruelty Investigations*, Blackwell Publishing, Ames, Iowa.

Scott, G.R. (1983) *History of Cockfighting*, Saiga Publishing, Surrey, United Kingdom.

Sinclair, L., Merck, M., and Lockwood, R. (2006) *Forensic Investigation of Animal Cruelty: A Guide for Veterinary and Law Enforcement Professionals*, Humane Society Press, Washington, DC.

Yeagley, T.J., Reichard, M.V., Hempstead, J.E. *et al.* (2009) Detection of *Babesia gibsoni* and the canine small *Babesia* "Spanish isolate" in blood samples obtained from dogs confiscated from dogfighting operations. *Journal of the American Veterinary Medical Association*, **235**(5), 535–539.

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28
Equine Cruelty

Pamela Corey

INTRODUCTION

According to the United States Department of Agriculture (USDA) agricultural census of 2007, the nation's equine population was estimated at almost five million, which includes animals used for breeding, showing, and competing in a wide range of equestrian sports (USDA, 2007). Examples include the racing of Thoroughbred, Standardbred, Quarter Horse, and Arabian breeds; domestic breeding and international importation of Warmblood types for show jumping and dressage, as well as the use of light and heavy horses on ranches, working farms, and in rodeo events. Backyard horse ownership is a large component of the American horse population, involving a wide range of equines from miniature horses and donkeys to gaited breeds suitable for pleasure or trail riding. More recent statistics estimated the total equine population in 2010 to be between nine and ten million (FAOstat, 2012).

An overview of active mistreatment as well as passive neglect of the horse will be addressed in this chapter. Guidelines for the layperson and veterinarian to use in the examination and treatment of an abused or malnourished horse will be presented.

OVERVIEW OF EQUINE CRUELTY

Many owners are unprepared for the expense and responsibility of caring for a horse. The purchase price or adoption fee of a horse may be affordable, but regular veterinary care, maintenance of hoof health and/or shoeing, boarding fees, feed, bedding, and equipment are expensive. A major illness or accident requiring medical or surgical care is an expense that can often exceed the cost of acquiring the animal. Neglect comes in many forms. Retirement of a geriatric horse to a farm without adequate supervision can sometimes result in injury or neglect that leads to starvation. When large numbers of horses are housed in common pastures and if stallions are not segregated from others, the resulting interactions may lead to accidental injury. Competition for food occurs in a herd environment, resulting in less dominant horses becoming underweight.

State misdemeanor animal cruelty laws usually apply to all animal species. Section 353 of New York State's Agriculture & Markets law is similar to other state cruelty laws in that it prohibits overdriving, overloading, torturing, cruelly beating, unjustifiably injuring, maiming, or mutilating any animal, as well as depriving any animal of necessary food, drink, or sustenance, and any acts that cause, permit, or further any of these acts of cruelty. The felony animal cruelty law is specific to companion animals, which might include the horse living in the backyard or otherwise not being bred, trained, or shown for commercial purposes. A felony charge is for aggravated cruelty that results in grievous injury or death. Recently a large-scale starvation case on an Upstate New York Thoroughbred breeding farm resulted in 35 misdemeanor cruelty charges against the owner. Although a number of the horses died or were euthanized, possibly as a result of the neglect, felony charges nevertheless were not appropriate because of the commercial nature of the farm. This case

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highlights the need for legislative change in the equine designation as livestock (Post, 2009).

For equines, depending on individual circumstances, the following could be termed necessary sustenance: adequate shelter, daily supervision, and routine hoof care. Other basic necessities include an environment free of man-made hazards, food and water uncontaminated by pests, and an existence that provides the horse, a herd-based prey animal, a life without isolation or overcrowding. All of these are components of state and international guidelines for horse housing facilities and are considered to be minimum care standards for humane guardianship of the equine (AAEP, 2004).

Reports of animal neglect or cruelty may be investigated by a governmental animal care and control agency, or a private nonprofit humane society or society for the prevention of cruelty to animals (SPCA) with cruelty investigation powers. These humane investigators often have special law enforcement training and are authorized by state or local law to issue citations and charge individuals. If they lack enforcement powers, they may work in concert with police. The investigation of cruelty complaints is the responsibility of local police and sheriffs' office, especially when a qualified animal agency is not present in the community.

Veterinarians may be mandated or permitted to report suspected animal cruelty and in some states are protected from liability if they do so in good faith. (See the chapters on overview of animal cruelty laws and medical evaluation of abused live animals for more information.) A veterinarian might be asked by humane law enforcement to examine a horse or group of horses to determine their physical health and possible cause of injury. Facility overcrowding that leads to poor sanitation may adversely affect the health of the animals. Local authorities must determine whether injury or neglect has been caused by the conditions and/or whether there is a need for education. Many jurisdictions do not have the facilities to handle seizure and housing of large animals, or large numbers of horses. Such cases are extremely costly, requiring housing, feed, veterinary, and sometimes labor-intensive nursing care.

EVALUATING ABUSE AND NEGLECT

The domestic horse can be housed in various environments, from large, high-quality, climate-controlled barns to a field with a three-sided shelter from wind and precipitation, often called a lean-to. Many horses, such as the racehorse or highly trained show jumper, are housed indoors in individual stalls and, except for daily riding exercise, are rarely provided with free turnout in paddock or pasture, in hopes of reducing the risk of self-injury. The other extreme is a herd environment where a group of horses is housed in a large pasture with or without natural or man-made shelter where they may, or may not, be individually monitored daily for illness or injury. Examination of the amount of pasture and stabling available for the number of animals being housed is very important. Insulated barns may not be necessary for shelter if there are adequate numbers of paddocks with lean-tos or sheds for shade and windbreak.

Evaluating a complaint will involve obtaining a general overview of the environment as well as performing individual horse examinations. Important first steps will be to determine the number of animals on the property, the type of housing, and the availability of pasture and/or stored feed. The presence or absence of standard husbandry practices will provide information about the general sanitation and health of the animals. Clean water must be available and accessible. There are many types of watering systems, from individual and automatic to containers that might freeze in the winter, making access impossible. The presence of snow or ice is not an acceptable substitute for the presence of accessible, potable liquid water.

If the horses are housed in stalls, the cleanliness of the environment will be associated with the amount and type of bedding that is present. Straw or wood shavings must be of sufficient depth to absorb urine (usually at least 3 inches deep), and the soiled bedding should be removed daily to prevent the horse from standing in a wet environment. Hay and grain must be free of mold and dust and stored in containers or areas that are rodent and pest free.

Body Condition Scoring

The Henneke body condition scoring system originally was developed to evaluate fertility in mares on the basis of their body fat percentage (Henneke *et al*., 1983). Horse breed type, conformation, and height do not influence a condition score and can be combined with a weight tape or other weight measure to identify underweight or obese horses. The system can also be utilized to calculate overall weight gain

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or loss. Taking into consideration the length of the hair coat and using hands-on palpation of the horse, six areas of fat deposition are evaluated: neck, withers, shoulder, loin, ribs, and tailhead. Each area is given a numeric score from 1 to 9, and the numbers are totaled and divided by 6.

It is generally agreed that a body condition score (BCS) of 5 is ideal and that a score of 3 or lower is considered underweight. Horses who are extremely emaciated (BCS 1) or emaciated (BCS 2) are considered to have used up vital stores of fat on the body and internally around the heart and other organs. These horses have also catabolized muscle for energy and may be weak and/or unable to stand for long periods of time (see Figures 28.1 and 28.2).

Examination of the Horse

While evaluating a horse's body condition, other areas of examination include the skin and hair coat and the respiratory, cardiovascular, and musculoskeletal systems. The general appearance of the horse, including skin and hair, may be affected by internal or external parasitism as well as by lack of grooming. Obvious scars or wounds may be evidence of herd competition or fights between dominant and submissive individuals. A rough dull coat and a pot-bellied appearance despite ribs that are easily apparent may indicate intestinal parasitism. General or localized evidence of hair loss might indicate fungal or bacterial infections; rainrot or ringworm infections can result from a lack of grooming, an extremely wet environment, or a suboptimal immune system. Any mucous discharge from the eyes or nose should be noted as well as the respiratory rate of the horse. A horse at rest will usually have a respiratory rate or 12–20 breaths per minute, and it would be unusual to see the nostrils flaring or note any audible breath sounds. A horse with a fever will often be dull, depressed, and lethargic. The normal rectal temperature of an adult horse ranges from 99 to 101°F. Hydration status can be assessed by the appearance of the oral mucous membranes and sometimes by a test of skin turgor (although pinching the skin of the neck to determine its elasticity can be misleading in that elasticity can be affected by the age of the horse).

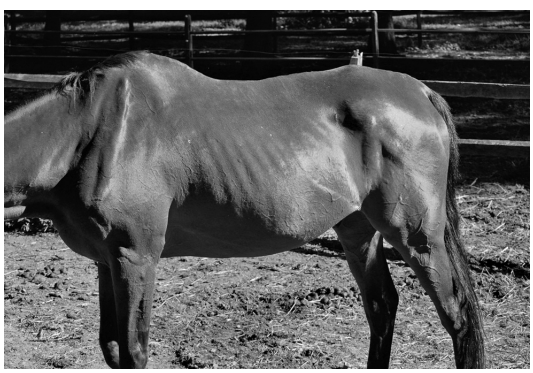


Figure 28.1. Example of a horse with a body condition score (BCS) of 2.



Figure 28.2. Example of a horse with a body condition score (BCS) of 4.

Lameness may be obvious, especially when the horse is in motion, or it can be exhibited by more subtle, cautious behavior at rest. Chronic laminitis, an inflammatory condition of the soft tissues of the hooves, is apparent in the way horses stand with their front feet weighted toward the heels or by shifting weight even when standing on soft ground. Laminitic horses present a special situation as they may be obese or prone to weight gain and consequently be fed poor-quality forage and little or no grain.

Overgrowth of the hooves is often the first and most obvious sign of neglect in the horse and can appear mild and of minimal consequence even though internal structures may already be seriously affected. Bone rotation or infection can be present without obvious signs of distress. If hygiene is poor and the horse is chronically standing in manure,

infection of the soft tissues of the heel bulbs is common, sometimes with maggot infestation. A foul odor might be present, or a peeling or sloughing of the frog when the underside of the hoof is examined. These types of conditions cause significant distress and pain.

Pain and distress in the horse are often difficult to identify because varying degrees of stoicism exist in the species, as in any prey animal, causing them to disguise their pain. In the past it was thought that an elevated heart rate in an otherwise quiet or dull horse might be the only clinical sign of pain in a horse with colic who didn't actively thrash or roll in the stall. Recently, studies have analyzed other parameters of horse behavior to evaluate discomfort, such as interactions with caregivers and direct observation of posture and locomotion (Sellon *et al*., 2004). Horses recovering from surgery were observed in order to identify and score their movements and interactions. Parameters that were evaluated included head height and ear position as well as location in the stall while at rest, presence of spontaneous movement in the stall, and responses to human presence and offers of grain. Horses in the study were given either a pain-relieving medication or a saline "placebo." Results showed that the horses receiving the medication showed more normal postural and social behaviors.

Obvious injuries or illnesses manifest in the horse with various signs such as muscle tension, trembling, holding a limb off the ground, or showing an inability to stand or walk. Close attention to individuals' responses to their surroundings, to other animals and people, as well as to where they may choose to rest can give clues to the degree of comfort or pain they are experiencing. In the study mentioned above, horses in pain exhibited minimal interactions with others and often stood in the back of their stalls with heads lowered.

If any signs of incoordination (ataxia) or severe weakness are noted, a veterinary exam and treatment are necessary to rule out causes other than malnutrition. Vaccinations for mosquito-borne diseases in the United States, including Eastern equine encephalitis and West Nile virus, are recommended annually. Unvaccinated horses who contract these diseases can be so severely affected neurologically that they are unable to stand or walk. Other neurologic diseases exist, including rabies, which can produce similar clinical signs and can also affect horses' ability to swallow.

CARE OF THE STARVED HORSE

Refeeding of the starved horse requires an evaluation of baseline physical findings such as BCS, a thorough dental exam for infections and sharp or broken teeth, identification of parasite load, and evaluation of individual appetite and musculoskeletal strength. Horses in severe states of malnutrition should have minimal handling in order to reduce stress and discomfort. Dental work, if necessary, should be delayed until the horse has shown weight gain, as the sedation that is often necessary for this procedure will lower blood pressure and affect the horse's balance, coordination, and digestion. If parasites are identified by fecal flotation, an anthelmintic (dewormer) should be administered on the basis of a veterinarian's advice. Deworming treatment may also be delayed or given on an incremental basis depending on the horse's overall condition.

Studies of feeding in starved horses agree that forage, preferably alfalfa hay, should be offered in small amounts, and that documentation of weight gain must be performed (Stull, 2003). Evaluation of basic blood chemistries to identify electrolyte abnormalities is sometimes necessary. Monitoring of manure output and consistency allows evaluation of gastrointestinal health and helps to gauge whether an increased amount of feed will be tolerated. The introduction of grain should be done slowly, and the horse must be monitored for development of laminitis or founder. Extremely emaciated horses can develop intestinal bacterial overgrowth or severe electrolyte disturbances if fed too much too quickly. Rarely, a horse may need initial oral or intravenous fluid support by means of a nasogastric tube or intravenous catheter placed by a veterinarian. A program of refeeding and judicious use of dewormers, vaccinations, hoof, and dental care should be implemented with the help of a veterinarian. A basic guideline would include the following:

1. Record initial weight via weight tape measurement, results of the physical examination, and identification of horse.
2. On the basis of the horse's prior access to feed, begin giving handfuls of grass or alfalfa hay on

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an hourly basis. Monitor for signs of colic or diarrhea. Provide access to water.

3. Daily reevaluation of appetite, attitude, and manure output should be performed. Weight can be measured every other day. If all parameters are stable on the second day, grass hay can be supplied in more normal portions (flakes).
4. Depending on parasite identification and the individual horse's condition, a dewormer can be given by the third day.
5. Concentrate feeding can be introduced on the fourth day in very small amounts if there are no contraindications. An easily digestible balanced grain such as an "Equine Senior" product can be used.

See Appendix 28.1 for more information about the treatment of starved horses.

ACTIVE ABUSE

Active maltreatment during riding or training may be reported by a witness but can be difficult to substantiate unless physical evidence of injury exists, such as whip or spur marks, open wounds from tack or other equipment, or lameness or swelling of a limb. A horse's behavior may be affected by how he or she is housed and handled and by interactions with other horses. Horses housed in stalls might exhibit anxiety and nervousness as a result of rough handling and may overreact to stall-cleaning implements or when being saddled or bridled. Horses can develop undesirable behaviors or display attitudes that reflect discomfort with their environment such as stall walking, weaving (swaying back and forth repetitively in the stall), or cribbing (grasping a fence or wall with their teeth and sucking air.) In some cases, an elevated heart rate in an otherwise quiet or dull horse may be the only clinical sign of pain or distress.

Active mistreatment of the equine species is caused by aggressive or incorrect training methods that cause pain or injury to the horse. While accidents are prevalent in any equine discipline, sports such as racing, polo, show jumping, and rodeo can often result in chronic musculoskeletal problems and so-called "career-ending" injuries. Disciplinary bodies and regulatory organizations exist in most equine sports to create rules and regulations about the use of medications, training methods, and equipment. Drug testing and veterinary oversight of individual horse health during and after competition is performed by such groups as the United States Equestrian Federation (governing recognized horse shows nationally), state racing commissions, and the International Equestrian Federation (FEI), for example. Reports of abuse may be made to such groups by competitors or event attendees.

HUMANE CONCERNS

Carriage horses

Urban carriage horse industries are criticized for having minimal standards of housing and veterinary care, inadequate work regulations, and hazardous working conditions. Weather extremes, congested traffic, and road hazards make the work of these horses unhealthy and often dangerous. Accidents that endanger human and equine lives can occur if horses become spooked by loud noises or unexpected sights and sounds while working in the streets. If injured, emergency veterinary care for these horses is difficult to obtain as most practicing equine veterinarians live some distance from urban areas, and local small animal veterinarians often feel uncomfortable providing care to horses. Even if urban horses receive time away from the city, the stables can't provide them with daily access to pasture or turn-out. Lack of access to grass can contribute to nutritional problems and lead to muscle disease, especially in the draft horse breeds (Valentine and Wildenstein, 2000). Enforcement of regulations is required to monitor and protect working horses and their welfare; city agencies often need support from animal control or local SPCA agents to respond to complaints. Carriage horse regulations exist to improve the welfare of the animals through restriction of the number of hours they can work as well as the areas of the city where they may be hired. The ASPCA's Humane Law Enforcement agents have historically performed the bulk of the carriage horse monitoring in New York City, acting as the city department of health's designee for taking the air temperature and monitoring the weather conditions for these working horses. In New York City, the temperature restrictions omit humidity or wind chill factors, but extreme weather that affects motor vehicle traffic such as snowfall, ice, or high wind will result in suspension of the carriage trade and require

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return of the horses to their stables for safety reasons. Other US cities that have carriage industries are trying to make legislative improvements. In Chicago, for example, a 2011 ordinance requires that the carriage driver be responsible for cleaning up after the horse, and the city is also seeking to increase safety by restricting carriage operations to parks (Holmes, 2011).

Soring

The "soring" of the Tennessee Walking Horse breed was so egregious that a law was passed to ban it in 1970 (The Horse Protection Act). The practice continues, however, prompting a recent white paper on the subject by the American Association of Equine Practitioners (AAEP, 2008). The practice of soring consists of the application of caustic, blistering agents to the pasterns, the use of chains and other heavy devices on the legs, and special shoeing in order to exaggerate the natural high-stepping action of this show horse. USDA inspectors use digital radiography and thermography (a camera that detects heat) to identify horses that have been treated illegally.

Interfering with Tails

Despite state laws and horse show regulations against operating on the tails of horses, this practice continues in certain breeds. The tails of Western Pleasure and Hunter horse types are most commonly interfered with by injection of anesthetics or other agents to the nerves to prevent swishing or lashing of the tail during competition. Such movement of the tail is undesirable because it shows excitement, impatience, or anxiety in classes where a calm, quiet demeanor is rewarded. In reality, a swishing tail can be evidence of musculoskeletal pain or displeasure when ridden. Serious side effects of this practice of deadening the tail include permanent paralysis and life-threatening infection.

The tails of some draft horse breeds are docked by amputation of the vertebrae. This practice is illegal in some states and has been prohibited in the United Kingdom since 1949. Historically, the reason for tail docking was to prevent the reins from being caught under the tail while driving. The tails of some gaited breeds such as the American Saddlebred, whose animated, excited carriage is desired, are manipulated by setting in a device that causes them to be carried abnormally high. The muscles of the tail may be surgically cut to allow the tail more movement. A high tail carriage is also desirable in the Arabian horse, which is also perceived as being a spirited and reactive breed. Sometimes this is accentuated by the introduction of a ginger paste into the anus or rectum that produces heat and irritation, causing the tail to be lifted. This practice is illegal in the show ring.

Safety Concerns in Equine Sports

Governing bodies exist to oversee most equestrian disciplines and are designed to protect horses against cruel, inhumane, or unsafe training practices, overwork, and abuse of medications. In 2008, the National Thoroughbred Racing Association created a Safety and Integrity Alliance, which is working to improve the welfare of the racehorse by holding American racetracks to higher standards through accreditation. This alliance requires tracks to report racetrack breakdowns and provide aftercare and retirement to racehorses, among other policies. The alliance hopes to certify the safety of individual racetracks across the country. Efforts such as these are notable because they are in part reactive to negative publicity surrounding the televised breakdowns of horses. In 2008, Racing Victoria Limited (RVL) in Australia announced that as a result of an increase in horse deaths, steeple chasing would be banned in the year 2011. Instead, in 2010, the RVL announced a reprieve for 1 year while jump safety was further examined and fatality numbers decreased significantly. Equestrian cross-country events around the world have been marred by increasing rider and horse accidents and deaths, and the United States Equestrian Federation is taking steps to improve safety, studying the use of break-away materials ("frangible technology") in their historically solid jumps and obstacles.

CONCLUSION

The American Society for the Prevention of Cruelty to Animals (ASPCA), the first animal protection organization in North America, was founded in response to horse abuse that was largely a result of the horse's role in the nineteenth century as a beast of burden pulling heavy wagons and being "overloaded, overdriven, and overworked," the language still found in the New York State animal cruelty laws. Scrutiny of equine industries by the public after

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televised racehorse and rodeo (Calgary Stampede) breakdowns, to name two examples, as well as concern over well-publicized cases of equine neglect, has produced an enhanced understanding of equine welfare issues. *Owning Responsibly* and *Putting the Horse First* are just two of the concepts promoted in response by equine welfare groups and veterinary organizations (Heird, 2011). There is strong support for a current legislative effort to prohibit the use of double-deck trailers for the transport of horses. The Thoroughbred racing industry held a "Raceday Medication Summit" in response to anti-racehorse-doping legislation introduced this year. Equine rescue groups are improving their networking ability and sharing ideas such as low-cost castration, vaccination, and euthanasia clinics for horse owners in need. Humane organizations, shelters, and veterinarians are working together to improve the welfare of the horse and prevent equine abuse.

REFERENCES

American Association of Equine Practitioners (AAEP) (2004) *Care Guidelines for Equine Rescue and Retirement Facilities*, AAEP Resource Library, Lexington, KY. Available online at http://www.aaep.org/pdfs/rescue_retirement_guidelines.pdf (accessed December 3, 2011).

AAEP (2008) Putting the horse first: Veterinary recommendations for ending the soring of Tennessee walking horses. Available online at http://www.aaep.org/white_papers.htm (accessed June 21, 2012).

FAOstat (2012) http://faostat3.fao.org/home/index.html#VISUALIZE, Accessed August 29, 2012.

Heird, J. (2011) Abusive treatment and subsequent policy development within various breeds of show horses in the USA, in *UFAW Animal Welfare Series Equine Welfare*, 1st edn (eds C.W. McIlwraith and B.E. Rollin), Wiley-Blackwell Publishing, Ames, Iowa, pp. 245–254.

Henneke, D.R., Potter, G.D., Kreider, J.L. *et al*. (1983) Relationship between condition score, physical measurements and body fat percentage in mares. *Equine Veterinary Journal*, **15**, 371–382.

Holmes, E. (2011) Carriage drivers raise stink over horse urine law. WLS-TV ABC 7 Chicago, Illinois. Available online at http://abclocal.go.com/wls/story?section=news/local&id=8044978 (accessed December 3, 2011).

Post, P. (2009) N.Y. officials hope to strengthen abuse laws in light of Paragallo arrest. *Thoroughbred Times*, November 27, 2009. Available online at http://www.thoroughbredtimes.com/national-news/2009/november/27/ny-officials-hope-strengthen-abuse-laws-in-wake-of-paragallo-arrest.aspx (accessed December 3, 2011).

Sellon, D.C., Roberts, M.C., Blikslager, A.T. *et al*. (2004) Effects of continuous rate intravenous infusion of butorphanol on physiologic and outcome variables in horses after celiotomy. *Journal of Veterinary Internal Medicine*, **18**(5), 555–563.

Stull, C.L. (2003) Nutrition for rehabilitating the starved horse. *The Horse Report*. Center for Equine Health, School of Veterinary Medicine, UC Davis, CA.

USDA (2007) National Statistics Service, Census of Agriculture Vol. 1 Ch. 1 U.S. National Level Data. http://www.agcensus.usda.gov (accessed June 21, 2012).

Valentine, B. and Wildenstein, M.J. (2000) *Draft Horses: An Owner's Manual*. P 118 Rural Heritage, Gainesboro, TN.

VetBooks.ir

Appendix 28.1
Resources for Handling Starved Horses

Houpt, K.A. (2001) Equine welfare, in *Recent Advances in Companion Animal Behavior Problems*, Ithaca, New York. Available online at http://www.ivis.org (accessed June 21, 2012).

Kronfeld, D.S. (1993) Starvation and malnutrition of horses: Recognition and treatment. *Journal of Equine Veterinary Science*, **13**(5), 298–303.

Poupard, D.B. (1993) Rehabilitation of horses suffering from malnutrition. *Journal of Equine Veterinary Science*, **13**(5), 304–305.

Whiting, T.L., Salmon, R.H., and Wruck, G.C. (2005) Chronically starved horses: Predicting survival, economic and ethical considerations. *The Canadian Veterinary Journal*, **46**(4), 320–324.

Wilson, Julia H. and Fitzpatrick, Drew A. (2004) How to manage starved horses and effectively work with Humane and Law Enforcement officials, *AAEP Proceedings*, **50**, 428–432.

Witham, C.L. and Stull, C.L. (1998) Metabolic responses of chronically starved horses to refeeding with three isoenergetic diets. *Journal of the American Veterinary Medical Association*, **212**(5), 691–696.

INTERNET

http://www.unwantedhorsecoalition.org Responsible ownership guide for horse owners (accessed June 21, 2012).

http://www.sanctuaryfederation.org (accessed June 21, 2012) *Operational Standards for Rescues/Sanctuaries*.

Section 5
Shelter Programs

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Emergency Medicine in the Animal Shelter

Cynthia D. Delany

INTRODUCTION

According to the Association of Shelter Veterinarian's (ASV) Guidelines for Standards of Care for Animal Shelters, "An emergency medical plan must be in place to provide appropriate and timely veterinary medical care for any animal who is injured, in distress, or showing signs of significant illness. Staff should be trained to recognize conditions that require emergency care. The emergency care plan must ensure that animals can receive proper veterinary medical care and pain management promptly (either on site or through transfer to another facility) or be humanely euthanized by qualified personnel as permitted by law." (ASV, 2010).

As these guidelines illustrate, all shelters need to have a plan in place not only for dealing with routine wellness and nonemergency veterinary care, but also for dealing with medical emergencies. One of the most important aspects of a plan for dealing with medical emergencies involves training staff to recognize what constitutes a medical emergency. Staff training should also include how to assess pain. (See the chapter on medical evaluation of abused live animals.) The shelter's emergency medical care plan should include a list of conditions that typically warrant emergency treatment such as shock, hypo- or hyperthermia, seizures, difficulty breathing (dyspnea), uncontrollable bleeding, pain, etc. The plan should include protocols for contacting a veterinarian day or night to provide timely emergency care when these conditions are seen. Whether a staff veterinarian, a local general practitioner, or a local emergency care facility is used, shelter staff need to know how to contact the appropriate veterinarian(s), and protocols must be in place for transporting the animal to the appropriate facility or having the veterinarian attend to the emergency on site.

SPECIFICS OF IN-SHELTER EMERGENCY CARE

It is not easy to define the typical animal shelter emergency patient, just as it is not easy to define the typical animal shelter. Shelters vary greatly in size, number of animals handled, staffing, financial resources, and availability of veterinary facilities and veterinary staff. Emergencies can also vary widely in the type of animal presenting, the chronicity of the illness or injury with which he or she presents, and whether or not the issues are life threatening.

However, every animal shelter will be presented with animals in need of immediate veterinary assessment and care. As a result, shelters need to be prepared and able to provide emergency care when necessary. In some cases, this may mean partnering with a local veterinary clinic to provide urgent care; in other shelters this will mean equipping, staffing, and maintaining an on-site veterinary facility able to

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provide both regular and urgent care for the animals seen at the shelter.

Who Can Provide Emergency Medical Care in the Shelter?

The Veterinary Practice Act of each state defines specific duties that must be performed by a veterinarian, as well as those that may be delegated to a registered, licensed, or certified veterinary technician or to a lay person (US Department of Labor, 2010). It is important to adhere to these standards in the shelter in order to protect the shelter and the licenses of the professionals working there, as well as to maintain appropriate standards of care for the shelter animals. In general, the roles of diagnosing and prescribing treatment are limited to the licensed veterinarian(s), while providing the prescribed care can be relatively freely delegated. However, some delegated duties, such as inducing anesthesia via an intravenous (IV) injection, are restricted to veterinary technicians. It is important to review the veterinary practice act for the state where the shelter is located as well as any special restrictions imposed by the state's licensing and veterinary medical board when developing a shelter's emergency care plan.

In most animal shelters, licensed veterinarians and technicians are in shorter supply than nonlicensed technicians, kennel workers, animal control officers, volunteers, and other nonveterinary lay staff. Being able to appropriately train and use these shelter team members is imperative to enable the shelter veterinarian to leverage all available resources and provide the best care possible to the shelter's animals.

Many veterinarians who work with and for shelters find that developing a set of contingency orders and making themselves available by telephone to confirm appropriateness of using these contingency orders is an effective and efficient way to provide care for animals through other staff members and volunteers at times when they themselves are not on site at the shelter. It is advisable to check with the state veterinary medical board or association and other local shelter veterinarians to determine if this is appropriate and feasible. The next steps are to train support staff and volunteers in basic assessment of animals and recognition of illness and injury and then empower them to seek veterinary attention when concerns arise.

Triage and Basic Supportive Care

Once an animal in the shelter has been identified as requiring special care, it becomes vital to determine if the animal's condition is in fact an emergency. The basis of emergency medicine is the concept of triage. Triage is derived from the French "triager," which means to sort. The basic idea is to quickly assess an animal who presents for medical care to determine how critical their condition is and how urgent their need is for immediate medical care. The first step in triage is an efficient initial examination of the animal's vital systems. The well-recognized "ABC" system is often employed as a starting point. Essentially this means assessing the animal first for an airway: is anything preventing airflow? Then assess breathing: in the absence of an airflow obstruction, is the animal breathing, or is there something impairing breathing? Third, circulation is assessed: is the heart pumping and blood effectively circulating to the tissues?

Assessment of airway involves observing the animal, evaluating the airway, and listening for breath sounds. Assessment of breathing involves watching the animal's respiratory efforts, ausculting (listening with a stethoscope) the lungs, and percussing (tapping on) the chest. Assessment of circulation involves both ausculting the heart for rate, rhythm, murmurs, and dullness of heart sounds as well as palpating for appropriate pulse strength (checking femoral and jugular pulses is helpful) and checking mucous membrane color and capillary refill time.

If any pathology is found during the ABC assessment, the issues identified must be immediately addressed. In most cases, this will require skilled veterinary care by a veterinarian or technician: instituting cardiopulmonary resuscitation (CPR) efforts in extreme situations; improving airway via intubation or tracheostomy in situations with a primary airway obstruction; instituting positive pressure ventilation for absent or ineffective respiratory efforts, providing supplemental oxygen if needed; possibly using centesis to remove free air or fluid from the thorax; or providing manual (chest compressions) or medicinal (IV fluids, pressure-supporting medications, or arrhythmia-treating medications) interventions as appropriate.

Beyond the most life-threatening ABCs, an assessment of overall physical status—mentation, neurological status, pain status, wounds, dehydration,

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or other potentially life-threatening abnormalities—should be made quickly and efficiently. If an animal is determined to be stable by a trained member of the veterinary team, it may be possible to postpone further assessment and treatment. If there is any question of an animal's stability, or if it is apparent that postponing care could lead to or prolong animal suffering, compromise the animal's life or prove detrimental to the animal's long-term outcome, then care must be provided immediately. In addition to medical concerns, shelters often must deal with legal and ownership issues when providing emergency care for shelter animals. Shelter policies should provide specific guidelines for urgent animal care, making it clear that all animals should be provided care to alleviate pain and suffering and to address life-threatening problems.

BASIC EMERGENCY SUPPLIES NEEDED

Formulary

Medical supplies and a formulary of emergency and nonemergency drugs should be available to deal with emergencies that may present in a shelter setting. Basic CPR drugs to address cardiovascular emergencies include epinephrine, atropine, and dopamine; in addition, furosemide and lidocaine are inexpensive but essential cardiovascular medications to have on hand. Mannitol and injectable steroids such as dexamethasone are important to have available for treating allergic reactions and general and specific neurological and hypersensitivity-related emergencies; medications useful for treating tremors and seizures; drugs such as methocarbamol, diazepam, and propofol are also valuable to have on hand.

The well-equipped formulary should also include an adequate selection of pain medications, both anti-inflammatory (nonsteroidal and steroidal) and opioid derived; appropriate injectable and oral antibiotics; and medications to address gastrointestinal upset (including antiemetics, H2 blockers, and antidiarrheals). An emesis-inducing agent such as apomorphine and a toxin-binding agent such as activated charcoal are also useful for cases of known or suspected toxin ingestion. Because shelters often are unable to provide intensive care to animals, it is useful to keep this in mind when stocking the shelter's formulary. It can be helpful to utilize medications that are administered less frequently (for example, once daily instead of three times daily when an option is available).

Supplies

In addition to an appropriately stocked medication formulary, it is important to maintain an adequate selection and supply of products used to deliver fluid therapy when needed. This includes IV catheters and needles in various sizes, actual intraosseous catheters or large-bore needles, and associated IV fluid administration supplies such as T-ports, male adapters, primary sets, extension sets, buretrols, and a selection of IV fluids. In general, stocking a balanced electrolyte solution such as lactated Ringer's solution (LRS), Norm-R® or Plasmalyte® as well as normal saline, half-strength saline, and, if possible, a colloid such as Hetastarch can be very useful. A supply of 50% dextrose is also vital in the shelter setting due to the large number of neonatal animals who may present with hypoglycemia. An IV fluid pump is convenient, but it is also possible to maintain IV fluids with a manual drip calculation system.

In many shelters, the ability to acquire sophisticated veterinary equipment may be limited. However, for the purposes of addressing an emergency, it is vital to have a source of oxygen. This can be addressed with an anesthesia machine when an oxygen cage is not available. Standard anesthesia monitoring equipment such as a pulse oximeter/heart rate monitor can provide important and adequate information. A source of warmth is vital for treatment of hypothermia, and while sophisticated warming systems are ideal, in lieu of this, a standard heating pad (at the appropriate setting and covered to prevent thermal injury) or simple warmed IV fluid bags can provide a more than adequate heat supply.

CREATIVITY IN THE FACE OF LIMITATIONS

The hallmark of the good emergency veterinarian is the ability to utilize knowledge, skills, and abilities even in the face of limitations. This is true of the private practice veterinarian as well as of the shelter veterinarian. In the typical shelter, this becomes even more vital, as resources may be more constrained than in the typical private practice or state-of-the-art emergency hospital.

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Circumstances may arise in which ideal care, for example, having a skilled technician place an IV catheter in a hypovolemic small animal and begin bolusing crystalloids and colloids or blood products while monitoring a continuous blood pressure, may need to be replaced by a more basic way to address the situation, such as a hand-pressure or inflatable pressure bag to bolus a large volume of subcutaneous fluids while palpating a femoral pulse and monitoring mucous membrane color and capillary refill time for a response.

In many instances, sophisticated diagnostics such as full blood panels, radiographs and ultrasound, or other testing are unavailable, but emergency care must still be rendered. A thorough physical examination and minimal diagnostics such as packed cell volume and total protein (PCV/TP), blood glucose on a glucometer, BUN via an Azostix strip, urine specific gravity on a refractometer, and urine dipstick analysis can often be used to obtain basic information on an animal's status. The skilled shelter veterinarian must be an expert at performing a comprehensive physical examination, trust their findings, and act upon them to render appropriate emergency care. This use of basic diagnostic skills, knowledge, and experience should not be interpreted as a lower standard of care for shelter animals, but rather an appropriate use of available resources.

Another important consideration for the shelter veterinarian is that the care being provided is often only temporary while waiting to determine if the animal is going to be reclaimed by an owner, transferred to a rescue group, placed for adoption, or euthanized. For example, in a private practice setting, an animal presenting with a suspected fracture will almost always have radiographs taken before the application of even a temporary external coaptation device (splint or cast) and will then be assessed for the need for further permanent stabilization such as open or closed reduction or surgical fixation, utilizing expensive equipment and techniques, etc. In contrast, in the shelter, often the goal is to keep the animal comfortable for a 3- to 7-day holding period before even considering more extensive care. A palpable fracture in a location that can be stabilized with external coaptation should be stabilized and appropriate analgesics provided to keep the animal as comfortable as possible until a decision can be made as to what the animal's permanent disposition will be. Once a decision has been made to move the animal forward toward placement, a longer-term medical and possibly surgical management plan can be formulated. In many cases, the long-term plan for the animal's care will be significantly affected by financial resources, the animal's legal status, and availability of skilled veterinary or nursing care (either in the shelter, full service veterinary hospital, or foster care setting), not just the animal's medical or behavioral status or adoptability. For example, it may be determined after analysis of all options that amputation is a viable alternative for an animal who would otherwise require expensive surgical fixation of a fracture or euthanasia. Shelters often find that animals with three legs adjust readily and are easily rehomed and that this is a very reasonable decision.

In some cases, when an animal is seized due to a cruelty or other legal complaint, emergency care decisions must also consider the animal's legal status. Shelters are not hospitals, and many of these animals need emergency and long-term, follow-up care, which may later become part of the related legal investigation. In these instances, after stabilizing the patient and alleviating any pain, it may be necessary to make arrangements to transport the animal to a full-service veterinary facility as soon as possible or make sure all care is rendered without limitations by appropriate on-site veterinary staff.

EQUIPMENT ACQUISITIONS

Although the typical private practice acquires equipment from major veterinary medical distributors, it often behooves the shelter veterinarian to explore alternative sources of equipment. By contacting local veterinary and human hospitals about equipment and supplies, the shelter can often find surprisingly valuable donations. As veterinary hospitals upgrade equipment, their older equipment is often available for donation or little cost to a local animal shelter. The same is true of many human hospitals; durable goods and equipment as well as supplies that hospitals may dispose of after one use often can be appropriately re-used in a shelter setting. Many local colleges and businesses will also have surplus equipment storehouses or donation programs that local shelters can access. Online websites and online auction sites are also surprisingly good sources of many commonly needed pieces of medical and surgical equipment and supplies. In many shelters,

volunteers can be enlisted to act as donation solicitors for the shelter's medical program, often with impressive results.

Dedicated veterinary equipment and supplies manufacturers can also be excellent sources for donations. In cases of overstocking, products nearing an expiration date, or equipment that has suddenly become obsolete due to technological advances, these companies can become valuable partners in obtaining the needed equipment and supplies. In general, however, shelters should avoid using expired drugs as they may be less effective as well as raise questions regarding the quality of medical care provided at the shelter.

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HUMANE EUTHANASIA

Shelter veterinarians are often presented with animals who have significant illness or injury, and the decision must be made immediately whether the animal can be maintained humanely in the shelter setting for a normal holding period or whether the animal's medical condition dictates that immediate euthanasia is the more appropriate and humane option.

Many shelters are under the jurisdiction of a government or municipal agency that provides guidance as to whether an animal legally must be held for a set period of time (usually 3 to 7 days) before euthanasia can be considered, as well as when medical necessity dictates that this holding period be disregarded. In many areas, stray animals are subject to a legal holding period unless they are deemed by a licensed veterinarian to be "irremediably suffering" or some similar veterinary determination that would condone immediate humane euthanasia. It is imperative that shelter veterinarians make themselves aware of local laws and formulate appropriate protocols for their shelter to help determine when an animal is irremediably suffering and should be euthanized without a stray hold. Regardless of the legal requirements, in cases where an animal is euthanized without completing the required stray hold, it is essential that the animal's medical condition be documented in detail in writing to explain why humane euthanasia was performed before the mandated holding period expired. It is also advisable to take good-quality photographs, especially if it helps document the animal's condition.

In general, the thought process behind this decision should include the consideration that there may be an owner or caregiver searching for their pet who would choose to provide appropriate, life-saving care if they were able to find him or her. This should then lead to further contemplation of what range of care an owned animal in a similar condition might typically receive in a private practice. For instance, an animal with a broken leg is likely in pain, but in the absence of additional untreatable life-threatening injuries, it can be reasonably expected that the animal will be made comfortable through the administration of appropriate pain medication, fracture stabilization if possible, and movement restriction. If in a private practice setting an animal with the same presenting complaint would be treated with pain medication, fracture stabilization, cage restriction, and then either no further care or possibly the scheduling of orthopedic surgery in the following days, it seems reasonable to provide the shelter animal with a similar level of care and an appropriate holding period to give a potential searching owner time to find their pet.

Although the decision to humanely euthanize an animal before the appropriate stray holding period is up may be a difficult one, it is one that should be carefully considered in light of all factors. In general, an animal's adoptability is not taken into consideration when determining whether or not to humanely euthanize without observing the stipulated stray holding period; in fact, the stray holding period is meant to give owners time to locate their pets and has no relation to an animal's ultimate adoptability if not reclaimed. As with all stray animals, if the sick or injured animal presents with an identifying tattoo, collar and tag, or microchip, every effort should be made to locate the owner and provide suitable palliative care in the meantime. Once the stray holding period has ended, the issue of whether the animal can be adopted or rescued, etc. should be considered for the sick or injured animal the same way it would for any other shelter animal. Ultimately, whether an animal with a serious but treatable medical condition is provided with the needed care and placed for adoption after the stray holding period is over is dictated by the individual animal's ultimate adoptability, shelter resources, and the shelter's general adoptable population and adoption rates.

Because many nonshelter veterinarians may not be aware of the legalities of stray holding periods, it

is imperative that shelters working with a local general practitioner or emergency clinic to provide after-hours and other emergency care for shelter animals provide these practitioners with clear guidelines on shelter policies, local legal guidelines for the care of animals presenting as strays, and any other relevant regulations.

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MEDICAL RECORDS AND DOCUMENTATION

The law and good practice standards require that veterinarians maintain appropriate written medical records for animals under their care. In the animal shelter setting, a streamlined process of creating medical records is important to handle the generally high number of patients most shelter veterinarians will treat. A basic description of the animal and any known identification including a shelter-assigned ID number should be a part of the medical record. Physical examination findings, diagnosis, and prescribed treatment must all be included in this record in order to be in compliance with state board regulations regarding medical records. Computerized systems make the maintenance of these types of basic records much easier than a handwritten system. A user-friendly shelter management program, veterinary practice management program, or even a simple database program can all be customized to provide an accurate and efficient medical records system. Creating an appropriate programmed set of document templates or "macros" for commonly seen conditions can further streamline the recordkeeping process.

In addition, creating a system for ensuring that animals under emergency medical care receive ongoing needed daily medications or treatments is vital in the often fast-paced animal shelter setting. The use of a whiteboard treatment schedule, a written shelter census medical care binder, or individual treatment sheets on the cages of animals under care are all viable alternatives. When designing a shelter's medical care system, it is important to note that there is benefit to maintaining transparency. This allows individuals outside the medical program to be aware of animals who are being assessed and treated for medical conditions. For example, in shelters where animals have treatment sheets on their cages, anyone who sees that animal will be able to tell that he or she is under medical care (versus a system not visible to other staff and the general public). This can lead to a positive public perception of the shelter and the care it provides to the animals. It can also decrease the amount of duplicate recordkeeping on animals requiring medical care. Once treatment is completed, any written record of such care should be kept as part of the animal's medical record, and a copy of any medical documentation should be provided to any person reclaiming or adopting an animal.

CONCLUSION

In general, most animal shelters are not equipped to provide full-service veterinary care. Despite this fact, society often expects animal shelters to provide the same level of veterinary care as would be provided in a private practice setting. In order to reduce animal suffering and meet these expectations, shelter staff should be trained to recognize medical emergencies and evidence of pain. Written protocols and policies should be developed to provide both medical and procedural guidance to staff providing care to the animals so that shelter animals requiring veterinary care receive that care in a timely manner.

REFERENCES

ASV (2010) *Guidelines for Standards of Care for Animal Shelters*. Available online at http://www.sheltervet.org (accessed June 15, 2012).

US Department of Labor, Bureau of Labor Statistics (2010) *Veterinary Technologists and Technicians*. Available online at http://www.bls.gov/oco/ocos183.htm (accessed January 12, 2012).

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Euthanasia

Martha Smith-Blackmore

INTRODUCTION

Euthanasia is one of the most difficult and emotional topics in the field of animal sheltering. Conflict and controversy persist in many communities over whether any "adoptable" animals should be euthanized. Still, euthanasia is necessary when an animal is suffering from an untreatable condition, when the animal poses public health risk due to his or her aggressive behavior, or when the numbers of animals outweigh the available resources to provide appropriate and humane care for them. Regardless of the debate that swirls around euthanasia in animal shelters, when euthanasia is performed, it is essential that it be done in a manner to minimize fear and distress in the animals being euthanized. It is important to recognize that the euthanasia of animals is a task requiring specific skills and resources, not only for the euthanasia process itself, but also for the physical and emotional protection of the staff.

Many might say the word "euthanasia" itself is often used too lightly to describe death inflicted on an animal. In order to meet the true meaning of euthanasia, a death must be "good," or "graceful." Too often, death inflicted on animals involves unnecessary fear and distress. To describe this, one might need to coin a new word, something like "dysthanasia"—a hard or difficult death. This text uses the word euthanasia to mean intentionally putting animals to death, but with the goal that all deaths in animal shelters truly embody the meaning of the word euthanasia: dying gracefully, and as free from fear and distress as possible.

CRITERIA FOR EUTHANASIA IN SHELTERS

Animals euthanized in shelters may be homeless offspring, stray, feral, disowned, or lost companions. They may also be victims of animal cruelty: animals bred or trained for aggression who cannot be safely rehabilitated, hoarded animals who are unsocialized to people but not equipped to survive outdoors either, animals who are abandoned or accidentally, intentionally, or negligently injured or debilitated so severely that appropriate treatment is beyond available resources, and animals discarded by sport racing, pet stores, and failed breeding-for-profit schemes. They may also be patients who were abandoned by their owners at veterinary hospitals, which often turn these animals over to shelters. Some owners also choose to have their pets euthanized at the shelter because private practitioners may refuse to perform so called "convenience euthanasia," or because the owners cannot afford to pay for the procedure at a veterinary hospital. Even as the sheltering community makes progress in finding ways to rehabilitate and rehome more animals and to prevent relinquishment, it will almost certainly continue to be called upon to provide services for elderly, sick, and injured animals for whom euthanasia will be the kindest option available. Whether they are in shelters or not, euthanasia is, and always will be, an inextricable part of compassionate care for animals. Therefore there must be continued discussion, debate, and research on the methods by which shelters will intentionally end the lives of the animals it shelters.

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EUTHANASIA IN PRIVATE PRACTICES VERSUS SHELTERS

Although veterinarians in private practice perform euthanasia on a regular basis, the population of animals they euthanize is often quite different from the population for whom euthanasia has been deemed necessary at animal shelters. Most patients euthanized in a veterinary hospital have behavior problems or are elderly, debilitated, and/or severely sick or injured, and are often accompanied by their owner or family. Private practitioners may euthanize one or two animals a day at most, and some days none at all. In best-case scenarios, many of these euthanasia decisions have been carefully considered over a period of time and may be performed after extensive medical care and resources have been expended and everyone involved has been consulted and counseled. In contrast, animal shelters may routinely euthanize several animals daily, including neonates and healthy young animals, dogs and cats who are feral, fractious, unsocialized, and/or aggressive (but otherwise physically healthy), severely debilitated, diseased, or injured animals, injured wildlife, apparently healthy but rabies-vector species of wildlife, small mammals, reptiles, birds, fish, farm animals, horses, and exotic pets. In many cases, little is known about the temperament, history, or previous life experiences of animals being euthanized in shelters, and those persons performing such euthanasia must have specific training in animal handling and interpreting animal behavior signals, and must exercise more caution than is often required for private-practice euthanasia. In addition, there is the emotional response to euthanizing an animal who has no family to comfort or grieve for him or her, and the irony of animal caregivers entering a field to save animals only to find themselves in the position of sometimes having to kill healthy, adoptable animals only because a home cannot be found for them. This has been referred to as the "caring–killing paradox" (Arluke and Sanders, 1994).

An additional consideration for shelters is the legalities for the procedure. In private practice, the owner or caregiver must give permission for euthanasia to be performed. In shelters, euthanasia sometimes must be considered for stray animals to end suffering that cannot otherwise be alleviated, even though the owner cannot be found and the shelter does not yet have legal possession of the animal. In these cases, it is imperative that the reasons for euthanasia be carefully documented in accordance with local regulations. A statement from a licensed veterinarian may be required in some cases; in others this may fall upon the shelter manager and another citizen or law enforcement agent.

Private practitioners most often euthanize their patients by intravenous (IV) injection of a sodium pentobarbital solution, and have unrestricted access to all the equipment and drugs they need to sedate, tranquilize, or anesthetize the patient prior to euthanasia. Rarely do private practitioners use or even consider using other routes of administration of sodium pentobarbital, such as intracardiac (IC) or intraperitoneal (IP) injection, or other methods of euthanasia, such as carbon monoxide (CO) inhalation. Very few veterinarians receive formal training in performing euthanasia; although this is changing, most veterinary curricula only discuss the pharmacologic effects of sodium pentobarbital and provide minimal, if any, training in advising and counseling grieving owners of animals being euthanized. Specific euthanasia techniques and methods as well as adjunctive techniques such as pre-euthanasia chemical and physical restraints are rarely taught in a formal veterinary curriculum.

Shelter Euthanasia

Veterinarians may be called upon to perform euthanasia in a shelter, but more often it is routinely performed by a trained, nonveterinary professional. Ideally, an experienced and properly trained shelter worker will be knowledgeable, accept the factors that led to the decision to euthanize the animal and be experienced at physically handling and providing for the emotional needs of shelter animals. To become adept at euthanasia, a shelter worker needs appropriate and ongoing training on the latest methods, techniques and materials available, proper equipment, access to and understanding about the drugs that enhance the safety and quality of euthanasia (including controlled substances that will be discussed later in this chapter), and moral and psychological support for performing an emotionally difficult task that is rarely appreciated by the general public. This requires organizational commitment of appropriate resources for the management of

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"compassion fatigue" for all employees of an animal shelter. Personnel turnover is reduced by the provision of resources such as a designated euthanasia room, the exclusion of other live animals from the vicinity during euthanasia, and the removal of euthanized animals from a room prior to entry of another animal to be euthanized. On the other hand, when decisions regarding euthanasia of animals are made on the basis of factors other than behavior and health, personnel turnover increases (Rogelberg, DiGiacomo, Reeve, *et al*., 2007).

Burnout and Compassion Fatigue

Burnout and compassion fatigue are all-too-common syndromes in the animal sheltering field, and the euthanasia of shelter animals is a significant contributor. Burnout is "the syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment" suffered at the workplace, and can occur in any field. Compassion fatigue is secondary traumatic stress known as "the cost of caring" in caregiving fields such as animal sheltering. Symptoms of compassion fatigue can include feeling powerless, being scared and paranoid, feeling guilty, experiencing intrusive thoughts, rage (sometimes unpredictable), depression, hypersensitivity, sleep disturbances, and simply being worn out. Unnecessary stressors can compound these issues, such as pressure to complete too many tasks in too little time, boring or repetitive work, loneliness, or being provided with too little training and equipment. In addition, people who are attracted to care-giving often enter the field already compassion fatigued; strongly identifying with helpless, suffering, or traumatized animals may be the motive for entering the field in the first place. Those who are most idealistic and dedicated may be those most at risk (Figley and Roop, 2006).

These stresses, though emotional, can be expressed as physical suffering. There is a neurobiological component to compassion fatigue, and it can lead to lethargy, stomach ulcers, high blood pressure, and back pain. Secondary trauma may be experienced by other individuals in the organization, whether or not they play a direct role in the euthanasia of animals. In addition, some shelter workers may not be interested in or knowledgeable about animals or the field of animal care-giving and view the work simply as a job they were assigned to do. If these workers are uncomfortable around or fearful of animals, or are seen as being callous and indifferent to animals in distress, they may add to the distress of the emotionally invested employee.

Caregivers can be taught to protect themselves from compassion fatigue and to focus on the compassion satisfaction they get from the positive aspects of their work. This means focusing on the successful adoptions rather than the losses and the constant influx of animals. Compassion fatigue workshops can help caregivers set limits and develop balance in their lives, and employee assistance programs can provide one-on-one counseling. Through these practices and resources, employees can become resilient, stay on the job longer, and be more effective in their day-to-day work. Protecting shelter workers helps to preserve a quality of life for the animals by ensuring that these caregivers retain their compassion and empathy.

Training for Euthanasia

Each state has its own regulations, training, and certification of euthanasia technicians, as well as access, or lack thereof, to controlled substances used for pre-euthanasia purposes. Some states require a person who performs euthanasia, commonly referred to as a euthanasia technician, to receive training of specified length and content, while others require only that euthanasia technicians receive instruction from a licensed veterinarian. Some other states require no training whatsoever of persons who perform euthanasia. Many states allow animal shelters direct access to sodium pentobarbital; that is, after meeting certain requirements, shelters may obtain and use sodium pentobarbital for euthanasia purposes without oversight by a veterinarian. Other states permit only indirect access; a veterinarian must agree to obtain, and oversee the use of, sodium pentobarbital used by the shelter. This latter situation is fraught with difficulty for both parties. Since many animal shelters do not have a veterinarian on staff, oversight may be an act of volunteerism, and the veterinarian must take precautions to ensure that record-keeping, storage, and use requirements are adhered to. (See the chapters on legal issues.) Likewise, the shelter must secure the trust and cooperation of a

local licensed veterinarian, a task that is not always possible.

Procuring controlled drugs for pre-euthanasia sedation such as ketamine, xylazine, tiletamine–zolazepam, midazolam, dexdomitor, or domitor is often even more difficult. Most shelters that do not employ a veterinarian on staff do not have access to these crucial drugs. Because of these difficulties, some shelters have resorted to the use of the CO chamber to perform mass euthanasia. More and more states are recognizing that CO and other gas euthanasia methods are inhumane and are enacting legislation to ban them and move toward requiring euthanasia by injection (EBI). Legislation that bans the CO chamber should be linked to legislation that ensures shelters have access to the necessary training, drugs, needles, and syringes to perform the task humanely.

The American Humane Association (AHA), the Humane Society of the United States (HSUS), and the National Animal Control Association (NACA) all offer training courses for EBI, the curricula of which are usually tailored to conform to the euthanasia certification standards of the states in which they are presented (in those states that have such standards). Some states provide their own programs for training euthanasia technicians, often offered through veterinary technician training programs or private companies such as Animal Care Technologies (ACT, 2009). These courses are taught by both veterinarians and nonveterinarians. In California, for example, persons who are not veterinarians or registered veterinary technicians who wish to teach euthanasia must be certified as euthanasia instructors by the State Humane Association of California and the California Animal Control Directors Association.

In those states that do not have formal training programs for euthanasia technicians, veterinarians are often asked to provide such training on an individual basis. Before accepting this responsibility, a veterinarian should be certain that he or she is knowledgeable about all aspects of euthanasia in animal shelters, including the shelter's philosophy and mission. He or she must be able and willing to convey the necessary information and technical skills to those who are being trained, as well as be able to provide ongoing supervision and support for those persons.

When attempting to determine what the requirements are for performing euthanasia of shelter animals and for obtaining sodium pentobarbital and other controlled drugs used as pre-euthanasia agents, the regulations in the state in which euthanasia is to be performed should be consulted. State boards of pharmacy, departments of health, and state humane and animal control associations are usually the best sources of information regarding these issues.

Personal Responses to Euthanasia

Animal sheltering is a stressful occupation, and adding euthanasia to the list of a shelter worker's duties may compound the distress the occupation creates in many who choose to pursue it. The many sources of distress involved with euthanasia include but are not limited to

- making decisions about which animals must be euthanized, often on the basis of factors such as whether there are enough homes or resources for humane care available, which have nothing to do with the animals themselves;
- stress from conflict over the decision for a particular euthanasia within the organization, such as between managers and employees, volunteers, or foster caregivers;
- performing the act itself;
- confrontations with members of the public, media or even family members who do not understand the need for and the process of euthanasia;
- and providing final care (disposal of the body after euthanasia).

The task of euthanasia must be entrusted to persons who can maintain the ability to evaluate every animal on an individual basis and provide the best possible death experience considering each animal's physical and emotional needs and temperament. Euthanasia must never be performed by those who are callous or indifferent to the distress that animals may feel in a euthanasia situation, even if those persons outwardly appear to be more capable of handling the psychological side effects of performing euthanasia. The best possible euthanasia experience for each animal, one free from fear and distress, should be the goal of those performing the task. Persons who are unable to provide such euthanasia after appropriate training must be dismissed from the task altogether.

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Euthanasia technicians may experience feelings of anger, frustration, defeat, irritability, guilt, sadness, and remorse. These feelings can be compounded by other stressful aspects of the euthanasia technician's life, such as relationships with family members and various life events such as divorce, moving, and illness of a family member.

Negative coping mechanisms or "immature defenses" employed by some euthanasia technicians to relieve euthanasia-related stress include displacing guilt and frustration on the surrendering public, absenteeism, belligerence, careless and callous handling of animals, substance abuse, withdrawal, denial, passive–aggressive behavior, acting out, and fantasy (Vaillant, 1993). Chronic, severe, or even suicidal depression is possible. There have been cases of employee suicides and attempted suicides resulting from misuse of sodium pentobarbital euthanasia solution acquired from the shelter. Withdrawal from the animal sheltering profession entirely is commonplace.

Positive coping mechanisms or "mature defenses" can help personnel who perform euthanasia deal with their stress. These positive qualities include altruism, sublimation, anticipation, and humor. It is helpful for an organization to develop an attitude of collaboration with the community to create a sense of working together to find a positive solution for animals. Staff should be trained to understand that animal relinquishment to a shelter is usually multifactorial and complicated; such understanding promotes compassion and diffuses frustration. Regular physical exercise, engaging in hobbies, sports, or other activities unrelated to animal sheltering, adopting companion animals from the shelter who might otherwise have been euthanized and providing them with a caring home, and talking openly to those co-workers, friends, and family members who are able to understand the complex issues and emotions that surround euthanasia are all positive coping strategies.

Not all of these outlets are available to all euthanasia technicians, and some do not avail themselves of positive coping strategies. Many report that finding someone appropriate to talk to about euthanasia and the stress it causes is difficult. Counseling of persons who perform euthanasia can be helpful, but it must be carried out by professional counselors who are familiar with both the stressors inherent to performing euthanasia in the animal shelter setting as well as the demands of a shelter career. Those who supervise staff who perform euthanasia should receive training in recognizing signs of compassion fatigue, emotional distress, and burnout in their staff, and be prepared to offer resources for coping with such.

There are several steps that shelter management can take to diminish the distress that euthanasia technicians are subjected to. Euthanasia responsibilities should be rotated as much as possible amongst trained personnel to minimize the amount of time any one person spends performing the task. Euthanasia technicians should be given flexibility to work with appropriately trained coworkers they like and trust to create a team that works well together.

Shelter management and euthanasia technicians should maintain flexibility regarding euthanasia of individual animals, allowing technicians themselves to determine whether they do or do not wish to be involved in the euthanasia of animals they may have become attached to. Technical proficiency greatly diminishes euthanasia-related stress; training opportunities should be provided on a regular basis so that euthanasia technicians can acquire new information and hone existing skills and knowledge. Shelter management and supervisors should listen carefully to concerns expressed by euthanasia technicians and other staff with regard to euthanasia. In return, euthanasia technicians should understand that supervisors and shelter management may be considering a "bigger picture" that encompasses the shelter's mission and resources, and are likely considering the health and survival of the program over the long term. Some programs have created a euthanasia panel for the decision-making process. This model allows for input from all parties with regard to euthanasia decisions. Even though the shelter management will have the final say in the outcome, this process allows for a sense of contribution and control of the euthanasia decision-making process.

Euthanasia Policies

Deciding which animals to euthanize is probably the hardest part of a difficult task. Euthanasia policies should be enforced in an objective and consistent manner, and all internal policies and procedures should be designed to minimize stress.

Surprisingly, many animal sheltering agencies have no formal or even informal criteria for making decisions about which animals should be euthanized,

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a situation laden with hazards. Some agencies have only unwritten criteria that are passed along orally from one generation of employees to another. Lack of euthanasia criteria creates an undue legal and emotional burden on the person or persons charged with making euthanasia decisions. It allows for inconsistency and personal bias to become factors in decisions about whether animals live or die. It makes it difficult for an agency to convince anyone that euthanasia decisions are not arbitrary or subjective. Written protocols for the decision-making process can aid in supporting the process, and it is important to communicate this process to stakeholders such as board members, employees, volunteers, foster caregivers, and the community at large. Shelters that profess to be "no-kill" often find themselves embroiled in controversy if they kill any animals, even if only occasionally.

Some shelters are divided on the issue of whether to offer owner-requested and owner-present euthanasia services. Many agencies do offer these services, and staff who perform them must be given resources to help them deal not only with the technical difficulty of euthanizing an animal as an owner looks on, but also the emotional burden of providing support to a grieving pet owner. An excellent reference that specifically addresses this has been published (Lagoni, Butler and Hetts, 1994), and there are many other resources available, including scientific literature, support groups, and telephone counseling services. The local veterinary school may have a free pet-loss hotline staffed by trained counselors or veterinary students to assist grieving pet owners.

The agency should also verify with their state's licensing board for veterinary medicine that owner-present euthanasia can legally be performed by euthanasia technicians and is not considered the practice of veterinary medicine. This may be the case if, for instance, fees are collected to perform the euthanasia at the owner's request, regardless of whether the animal has been relinquished to the sheltering agency.

CRITERIA FOR SELECTION OF EUTHANASIA CANDIDATES

The criteria that are used to determine whether an animal is to be euthanized are not simply whether he or she is "adoptable," as that term is organic, and an animal's "adoptability" depends on factors both inherent and external to that animal. An animal's species, breed or breed-type, sex, neuter status, age, health status, physical disabilities, specific health needs, temperament, behavior and behavioral issues, background, and history all play a part in determining whether he or she is likely to be made available for adoption. In addition, the sheltering agency's mission and its financial, medical, human, and physical resources all contribute to its "capacity for care." It is this capacity for care that determines whether an animal can be held or made available for adoption. (For more information on capacity for care, see the chapter on population management.)

The characteristics of the community in which the shelter is located also play a role in influencing euthanasia decisions: for example, the number of adoptive homes, their financial resources, their views about shelters as a source for acquiring a new companion animal, and their propensity to adopt a mature animal as opposed to a juvenile. Some of these factors, such as the animal's age, are inalterable. Other factors may be flexible, depending on the time of year or the current population census. Still others can be intentionally changed. For example, decreasing the average length of stay for each shelter animal effectively increases available cage space. (See the chapter on population management for more information on length of stay.)

Keeping in mind that the adoptability of any particular animal is an inconstant, a shelter's staff should create criteria to assist in making the difficult decisions about which animals are to be euthanized. How these criteria are developed and implemented varies from one organization to the next, but once criteria are developed for an agency, it is important in the interest of uniformity and consistency that they be accepted, implemented, and adhered to by management, staff, boards of directors and volunteers. Criteria should be reassessed on a regular basis. None can be inflexible, and occasionally exceptions to the rules must be made. Municipal shelters, which see a constant influx of new animals, may have a greater need for a fixed policy; smaller groups with control over when or how animals are admitted may be more flexible. Those who apply the criteria must be committed, supportive, and consistent. Everyone involved must be imbued with a sense of the value of the euthanasia criteria to the animals, the general

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public, the shelter as a whole, and individuals who are associated with the sheltering agency.

New strategies may be developed over time to reduce the euthanasia of healthy animals. Collaborating with breed and other rescue and foster care groups, other shelters, and transport programs may help create better outcomes for animals and manage the population without relying on euthanasia as a major population management tool. Reductions in intake numbers through spay/neuter outreach also will minimize euthanasia in the future.

METHODS OF EUTHANASIA

Just as definitive information about the numbers of animals who are sheltered, rehomed, and euthanized each year in the United States are difficult to obtain due to the autonomy of animal sheltering agencies, information about methods of euthanasia used on those populations is lacking. EBI of sodium pentobarbital is mandated by law in some states. Unfortunately, gunshot, decompression, choking, chest compression, inhalation of gas from automobile engines, CO_2, decapitation, freezing, poisoning, drowning, blunt trauma to the head, and injection of paralytic agents as methods of attempted euthanasia by animal care and control agencies have been exposed. No drug or euthanasia method deemed unacceptable by the American Veterinary Medical Association (AVMA) euthanasia guidelines discussed below should ever be used to euthanize shelter animals. Deviation from the use of EBI may be justified on rare occasions where, for example, an animal may have to be euthanized in the field by gunshot to immediately end their suffering or protect others from imminent harm.

Like all other aspects of medicine, the knowledge of and favored methods for performing euthanasia change with time. Methods that once seemed appropriate and humane are no longer deemed so, as newer scientific information, drugs, methods, and techniques become available and public awareness, esthetic considerations, and public policy changes.

The methods used by a particular animal sheltering agency may vary depending on that agency's resources (physical, financial, educational), the characteristics of the population of animals being euthanized, the skills, experiences, sensibilities, and ethics of the persons performing euthanasia, the community's involvement (or lack thereof), and any legal mandates regarding euthanasia methods that pertain to that jurisdiction.

AVMA Guidelines on Euthanasia

The AVMA first published its *Report of the AVMA Panel on Euthanasia* in 1963 and updated it in 1972, 1978, 1986, 1993, and 2000. In 2006, the AVMA decided to convene a panel of scientists at least once every 10 years to review all literature that scientifically evaluates methods and potential methods of euthanasia for the purpose of producing the renamed *AVMA Guidelines on Euthanasia*. The first guidelines document was published in 2007 and in 2011 is undergoing review. In the past, the panel constructing the guidelines numbered anywhere from 7 to 17 members appointed by the AVMA. Now, the guidelines are reviewed and rewritten by 12 working groups comprising as many as 72 veterinary practitioners, scientists, animal control officers, academicians, and representatives from other disciplines appointed by the AVMA Animal Welfare Committee.

The guidelines are intended for use by members of the veterinary profession who carry out or oversee the euthanasia of animals. Although the guidelines may be interpreted and understood by a broad segment of the general population, they explicitly state that a veterinarian should be consulted in the application of the recommendations. The report's greatest value is that it considers euthanasia in a wide variety of circumstances, including animals in shelters, and is a published scientific reference presented by a preeminent professional veterinary organization. The report is easy to access (even available as a full-text document online at www.avma.org) and well referenced. One fault in the use of the report is that the recommendations are widely interpreted and used by several different populations of nonveterinarians without any veterinary oversight. A few state legislatures have incorporated the recommendations into law, allowing little opportunity for interpretation regarding application to a specific agency, circumstance or individual animal. While these laws were meant to ensure that animals receive the most acceptable form of euthanasia, it does allow the opposite to occur in some cases. The report defines many methods of euthanasia that are not considered appropriate for the euthanasia of animals in a shelter as acceptable. For example, thoracic compression,

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decapitation and cervical dislocation are considered conditionally acceptable methods of euthanasia for birds. However, these methods should be avoided not only because more humane methods are available, but also because some veterinary experts have expressed concern that these methods are in fact inhumane (Bennett, 2001; Ludders, 2001). In addition, the 2007 *Guidelines* consider carbon dioxide (CO_2) and CO euthanasia of dogs and cats to be acceptable. This is in direct conflict with the opinion of the major professional organizations that work with shelters, including the Association of Shelter Veterinarians (ASV), American Society for the Prevention of Cruelty to Animals (ASPCA), AHA, HSUS and the NACA. Those who fail to recognize the broad scope of the report—that is, a scope not limited to animal shelter euthanasia—may misinterpret these recommendations and incorrectly apply them for use in the shelter setting.

The report presents and classifies the many possible methods of euthanizing animals and evaluates them on the basis of 12 criteria that should be used to determine the usefulness and appropriateness of a particular method of euthanasia for a specific species and purpose. It is beyond the scope of this chapter to present all the information in the report, but key for shelters among those recommendations are that the chosen method must induce loss of consciousness and death without causing pain, distress, anxiety, or apprehension; be quick, reliable, irreversible, appropriate for the species, age and health of the animal; and be safe for personnel. The shelter must be able to obtain the necessary drugs and equipment and consider their human abuse potential. Consideration must also be given to the emotional impact of the method on the staff. The report presents in tabular form what are considered to be acceptable, conditionally acceptable and unacceptable methods of euthanasia, describing for each method the species to which it applies. Any person associated with decision making regarding the shelter's euthanasia process should be familiar with the most current edition of the *AVMA Guidelines for Euthanasia*.

Carbon Monoxide

Inhalation of CO is still used in many locales, but this and other gas chamber euthanasia methods are banned or restricted for use in many states, and its use is increasingly controversial. CO is an odorless gas that combines with hemoglobin to form carboxyhemoglobin, which interferes with the ability of the red blood cell to uptake oxygen. It is tasteless and highly toxic, making it extremely hazardous to both animals and humans. It also has the potential to cause an explosion at high concentrations. The illness of one shelter worker and death of another due to CO have been documented and publicized (Poole, 2000, Pawlaczyk, 1997). Chronic exposure to low levels of CO can also cause serious human health problems.

Arizona, Delaware, Illinois, New Jersey, New York, Rhode Island, Wyoming, and Washington prohibit the use of CO_2 and CO gases to euthanize any shelter animal (including feral cats and wildlife). California bans CO euthanasia of any conscious animal. Connecticut, Florida, Maine, Maryland, New Mexico, Oregon, Tennessee, and Virginia have prohibited the use of CO_2 and CO for euthanasia of shelter cats and dogs.

The ASV has deemed the use of CO for euthanasia in animal shelters to be unacceptable in both mass and individual circumstances due to significant humane, operational, and safety concerns. Placing multiple animals in a CO euthanasia chamber can dilute the effective concentration of gas that each animal receives, creating a haphazard euthanasia experience that can be prolonged. The rapid flow rates necessary to achieve the recommended CO levels can result in noise levels that frighten animals. Slowing down the flow rates delays effective CO concentration, increasing the time to achieve loss of consciousness and possibly contributing to convulsions and muscle spasms prior to the loss of consciousness. The average time to loss of consciousness has not been precisely determined, and it is not known if the vocalization and agitation some dogs exhibit are signs of distress. Failure to maintain the chamber properly can result in dangerous gas leaks that are known to be hazardous to other animals and personnel. Minor gas leaks can cause inconsistent gas concentrations during operation, which can cause extreme animal distress and suffering prior to death. Juvenile, aged, pregnant, sick, and injured animals can experience delayed absorption and circulation of CO, and because shelters are unlikely to know every animal's age and health status, inhumane euthanasias ("dysthanasias") with CO are very likely to occur.

The use of CO cannot be justified as a means to save money, increase safety, or distance staff

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emotionally from the euthanasia process. Placing dangerous animals in the chamber still requires that animals be handled safely and humanely. CO euthanasia takes longer than EBI and has not been shown to provide emotional benefits for staff. Studies have shown that CO is actually more expensive than EBI. The AHA commissioned a study in 2009 on the costs associated between EBI and gas. Using data from an animal sheltering organization in North Carolina, the number of dogs and cats euthanized in 2007 was 5427. The study showed that the cost to use CO gas was $4.98 per animal. The cost to use CO without a tranquilizer is $4.66 per animal. The cost to use EBI, however, was only $2.29 per animal (AHA, 2009).

The ASV, ASPCA, HSUS and AHA all recommend EBI of sodium pentobarbital as the only acceptable method for euthanasia of dogs and cats in animal shelters. They strongly urge all agencies currently using CO to transition to EBI or partner with a local veterinarian who can provide this service. Shelters should research state laws regarding access to euthanasia and pre-euthanasia drugs, syringes and needles and convert to EBI of sodium pentobarbital if statutes permit it and as soon as training, drugs, and equipment can be acquired. Unfortunately, despite these recommendations, for a variety of reasons, many agencies continue to use CO chambers. Those agencies should be encouraged to take whatever steps are necessary to switch to EBI, including proposing legislative changes if necessary.

Whenever CO is used, the precautions outlined by the AVMA panel are the minimum standards that should be employed (Table 30.1). Veterinarians working with shelters that utilize CO are still responsible for ensuring that individual animals are each humanely euthanized just as if they were utilizing sodium pentobarbital.

Table 30.1. AVMA Euthanasia report recommendations for use of carbon monoxide (CO) for euthanasia.

1. Commercially compressed CO must be used
2. Personnel must be thoroughly instructed in its use and understand its hazards and limitations
3. The CO chamber must be of the highest quality construction and should allow for separation of individual animals
4. The CO source and chamber must be located in a well-ventilated environment, preferably out of doors
5. The chamber must be well lit and have view ports that allow personnel direct observation of the animals
6. The CO flow rate should be adequate to achieve a uniform CO concentration of at least 6% after animals are placed in the chamber
7. If the chamber is inside a room, CO monitors must be in place to warn personnel of hazardous concentrations

Source: Adapted from AVMA, 2007 Guidelines on Euthanasia

Euthanasia by Injection of Sodium Pentobarbital

Sodium Pentobarbital

By far, the preferred method for euthanizing shelter dogs and cats (and most other species) is injection of sodium pentobarbital, also known as pentobarbital sodium and pentobarbitone, a class II controlled substance. When administered intravenously (IV), sodium pentobarbital depresses the central nervous system (CNS) and causes an animal to advance through all five stages of anesthesia (Table 30.2) in swift succession, resulting in rapid unconsciousness, anesthesia, and death.

The US Controlled Substances Act schedules controlled substances in five categories, numbered I–V, where class I drugs are the most dangerous with the greatest risk of abuse by humans, and class V are considered to be at the lowest risk of abuse.

Table 30.2. Five stages of anesthesia/euthanasia.

I. Sedation: the animal becomes calm and sleepy
II. Involuntary excitement
III. Light anesthesia
IV. Deep anesthesia
V. Apnea (respiratory arrest) followed by cardiac arrest

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The lower the classification of the controlled substance, the greater the record-keeping requirements and difficulty in obtaining the drug. Because sodium pentobarbital and several of the drugs used as pre-euthanasia adjuncts are substances with potential for inducing psychological and/or physical addiction when administered to humans, they are controlled by the Drug Enforcement Administration (DEA) pursuant to the Controlled Substances Act of 1970 and, in most states, by an additional state agency such as the department of health or board of pharmacy. Whether the drugs are available to animal sheltering agencies directly or indirectly (through a veterinarian), strict record keeping and security are necessary in order to maintain access to them. Complete details of requirements are available in Title 21 Code of Federal Regulations (CFR) Part 1300. The complete text of Part 1300 of the CFR, as well as other useful information, can be accessed on the DEA website (DEA, 2011).

Although there may be some difficulty in obtaining, safely storing, and tracking barbiturates for euthanasia, EBI remains the euthanasia method of choice in shelters. "Intravenous injection of a barbituric acid derivative is the preferred method for euthanasia of dogs, cats, other small animals, and horses. Intraperitoneal injection may be used in situations when an intravenous injection would be distressful or even dangerous. Intracardiac injection must only be used if the animal is heavily sedated, unconscious, or anesthetized" (AVMA Guidelines on Euthanasia, 2007).

Several preparations containing sodium pentobarbital and the anticonvulsant drug phenytoin, which is cardiotoxic, are also available (see Table 30.3). The purpose of adding phenytoin is twofold: It enhances cardiac arrest and diminishes the potential for human abuse by denaturing the sodium pentobarbital compound from a class II to a class III drug. Therefore, this combination of sodium pentobarbital and phenytoin is more readily available to veterinarians and particularly to animal shelters for euthanasia.

A combination of pentobarbital with a neuromuscular blocking agent is not an acceptable euthanasia agent. T-61 is an injectable, nonbarbiturate, nonnarcotic mixture of three drugs that is no longer commercially available in the United States. This drug provides a combination of general anesthetic, curariform, and local anesthetic. It is still available in Canada and other countries. When used, T-61 must be injected *IV* at a slow, carefully monitored rate because when injected improperly there is some question that the differential absorption rate and onset of action of the active ingredients may lead

Table 30.3. Sodium pentobarbital formulations.*

Class II drug	Manufacturer	Conc. (mg/ml)
Sleepaway®	Fort Dodge Animal Health (Overland Park, KS)	260
Euthanasia®	Anthony Products Co. (Arcadia, CA)	390
Euthanasia Solution	Veterinary Laboratories (Lenexa, KS)	324
Fatal-Plus® Solution	Vortech Pharmaceuticals Ltd. (Dearborn, MI)	390
Class III drug	**Manufacturer**	**Conc. (mg/ml)**
Beuthanasia®-D Special	Schering Plough Animal Health Corp. (Union, NJ)	390 (sodium pentobarbital) + 50 (phenytoin)
Euthasol®	Delmarva Laboratories Inc (Midlothian, VA)	390 (sodium pentobarbital) + 50 (phenytoin)

*Many sodium pentobarbital formulations have been made available by various manufacturers. This list includes the most commonly used formulations but may not be comprehensive.

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to intense pain and anxiety from paralysis before the loss of consciousness.

Most formulations of sodium pentobarbital contain 390 mg of sodium pentobarbital (6 grains) per milliliter of solution. However, it also comes in formulations with 260 mg/ml, 324 mg/ml and 389 mg/ml. When pentobarbital sodium powder is reconstituted with 250 ml of water, it contains 392 mg/ml. Phenytoin-added euthanasia solutions are pentobarbital sodium 390 mg/ml & phenytoin sodium 50 mg/ml. The manufacturer's suggested dosage for both IV and IP administration should be consulted; most formulations are administered at a dose of 1 ml/10 lbs of body weight for IV administration. A dose of 3 ml/10 lbs of body weight delivered intraperitoneally (IP) for cats has been described (Rhoades, 2002).

Routes Of Administration

The cessation of life as the result of the injection of sodium pentobarbital does not necessarily constitute a humane death. Determining the best method of handling the animal and the best route of administration of sodium pentobarbital are both crucial to providing the best possible quality euthanasia. The route chosen depends on many factors, including the behavior of the animal, the degree of injury or illness affecting the animal, the skill and comfort of the person administering the injection as well as of those who are assisting with restraint, and the formulation of sodium pentobarbital that is being used. Sodium pentobarbital euthanasia formulations work best when injected IV. Once in the vein, sodium pentobarbital takes 45–90 seconds to cross into the brain, the primary site of action. Information regarding the IP administration of unadulterated (class II) sodium pentobarbital solution to cats has been published (Rhoades, 2002). Alternatively, sodium pentobarbital takes 5–15 minutes to take effect after IP injection. Oral administration of the powdered form of sodium pentobarbital has also been described, mainly for use in animals who are too dangerous to be handled. (More information is provided later in this chapter.)

Intravenous (IV) Injection

IV injection is the process of injecting the solution directly into a vein and is the preferred route for adult dogs and puppies over ten pounds. IV injection of euthanasia solution may be performed on calm, compliant animals without pre-sedation. Stressed, anxious, or panicked animals will benefit from pre-euthanasia sedation. Also, in some cases, blood pressure may be too low to access a particular vein, the fur may be too matted over the veins, or restraint too difficult or risky to achieve on a conscious animal.

When IV injection is performed properly, death occurs very quickly. The most common veins chosen are the cephalic vein on the front leg and medial saphenous vein on the rear leg, but injections may also be given via the jugular vein on the neck or lateral saphenous vein on the hind leg. A 20–23 gauge needle should be used, depending on the size and weight of the animal and the condition of the vein. Euthanasia technicians should be familiar with the location of each vein, and how to restrain and position the animal for injection at all venipuncture sites.

Intraperitoneal (IP) Injection

IP injection is the process of injecting the solution directly into the abdominal cavity, where it is absorbed into the circulatory system across the peritoneum, which lines the abdominal cavity. IP injection does not appear to upset rodents, rabbits, cats, and small puppies when performed quickly, with minimal restraint, and with a fresh needle of the appropriate gauge and a long, sharp bevel. The AVMA guidelines acknowledge that IP injection of a nonirritating euthanasia agent is acceptable when IV administration is impractical or impossible. The method is widely used in US animal shelters for euthanasia of cats, kittens, and puppies under ten pounds. It is particularly favored by the animal shelter community as a method that provides a humane death for feral, fearful, or fractious cats, especially when other pre-euthanasia drugs that might provide chemical restraint or sedation are unavailable, because IP administration often can be accomplished with minimal restraint. Once the injection is completed, animals should be placed in a dark, fairly confined space where they can transition to unconsciousness and death without the fear and distress inflicted by human touch or proximity.

Because dogs and puppies over ten pounds tend to struggle to right themselves as they experience the involuntary excitement stage of anesthesia (stage II) with IP injection of sodium pentobarbital, this method is not appropriate for them except in rare

cases. Most cats, kittens, and puppies, however, advance smoothly through all five stages of anesthesia within 15–30 minutes after IP administration, especially when they are placed in a warm, dark, quiet area during the transition period to an anesthetized state.

Concern has been expressed that when sodium pentobarbital–phenytoin combinations are administered by the IP method, phenytoin may exert its effect on the heart before the sodium pentobarbital component has caused unconsciousness (Fakkema, 1999). The AVMA guidelines state that the pharmacologic properties and recommended use of sodium pentobarbital–phenytoin combinations are interchangeable with those of pure barbituric acid derivatives, but it does not directly address the question of administering such a combination by the IP route. Until more information is available regarding the absorption rates of these two drugs from the peritoneal cavity, it is prudent to use only unadulterated sodium pentobarbital (class II) for IP injection.

IP injection must be performed in the right lower quadrant of the abdomen in order to avoid inadvertent injection into the liver, spleen, or kidneys. Once the needle is introduced into the abdomen, the operator must draw back on the syringe to ensure he or she is not injecting solution into the lumen of a bowel loop or the urinary bladder.

Intracardiac (IC) Injection

Performing IC injection on a conscious animal is unacceptable because it causes pain, is technically difficult to perform accurately, and is unpredictable if performed inaccurately. Reliably injecting directly into one of the chambers of the heart is difficult, especially in animals weighing less than ten pounds, although rapid absorption of sodium pentobarbital from the myocardium or from the thoracic cavity masks misdirected injection. The AVMA guidelines condemn IC injection of sodium pentobarbital in conscious animals, yet this method continues to be used by many agencies. IC injection of sodium pentobarbital is only acceptable when performed on an anesthetized or comatose animal. A careful assessment of the animal's level of consciousness should always be performed before using this method.

Other Routes of Injection

A technique for intrahepatic administration of sodium pentobarbital in cats has been published (Grier and Schaffer, 1990) and later revised by the same authors (Grier, Colvin and Schaffer, 1996). The use of this technique is now considered unacceptable for animal shelters due to concerns about discomfort induced by injection into the liver. Although the parenchyma of the liver does not have pain receptors, the capsule has stretch receptors which are exquisitely painful when stimulated. The injection of a volume of fluid into the liver causes the capsule to stretch and inflicts pain. This principle holds true for other intra-organ injection as well.

Because of the acidic nature of sodium pentobarbital, injection into subcutaneous (SC) tissues or muscle is painful. Slow absorption from those sites also results in slow and unpredictable advancement through the five stages of anesthesia. For these reasons, sodium pentobarbital should never be injected subcutaneously (SC) or intramuscularly (IM). Likewise, injection into the lungs, thoracic cavity, kidneys, spleen, and spinal fluid are inappropriate methods of administration.

The Euthanasia Environment

The method of restraint used to position the animal for injection, the environment and circumstances surrounding the act of injection, and the route of administration all contribute to the humaneness, or lack thereof, of the procedure. The environment in which an animal's death is induced plays a significant role in the quality of that death. The physical facilities of US animal shelters range from grandiose to squalid, as do the euthanasia areas within those shelters.

Ideally, a quiet, well-lit and well-ventilated room is designated specifically for the task of euthanasia. It should be somewhat removed from heavy foot traffic and if possible, soundproofed from the shelter's daily activities and noise. The room should be easy to clean and free of distractions such as ringing telephones and piped-in music. It should not be overly large, but be spacious enough to comfortably accommodate two euthanasia technicians and allow for safely maneuvering with a large dog. It should have easy access to holding cages and kennels, and a storage area for bodies—usually a walk-in morgue or truck that can take bodies directly to a crematorium,

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landfill, or rendering facility. There should be a storage area where euthanasia supplies can be stocked and readily available, as well as secured in a manner in accordance with DEA and any state requirements. There should be two counter-height surfaces made of an easily cleaned material, one for completing paperwork and one for placing animals for injection. Lighting that can be dimmed and soothing décor can create a peaceful atmosphere that calms both animals and people involved in the euthanasia process.

At minimum, equipment and supplies in the room should include an assortment of needles and syringes; a pair of quiet, well-maintained hair clippers; euthanasia and pre-euthanasia drugs and log books to document their use; a calculator and drug dosage charts; a scale to weigh animals, a universal microchip scanner; pens and blank paper; euthanasia manuals and training materials to which technicians can refer if necessary; pen lights and stethoscopes to be used in the verification of death (pen lights for examining pupillary response, stethoscope to verify cessation of a heartbeat); tourniquets (many types are available); restraint equipment including muzzles, leashes, thick gloves, thick towels, a net, a control pole, pole syringes, and a squeeze cage; cotton balls and diluted alcohol for wetting fur to reveal veins; body bags for final disposition; cleaning supplies; a first aid kit; and a medical waste ("sharps") disposal container.

A method for signaling that euthanasia is taking place should be instituted, especially if the room is used for more than one purpose; a locked door or a sign placed on the outside of the door usually suffices to alert others that the room is off-limits during the procedures. Only staff involved in the procedures should be permitted in the room when euthanasia is taking place so that all attention can be given to the animal's comfort and needs and to minimize distractions and euthanasia errors.

Animal Handling

The euthanasia process begins long before sodium pentobarbital is injected. The manner in which the animal is removed from the cage, transported to the euthanasia room, and handled on arrival sets the tone for the quality of euthanasia that will be provided. A safety assessment should be made first, but all animals should be handled gently and reassuringly. Euthanasia technicians should take steps to determine how much restraint and interaction is necessary to provide a humane procedure. Food-motivated animals may benefit from food treats and/or petting, gentle talking, and positive rewards in the moments leading up to the euthanasia process. Animals who appear to be fearful, unsocialized, or fractious should be assessed and provided with pre-euthanasia sedation, tranquilization, or anesthesia as needed. See Table 30.4 for definitions of the actions of pre-euthanasia drugs.

Table 30.4. Definitions of modes of action of pre-euthanasia drugs.

Anesthesia:	Loss of feeling or sensation, especially the loss of pain sensation induced to permit the performance of a potentially painful procedure
Analgesia:	Absence of sensibility to pain, particularly the relief of pain without loss of consciousness
Sedation:	A state in which an animal is calm and less responsive to stimulation, usually accompanied by drowsiness or sleep
Tranquilization:	A state in which an animal is calm and less responsive to stimulation usually without sleepiness (although tranquilization may allow a tired animal to sleep voluntarily)

To avoid euthanasia of the wrong animal, the animal's identity should be double checked against the accompanying paperwork, proper authorization for the procedure should be verified, photographs and databases should be searched for recent reclaim calls, and the animal should be carefully scanned at least one more time for the presence of a microchip.

If physical restraint tools such as a pole syringe, net, or squeeze cage are used, they must be used in a professional manner, with only the necessary amount of pressure applied. Animals get excited in stressful situations, but euthanasia technicians must not react

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in kind; they must remain calm, quiet and composed and work in a slow, deliberate manner.

There is some evidence that animals have psychological responses to euthanasia and the death of other animals. Rats are known to show a fright reaction to blood or muscle from their own and closely related species (Stevens and Saplikoski, 1973; Hornbuckle and Beall, 1974; Stevens and Gerzog-Thomas, 1977). Some animals respond to the presence or the sight of a dead animal (both those with whom they are and are not acquainted), while others seem oblivious. It is reasonable to assume that some animals experience some level of distress when exposed to the sight, smell, or presence of an animal who has already been euthanized. Ideally, an animal should not view the euthanasia of another animal. Realistically, the physical constraints of some animal shelters make this separation of animals a difficult task; animals to whom sodium pentobarbital has been administered may need to be observed for a period of time (often while other animals are being euthanized) before death can be confirmed. Efforts to separate animals by arrangement of rooms, cages, kennels, and barriers such as doors and curtains should be made. Blood, urine, feces, and other bodily residue should be cleaned thoroughly with a neutral deodorizing solution from the surface on which euthanasia is performed before another animal is introduced to the same surface. Because animals live in a more richly perceived world of odors, it is important to recognize that what may smell pleasant to humans may be noxious to an animal; heavily perfumed commercial deodorizers should be avoided. The use of products such as synthetic feline facial pheromone (Feliway®) and dog appeasing pheromone (D.A.P.®) diffusers may exert a calming influence in the euthanasia room.

Mothers and Neonates

Mother animals and their neonates are an exception to the rule for separation from other animals during euthanasia. Mothers should be euthanized prior to their offspring so that they will not be distressed at being separated from their litter, or by seeing their dead offspring. The neonates should be euthanized immediately following the mother. If they are euthanized by IP injection of sodium pentobarbital, a procedure that will anesthetize them before their death, they can be placed together with their mother's still-warm body and their other littermates for comfort.

Fetuses

Euthanasia of the fetus at the time of pregnant spay is a difficult topic that elicits varied opinions. The fetus is apparently actively maintained in a sleep-like state by several endogenous neuroinhibitory mechanisms, and consciousness evidently appears for the first time only after birth (www.journals.elsevierhealth.com). The decision to euthanize the fetuses in the uterus of the queen or dam removed at the time of spay has often been made on the basis of supposition by veterinarians, and in reality has more welfare implications for veterinarians and staff than it does for the unborn fetuses. The options are to remove the uterus en bloc with the fetuses inside and to gently place the uterus in a dark place (wrapped in a towel or surgical paper) so the fetuses may pass away undisturbed; to palpate the abdomens of the fetuses through the uterus and to inject each fetus with an IP injection of euthanasia solution; or to open the uterus and euthanize each fetus individually.

During surgery, the fetuses experience the same anesthetic environment as the mother. In addition, the drugs are present in the same concentration in the amniotic fluid. Once the uterus is removed from the mother's circulatory system, it becomes a closed system recirculating the anesthetic drugs and oxygen in the system. The fetuses consume the available oxygen, become hypoxic, and pass away while being bathed in the drug-saturated amniotic fluid.

Although the fetal neural apparatus may be able to support consciousness during late pregnancy, the evidence is that the fetus remains unconscious throughout. Fetal, placental, and uterine tissues play a key role in providing chemical and physical factors that together actively maintain the fetus in a continuously unconscious state. The movements often observed before fetal death are subcortical reflex responses to the increasing hypoxemia and hypercapnea, and are not a cause for welfare concern. If fetuses are kept in the uterus until they are dead, no welfare compromise occurs (Mellor, 2010).

However, opening the uterus exposes the fetuses to many stimuli including light, thermal changes, and air. These changes could transition a near-term fetus to an air-breathing physiology, giving the fetus an

opportunity to struggle for breath. This will necessitate euthanasia of the fetus.

Drug Handling

As previously discussed, sodium pentobarbital and several of the drugs used as pre-euthanasia adjuncts are controlled by the DEA pursuant to the Controlled Substances Act of 1970 and, in most states, by additional state agencies. Whether the drugs are available to animal sheltering agencies directly or indirectly (through a veterinarian), strict record keeping and security are necessary. For complete details of requirements, see DEA (2011) in the references list.

RESTRAINT—CHEMICAL AND PHYSICAL

The quality of euthanasia does not depend solely on the method (sodium pentobarbital injection versus CO inhalation, for example) that is utilized. Far more important in most cases are the circumstances surrounding the euthanasia procedure, and perhaps most important of all is the method of restraint by which the animal is handled. Using an appropriate, effective, and humane method of restraint, whether chemical, physical, or a combination of the two, can mean the difference between a distressful and unsafe end to the animal's life, and an end that is both peaceful for the animal and safe for the person administering euthanasia.

Regardless of the method of euthanasia chosen, the animal must be restrained to some degree. The proper use of pre-euthanasia drugs and equipment is often erroneously omitted from euthanasia protocols and practices. Some agencies are not knowledgeable about or familiar with the use of specialized equipment and adjunctive drugs, some are unconvinced of the need, and many do not have access to the drugs and equipment that improve the ease, quality, and safety of euthanasia. Ironically, in some cases, pre-euthanasia drugs are routinely overused or misused as a substitute for adequate staffing and professional restraint and handling.

Chemical Restraint—Pre-euthanasia Drugs

Key to understanding the actions of commonly used pre-euthanasia drugs is knowing the difference between sedation, tranquilization, analgesia, and anesthesia, and knowing which actions the drug or drug combination being used, at the dose being used, is expected to produce (Table 30.4). Understanding the five stages of anesthesia, and the clinical signs of each, is also important (Table 30.2).

A number of drugs are commonly used to provide analgesia, anesthesia, sedation, tranquilization, and/or immobilization of animals who are frightened, painful, fractious, aggressive, and/or unaccustomed to human handling. Because some of these drugs can potentially be abused by humans, their availability may be restricted or prohibited for use by animal shelter workers. The most widely used drugs are acepromazine, ketamine, tiletamine–zolazepam, and xylazine.

In order to use these drugs appropriately and effectively, euthanasia technicians must understand their effects and how those effects may vary depending upon the dose, the time and route of administration, the extent of absorption, and the individual characteristics of the animal to whom they are administered. They must also understand how to combine and administer these drugs, and how to evaluate the animal to determine what effect they have produced.

Acepromazine

Acepromazine is an inexpensive phenothiazine tranquilizer that is commonly used as a pre-euthanasia drug, either alone for its tranquilizing effect or in combination with other pre-euthanasia drugs to enhance their effects. In particular, studies have demonstrated that premedication with acepromazine significantly enhances the quality of death induced by inhalation of CO in dogs (Dallaire and Chalifoux, 1985). Although it is a so-called legend drug (a prescription drug, federal law restricts its use to "by or on the order of a licensed veterinarian"), it is not a controlled substance, and most animal shelters obtain and use it without veterinary oversight.

Acepromazine is approved for use in dogs, cats, and horses, but is also used in many species for which FDA approval has not been sought or granted. It can be administered IM, SC, or orally, offering flexibility to the euthanasia technician. Its effect on animals varies widely. The tranquilizing effect of acepromazine alone will calm fractious and frightened animals, but does not protect the euthanasia technician from an aggressive animal. This limits its usefulness as the sole pre-euthanasia drug the shelter has access to. Another drawback is that occasionally an animal will develop the

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contradictory symptoms of aggressiveness and generalized CNS stimulation after receiving acepromazine (Plumb, 2008), and the drug may increase the likelihood of seizures in an epileptic animal. The hypotensive effects of acepromazine may make subsequent venipuncture difficult in some animals, particularly those who are already suffering from cardiovascular compromise. This is particularly problematic for shelters because they are unlikely to know an animal's history of seizures or cardiovascular disease. Used alone as a pre-euthanasia agent, acepromazine is typically administered to cats at a dose of 0.25–0.50 mg/lb and to dogs at 0.5–1.0 mg/lb SC or IM, 10–15 minutes prior to restraint for IV or IP injection of sodium pentobarbital. Acepromazine is also commonly mixed with ketamine to create a pre-euthanasia combination with the useful properties of sedation and dissociation.

Xylazine (Rompun®)

Xylazine is an alpha-2-adrenergic agonist that has some attributes similar to acepromazine for use as a pre-euthanasia drug: It is an inexpensive prescription drug but not a controlled substance, and can be administered SC or IM. It is classified as a sedative/analgesic with muscle relaxant properties. Its effects on the cardiovascular system include an initial increase in blood pressure, followed by a longer period of lowered blood pressure (Plumb, 2008), which may make subsequent venipuncture difficult and delay the action of sodium pentobarbital. The most significant drawback of using xylazine is that it frequently causes vomiting in cats and dogs, decreasing the quality of the euthanasia procedure, but this effect can be diminished by fasting the animal for a few hours beforehand and/or by using xylazine in combination with other drugs such as acepromazine (which has antiemetic properties) or ketamine. It may also render animals more reactive to loud noises (Rhoades, 2002).

Xylazine is manufactured and widely distributed in two strengths, 20 and 100 mg/ml, and those who use it must be familiar with this difference in order to dose the drug properly. Xylazine is approved for use in dogs, cats, horses, deer, and elk. Used alone as a pre-euthanasia agent, xylazine is typically administered at a dose of 1.0 mg/lb SC or IM, 10–15 minutes prior to restraint for IV or IP administration of sodium pentobarbital. Xylazine is also commonly mixed with ketamine to create a pre-euthanasia combination.

Ketamine

Ketamine is a rapidly acting general anesthetic with analgesic activity. Ketamine has been approved for use in nonhuman primates and cats. Used alone, it does not induce deep anesthesia, causes increased muscle tone, and may induce seizures, and therefore it is best used in combination with other drugs, such as xylazine. Ketamine is a controlled substance (CIII); it is a popular drug with a high potential for diversion for illicit human use. Ketamine has been associated with numerous scams and burglaries affecting both private veterinary practices and animal shelters nationwide. Increased control in response to human abuse of the drug has made it more difficult for many sheltering agencies to acquire ketamine; nonetheless, it remains a very useful and inexpensive drug for pre-euthanasia injection.

Two common uses of ketamine for pre-euthanasia purposes are (1) in combination with acepromazine (2 ml of acepromazine added to one 10 ml bottle of ketamine, administered to cats at a dose of 0.05–0.10 ml/lb body weight IM), and (2) in combination with xylazine (2 ml of 100 mg/ml concentration xylazine added to one 10 ml bottle of ketamine, administered to cats, dogs, raccoons, opossums, and skunks at a dose of 0.06 ml/lb body weight IM). Administration of an appropriate dosage of a combination of xylazine–ketamine can provide anesthesia that is deep enough for an IC injection of sodium pentobarbital (Rhoades, 2002). It is the responsibility of the euthanasia technician to ensure a deep enough plane of anesthesia has been reached before administering the IC injection.

Telazol

Telazol is a combination of tiletamine (an anesthetic chemically related to ketamine) and zolazepam (a minor tranquilizer related to diazepam) that has become a popular choice for pre-euthanasia use. Properly dosed and administered, the combination provides good anesthesia combined with muscle relaxation as well as analgesia. Concern has been expressed that tiletamine–zolazepam is too costly for routine use by animal shelters, and it is true that the per-volume cost is significantly higher than that of the other commonly used pre-euthanasia drugs.

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However, the low-volume dose (0.1–0.4 ml per 10 lbs body weight) of tiletamine–zolazepam required creates an advantage that makes the cost comparable to other drug combinations. The small dose also increases the ease and comfort of administration to the animal and thereby the degree of safety of the euthanasia technician. The excellent quality of anesthesia induced by the combination greatly enhances the quality of euthanasia that is provided, all factors that should be considered when making a financial decision regarding the feasibility of using tiletamine–zolazepam as a pre-euthanasia agent. Tiletamine–zolazepam is a controlled substance (CIII), approved for use in cats and dogs. It is administered IM, and may sting.

Other Pre-Euthanasia Drugs

Sodium pentobarbital is sometimes used as a pre-euthanasia drug; it may be administered orally to produce sedation or light anesthesia, or injected IP, followed by an IV or IC injection once the animal is anesthetized. Oral administration of other combinations of the drugs discussed above have been explored (Ramsay and Wetzel, 1998; Wetzel and Ramsay, 1998; Grove and Ramsay, 2000), with good results in some cases. Other drugs that are not widely used but may also prove suitable for pre-euthanasia purposes include medetomidine, diazepam, domitor, dexdomitor, butorphanol, and buprenorphine.

Physical Restraint

No other aspect of euthanasia influences the quality of death an animal experiences as does the method of physical restraint used before and during the procedure. The goal of restraint is multifold: to reduce the animal's fear as much as possible (or at least avoid inducing fear), to control the animal for administration of euthanasia, to control the animal's physical response to the euthanasia method, and to protect the persons administering euthanasia from injury. The methods discussed here pertain primarily to methods used to restrain dogs and cats for IV, IP, intramuscular (IM), and SC injections of pre-euthanasia drugs or drug combinations and EBI of sodium pentobarbital, but they can also be used to restrain and prepare animals for CO inhalation by those agencies that continue to use that method.

Animal restraint is as much an art as it is a skill. Some people are naturally adept at humanely and calmly restraining animals, most others can learn how to do it, and a few people will never become accomplished at animal restraint because they do not possess the animal—behavior-recognition skills and compassion necessary to the task. Staff who cannot demonstrate proficiency at proper animal restraint should not handle animals for euthanasia.

Evaluating the temperament of the animal to be euthanized is the first step in the process. Ideally, whatever information is known about the animal's temperament, whether gleaned from the previous owner or from shelter workers familiar with the animal should be made available to the person(s) performing the euthanasia. Observing the animal's response to approach and removal from the kennel and normal handling by staff should give the euthanasia technician some idea of their temperament and their need for and tolerance of restraint efforts. When in doubt, the wisest approach is to administer a pre-euthanasia drug or drug combination prior to euthanasia.

Two people should work together to sedate, tranquilize, anesthetize, and/or euthanize an animal. In determining what method of restraint might work best for a particular animal, the animal's size, temperament, degree of socialization, and physical condition must be considered. Other variables to consider include the skill and experience of the euthanasia technician and staff, the equipment and drugs that are available, the environment in which euthanasia will take place, and the method by which euthanasia will be administered.

Many dogs who are socialized to human handling can be easily restrained for cephalic venipuncture and direct IV administration of sodium pentobarbital. Gentle and reassuring chatter and petting or stroking these animals should be encouraged. Some animals who are somewhat fearful may be calmed by the application of a muzzle. Workers should be aware of the impact of their own body language, attitude, and the volume of their voice on the animal. Leaning over most dogs is an intimidating or threatening posture and can heighten a fear response.

A dog who cannot be restrained with a muzzle and oral acepromazine should be sedated, tranquilized, or anesthetized with a SC or IM injection of a pre-euthanasia drug prior to IV injection of sodium pentobarbital. Necessary restraint for this procedure may consist only of a leash and/or a muzzle and

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physical restraint, or may require restraint of the dog with a control pole or squeeze mechanism.

If needed for safety, the noose of a control pole should be applied gently but firmly to the dog's neck and used by one technician to hold his head in a corner of the room or gently against a wall while the other technician administers an IM injection into one of the dog's thighs. Another method is to use a leash threaded behind a cage or room door to safely immobilize a dog's head while an IM injection is administered in the hind leg. Smaller dogs can be gently but firmly pressed in the corner of a room or kennel. A rubber-coated rack, such as those designed to fit in the bottom of a stainless steel kennel cage to prevent the animal from becoming soiled, works well for this purpose, and can be used to gently but firmly restrain the dog against a wall or other solid surface while an injection is administered into the muscles of a rear leg through the grate-like openings of the rack. After the injection, the dog can be released or loosely tethered in a confined area and carefully observed until the pre-euthanasia agent has taken effect. A pole syringe can also be used to administer a pre-euthanasia drug, but it is usually necessary for the dog to be confined in such a way that he does not struggle against the needle when it is placed in order to avoid a broken or bent needle, failed drug delivery, and significant discomfort to the animal.

Oral Administration of Sodium Pentobarbital

An aggressive, fearful, or anxious dog can be given sodium pentobarbital orally, either by placing the powdered drug in capsules and hiding them in small meatballs of canned dog food, or by mixing the powder or liquid form of sodium pentobarbital (Ramsay and Wetzel, 1998; Rhoades, 2002) with canned dog food and feeding the mixture to the dog. Oral dosing of sodium pentobarbital requires three times the dose of IV dosing. The suggested powder dose is 1 grain powder per pound of body weight. This equals approximately one teaspoon for a forty-pound dog, or one tablespoon for a hundred-pound dog; when the weight of the dog is unknown or estimated, it is safest to aim for overdosage.

When measuring and mixing the powder, gloves and a mask must be worn. The bottle of powder used for oral dosing should be clearly marked so that it is not mistaken for a new bottle and erroneously reconstituted to an inappropriately diluted solution; and the powder used must be recorded. For DEA record keeping, subtract the amount in grams of powder removed from the bottle. A teaspoon of sodium pentobarbital powder is approximately 4.5 grams, and a tablespoon is approximately 13 grams. The bottle label will state the starting gram weight of the powder.

The dog should not be fed prior to the euthanasia meal in order to aid in the rapid absorption of the drug and to increase the likelihood of the euthanasia meal being eaten readily. This procedure should be performed only in a safely enclosed area. The dog and the food should be carefully and continuously monitored until he or she becomes deeply sedated or anesthetized, usually within 15–60 minutes of ingestion of an appropriate dose. Any uneaten food must be disposed of properly to ensure it is not mistakenly fed or accessed by any other animal. One recommendation is to dispose of the uneaten food with the body of the animal.

Once a dog is sedated or anesthetized, sodium pentobarbital can be injected into the cephalic vein located on the top of the front limb or lateral saphenous vein located over the hock of the hind limb. In a deeply anesthetized dog of medium to large size, the sublingual vein under the tongue can also be easily accessed and used for injection if other veins are less readily accessible. Administration of an IC injection of sodium pentobarbital to a deeply tranquilized or anesthetized dog is considered acceptable; however, IV injection is usually easier to perform than accurate IC injection in a large dog.

EUTHANASIA BY INJECTION TECHNIQUES

It is not the purpose of this chapter to teach euthanasia procedures or protocols, or to be used as a substitute for professional euthanasia training. Some key points will be made to supplement and reinforce the importance of good technique to provide humane procedures.

Small Puppies

Small puppies who are too agitated to tolerate restraint or too small for cephalic venipuncture can be sedated, tranquilized, or anesthetized prior to venipuncture, or be given an IP injection of unadulterated, pure sodium pentobarbital (see discussion of IP administration to cats, below). This method

should not be used routinely on adult dogs; however, it may be used in some rare circumstances such as in a moribund, hypotensive animal.

Cats

More cats are euthanized in US animal shelters than any other animal, yet progressive knowledge about how to humanely end the lives of cats has advanced slowly. A large number of cats who are presented for euthanasia are feral or fractious, and even well-socialized cats rarely tolerate the type of handling and restraint that is necessary to safely and humanely perform venipuncture. The safety hazard an agitated cat presents to the euthanasia technician is significant, but that hazard can be overcome with proper restraint techniques.

A few cats, usually large, well-socialized males, will allow cephalic venipuncture for direct administration of sodium pentobarbital; still others will allow themselves to be restrained for venipuncture of the medial saphenous vein, which is located on the inside of the rear leg. Euthanasia technicians-in-training should practice restraint on cats for blood draws and handling the syringe with one hand in order to develop the necessary dexterity before actually performing euthanasia.

Conscious cats and kittens (and puppies under ten pounds) can also be administered pure, unadulterated sodium pentobarbital by IP injection (Grier and Schaffer, 1990; Grier, Colvin and Schaffer, 1996; Rhoades, 2002), in the right lateral side of the abdomen caudal to the umbilicus (the left side of the abdomen is avoided to prevent injection into the stomach, where uptake may be delayed; the cranial abdomen is avoided to prevent injection into the liver or spleen). Most puppies and kittens and many adult cats will tolerate this method of administration well. To perform the injection, an adult cat or puppy should be placed on a counter-height surface facing away from the euthanasia technician. The restraining technician lifts the animal's front end by gently scruffing him or her by the back of the neck or placing one hand under the chest to lift the front feet off the surface so that the abdomen is exposed and the injection can be made. Young kittens and tiny puppies are usually comfortable being gently held in the air by their scruff as long as their bottoms are cupped, and their weight supported by the other hand of the restraining technician. They can then be turned so that their abdomen faces the technician for injection. After IP injection of sodium pentobarbital, the animal is placed in a warm, quiet, secure, darkened area (such as a plastic cat carrier, a stainless steel cage with a cover draped over the door, or a transfer cage with a cover draped over the entire cage) while the sodium pentobarbital takes effect and the animal advances through the five stages of anesthesia/euthanasia, a process that may take from 5–15 minutes, sometimes longer. Kittens and puppies can be placed with the body of their mother (euthanized immediately prior) and/or their similarly injected littermates immediately after injection, so that they experience the warmth, company and familiar smell of their litter as they become sedated and then anesthetized. The animals are checked every 5–10 minutes to ascertain that the drug is having the desired effect, and to verify death once it occurs. If progression to death does not occur within 15 minutes, a second dose of euthanasia solution should be administered. The recommended dose of sodium pentobarbital for IP injection is 3 ml/lb body weight of a 6-grain (390 mg/ml) formulation (Rhoades, 2002).

Cat Restraint

A cat who is too fractious or unsocialized to be safely handled should be injected with a pre-euthanasia drug prior to sodium pentobarbital injection. The key to performing such an injection with minimal stress is the means by which the cat is confined when the process begins; the cat should not be removed from the confinement until she is deeply tranquilized or anesthetized. Most protective animal-handling gloves offer poor control and increase the chance of injury to the euthanasia technician, while doing nothing to minimize the cat's apprehension. Control poles and cat tongs have enormous potential for injury and abuse, and their use is not consistent with providing a humane death for cats.

Ideally, the cat is in a plastic carrier, metal transfer cage, or humane trap when the euthanasia process begins; if the cat is in a larger enclosure, a humane trap or carrier can be placed in that enclosure and covered with any dark covering, whereupon the cat will usually move into the darkened area. Trap dividers can be used to carefully press the cat into one end of a humane trap, or the carrier can be set on end so that the cat is cornered in the bottom and an IM injection of a pre-euthanasia drug can be given,

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with or without a pole syringe. Alternately, the cat can be transferred into a small cage with a squeeze mechanism, and be gently squeezed into a position that allows an IM injection to be given. A squeeze mechanism can consist of a cage made expressly for this purpose, or the use of a protective barrier (such as a piece of plywood or plexiglass, or a thick blanket) that can be used to maneuver the cat to one end of the cage while preventing her access to the euthanasia technician. Netting is a third method that can be used on cats who cannot be maneuvered into a small enclosure. A fishing-style net (but with a finer mesh) is placed over the cat. Once the cat, within the net, steps over the rim of the net, the rim is lifted so that the cat is sealed in a loop of the net, at which point he or she can be gently manipulated into position for IM injection. There are a number of nets specifically designed for cat restraint available from animal care equipment companies such as Animal Care Equipment and Services (ACES) or Campbell Pet Company.

All of these methods allow the cat to be deeply tranquilized, sedated, or anesthetized, whereupon he or she can be safely handled for the injection of sodium pentobarbital. The behavior of fractious and feral cats can quickly escalate, and euthanasia technicians must be careful that their own actions do not provoke or mirror those of the cat. Maintaining a calm demeanor when handling an agitated cat allows the technician to provide euthanasia in the most humane manner possible. For both humane and human safety reasons, agencies must commit the necessary resources of time, money, training, supplies, and equipment to ensure appropriate euthanasia of cats takes place.

EUTHANASIA OF SPECIES OTHER THAN CATS AND DOGS

Without adequate training and resources, the task of providing a humane death for species other than cats and dogs is a challenging one. Staff may be less accustomed to handling other animals, to recognizing or dealing with their natural behaviors, and to protecting themselves from them. Anatomical variation also complicates the task. Pre-euthanasia sedation should be considered in all unfamiliar species, particularly if the animal is apparently anxious or unaccustomed to handling. For most species, EBI of sodium pentobarbital is the preferred method. Euthanasia methods are presented here by species. Regardless of the species or method chosen, each animal should be treated with compassion and respect throughout the process, ensuring that euthanasia has been properly and legally authorized, and death must be carefully verified before the body is removed. For information on the euthanasia of exotic animals, the reader is referred to the reference guide by the American Association of Zoo Veterinarians.

Small and Medium-Sized Mammals

Guinea pigs are usually calm animals who can be euthanized by IP administration of sodium pentobarbital; as with puppies, cats, and kittens, they should be handled on a counter-height surface and placed in a warm, dark, quiet area while they advance through the five stages of anesthesia before death. Some hamsters, gerbils, rats, mice, and other small rodents can be held cupped in a hand or by their scruff for an IP injection, but some will be quite unsocialized to handling and others will be too fearful to allow it. These small animals can be maneuvered or gently pressed with objects such as a plastic margarine dish or lid, a small piece of hardware cloth, or any mesh-like object that can be used to move them into a position that allows access to the abdomen. Because these animals can easily be dropped or quickly escape over the edge of a raised surface, it is a good practice to work with them inside an open-top box or cage placed on a counter-height or lower surface. One milliliter (ml) of sodium pentobarbital is an adequate dose for these tiny animals. Careful verification of death must be performed. If death cannot be confirmed, the animal should be set aside in a secure place until rigor mortis has occurred.

Ferrets can be euthanized with an IP injection of sodium pentobarbital, and restraint is the same as that for a cat or kitten. Ferrets who are not comfortable being handled can be given a pre-euthanasia drug or drug combination appropriate for cats, administered by the same techniques.

For rabbits, in general, the same pre-euthanasia drugs used for dogs and cats can be used, but doses should be doubled. The same is true for sodium pentobarbital, which may be easily given IP to rabbits who tolerate handling. Rabbits have large veins in their ears; once they are deeply tranquilized or

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anesthetized, it is often possible to inject sodium pentobarbital into these veins.

Raccoons, squirrels, and opossums can be tranquilized or anesthetized in the same manner as feral cats: by maneuvering them within a small cage or squeeze mechanism, a pre-euthanasia drug or drug combination (any of those appropriate for cats) can be injected IM. Death is induced by IP injection of sodium pentobarbital once the animal becomes anesthetized. Appropriate care should always be taken to avoid being scratched or bitten when euthanizing wild animals, especially with those considered to be local rabies vector species.

Skunks are euthanized in the same manner as raccoons, squirrels, and opossums, but care must obviously be taken by the euthanasia technician to avoid being sprayed. Covering the skunk's cage with a dark cloth, working in a quiet area, and proceeding in a calm, quiet, and deliberate manner greatly diminishes the possibility of being sprayed. Once the skunk is maneuvered into position for injection, a pole syringe will keep the technician somewhat out of the line of fire, should there be one. Because of the odor involved, a dedicated euthanasia shed or outbuilding may be advantageous for the purpose of skunk euthanasia in shelters where skunks are routinely euthanized.

Pigs

Although Vietnamese potbellied pigs, fad pets of the 1980s, are no longer as popular, many are still kept as pets, and they, as well as pet domestic pigs may be relinquished to animal shelters. When euthanasia is necessary, a 1:1 mixture of ketamine and acepromazine given at a dose of 1 ml per 10 lbs IM will provide deep sedation/light anesthesia and allow IV administration of sodium pentobarbital. The IM injection should be given into the muscles of the thigh. Most pigs are very difficult to restrain and scream loudly when handled no matter how gently; the best way to perform this injection is to maneuver the pig into a corner using a large barrier, such as a piece of plywood or a sorting panel (a commercially available plastic barrier designed expressly for the purpose of moving pigs). The euthanasia technician should reach over the barrier and inject into the rear leg muscles while the person holding the barrier distracts the pig's attention. Using a 1-½ inch needle will ensure injection is made into the muscle rather than the overlying fat. Once the pig is sedated/anesthetized, sodium pentobarbital is injected into the cephalic vein, which is visually obscure but found in the same location as that of a dog. (The jugular veins in pigs are very deep and difficult to find.)

Lizards, Snakes and Reptiles

Iguanas, other lizards, and snakes may be relinquished to shelters for a variety of reasons. When handling them, if the species cannot be readily determined, it should be assumed to be a nonnative, venomous animal who should be handled by a herpetologist. The nearest wildlife rehabilitator or large zoo should be contacted for referral to someone who is knowledgeable and authorized to provide assistance with these species. Local authorities should be contacted for information about the legalities of handling native snakes and lizards.

Methods for euthanasia of reptiles are described in the reptile chapter of this textbook and in other resources. Contrary to popular belief, freezing is not an acceptable, humane means of euthanizing reptiles. Mader (1996) recommends pre-euthanasia anesthesia induced by IM injection of tiletamine–zolazepam (25 mg/kg) or ketamine (100 mg/kg), which should require 15–20 minutes to take effect, whereupon sodium pentobarbital is administered by the IV, IC, or intracoelomic (intrapleuroperitoneal, the equivalent of IP in mammals) route. The location for IC injection of snakes depends on the particular species; a snake's heart is generally located one-third of the distance from the head to the tail, and may be located by palpation; a Doppler device aids in the location of the heart. A lizard's heart can also be palpated, or euthanasia solution can be injected into the ventral tail vein. Intrapleuroperitoneal injection is performed by inserting the needle lateral to the ventral midline in the caudal one-third of the body for snakes and lateral to the ventral midline in the abdominal region of lizards. As with mammals, unconsciousness or deep sedation/light anesthesia must be verified before an IC injection is administered.

Because of their very slow metabolism, reptiles may appear to be dead when they are not. Reptile bodies should be placed in a room-temperature enclosure for 24–48 hours for observation to verify euthanasia. When euthanasia of a snake or lizard is performed at the owner's request, the owner should

be advised to pick up the body at a later date, rather than take it home with them immediately.

Birds

Birds can be considered in three classes: small birds (parakeets, canaries, cockatiels, lovebirds, finches, etc.), mid-sized birds (parrots, cockatoos, macaws, pigeons, small chickens), and large birds (ducks, geese, guineas, peacocks, larger chickens). Consult with someone who is experienced in handling birds for information about appropriate restraint. A special word of caution regarding the euthanasia of wild species of birds: because of the Migratory Bird Treaty Act of 1918, a permit from the US Fish and Wildlife Service (FWS) must be obtained to transport, possess, house, or euthanize migratory birds. This act covers more than 800 species of birds including sparrows, grackles, pigeons, geese, owls and other birds of prey. It is safest to assume any wild bird is a migratory bird covered by this act.

All birds have a brachial ("wing") vein located on the medial side of the wing near the cubital joint (equivalent to the elbow joint) that can be used for IV injection of sodium pentobarbital. Severely injured or frightened birds can be anesthetized first with an IM injection into the pectoral muscles of a mixture of xylazine (20 mg/ml) and ketamine (100 mg/ml) and in a 1:5 volume combination, at a dose of 0.05 ml of each per lb for large birds (0.5ml/10 lbs), or 0.1 ml of each per lb for small and mid-sized birds. Telazol (100 mg/ml) may also be administered at a dose of 0.5ml/10 lbs (Rhoades, 2002). The bird is placed in a cardboard box in a quiet place until anesthetized, and then given sodium pentobarbital into the brachial vein or IP (at an IP dose of 0.3ml/lb) by inserting the needle perpendicularly directly beneath the breastbone (keel).

Fish

The only drug approved by the Food and Drug Administration (FDA) for euthanasia of fish is MS-222, an anesthetic also known as Finquel® or tricaine methanesulfonate (Argent Chemical Laboratories, Inc., Redmond, WA). Immerse the fish in a container of 350 ppm MS-222 (350 mg MS-222 per liter of water) for 10 minutes. MS-222 immersion is also an appropriate euthanasia method for amphibian species.

Horses

Equine euthanasia is an often inelegant, controversial, and always potentially dangerous procedure. Even when properly tranquilized prior to administration of an IV injection of sodium pentobarbital, a horse can fall suddenly or violently, or rear up, potentially striking his or her handlers. Horses should be euthanized by two experienced horse handlers, at least one of whom is experienced with equine euthanasia. A pre-euthanasia tranquilizer or tranquilizer combination (xylazine, detomidine, and acepromazine) is recommended in all cases. A large volume of 390 mg/ml sodium pentobarbital must be injected at a dosage of 1ml/10 lbs. Because typically 60–120 ml or more must be administered, use of 60 cc syringes and placement of a jugular catheter is recommended to facilitate the injections and enhances the safety of the person performing the IV injection.

Although gunshot and captive penetrating bolt are considered acceptable methods of equine euthanasia, these methods pose drawbacks in the shelter setting. Use of gunshot should only be considered under special, extreme circumstances. For example, for a horse trapped in a remote area where access or burial will be delayed or complicated, or the animal cannot be touched, gunshot by trained individuals may be used to quickly and humanely end the horse's life. Complications associated with carcass contamination by sodium pentobarbital and consumption by scavengers (bald eagles have died when feeding on a horse euthanized by pentobarbital injection) contribute to the necessity of considering gunshot.

Drawbacks to use of the penetrating captive bolt have been described as follows: (1) A second step, exsanguination or pithing for example, is strongly recommended to ensure the humane and quick death of the animal; (2) Few veterinarians are likely to have been trained in its use or to have had enough experience with the method to be either comfortable or proficient with it; (3) The equipment must be properly maintained to be safe and effective; (4) To be quick and effective, it is critical for firm pressure to be placed in the proper position against the horse's forehead; (5) Proper restraint is essential for correct positioning of the equipment, and a conscious animal is likely to resist and move, often necessitating more than one attempt at euthanasia; (6) It is considered by many to be aesthetically unpleasant; and (7) There are safety

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hazards for the veterinarian using the equipment. EBI, when possible, remains the preferred method of euthanasia of equines and is the method advocated by Veterinarians for Equine Welfare (www.vetsforequinewelfare.org/equine-euthanasia).

An important practical consideration is that arrangements for the final disposal of the body must be made prior to euthanasia; the horse should be euthanized in a location that allows for removal of the body.

Farm Animals

Sheep, goats, and cattle must sometimes be euthanized in a shelter environment. Sheep, goats, and calves who are tractable can be manually restrained and euthanized by IV injection of sodium pentobarbital into the cephalic or jugular vein. Adult cattle should be injected in the jugular vein. These species are extremely susceptible to the effects of xylazine, and can be tranquilized prior to euthanasia with an IM injection of a volume as small as 1 ml of a 100 mg/ml formulation per 1000 lbs body weight (0.1 mg/lb) As with horses, disposal considerations must be made in advance of euthanasia.

SPECIAL EUTHANASIA CASES

Rabies and Reportable Diseases

In some cases it may be necessary to euthanize an animal suspected of having rabies or another reportable disease. In the case of rabies, the head of the animal must be removed and submitted for testing. It is important to contact the state laboratory responsible for rabies testing to ensure proper handling and submission of the sample. In the case of bats, the entire body may be submitted. Each shelter should have the proper equipment for removal of the head, and euthanasia technicians should be trained in biosecurity techniques for handling these animals before, during, and after euthanasia. Shelters should be aware of any reportable diseases and work closely with state and local veterinarians to ensure that necropsies and appropriate diagnostic testing can be performed on any suspect animals.

Field Euthanasia

There may be some special circumstances where shelter workers may be called upon to perform euthanasia in the field rather than at the shelter. This may occur during disasters, at an animal hoarder's facility, in emergency situations where the animal cannot be transported to a veterinary hospital or the shelter, or when no licensed veterinarian is available. In these cases, forethought and planning should be done to ensure that equally high standards of care are provided for these euthanasias as for those done within the walls of the animal shelter. The shelter should have written protocols in place for field euthanasia. Proper legal consent or authorization for euthanasia should be obtained whenever possible before procedures are performed. Consideration of alternate methods to EBI may be necessary, such as gunshot. In addition to bringing euthanasia and pre-euthanasia drugs, a selection of syringes and needles, a stethoscope, exam gloves, and other essential euthanasia equipment to the scene, appropriate capture, safety, and restraint equipment should also be brought along in order to provide the breadth of choices that may be necessary to achieve the task in a humane manner. In addition, consideration must be given to the possibility of public-witnessed euthanasia and the impact that may have on the situation. A good description of field euthanasia can be found in the Euthanasia Training Manual by Rhoades (2002).

VERIFICATION OF DEATH

There is no single method for accurate verification of death immediately after it occurs; a combination of observations is necessary. The corneal and pupillary reflexes as well as the femoral pulse should be absent. There should be no signs or auscultable sounds of respiration. The heartbeat should neither be palpable nor auscultable. Mucous membranes should be pale or cyanotic; the color of the gums, conjunctiva, penis, and vulva may be examined. Rigor mortis ("stiffness of death"), when it occurs, is the most reliable sign; it usually develops within a few hours after death, then gradually dissipates. Onset and dissipation is subject to a number of variables including ambient temperature and muscularity. Birds are an exception to this rule as rigor mortis in avian species develops within minutes. Rigor mortis may fail to develop in juvenile animals or in animals who are elderly or severely debilitated. Hypothermia at the time of death may slow down the onset of rigor mortis, and hyperthermia may speed up its appearance and disappearance. When doubt exists as to whether death has occurred, the animal's body should be set aside

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in a secure place and should be periodically reexamined until death has been absolutely verified. If uncertainty about death persists, a needle attached to a syringe may be inserted into the heart of an unconscious and presumed deceased animal (and blood aspirated to verify penetration of the heart) to make certain there is no movement indicating a heartbeat is still present. Failure to carefully and accurately verify death of an animal is an unacceptable error. Regardless of the effectiveness of the method of euthanasia used, errors in administration, as well as individual physiological peculiarities of the animals being euthanized will occur on occasion, resulting in the failure of usual euthanasia procedures to cause the death of the animal.

PERSONAL SAFETY DURING EUTHANASIA

Like many aspects of shelter work, the task of euthanasia is laden with opportunities for injury. Possible injuries include bite and scratch wounds; exposure to zoonotic diseases such as rabies, scabies, ringworm, and leptospirosis; back injuries resulting from lifting or restraining large animals; traumatic injuries resulting from restraint of a large dog; punctures or lacerations from needles; mucous membrane exposure to sodium pentobarbital and other drug substances; inhalation of CO; and slipping, tripping, and falling, particularly on wet floors, urine, feces, and/or saliva. Another unfortunate danger that cannot be overlooked is workers who may deliberately inject themselves with euthanasia or pre-euthanasia drugs in attempts to get high or commit suicide. The emotional hazards of performing euthanasia have already been discussed.

Many of the hazards associated with euthanasia can be avoided with good work practices, such as proper lifting techniques, keeping work areas clean, well lit and uncluttered, avoiding distractions, and working cooperatively with all staff to perform this challenging task. Maintaining animal restraint equipment in good working condition, as well as utilizing appropriate chemical restraint options are tools essential to euthanasia safety, as is proper instruction in how to use those tools humanely and effectively. Good hygiene practices prevent the bulk of zoonotic disease transmissions. Pre-exposure rabies vaccination is essential for any person expected to perform euthanasia of animals of unknown origin and health history. Shelter management should appraise the emotional health of employees who perform or participate in the euthanasia process in order to provide interventions before the situation becomes critical.

BODY DISPOSAL

Euthanasia does not end when death has been verified; the body of the animal must be disposed of. Most US animal shelters dispose of animal remains in one of three ways: cremation, landfill burial, and rendering. All three methods have significant drawbacks, and each agency must determine which method is most appropriate. Composting, a fourth method for disposing of a large mass of bodies has been described (Glanville and Trampel, 1997). Concerns that the rendered remains of shelter animals might find their way into commercial pet foods in the form of bone meal or fat have been widely circulated, often in a sensational manner. The FDA's Center for Veterinary Medicine (CVM) found no evidence of cat or dog remains in the commercially available dog foods it sampled. As a part of its study, the CVM developed technology for detecting dog and cat DNA in dog food, and results demonstrated a complete absence of material that would have been derived from euthanized dogs or cats (FDACVM, 2002).

LEGAL CONSIDERATIONS AND RECORD KEEPING

It is beyond the scope of this chapter to fully discuss the various laws pertaining to euthanasia in shelters, or the regulations regarding the procurement, storage, and use of the euthanasia and pre-euthanasia drugs and equipment, although most of these have been alluded to throughout the chapter. Veterinarians, veterinary technicians, euthanasia technicians, and shelters are subject to a variety of state, federal, and local laws regarding management of animals for euthanasia, euthanasia methods that may or may not be legal, proper body disposal, training requirements, and Department of Health, Occupational Safety and Health Administration (OSHA) and DEA regulations. All staff directly involved in euthanizing shelter animals are strongly advised to become familiar with the various laws in their state.

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CONCLUSION

The goal for all those involved in humane animal sheltering should be twofold: to euthanize the fewest number of animals possible, and to ensure the best possible death for those who must be euthanized. Every animal deserves the best quality of life *and* death that can be offered, and that requires that shelter workers acquire sufficient skills, experience and knowledge to enable them to meet each animal's unique and individual needs. Best practices for humane euthanasia are well defined, but not necessarily well known. Through the dissemination of information and the provision of adequate resources, a humane death for every animal can be ensured.

REFERENCES

ACT (Animal Care Technologies) (2009) Humane Animal Euthanasia Online Training. Available at http://site.4act.com/training-your-staff/shelter-training (accessed December 4, 2011).

AHA (American Humane Association) (2009) Humane euthanasia of shelter animals fact sheet. Available online at http://www.americanhumane.org/assets/pdfs/animals/adv-co-ebi-cost-analysis09.pdf (accessed December 5, 2011).

Arluke, A. and Sanders, C.R. (1994) Managing emotions in an animal shelter, in *Animals and Human Society: Changing Perspectives* (eds A. Manning and J. Sherpell), Routledge, New York, NY.

AVMA (American Veterinary Medical Association) (2007) AVMA Guidelines for Euthanasia 2007. Available online at http://www.avma.org/issues/animal_welfare/euthanasia.pdf.

Bennett, R.A. (2001). Association disagrees with euthanasia method for avian species. *Journal of the American Veterinary Medical Association*, **218**, 1262.

Dallaire, A. and Chalifoux, A. (1985) Premedication of dogs with acepromazine or pentazocine before euthanasia with carbon monoxide. *Canadian Journal of Comparative Medicine*, **49**, 171–178.

DEA (Drug Enforcement Administration) (2011) Available online at http://www.deadiversion.usdoj.gov/faq/general.htm (accessed June 11, 2012).

Fakkema, D. (1999) *Operational Guide for Animal Care and Control Agencies (Euthanasia)*, American Humane Association, Englewood, CO.

Figley, C.R. and Roop, R. (2006) *Compassion Fatigue in the Animal Care Community*, Humane Society Press, Washington, DC.

FDACVM (Food and Drug Administration/Center for Veterinary Medicine) (2002) *Report on the risk from pentobarbital in dog food*, http://www.fda.gov/AboutFDA/CentersOffices/OfficeofFoods/CVM/CVMFOIAElectronicReadingRoom/ucm129131.htm (accessed December 8, 2011).

Glanville, T.D. and Trampel, D.W. (1997) Composting alternative for animal carcass disposal. *Journal of the American Veterinary Medical Association*, **210**, 1116–1120.

Grier, R.L. and Schaffer, C.B. (1990) Evaluation of intraperitoneal and intrahepatic administration of a euthanasia agent in animal shelter cats. *Journal of the American Veterinary Medical Association*, **197**, 1611–1615.

Grier, R.L., Colvin, T.L. and Schaffer, C.B. (1996) *Euthanasia Guide for Animal Shelters*, Moss Creek Publications, Ames, IA.

Grove, D.M. and Ramsay, E.C. (2000) Sedative and physiologic effects or orally administered α2-adrenoceptor agonists and ketamine in cats. *Journal of the American Veterinary Medical Association*, **216**, 1929–1932.

Hornbuckle, P.A. and Beall, T. (1974) Escape reactions to the blood of selected mammals by rats. *Behavioral Biology*, **12**, 573–576.

www.journals.elsevierhealth.com/periodicals/applan/article/S0168-1591%2806%2900112-2/abstract?refissn=0168-1591&refuid=S0168-1591%2808%2900011-7 (accessed June 18, 2012)

Lagoni, L., Butler, C. and Hetts, S. (1994) *The Human-Animal Bond and Grief*, W.B. Saunders Co., Philadelphia, PA.

Ludders, J.W. (2001) Another reader opposing thoracic compression for avian euthanasia. *Journal of the American Veterinary Medical Association*, **218**, 1721.

Mader, D.R. (1996). Euthanasia and necropsy, in *Reptile Medicine and Surgery* (ed D.R. Mader), W.B. Saunders Company, Philadelphia, PA, pp. 277–281. ISBN: 0721652085.

Mellor, D.J. (2010) Galloping colts, fetal feelings, and reassuring regulations: Putting animal-welfare science into practice. *Journal of Veterinary Medical Education*, **37**, 94–100.

Pawlaczyk, G. (1997) Gas sickens pound director. *Belleville (OH) News-Democrat* Saturday, July 12.

Plumb, D.C. (2008) *Veterinary Drug Handbook*, 6th edn, Iowa State University Press, Ames, IA.

Poole, J. (2000) Man succumbs to fumes while putting dogs to sleep. *The Times & Free Press (Detroit)*, Wednesday, March 29.

Ramsay, E.C. and Wetzel, R.W. (1998) Comparison of five regimens for oral administration of medication to induce sedation in dogs prior to euthanasia. *Journal of the American Veterinary Medical Association*, **213**, 240–242.

Rhoades, R.H. (2002) *The Humane Society of the United States Euthanasia Training Manual*, Humane Society Press, Washington, DC.

Rogelberg, S.G., DiGiacomo, N., Reeve, C.L., *et al.* (2007) What shelters can do about euthanasia-related stress: An examination of recommendations from those on the front line. *Journal of Applied Animal Welfare Science*, **10**(4), 331–347.

Stevens, D.A. and Gerzog-Thomas, D.A. (1977) Fright reactions in rats to conspecific tissue. *Physiological Behavior* **18**: 47–51.

Stevens, D.A. and Saplikoski, N.J. (1973) Rats' reactions to conspecific muscle and blood: Evidence for an alarm substance. *Behavioral Biology*, **8**, 75–82.

Vaillant, G.E. (1993) *The Wisdom of the Ego*, Harvard University Press, Cambridge, MA.

Wetzel, R.W. and Ramsay, E.C. (1998) Comparison of four regimens for intraoral administration of medication to induce sedation in cats prior to euthanasia. *Journal of the American Veterinary Medical Association*, **213**, 243–245.

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31
Foster Care

Martha Smith-Blackmore and Sandra Newbury

INTRODUCTION

Proactively managed foster care programs often play a crucial role in the life-saving mission of shelters. Foster programs can be used to provide individualized care and housing to meet the specific needs of animals with a variety of health and behavioral conditions, and may also be a key component of a population management plan. Well-organized foster programs can provide many benefits but also pose challenges.

One advantage to housing in a home environment is that it may allow time for active immunity to develop in susceptible individuals before exposing them to the shelter. This is important not just for kittens and puppies; many adult animals entering shelters are also immunologically naive. Foster care can also provide more opportunities than many shelter environments for socialization, exploration, and expressing a wide range of normal behaviors. In addition, many interventions for health or behavioral problems are facilitated by the consistency that can be provided by a single dedicated primary caregiver in a quiet, enriched, low-stress setting that may be more conducive to rehabilitation or recovery. Foster care may help to reduce housing needs in the shelter or provide additional offsite housing prior to special events while saving on daily care costs for the shelter. Social connections or foster-caregiver-driven adoption events may provide additional outlets for adoption.

These benefits must be weighed carefully against the potential costs and risks. While foster programs may conserve resources for daily care, they often require legal agreements, and substantial investments in communication, training, management, record keeping, veterinary care, and behavioral support. Risks to public or animal health and to animal welfare are potentially increased by sending shelter animals out into the community before they are ready for adoption. In addition, regardless of their experience levels, some caregivers may fail to provide adequate care, creating welfare issues for the animals involved.

These important liability and safety considerations are best addressed through a systematic process of staff and caregiver training, screening of animals and people involved, and matching the foster animal's needs to the level of training and the environment of the foster care provider. Similar risks exist anytime shelters send animals out into communities, whether through foster, adoption, transfer, or rescue.

The level of resource investment required and potential for problems depend on the scope of the program. As the number of animals in foster care increases, so does the need for investment in coordination, screening, program management, care, and marketing for positive outcomes. Shelters should be cautious about extending their foster programs beyond their resources.

Foster programs may also bring increased pressure for positive outcomes. The process of defining outcomes for individual animals becomes more complex as it becomes a community conversation. When managed well, this can lead to collaborative

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solutions, but in some cases, foster caregiver expectations may exceed the shelter's or community's capabilities to save lives, leading to frustration for all involved. Investment in planning, communication, monitoring, training, and support for foster programs is essential to create strong community support, limit conflicts, ensure good welfare, and maximize life-saving capacity.

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GOALS AND PLANNING

Some organizations do not have a physical facility but rather are a network of foster homes providing care and housing; the foster homes *are* the shelter. More commonly, foster programs are run as supplements or alternatives to housing and care within a shelter facility. These foster programs are best understood as an additional offsite holding area of the shelter. Planning foster programs involves setting goals and planning pathways and steps for care; this helps ensure that adequate resources and capacity for care are available to support the program at each step.

Goals

As with any program, defining clear goals and expectations helps guide planning and daily activities. Ideally, goals are set with plans and protocols in place before initiating a program of foster caregiving, but existing programs can also benefit enormously from an examination (or reexamination) of goals and reorganization according to defined priorities.

Foster care programs have often formed "spontaneously" at animal sheltering agencies, a natural outgrowth of the desire of shelter employees and volunteers to do more as individuals for specific animals. While it is possible for an informal program to be successful, too often the result is poor monitoring of animals and lack of support—both financial and emotional—for foster caregivers; the result may be frustration and disappointment for caregivers and inappropriate or inadequate care for the animals. Animals, as well as public support and the morale of staff and volunteers, may suffer under these circumstances. Introducing some structure to informal programs helps provide caregivers and animals the support they need to succeed. Defining goals also helps identify programmatic needs that can be highlighted for public support and development.

Common goals for foster programs are

- Increase the life-saving capacity of the organization. This is the ultimate goal for many shelter foster programs, but even if life saving is not increasing, improvements in welfare, staff morale, and resource investment still make foster programs worthwhile.
- Improved welfare. Foster homes can provide animals more enriched, usually cage-free environments and more potential for individualized care, positive interactions, and opportunities for bonding with humans.
- Increased capacity for care. Reducing the in-shelter population increases the amount of time and space available for the animals who remain in the shelter.
- Reduced length of stay (LOS) in the shelter. Minimizing the amount of time each animal spends in the shelter reduces the risk of disease for individuals and for the populations as a whole.
- Increased potential for adoptions. Foster parents are often excellent advocates for their foster pets and may find homes for adoption through their own network of friends.
- Maximizing resources. Foster programs may help to maximize resources, but they may not always reduce costs. Outsourcing care may reduce the shelter's food and basic care expenses if this is assumed by the foster caregivers. However, expanding the overall number of animals under care by creating an additional offsite housing area is likely to increase overall costs.

For some shelters, foster programs may reduce resource investment, but for many shelters foster programs will need a significant investment to be successful.

Planning Care Capacity for Foster Animals

When creating a foster care program, each organization should ensure that adequate care can be provided for foster animals. Care needs for each animal must be matched with the resources and training level of the foster caregiver and the characteristics of the foster home as well as the support available from the shelter. Planning for appropriate screening and follow-up care, either medical or behavioral, is essential for a program to run successfully. Outlining

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responsibilities for care helps shelters plan for future needs and helps foster parents and shelters understand the commitment they are making. Programs should be designed to function within the limits of their capacity to provide appropriate care and support for the animals and the caregivers.

It is important to recognize that a foster program may effectively increase the total number of animals in care and thus may stretch the limits of capacity to provide medical or behavioral care if these services are provided by the same staff who care for animals in the shelter. Foster animals must be included in estimates of numbers of animals needing physical examinations, revaccination, behavioral counseling, or special treatments. Just because an animal is not physically on site does not relieve the shelter of its responsibility to provide for the foster animal's welfare. Some shelters have developed systems where offsite veterinarians or behaviorists provide care. In other cases, foster caregivers may be responsible for seeking professional services for care. These systems may be more difficult to track and monitor but illustrate that many different models can be successful. See the chapter on legal issues for more information on this subject.

Planning for Live Release

In addition to ensuring appropriate care is provided for animals in foster care, shelters should also try to ensure there will be opportunities for positive outcomes. While there are some foster caregivers who are willing to take animals even when the outcome is uncertain, most people will expect the shelter to provide a positive outcome for their foster pet. Caregivers should receive training that outlines possible reasons or situations when a foster animal may not be a candidate for adoption, risks for particular categories, or things that may go wrong for individual animals. For example, foster caregivers should be informed that neonatal orphan kittens are known to have a higher risk for illness and mortality in the first few weeks of life. This risk increases for orphaned kittens who may not have had the benefit of maternal antibody transfer.

Evaluating intake and adoption or live release trends will help shelters estimate how many animals to send to foster care and to plan for both housing and a positive outcome for the animals once their care in foster homes has been completed. Estimating adoption-driven capacity and comparing it to intake expectations may help with this evaluation (see the chapter on population management).

As an example, early in "kitten season" there may be very few kittens available for adoption in the shelter, but if neonates are sent out to foster at this time, they will be returning in approximately 7–8 weeks for adoption. This may be the height of the season, with large numbers of kittens already available for adoption from current new intake. The shelter may need to plan special adoption promotions or other programs to place these foster kittens instead of bringing them into an already overloaded shelter system. Many shelters have successfully created pathways where foster kittens rarely enter the shelter but are the main source of adoptions for offsite events or promotions. These programs should be balanced with promoting or maintaining adoptions for kittens entering the shelter directly so that live releases are increased overall. Saving foster kittens at the expense of new admissions would not meet the goals for most programs. This concept is equally true for adult animals or those with special needs. Return from foster must be anticipated with a plan for how a home will be found.

How Many Foster Homes?

Estimating the number of homes required helps evaluate resource needs for foster programs. Table 31.1 shows an example of annual foster care planning for kittens. Column A shows total feline intake; column B shows total number of kittens entering the shelter who would have benefitted from foster care in the prior year. Column C divides the number of individual kittens by two in the winter months and by three in the peak months as an estimate of how many foster homes would be needed (assuming kittens will most often go to foster in groups of two or three). This example estimates the number of foster homes that would be needed to place all kittens in foster care separate from any assessment for capacity to provide care. The table shows the maximum number of foster homes needed for the animals entering the shelter during each month. If the average LOS is about 1 month, then many foster homes can likely be cycled and reused in the next month, but if LOS in foster is longer (e.g., 2 months) then the number of homes needed for 2 months of intake would need to be recruited (30 in August + 40 in

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Table 31.1. Estimating the number of foster homes needed by month.

	A	B	C
	Total intake	Kitten intake needing foster care	New foster homes needed this month
January	184	32	16
February	122	17	9
March	162	14	7
April	167	23	12
May	199	45	23
June	350	99	33
July	330	97	32
August	349	90	30
September	343	121	40
October	331	109	36
November	246	67	22
December	223	41	21

September = 70 homes). Since some homes will want a break from fostering and some animals will spend longer in care than expected, more homes should always be recruited than the expected need. Estimating for seasonal or other trends in demand for caregivers is important; for kittens, especially, there will be a much greater need during peak season.

Foster Program Coordination

A foster care program needs a dedicated coordinator who is knowledgeable about the shelter's operations and policies and has training and experience sufficient to support and guide caregivers as well as serve as a focal contact for a network of foster mentors. A volunteer or staff member may fill the position. The foster coordinator should have a working knowledge of animal health and behavior. The coordinator should be meticulous about record keeping and have strong communication skills. Depending on the scope of the program, the job of a foster care coordinator may range from performing a few simple activities throughout the day to managing a full department.

Planning Foster Care Pathways

Animals requiring foster care may be categorized on the basis of their reason for going to foster: underage for adoption; medical care; postsurgical care; behavioral evaluation, rehabilitation or training; space; and hospice care ("fospice"). While it may be appropriate for one organization to include all categories in their program, other organizations may not have the capacity or need to provide foster care pathways for all categories.

Since needs, responsibilities, and level of support required may vary for each pathway, foster caretakers should be provided with training and a detailed explanation of their responsibilities, including medications, treatments, or follow-up visits needed and an approximate date of return for each animal who goes into their care. For clarity, and to minimize problems as well as liability, all responsibilities, protocols, and expectations should be clearly communicated in writing. (See the chapter on legal issues for more information.)

Foster caregivers in each of these categories must be willing and able to follow precise instructions for care. Real risks to animals or humans may arise from noncompliance with prescribed care or treatment schedules, or from failure to recognize problems as they arise.

Under Age for Adoption

For many shelters, this category is the superhighway of all the foster pathways. Large numbers of young animals pass through shelter foster programs each year. Neonates or animals too young for adoption can be shielded from exposure to infectious disease at the shelter while in foster care while also having opportunities for exploration and socialization as they mature; young animals can receive the often around-the-clock individualized care they require from trained volunteer caretakers; and mothers can deliver and rear their young in a protected, less stressful environment. This pathway will require a detailed schedule of routine vaccinations, deworming, and spay/neuter surgery as well as careful monitoring by the foster caregiver so that problems can be identified and addressed as quickly as possible. Real risks for animal welfare exist in this pathway if care providers do not have adequate training, skills, and veterinary support. Neonatal animals in particular have much more intensive care needs than older animals. Younger animals also have greater susceptibility to infectious diseases, and lax practices for transmission prevention can have catastrophic consequences.

In addition, if this pathway becomes overextended, delaying return for adoption, young animals may miss their opportunity to be adopted while they are highly desirable young kittens and puppies.

Medical Care

Animals undergoing medical treatment may be provided daily care and medical treatments outside the shelter in an enriched environment. Stress is a significant cofactor in respiratory disease of both cats and dogs, so moving affected individuals to a home setting may improve the likelihood or speed of recovery. Some treatments would require specific restrictions such as leash walks only or limited exercise following heartworm treatment. This pathway will require an organized, detailed schedule for providing and monitoring medical treatments and follow-up care. Foster caregivers must understand the reasons and side effects of treatments provided. Risks may exist for humans or other animals in the foster home environment if foster caregivers do not have adequate facilities (e.g., space to separate foster animals from household pets, ability to disinfect the environment), training, and support (e.g., advice and medical follow-up evaluation) to provide the level of care necessary to maintain health and welfare.

Postsurgical Care

Fostering for postsurgical care is appropriate when the animal will not be available for adoption during the postsurgical recovery period and whenever direct personal nursing care is needed but hospitalization is no longer required. Fostering during the postoperative period helps assure that patients receive individualized care monitored by the shelter during the time when complications such as wound breakdown or infection may occur. Less stressful environments promote healing, and reduced anxiety may decrease pain perception. This is especially important in any case where strict cage rest in a quiet environment and close monitoring are necessary but unlikely to be available at the shelter. Fostering may also be appropriate when an animal is recovering from a surgery that may appear gruesome to the average adopter, such as an enucleation or amputation. Even though animals may be comfortable and stable enough to be made available for adoption, these conditions may be more readily accepted by the adopting public after the sutures are removed and the fur has begun to regrow.

Foster caregivers who are providing postsurgical care must be fully educated on what to expect, especially regarding complications, and competent enough to provide proper wound care, exercise restriction, appropriate quiet enrichment activities, massage and physical therapy, and pain management. Postsurgical fostering is generally short term but may be intensive during the recovery period. Non-compliance with treatment directives may lead to the need for repeated surgical interventions or even outright surgical failure.

Behavioral Care

Behavioral foster care can be provided by trained volunteers who take foster animals into their own homes for more in-depth behavior evaluation, individualized behavioral training, or a behavior modification program. Behavioral care can range from simple involvement in normal day-to-day home life activities for undersocialized animals to intensive interventions intended to rehabilitate animals with problematic behaviors. Basic manners training programs, carried out in foster care, may improve an animal's likelihood of adoption. In some cases, a brief period of observation to further evaluate an animal's behavior in a home setting may be a valuable tool to help provide additional insights useful in developing individualized treatment plans, predicting behavioral outcomes, and eventual adoption placement.

The techniques required for behavioral rehabilitation in foster care require professional oversight and may be labor intensive and time consuming. To be successful, interventions must be applied consistently by everyone in the household over a period of time, but success is never guaranteed. Finding the right match of animals and foster caregivers for this pathway can be a challenge. According to the Association of Shelter Veterinarians' (ASV) Guidelines for Standards of Care in Animal Shelters, "attempting behavior modification with aggressive animals poses concerns due to safety and liability risks; animals believed to be dangerous should not be re-homed." (ASV, 2010; Bollen and Horowitz, 2008) This is especially true in foster care where the general public may be at greater risk.

According to the ASV: "[Behavior modification] practices must adhere to the well-described scientific

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principles of animal behavior and learning including positive reinforcement, operant conditioning, systematic desensitization and counter-conditioning. In some cases, the use of medications, prescribed by a veterinarian, in combination with behavior modification techniques, may be required." (ASV, 2010).

All behavioral treatment plans should include training goals and target dates, written behavioral guidelines, and regular behavioral reevaluations. Appropriate supervision of foster caregivers providing behavioral care in their homes is essential to protect animal welfare and public safety. Opportunities for adjusting treatment plans may be missed without regular follow-up and intervention. Some resources for training for specific behavior remediation may be found through the Center for Shelter Dogs in Boston, Massachusetts (http://centerforshelterdogs.org/).

Capacity (Space)

As mentioned previously, some organizations house all their animals in foster settings while others may use foster care as an additional holding area for healthy animals. For example, foster care may facilitate gathering animals for a transport program or an upcoming adoption event. Even if sufficient capacity for care is available at the shelter, if a prolonged stay is expected, foster care often provides a better "waiting area" than in-shelter housing because of less strain on shelter resources, better opportunities for enrichment, and reduced stress and exposure to disease. This pathway functions best with a clear plan for return from foster coupled with a positive outcome. Placing animals into foster care in an effort to make up for a fundamental disparity between intake and live release without a clear plan or expectation for a positive outcome risks heartbreak for the foster caregivers and invests shelter resources unproductively.

Foster to Adopt

Foster-to-adopt can be a beneficial tool to move an animal to an anticipated adoptive home when certain conditions prevent the legal transfer of ownership. Animals may be allowed to leave the shelter and enter an intended adopter's home through a foster-to-adopt pathway prior to the end of their mandatory stray hold period. Although the adoption cannot be legally finalized until the stray hold period has expired, in many communities, especially where owner reclaims are rare, this pathway provides animals an option for the shortest possible LOS and decreases capacity requirements in the shelter. Potential adopters must be informed that if an owner arrives, he or she has the legal right to reclaim the animal up until the end the waiting period; pictures and descriptions of the animals are generally posted to aid owners who are looking for their lost pets.

Another example of a typical foster-to-adopt situation would be an animal convalescing from a condition or who is too young to undergo spay or neuter surgery. Foster-to-adopt can also be used to give the animal and the people time to interact in the home setting before the adoption commitment is made. The foster home may have right of first refusal if another adoptive home becomes available. Programs often allow potential adopters to foster for a fixed time (usually 2 weeks) at which point they must decide whether they are going to be adopters or schedule plans for the animal's return for adoption from the shelter. Having this requirement in place helps prevent animals from becoming stuck in foster limbo.

Shelters should have a written "foster-to-adopt" agreement that covers the terms of ownership, responsibilities for both the shelter and the foster home, and fees that may be refundable or used toward the adoption fee. Nonrefundable fees that may be applied toward the adoption fee help to encourage serious foster-to-adopt applications. For more information see the chapter on legal issues.

Another option, also sometimes referred to as foster-to-adopt, encourages foster caregivers to seek offsite adoption opportunities though various sources including their own circle of friends, website postings, or other media outlets.

Before being placed in this pathway, animals should have received all appropriate vaccinations and other preventive medical and behavioral care that all shelter animals would receive prior to adoption. The foster caregivers should receive training in the shelter's adoption protocols.

"Fospice" Care

Fospice care (foster hospice) is foster care provided to animals who may be ineligible for adoption due to old age or a serious or terminal medical condition, but who would benefit from some time living in a loving home providing specialized care. The

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sheltering organization should ensure all the animal's medical, physical, and psychological needs can be met. Fospice caregivers must understand that these animals are considered terminally ill and medical decisions will have to be made regarding whether to allow them to die or to euthanize them to prevent suffering that cannot otherwise be alleviated. Caregivers should receive training to make realistic quality of life assessments, but fospice patients must receive frequent veterinary and quality of life assessments by shelter staff as well. One quality of life scale can be found here: http://www.veterinarypracticenews.com/images/pdfs/Quality_of_Life.pdf. The Quality of Life chapter in this text should also be consulted.

The final decision to end a fospice patient's life should be made together by the shelter staff and foster caregiver, but ultimately, the shelter must retain the decision-making authority in order to protect the animal's welfare. Providing fospice care can be very rewarding but may also be emotionally draining; caregivers and animals should be chosen very carefully. Fospice caregivers should be provided with resources for dealing with compassion fatigue and be encouraged to take breaks between animals. Finally, not every shelter will embrace fospice care. These programs drain resources because end-of-life care is expensive and time consuming to provide, and the programs may not fit the shelter mission of saving lives.

Temporary Foster to Support Owners or Animals in Transition

Other types of foster care programs provide a haven for pets of domestic violence victims (Ascione, 2000) and/or for pet owners who are temporarily unable to provide care due to short-term disruptions in their lives, such as those who are hospitalized or deployed in military service. Some agencies also provide care for pets of families undergoing such turmoil as divorce or homelessness. In some jurisdictions, animals being held as evidence in legal cases may be sent to foster care. These pathways require special attention to legal contracts since the owners in many cases have retained ownership of the animals. Responsibilities and permissions must be clearly outlined including who will pay for the costs of care and who may make medical decisions both routinely or in an emergency. Potential exists for foster families to become emotionally attached to their foster animals, complicating return to owners. Foster parents need to be clearly informed and agree in writing that the animals will be returned to their owners when their circumstances resolve or if ordered by the court. Conversely, some owners have difficulties resolving their problems and may want to keep animals in foster indefinitely. Written expectations for a time period to reclaim or surrender the animal to the shelter may help avoid prolonged foster stays, but individual circumstances can be very fragile and complex. Engaging a social worker to help with these conversations may facilitate the best resolution for all involved.

FLOW-THROUGH PLANNING FOR FOSTER ANIMALS

Scheduling, Efficiency, and Length of Stay (LOS)

Efficiency is as important for foster pathways as it is for the pathways within the shelter. Efficiency, especially in getting animals into foster, may be even more important when foster is required for specialized care or to prevent exposure to the shelter environment. Efficiently moving animals in and out of foster care may result in more animals receiving care from the same number of foster caregivers. For example, in a 16-week time period, a foster home with capacity to care for one litter of kittens may care for a single litter for 16 weeks or two litters for 8 weeks each. Delays in moving animals through the foster system will have a negative impact on resources for saving lives.

For each of the pathways previously described, a general schedule for procedures (vaccinations, spaying and neutering) and events, including return, can be outlined. As each animal is assigned to foster, the specific schedule for that animal can be laid out. Schedules for routine care can help caregivers plan visits back to the shelter or clinic and help ensure preventive treatments are provided in a timely way. Scheduling care as animals are going out to foster also helps to identify problems with inadequate capacity to provide care before the need is urgent, allowing time to correct the problem or helping to determine which animals (or how many) should be sent to foster care. For example, efficient scheduling requires knowing if there is a long list of animals needing spay/neuter or waiting for space in

adoptions. Assessment of projected population dynamics and likelihood of live release at time of return is also facilitated by scheduling or estimating return dates as the animals are going to foster care.

Readiness Systems

Readiness programs are designed to decrease the length of time an animal must spend in the shelter on the way to adoption. One example of a readiness program would be to have an on-call volunteer driver squad that will deliver kittens (and the needed supplies) to their foster caregivers immediately after their intake exam is finished. Readiness programs are based on projections of intake and preparing pathways in advance so they are ready for animals as they present to the shelter.

Readiness systems examine barriers that might keep animals in the shelter longer than necessary and make every attempt to remove them. These programs take some effort to organize and maintain. But, they can have a profound impact on individual animal health and welfare as well as reducing daily housing and care requirements in the shelter.

Diversion Programs

An alternative type of readiness program diverts animals before the point of intake to external pathways so that animals will be ready for adoption or transfer when they arrive. These programs also minimize the amount of time spent in the shelter, reducing overall care days. "Foster to Surrender," "Foster by Finder," or "Ready, Set, Go" programs encourage finders or owners relinquishing animals to "foster" them in their own homes until space is available or they are made ready for adoption or transfer. A sample protocol for a Ready, Set, Go program is provided in Appendix 31.1.

Selecting Animals

There is no one right way to select animals for foster care. Animal selection is best thought of as a matchmaking process between the animals in need of care and the people and environments available to provide that care. This matchmaking must be done in combination with an evaluation of population dynamics and available resources. Determining which animals are the best candidates for foster care varies widely on the basis of the goals and resources of the organization and the realities of which animals can be placed through adoption or transfer. In each case though, the well-being of the animal, the foster care provider, and the public must be carefully considered. Animals should not be sent to foster care if adequate resources to safely care for them cannot be provided.

Screening and Preventive Treatments Prior to Foster Placement

Screening of animals by trained staff (or volunteers) for health and behavior problems prior to foster placement helps protect foster caregivers, their families, and their homes and aids the matching process. A physical examination must be performed and preventive and prophylactic treatments provided that benefit the animal and help protect the foster home.

Vaccination

Vaccination on intake is an essential life-saving tool even for animals who are being sent directly to foster care. Animals older than 4 weeks should be vaccinated on intake, prior to foster placement. If neonates are placed in foster prior to vaccination, vaccination should be scheduled to begin at 4 weeks of age with revaccination at 2-week intervals.

Behavioral Assessment

All animals should receive a behavior evaluation prior to foster placement. Ideally, behavior would be evaluated using a combination of history and observations made in the shelter. Many systematic behavioral evaluations have been developed. These programs may help to elucidate an animal's personality, determine what behavioral care the animal may require while in foster care, help determine the most appropriate placement match, and help screen out animals for dangerous aggression issues. See the behavior section of this text for additional information on assessments.

Infectious Disease

Animals should be examined for clinical signs of infectious disease. Of greatest concern in foster programs are durable, highly contagious pathogens (e.g., parvovirus, panleukopenia, coccidia, ringworm) as well as those that are zoonotic (e.g., scabies, ringworm, or rabies). A complete physical examination should be performed on all foster care candidates. Obvious signs of illness (e.g., coughing, vomiting, drooling, nasal discharge) should be

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noted, and a check for external parasites as well as a Wood's lamp exam to screen for dermatophytosis (ringworm) should be conducted.

Fecal Exams and Prophylactic Treatment

Fecal examination may reveal specific internal parasites but has low sensitivity for the less common pathogens and may be labor intensive. While a positive fecal test confirms an infection, a negative fecal does not rule one out. Animals should be treated prophylactically with a broad spectrum dewormer effective against at least roundworms and hookworms starting at 2–3 weeks of age and repeated every 2 weeks until 2 months of age and then placed on an ongoing monthly schedule. This protocol best ensures animals are free of the most common and zoonotic parasites and prevents contamination of foster homes. In areas where whipworms are common, or whenever unthriftiness or diarrhea persists after broad spectrum deworming, a fecal exam should be performed so that targeted treatment can be provided. In addition, because coccidia are not uncommon and are not affected by a general broad-spectrum treatment, puppies and kittens should be treated at 2–3 weeks of age with a coccidiocidal medication (such as ponazuril) prior to placement in foster care, and retreated 7–14 days later.

FeLV/FIV Testing

For cats, blood tests should be performed for feline leukemia (FeLV) and feline immunodeficiency virus (FIV) to help screen for infectious animals, but if testing is performed just after intake, it should be noted in the animal's record. The foster caregiver should be informed that there is a possibility that although the animal may test negative now, he or she may test positive later. Cats should be retested 1–3 months after initial intake to confirm their status. Some programs elect to retest when animals return from foster, even if sooner than 1–3 months. If animals who test positive are sent to foster care, they should be sent only to homes where resident cats are also test-positive, or where there are no other cats.

Heartworm Testing

Dogs should be tested for heartworm disease and started on a preventative treatment prior to foster placement. Dogs who are heartworm-positive will be less of an infectious risk once they are started on a preventive treatment, even if they have not received definitive treatment. Even if a shelter cannot afford to test for heartworm status, preventive treatment should still be started. The risk of complications from preventive treatment is low even in heartworm-positive animals, and according to the American Heartworm Society, the benefit of eliminating microfilaria outweighs the potential problems. This is true for cats as well as dogs.

Heartworm testing in cats has limitations, and negative tests do not necessarily rule out an infection. Regardless of whether the shelter decides to test or not, preventive treatment should still be administered prior to placement in foster care. Heartworm testing in cats may be indicated for individual cats with bronchitis, weight loss, or other unexplained failure to thrive.

Other Testing

If any clinical signs are seen that are consistent with infectious diseases, appropriate testing, including screening for tickborne diseases, should be performed. Testing should also be performed if uncommon or unusually severe signs are seen with common illnesses (e.g., URI (upper respiratory infection)).

Routine, Follow-Up, and Emergency Care Needs

Routine health and behavioral care should be provided for foster animals in addition to follow-up care for specific problems. Puppies and kittens should be examined, weighed, dewormed, and revaccinated every 2 weeks with core vaccines canine distemper, hepatitis, parainfluenza and parvo (DHPP) and feline rhinotracheitis, calici and panleukopenia (FVRCP). until they reach 18–20 weeks of age. Deworming is especially important for nursing mothers and their young, since the hormones of lactation induce larval migration to the mammary glands and intestines. Neonates should be vaccinated against rabies when they reach 3 months of age if they are healthy enough. Neonates and animals recovering from significant disease or surgery may need to be examined more frequently. Medications, treatments, and heartworm and flea and tick preventatives should be given on schedule or as needed.

Routine recheck appointments provide an excellent opportunity to identify problems early and to discuss any questions or behavioral concerns that may arise. Routine recheck appointments for foster kittens and puppies are commonly handled by an

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individual in the shelter trained to give vaccinations and medications, recognize signs of problems, and identify the need for veterinarian involvement. Special care should be taken at these appointments to avoid exposing foster animals to disease so it may be best to designate specific staff for this task who have not handled other potentially infectious animals earlier in the day. Animals assigned to novice foster caregivers may need to be examined more often than those of experienced program participants, who may be more skillful at providing care and more adept at recognizing problems.

A medical record should be kept for each individual animal that includes body weight and physical examination findings as well as the results of any tests and administration of any vaccines, anthelmintics, or medications. This information should be recorded for each visit, and any changes to the treatment plan should be discussed carefully with the caregiver.

If the sheltering agency allows foster caregivers to obtain veterinary care on their own, the sheltering agency is still responsible for ensuring the animal is receiving appropriate care. At each visit with a shelter staff person, the foster caregiver should provide records of any care provided by their veterinarian. A written record of the events of each visit should be kept in the record for each animal by the agency.

Emergency care for foster animals must be included in the care plan. While in some cases the potential need for emergency care may be anticipated, unexpected emergencies may also arise. Foster caregivers should be given clear instructions about who to call and where to go, what degree of intensive care or intervention would be possible, and who will be responsible for payment.

Foster animals should be trained, socialized, and handled frequently. When possible, providing positive experiences of restraint for examination and other procedures such as having their nails clipped and ears cleaned will help the animal adjust to normal life. Dogs and puppies should be housetrained and crate trained, and be taught basic "manners" such as recalls, how to sit and stay on command, and to walk calmly on a leash. Many cats can also be successfully trained to come when called or to walk on a leash. Teaching a foster animal basic pet "etiquette" enriches their lives, helps create bonds with humans, and increases their chances of successful adoption.

Monitoring Animals in Care, Foster Pathways, Programs, and Caregivers

In order to keep track of the progress of individual foster animals, caregivers should monitor weight, appetite, elimination, signs of illness, behavior, and other parameters that may be important, record their findings, and bring monitoring records with them to any follow-up appointments. Online monitoring systems, where caregivers can input their daily monitoring information, allow the shelter to regularly check parameters being monitored.

Foster pathways should be regularly monitored to ensure all aspects are running smoothly. Pathway monitoring should include tracking average LOS in the shelter while waiting for foster pickup as well as average LOS in foster, including a specific evaluation of time spent waiting for services or housing needed to progress toward adoption. When average LOS begins to rise, pathways should be examined to see if the increase in time spent is due to the system being overextended. Ideally, shelters should have at the time animals are sent to foster at least a tentative treatment plan or time frame for most foster animals that includes scheduling appointments for rechecks, follow-up treatments, examinations, and return for adoption. In some cases, animals may be sent to foster while waiting for a special procedure to be scheduled. Even then, a plan should be outlined with a time line for checking in and monitoring progress.

Foster programs should have a clear record indicating the current status of each animal in foster care. The number of animals in foster care and the needs of those animals should be carefully tracked to avoid overextending the population beyond the organization's ability to provide care, or losing animals to follow-up.

Outcomes and problems should be monitored for each animal, each foster home and caregiver, and each individual pathway as well as for the program as a whole. Monitoring should include an evaluation of outcomes, the incidence of problems, and success rates according to risk group. For example, if evaluating a problem with mortality in foster kittens, it may be important to consider neonates and older kittens separately in order to pinpoint where the problem lies. Similarly, if there are a disproportionate number of problems in a single foster home, more investigation is needed.

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Table 31.2. A basic chart to account for all animals in the foster program.

	Into foster care	Returned from foster care	Census in foster care on first day of month
January	14	30	45
February	11	19	29
March	27	15	21
April	37	27	33
May	103	36	43
June	93	108	110
July	59	62	95
August	49	43	92
September	59	60	98
October	54	54	97
November	34	74	97
December	20	108	57

Data Collection

Basic data to collect for all foster animals are: reason for foster, age, time in foster (date in and date returned), and outcome. Some additional data that help with monitoring care in foster programs include: weight changes, health and behavior status as animals leave for foster, health and behavior status as animals return from foster, follow-up visits required, and number of treatments or treatment time required. These parameters allow for evaluation of real and hidden costs and benefits in terms of time and labor investment. This data may also help track trends for times of year when foster is in greater demand and when system problems are most likely to occur.

In addition, basic program tracking should include start and ending census numbers in foster care, numbers entering into foster care, and numbers returning as shown in Table 31.2. The number in foster care on the first day of February should be equal to the number in care on January 1 plus the number sent to foster in January minus the number returned from foster in January. These numbers will allow a monthly audit to make sure all animals are accounted for as well as keep track of changes in the size of the program.

Figure 31.1 and Table 31.3 show this basic data combined with data from intake to illustrate the effect of returning foster kittens on population dynamics. Returning kittens increase the intake of animals ready for adoption. The effect is very small in the off-season (January through April in this example) but can have a substantial effect in peak kitten season. For example, in June, 257 cats entered the shelter ready for adoption, and 108 kittens returned from foster, also ready for adoption. In all, the total adjusted intake was 365 adoptable cats. In addition, 93 kittens were sent to foster directly from intake,

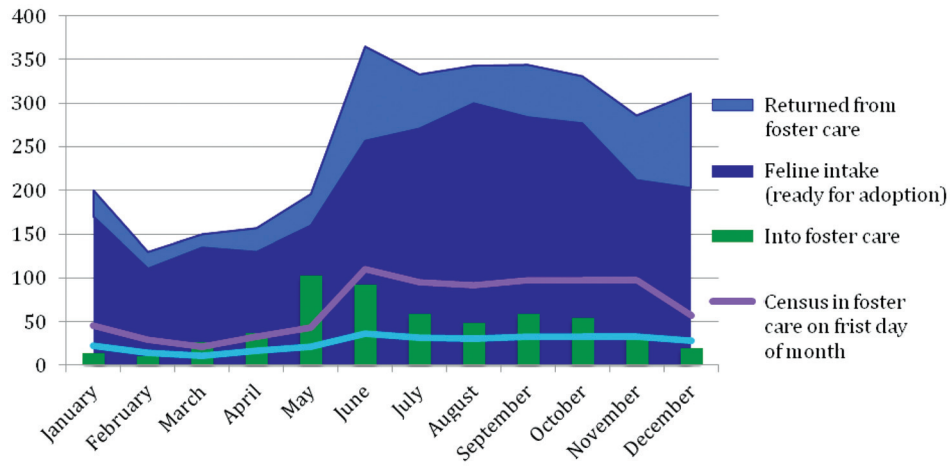


Figure 31.1. Impact of animals returning from foster care on intake.

Table 31.3. The effect of kittens returning from foster care on population dynamics.

	Feline intake (ready for adoption)	Returned from foster care	Into foster care	Census in foster care on first day of month	Number of homes used
January	170	30	14	45	23
February	111	19	11	29	15
March	135	15	27	21	11
April	130	27	37	33	17
May	160	36	103	43	22
June	257	108	93	110	37
July	271	62	59	95	32
August	300	43	49	92	31
September	284	60	59	98	33
October	277	54	54	97	32
November	212	74	34	97	32
December	203	108	20	57	29

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with a plan to return in the coming months. The number of animals in foster care and the number of foster homes in use are also tracked in this example data set.

FOSTER HOMES AND CAREGIVERS

Foster caregiving is most commonly a volunteer activity. The pool of volunteers may come from a wide range of sources in the community. While many families enjoy doing foster care together, shelters should check their local regulations, as in some cases primary caregivers should be 18 years of age in order to enter into a legally binding contract. Younger people who wish to participate in the foster care program should be allowed to do so in partnership with an adult who is willing to take primary responsibility. Many shelters have created outreach programs that partner with organizations (e.g., college clubs, scouts, or 4H clubs) in their community to expand their foster care programs and have shelter animals serve as community ambassadors.

Labor laws may determine whether shelter staff are allowed to volunteer to provide foster care in their homes for animals from the shelter where they are employed. The practice has resulted in fines for at least one sheltering organization. If employees volunteer to provide foster care at home, it must be made clear that fostering is separate from their work activities. There should be no unspoken pressure for employees to foster.

Recruiting and Retention

Having good foster homes ready and willing to take in animals does not happen by accident. Advance recruiting and training of foster caregivers on the basis of expectations for what the need will be are essential components of any successful foster program.

Recruiting adequate numbers of volunteers is essential to prevent foster-home crowding, facilitate periodic rest breaks, and limit foster home burnout. Even if an adequate number of caregivers have volunteered foster-home recruitment as an ongoing activity supports growth and support of the program, continually bringing in new people as others advance their experience and training.

Providing caregivers with support and training will help ensure their efforts are successful. Positive experiences are likely to lead to retention while negative experiences may cause a volunteer to withdraw from the program. Losing a well-trained and dedicated foster home represents the loss of a huge investment in recruitment, training, and experience, all of which would have to be reinvested in a replacement. Providing training may even help recruitment efforts because many people will come to the

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program appreciating it as an enriched and valuable learning opportunity.

Actively recognizing the important life-saving contributions of foster caregivers (e.g., through awards, events, advancement, or news stories) is equally important since foster homes are more likely to continue their work when they feel appreciated.

Below are a few basic goals for recruitment and retention of foster homes:

- Recruit adequate numbers of volunteers
- Provide training and support before animals arrive
- Don't overburden individual caregivers or foster homes
- Match caregiver skills to animals' needs
- Require periodic rest breaks from fostering
- Provide opportunities for growth and ongoing learning
- Recognize and appreciate contributions

Regulations

Some organizations and governmental agencies have instituted regulations or policies to try to better monitor or control foster care programs. Requirements and regulations for foster homes or foster caregivers vary by location and organization.

Many states have written regulations that require the issuance of licenses or permits to foster homes either by the government or by the shelter itself. These regulations include foster home registration; limits on the numbers of animals; timing of reevaluation; and requirements for inspection of the foster home as well as other aspects of foster care. For example, in Colorado, home visits are required for all foster caregivers (Colorado Pet Animal Care Facilities Act: C.R.S. § 35-80-101-117). In Illinois, foster homes must have a permit and may not exceed four animals at any given time (IL ST CH 225 § 605/1 – 22).In Virginia, a statement is required from each foster caregiver attesting to the fact that they have never been convicted of animal abuse, cruelty, neglect, or abandonment (VA ST § 3.2-6549).

These laws were designed to protect public health and fostered animals located in offsite or decentralized care. Awareness has grown that although there are many excellent foster care programs, unfortunately animal hoarding, animal neglect and abuse, or problems with infectious disease can also be associated with some foster homes. In some cases, problematic individuals may even be drawn to foster care as part of their pathology. In several hoarding situations, animals belonging to the local shelter have been found present in "foster care" within the hoarding environment. In some cases, animals from more than one organization have been present.

Each shelter and foster program has the responsibility to know the regulations that apply in their own state or region and how they are interpreted. In addition, shelters have the responsibility to monitor for and respond to problematic individuals or homes who may become involved with their foster programs.

Home Visits

Home visits can serve an important role in ensuring that the foster home is a suitable environment for shelter animals and can facilitate a dialog about proper care of the animals in that particular setting. There is a wide range of acceptable environments and providers of foster care, just as there is of people and their pets living in homes. Policies and regulations should allow for varied environments as long as they provide acceptable care.

Although valuable in some circumstances, conducting home visits for all foster caregivers can be a difficult goal to achieve. In addition, environments may change after a visit, so repeat visits or unannounced visits may be necessary for accurate assessments. Visits require a great deal of staff (or volunteer) time as well as an organized system for scheduling. Initial home visits or complex registration processes may also delay getting a much-needed foster home into use.

Many organizations are concerned that requiring home visits will make foster caregivers uncomfortable, create a sense of mistrust, or even deter people from signing up to foster; other organizations feel that home visits ensure that foster homes are an acceptable extension of their organization and meet their standards for care. Ultimately, it is the foster care provider's responsibility to provide basic care for the animal while in their care, just as shelters would expect an adopter to care for their pet. Some organizations require home visits for specific reasons or for following known or suspected problems but not for all foster situations. Where state or local regulations do not exist, each organization

needs to find a balance between protecting foster animals and maximizing their available foster homes—just as they find a similar balance when adopting out their animals. If an organization selectively enforces an inspection program, it must ensure that inspections are on the basis of valid concerns and not on discriminatory policies.

If home visits are performed, an assessment should consider safety issues; the ability to separate foster animals from pets and people in the home; ease of disinfection; general cleanliness and condition of the environment as well as other animals already in the home.

Limits/Numbers

In some communities, the number of animals housed by each foster caregiver is limited by regulation. Many sheltering organizations impose limits on either the number of individual animals or the number of family units who can be simultaneously cared for by a single foster home. A family unit may be defined as a group of animals who are related or originate from the same close environment. Other organizations rely on their foster caregivers' judgment, training, and experience in setting their own reasonable limits on the basis of their ability to provide care. The ASV Guidelines for Standards of Care state, "capacity to provide humane care has limits for every organization, just as it does in private homes." These limits for capacity hold equally true for foster homes.

Cumulative Exposure Risk

Risks from increasing numbers of fosters and from combining unrelated animals should be carefully considered and balanced with the benefits of expanding the number of animals who can be placed in foster care. Plans that mitigate disease transmission in the home and good screening prior to placement help reduce risk generally, but they are especially important in foster environments caring for multiple unrelated animals.

Each sheltering organization should be understood to be a unique microcosm of infectious disease risk. Particular pathogens or strains may be present, originating from animals arriving from various backgrounds. When animals from more than one shelter are mixed together, risk sets are multiplied, significantly elevating the overall exposure risk, especially if foster animals stop over in the shelter before foster placement.

Similarly, providing simultaneous foster care for more than one animal family unit, even if from the same shelter, increases the risk of disease transmission between families. Thus, family units are an important concept in foster caregiving and planning. A family unit is understood to have had similar exposures or infectious potential; it is unlikely any new infectious diseases would be transmitted among them unless a new pathogen was introduced. A family unit should consist of animals who can comfortably share the same housing space without behavioral concerns.

While in some cases risk is associated with introduction of a particularly virulent virus such as parvovirus, in other cases the risk comes from exposure to multiple pathogens which may work synergistically to cause more serious disease or even death. In addition, in some cases, such as in feline infectious peritonitis (FIP), transmission of the underlying pathogen (feline enteric coronavirus) may be ongoing and quiet once it is introduced. Many or all animals will be exposed. In most cases, the coronavirus will cause little, if any problem, but in some cases problematic strains may be transmitted. While most cats will never develop FIP, they may continue to harbor and shed potentially fatal virus. When exposed, others may develop fulminant disease. (For more information on FIP, see the chapter on overview of disease.)

Accumulated infectious risk can be theoretically quantified as an exposure risk level. As an example, one kitten or one family unit would have an exposure risk of one. A second kitten added into the same foster home would give the environment an exposure risk of two. This would continue as kittens or family units are added; if three more were added, the exposure risk would then be five $(2 + 3)$. Even if four of these animals were sent out to adoption, the accumulated exposure risk level for the remaining kitten and in that particular foster home would remain at five. If a new kitten then were added, that kitten's exposure risk level would jump from one to six after introduction. In order to avoid developing or maintaining high accumulated infectious disease risks, foster homes with more than one family unit should periodically empty their homes. It is important to realize that family pets in the home

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environment may also contribute to this accumulated risk. In most cases, however, if sound practices are followed, the risk to foster animals from resident pets is usually less than the risk of exposure if the foster animals were to stay in the shelter environment. Limiting numbers, careful sanitation, and allowing a time gap between foster animals all help reduce cumulative risk.

Risk from many pathogens may accumulate. One example of a complex infectious risk from resident pets is associated with coronavirus and FIP. Resident cats may be infected but clinically unaffected with potentially mutable strains of coronavirus. While the resident cat's own genetics may prevent the mutation, the resident cat may potentially be a source of infection for other cats, especially kittens. Being a resident in a high-traffic environment increases the possibility that the cat will become infected with a mutable strain because of the risk of repeated exposure to novel strains. While resident cats in foster homes do present some risk, it is still most often a lesser, manageable risk. A UC Davis study by Pedersen showed that for animals housed in a shelter, transmission of coronavirus was almost universal within a short time following shelter admission. Risk in foster care should be considered when planning flow through (plan for reduced accumulated exposure risk) and whenever FIP outbreaks are seen in foster animals or shelters with resident cats (Pedersen *et al*., 2004).

Despite the risks of transmission from combining family units, there may be times when the behavioral or other benefits of combining animals may outweigh the risk of infectious disease. These should be carefully considered, balancing risk for all involved. As an example, single orphaned pups or kittens may experience more normal behavioral development if they are combined with another well-screened singleton. In this case, the risk of infectious disease is equal and balanced by the behavioral benefits for each orphaned singleton. Still, it is likely only worth the risk if long-term foster care is required. On the other hand, adding a single puppy or kitten to a healthy litter may benefit the singleton but may not balance well with the risk for the rest of the group. Although the history of orphaned animals is usually unknown, infectious disease may be an underlying reason why an orphan arrives at the shelter alone (e.g., perhaps the rest of the litter died), so singletons should be cautiously understood to carry some additional risk. These risks should also be considered when placing orphans with a surrogate nursing mother.

Evaluating Care Needs

Foster homes should be encouraged to function within their capacity for care. Working well within their limits helps ensure they will not become overextended as needs increase.

Care requirements may change quickly and dramatically, especially for young animals. In some cases having two young animals together may make some things easier, but other aspects of care become more difficult. A healthy litter of kittens with their mother may require mostly affection and fairly basic cleaning and feeding. But if, for example, the kittens become ill or the mother is not producing enough milk, care needs may quickly exceed expectations and the abilities of the caregiver. Monitoring each individual (e.g., appetite or elimination) is also more difficult as numbers increase, so problems may be discovered later, making intervention more urgent or more complex. Although young animals should not be separated from their mothers prematurely (in some regions this is prohibited by law), when a large orphaned litter is going into foster care, it may be best to divide the animals into smaller groups and send them to more than one foster home.

Needs may also change and increase as young animals develop. While a litter of very young puppies or kittens may quietly stay close by their mother, as they grow they will expand their range and their level of activity as well as their capacity to make a mess, investigate, and discover dangers in the home. "For puppies and kittens less than 4 months old, proper socialization is essential for normal behavioral development. Without daily handling and positive exposure to a variety of novel stimuli, animals may develop chronic fear and anxiety or suffer from the inability to adjust normally to their environments." (ASV, 2010)

Training

Providing training for foster caregivers prior to placing animals in their homes is essential for success. Before receiving foster animals, all caretakers should receive training that includes: basic animal care

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and behavior; potential risks of fostering (including zoonotic disease); modes of disease transmission and transmission reduction; preparing their homes for safety; selecting an appropriate location; keeping adequate records (e.g., weight changes or treatments given at home); sanitation; and recognition of problems. Expectations and foster responsibilities should also be clearly communicated. Training should detail financial responsibilities for the foster caregiver and shelter as well as legal issues regarding ownership of the animal. Training should also include the same basic orientation to the organization that other shelter volunteers receive since many foster caregivers are new volunteers. Training instructions should also be detailed in a readily accessible foster manual. These instructions should be reviewed and updated regularly. Specific instructions regarding who to contact and what to do if problems or emergencies arise (e.g., relevant phone numbers, addresses, and directions) should be included. Manuals should also provide sample monitoring sheets for appetite, elimination, growth, and behavior. Many excellent examples of manuals or other training materials for foster care programs are available and freely shared on the Internet.

In-person orientations should also be held so that foster caregivers may be introduced to the materials and receive guided, hands-on experience; these hands-on sessions are an excellent opportunity for caregivers to demonstrate a baseline level of skill and comprehension. One of the most powerful training tools for foster caregivers may be instruction in what "normal" looks like; having a clear understanding of "normal" helps enormously with recognition when something is going wrong.

Level Systems and Mentorship Programs

All foster caregivers should receive training in meeting the needs of the specific types of animals they are signing up to foster. Most foster caregivers do best starting with simple, basically healthy and uncomplicated foster animals (e.g., healthy 6- to 8-week-old kitten), and working up to medical, postsurgical, behavioral, elderly, or neonatal fosters.

Many shelters have used mentorship and a system of ascending training levels to help support and train their foster caregivers. In these systems, animals as well as caretakers are assigned to levels. The animal's level reflects a "degree of difficulty" that is matched with the skill level of potential caregivers. Level systems encourage foster caregivers to engage in further training.

Mentors for foster caregivers at lower training levels are selected from the pool of people with more advanced training. Assigning an experienced caretaker as a first resource for caregivers who are new to the program creates a volunteer support network. This network serves to triage the number of calls that must be handled directly by a foster coordinator and allows the foster program to grow while maximizing precious resources.

Environment

Just as foster caregivers vary in their abilities and interests in which types of animals they can or will successfully foster, their home environments vary in suitability to house different animals. The physical attributes of a home should be carefully considered in conjunction with the members of the household and appropriately matched with the needs or risks associated with each animal needing foster care. Any history of or ongoing concerns for infectious disease exposure in the foster environment should also be evaluated. A scaled matching system could be developed for foster home environments to accompany caregiver skill level and animal "degree of difficulty" scales discussed above.

Physical Space

Ability to Disinfect

Ease of sanitation and disinfection are critical considerations in matching foster care animals to a foster home. Although foster homes may be a more comfortable living environment for animals than kennels or cages in the shelter, these softer environments, with carpeting, upholstered furniture, and grassy back yards are often more difficult to disinfect. Foster caregivers' homes and yards may become substantially contaminated with difficult to remove, infectious organisms such as fungal spores, unenveloped viruses such as parvovirus or parasites. This creates risk for future foster animals and possibly for resident pets, may cause risk of ongoing exposure or reinfection, and increases the chances that caregivers themselves will become infected with zoonotic pathogens.

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Screening for signs of infectious disease, vaccination on intake or before, and treating prophylactically for environmentally persistent pathogens (e.g., coccidia, fleas) prior to placement in foster care substantially reduces the risk of contamination in homes. Foster caregivers should be trained to take precautions to prevent or minimize contamination of their home environments, including regular cleaning that removes shed hair, grease, dirt and debris, and daily, or more frequent, removal of feces from litter boxes and yards since some organisms can be prevented from developing into their infectious forms if removed within 24 hours.

Because young animals are more susceptible to infections and are also more likely to shed resistant pathogens like parvoviruses into the environment, they are best cared for in foster environments that can be readily disinfected, especially for the first 2 weeks of foster care. This 2-week recommendation is on the basis of the incubation period for infections with the pathogens that are the most problematic environmental contaminants: canine parvovirus, feline panleukopenia (also a parvovirus) and ringworm.

Similarly, foster homes accepting animals with known or suspected infectious diseases should be prepared to confine animals in rooms that can be easily disinfected. Since clinical signs of infectious diseases can arise suddenly even in apparently healthy animals, ideally all newly arriving foster animals would be kept in an appropriately sized room of the house that could be easily cleaned and disinfected.

Quality of Space

Some foster caregivers may opt to provide cage or kennel housing for newly arrived animals in an effort to minimize environmental contamination or reduce potential transmission between animals. In some cases, an extra bathroom may serve as adequate housing for new animals until the risk of environmental contamination with infectious pathogens has passed. In general, however, the quality of housing units, space in the housing area (cage, kennel, or room), enrichment, and opportunities for exercise in the foster home should be consistent with recommendations for animals in shelter care. The ASV Guidelines for Standards of Care in Animal Shelters identify the need for "separate areas for urination/defecation, feeding and resting and sufficient space to stand and walk several steps, and sit or lie at full body length."(ASV, 2010) In addition the guidelines state, "At a minimum, animals must be provided regular social contact, mental stimulation and physical activity."

In addition, foster animal living space should allow for cycles of light and dark (ideally natural light), fresh air, adequate ventilation, and temperature control appropriate to each individual animal. Temperature control and adequate bedding is especially important for very young animals who are not able to maintain their own body temperatures until they are more than 3–4 weeks of age.

Household Members: Adults, Children, and Other Pets

Foster caregivers and shelters should consider other human and animal inhabitants of the foster home as part of the process when selecting an appropriate foster situation. Shelters should work with foster caregivers to carefully assess what risks their own pets may pose for foster animals and what effect the introduction of new animals may have on the residents. Foster caregivers should consult both the shelter veterinarian and their own veterinarians to discuss potential risks for the specific animals in their home. Households with puppies or kittens less than twenty weeks of age who may be too young to be effectively immunized should not foster shelter animals.

Caregivers should also carefully evaluate possible objections and detrimental effects for other people living in the home. Foster care disrupts and sometimes strains normal routines and presents potential risks for everyone in the home as well as for the foster animals. Risks may be reduced but are never completely eliminated. Some potential risks arise from interactions between humans and animals (e.g., bite injuries or inter-animal aggression); some are more related to infectious disease.

Integrating Foster Pets into Foster Homes

Separation of foster animals from household members, human and animal, is ideal from an infectious disease standpoint. But, even with good separation of housing space, it is very difficult to eliminate the possibility of disease transmission or environmental contamination of a home setting. As described above, initial separation, limits on numbers, and

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periodically emptying the house of foster animals help to reduce risk of exposure.

Behaviorally, all the pets in the home may experience stress from a constant flow of new animals and social reorganization. This stress may lead to behavioral or health problems for both foster animals and household residents. Limits on numbers may help reduce this stress. Providing initial separation allows both foster animals and household pets time to acclimate.

Even though combining foster animals, housemates, children, and household pets may lead to problems, ongoing separation is often difficult to achieve from a human behavioral perspective and may be less than ideal for many animals from an animal behavioral perspective as well. The reality is that many foster caregivers like to integrate their foster animals into their households. This makes fostering fun, and animals may benefit enormously from the socialization.

Educating foster caregivers on the potential risks of integrating foster animals into their homes may help them make better choices to protect their families and pets as well as their foster animals. Such warnings probably are most effective in convincing people to keep fosters separate during a fairly brief introduction period. But given human nature, it probably would be unrealistic for a shelter to expect that foster homes will maintain effective, ongoing separation of their pets and family members from their foster animals. For this reason, numbers should be limited and only foster homes with special training, an appropriate environment, and a history of compliance should be selected if animals with known infectious disease or problematic behavior are sent into foster care.

Vaccination and Testing for Pets of Foster Caregivers

Foster caregivers should work with their own veterinarian to confirm adequate immunization of their pets and design a vaccination protocol tailored to the increased risks that their pets may face on the basis of an assessment of potential for exposure balanced with efficacy and risk from vaccination. At a minimum, foster caregivers should ensure that their pets have been vaccinated with core vaccines (FVRCP or DHPP) and rabies; have tested negative for FeLV and FIV; and have received preventive medications for internal and external parasites. To reduce potential liability and minimize disease risks, shelters should require foster caregivers to confirm that these criteria have been met before sending shelter animals into the home. Foster caregivers who have FeLV- or FIV-positive cats in their home should only foster cats who test positive.

In addition to the core vaccines and rabies, other vaccination recommendations for pets of foster caregivers may include:

- FeLV vaccination for cats. The recombinant vaccine product for FeLV is associated with very low risk of vaccine-associated sarcoma. Even when FeLV testing is done for foster cats prior to placement, risk of transmission may still exist.
- Canine influenza vaccination for dogs. These vaccines are labeled for use in puppies 6 weeks of age and older to reduce the severity of clinical signs and decrease the duration of viral shedding. Like many respiratory vaccines they may not completely prevent infection. Vaccines should be given as two injections, 2–4 weeks apart. Immunization should not be considered to be effective until at least 1 week after the second dose is given.
- Annual intranasal vaccination for respiratory pathogens. An intranasal vaccination to protect against bordetella, adenovirus, and canine parainfluenza is recommended for dogs who are living in the homes of foster caregivers. The parainfluenza and bordetella components are especially important because mucosal immunity for those pathogens develops best in response to intranasal inoculation. For cats, there may be no additional benefit from adding an intranasal vaccination compared to the injectable alone. In general, vaccines for these respiratory pathogens provide protection that lessens the severity or duration of disease but do not provide complete immunity.

CONCLUSION

Well-designed and managed foster programs can provide increased animal welfare and life-saving capacity in animal shelters. Goal planning, structured support, and ongoing review of foster program practices increase the likelihood of success. Matching foster animals with appropriate caregivers helps to reduce risks and ensure animal welfare. Although

safety and welfare risks to shelter animals, caregivers, and caregivers' pets cannot be completely removed, adherence to the recommendations in this chapter will help to reduce those risks.

REFERENCES

Ascione, F.R. (2000) *Safe Havens for Pets: Guidelines for Programs Sheltering Pets for Women Who Are Battered*. Utah State University, Logan, Utah.

ASV (Association of Shelter Veterinarians) (2010) Guidelines for standards of care in animal shelters. Available online at http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29. Accessed July 31, 2012.

Bollen, K.S. and Horowitz, J. (2008) Behavioral evaluations and demographic information in the assessment of aggressiveness in shelter dog. *Applied Animal Behaviour Science*, **112**(1–2), 120–135.

Pedersen, N.C., Sato, R., Foley, J.E. *et al*. (2004) Common virus infections in cats, before and after being placed in shelters, with emphasis on feline enteric coronavirus. *Journal of Feline Medicine and Surgery*, **6**(2), 83–88.

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Appendix 31.1
Ready, Set, Go!

This appendix provides an example of a basic protocol for a foster-to-surrender or diversion program that prepares cats for adoption in foster care or in their homes prior to shelter housing.

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Ready, Set, Go! A Surrender Preparedness Program for Cats

Part I. The *Ready, Set, Go* Questionnaire

Use a *Ready, Set, Go* questionnaire to assess how ready each cat is for adoption when receiving calls to schedule surrender appointments. The questionnaire is intended for use by front office staff to determine if the cat is ready for adoption, and if not, to decide what steps would need to be taken to get the cat ready for adoption from the shelter.

The Questionnaire: How ready is the cat for adoption?

- Age. Is the cat old enough for adoption?
- Vaccine history. Are the cat's vaccinations adequate and up to date?
- Veterinary records or brief health history. Does the cat need veterinary evaluation, care, or treatment prior to being made available for adoption? (If the cat has been receiving regular medical care, request that the owner contact the veterinarian to obtain copies of the cat's records.)
- Reproductive status. Has the cat been spayed or neutered?
- Physical condition. Does the cat have any growths or swellings? Are there any skin lesions?
- Are there other animals in the owner's home?

Part II. The *Ready, Set, Go* Appointment

If the cat is not ready for adoption, a *Ready, Set, Go* appointment should be scheduled. It is important to stress that participation in the program is in the best interests of the cat and will increase the likelihood of the cat being placed for adoption.

Scheduling the Appointment

- *Ready, Set, Go* appointments should be recorded on a *Ready, Set, Go* scheduler.
- Surgical Waiver, Promise to Reclaim, or Surrender/Foster Agreement forms should be signed by the owner at drop-off time if the cat is being left at the shelter for spay/neuter.
- Pick-up should be scheduled on the afternoon of the same day.
- Discharge instructions should be provided and a date/time to return for adoption should be scheduled and confirmed with the owner or fosterer at the time of pick-up.The *Ready, Set, Go* appointment may consist of:
  - Physical examination
  - Wood's lamp exam +/− fungal culture sampling
  - Vaccinations
  - FeLV/FIV testing
  - Flea control
  - Deworming
  - Review of veterinary records
  - Diagnostic testing if indicated
  - Microchipping
  - Spay/neuter surgery

Part III. *Ready, Set, Go* Program Components

- Establish a core group of *Ready, Set, Go* foster caregivers who would be on call. A list containing contact information and current cats in foster care should be maintained.
- If a cat is abandoned at the *Ready, Set, Go* appointment, or if the owner is unwilling or unable to participate in *Ready, Set, Go*, cats who would benefit from *Ready, Set, Go* can go through the process in foster care.
- In the event a *Ready, Set, Go* program cat was unexpectedly surrendered or abandoned, admitting or medical staff would contact a foster home on the list.
- The foster coordinator would alert foster caregivers about cats in the program once arrivals are scheduled.
- Ideally, *Ready, Set, Go* cats should return to home or foster care for at least 1 week before returning for adoption. Average commitment for foster care is _____ days to _____ weeks.

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32
Disaster and Emergency Planning and Response for Animal Shelters

Kevin M. Dennison and Jeanie Lin

INTRODUCTION

Animal shelters and control agencies have many roles within the community that support public and animal health and safety. Supporting emergency preparedness and response is a critical role of this mission. Continuity of business and contingency planning are also key preparedness activities that help ensure the availability of a community's animal services during a disaster.

ESSENTIAL CONCEPTS IN EMERGENCY MANAGEMENT

Emergency management involves many moving parts, and animal shelters and staff can be more efficiently engaged in preparedness and response activities if they understand the larger context. It is important that shelter staff become familiar with the emergency management officials in their communities before disaster strikes.

Understanding the shelter's emergency management role requires a basic knowledge of emergency management in the United States, including the Robert T. Stafford Disaster Relief and Emergency Assistance Act, the National Response Framework (NRF), and the Incident Command System (ICS).

The National Alliance of State Animal and Agricultural Emergency Programs (NASAAEP) has developed an *Animal Emergency Management Planning and Resource Management Roadmap* (NASAAEP Planning and Resource Management Best Practice Working Group) document that can serve as a more comprehensive overview of key animal emergency management issues.

What is the Stafford Act?

The Stafford Act (www.fema.gov/pdf/about/stafford_act.pdf) provides the authority for the president and Federal Emergency Management Agency (FEMA) to act in disasters. After Hurricane Katrina, Congress passed two pieces of legislation, the Pets Evacuation and Transportation Standards (PETS) Act and the Post-Katrina Emergency Management Reform Act that amended the Act to add responsibilities pertaining to household pets and service animals. The Stafford Act now mandates:

1. State and local plans address the rescue, care, shelter, and essential needs of individuals and their pets and service animals. FEMA is granted authority to set standards for such plans.
2. The FEMA administrator may provide funding to States to aid in the development of capabilities pertaining to household pets and service animals. While the Act did not provide specific funding, it opened the door for funding of pet-related projects under various current FEMA grant programs, such as the State Homeland Security Grant program, Emergency Management Performance Grants (EMPG), and Citizen Corps Grants.

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3. FEMA is authorized to use Federal resources to address the needs of household pets and service animals within the context of certain Federal disaster declarations.

What are the National Incident Management System (NIMS) and the National Response Framework (NRF)?

NIMS is the overall response system for preparedness and response to disasters. NIMS can be accessed at http://fema.gov/emergency/nims/. The NRF is a national plan that sets forth the roles, responsibilities, and relationships among local, state, Federal, tribal, territorial, or non-governmental entities in all phases of emergency management. The NRF can be accessed at http://www.fema.gov/emergency/nrf/.

What is the Incident Command System (ICS)?

The ICS is a standardized flexible and scalable system for directing on-scene emergency response. An Incident Commander (IC) leads the effort, and has a Command Staff (Safety, Liaison, and Public Information Officers). ICS organizes four key functions under General Staff that report to the IC. These include Operations (tactical response), Planning, Logistics, and Finance/Administration. In small incidents, some personnel will perform multiple functions. In large incidents, functions can be expanded and managed by multiple personnel. A basic understanding of ICS is critical for everyone engaged in emergency response or support. Detailed information on the ICS can be found at http://www.fema.gov/emergency/nims/IncidentCommandSystem.shtm.

ANIMAL SHELTER ROLES IN PLANNING AND PREPAREDNESS

In emergency management, all community animal populations should be considered. Below is a comprehensive list of common animal populations.

1. Family pets. For many people, pets are family members. How pets are managed will impact the safety and psychological well-being of people (Hall, 2004). For example, failure to accommodate pet issues during disasters can lead to pet owners refusing to evacuate (Heath, 2001). Keeping pets and other animals safe can have an extremely positive effect on the mental health of owners and their communities. Conversely, if pets or other animals are endangered, owners and communities may suffer much greater emotional duress.
2. Service animals. These animals must almost always be permitted to stay with their owners in accordance with the Americans with Disabilities Act (U.S. Department of Justice).
3. Commercial farm animals. Commercial livestock and poultry can be an extremely important population, and livestock producers and associations need to be involved in the planning process. Disasters impact not only the well-being of livestock but also community health and economics.
4. "Backyard Livestock." Non-commercial or "backyard" livestock include horses, small poultry flocks, and an assortment of livestock kept for hobby, companionship, competitive events, and other non-commercial uses. Local communities may need to accommodate the needs of such people and animal populations in order to prevent evacuation failure.
5. Working animals. Animals such as the horses and dogs used in law enforcement or search and rescue (SAR) have a very strong bond with humans and are usually best managed in team units with their handlers.
6. Wildlife. Native wildlife may be impacted in a disaster through injury, displacement, or destruction of habitat.
7. Wildlife facilities should be considered in emergency management, including zoos, aquaria, entertainment entities (e.g., circuses), and wildlife-ranching facilities.
8. Animal facilities. Other various animal facilities may be affected by disasters. These include veterinary hospitals, animal shelters, sanctuaries, rescue and foster care groups, biomedical research facilities, pet stores, non—livestock-commercial animal breeding operations, and equestrian centers.
9. Traveling events. Rodeos, roadside menageries, petting zoos or circuses may be present within a disaster area.

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10. Animals being used illegally. On rare occasions, criminal activities involving animals, such as animal hoarding or animal fighting, may surface during a disaster.

What are the Planning and Preparedness Roles for Animal Shelters?

The best case scenario is that all households and businesses plan for disasters affecting their animals and do not need government assistance. While this is rarely possible, outreach to the community on personal and business preparedness is critical. FEMA provides an excellent framework in *Comprehensive Planning Guidance (CGP) 101,* updated in 2010, to address pets and service animals (Federal Emergency Mangagement Agency, 2010).

Emergency management agencies have overall responsibility for developing their communities' emergency operations plans, but they are not always aware of all the animal activity in their communities. Animal shelters play a role to raise awareness. Some groups to consider engaging are listed in Table 32.1.

How Does a Community Begin Developing an Animal Emergency Plan?

A critical early step in designing an animal emergency plan is to perform a risk assessment. Risk can be thought of as having three component parts: hazards, vulnerabilities, and consequences. In understanding hazards, a community must know what types of emergencies occur historically, and what hazards are likely to occur. Further, a community should include those hazards that are less likely, but would create extreme challenges. In addition, a community should consider whether it can be tasked to serve as a host community in support of an evacuated neighboring community.

A vulnerabilities survey includes knowing what people, buildings, systems, and infrastructure might be vulnerable to the above hazards. For example, if flooding is a hazard, what parts of the community lie within the 100- and 500-year floodplains?

Finally, a community should consider the consequences of each hazard impacting the community's vulnerable elements. In a community that floods seasonally, if both the water and sewage plants are in the floodplain for a 100-year flood, then the consequence might be disruption of potable water and sewage management.

Communities should plan for the types of emergencies they experience most often, focus on the community elements that are most vulnerable in those emergencies, and identify the most damaging effects when those elements are impacted.

Table 32.1. Potential community animal resources.

- Animal control and sheltering entities
- Law enforcement
- Veterinarians, veterinary technicians and local veterinary medical associations
- Public health and environmental health officials
- Livestock producers
- Cooperative Extension agents
- Fairgrounds or parks departments
- SAR entities, including mounted SAR or mounted sheriff posse
- Animal exhibitors/educational organizations such as zoos, aquaria, trainers, wildlife sanctuaries, petting zoos, and circuses
- Wildlife rehabilitation facilities
- Animal feed and supply retailers
- Animal rescue organizations
- Local Emergency Planning Committees (LEPC) (EPA mandated planning groups)
- Community voluntary organizations active in disaster response, such as Red Cross, Salvation Army
- Boarding or breeding kennels
- Equestrian organizations
- Citizen Corps and Medical Reserve Corps programs
- Animal competition entities (e.g., sled dog racers, race tracks, animal trainers)
- Universities (e.g., agricultural colleges, veterinary medical colleges, veterinary technology programs)
- Biomedical research facilities
- Locally based representatives of state agencies such as agriculture, state animal health officials, brand inspectors, or wildlife agencies

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Establishing good collaborative relationships between the lead agency or agencies and the jurisdictional emergency manager prior to a disaster is essential. If the shelter can work with the emergency manager to identify the supporting agencies and resources, then stakeholders can discuss the planning process, risk assessment, identification of resources, and development of an animal plan. The animal plan will be a component of a community's overall emergency operations plan. FEMA CPG 101 suggests the following format for community plans.

1. Introductory Material
2. Purpose, Scope, Situation, and Assumptions
3. Concept of Operations
4. Organization and Assignment of Responsibilities
5. Direction, Control, and Coordination
6. Information Collection and Dissemination
7. Communication
8. Administration, Finance, and Logistics
9. Plan Development and Maintenance
10. Authorities and References

The plan should be concise and address questions of who is responsible, what they are responsible for, when those responsibilities are in effect, and how to manage the particular issue. A full description of community animal emergency planning issues is included in the text Community Animal Emergency Planning by Dennison (Dennison, 2009).

What Relationships are Needed to Support the Plan?

Some animal shelters provide services to the community by contract with the local government. In some cases, contracts may need to address how to manage issues and expenses beyond routine animal sheltering services. Emergency contracts with vendors may be needed to guarantee the availability of certain services in an emergency.

Many times, formal agreements are required for legal reasons, reimbursement, and to expedite requests. Mutual aid agreements (MAA) or memoranda of understanding (MOU) are agreements commonly used in emergency management. A community might consider MOUs and MAAs between the animal shelter and local emergency management, human sheltering organizations, animal welfare or professional groups, potential emergency animal shelter sites (e.g., schools, fairgrounds, vacant warehouses), and vendors.

What are Community and State Animal Response Team (CART or SART) Programs?

Some communities have developed CART programs for animal emergency management. CART programs vary considerably in their design, mandate, and management. CARTs are usually organized and operated under the supervision of the local emergency management agency and may create response partnerships. CARTs can be a powerful venue for delivery of emergency management training, and can generally deploy personnel through the ICS. This ensures that animal response personnel are deployed as part of the overall emergency response and have a formal role. In some cases, CART functions could be enhanced by Citizen Corps programs such as Community Emergency Response Teams or Medical Reserve Corps Units. CARTs should also be engaged with non-governmental organizations through local Voluntary Organizations Active in Disaster (VOAD) groups. CARTs can address challenging issues on volunteer liability and injury issues, and some have been developed specifically for volunteer recruitment, training, and management. Other CARTs function as an umbrella group, with the member organizations retaining the responsibility for volunteer management.

State Animal/Agricultural Response/Resource Teams (SARTs) may be either a component of the state government or a nonprofit response organization formally affiliated with the state. A non-governmental SART program may be an independent nonprofit organization capable of accepting charitable donations directly. It may also be organized as a program under an existing charitable organization, such as a state veterinary medical foundation. While great diversity exists between SART programs, some basic features are common for most. They generally provide a venue for collaboration and partnership between governmental and private sectors. SARTs can provide a mechanism to accept volunteers, donated services, materials, and funds. In

addition, SARTs usually offer emergency management and responder training.

What is the Impact of State Activities and Resources on Animal Control Organizations and Shelters?

Every state has a unique set of statutes and responsibilities for animal response capabilities. Often, state animal control associations and/or state animal welfare organizations can be key partners for the state. In general, the state role is to support local communities, and to act as intermediary between local communities and the federal government in major disasters. The state animal health official (often termed the state veterinarian) is often engaged as the lead official for animal issues, particularly livestock. Some states have tasked other entities, including the state emergency management agency, SART, and state humane organizations, with animal response roles, particularly for pets.

Developing state animal emergency plans is a somewhat similar process to local plan development. Ideally, the lead state agency (or agencies) and emergency management agency identify and engage the stakeholders in the planning process. In contrast to the local plan, the primary purpose of most state plans is to detail how a state supports local communities. Note that there are some cases where a state animal health official will share authority with a federal official, such as in outbreaks of diseases of national consequence (e.g., avian influenza, monkey pox, or foot and mouth disease).

ANIMAL EMERGENCY RESPONSE MISSIONS

There are many activities involved in animal emergency response. These include the list below.

a. Activation and rapid needs assessment
b. Evacuation and transportation
c. Sheltering
d. Veterinary medical response
e. Animal search and rescue (ASAR)
f. Animal decontamination
g. Response to animal disease emergencies

Best practice information is available for many of these missions through the reference library of the NASAAEP in conjunction with Iowa State University Center for Food Security and Public Health (NASAAEP Library). Each of those mission areas is detailed in Tables 32.2–32.7.

In emergencies, shelter veterinarians may find themselves in a leadership role to secure appropriate veterinary medical care for pets and other animals. A more comprehensive discussion of this topic can be found in the text Veterinary Disaster Response by Wingfield (Wingfield, 2009). It is imperative that the shelter veterinarian coordinate with local public health officials in the management of zoonoses and other veterinary public health issues. Many zoonoses, such as ringworm, rabies, and salmonella, are a continual concern in animal populations, but several others, such as anthrax, plague, or Q-fever, are also considered potential

Table 32.2. Activation and assessment mission.

Description	Activation of the community animal plan is done according to ICS via the lead agency for the plan. The lead agency performs an initial assessment to determine which components of the plan and which resources should be activated. Once activated, all animal organizations contribute to ongoing assessment.
Key challenges	• Local plans should designate the agency or organization responsible for initial assessment. • Before the animal welfare community embraced ICS, animal response might have been established and operated independently of the overall incident ICS. This can be extremely counterproductive and could even result in injury or death for animals and people.
Role of the animal shelter	Animal shelters need to provide periodic reports through ICS on sheltered pet numbers, capacities, challenges, and resource needs.

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Table 32.3. Animal evacuation and transportation mission.

Description	Movement of animals from a hazardous area or to another incident location. *Owners have the primary responsibility for the evacuation of their animals*, but may not have resources or the ability to do so.
Key challenges	• Citizens relying on public transportation will need assistance in evacuating their animals. When possible, animals and owners should be transported together. Failure to have a plan to assist people with animals may result in people refusing to evacuate. • Some owners may be away from home when the evacuation is ordered. Options should be evaluated, if safe, for allowing owners to recover animals or having response teams recover animals. • Livestock transportation teams should be pre-identified, trained, and trucks/trailers evaluated for mechanical safety. • Transportation environments should protect animals from extreme heat or cold as appropriate for the size and species. • Transportation environments should be adequately ventilated. Many cargo areas or refrigerator trailers are not ventilated and could cause mass mortality or injury if used for live animals.
Role of the animal shelter	Animal control or shelters may be engaged in evacuation and transportation of pets and other animals. Animal evacuation is enhanced by clearly communicating locations for emergency animal sheltering and private options for animal sheltering (hotels).

bioterrorism agents (Centers for Disease Control and Prevention).

Animal decontamination is a highly variable mission, ranging from removal of floodwater contaminants or disaster debris from incoming animals to removing radioactive particulates from an animal. Specific information on decontamination is available in the text, Basic Veterinary Decontamination by Murphy (Murphy, 2009). The NASAAEP Library also contains a very useful discussion of current animal decontamination challenges (NASAAEP Animal Decontamination Best Practices Working Group, 2011).

State and federal animal health officials are generally the response authorities for addressing animal disease outbreaks of national concern. A wealth of information on animal diseases and emergency response is available via the Veterinary Services Web site (http://www.aphis.usda.gov/animal_health/emergency_management/) and through the Iowa State Center for Food Security and Public Health (http://www.cfsph.iastate.edu/index.php). Animal shelters generally play a minimal role in these types of events.

INCIDENT SUPPORT AND MISCELLANEOUS ISSUES

The NIMS, NRF, and most state and local plans define a coordinated hierarchy for assistance requests. Animal shelters need to understand these mechanisms. If local resources are overwhelmed, the request for additional resources should be coordinated with or through the local incident command structure. Local incident command may seek additional resources from other locals (e.g., activation of agreements with surrounding counties), or elevate the request to the state for assistance. Similarly, if a state is unable to provide a response to the request, it can reach out laterally (to other states) or elevate it to the next level (federal, given certain conditions such as after a federal disaster declaration). The 50 states participate in a mutual aid system called Emergency Management Assistance Compact (EMAC). Note that contractors or non-governmental organizations can enter at any level upon request.

In requesting, finding, and deploying these additional resources, details should be provided on their anticipated scope of work, where they should go, and how to check in at the incident. The check-in process

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Table 32.4. Emergency animal sheltering.

Description	Emergency care of animals at various locations. Whenever possible owners should be encouraged to plan to find private accommodations for their animals. Emergency animal sheltering operations may be animal-only shelters or may be: • Co-located: Operated in close proximity to an emergency shelter for people, but with separate management. Owners provide much of their animals' care. • Cohabitational: Human sheltering and animal shelter are operated together in one facility with unified management. Example: People, horses, and pets sheltered at fairgrounds. • "Pet friendly," while used in some FEMA documents, is poorly defined and is best suited to describe hotels that accept pets.
Key challenges	• Site identification and development of use agreements should occur in the planning process. • Sites must be protected from damage during use and restored at the end of use. • Communities may need to serve as "host" communities and shelter animals from other communities. • Intake should include animal identification, photographing animals (with owner if possible), record creation, documentation of history and owner information, and a brief health and behavioral evaluation. Accurate and detailed written animal records are key to the post-disaster return of pets and other animals to the owners. • Livestock intake, identification, examination, and housing should follow guidance providing by state agricultural officials. • Owner responsibilities must be communicated in detail and provided in writing. • Shelter staff and owners should be trained in accepted cleaning and disinfection procedures. • Internet, social media, and bulletin boards can all be very useful in reuniting people and animals. • Holding times for animals lost in disasters may be influenced by lost property statutes in addition to stray animal laws. Consultation with legal counsel is advised before adopting out or fostering animals recovered in disaster situations. • Security should be provided for animals, responders, and owners as appropriate for the incident.
Role of the animal shelter	Animal shelters may need to provide emergency sheltering at their primary facility or operate an additional emergency animal sheltering location.

is essential for the safety of all and to document the overall response costs.

Did the PETS Act Provide for Federal Funding of Pet Response in Disasters?

Yes, but only in certain circumstances, and with the appropriate documentation. Most of the FEMA response and recovery cost-sharing is accomplished through either direct assistance (FEMA operations, mission assignments to federal agencies, contractors, or direct purchases) or through FEMA Public Assistance (PA) grants. The PA system was already a well-established system, and funding for household pet and service animal issues is now one component of a much larger system. General information on the PA program can be found at http://www.fema.gov/government/grant/pa/index.shtm. Specific information on eligible household pet and service animal expenses can be found in the PA Disaster Assistance Policy on pets (Eligible Costs Related to Pet Evacuations and Sheltering, 2007). It is important to note that "household pet" is defined in FEMA

Table 32.5. Veterinary disaster care.

Description	Provision of veterinary care to animals in emergency incidents, including general examination, preventive care, and minor veterinary treatment at emergency animal sheltering sites. In addition, the planning process should examine challenges in providing more substantial clinical diagnostics and treatment for disaster animals whose owners are unknown. Veterinary disaster care also includes collaboration with local public health agencies on the management of zoonotic disease threats.
Key challenges	• Preventive healthcare procedures (vaccination, parasite control, etc.) should be established for each animal emergency sheltering site. • If additional veterinary personnel are needed from out of state, care must be taken to ensure appropriate consideration of licensure issues. Many states have a defined mechanism for emergency licensure of veterinary responders. • If animals must be relocated out of state for adoption or longer-term sheltering, care should be taken to minimize the possibility of transporting infectious agents that might be endemic in the area of origin. Veterinarians should work with state animal health officials to determine what vaccinations, treatments, testing, certificates of veterinary inspection, and permits are needed for such movements.
Veterinary reserve programs	Shelter veterinary professionals should consider joining local, state, and national veterinary reserve programs. • State or local veterinary reserve programs may include Medical Reserve Corps (MRC) units (www.medicalreservecorps.gov) or programs managed by state animal health officials. • The American Veterinary Medical Association hosts the VMAT program. http://www.avma.org/vmat/default.asp • The Department of Health and Human Services' National Veterinary Response Team (NVRT) program is a Federal Reserve program under the National Disaster Medical System. http://www.phe.gov/Preparedness/responders/ndms/teams/Pages/nvrt.aspx • The NAHERC is a reserve veterinary program of USDA APHIS Veterinary Services. http://www.aphis.usda.gov/animal_health/emergency_management/naherc.shtml.

Table 32.6. Animal search and rescue (ASAR).

Description	The recovery of animals from disaster areas by search, technical rescue (water rescue, mechanical extraction, air lift, etc.) or by trapping. Rescue in this context is used differently than in terms like "greyhound rescue." Some ASAR activities transition into regular animal control missions. ASAR should be coordinated with human SAR operations and may continue after human SAR has ended.
Key challenges	• ASAR requires substantial training in order to support human SAR operations safely. • TAR teams require extensive training and specialized equipment. TAR teams must be affiliated with local fire-rescue authorities or animal control. TAR teams may be able to provide assistance to multiple jurisdictions via mutual aid. Livestock trailer accidents are a common incident in which TAR resources are imperative. • Veterinary support may be needed for ASAR.
Role of the animal shelter	ASAR is typically led by local animal control authorities and shelters may provide personnel to train with such teams.

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Table 32.7. Animal decontamination.

Description	Animal decontamination is the removal of potentially hazardous materials from animals via bathing or other procedures. In disasters, such materials can range from flood water or debris residues to specific chemical or radiological contaminants.
Key challenges	• Personal protective equipment (PPE) will be required. At a minimum, barrier protection will be needed, including gloves, apron/water resistant coveralls, goggles, boots, cap, and barrier mask or face shield. For most incidents, safety or hazardous material (HAZMAT) personnel will determine what PPE will be necessary for animal decontamination response. • If respiratory protection is needed, OSHA requirements include medical screening, fit testing and training on respirators. Such respiratory protection programs should be implemented for animal decontamination personnel *prior* to the incident. • Additional training may be indicated for animal decontamination teams on the basis of local recommendations from emergency management and HAZMAT personnel. Such training might include OSHA approved Hazardous Waste Operations Emergency Response (HAZWOPER) awareness or higher levels of training programs. • Currently, bathing is the gold standard for animal decontamination. Soap and water followed by clean water rinse will reduce or eliminate most contaminants effectively. Factors such as hair, matting, temperatures, limited water supplies, and waste water containment may be considerations in creating incident-specific animal decontamination procedures. Coordination with incident HAZMAT personnel and the ICS Safety Officer is imperative.
Role of the animal shelter	Animal shelters may need to decontaminate incoming animals at their facility or an emergency animal sheltering site.

policy, but this is specific to the context of FEMA reimbursements. Other organizations may define "pet" differently.

There are three essential elements that will maximize the likelihood of securing a PA grant on local pet issues when the appropriate federal declaration is in place. PA experts are available in each of the ten FEMA regions who can provide valuable planning and response resources. Animal shelters need to coordinate with local emergency management during the planning phase to understand funding eligibility and develop necessary agreements to facilitate such eligibility. In activating a plan, shelters should ensure that all animal response portions are formally tied to the overall incident, and animal issues documented within the Incident Action Plan (IAP).

Documentation is very important. Sign-in sheets and other documentation about positions, work performed, hours worked, equipment/vehicles used (VINs are helpful for valuing that use), and supplies contributed support the reimbursement request. Even if reimbursement is not needed for a particular group, their efforts should be documented. Frequently those donated services can be translated into a dollar value used as part of cost-sharing with FEMA.

What are the Response Communication Challenges for Animal Shelters in Emergency Incidents?

Normal communications may not work well in disasters. Like all response organizations, animal shelters need to consider backup communications systems such as cellular text messaging, radios (including citizen band radios), older model hard-wired telephones, amateur (ham) radio operators, and even written messages and messengers. Animal issues

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are often time sensitive, and exchanging information with the community is extremely important. Emergency instructions, such as evacuation orders, should include information for animal owners. Throughout the incident, the animal response team should determine what information the citizens need, and then work through ICS to get that information to the public.

Animals are often a highly emotional topic of discussion in disasters, and inaccurate information can spread quickly. Animal shelters should consider dedicating a person or team to monitor Internet and social media communications.

What is Critical Incident Stress and Psychological First Aid?

Critical incident stress refers to stress and anxiety brought on by the psychological impacts of a disaster. Deaths, injuries, lost animals, loss of property, community destruction, environmental damage, and the general impacts of fear and uncertainty can impact both survivors and responders. Animal response supervisors should consider providing animal response personnel with psychological first aid, which is often a component of incident response beyond animal issues. Psychological first aid can generally be accessed through the incident command or local emergency operation center.

TRAINING

The baseline training modules for all emergency management volunteers are available at no cost on the FEMA Emergency Management Institute (EMI) Independent Study site (http://training.fema.gov/EMI/).

- Introduction to Incident Command (FEMA IS-100)
- National Incident Management System (FEMA IS-700)
- IS-10 Animals in Disaster Part A
- IS-11 Animals in Disaster Part B Community Planning
- IS-111 Livestock In Disasters

EMI provides many other no-cost courses ranging from additional ICS courses, to hazard-specific courses, business contingency planning, hazard mitigation, volunteer management, and more.

The Citizen Corps program provides training opportunities through local Community Emergency Response Teams. Recently, the Community Emergency Response Team (CERT) program released a two-part training program providing awareness level training on animal issues for CERT programs. Medical Reserve Corps programs also provide rich training opportunities for volunteers. This training is provided through the Public Health Foundation TRAIN system (www.train.org). TRAIN is used by many states to support a wide variety of emergency management training. Many state veterinary medical reserve programs provide training opportunities as does the USDA National Animal Health Emergency Response Corps (NAHERC) through the Iowa State University Center at www.naherc.sws.iastate.edu.

The National Alliance of State Animal and Agricultural Programs is continually building a catalog of available training resources as part of their Best Practice Library at http://www.learn.cfsph.iastate.edu/dr.

The AVMA Veterinary Medical Assistance Team (VMAT) program (www.avma.org/vmat/default.asp) provides training for its volunteers and will collaborate with state veterinary medical reserve programs to deliver training at the state level.

Several members of the National Rescue and Sheltering Coalition provide training on emergency animal sheltering, animal rescue/technical animal rescue (TAR), and other key missions. NARSC member information can be accessed through www.narsc.net.

One of the most effective training opportunities, after completing the online basic FEMA training, is engaging with the local and state emergency response community, including CART- and SART-type programs, in planning meetings and emergency exercises. Such activities serve to help not only orient animal response entities and individuals with the general emergency response community, but also cultivate key local relationships and help increase awareness of animal issues within that same community.

BUSINESS CONTINGENCY PLANNING FOR ANIMAL SHELTERS

All animal shelters should engage in facility business contingency (emergency) planning to protect staff, volunteers, the public, and animals at the facility better from emergencies. Protecting the facility

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and ensuring continuity of operations in turn protects the community. Failure to plan can not only endanger public health and safety but could undermine the credibility of the organization. Appropriate contingency planning can conserve scarce resources.

In general, such contingency planning for animal shelters should include the following:

1. "Buy-in" from senior management, board of directors, and/or political leadership to ensure that adequate time and resources are committed to the planning process.
2. Risk assessment (see section "How does a community begin developing an animal emergency plan?").
3. Review of current plans, operating procedures, insurance coverage, equipment, and systems that will impact the contingency planning effort.
4. Input from key staff, community experts, and professional advisors.
5. Development of the plan, addressing shelter responsibilities and activities, emergency animal care, animal evacuation, power and water disruption, data backup, communications (phone and Internet), recovery, training strategies, and plan updates.
6. Once written, it is important to periodically review, exercise, and update the plan.

Do not minimize the benefit of personal preparedness on the part of the animal shelter staff, since they may have additional responsibilities within the disaster beyond their own households.

Where can Additional Information on Personal Preparedness and Contingency Planning be Found?

Some selected references include:

- FEMA provides the www.ready.gov and most states maintain a similar website with personal preparedness information and links to resources.
- Ready Business (FEMA site with extensive resources): www.ready.gov/business
- Extension Disaster Education Network (EDEN) Ready Business course & materials: www.eden.lsu/edencourses/readybusiness/pages/default.aspx
- Contingency planning association
- The Zoo Animal Health Network was a collaborative venture between USDA APHIS and the Lincoln Park Zoo in Chicago, IL, and includes participation from USDA, the Association of Zoos and Aquariums, American Association of Zoo Veterinarians, the Global Federation of Animal Sanctuaries, and many other stakeholders. Best-practice materials on emergency planning for zoos are available on the ZAHN website: www.zooanimalhealthnetwork.org. While some material is specific to zoos, much of the information is directly applicable to other types of animal facilities, including veterinary hospitals and animal shelters.

EMERGENCY MANAGEMENT RESOURCES FOR VETERINARIANS

Non-governmental organizations:

1. American Veterinary Medical Association (AVMA), http://www.avma.org/disaster/default.asp, disaster resources for veterinarians, including reference CD, outreach materials, links to state plans and more.
2. National Alliance of State Animal and Agricultural Emergency Programs, www.nasaaep.org, Best Practice Library, http://www.learn.cfsph.iastate.edu/dr.
3. National Animal Rescue and Sheltering Coalition (NARSC), www.narsc.net, information on member organizations, resources, and training.

Federal agencies:

1. Federal Emergency Management Agency
   a. National Response Framework: www.fema.gov/emergency/nrf
   b. National Incident Management System: www.fema.gov/emergency/nims
   c. Incident Command System Resources: http://www.fema.gov/emergency/nims/IncidentCommandSystem.shtm
   d. Citizen Corps: www.citizencorps.gov
   e. DHS/FEMA Grants: http://www.dhs.gov/xopnbiz/grants

2. USDA Animal and Plant Health Inspection Service (APHIS):
   a. APHIS Emergency Preparedness and Response: www.aphis.usda.gov/emergency_response/
   b. Animal Care: www.aphis.usda.gov/animal_welfare/
   c. Veterinary Services: www.aphis.usda.gov/animal_health/
3. HHS (Health and Human Services)
   a. Medical Reserve Corps: www.medicalreservecorps.gov
   b. Centers for Disease Control and Prevention: www.emergency.cdc.gov

REFERENCES

(n.d.) Retrieved November 21, 2011, from Emergency Management Assistance Compact: http://www.emacweb.org/.

(n.d.) Retrieved November 21, 2011, from Community Emergency Response Team: http://www.citizencorps.gov/cert/training_mat.shtm.

Centers for Disease Control and Prevention (n.d.) *Emergency Preparedness and Response: Bioterrorism Agents/Diseases*. Retrieved November 21, 2011, from http://www.bt.cdc.gov/agent/agentlistcategory.asp.

Dennison, K.M. (2009) Community animal emergency planning, in *Veterinary Disaster Response* (ed W.E. Wingfield), Wiley-Blackwell, Ames, Iowa, pp. 425–434.

Eligible Costs Related to Pet Evacuations and Sheltering (2007) Retrieved November 21, 2011, from Federal Emergency Management Agency: http://www.fema.gov/government/grant/pa/9523_19.shtm.

Federal Emergency Mangagement Agency (2010) *Developing and Maintaining Emergency Operations Plans—Comprehensive Planning Guidance 101, Version 2*. Retrieved November 21, 2011, from http://www.fema.gov/pdf/about/divisions/npd/CPG_101_V2.pdf.

Hall, M.N. (2004) Psychological impact of the animal-human bond in disaster. *Journal of Psychiatric Practice*, **10**, 368–374.

Heath, S.E. (2001) Human and pet-related risk factors for household evacuation failure during a natural disaster. *American Journal of Epidemiology*, **153**, 659–665.

Murphy, L.A. (2009) Basic veterinary decontamination: Who, what, why?, in *Veterinary Disaster Response* (ed W.E. Wingfiel), Wiley-Blackwell, Ames, Iowa, pp. 231–238.

NASAAEP Animal Decontamination Best Practices Working Group (2011) *NASAAEP Animal Decontamination Best Practices Working Group White Paper*. Retrieved November 21, 2011, from NASAAEP Library: http://www.learn.cfsph.iastate.edu/dr/wg.docs/animal.decon.whitepaper8feb2011.pdf.

NASAAEP Planning and Resource Management Best Practice Working Group (n.d.) www.learn.cfsph.iastate.edu/dr. Retrieved November 21, 2011.

NASEEAP Library (n.d.) Retrieved November 21, 2011, from http://www.learn.cfsph.iastate.edu/dr/.

U.S. Department of Justice (n.d.) *Americans With Disabilities Act, Service Animal Definition and Guidance*. Retrieved November 21, 2011, from http://www.ada.gov/service_animals_2010.htm.

Wingfield, W.E. (2009) *Veterinary Disaster Response*, Wiley-Blackwell, Ames, Iowa.

ADDITIONAL RESOURCES

Gimenez, R., Gimenez, T. and May, K.A. (2008) *Technical Large Animal Emergency Rescue*, Wiley-Blackwell, Ames, Iowa.

Heath, S.E. (1999) *Animal Management in Disasters*, Mosby, Maryland Heights, Missouri.

Wingfield, W.E., Nash, S.L., Palmer, S.B. and Upp, J.J. (2009) *Veterinary Disaster Medicine: Working Animals*, Wiley-Blackwell, Ames, Iowa.

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Section 6
Behavior

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33
Behavior Evaluation, Adoption, and Follow-Up

Emily Weiss and Heather Mohan-Gibbons

INTRODUCTION

Animal shelters across the country have been making strides in decreasing intake and increasing live releases through a variety of programs. A significant number of animals entering shelters are adolescent and adult animals (Patronek *et al*., 1996a, 1996b; Salman *et al*., 1998), and while many relinquished animals are rehoming candidates, a large number have medical and behavioral issues (Kass *et al*., 2001).

It is a difficult and complex problem to move animals from intake to a live outcome in many sheltering facilities, as evidenced by many of the chapters in this textbook. The process of evaluation of behavior throughout the animal's stay is vital, as is identification of adopter needs and support of the adoption/post-adoption. This chapter will cover (1) identification of potential aggression and other behaviors that may slow live releases, (2) behavior evaluations to assist the adoption process, and (3) processes to increase live releases through adoptions.

CANINE AGGRESSION ASSESSMENTS

Dogs entering an animal shelter will show an array of behaviors both in the shelter and in the home. Canine behavior problems, including aggression, are a significant reason that dogs are surrendered to animal shelters (Salman *et al*., 2000). This may point to a possibly higher rate of potential behavior issues in shelter dogs than other populations. Other research found that survey respondents who obtained their dog from a shelter reported that the amount of effort required in caring for the dog exceeded their expectations compared to those sourcing dogs elsewhere (Patronek *et al*., 1996a). A study conducted in Northern Ireland focused on the prevalence of behavior problems reported by adopters 4 weeks post-adoption from a shelter that did not conduct formal assessments (Wells and Hepper, 2000). A survey was mailed to 1547 adopters, with 556 responding for a response rate of 37%; 68.3% of respondents reported undesirable behaviors in their new dogs, with fearfulness the most common behavior reported. In the same study, the researcher found that 89% of the dogs who were returned to the shelter were returned because of behavior issues.

Animal shelters have an ethical responsibility to identify aggression and other behavior issues before adoption. Although no assessment will capture all aggressive behavior, one can still be used as a tool to assist in the process. The Wells and Hepper study along with others (Houpt, Honig and Reisner, 1996) points to the issue of behavior and the risk to the human–animal bond. Behavior evaluations can serve as a way to decrease the likelihood of a return as well as a way to decrease liability in a shelter environment.

Research is ongoing to identify objective measures to assess behavior. One way is by having a

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valid questionnaire that owners can fill out to relay behavioral information about their dogs (Segurson, Serpell and Hart, 2005; Reisner, Shofer and Nance, 2007; van den Berg *et al*., 2010). C-BARQ (Canine Behavioral Assessment and Research Questionnaire), developed by researchers at the University of Pennsylvania Center for the Interactions of Animals and Society, is an exciting, validated tool for this purpose (Hsu and Serpell, 2003). Another approach is to directly interact with the dog in a systematic way through behavioral assessments. Some of these assessments are published (van der Borg, Netto and Planta, 1991; Netto and Planta, 1997; Hennessy *et al*., 2001; van den Berg, Schilder and Knol, 2003; Kroll, Houpt and Erb, 2004; Palma *et al*., 2005; Svartberg, 2005; Bollen and Horowitz, 2007; Bergamasco *et al*., 2010; Dowling-Guyer, Marder and D'Arpino, 2011; Valsecchi *et al*., 2011) while others can be learned from books and DVDs and by attending conferences.

Currently (as of 2012) no single assessment represents a gold standard. Without a standard teaching process, even the same assessment can yield greatly varying results based on the handlers' skill level and the environment chosen for the assessment. It should be a standard of practice that every assessment be performed in the way that it was designed. The certification process for the SAFER (Safety Assessment for Evaluating Rehoming) aggression assessment offered by the American Society for the Prevention of Cruelty to Animals (ASPCA) is one such way to ensure reliability (ASPCA, 2011a).

Note that aggression assessments should not be referred to as "temperament tests." Temperament refers to "humors" or traits that are likely stable and difficult to distinguish from learned behaviors. It is also important to note that in an assessment the dog is not being tested in a pass-fail manner. The assessment should be considered a snapshot of behavior to identify the likelihood that a dog may show aggression in certain situations. In SAFER, the whole spectrum of behavior responses of the dog is used to identify the level of resources he or she may need for adoption. Behavior can change with experience and through learning, and dogs can always be reassessed when a change in their behavior is noted and also if they are returned.

THE ROLE OF AGGRESSION ASSESSMENTS IN DECISION-MAKING

Many methods are used to gather information about a dog's behavior. One is the history of the animal before arriving at the facility, for example, the animal control report or owner surrender profile. Also, observations made by general staff, volunteers, the behavior team, the medical staff, and potential adopters while they are interacting with the animal can help create an in-depth profile for each individual. In addition, foster care providers can relay how the dog behaves in a home environment and assist in the decision-making process. Lastly, an aggression assessment can be an additional tool to capture some behaviors that identify the dog as having a higher probability of biting. Several of the publications referenced earlier have demonstrated some level of predictive value in behavior evaluations, but there is not one behavior evaluation that fully predicts future behavior. For this reason, behavior evaluations should be just one of the many tools in the decision-making process.

It is recommended that a video camera be used when performing any aggression assessment. Dogs use body language to communicate that they are uncomfortable. They display multiple micro-expressions, and often their behavior changes rapidly. A video camera will capture behaviors that assessors or observers may miss. It also records the behavior objectively and can be replayed for better interpretation of the behavior. Furthermore, video can be shared with other staff members, board members, rescue groups, or advocates to help ensure appropriate decisions are made for each individual. The video should be saved as part of the dog's record and behavioral profile.

When using any assessment, the behaviors should be repeatable when tested in the same way in the same environment as during the initial assessment. In the SAFER assessment, there is a certification process to ensure the assessor is performing SAFER correctly. If the assessment is done by two different certified assessors, the dog should show consistent behavior in both assessments. However, an aggression assessment should never be used in isolation. As previously mentioned, it is used in conjunction with other observations and tools for the decision-making process. It is crucial to gather information about the

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environment that sets the stage for a behavior to occur and worthwhile to see if some behaviors can be safely replicated. This information can be used to create a behavior modification protocol or to ensure the dog is placed in a supportive environment for the behavior problems identified.

While performing an aggression assessment, some behaviors will be identified as requiring behavior modification. The ASPCApro.org website has a plethora of information for shelters. One of the many resources it offers is a number of downloadable behavior modification programs. The programs implemented in each facility will vary with the resources available. First, there need to be staff, volunteers, or foster caregivers who are skilled at reading body language and interacting with dogs. Once those individuals are identified, then some high-risk dogs can be placed on an appropriate behavior modification program.

The facility will need to consider their resources on a daily basis. As each assessment is completed and behaviors needing modification are identified, the number of new dogs being enrolled in program will be limited by those resources. Also, a post-adoption follow-up protocol is essential for dogs who undergo behavior modification.

When attempting to modify potentially dangerous behavior, it is strongly recommended to work with trained behavior experts such as a Certified Applied Animal Behaviorist (CAAB) or a veterinary behaviorist. These professionals are more likely trained to work with these complex behavior challenges. If located in the nearby community, they should be consulted as needed. Even if not located nearby, many will consult with animal shelters about behavior cases over the telephone. It is very helpful to provide videotapes of the animal's behavior for these consultations in addition to the history and pertinent observations.

WHEN TO ASSESS

The ideal time to conduct an initial assessment on owner-relinquished dogs is at the time of intake. When owners were told at surrender that the information they provided was going to be used in adoption decisions for their dog, they were less forthcoming about owner-directed aggression and stranger-directed fear (Segurson, Serpell and Hart, 2005). When the assessment is performed at intake, the owner's presence can add valuable information about the dog's behavior. The opportunity to interface directly and respectfully with the owner before and after the assessment will facilitate a complete behavioral picture. Length of stay can decrease when assessments are performed at intake because dogs who display no behaviors that raise concerns can be immediately transitioned to the adoption process. Dogs with some concerns can be immediately offered support opportunities such as foster care, behavior modification, and enrichment. Dogs who display behavior issues at intake that are not confirmed by the owner should be reassessed.

SAFER was evaluated as an intake tool at the Wisconsin Humane Society in Milwaukee, Wisconsin. Dogs were assessed when the owner relinquished the dog and reassessed at 72 hours after intake. Of the dogs in this study, 85% showed the same behavior in both assessments. The behavior most likely to change was the behavior around the food bowl because many dogs did not eat when relinquished. For stray dogs, assessments should take place on the day prior to the end of their stray hold. This will assure no lag time between stray hold and their transition to adoptions, foster care, or other outcomes. For stray holds longer than 5 days, the assessment should occur after day 3. While there are no data to support that higher stress decreases the predictive value of an assessment, most behaviorists would recommend a 3-day wait before assessing.

Research at a shelter found that blood plasma cortisol levels in canines were highest during the first 3 days in a shelter and gradually declined thereafter (Hennessy *et al*., 1997, 2001). Cortisol is often used as a measure for psychological stress. Another study looked at a more diverse population of shelter dogs and found that urinary cortisol peaked at 17 days, and dogs who have experience being kenneled have lower urine cortisol levels than dogs who do not (Stephen and Ledger, 2006). Several studies showed that a dog's behavior cannot be used as a predictor of stress, as behavioral stress can be expressed in a wide range of ways and is difficult to correlate with cortisol levels in plasma (Hennessy *et al*., 1997), urine (Stephen and Ledger, 2006; Rooney, Gaines and Bradshaw, 2007), and saliva (Beerda *et al*., 1997). Although dogs may change their behavior when

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presented with a stressor, Beerda *et al*. (1997) found that the behavior observed did not correlate to saliva cortisol levels. Hubrecht (1995) found limited use of the dog's movement or body position as good markers of their welfare. How the dog behaves in response to stress in these studies seems to be related to the adaptive response of the individual, the stressor itself, how predictable the stressor is, and the dog's prior learning or experience.

When considering well-being of the animals in a shelter, adhering to standards of care for all individuals regardless of observed behavior is prudent. Offering daily enrichment (see the chapter on behavioral enrichment) is the first step in any behavior modification program. Providing enrichment and social interaction with dogs can reduce a dog's stress response. One study found that cortisol decreased in kenneled dogs when they were provided with regular enrichment and the decrease was not seen when the enrichment was offered infrequently (Lefebvre, Giffroy and Diederich, 2009). Offering enrichment by placing food in foraging toys can increase the dog's activity level, result in less barking, and allow the dog more opportunity to engage in appropriate behavior (Schipper *et al*., 2008). Providing human interactions with shelter dogs early in their stay can increase sociability and reduced cortisol levels (Coppola, Grandin and Enns, 2006; Bergamasco *et al*., 2010). Two vital ways to improve animal welfare is by providing environmental enrichment for all animals starting on the first day of their stay and adding social interaction with humans and conspecifics as soon as possible.

ASSESSMENTS FOCUSED ON OTHER BEHAVIORS

There are a few formal evaluations focused only toward matching dogs or cats to potential adopters. Match-Up II for dogs focuses on aggression as well as a variety of other behaviors important to the adopter (Animal Rescue League of Boston, 2011). C-BARQ offers this same option for dogs who have been living in a home before entering the shelter, as it is a survey for the guardian to predict behavior. The ASPCA's Meet Your Match® Canine-ality™ is another example of a program focused on identifying behaviors to help the match succeed (ASPCA, 2011b). Research points to the success rate of animal adoptions being enhanced when new owners have realistic and sensible expectations of the time, expense, and effort required for the individual pet (Kidd, Kidd and George, 1992a, 1992b). By identifying behaviors such as activity level, likelihood to engage with toys, and manners issues, shelters can better match adopters to the pet who will fit their lifestyle and expectations. All evaluations that the authors are aware of involve the assessment of observable, objective behavior. This is a vital piece of information to take note of, as behavior can change over time and can change as environmental factors change. Many of the assessment items in Canine-ality are based on research on the selection of service dogs from a shelter population (Weiss, 2002). That research involved assessing 75 dogs in a shelter environment with a variety of assessment items ranging from greeting through a cage door to interactions during play and interactions with strangers. Once assessed, the dogs were moved to a boarding facility where they were trained for 5 weeks in basic obedience and a retrieve task. After the 5 weeks of training, dogs were then tested in a variety of situations. A subset of the assessment items was found to be predictive of future behavior. While this research was initially geared toward service work, many of the identified behaviors were behaviors of interest to adopters. Canine-ality was designed to be conducted after an aggression assessment has been conducted for safety, as many of the assessment items (including a boisterous greeting in the kennel run and playing with toys) involve interacting with the dog in a way that may be unsafe in dogs with certain aggression issues (possession aggression, for example).

CATS

While the trend for intake for canines has decreased across much of the country according to ASPCA and Maddie's Fund data, the trend for cats is quite different. There are some locales with decreased intake for felines (Buffalo, New York and Boulder, Colorado, for example), but much of the country is still faced with significantly higher intake and lower "live release rates" (a formula of live outcomes divided by intake) for cats than dogs. A recent study by Lord *et al*. (2006) found the trend in Ohio to be an overall decrease in animal intake, with intake down 7% when compared to 1996. However, the decline was due only to a decrease in dog intake (17%), while cat intake increased by 20%.

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While some shelters have developed evaluation processes for cats, few formal tools exist. A recent study surveyed shelters and rescues regarding methods to distinguish unsocialized "feral" cats from frightened pet cats. Of the 555 survey respondents, only 15% had written guidelines (Slater *et al*., 2010).

Discriminating between feral and frightened pet cats is an issue for the majority of shelters that must admit all animals (open admission). Minimum hold times to make the determination vary from 1 day to more than 7 days (Slater *et al*., 2010), with the outcome for feral cats after that 7-day hold being potential euthanasia. The animal care days quickly add up (see the chapter on population management for more information on animal care days), as does the stress for a feral cat and a frightened pet cat held in traditional shelter housing. The identification of unsocialized cats who are likely to thrive in feral colonies versus frightened pet cats who would thrive in a home environment is one of great utility for animal shelter staff. A predictive assessment could help decrease animal care days, improve welfare, and increase live release rates for shelters.

Once the determination has been made that a cat is socialized, shelters are faced with the task of predicting the likely behavior of that cat in the home. The ASPCA's Meet Your Match® Feline-ality™ is the only feline assessment that the authors are aware of that has been developed for this purpose and used at a national level. The Feline-ality assessment is based in large part on an assessment tool developed three decades ago (Lee *et al*., 1983) to help identify cats appropriate for therapy work and was validated by Siegford *et al*. (2003). This assessment measures a cat's responses to standardized interactions with an unfamiliar person. Cats are then ranked into three distinct groups: High group—cats who display mostly safe, affiliative behaviors; Middle group—cats who display both safe, affiliative behaviors and some "questionable" behaviors; and Low group—cats who display little affiliative behavior and potentially display defensive or avoidance behaviors.

Other behavior elements for the Feline-ality assessment were derived from several studies noting the differences in behavioral response and to novel stimuli and environments as well as social interactions (McCune, 1995; Durr and Smith, 1997; Kessler and Turner, 1997) and a study focused on the methodology for rating the individual distinctiveness of domestic cats (Feaver, Mendl and Bateson, 1986). These studies note the individual differences between cats, with focus on responses to both novel stimuli (including environment) and social interaction. Feaver, Mendl and Bateson (1986) were the first to confirm that individual traits such as activeness, aggressiveness, fearfulness, sociability, and "curiosity" are reliably observed and measured. The ability to objectively observe these behavioral differences opened the door for a matching process that first assessed the cat's behavior and then matched it to adopters looking for those behavioral traits.

The Feline-ality assessment includes a set of in-cage assessment items that occur during the first 48 hours of the cat's stay, followed closely by an eight-item assessment conducted largely in a room that is novel to the cat. Cats are scored on two scales: one a scale of social interaction (called the independent-gregarious scale) and the other a scale of response to novel stimuli (called the valiance scale). On the basis of the scores on these two scales, cats are placed into one of nine Feline-ality categories. Adopters fill out a Meet Your Match Adopter survey that, when scored, matches them with cats who are most likely to meet their expectations. According to the ASPCA MYM Feline-ality guide (2008) and individual shelter reports, Feline-ality has helped to significantly increase adoptions, decrease length of stay, decrease returns, and decrease euthanasia.

ADOPTION CRITERIA AND ADOPTER COMMUNICATION

Performing assessments and giving appropriate support to the shelter animals are only part of the equation. How the shelter staff interacts with the visitors and potential adopters can have an impact on adoptions. Using the information gathered during the assessment process to help focus adopters on pets who best match their lifestyle can increase the likelihood that the adoption is successful by helping to ensure that adopters leave with pets who meet their expectations (Houpt, Honig and Reisner, 1996; Kidd, Kidd and George, 1992a). As adoption returns can be perceived as a failure by some shelters, tighter criteria on adoptions have been ongoing at many shelters since the 1970s, and their effect appears to be limiting the number of adoptions in shelters and sending

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those people to other sources to find a pet (Balcom and Arluke, 2001).

While many shelters still have policy-based adoptions, others are shifting away from this process and creating open adoptions based on dialogue rather than an interrogation. Instead of deciding if a person may adopt or not, the decision focuses on which animal would be a good match for the potential adopter (Balcom and Arluke, 2001). The Adoption Forum II, sponsored by PetSmart Charities® in 2003, brought together leaders in the field to discuss the issues surrounding adoptions. This group developed four basic hard criteria that must be met before an adoption could be approved: (1) The animal must be spayed or neutered; (2) No animal will be adopted to an applicant with a known history of animal or child abuse; (3) No animal will be adopted to an individual who is suspected of being drunk or high at the time of application; and (4) No animal will be adopted to be used as a food source. The group also developed useful guiding values in evaluating a potential placement: (1) The match would be suited to the individual animal and family; (2) The pet would be afforded appropriate veterinary care; (3) The pet's social, behavioral, and companionship needs would be met; (4) The pet would have a livable environment (including appropriate food, water, shelter, exercise); and (5) The pet would be respected and valued (PetSmart Charities, 2003).

FOLLOW-UP

Conducting follow-up with adopters post-adoption can be a good tool for extending support to the pet and adopter. While some organizations conduct follow-up for all adopters, it is crucial, at a minimum, to provide follow-up for higher risk adoptions. Higher risk may mean dogs or cats with behavioral or medical challenges, multi-pet households, and so on.

A study conducted by Marder (2002) involved follow-up specifically focused on behavior issues of dogs following adoption from the ASPCA. Contact was made for 43 of 62 dogs, 6–12 months post-adoption. Adopters were contacted by telephone and given a 60-item questionnaire. Most owners initially reported no behavior issues, but further probing revealed a variety of issues, the most common being house soiling, destruction, barking, and aggression to people. While most behaviors declined over time, aggression to individuals outside the home increased.

A recent study by the Michigan Humane Society (Lord *et al*., 2008) contacted adopters 1 week and 1 month post-adoption through a web-based survey and focused questions on health and behavior for both dogs and cats. The survey for the 1-week follow-up was filled out by 35% of adoptions (2802 adopters), and 40% (2575 adopters) responded to the 1-month survey. Those who did not have e-mail addresses were given the survey via phone, with the vast majority of respondents (84.7% and 96.6%, respectively) using the electronic format. More than one behavior problem was reported by 51% of dog and cat adopters, with dog adopters more likely to report more than one behavior problem (63% of dog adopters and 38% of cat adopters). House-training was the most commonly reported dog issue, and chewing, digging, or scratching at objects were the most common for cats. House-training issues were decreased at the 1-month call for dogs, while chewing, scratching, and digging increased. Chewing, scratching, and digging remained the most likely behavior issue for cats at month 1.

Behavior issues are often the primary reason that dogs are returned to shelters, with one study finding 89.7% of returns due to perceived behavior issues, some of which may have been normal behavior and unrealistic expectations (Wells and Hepper, 2000). The use of conversation-based adoptions and proper interpretation of behavior assessments can decrease the likelihood of a mismatch or sending an animal home with an unsupported behavior issue, but behaviors and expectations can change, and follow-up may help to further support adopters' relationships with their new pets.

While acquiring information on companion animals following placement can be difficult (Neidhart and Boyd, 2002; Patronek and Zawistowski, 2002) and may reach only a small percentage of adopters, reaching even a subset of the population of adopters can be useful. The Humane Society of Boulder Valley and Michigan Humane Society both have successful follow-up programs and are happy to share their practices. The Michigan Humane Society study referenced earlier highlights the importance of these interactions. When a behavior issue is identified, resources to resolve that issue can be provided. A useful resource for behavior protocols for commonly reported behavior issues is the ASPCA's Virtual Behaviorist, available at www.aspcabehavior.org. A

survey response can be linked directly to the protocol of the reported issue.

Most professionals in the field suggest multiple contacts with adopters, one soon after the adoption (often 3 days), one after a few weeks (often 3 weeks), and then again after a few months (often 3 months). It is crucial to keep good records of past interactions so that one can build on them as well as build a database of outcomes for pets with particular identified behavior issues. An organization may find that dogs or cats with particular behavior issues are much more likely to fail in a home environment. When faced with the tough and real decisions that must be made regarding euthanasia in most facilities, information to support the successful resolution, or failure, of a particular behavior issue in the home should become an important piece of that process.

CONCLUSION

Behavior evaluations for dogs and cats are an important part of the sheltering process. Properly timed and conducted evaluations can decrease length of stay, improve welfare, and increase adoption success. Regardless of which behavior evaluation an organization chooses, it is vital that the staff be fully trained and that resources are made available to assure consistent and reliable results. The tool should produce high inter-evaluator reliability, meaning that evaluators should each produce and observe the same behaviors when assessing the same animal. The evaluation should not be used as the sole tool to identify an animal's behavioral profile. The shelter staff's interaction with the adopter is just as important as the staff's interaction with the dog or cat, as without a proper interface with adopters, fewer adoptions can be made, more adoptions may be unsuccessful and without support, and more animals may be at risk for continued homelessness and euthanasia.

REFERENCES

American Society for the Prevention of Cruelty to Animals [ASPCA] (2011a) ASPCA SAFER. Available online at http://www.aspcapro.org/aspca-safer.php (accessed December 1, 2011).

American Society for the Prevention of Cruelty to Animals [ASPCA] (2011b) Meet Your Match. Available online at http://www.aspcapro.org/aspcas-meet-your-match.php (accessed December 1, 2011).

Animal Rescue League of Boston (2011) Match-Up II. Available online at http://www.centerforshelterdogs.org/Home/DogBehavior/MatchUpII.aspx (accessed May 17, 2011).

Balcom, S. and Arluke, A. (2001) Animal adoptions as negotiated order: A comparison of open versus traditional shelter approaches. *Anthrozoos*, **14**(3), 135–150.

Beerda, B., Schilder, M.B., Van Hoof, J. *et al*. (1997) Behavioural, saliva cortisol and heart rate responses to different types of stimuli in dogs. *Applied Animal Behaviour Science*, **58**, 365–381.

Bergamasco, L., Osella, M.C., Savarino, P. *et al*. (2010) Heart rate variability and saliva cortisol assessment in shelter dogs: Human–animal interaction effects. *Applied Animal Behaviour Science*, **125**, 56–68.

Bollen, K.S. and Horowitz, J. (2007) Behavioral evaluation and demographic information in assessment of aggressiveness in shelter dogs. *Applied Animal Behaviour Science*, **112**, 120–135.

Coppola, C.L., Grandin, T., and Enns, R.M. (2006) Human interaction and cortisol: Can human contact reduce stress for shelter dogs? *Physiology and Behavior*, **87**, 537–541.

Dowling-Guyer, S., Marder, A. and D'Arpino, S. (2011) Behavioral traits detected in shelter dogs by a behavior evaluation. *Applied Animal Behaviour Science*, **130**, 107–114.

Durr, R. and Smith, C. (1997) Individual differences and their relation to social structure in domestic cats. *Journal of Comparative Psychology*, **111**(4), 412–418.

Feaver, J., Mendl, M. and Bateson, P. (1986) A method for rating the individual distinctiveness of domestic cats. *Animal Behaviour*, **34**(4), 1016–1025.

Hennessy, M.B., Davis, H.N., Williams, M.T. *et al*. (1997) Plasma cortisol levels of dogs at a county animal shelter. *Physiology and Behavior*, **62**(3), 485–490.

Hennessy, M.B., Voith, V.L., Mazzei, S.J. *et al*. (2001) Behaviour and cortisol levels of dogs in a public animal shelter, and an exploration of the ability of these measures to predict problem behaviour after adoption. *Applied Animal Behaviour Science*, **73**, 217–233.

Houpt, K.A., Honig, S.U. and Reisner, I.R. (1996) Breaking the human-companion animal bond. *Journal of the American Veterinary Medical Association*, **208**(10), 1653–1658.

Hsu, Y. and Serpell, J.A. (2003) Development and validation of a questionnaire for measuring behavior and temperament traits in pet dogs. *Journal of the*

VetBooks.ir

American Veterinary Medical Association, **223**(9), 1293–1300.

Hubrecht, R.C. (1995) The welfare of dogs in human care, in *The Domestic Dog: Its Evolution, Behaviour and Interactions with People* (ed J. Serpell), Cambridge University Press, Cambridge, UK, pp. 180–198.

Kass, P.H., New, J.C., Scarlett, J.M. *et al*. (2001) Understanding animal companion surplus in the United States: Relinquishment of nonadoptables to animal shelters for euthanasia. *Journal of Applied Animal Welfare Science*, **4**(4), 237–248.

Kessler, M.R. and Turner, D.C. (1997) Stress and adaptation of cats (*Felis silvestris catus*) housed singly, in pairs and in groups in boarding catteries. *Animal Welfare*, **6**, 243–254.

Kidd, A.H., Kidd, R.M. and George, C. (1992a) Successful and unsuccessful pet adoptions. *Psychological Reports*, **70**, 547–561.

Kidd, A.H., Kidd, R.M. and George, C. (1992b) Veterinarians and successful pet adoptions. *Psychological Reports*, **71**, 551–557.

Kroll, T.L., Houpt, K.A. and Erb, H.N. (2004) The use of novel stimuli as indicators of aggressive behavior in dogs. *Journal of American Animal Hospital Association*, **40**, 13–19.

Lefebvre, D., Giffroy, J. and Diederich, C. (2009) Cortisol and behavioral responses to enrichment in military working dogs. *Journal of Ethology*, **27**, 255–265.

Lee, R.L., Zeglen, M.E., Ryan, T. *et al*. (1983) Guidelines: Animals in nursing homes. *California Veterinarian*, **3**, 231–237.

Lord, L.K., Reider, L., Herron, M.E. *et al*. (2008) Health and behavior problems in dogs and cats one week and one month after adoption from animal shelters. *Journal of the American Veterinary Medical Association*, **223**(11), 1715–1722.

Lord, L.K, Wittum, T.E., Ferketich, A.K. *et al*. (2006) Demographic trends for animal care and control agencies in Ohio from 1996 to 2004. *Journal of the American Veterinary Medical Association*, **229**(1), 48–54.

Marder, A.R. (2002) The animal shelter as an educational and research institution for applied animal behavior. *Paper presented at the Animal Behavior Society Meeting*, July, Bloomington, Indiana.

McCune, S. (1995) The impact of paternity and early socialisation on the development of cats' behaviour to people and novel objects. *Applied Animal Behaviour Science*, **45**, 109–124.

Neidhart, L. and Boyd, R. (2002) Companion animal adoption study. *Journal of Applied Animal Welfare Science*, **3**, 175–192.

Netto, W.J. and Planta, D.J. (1997) Behavioural testing for aggression in the domestic dog. *Applied Animal Behaviour Science*, **52**, 243–263.

Palma, C., Viggiano, E., Barillari, E. *et al*. (2005) Evaluating the temperament in shelter dogs. *Behaviour*, **142**, 1313–1334.

Patronek, G.J., Glickman, L.T., Beck, A.M. *et al*. (1996a) Risk factors for relinquishment of dogs to an animal shelter. *Journal of the American Veterinary Medical Association*, **209**(3), 572–581.

Patronek, G.J., Glickman, L.T., Beck, A.M. *et al*. (1996b) Risk factors for relinquishment of cats to an animal shelter. *Journal of the American Veterinary Medical Association*, **209**(3), 582–588.

Patronek, G.L. and Zawistowski, S. (2002) The value of data. *Journal of Applied Animal Welfare Science*, **5**(3), 171–174.

PetSmart Charities (2003) *Report on Adoption Forum II*, Phoenix, Arizona.

Reisner, I.R., Shofer, F.S. and Nance, M.L. (2007) Behavioral assessment of child-directed canine aggression. *Injury Prevention*, **13**, 348–351.

Rooney, N.J., Gaines, S.A. and Bradshaw, J.W.S. (2007) Behavioural and glucocorticoid responses of dogs (*Canis familiaris*) to kennelling: Investigating mitigation of stress by prior habituation. *Physiology and Behavior*, **92**, 847–854.

Salman, M.D., Hutchison, J., Ruch-Gallie, R. *et al*. (2000) Behavioral reasons for relinquishment of dogs and cats to 12 shelters. *Journal of Applied Animal Welfare Science*, **3**(2), 93–106.

Salman, M.D., New, J.C., Scarlett, J.M. and Kass, P.H. (1998) Human and animal factors related to the relinquishment of dogs and cats in 12 selected animal shelters in the United States. *Journal of Applied Animal Welfare Science*, **1**, 207–226.

Schipper, L.L., Vinke, C.M., Schilder, M.B.H. *et al*. (2008) The effect of feeding enrichment toys on the behaviour of kennelled dogs (*Canis familiaris*). *Applied Animal Behaviour Science*, **114**, 182–195.

Segurson, S.A., Serpell, J.A. and Hart, B.L. (2005) Evaluation of a behavioral assessment questionnaire for use in the characterization of behavioral problems of dogs relinquished to animal shelters. *Journal of the American Veterinary Medical Association*, **227**(11), 1755–1761.

Siegford, J.M., Walshaw, S.O., Brunner, P. *et al*. (2003) Validation of a temperament test for domestic cats. *Anthrozoos*, **16**(4), 332–351.

Slater, M.R., Miller, K.A., Weiss, E. *et al*. (2010) A survey of the methods used in shelter and rescue programs to identify feral and frightened pet cats.

VetBooks.ir

Journal of Feline Medicine and Surgery, **12**(8), 592–600.

Stephen, J.M. and Ledger, R.A. (2006) A longitudinal evaluation of urinary cortisol in kennelled dogs, *Canis familiaris*. *Physiology and Behavior*, **87**, 911–916.

Svartberg, K. (2005) A comparison of behaviour in test and in everyday life: Evidence of three consistent boldness-related personality traits in dogs. *Applied Animal Behaviour Science*, **91**, 103–128.

Valsecchi, P., Barnard, S., Stefanini, C. *et al*. (2011) Temperament test for re-homed dogs validated through direct behavioral observation in shelter and home environment. *Journal of Veterinary Behavior*, **6**, 161–177.

van den Berg, S.M., Heuven, H.C., van den Berg, L. *et al*. (2010) Evaluation of the C-BARQ as a measure of stranger-directed aggression in three common dog breeds. *Applied Animal Behaviour Science*, **124**, 136–141.

van den Berg, L., Schilder, M.B. and Knol, B.W. (2003) Behavior genetics of canine aggression: Behavioral phenotyping of golden retriever by means of an aggression test. *Behavior Genetics*, **33**(5), 469–483.

van der Borg, J.A.M., Netto, W.J. and Planta, D.J.U. (1991) Behavioural testing of dogs in animal shelters to predict problem behaviour. *Applied Animal Behaviour Science*, **32**, 237–251.

Weiss, E. (2002) Selecting shelter dogs for service dog training. *Journal of Applied Animal Welfare Science*, **5**(1), 43–62.

Wells, D. and Hepper, P.G. (2000) Prevalence of behaviour problems reported by owners of dogs purchased from an animal rescue shelter. *Applied Animal Behaviour Science*, **69**, 55–65.

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34
Behavioral Enrichment

Katherine Miller and Stephen Zawistowski

INTRODUCTION

Environmental enrichment should be part of a comprehensive animal care plan that supports the physical, behavioral, and psychological well-being of all animals throughout their stay in an animal shelter (Zawistowski, 2005). Enrichment may be defined as the provision of a captive animal with the ability to maintain or improve its physical, behavioral, and psychological functioning via modifications to the housing environment (Newberry, 1995; Young, 2003). The focus is on the outcome of the intervention, rather than the added feature itself.

GOALS AND BENEFITS OF ENRICHMENT PROGRAMS

Often the addition of a toy or other modification is considered "enrichment" without an outcome goal or monitoring of the intervention's efficacy in reaching that goal. Other times, enrichment is only implemented after an animal begins displaying aberrant behavior (Zawistowski, 2005). However, effective enrichment provides both therapy and protection against past, present, and even future stressors if thoughtfully implemented and appropriately monitored (reviewed in Fox, Merali and Harrison, 2006).

Enrichment goals should therefore include not only prevention or reduction of maladaptive behavior but also increases in behavioral diversity and in adaptive, normal behaviors. An appropriate goal is for the behavior of companion animals in a shelter to be qualitatively and quantitatively similar to that of pets living in low-stress home environments (Timmins *et al*., 2007). Achievements in reducing stress and increasing adaptive behavior are usually mirrored by improvements in physiological health, all of which, in turn, can improve chances for adoption.

Enrichment programs are also a creative way to heighten shelter staff morale by encouraging positive interaction between animals and staff, which can, in turn, further reduce or prevent animal stress (Carlstead, Brown and Strawn, 1993; Hennessy *et al*., 1998; Hemsworth, 2003; Bertenshaw and Rowlinson, 2009). Furthermore, adopters prefer animals housed in complex environments (Wells and Hepper, 2000), so shelters with enriched animal housing would provide more attractive options for adoption. Enrichment can also encourage positive interaction between adopters and pets (e.g., through interactive play or treat rewards for friendly behavior) and help them to envision the pet in their home.

THE IMPORTANCE OF INDIVIDUAL DIFFERENCES

Animal-housing areas within a shelter can vary substantially in lighting, temperature, drafts, odors, noise, exposure to other animals and human activity, and visual perspective. In addition, the typical shelter population includes animals ranging widely in age, source, past experiences, socialization history,

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temperament, and personality. Furthermore, individuals' responses to their environment vary across contexts and time (Jensen and Toates, 1993). As a result, neither a one-size-fits-all enrichment program nor a one-shot individual intervention will be sufficient. A successful enrichment program will be readily individualized and sustained throughout animals' shelter stay.

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TYPES OF ENRICHMENT

The ideas presented in the following sections are not exhaustive but should provide adequate information to start or expand a practical and effective enrichment program.

Physical Space

All shelter animals should be provided with enough space to stand, lie, turn around, walk several steps, stretch fully, and retreat from aversive stimuli. Space requirements should take into account an animal's need for separate functional areas for resting, eating/drinking, elimination, and exercise/locomotion. Cats need at least 20 inches between functional areas and group-housed cats prefer to maintain about 3 feet of personal space (Barry and Crowell-Davis, 1999; Rochlitz, 2002). If a group enclosure is too small, cats may display aggression or avoid each other by reducing activity. Cats may refrain from using a litter box placed too close to the food source, and vice versa. When a dog is forced to live in his elimination area, house-training will be increasingly difficult or, if already house-trained, he may hold his eliminations longer than he should, reducing health and increasing discomfort. Cramped enclosures frustrate locomotory and exploratory behavior and so are associated with inactivity, pacing, and other abnormal behaviors (Hubrecht, 2002; Clubb and Mason, 2003).

Perches, platforms, and time-shared exercise areas are simple ways to increase functional space. Office fostering or a "real-life room" furnished like a living room can provide a temporary, quiet respite for animals used to home living and can help acclimate those who are not. Challenging placements may also find greater success meeting potential adopters there. On-leash walks are another method of time-sharing space that is appropriate not only for dogs but also for some cats and small animals such as ferrets and rabbits if they can be acclimated to wearing a harness and if a safe, clean, quiet walking location is available for them.

Cage Furnishings

Cage furnishings can help motivate exploration, provide vantage points and retreat areas, and separate functional areas. Most cages allow an animal to view all areas at once without moving, which reduces motivation to move to gain information and ability to retreat from aversive stimuli.

Retreat Areas

Fearful or nervous animals, most cats (who are concealment specialists), and all small animal species (who may perceive humans as predators) should have a retreat area to behaviorally cope with potential stressors and that serves as a thermally protected resting area. Partial cage dividers, interconnected cages, boxes, and elevated perches can provide such optional retreats (Carlstead, Brown and Strawn, 1993; Gourkow and Fraser, 2006).

Elevated Perches and Platforms

Perches and platforms also provide a means for increasing and diversifying space and animal locomotion by providing a vantage point for observation and resting in a location that tends to stay clean and dry. Kenneled dogs provided with elevated platforms used them about 50% of their day and were subsequently rated as more confident, friendly, and playful (Hubrecht, 1993). Cats, who are good climbers, also use elevated areas, even more frequently than the floor (Podbersek, Blackshaw and Beattie, 1991). Perches allow socially (group) housed cats to select their resting locations depending on their level of confidence and social interests.

Elevated observation and resting areas can be easily created in existing cages (if there is enough vertical space) by adding a plastic travel kennel with the door removed (Figure 34.1), a sturdy box with a door hole cut into it, window perches, molded plastic lawn chairs, small sturdy tables, shelves, or raised walkways. The Hide-Perch-and-Go™ cat box is a cardboard in-cage structure that can be folded into

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Figure 34.1. A plastic travel kennel with the door removed can provide a retreat area as well as an elevated observation platform.

a carrier at adoption. Kuranda™ makes sturdy elevated dog and cat beds (see Table 34.1).

Soft Bedding

Bedding should be provided for all animals. It provides tactile comfort, aids thermoregulation, differentiates resting from other functional areas, and facilitates diverse behaviors including nesting, digging, exploration, and hiding. Cats seem to prefer polyester fleece to less-textured fabrics (Hawthorne, Loveridge and Horrocks, 1995 in Rochlitz, 2002) and have longer periods of deep sleep on soft bedding (Crouse *et al*., 1995 in Rochlitz, 2002). In group-housing, ample soft resting areas must be provided and spaced to prevent monopolization. Rolling a towel or a blanket into a bolster surrounding another can create a hiding place as well as a bed.

Scratching Pads

Cats require regular access to appropriate substrates for natural and necessary scratching behavior. Scratching helps to stretch muscles, remove the outer nail sheath, and create a communicative scent mark. Space-efficient options include door or wall-mounted scratchers like the disposable, cardboard Scratch and Stretch™ or carpet remnants mounted on cage walls with Velcro. Cost-efficient suggestions include blocks of rough wood or logs, stapling a carpet remnant over a piece of wood, or regular access to scratchers in an exercise area (see Table 34.2). Rubbing catnip or dangling a toy on a scratcher can initiate scratching behavior.

Social Interaction

Social interaction is generally one of the most highly effective enrichments for social species, providing physical and mental exercise, play opportunities, contact comfort, sensory stimulation, and novel experiences. However, social behavior depends not only on genetics but also on past experiences and current conditions (Scott and Fuller, 1965; Karsh and Turner, 1998), meaning motivation for social interaction will vary across individuals, time, and context.

Human Social Interaction

To be enriching rather than stressful, all human contact with sheltered animals should be positive and consistent, featuring the least restrictive handling possible. Inconsistent or rough caretaking procedures can increase fear and stress, but gentle, consistent handling by familiar people can be calming and make animals more accepting of unfamiliar people and adopters (Hoskins, 1995 in Rochlitz, 2002; Hemsworth, 2003; Gourkow and Fraser, 2006). Slow petting and soothing talk can calm animals (Wells and Hepper, 1999; Taylor and Mills, 2007), but men may need to be taught to pet more calmly and speak more soothingly than their natural inclination (Hennessy *et al*., 1998). Some animals may prefer to be stroked or groomed by people, but others may prefer to interact via a toy or treat. Still others will respond by fleeing or freezing, and for these animals, human contact may not be an effective enrichment.

Animal Social Interaction

Many shelters house animals individually in an attempt to reduce disease transmission and injury and ease maintenance. Social species, however, require

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Table 34.1. Commercially available enrichment items.

Item	Example product name(s)	Use	Species	Notes
Treat/food dispensers	Kongs, Squirrel Dude, Dogzilla	Fill with wet or mix of wet and dry foods. Can be frozen to increase difficulty of food extraction	Dogs	A greater percentage of wet food = greater difficulty
	Ball of the Wild, Play-N-Treat Ball, Fun Kitty Twist-N-Treat	Fill with dry kibble or treats. As pet rolls the item food is slowly released	Cats	
	Nature's Course	A ball inside a Y-shaped track that dispenses dry treats when the cat bats it	Cats	
	Tricky Treat Ball, Kibble Nibble, Buster Cube, Tug-A-Jug, Dog Pyramid, Canine Genius, Boomer Ball	Fill with dry kibble or treats. As pet rolls the item, food is slowly released. Drill holes in the indestructible Boomer Ball to fill with kibble for hard-core chewers like pit bulls	Dogs	
	Waggle, Bouncy Bone, Chuckle, Busy Buddy Football, Goodie Ship	These rubber toys have slots for treats	Dogs	
	Jungle Talk brand activity toys and treat dispensers	Interactive bird enrichments that require puzzle solving or permit shredding behavior and require balance and agility	Parrots, parakeets	
Chew toys	Nylabones, Galileo Bones, sterilized beef bones, Rope toys (natural fibers)	Can be suspended in kennel to keep clean. To increase interest, rope toys can be soaked in broth and then frozen and inside of sterilized bone rubbed with dog food or peanut butter	Dogs	
Puzzle toys	Dog Tornado, Dog Turbo, Dog Casino, Dog Brick, Dog Twister	Pets must manipulate the parts to access treats hidden in the compartments	Dogs, some persistent cats	Some offer the ability to increase difficulty as the pet learns
Chase toys	Chase-It	Toy is suspended from a long stick as an interactive "fishing rod" type chase toy	Dogs	Available at mychaseit.com
	Cat Dancer, DaBird and similar "fishing rod" type toys	Small toy at the end of a string or wire that bobs and bounces like a flying insect	Cats	

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Table 34.1.

Scratching pads	Stretch and Scratch	Small, disposable cardboard scratcher designed to be hung in shelter cages	Cats	Available at stretchandscratch.com
Pheromones	Dog Appeasing Pheromone analogue(DAP)	Mixed evidence of calming effect on dogs in stressful situations. Available as a collar, spray, or diffuser	Dogs	High air exchange rates in shelter may reduce efficacy of spray and diffuser
	Feline facial pheromone analogue (Feliway)	Mixed evidence of calming effect on cats in stressful situations	Cats	High air exchange rates in shelter may reduce efficacy of spray and diffuser
Auditory enrichment	Classical music CDs	"Best of" classical music compilations can be played through shelter sound system or localized using a portable CD player	Dogs, cats, humans	Animals will habituate to music played repeatedly. Auditory enrichment is not avoidable if an animal finds it aversive, so volume and effect must be carefully monitored
	Bird calls and nature sounds CDs	May provide auditory interest for predatory species. Examples include *Missouri Bird Calls* and *Stokes Bird Calls* audio CDs	Cats, dogs	Available at birdwatching.net. If played repeatedly, animals will lose interest
	"Calming" music CDs	Many CD collections that claim to soothe or calm pets are available, such as *Through a Dog's Ear, Relaxation Music for Pets and People, Canine Music, Pet Tunes, and Canine Lullabies*	Dogs, cats, humans	
	"Laughing" dog sounds CD	A sound recording of a dog at play, suggested as calming to shelter dogs	Dogs	Available at petalk.org. If played repeatedly, dogs will lose interest
	Everyday sounds CDs	Play at low levels in puppy and kitten nursery areas to begin habituating them to human child, household, thunder, and traffic noises	Dogs, cats	Available at legacycanine.com

(*continued*)

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Table 34.1. (*Continued*)

Item	Example product name(s)	Use	Species	Notes
Portable outdoor cat containment systems	Midwest cat playpen, Kittywalk portable containment systems	Keep cats and kittens safely contained during short outdoor excursions. Portable enclosures can be moved to a new, clean location for each cat	Cats	Available at midwesthomes4pets.com and kittywalk.com
Semi-permanent outdoor cat kennels	Cats on Deck, Pet Pro kennels, Cat Veranda window box	Keep cats and kittens safely contained during short outdoor excursions	Cats	Available at catsondeck.com, petprokennelstore.com, and petsafe.com
Outdoor cat fencing system	Purrfect fence	For creating a permanent, outdoor cat and kitten exercise yard	Cats	Available at purrfectfence.com
	Cat Fence-In	For creating a permanent, outdoor cat and kitten exercise yard	Cats	Available at catfencein.com
Pet strollers	Various	For supervised outdoor "walks" with cats, dogs with limited mobility, and for socialization walks with puppies and kittens	Dogs, cats	Available at justpetstrollers.com and kittywalk.com
Videos	Various videos designed for cats	These videos have lots of moving images to attract cats' interest. Examples include *Video Catnip, Cat-TV, The Bugs,* and *The Birds*	Cats	Cats seem to need to be close to the screen to express much interest

Table 34.2. Enrichment ideas using repurposed/donated items.

Item	Use	Species	Notes
Aluminum foil	Roll tightly into a ball for battable cat toy. Catnip may be rolled inside	Cats	
Animal scents	Create a scent trail for scent hounds to follow in the exercise area	Dogs	Scents are available in garden supply and outdoor supply stores
Bird feeder, squirrel feeder	Install outside exterior windows where pets can see the wildlife	Dogs, cats	Regularly empty and wash feeder and provide multiple feeder locations simultaneously to reduce transmission of disease among the wild visitors
Books and magazines	Volunteers or staff can spend 15–30 minutes reading calmly to animals in their cages to promote relaxation	All	The person should ignore unruly or attention seeking behavior and remain calm and minimally interactive with the pets
Bowling pins and balls	Durable toys for hard-core chewers like pit bulls	Dogs	Pins are more fragile, the balls are fairly indestructible. Set up in exercise area safe for rowdy play
Broom or mop handle	String a rope though the hole at the end and tie a plush toy to the end of it to create an interactive dog chase-it toy	Dogs	
Cardboard egg cartons	Place goodies inside, poke some holes and seal with nontoxic glue for a shreddable feeding puzzle	Dogs, parrots, rabbits	
Cardboard box, shoebox	Leave upright or upside down to provide elevated perch, hiding place or exploration or chewing opportunity	Dogs, cats, rabbits, rodents, reptiles	Cut at least one hole in the side for a door in case the box gets turned over on top of the animal
Cardboard milk carton or cereal box	Place dry food/treats inside and poke holes for a shreddable feeding puzzle	Dogs	Rinse and remove any plastic rings or bags first. Layer boxes inside each other or poke fewer holes to increase the challenge
Cardboard paper towel or toilet tissue rolls	Place dry food/treats inside and fold ends over for shreddable feeding puzzle	Dogs, cats, parrots, rabbits, rodents	Nest one inside another to increase the challenge
	Leave open and empty to provide hiding or exploration opportunity	Rodents	

(*continued*)

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Table 34.2. (*Continued*)

Item	Use	Species	Notes
Carpet remnants and lumber scraps	Using a staple gun, sturdy lumber scraps can be covered with pieces of carpet to make cat scratchers. Alternatively, stick strong Velcro on the back and secure carpet squares directly to cage walls	Cats	Cut multiple pieces of carpet at once for easy replacement later. Wrap the wood in a study plastic bag before covering with carpet, to keep the wood clean and reusable. Vinyl-backed carpet runners will not unravel when cut
Chinese food take-out containers	Stuff with shredded paper mixed with treats and small toys and hang in cage	Parrots, rabbits, rodents	
Cooking spices (cinnamon, vanilla)	Mix with water in a dilute solution and dab onto paper towel or a toy for olfactory enrichment	Dogs, cats, rabbits, rodents	Can be bought in bulk from warehouse stores. Odor could be strong to animals' keen noses, so must be avoidable or optional for the animal to prevent stress
Corrugated cardboard	Cut into strips, roll into circles and keep adding consecutive outer rings until the roll is large enough for a cat to sit on and scratch	Cats	
	Strips hung from cage sides or top as climbing, shredding, and chewing opportunity	Rabbits, birds, rodents	
Cotton T-shirts	Cut into pieces and sew into double-layered sacks filled with small toys, shreddable material, and/or treats. Or cut/rip pieces, fill as above, and tie into a knot	Parrots	Most parrots will manipulate, shred, and extract the goodies inside. Slowly increase difficulty of extraction of goodies
Film canisters	Place pebbles or pennies in canisters to make rattling cat toys	Cats	Becoming more scarce due to the popularity of digital photography
Flower pots (pottery)	Sleeping and play area for rabbits and small rodents	Rabbits, rodents	
Fresh, whole fruits and vegetables	Whole frozen carrots, apple slices, or bananas as dog chewies and puppy teething toys. Stuff 1/2 frozen banana inside a treat dispenser to make it last longer	Dogs	To ensure a balanced diet, use as a supplement to commercial diets. Remove uneaten fresh food before it spoils. Parrots must not eat apple seeds
	Provide whole and fresh as a feeding supplement for rabbits, rodents, and parrots	Rabbits, rodents, parrots	
	Using mini-pumpkins or small squash, poke holes and insert berries or other goodies into the hollow center	Parrots	

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Table 34.2. (*Continued*)

Item	Use	Species	Notes
Glass jars (wide-mouth)	Sleeping and play area for small rodents	Rodents	
Golf balls, ping-pong balls	Battable toy	Cats	Not safe for use with dogs
Hairbrushes or scrub brushes	Secure to the wall at cat body-height for cats to rub against. Natural hair bristle brushes can be impregnated with food particles for birds to forage	Cats	Brushes must not contain any cleaning chemicals, paints, varnishes, etc. Cannot be adequately disinfected, so discard rather than reuse
Ice cube trays	Make frozen cubes of diluted broth or kibbles frozen in ice cubes	Dogs	Ice cubes will skate around on the floor so best to use on clean surfaces. Also will leave a puddle in cage if not eaten
Lavender oil	Evidence suggests a calming effect on dogs. Spritz on a bandana to tie around the dog's neck or just outside the kennel, or spray around the kennel itself where it will not be licked	Dogs	May be particularly useful to calm travel-related nausea and anxiety
Log of nonpoisonous wood	Scratching material Chewing opportunity	Cats Rabbits, rodents	To ensure the wood is not poisonous, check aspca.org/pet-care/poison-control
Mirrors	"Companionship" for lone birds and horses	Birds, horses	
Packing paper	Wad into a ball and stash treats or scents inside	Dogs, cats, rodents, parrots	
Paper bag	Place dry food inside and fold top over for a shreddable feeding puzzle	Dogs, cats, rabbits, rodents	Be sure to remove any handles first
	Leave open and empty to provide hiding or exploration opportunity	Cats, rabbits, rodents	
Paper plates	Cut into quarters then string a wire through the centers to make a shreddable wreath to hang in parrot or rabbit cages	Parrots, rabbits	
Plastic bottle caps	Poke hole in center and suspend from a ruler for a "fishing rod" chase-it toy	Cats	Use string and ribbon with caution. Sturdy cord is preferable

(*continued*)

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Table 34.2. (*Continued*)

Item	Use	Species	Notes
Plastic dog crate with door removed	Use top half or whole crate in dog kennels and in large cat kennels as resting and observation platforms. Also good to begin crate training dogs	Dogs, cats, rabbits	
Plastic Easter eggs	Fill each half with canned food as a wobbling puzzle feeder	Cats	
Plastic litter box or dishpan	Fill with bedding, shredded paper, hay, or straw for digging and nesting	Rabbits, rodents, birds	Mix some treats in for extra interest
Plastic packing strapping	Wiggle it as an interactive cat toy	Cats	Use scissors to round the ends off to eliminate sharp edges
PVC pipe sections	Sleeping and play area for small rodents	Rodents	PVC pipes are available in many shapes including curves, T's, and Y's
Quaker oats box	Leave open and empty to provide hiding, chewing, and exploration opportunity	Rabbits, rodents	
Rodent bedding (used)	Place into fabric pillowcase, sock tied at one end, or other cloth bag for scent enrichment. Drag around exercise area to make a scent trail	Dogs, cats	Avoid soiled litter containing urine or feces. Use only bedding from indoor pet rodents known to be healthy. Some dogs may try to consume the bedding
Rye grass or catnip grown in flower pots	Can be grown from seeds economically. Many cats, rabbits, and rodents enjoy nibbling on fresh greens	Cats, rabbits, rodents	Rye grass in pots usually needs to be replanted every 2–3 weeks
Shower caddy or small bucket	Stock with small treats or toys and hang outside dog kennels and cat cages with a request for passers-by to give the pet a treat or toy. Good for shy animals and prevention of barrier frustration	Dogs, cats	Unreachable treats can be frustrating for some pets. Visitors may be asked to carry a treat caddy with them instead
Shower curtain rings	Toys that are easy to manipulate and carry	Cats, rabbits	
	Link together for hanging bird jungle gym or cat toy	Cats, birds	Not strong enough for use with larger birds and parrots
Shredded office paper	Scatter food inside for foraging, digging, and nest building	Cats, rabbits, rodents, birds	

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Table 34.2. (*Continued*)

Item	Use	Species	Notes
Towels, blankets, tube socks	Soft, washable bedding	Dogs, cats, rabbits, rodents	Some dogs will consume towels. Must be thoroughly disinfected between animals
	Knot small towels and socks or braid strips of towels to make toys. May be wetted and frozen for teething puppies. Hang towel "rope" in cage for parrots for unpredictable perching and shredding	Dogs, birds	Should be used under supervision—some dogs may try to consume towels and socks
Yardstick or ruler	Tie a thin but sturdy cord to one end and a small toy to the other as an interactive cat chase-it toy	Cats	
Yogurt containers	Glue together with nontoxic glue, poke holes, and place dry food inside to make a cat puzzle feeder or hang as a kitty piñata	Cats	Use string and ribbon with caution. Sturdy cord is preferable

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appropriate social environments to remain mentally healthy, which should be considered equally important as physical health (ASV, 2010). Pair-housed dogs sleep more, vocalize less, and show less abnormal behavior than isolate-housed dogs (Coppinger and Zuccotti, 1999), and being good with other dogs increases dogs' adoption rates (Luescher and Medlock, 2009). Social behavior must be exercised in order to grow (Coppinger and Zuccotti, 1999), so shelters must strive for regular social interaction for animals motivated to participate. Pair-housing of compatible animals or regular, supervised social group sessions are viable options.

The initial introduction of unfamiliar animals is often the time of highest social tension. Introduce animals in an unfamiliar, "neutral" area and provide the chance to play, explore, or walk simultaneously to form initial positive associations. Note that placing incompatible, under-socialized, or too many animals together can be so stressful as to counteract any potential benefits (Kessler and Turner, 1999).

Cats have a flexible social system whereby they congregate around reliable food sources but, lacking social behaviors that diffuse conflict, they use distance to reduce social tension (Leyhausen, 1979 in Rochlitz, 2005). Therefore, housing cats socially requires enough space for ample feeding, resting and elimination areas to deter monopolization and to permit each cat at least 3 feet of personal space (or to at least separate themselves visually). Compatible cats can be housed in pairs or groups not exceeding 10–15 cats (Kessler and Turner, 1999; Rochlitz, 2005; Griffin and Hume, 2006). Introduce new cats to groups gradually, by housing the newcomer in a large dog crate inside the group area for a few days (Griffin and Hume, 2006) and integrate several newcomers at once on a weekly or biweekly basis to minimize frequency of stressful introductions (Ottway and Hawkins, 2003).

Object Play and Toys

The provision of toys is probably the most common enrichment attempt in shelters. Whether and how an animal actually uses them depends on myriad factors including age; experience with toys (naïve animals may fear or not recognize toys as playthings); mental

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and physical state (depressed, stressed, or ill animals usually do not play but moderately hungry animals can be more playful); characteristics of the toy (cats prefer small to large toys while dogs spend more time using chewy than hard toys); presence of a playmate; and habituation (most animals lose interest in a toy within a day) (de Monte and Le Pape, 1997; Hall and Bradshaw, 1998; Hubrecht, 2002; Young, 2003; Wells, 2004). Play may also peak in response to suboptimal maternal care, after a period of play deprivation, or as animals attempt to reduce social tensions (Held and Spinka, 2011).

Different types of toys can be used to promote expression of different types of species-appropriate behavior and should be changed at least daily to maintain interest (Hall, Bradshaw and Robinson, 2002; Young, 2003; Wells, 2004). Toys should be introduced gradually to animals who fear novel objects. A note of caution: If toys are to be reused or shared with other animals besides a cage-mate, they should be disinfected first to prevent disease transmission. Also, any enrichment item that may be chewed up, damaged, broken or ingested should be inspected regularly and monitored for safety.

In addition to enrichment benefits for the animals, play with potential adopters can promote formation of an initial bond. Adopters prefer dogs with toys, even if they are not currently playing with them (Wells and Hepper, 2000), while cats who are active in their cages are more likely adopted (Fantuzzi, Miller and Weiss, 2010); interactive play could spur such activity.

Occupational Enrichment

Feeding/Foraging Enrichments

Foraging is exploration to learn about potential food sources. Companion animals retain their ancestral motivation to occupy themselves in this way (Inglis, Forkman and Lazarus, 1997), but confined animals have few options to do so. Foraging enrichments exercise both the muscles and the mind, and make animals' daily behavior more "natural" in range and substance. They can also reduce lethargy and frustration-related behavior, such as barking and pacing (Mason *et al*., 2007; Schipper *et al*., 2008).

Ideally, food delivery and content will mimic each species' natural feeding strategy: cats should chase, bat, or pounce and dogs should scavenge, lick, and gnaw to obtain food. There are many commercial feeding enrichments available (Figure 34.2) and many ways to repurpose household or donated items to make foraging enrichments (Figure 34.3). Monitoring individuals' use of foraging enrichments is critical to ensure they are eating their full daily ration, since skill and motivation to use foraging devices will vary.



Figure 34.2. Examples of commercial feeding and foraging enrichments. (L to R, row 1) Feline Treat-N-Play™ ball, Goodie Ship™, Funkitty Twist 'n Treat™; (row 2) Kibble Nibble™, Kong®, Dogzilla®, canine Twist 'n Treat™; (row 3) Bob-A-Lot™, Everlasting Fun Ball™, Busy Buddy® Football, Tug-a-Jug™.



Figure 34.3. Examples of no-cost feeding and foraging enrichments. (L to R) Cardboard egg carton closed with nontoxic glue, cardboard tissue tube with the ends partly folded over, yogurt containers with holes punched in the ends and joined with nontoxic glue (cats only), paper bag with cut holes and the top folded over, packing paper wadded to create food-hiding nooks, cardboard milk carton with plastic spout removed.

Training

Simple training exercises can increase behaviors that improve chances of adoption. In one study, dogs with basic training skills were 1.4 times more often adopted (Luescher and Medlock, 2009). Most animals can learn to earn their food by performing trained behaviors, such as sitting calmly at the front of the cage, walking on leash without pulling, and refraining from jumping up. Also, shy animals can be rewarded for displaying social behavior such as approaching the front of the cage or touching their nose to an outstretched hand (Figure 34.4). Hard-to-place animals can be taught eye-catching tricks. Training methods must be primarily based on use of positive reinforcement in accordance with current professional guidelines (APDT, 2003; ASV, 2010). A variety of books, DVDs, and Internet sites provide how-to information on basic clicker training for shelter animals (see Table 34.3).

Sensory Stimulation

Sensory enrichment targeting a species' dominant sense with harmless, non-stressful stimuli can boost behavioral diversity and ease boredom for longer-term shelter residents (Wells, 2009).

Television/Videos

Many videos are marketed for dog and cat enrichment, typically featuring images of moving animals or objects. Videos may temporarily reduce time spent at the back of the cage, sleeping by cats, and barking by dogs (Graham, Wells and Hepper, 2005; Ellis and Wells, 2008). However, sheltered dogs and cats



Figure 34.4. Using positive reinforcement to train a shy dog to approach and touch his nose to an outstretched hand.

Table 34.3. Enrichment resources.

Environmental enrichment websites	
American Society for the Prevention of Cruelty to Animals (ASPCA)	www.aspcapro.org/saving-lives/enrichment-for-shelter-dogs/
Humane Society of the United States	www.animalsheltering.org
Environmental Enrichment Scrapbook	www.well.com/user/abs/dbs/eesb
The Shape of Enrichment	www.enrichment.org
Animal Welfare Institute's *Comfortable Quarters for Laboratory Animals* series (a wide variety of species are covered)	www.awionline.org/pubs/cq02/cqindex.html
USDA Animal Welfare Information Center's *Environmental Enrichment Information Resources for Laboratory Animals*	www.nal.usda.gov/awic/pubs/enrich/intro.htm#intro
USDA Animal Welfare Information Center's enrichment suppliers and products page	www.nal.usda.gov/awic/pubs/enrich/supplier.htm
Clicker training information	www.clickertraining.com
Clicker training demonstration videos	Various on www.youtube.com
Environmental enrichment manuals and DVDs	
Open Paw Shelter Manual	www.openpaw.org
CatSense System: The British Columbia SPCA's Cat Welfare Enhancement Program	www.spca.bc.ca/welfare/professional-resources/catsense/catsense.html
Captive Foraging	http://avianstudios.com/products/

only spend 5–10% of their time watching such video images, and interest wanes over the first hour, possibly because the shelter environment is so stimulating, their visual systems are not well suited for TV viewing, or novelty is the critical aspect (Ellis and Wells, 2008). Videos could even cause frustration because the images are not interactive. There seem to be limits to the enrichment value of video for cats and dogs in shelters.

Audio/Music

A shelter is rarely quiet. In addition to the noise of caretakers, equipment, and the animals themselves, shelters commonly play music for human entertainment or to try to relax the animals. Despite their claims, virtually no commercial "calming" music has been subjected to scientific evaluation of effects. There is evidence, however, suggesting that talk radio may be useful for accustoming undersocialized cats, puppies, and kittens to the sound of human voices while classical music compilations can increase resting and decrease barking by dogs (reviewed in Wells, 2009).

Given the high levels of ambient noise in shelters, though, sound *reduction* could be more beneficial than sound *introduction*. Sometimes caged animals may prefer silence to even slow-tempo classical music (McDermott and Hauser, 2007). Because auditory enrichment is unavoidable and uncontrollable by the animals, careful monitoring is required to ensure it does less harm than good.

Olfactory Stimulation

Research suggests that diffusing the scents of lavender and chamomile oils in the kennel areas of a shelter can increase resting and reduce barking by dogs, whereas diffusion of the scents of peppermint and rosemary oils can be excitatory (Graham, Wells and Hepper, 2005), which could be beneficial for depressed individuals. While shelter cats did not display equivalent effects of these scents, catnip often stimulates activity in cats, as can the scents of cinnamon and ginger (Wells, 2009). A note of caution: The use of any spice or herb in animal areas should be approved by the shelter veterinarian or animal care staff.

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When used with pets in homes, synthetic forms of feline facial pheromone (Feliway®) and dog appeasing pheromone (DAP®) have helped reduce fear, anxiety, and stress-related behaviors including urine marking and noise sensitivity, and aided puppies' socialization and adjustment to new environments (Mills and Mills, 2001; Estelles and Mills, 2006; Denenberg and Landsberg, 2008). In sheltered dogs, barking was reduced and resting increased after 7 days exposure to DAP (Tod, Brander and Waran, 2005); however, one unpublished study by the second author of this chapter found no effects of Feliway on the behavior of group-housed sheltered cats. In shelters, the pheromones' effects may be swamped by high levels of stimulation or mitigated by frequent room air exchanges, plus days or weeks of continuous exposure to the pheromones may be necessary to note significant behavior changes. The effects of DAP and Feliway should be fully monitored in shelters to ensure their money is well spent.

REMOVING OBSTACLES TO ENRICHMENT

Shelters often find excuses for not enriching animals' lives, such as lack of funds or manpower, or that they are doing their best "under the circumstances." Others cite disease-transmission concerns. These excuses are not acceptable for a regulated research facility housing dogs and cats and should not be acceptable for animal shelters (Patronek and Sperry, 2006; ASV, 2010).

The potential drawbacks of providing enrichment can be mitigated with thoughtful implementation and effective monitoring. For example, if disease control is a concern, focus on disposable or disinfectable items, sensory enrichment, or human interaction and training. Impact on staff time can be minimized by recruiting volunteers to manage the enrichment program, which is highly attractive work. Limited resources can be judiciously allocated by focusing on donated enrichments (see Table 34.2) and those that monitoring finds most effective.

CONCLUSION

While much research has been conducted regarding enrichment of animals in research facilities and zoos, shelters are a relatively new frontier in the implementation and study of environmental enrichment. It is strongly recommended therefore that shelters make the effort to track their enrichment work and share their experiences not only to ensure effective use of limited resources but also to create a shelter-centric foundation of knowledge for future shelter designs and programs.

REFERENCES

Association of Pet Dog Trainers [APDT] (2003) Code of professional conduct and responsibility. Available at http://www.apdt.com/about/mission.aspx

ASV (2010) Association of Shelter Veterinarians Guidelines for standards of care in animal shelters available online at http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29.

Barry, K.J. and Crowell-Davis, S. (1999) Gender differences in the social behaviour of the neutered indoor-only domestic cat. *Applied Animal Behaviour Science*, **64**, 193–211.

Bertenshaw, C. and Rowlinson, P. (2009) Exploring stock managers' perceptions of the human–animal relationship on dairy farms and an association with milk production. *Anthrozoos*, **22**(1), 59–69.

Carlstead, K., Brown, J.L. and Strawn, W. (1993) Behavioural and physiological correlates of stress in laboratory cats. *Applied Animal Behaviour Science*, **38**, 143–158.

Clubb, R.A. and Mason, G.J. (2003) Captivity effects on wide-ranging carnivores. *Nature*, **425**, 473–474.

Coppinger, R. and Zuccotti, J. (1999) Kennel enrichment: Exercise and socialization of dogs. *Journal of Applied Animal Welfare Science*, **2**(4), 281–296.

Crouse, S.J., Atwill, E.R., Lagana, M. *et al*. (1995) Soft surfaces: A factor in feline psychological well-being. *Contemporary Topics in Laboratory Animal Science*, **34**(6), 94–97.

de Monte, M. and Le Pape, G. (1997) Behavioural effects of cage enrichment in single-caged adult cats. *Animal Welfare*, **6**(1), 53–66.

Denenberg, S. and Landsberg, G.M. (2008) Effects of dog-appeasing pheromones on anxiety and fear in puppies during training and on long-term socialization. *Journal of the American Veterinary Medical Association*, **233**(12), 1874–1882.

Ellis, S.L.H. and Wells, D.L. (2008) The influence of visual stimulation on the behaviour of cats housed in a rescue shelter. *Applied Animal Behaviour Science*, **113**, 166–174.

Estelles, M.G. and Mills, D.S. (2006) Signs of travel-related problems in dogs and their response to treatment with dog-appeasing pheromone. *Veterinary Record*, **159**, 140–148.

Fantuzzi, J.M., Miller, K.A. and Weiss, E. (2010) Factors relevant to adoption of cats in an animal shelter.

Journal of Applied Animal Welfare Science, **13**(2), 174–179.

Fox, C., Merali, Z. and Harrison, C. (2006) Therapeutic and protective effect of environmental enrichment against psychogenic and neurogenic stress. *Behavioural Brain Research*, **175**, 1–8.

Gourkow, N. and Fraser, D. (2006) The effect of housing and handling practices on the welfare, behaviour and selection of domestic cats (*Felis sylvestris catus*) by adopters in an animal shelter. *Animal Welfare*, **15**, 371–377.

Graham, L., Wells, D.L. and Hepper, P.G. (2005) The influence of visual stimulation on the behaviour of dogs housed in a rescue shelter. *Animal Welfare*, **14**, 143–148.

Griffin, B. and Hume, K.R. (2006) Recognition and management of stress in housed cats, in *Consultations in Feline Internal Medicine*, Vol. 5 (ed J. August), W.B. Saunders Company, St. Louis, Missouri, pp. 717–734.

Hall, S.L. and Bradshaw, J.W.S. (1998) The influence of hunger on object play by adult domestic cats. *Applied Animal Behaviour Science*, **58**, 143–150.

Hall, S.L., Bradshaw, J.W.S. and Robinson, I.H. (2002) Object play in adult domestic cats: The role of habituation and disinhibition. *Applied Animal Behaviour Science*, **79**, 263–271.

Hawthorne, A.J., Loveridge, G.G. and Horrocks, L.J. (1995) The behaviour of domestic cats in response to a variety of surface-textures, in *Proceedings of the Second International Conference on Environmental Enrichment* (ed B. Holst), Copenhagen, Denmark, pp. 84–94.

Held, S.D.E. and Spinka, M. (2011) Animal play and animal welfare. *Animal Behaviour*, **81**, 891–899.

Hemsworth, P.H. (2003) Human–animal interactions in livestock production. *Applied Animal Behaviour Science*, **81**(3), 185–198.

Hennessy, M.B., Williams, M.T., Miller, D.D. *et al.* (1998) Influence of male and female petters on plasma cortisol and behaviour: Can human interaction reduce the stress of dogs in a public animal shelter? *Applied Animal Behaviour Science*, **61**, 63–77.

Hoskins, C.M. (1995) The effects of positive handling on the behavior of domestic cats in rescue centres. MSc thesis, University of Edinburgh, UK.

Hubrecht, R. (1993) A comparison of social and environmental enrichment methods for laboratory housed dogs. *Applied Animal Behaviour Science*, **37**, 345–361.

Hubrecht, R. (2002) Comfortable quarters for dogs in research institutions, in *Comfortable Quarters for Laboratory Animals* (eds V. Reinhardt and A. Reinhardt), Animal Welfare Institute, Washington, DC, pp. 56–64.

Inglis, I.R., Forkman, B. and Lazarus, J. (1997) Free food or earned food? A review and fuzzy model of contrafreeloading. *Animal Behavior*, **53**, 1171–1191.

Jensen, P. and Toates, F.M. (1993) Who needs 'behavioural needs'? Motivational aspects of the needs of animals. *Applied Animal Behaviour Science*, **37**, 161–181.

Karsh, E.B. and Turner, D.C. (1998) The human–cat relationship, in *The Domestic Cat: The Biology of Its Behaviour* (eds D.C. Turner and P. Bateson), Cambridge University Press, Cambridge, UK, pp. 159–177.

Kessler, M. and Turner, D. (1999) Socialization and stress in cats (*Felis silvestris catus*) housed singly and in groups in animal shelters. *Animal Welfare*, **8**, 15–26.

Leyhausen, P. (1979) *Cat Behaviour: The Predatory and Social Behaviour of Domestic and Wild Cats*, Garland STPM Press, New York.

Luescher, A.U. and Medlock, R.T. (2009) The effects of training and environmental alterations on adoption success of shelter dogs. *Applied Animal Behaviour Science*, **117**(1–2), 63–68.

Mason, G., Clubb, R., Latham, N. *et al.* (2007) Why and how should we use environmental enrichment to tackle stereotypic behavior? *Applied Animal Behaviour Science*, **102**, 163–188.

McDermott, J. and Hauser, M. (2007) Nonhuman primates prefer slow tempos but dislike music overall. *Cognition*, **104**, 654–668.

Mills, D.S. and Mills, C.B. (2001) Evaluation of a novel method for delivering a synthetic analogue of feline facial pheromone to control urine spraying in cats. *The Veterinary Record*, **149**(7), 197–199.

Newberry, R.C. (1995) Environmental enrichment: Increasing the biological relevance of captive environments. *Applied Animal Behaviour Science*, **44**, 229–243.

Ottway, D.S. and Hawkins, D.M. (2003) Cat housing in rescue shelters: A welfare comparison between communal and discrete-unit housing. *Animal Welfare*, **12**, 173–189.

Patronek, G.J. and Sperry, E. (2006) Quality of life in long-term confinement, in *Consultations in Feline Internal Medicine*, Vol. 5 (ed J.R. August), W.B. Saunders Company, St. Louis, Missouri, pp. 621–634.

Podbersek, A.L., Blackshaw, J.K. and Beattie, A.W. (1991) The behaviour of laboratory colony cats and their reactions to a familiar and unfamiliar person. *Applied Animal Behaviour Science*, **31**, 119–130.

VetBooks.ir

Rochlitz, I. (2002) Comfortable quarters for cats in research institutions, in *Comfortable Quarters for Laboratory Animals*, 9th edn (eds V. Reinhardt and A. Reinhardt), Animal Welfare Institute, Cambridge, UK, pp. 50–55.

Rochlitz, I. (2005) A review of the housing requirements of domestic cats (*Felis silvestris catus*) kept in the home. *Applied Animal Behaviour Science*, **93**, 97–109.

Schipper, L.L., Vinke, C.M., Schilder, M.B.H. *et al.* (2008) The effect of feeding enrichment toys on the behavior of kennelled dogs (*Canis familiaris*). *Applied Animal Behaviour Science*, **114**, 182–195.

Scott, J.P. and Fuller, J.L. (1965) *Genetics and the Social Behaviour of the Dog*, University of Chicago Press, Chicago.

Taylor, K.D. and Mills, D.S. (2007) The effect of kennel environment on canine welfare: A critical review of experimental studies. *Animal Welfare*, **16**, 435–447.

Timmins, R.P., Cliff, K.D., Day, C.T. *et al.* (2007) Enhancing quality of life for dogs and cats in confined situations. *Animal Welfare*, **16**(5), 83–87.

Tod, E., Brander, D. and Waran, N. (2005) Efficacy of dog appeasing pheromone in reducing stress and fear related behaviour in shelter dogs. *Applied Animal Behaviour Science*, **93**, 295–308.

Wells, D.L. (2004) A review of environmental enrichment for kennelled dogs, *Canis familiaris*. *Applied Animal Behaviour Science*, **85**(3–4), 307–317.

Wells, D.L. (2009) Sensory stimulation as environmental enrichment for captive animals: A review. *Applied Animal Behaviour Science*, **118**(1–2), 1–11.

Wells, D.L. and Hepper, P.G. (1999) Male and female dogs respond differently to men and women. *Applied Animal Behaviour Science*, **61**, 341–349.

Wells, D.L. and Hepper, P.G. (2000) The influence of environmental change on the behaviour of sheltered dogs. *Applied Animal Behaviour Science*, **68**, 151–162.

Young, R.J. (2003) *Environmental Enrichment for Captive Animals*, Universities Federation for Animal Welfare, Oxford, UK.

Zawistowski, S. (2005) Effects of environmental enrichment on pet well-being. Paper presented at the North American Veterinary Conference, Orlando, Florida.

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35
Animal Behavior Forensics: Evaluation of Dangerous Dogs and Cruelty Victims

Pamela J. Reid

INTRODUCTION

Shelters are frequently faced with caring for animals who are embroiled in legal cases. The case may concern an animal who carried out a serious attack on a person or other animal, or the shelter might be housing a group of animals seized from a neglectful or abusive situation. If legal action is pending, the court or one of the litigators may request that the animals undergo behavior evaluations. Depending on the case, an animal behaviorist may be brought in or the shelter's behavior staff may be asked to perform the evaluations. This chapter outlines the history of forensic behavior evaluations and makes recommendations for appropriate assessment tools.

DANGEROUS DOGS: SERIOUS AND FATAL DOG ATTACKS

The earliest documented behavior evaluations were conducted on dogs who had attacked and seriously injured or killed people. The objective of these evaluations was to determine the circumstances that elicited or escalated the attacks. Consequently, the evaluations took the form of a simulated re-enactment of the event. For instance, Borchelt *et al*. (1983) assessed a group of dogs who chased, brought down, and nearly killed an 11-year-old boy. They arranged for a trainer, protected by a padded suit, to run away from the dogs. The dogs, enclosed in a football field, did not attack the running man until a motorcycle went by the fence. The dogs chased the vehicle and then redirected their chase on to the man. Screaming, kicking, and struggling prompted the dogs to escalate their attack. The researchers conducted the same test with a group of similar dogs with no known history of aggressive behavior. These dogs did not chase the motorcycle or the running man, nor did they display any aggressive behavior. On the basis of the results of the evaluation, researchers concluded that the dogs were likely searching for or chasing prey when they came across the boy playing in a field and attacked him.

A second case reported by Borchelt *et al*. (1983) involved six dogs believed to have killed an 81-year-old woman in her home. There was public skepticism that the dogs were capable of such an attack, given their small stature and timid natures. However, the evaluation revealed that when an unfamiliar person approached the group of dogs directly, they barked, growled, and attempted to bite. The person had to use a broom to ward them off. Next, the dogs were presented with a large doll, suspended by a stick, moving toward them. The dogs barked and bit the doll's legs and torso. When the doll was released as though falling as the victim might have done, the dogs began biting and tugging at the doll's head,

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neck, and extremities. The pattern of this attack was consistent with the injuries sustained by the victim. The same tests conducted with a group of four shelter dogs with no known history of attacking humans provoked no aggressive behavior toward the person or the doll. The researchers were able to state that five of the six dogs likely took part in the attack on the woman.

In these examples, the general attack scenario was known. The researchers were tasked with confirming that the dogs were capable of carrying out such attacks. Hence, the assessment protocol was tailored to mimic the circumstances of each event. In such cases, the prosecution may want to know the specifics of the attack, including whether the victim behaved in a way that triggered the dog to behave aggressively, or whether the owner had cause to believe the dog was dangerous. Alternatively, the owner may desire an evaluation of the dog to support his or her claim that the dog is not dangerous or that the circumstances were sufficiently unusual as to provoke any dog.

It is rare for dogs to attack and seriously injure or kill people. Thus, it is important not only from a legal standpoint but also from a scientific perspective to gather as much information about dogs involved in life-threatening attacks as possible.

ANIMAL CRUELTY CASES

Victims of cruelty comprise another group of animals that often becomes the focus of legal cases. Court cases involving animals from dogfighting, hoarding, or puppy mill situations may be strengthened by the information provided by a behavior evaluation. In a dogfighting raid, for instance, supportive evidence such as the ancillary tools of the trade (see the chapter on animal fighting) may be unavailable. Assessing the dogs' behavior toward other dogs can expose the unique style of the pit-fighting animal, thereby supporting a conviction of organized dogfighting.

Even if behavioral evidence is unnecessary for the case, animals seized in cruelty cases need to be assessed to determine their disposition, that is, their suitability for rehoming, sanctuary, or euthanasia. Since the widely publicized Michael Vick dogfighting case of 2007, the public has lauded animal welfare organizations for their efforts to rehabilitate and rehome cruelty victims whenever possible. Unfortunately, fighting dogs are often too aggressive toward other animals to be safely adopted by the public, and animals from puppy mills or hoarding environments may be so poorly socialized and fearful that they can never make suitable pets. But it is important to acknowledge that these problems are not characteristic of all individuals. Some animals are amazingly resilient and appropriate for placement. To develop evaluations that can identify such animals, behaviorists have relied upon experience gleaned from assessing animal perpetrators of attacks and from evaluating populations of shelter dogs.

The primary goal of a disposition evaluation is to gain an overview of the dog's characteristic behavior patterns, potentially uncovering behaviors that could prove problematic for the dog's future as a pet, as a working animal, or as a resident in a long-term sanctuary. Therefore, it is recommended to start with a behavior evaluation that presents a range of everyday experiences. The two most thorough programs currently used to evaluate dogs in American shelters are the Assess-a-Pet™ (Sternberg, 2002) and Match-Up II (Animal Rescue League of Boston, 2011). Alternatively, SAFER (ASPCA, 2008a) can be enhanced with additional subtests to render it more complete for this application.

The tester should be unfamiliar to the dog. It is best to have at least two people involved in the evaluation process: a tester and a handler. The handler's primary role is to restrain the dog and keep the tester safe while he or she presents stimuli to the dog. Both tester and handler should be well versed in defensive-animal handling techniques. The testing progresses more efficiently if there is also a scorer who records the dog's responses on a standardized form. Each of the evaluations named above has corresponding score sheets on which the scorer can record the animal's responses. For legal, teaching, or research purposes, it is also advisable to have a videographer tape the evaluation.

THE STANDARD BEHAVIOR EVALUATION

A typical shelter behavior evaluation consists of the following components:

- Initial greeting and cage behavior. This subtest assesses how the dog reacts to approach by a friendly stranger when the dog is in an enclosed

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space. While most dogs will be focused on escaping confinement or engaging in friendly interaction, some dogs will react aggressively, especially if the dog perceives himself as "trapped." If it can be done safely, the dog should always be removed from the kennel for the remainder of the evaluation, as his behavior may change once unconfined. This might require having someone who has befriended the dog remove him or taking the dog out with a catch pole.

- Handling. There are many different procedures for appraising the dog's reaction to being handled by a stranger, and there is no evidence to suggest that one procedure is any more informative than another. Some evaluators advocate handling that focuses on the dog's body and feet, others on the dog's head and mouth. It is recommended to begin with friendly, noninvasive touch, such as gentle strokes along the dog's shoulders, sides, and rump (see Figure 35.1). This reveals if the dog is comfortable with nonthreatening contact. It also establishes the beginning of a relationship between the tester and the dog.

  Then advance to less pleasurable contact, such as lifting and manipulating a paw or pinching the webbing between the toes, holding the dog's muzzle closed, opening the dog's mouth, or pinching the dog's thigh. This invasive handling assesses how the dog responds when the touch is displeasing or even mildly painful and is similar to what might happen during grooming or a visit to the veterinarian. A full range of responses across dogs may be expected to be seen: playful and friendly, mild discomfort, wariness, extreme fear, and aggression.
- Play. Some dogs become highly aroused during play with a person, so it is useful to determine whether arousal manifests itself as unruly, rambunctious play, mouthiness, sexual behavior, or aggression. The play can take the form of short bursts of tag with the tester or tug-of-war with an appealing toy. Dogs who were not kept as pets often do not respond appropriately to play invitations. They react as though afraid of the tester or the toy, or they simply follow the tester without exhibiting play behavior. This does not mean that they cannot learn to play; it simply reveals they have never had the experience of playing with humans. If the dog appears especially unnerved by the tester's attempts to play, take a few moments for calm interaction with the dog so that the subsequent tests are not unduly influenced by this experience.
- Food guarding. It is recommended to test the dog with canned food or a mixture of canned food and kibble, as most dogs find moist food more palatable and, therefore, are more likely to guard it than dry food. There is much controversy among experts over how much to "push" a dog during the food-guarding test. The goal is to expose the dog to experiences he is likely to encounter in a home, so it would seem that a moderate level of interference is appropriate. The dog should be permitted to eat for several seconds. Then, the tester approaches the dog from behind, saying something innocuous like, "What do you have?" Using a commercially available Assess-a-Hand, which is a fake human hand affixed to a stick, the tester touches the dog on the withers and on the back of the neck. Next, the tester touches the dog on the side of the face while saying something like, "What do you have?" or "Can I have that?" The tester then becomes more forceful—pressing against the side of the dog's face to push him out of the bowl while saying sternly, "Get out of that!" (see Figure 35.2).



Figure 35.1. Tester massages dog firmly along the sides of the body to assess dog's reaction to comfortable handling.

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Figure 35.2. Tester uses fake hand to gauge dog's reaction to being pushed away from a valued resource, such as food or chew bones.



Figure 35.3. A toddler-sized doll is "walked" toward the dog to simulate an approach by a child.

If the dog displays no interest in eating, this should be scored as a "no test," as there is no information on which to base a decision. If the dog responds aggressively during this subtest, permit him time to "de-arouse" before proceeding.

- Chew bone guarding. Testing the dog's tendency to guard a chew bone follows the same protocol as the food bowl subtest. A highly desirable item, such as a bully stick or a pig ear rather than a rawhide, should be used. The dog should be permitted to have the item for several seconds. The handler can allow the dog to move with the bone to a more comfortable or secluded area, provided that the new location does not compromise the tester's safety. The same sequence of interference is followed as for the food-guarding test. If the dog picks up the bone and avoids the tester but exhibits no aggression, the handler can shorten the leash to prevent the dog from moving away. This will reveal if the dog will become aggressive when cornered.

  If the dog shows no interest in the chew item, this should be scored as a "no test," as there is no information on which to base a decision. If the dog responds aggressively during the subtest, permit him time to "de-arouse" before proceeding.
- Doll test. The use of a toddler-sized doll to simulate the approach of an unfamiliar child is a controversial test. Evidence for a correlation between real-life responses to children and dolls is mixed (Borchelt *et al*., 1983; Wright and Lockwood, 1987; Kroll, Houpt and Erb, 2004). There is some suggestion that the use of a doll measures the dog's reaction to novelty, which may underlie some dogs' aggressiveness toward children (Penny and Reid, 2001).

  The tester should appear from behind a barrier with the doll as though they are walking together hand-in-hand. The tester speaks in a child-like voice and approaches the dog directly. As the doll nears the dog, the handler should permit the dog to approach the doll, keeping the leash low and slightly taut, in case the dog lunges at the tester (see Figure 35.3).

  After a few seconds, the doll should make a sudden movement, such as lurching forward, to ascertain the dog's reaction to an unpredictable gesture. If the dog continually moves away from the doll but exhibits no aggression, the handler should shorten the leash and prevent the dog from avoiding the doll to gauge if the dog would be aggressive when cornered by a child. This is important to know, as tethering is a significant risk factor in dog bites (Gershman, Sacks and Wright, 1994).
- Threatening stranger test. The purpose of this subtest is to see what the dog does when faced with an intimidating person. It also reveals how the dog responds to drastic changes in human behavior (Vas *et al*., 2008). While the handler restrains the

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dog with a low, taut leash, the tester should appear from behind a barrier. Yelling at the dog and making threatening gestures, the tester should move directly toward the dog. The handler must remain especially vigilant during this test to prevent the dog from lunging at the tester while still giving the dog the freedom to exhibit his natural reaction. Once in close proximity, the tester should relieve pressure on the dog by turning to the side and speaking to the dog in a conciliatory manner. If the dog exhibits friendly behavior, the handler should allow the dog to approach the tester, and the tester can reciprocate with friendly interaction. At no time should the tester approach the dog if he does not appear relaxed.

This test is sensitive to the sex of the tester. If possible, it is most informative to use a male tester, as dogs tend to be more reactive to a man than to a woman (Lore and Eisenberg, 1986; Netto and Planta, 1997).

- Dog–dog test. Testing how the dog responds to other dogs is usually the most difficult component of the evaluation because it poses significant safety risks to both the test dog and the stimulus (helper) dog. It is also challenging to find the right type of stimulus dog. A stimulus dog should be moderately social and tolerant of boorish or aggressive behavior. It is crucial to be observant if using the same stimulus dog for repeated tests. A dog that starts off friendly can quickly become defensive after a few experiences with unruly or aggressive test dogs.

Conducting a behavior evaluation requires superb dog-handling skills and consistent presentation of stimuli. Observing and scoring the dog's behavior demands a high degree of expertise and experience. The most significant challenges for interpretation are distinguishing between rough play, play tempered by fear, unruliness and lack of manners, courtship and sexual behavior, aggressive threats (bluff), and actual aggression. To be fair to the dog, it is imperative to restrict conclusions to what is observed. For instance, a rigid body stance or a hard stare may not always be a precursor to aggression. The behavior should be noted, and the dog may need further testing. Behaviors believed by some to be "warning signs" for aggression, such as erecting the penis, swiping the genitalia against the handler, intense prolonged sniffing of the environment, and shoulder rubbing, are wholly unsubstantiated and should not be considered in the decision-making process.

ADDITIONAL EVALUATION OF FIGHTING DOGS

Dogs confiscated from fighting environments tend to be less likely to exhibit aggression toward people than dogs from general shelter populations (Personal observations by the authors). However, they need to be evaluated extensively for aggressive behavior toward other dogs. In addition to implementing the standard behavior evaluation, it is recommended that additional dog–dog testing be conducted. The characteristic physical scarring (see the chapter on animal fighting) is evidence that the dog has been fought, but this does not mean it was a willing fighter. Some dogs from fighting stock will attack other dogs at the first opportunity, even if they have had no fighting experience, while others need to be encouraged before they develop the tendency to fight. Even young dogs should be evaluated, as aggression toward other dogs can emerge as early as 10 weeks of age (Clifford, Boatfield and Rubright, 1983).

Careful selection of stimulus dogs is critical when evaluating fighting dogs. Two subtests should be conducted: one with a stimulus dog of the opposite sex and one with the same sex. Fighting dogs may be more likely to react favorably, that is, nonaggressively to an opposite-sex dog, so that should be the first in the sequence. Although it is not always possible due to medical or logistical reasons, stimulus dogs should be completely unrelated to the case. If this is not possible, try to learn which dogs might have been fought together and avoid pairing those up. It should also be determined where dogs were situated in the fighting yard to make sure paired test dogs and stimulus dogs were not tethered next to each other. These dogs will be less reactive to each other than to a novel dog (T. Mills, personal communication).

For safety reasons, it is recommended that dogs initially be introduced on opposite sides of a barrier, such as a chain-link fence. The dogs should be restrained on leashes to prevent contact, as ears, paws, tails, and lips can still be bitten through a fence. If the dogs appear friendly, uninterested or avoidant, move the dogs away from the barrier and permit



Figure 35.4. The test dog's reaction to a friendly "helper dog" is assessed by having the dogs in close visual contact. If the test dog appears to be nonaggressive, the dogs are permitted to greet. Leashes are kept taut to allow handlers to pull the dogs apart quickly if necessary. However, handlers should ensure that the leashes do not interfere with the natural behavior of the dogs.

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them to approach each other directly. Stop when they are still 0.6–1.5 m (2–5 feet) away. If the test dog displays neutral or friendly behavior, carefully allow the two to greet nose-to-nose (see Figure 35.4).

If it is unclear whether the test dog will respond aggressively, it is advisable to muzzle the test dog and then bring the dogs together. Unfortunately, sometimes the test dog will be too distracted by the muzzle to display normal behavior. If this is the case, the test provides insufficient information and should be scored as a "no test."

Handling the dogs properly is a critical skill for the dog–dog tests. The dogs should wear thick buckle collars to avoid discomfort. Their leashes should be slightly taut to maintain control while at the same time exert minimal pressure on their necks to avoid frustration-elicited aggression. Each handler should hover close to the dog, moving in such a way as to prevent the leashes from becoming entangled while staying directly behind the dog's rear in case the dogs need to be pulled away from each other.

Some behavior experts believe that it may be informative to test the dog with a fake dog, such as a life-sized plush toy. A preliminary study indicates that there may be some validity to this procedure with dogs that have a history of fighting other dogs (Reid, Collins and Martinez, manuscript in preparation). A fake dog that is standing erect, with short hair and visible eyes to ensure it appears dog-like, should be used. It should be presented wearing a leash and collar and accompanied by a handler. The test dog should be held on a leash to guard against redirected aggression onto one of the handlers. Position the fake dog to stand still, or move it forward toward the test dog. The handler should permit the test dog to approach the fake dog on a loose lead (see Figure 35.5).

If the test dog postures toward the fake dog, tug the leash to make the fake dog move slightly forward. If the test dog continues to posture by assuming a stiff body position and a strong focus on the fake dog, move the fake dog so as to make contact with the test dog's face ("sniffing") or with the test dog's withers ("standing over"). At some point, allow the fake dog to fall in front of the test dog. This may elicit aggression. If the test dog interacts with the fake dog, it is important to distinguish between play, sexual behavior, and aggression. In some instances, these can be challenging distinctions for even an experienced observer to make.

In most cases, dogs confiscated from dogfighters are reproductively intact. It has not been scientifically documented if dogs change in their response toward other dogs following spaying or neutering as mature animals. However, anecdotes support that if an adult male dog exhibits sexual behavior toward other dogs prior to neutering, he probably still will after neutering. Likewise, unless the female is in estrous during testing, her behavior toward other

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Figure 35.5. It is recommended that dogs from dogfighting cases be assessed with a fake dog first. If the dog displays aggression toward the fake dog, it is likely that the dog will exhibit similar aggressive behavior toward a helper dog. This approach minimizes the risk of injury to dogs and handlers.

dogs is unlikely to be influenced by her reproductive status.

Dogs with a history of fighting or a strong predisposition toward fighting often exhibit extreme aggressive reactions toward other dogs. These dogs typically focus intensely on the stimulus dog. They may lunge and pull in an attempt to make contact with the dog or they may move in a slow, stalking fashion. Some growl and snap, others bark excitedly, and still others are silent. With the fake dog, they either attack with no hesitation or they launch an attack once the fake dog rears up or falls down. The attack is usually characterized by full-mouthed bites, holds, and shakes. These dogs are unsafe around other animals. At this point in time, there is no information as to the effectiveness of behavior modification, so euthanasia is the recommended outcome.

ADDITIONAL EVALUATION OF HOARDER AND PUPPY MILL DOGS

A comprehensive assessment of hoarder and puppy mill dogs should include the standard behavior evaluation plus additional tests for fear and sociability. While these animals tend to be extremely social with other dogs, their sociability with people and their reaction to novelty can be highly abnormal. Dogs raised in impoverished (barren or unenriched) environments have been shown to exhibit a variety of behavioral deficits, including excessive fear of strangers, defensive aggression toward people, catatonia, frenetic and inappropriate activity, and inferior learning and problem-solving abilities (Clarke *et al*., 1951; Thompson and Heron, 1954a, 1954b; Fisher, 1955; Thompson and Melzack, 1956; Freedman, King and Elliot, 1960). Long-term follow-up on dogs adopted from puppy mills confirms that often these deficiencies are relatively permanent (McMillan, Duffy and Serpell, 2011).

The evaluation should start with the tester seated and the dog loose in a room. The tester should refrain from soliciting interaction with the dog and, instead, focus on a book or handheld device. After 1–2 minutes, the tester actively interacts with the dog. These subtests give the dog time to acclimate to the testing environment and indicate how motivated the dog is to socialize with people.

Toward the end of the evaluation, include additional fear subtests. Fear responses easily compound on each other, so it is important to give the dog time to recover between subtests. King, Hemsworth and Coleman (2003) found that exposing a dog to a slowly moving remote-controlled car provides a measure of the dog's response to novelty. They placed the car a few feet from the dog and moved it away from the dog until it hit a wall. The dog was subsequently observed for 60 seconds to see if it would

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investigate the car. King, Hemsworth and Coleman (2003) also determined that a dog's response to an umbrella opening and closing provides a measure of its startle response. To also get an indication of recovery time, give the dog a bowl of food, open and close the umbrella, monitor the dog's behavior for 60 seconds, remove the umbrella, and return to the dog. This sequence reveals those dogs who are too frightened to resume eating. Some dogs rapidly form an association between the scary umbrella and the tester and become frightened of the tester, even though the umbrella is no longer present.

Dogs from hoarding and puppy mill situations are often so unsocialized that it is difficult, if not impossible, to evaluate them. Most have never been in novel environments. Few have interacted with unfamiliar people. Many have never worn a collar and leash or experienced any form of restraint before. It may be necessary to skip subtests that might prove too frightening for the dog, such as the play and umbrella tests. Sometimes it is helpful to conduct the dog–dog test early in the evaluation to bring the test dog out of his shell before proceeding.

Dogs who exhibit no sociability toward humans are unlikely to make suitable pets. Those dogs who panic to the point of self-injury and those who are catatonic in novel environments should be humanely euthanized. Even though some of these dogs eventually become somewhat tame in home-like surroundings, they are rarely able to cope with everyday stressors. McMillan, Duffy and Serpell (2011) found that 83% of former puppy mill breeding dogs still exhibit behavior problems in the home, including fear, house-soiling, sensitivity to being touched, and compulsive behaviors. Their quality of life can be severely compromised.

CATS

Cats who have been victims of cruelty, particularly hoarding, should be evaluated for their tameness. Hoarder cats can be comparable to feral cats in their behavior if they have had limited contact with people. There is currently no accepted protocol for distinguishing between unsocialized cats and those temporarily stressed from being in the shelter environment, although research is currently underway to develop such a test (Katherine Miller, personal communication). For cats who can be evaluated, the ASPCA's Feline-ality (ASPCA, 2008b) is a good procedure for matching cat behavioral tendencies with adopter preferences.

DISPOSITION

The results of a behavior evaluation should be used in conjunction with medical findings to determine the best possible outcome for victims of animal cruelty. Many will be suitable as pets and can be funneled into rescue groups and shelters for placement. Some may need a period of socialization or behavior modification provided by shelters, rescue groups, or experienced fosterers before being considered for placement. Animals who are inappropriate as companions, either because of severe aggression or due to a compromised quality of life, should either be humanely euthanized or placed in long-term sanctuary housing. If a sanctuary is to be considered, serious thought should be given to whether the animal would experience an acceptable quality of life. Often these refuges are densely populated with limited opportunities for substantive contact with caretakers. Animals who are highly social and can live in conspecific groups may be best suited for sanctuary life.

CONCLUSION

Evaluating the behavior of animal perpetrators of attacks on humans and animal victims of cruelty is a fascinating area of animal forensic science. Not only do the results of such evaluations provide valuable information to the justice system and to shelter staff tasked with disposition, but also these data give important insight into special populations of animals. Furthermore, behavior evaluations enable the identification of abused animals who can make suitable pets and be successfully integrated into society.

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REFERENCES

Animal Rescue League of Boston (2011) http://www.centerforshelterdogs.org/Home/DogBehavior/MatchUpII.aspx.

ASPCA (2008a) http://www.aspcapro.org/aspca-safer.php.

ASPCA (2008b) http://www.aspcapro.org/feline-ality-faqs.php.

Borchelt, P.L., Lockwood, R., Beck, A.M. and Voith, V.L. (1983) Attacks by packs of dogs involving

predation on human beings. *Public Health Reports*, **98**, 57–66.

Clarke, R.S., Heron, W., Fetherstonhaugh, M.L. *et al*. (1951) Individual differences in dogs: Preliminary report on the effects of early experience. *Canadian Journal of Psychology*, **5**, 150–156.

Clifford, D.H., Boatfield, M.P. and Rubright, J. (1983) Observations on fighting dogs. *Journal of the American Veterinary Medical Association*, **183**, 654–657.

Fisher, A.E. (1955) The effects of differential early treatment on the social and exploratory behavior of puppies. Doctoral dissertation. Pennsylvania State University.

Freedman, D.G., King, J.A. and Elliot, O. (1960) Critical period in the social development of dogs. *Science*, **133**, 1016–1017.

Gershman, K.A., Sacks, J. and Wright, J.C. (1994) Which dogs bite? A case-control study of risk factors. *Pediatrics*, **93**, 913–917.

King, T., Hemsworth, P.H. and Coleman, G.J. (2003) Fear of novel and startling stimuli in domestic dogs. *Applied Animal Behaviour Science*, **82**, 45–64.

Kroll, T.L., Houpt, K.A. and Erb, H.N. (2004) The use of novel stimuli as indicators of aggressive behavior in dogs. *Journal of the American Animal Hospital Association*, **40**, 13–19.

Lore, R.K. and Eisenberg, F.B. (1986) Avoidance reactions of domestic dogs to unfamiliar male and female humans in a kennel setting. *Applied Animal Behaviour Science*, **15**, 262–266.

McMillan, F.D., Duffy, D.L. and Serpell, J.A. (2011) Mental health of dogs formerly used as 'breeding stock' in commercial breeding establishments. *Applied Animal Behaviour Science*, **135**, 86–94.

Netto, W.J. and Planta, D.J.U. (1997) Behavioural testing for aggression in the domestic dog. *Applied Animal Behaviour Science*, **52**, 243–263.

Penny, N.J. and Reid, P.J. (2001) Canine aggression toward children: Are simulations valid tools? in *Proceedings of the 3rd International Congress on Veterinary Behavioural Medicine* (eds K.L. Overall *et al*.), Universities Federation for Animal Welfare Publications, Wheathampstead, UK.

Sternberg, S. (2002) *Great Dog Adoptions: A Guide for Shelters*, The Latham Foundation, Alameda, CA.

Thompson, W.R. and Heron, W. (1954a) The effects of restricting early experience on the problem-solving capacity of dogs. *Canadian Journal of Psychology*, **8**, 17–31.

Thompson, W.R. and Heron, W. (1954b) Exploratory behavior in normal and restricted dogs. *Journal of Comparative and Physiological Psychology*, **47**, 77–82.

Thompson, W.R. and Melzack, R. (1956) Early environment. *Scientific American*, **194**, 38–42.

Vas, J., Topál, J., Győri, B. *et al*. (2008) Consistency of dogs' reactions to threatening cues of an unfamiliar person. *Applied Animal Behaviour Science*, **112**, 331–344.

Wright, J.C. and Lockwood, R. (1987) Behavioral testing of dogs implicated in a fatal attack on a young child. Paper presented at the Animal Behavior Society meeting, Williamstown, MA.

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36
Behavioral Pharmacotherapy in the Animal Shelter

Amy Marder

INTRODUCTION

Behavioral pharmacotherapy (the use of drugs to treat behavior problems) is now commonly prescribed as part of veterinary behavioral therapy programs (Simpson and Papich, 2003). Developments over the past decade have allowed practitioners to rationally use psychotropic drugs to aid in the treatment and management of difficult behavioral problems in dogs and cats. Drug therapy is rarely prescribed alone, but as an adjunct to a behavior modification program. The same behavior problems that are successfully treated with the help of drug therapy in owned animals are also seen in shelter animals. Unfortunately, animals in shelters often do not have the close scrutiny that owners can give or a person to implement a consistent behavior modification program, making the use of safe and effective drug therapy difficult in the shelter environment. Some shelters, however, now have the advantage of having full-time veterinarians on staff who can diagnose behavior problems and prescribe drug therapy along with behaviorists or trainers who can design and implement behavior modification programs, making the treatment of behavior problems with the help of drug therapy more feasible.

INITIATING DRUG THERAPY

Before drug therapy is considered, a shelter veterinarian should do the following:

Make a Behavioral Diagnosis

As with any disease, an effective treatment protocol requires that a diagnosis be made. Information necessary to make the diagnosis can be obtained from several sources. Behavioral problems may have existed in the previous home, so a thorough behavioral history taken before or at intake to the animal shelter is necessary to reveal previous problems. Unfortunately, behavioral information obtained at intake relies on owner reports and is sometimes inaccurate, and little or no previous behavioral information can be obtained for strays. Behavioral problems may also arise while animals are housed in the shelter, making careful monitoring of behavior by staff necessary to make a diagnosis. Furthermore, many shelter animals now receive formal behavioral evaluations, which may reveal other behavior problems and are also a tool to obtain information necessary to make a diagnosis.

Be Familiar with Indications, Doses, Side Effects, and Contraindications of the Drugs that are Likely to be Prescribed

After the diagnosis is made, a treatment plan consisting of behavior modification and drug therapy can be prescribed. A physical exam, complete blood count (CBC), and blood chemistry screen may be required to identify any possible contraindications for drug therapy. A low dose of the drug is likely to minimize

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side effects and can be increased if no serious side effects are seen. Daily monitoring and recording of behavioral and medical effects are essential.

Prescribe a Concurrent Behavior Modification Program

Drug therapy is most effective when used as a part of a behavioral therapy program. The behavioral therapy program can be designed by an animal trainer but should be approved by the veterinarian responsible for treatment. Before prescribing drug therapy, competent staff members or volunteers should be recruited and trained to implement the behavioral therapy program to ensure consistency.

Train Staff to Administer Drug Therapy

Just like drug therapy for medical problems, psychotropic drugs may be administered by several routes. Competent staff must be available to treat the animals. As most of the psychotropic drugs are readily available in oral preparations, this is the route most commonly employed. For difficult animals, medication can be administered in meals if the animal is eating. This can be accomplished by placing the medication in a small amount of food and observing the animal to ensure the medication is consumed in its entirety prior to feeding the balance of the meal. There are commercial preparations available to make medications more palatable, including FLAVOR X; having a compounding pharmacy to prepare the medication in a flavored base is another option. Although it may be attractive to use the transdermal route to deliver psychotropic medication, it is uncertain if therapeutic blood levels are obtained (Ciribassi *et al.,* 2003).

Prepare to Monitor Animals for Effect and Side Effects

All animals on drug therapy must be monitored daily, not only to determine if the treatment is effective, but also to determine as soon as possible if there are any side effects. Many of the psychotropic drugs diminish appetite, which can be detrimental to stressed shelter animals. Staff must be aware of the side effects of the medications used so that they can watch for them.

Many drugs require weeks to see their full therapeutic effect; however, it is not unusual to see beneficial effects sooner. Many shelters do not have the space to keep animals long enough to see the full effects of the drugs. Fostering an animal for at least 1 month while on drug therapy would allow staff to see the effect of longer-term drug therapy in a home environment. However, changes that are seen in a foster home may not carry over to the shelter environment, and it might be best to adopt the animal directly from the foster home.

EXPENSE

Most of the commonly used psychotropic drugs are available in generic forms, and many pharmacies have programs for people with limited income, keeping the cost of the drugs affordable. The cost of the veterinary forms of the drugs is usually higher. The prescribing veterinarian should be knowledgeable about affordable programs. Many, if not most, of the drugs are not approved for use in dogs and cats, and thus are prescribed and used extra-label. And because many shelter animals have incomplete medical histories, the prescribing veterinarian must decide if a preliminary CBC and chemistry profile are necessary for safety purposes before starting drug therapy, as the blood work is an additional expense.

ADOPTION AND FOLLOW-UP

If an animal is placed on drug therapy while in the shelter and the therapy seems to be effective, the animal will most likely need to go home with drug therapy. Some people are reluctant to agree to the cost and responsibility of continuing therapy, thus reducing the animal's adoptability. Animals sent home on drug therapy also need to be followed up by the prescribing veterinarian.

Although it is true that tests to monitor the drug therapy would be an additional expense, in practice this hardly ever happens. Once the animal's behavior is stable after adoption, the new owner can be advised to gradually wean the animal off drug therapy. In most cases adopters end up discontinuing drug therapy on their own.

WHEN DRUG THERAPY SHOULD BE CONSIDERED

When an animal's well-being is compromised by shelter life, and enrichment techniques such as exercise, companionship, and training have proved ineffective in improving the animal's state, drug therapy should be considered. Examples are anxious/fearful

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animals who are continuing to hide or tremble after 2 or 3 days and are not showing essential normal behaviors such as eating, eliminating, and grooming, are overactive, or are exhibiting compulsive behaviors. Dogs with a history of separation anxiety most often do not show signs while in the shelter but can benefit from a behavioral treatment program and drug therapy. Urine marking in both dogs and cats (spraying) is also reduced with drug therapy. As aggressive animals may become more aggressive after treatment with many psychotropic drugs, it is advised that they not be treated with drugs.

Pheromone therapy may also be effective in reducing the stress associated with shelter housing. See Table 36.1 for a list of psychotropic drugs that may be suitable for use in shelter animals.

Anxiety

Some animals exhibit extreme fear/anxiety when introduced to the shelter environment. Some are afraid of the environment and some are afraid of people. Most acclimate within days, while others fail to do so. If standard enrichment techniques do not reduce the anxiety, and alternative housing, such as foster care, is not available, anti-anxiety medication may be helpful. However, as some anti-anxiety medication may disinhibit aggression (Simpson and Papich, 2003), close monitoring is required to ensure the safety of the shelter staff.

Fearful cats who continue to hide, sometimes in their litter boxes, despite the use of hide-and-perch boxes or visits from people, may benefit from treatment with benzodiazepines. Due to hepatotoxicity associated with diazepam, alprazolam is preferred at the dose of 0.125 mg/cat once or twice daily. The alprazolam can be mixed with a flavor, condensed milk, or water from a can of tuna fish and mixed with a small amount of food. Dogs who are anxious may hide or become overactive. These dogs may be helped by treatment with fluoxetine (1 mg/kg) or paroxetine (1 mg/kg) once daily.

Compulsive Behaviors

The conflict and frustration experienced by shelter animals may result in the appearance of compulsive behaviors. Compulsive behaviors are repetitive, sustained, and out of context. Common compulsive behaviors seen in dogs housed in shelters are tail chasing, pacing, jumping, weaving, self-licking, leg or foot chewing, self-directed aggression, cage licking, and persistent barking. In cats, tail chasing, tail chewing, and overgrooming may be observed. There appears to be a genetic predisposition for compulsive disorders. German Shepherds and American Pit Bull Terriers tend to tail chase, while Doberman Pinschers flank suck (Luescher, 2003; Dodman *et al*., 2010). It is also probable that compulsive behaviors are more likely to appear when animals are housed in confinement for longer periods of time and when animals are going through transitions.

Behavior modification programs stressing consistency and activity can be combined with drug therapy to treat compulsive behaviors. Both clomipramine (Hewson, 1998) and fluoxetine (Rapaport, 1992; Irimajiri *et al*., 2009) have been shown to be effective in reducing compulsive behaviors. As it may take 4 weeks or longer to see an effect, it is imperative that a behavior modification program be implemented at the onset of drug therapy. Drug therapy should be continued for at least 3 weeks after a satisfactory reduction has been seen. The drug is then gradually weaned over 3–4 weeks (Luescher, 2003) while continuing behavior modification.

Separation Anxiety

Although dogs rarely show signs of separation anxiety while in the shelter, those with a history should be treated. A treatment program of short departures can be combined with treatment with fluoxetine (1 mg/kg) or clomipramine (2–4 mg/kg) (Takeuchi, Houpt and Scarlett, 2000).

Urine Marking

Many dogs urine mark when housed in the shelter and often during the adjustment in their new homes. Some cats also urine mark in the shelter and likewise may continue after adoption. Fluoxetine has been shown to reduce urine marking in both dogs (1 mg/kg) and cats (0.25 mg/cat) (Pryor *et al*., 2001).

Pheromone Therapy

Recently, the use of synthetic pheromone preparations has been promoted for the treatment of some behavioral problems. Investigators believe that their effect on individual behaviors could be explained by a generalized effect on stress reduction (Paget and Gaultier, 2003). If this is true, they are promising candidates for use in animal shelters.

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Table 36.1. Drugs used to treat behavior problems in dogs and cats.

Drug name	Canine dose	Feline dose	Uses	Relative cost	Side effects
Acepromazine	0.55–2.2 mg/kg[a]	1.1–2.2 mg/kg[i]	Chemical restraint	$	Hypotension, central nervous system (CNS) stimulation, contradictory responses; use with caution in Boxers and Greyhounds
Alprazolam	0.02–0.1 mg/kg PO q 8–12 h[b]	0.125–0.25 mg/cat q 12 h[c]	Anxiety, noise phobias, canine submissive urination, feline urine marking	$	Sedation, ataxia, increased appetite, paradoxical excitation
Amitriptyline HCl	2.2–4.4 mg/kg q 12–24 h[d,e]	5–10 mg/cat q 24[c,f] 2.5–5.0 mg/cat q 12–24 h[g]	Anxiety, canine/feline fear aggression, feline urine marking, feline displacement grooming, canine stereotypy	$	Sedation, gastrointestinal (GI) effects, dry mouth, increased thirst, urinary retention
Buspirone HCl	2.5–10 mg/dog q 12–24 h or 1.0–2.0 mg/kg q 12 h[f] 1.0 mg/kg q 8–12 h[h]	2.5–7.5 mg/cat q 12 h[h] 2.5–5.0 mg/cat q 8–12 h[c]	Phobia, anxiety, feline urine marking	$$	Uncommon; not sedating
Chlorpheniramine maleate	0.22 mg/kg q 8 h[i]	1–4 mg/cat q 12–24 h[i]	Sedation	$	Sedation, anticholinergic effects, GI effects
Clomipramine HCl	2–4 mg/kg q 24 h or divided q 12 h[j]	0.5–1 mg/kg q 24 h[k]	Canine separation anxiety, feline urine marking, compulsive disorder, feline hyperesthesia syndrome, feline psychogenic alopecia, canine acral lick dermatitis, phobia	$$	Sedation, GI effects, anticholinergic effects, cardiac effects
Clorazepate dipotassium	2 mg/kg q 12 h[f] 0.55–2.2 mg/kg q 4 h[l]	0.5–1.0 mg/kg q 12–24 h[l]	Anxiety, noise phobias, canine submissive urination, feline urine marking	$$	Sedation, ataxia
Cyproheptadine HCl		2 mg/cat q12 h[m]	Feline urine marking	$	Anticholinergic effects, sedation
Diazepam	0.55–2.2 mg/kg prn[h]	1–4 mg/cat q 12–24 h[f] 0.2–0.4 mg/kg q 12–24 h[n]	Phobia (canine or feline), feline urine marking	$	Rare cases of acute liver failure in cats, sedation, paradoxical excitation, muscle relaxation, increased appetite

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Doxepin HCl	3–5 mg/kg q 12 h (max dose 150 mg/dog q 12 h)[o]	0.5–1.0 mg/kg q 12–24 h[h]	Compulsive disorders resulting in self-mutilation, feline psychogenic alopecia	$$	Hyperexcitability, GI effects, lethargy
Fluoxetine HCl	1.0–1.5 mg/kg q 24 h[o]	0.5–1.0 mg/kg q 24 h[h,o]	Aggression, canine separation anxiety, compulsive disorders, feline urine marking	$$	Lethargy, inappetence, GI effects
Hydrocodone Bitartrate	0.25–1.0 mg/kg q 8–12 h[p]	1.25–5.0 mg/cat q 12–24 h[p]	Compulsive disorders resulting in self-mutilation	$	Sedation, constipation, GI effects
Imipramine HCl	2–4 mg/kg q 12–24 h[f]	0.5–1.0 mg/kg q 12–24 h[h]	Canine submissive urination	$	Sedation, anticholinergic effects
Medroxyprogesterone acetate	5–10 mg/kg SQ, IM; do not exceed three treatments per year[q]	10–20 mg/kg SQ[q]	Treatment of last resort for aggression and feline urine marking	$	Polyphagia, polydipsia, sedation, diabetes mellitus, pyometra, mammary hyperplasia, endometrial hyperplasia, carcinoma
Megestrol acetate	1.1–2.2 mg/kg q 24 for 2 wk, then 0.5–1.1 mg/kg q 24 for 2 wk[q]	5 mg/cat q 24 h for 2 months[r]	Treatment of last resort for aggression and urine marking	$	Same as medroxyprogesterone acetate
Melatonin	0.1 mg/kg q 8–12 h (with amitriptyline)[s]		Canine fear, phobia	$	Side effects appear to be minimal, but not well studied
Methylphenidate HCl	5 mg (small dog)–20 mg (large dog) q 8–12 h; do not give near bedtime[h] 2–4 mg/kg q 12–24 h[p]		Canine hyperkinesis	$$$$	CNS arousal, GI effects, inappetence, cardiac effects, hypertension, stranguria
Naltrexone HCl	2.2 mg/kg q 12 h[f]	25–50 mg/cat q 24 h[h]	Canine acral lick dermatitis, canine stereotypic behavior, compulsive disorders	$$$$	GI effects, insomnia, nervousness
Paroxetine HCl	0.5–1.0 mg/kg q 24 h[f]	0.5–1.0 mg/kg q 24 h[h] 1.25–2.5 mg/cat q 24 h[t]	Aggression, canine separation anxiety, compulsive disorders, feline urine marking	$$	Lethargy, GI effects, inappetence, constipation
Phenobarbital	2–8 mg/kg q 12 h[f] 1.5–2.0 mg/kg q 12 h[u]	2–3 mg/kg prn[i]	Canine/feline compulsive tail chasing, unprovoked canine rage aggression	$	Lethargy, ataxia, polyuria, polydipsia, polyphagia

(*continued*)

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Table 36.1. (*Continued*)

Drug name	Canine dose	Feline dose	Uses	Relative cost	Side effects
Phenylpropanolamine HCl	1.1 mg/kg q 8 h[v]		Canine submissive/excitement urination	$	Restlessness, hypertension, anorexia
Propranolol HCl	5–40 mg/dog q 8 h[o]	0.25 mg/kg prn[o]	Canine fear aggression, noise phobia	$	Bradycardia, lethargy, hypotension, syncope
Selegiline HCl	0.5–1.0 mg/kg q 24 h in am[w]		Canine cognitive dysfunction syndrome	$$	GI effects, restlessness or lethargy, anorexia
Sertraline	0.5–4.0 mg/kg q 24 h[h]	0.5–1.0 mg/kg q 24 h[h]	Anxiety, fear, aggression	$$	Sedation, GI effects

All doses are per os (oral) unless otherwise indicated.
prn, as needed; SQ, subcutaneous (beneath the skin); IM, intramuscular.
[a]Package Insert, Prom Ace®, Fort Dodge.
[b]Landsberg, Hunthausen and Ackerman, 1997.
[c]Marder, 1991.
[d]Juarbe-Diaz, 1997a.
[e]Juarbe-Diaz, 1997b.
[f]Papich, 2002.
[g]Sawyer, Moon-Fanelli and Dodman, 1999.
[h]Crowell-Davis *et al*., 2001.
[i]Overall, 2000.
[j]Package Insert, Clomicalm®, Novartis.
[k]Reisner and Houpt, 2000.
[l]Overall, 1997.
[m]Schwartz, 1999.
[n]Cooper and Hart, 1992.
[o]Crowell-Davis, 1999.
[p]Marder and Bergman, 1999.
[q]Voith and Marder, 1998.
[r]Hart and Eckstein, 1998.
[s]Aronson, 1999.
[t]Mills and Simpson, 2002.
[u]Dodman *et al*., 1992.
[v]Plumb, 1988.
[w]Package Insert; Anipryl®; Pfizer.

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Unlike drug therapy, synthetic pheromones have no toxicity or side effects. Administration is external, either through an environmental spray or diffuser, making dispensing simple. Although expensive, many animals are treated at the same time. Feliway® (Veterinary Products Laboratories), a mixture of synthetic feline facial pheromones, has been shown to be effective in reducing urine marking and anxiety in cats being transported, having intravenous catheterization and being hospitalized. Dog appeasing Pheromone® (Veterinary Products Laboratories), a synthetic analog of the appeasing pheromone secreted by nursing bitches, has been shown to reduce signs of separation anxiety and noise phobia (Paget and Gaultier, 2003). Although there are several anecdotal reports of pheromones reducing stress in shelter animals, at this time there are few published controlled studies of their effectiveness (Griffith *et al*., 2000).

CONCLUSION

Shelters have made a lot of progress since the days in which a behavior problem automatically disqualified an animal for consideration for adoption or placement. Now it is not uncommon for animals with behavior problems to be treated in shelters by trainers or behaviorists and veterinarians with combinations of behavior modification and drug therapy, both before and after adoption. Careful adherence to and monitoring of such programs has the chance of qualifying many more animals for adoption.

REFERENCES

Aronson, L. (1999) Animal behavior case of the month: Extreme fear in a dog. *Journal of the American Veterinary Medical Association*, **215**, 22–24.

Ciribassi, J., Luescher, A., Pasloske, K. *et al*. (2003) Comparative bioavailability of fluoxetine after transdermal and oral administration to healthy cats. *American Journal of Veterinary Research*, **64**(8), 994–998.

Cooper, L. and Hart, B.L. (1992) Comparison of diazepam with progestin for effectiveness in suppression of urine spraying behavior in cats. *Journal of the American Veterinary Medical Association*, **200**, 797–801.

Crowell-Davis, S. (1999) Behavior psychopharmacology. Central Veterinary Conference, Kansas City.

Crowell-Davis, S.L., Curtis, T., Murray, T. *et al*. (2001) Pharmacology for veterinarians: Knowing which drug to use and when to use it. Lecture Notes, College of Veterinary Medicine, University of Georgia.

Dodman, N.H., Miczed, K.A., Knowles, K. *et al*. (1992) Phenobarbital-responsive compulsive tail chasing in a dog. *Journal of the American Veterinary Medical Association*, **201**, 1580–1583.

Dodman, N.H., Karlsson, E.K., Moon-Fanelli, A. *et al*. (2010) A canine chromosome 7 locus confers compulsive disorder susceptibility. *Molecular Psychiatry*, **15**, 8–10.

Griffith, C., Steigerwald, E., Buffington, C. *et al*. (2000) Effects of a synthetic facial pheromone on behavior of cats. *Journal of the American Veterinary Medical Association*, **217**(8), 1154–1156.

Hart, B.L. and Eckstein, R.A. (1998) Progestins: Indications for male-typical behavior problems, in *Psychopharmacology of Animal Behavior Disorders* (eds N.H. Dodman and L. Shuster), Blackwell Science, Massachusetts, pp. 255–263.

Hewson, C. (1998) Efficacy of clomipramine in the treatment of canine compulsive disorder: A randomized, placebo-controlled, double blind clinical trial. *Journal of the American Veterinary Medical Association*, **213**, 1760–1766.

Irimajiri, M., Luescher, A., Douglass, G. *et al*. (2009) Randomized, controlled clinical trial of the efficacy of fluoxetine for treatment of compulsive disorders in dogs. *Journal of the American Medical Association*, **235**(6), 705–709.

Juarbe-Diaz, S.V. (1997a) Social dynamics and behavior problems in multiple dog households. *Veterinary Clinics of North America, Small Animal Practice*, **27**, 497–514.

Juarbe-Diaz, S.V. (1997b) Assessment and treatment of excessive barking in the domestic dog. *Veterinary Clinics of North America, Small Animal Practice*, **27**, 515–532.

Landsberg, G., Hunthausen, W. and Ackerman, L. (1997) *Handbook of Behavior Problems of the Dog and Cat*, Butterworth Heinemann Publishers, Oxford.

Luescher, A. (2003) Diagnosis and management of compulsive disorders in dogs and cats. *Veterinary Clinics of North America, Small Animal Practice*, **33**(2), 253–267.

Marder, A.R. (1991) Psychotropic drugs and behavioral therapy. *Veterinary Clinics of North America, Small Animal Practice*, **21**, 329–342.

Marder, A.R. and Bergman, L. (1999) Guidelines for the use of psychotropic drugs for behavior problems, in *Pet Behavior Protocols* (ed S. Hetts), AAHA Press, Lakewood, Colorado.

Mills, D.S. and Simpson, B.S. (2002) Psychotropic agents, in *BSAVA Manual of Canine and Feline Behavioral Medicine* (eds D.F. Horwitz and D.S. Mills), BSAVA Press, Gloucester, UK, pp. 237–248.

Overall, K.L. (1997) *Clinical Behavioral Medicine for Small Animals*, Mosby, St. Louis, Missouri.

Overall, K.L. (2000) Behavioral pharmacology. American Animal Hospital Association 67th Annual Meeting, Toronto.

Paget, P.G. and Gaultier, E. (2003) Current research in canine and feline pheromones. *Veterinary Clinics of North America, Small Animal Practice*, **33**(2), 201–208.

Papich, M.G. (2002) *Saunders Handbook of Veterinary Drugs*, WB Saunders, Philadelphia, Pennsylvania.

Plumb, D.C. (1988) *Veterinary Pharmacy Formulary*, 2nd edn, Minnesota Veterinary Teaching Hospital, St. Paul, Minnesota.

Pryor, P., Hart, B., Cliff, K. *et al*. (2001) Effects of a serotonin reuptake inhibitor on urine spraying behavior in cats. *Journal of the American Veterinary Medical Association*, **219**(11), 1557–1561.

Rapaport, J. (1992) Drug treatment of canine acral lick: An animal model of obsessive compulsive disorder. *Archives of General Psychiatry*, **49**, 517–521.

Reisner, I. and Houpt, K. (2000) Behavioral disorders, in *Textbook of Veterinary Internal Medicine: Diseases of the Dog and Cat* (eds S. Ettinger and E. Feldman), WB Saunders, Philadelphia, Pennsylvania.

Sawyer, L.S., Moon-Fanelli, A.A. and Dodman, N.H. (1999) Psychogenic alopecia in cats: 11 cases (1993–1996). *Journal of the American Veterinary Medical Association*, **214**, 71–74.

Schwartz, S. (1999) Use of cyproheptadine to control urine spraying and masturbation in a cat. *Journal of the American Veterinary Medical Association*, **214**, 369–371.

Simpson, B. and Papich, M. (2003) Pharmacologic management in veterinary behavioral medicine. *Veterinary Clinics of North America, Small Animal Practice*, **33**(2), 377–382.

Takeuchi, Y., Houpt, K. and Scarlett, J. (2000) Evaluation of treatments for separation anxiety in dogs. *Journal of the American Veterinary Medical Association*, **217**(3), 342–345.

Voith, V.L. and Marder, A.R. (1998) Canine behavioral disorders, in *Handbook of Small Animal Practice* (ed R.V. Morgan), Churchill Livingstone, New York.

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Section 7
Spay/Neuter

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37
Spay/Neuter Services for Shelter and Community Animals

Kathleen V. Makolinski

INTRODUCTION

Assessing a community's need for spay/neuter (also referred to in this chapter as sterilization) services and reviewing the various methods to deliver such services helps direct time, money, and effort toward development of high-quality, high-volume programs that best suit the community's particular circumstances (American Society for the Prevention of Cruelty to Animals, (ASPCA) 2012b). In addition, collecting relevant community data will assist in determining the program's impact on the problem of homeless pets and allow for further targeting of spay/neuter services in the future.

ASSESSING A COMMUNITY'S RESOURCES AND NEED FOR SPAY/NEUTER SERVICES

Establishing which spay/neuter services exist for shelter, rescue groups and privately owned animals as well as for free-roaming cats is a necessary step in the assessment process. A zip code may be entered into the ASPCA/PetSmart Charities online Low Cost Spay/Neuter Clinic Database to see a list of related programs in a given location (ASPCA/Pet Smart Charities, 2012), and SPAY/USA provides an online referral service to a network of affordable spay/neuter programs and clinics (SPAY/USA, 2012).

It is also helpful to have a lead organization to collect pertinent information from local veterinarians and animal welfare organizations (shelters, animal control agencies, rescue groups, and feral cat caregivers). Answers to the following questions should be sought (ASPCA, 2012b):

- Are animals spayed/neutered prior to their release from shelters and rescue organizations?
- Are shelter animals spayed/neutered within the facility or off-site?
- Are pediatric (animals younger than 6 months of age) sterilization procedures performed?
- Do existing programs spay and neuter free-roaming cats?
- Do current spay/neuter programs for shelter and privately owned animals and free-roaming cats meet the demand for such services?
- Do veterinarians partner with humane organizations to promote spay/neuter?
- Which animal populations (shelter, privately owned, free-roaming) have difficulty obtaining spay/neuter services, and why?

This information is gathered in an effort to determine the community's resources, their outstanding needs, and barriers to the use of currently offered spay/neuter services.

Ultimately, it should be determined if a new spay/neuter program is needed or if better utilization of an existing program is necessary (ASPCA, 2012b). Either way, the assessment process allows

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leaders to set goals, maintain focus, and measure progress (St. Arnaud, 2003).

OVERCOMING BARRIERS TO SPAY/NEUTER

For privately owned animals, the cost of spay/neuter surgery factors heavily into the decision on whether to have the procedure performed on their cat or dog (Cammisa, 2009; Ipsos Marketing, 2009; Ramón, Slater and Ward, 2010). Other reasons for failure to spay/neuter animals include "Haven't gotten around to it," and "Did not feel it was necessary (pet is confined in home)." Dog and cat owners also gave "Pet is too young" as a reason their animal was not spayed/neutered. However, some pet owners and caregivers were uncertain regarding the age it was acceptable to have spay/neuter performed (Ipsos Marketing, 2009). In addition, some owners indicated that they intended to breed the animal, that they were unaware of a spay/neuter program, or that they were unable to access the program (Cammisa, 2009). Therefore, promoting awareness of the availability of low-cost, high-quality, high-volume spay/neuter programs, as well as public education regarding the impact that intact dogs and cats have on our society and a generally accepted age range for spay/neuter are essential components of any successful spay/neuter program (Ipsos Marketing, 2009). Making such programs easily accessible to interested animal caregivers is also very important.

For animal shelters, comparing the cost between on-site sterilization programs and transporting animals off-site for sterilization can help determine if developing an in-shelter surgical suite is a fiscally sound decision. In addition to fiscal considerations, it is also important to verify that any in-shelter or on-site program offering sterilization services is in compliance with all regulations pertaining to the state's veterinary practice act.

COLLECTING RELEVANT DATA

The community assessment is an opportune time for animal control agencies, shelters, rescue groups, and spay/neuter programs to collect and share baseline data regarding animal intake, live release, euthanasia, and the number of spays/neuters currently being performed. Obtaining such information on a community-wide basis will allow for a comprehensive evaluation of the homeless animal problem and help enable an assessment of the impact of spay/neuter services on shelter animal statistics.

It is useful to collect the following information on all animals admitted to an animal shelter or a rescue agency:

- Age
- Species
- Sex and spay/neuter status at intake
- Breed (dogs only)
- Location (full and accurate address where animal lived or was found)
- Weight
- Intake type (source of animal: for example, owned, free roaming, rescue organization)

It is also important that spay/neuter programs record the information noted above for each animal as well as the animal's date of surgery (E. Weiss, personal communication, 2010).

This information should be recorded in such a manner that both shelters and spay/neuter programs can easily access the data for analysis. Recording and monitoring shelter intake information as well as live outcomes and euthanasia for animals per thousand people in a defined geographic location is valuable for tracking significant trends over time and in comparison to other geographic locations.

PROVIDING TARGETED SPAY/NEUTER SERVICES

A key goal of a spay/neuter program is to reduce shelter animal intake. Evaluating relevant statistics can help a community target its spay/neuter services for the greatest impact on reducing shelter admissions. For example, if the locations (preferably determined by addresses or zip code) that yield the greatest number of kitten admissions are known, the local spay/neuter program might advertise and offer subsidized services for felines in this area. The use of a geographic information system (GIS) to map the addresses of animals at the time they are admitted to a shelter as well as the addresses of animals who are presented to a spay/neuter program can help a community determine where spay/neuter resources can best be focused. Over time, this mapping strategy allows for the visualization of the effect that geographically targeted spay/neuter is having on shelter intake. It also helps to refocus spay/neuter efforts or marketing strategies as needed in the future

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(E. Weiss, personal communication). Additional information regarding use of GIS for this purpose can be found at: www.aspcapro.org (ASPCA, 2012a).

A recent study showed that the percentage of cats spayed or neutered differed significantly by annual family income: 96.2% of cats in households with annual family incomes ≥$75 000 were neutered, and 51.4% of cats in households with annual family incomes <$35 000 were neutered (Chu, Anderson and Rieser, 2009). Providing subsidies to spay and neuter the pets of individuals who prove they qualify for or actually receive public assistance is another means to target such services. Funding to provide subsidies can be obtained through a wide variety of private organizations and public means. Subsidy programs should clearly define what they will or will not cover, such as required vaccinations, testing for diseases such as feline leukemia (FeLV), feline immunodeficiency virus (FIV), and heartworms, or preoperative screening tests. If required by the spay/neuter program, such items may need to be paid for by an animal's caregiver.

HIGH-QUALITY, HIGH-VOLUME SPAY/NEUTER PROGRAM MODELS

There are several spay/neuter program models currently in existence, each having distinct advantages and challenges.

Spay/Neuter Clinics Located Within Animal Shelters

One of the major advantages of having a surgical suite within a shelter is that it allows for resident animals to be spayed/neutered prior to their release from the shelter. This often proves to be the most economical way for organizations to spay and neuter their animals.

Contracts that require the adopter to arrange for sterilization postadoption are often difficult to enforce and require valuable staff time to confirm that surgery was completed. Utilizing such clinics to sterilize privately owned animals or free-roaming cats enables a comprehensive use of a community resource in a cost-effective manner. The same surgical equipment as well as staff and volunteers can often be shared between programs.

The shelter's location within the community may pose a challenge for the public in accessing service. Many shelters are located in areas that may be difficult to reach via public transportation or may be too far or inconvenient to travel to. State veterinary practice acts may prohibit shelters from providing service to privately owned animals. In addition, in order to minimize the spread of infectious disease between shelter and privately owned animals or free-roaming cats, the program must provide separate and appropriate housing for the public's animals during their stay at the in-shelter spay/neuter clinic.

"MASH" (Mobile Animal Surgical Hospitals) Spay/Neuter Programs

"MASH" programs transport medical equipment and supplies to various locations to perform spay/neuter. Site selection is critical. Running water, heat, and electricity are required at the site. Such locations should be relatively easy to clean and disinfect, limit the risk for spread of zoonotic diseases, and be generally acceptable to community members.

MASH programs have relatively low start-up costs and quick start-up times. Other advantages are the ability to visit areas in great need, work with a large number of shelters/rescue organizations, and call upon volunteers to arrange clinics in their communities. Since such programs may spay/neuter privately owned animals, free-roaming cats, and animals from rescue organizations in several different communities, it is important for coordinators to establish and clearly communicate the number and type (species, weight, age, and health status) of animals who can be served at each clinic.

The obvious disadvantages of this type of program include wear and tear on equipment due to constant transport, extra travel time for staff, and the need for a home base to store equipment and sterilize surgical instruments (ASPCA, 2012c).

Mobile Spay/Neuter Clinics (MSNC)

The advantages of a mobile spay/neuter clinic include the ability to serve a wide geographic area in both city and rural locations, provide service to areas underserved by private veterinary hospitals, and access animal populations in need. These services are typically provided in specially retrofitted trucks or ready-made mobile veterinary units or vans. Larger units can accommodate a greater number of animals and may be able to serve large/giant breed dogs. To maximize the number of animals served by smaller units which have few or no cages, animals

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can be monitored and recovered by trained staff in an off-board location. Obviously, the clinic has a very visible presence and can be used for promotion of the program. When not being used for spay/neuter, the unit can transport animals, be utilized during disasters, or be used as an off-site adoption center.

The disadvantages are that mobile clinics can be quite costly to purchase and maintain. It may be necessary to hire a person to serve as driver only, which adds to the labor costs. While some units can be relatively spacious, others are fairly small, and acclimating to working in such a small space can be difficult for some people. Also, there may be greater staff exposure to anesthetic waste gas since such gas is exhaled from recovering patients who are often in close proximity to patient induction and surgical areas. One needs to consider insurance and maintenance costs for the mobile clinic as well as the variable cost of fuel. It is important to ensure that a local company is available to provide service for the mobile clinic (ASPCA, 2012c).

The location of the van should be carefully chosen to avoid parking in close proximity to established veterinary practices, as this may cause serious friction with local practitioners. If the van moves to several different locations, the public must be able to readily access information regarding its whereabouts and the requirements for utilizing the service (Figure 37.1).

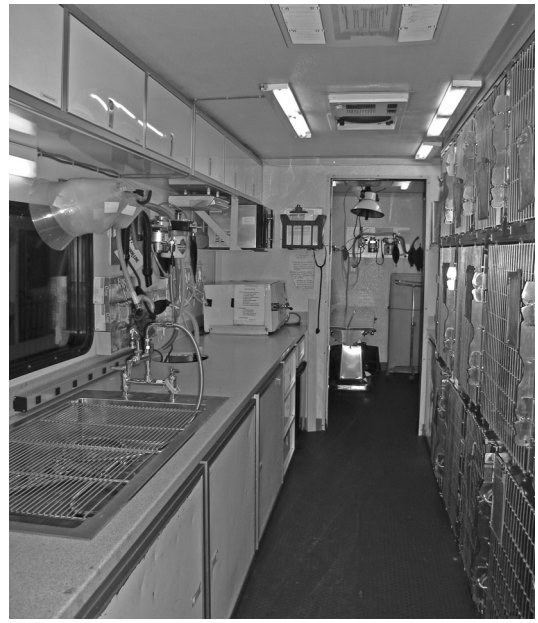


Figure 37.1. Efficient use of space in a mobile spay neuter clinic. Note wall-mounted isoflurane machines, ample supply of latched cabinets, and separate surgical suite. (Photo courtesy K. Makolinski.)

Stationary, Independent Spay/Neuter Clinics

Stationary clinics are self-contained entities that deliver spay/neuter and in some cases, wellness services. Since there is less time spent moving and setting up the equipment for the day, this model often results in the highest number of surgeries performed. The clinic has a constant, visible presence in the community. The use of an animal transport vehicle will increase access to the clinic. A few drawbacks include higher start-up costs as well as longer start-up time (ASPCA, 2012c). In an effort to best ensure success, it is recommended that the clinic be established in an area with a human population of at least 250 000 within a 60-mile radius. An animal transport vehicle is essential when the clinic's site has a human population at the lower end of this recommendation (Q. Mazzina, personal communication, 2011). When determining a location for the clinic, local zoning laws should be reviewed to ensure compliance (Figure 37.2).

Subsidized Spay/Neuter Program in Private Veterinary Hospitals

Subsidies may be provided by veterinarians or through charitable or governmental programs. The benefits of subsidy programs are that clients can schedule appointments close to their home and there is an opportunity for them to build a relationship with the veterinarian for future care of their animal. Participating veterinarians may also learn more about issues surrounding companion animal overpopulation. In addition, there may be relatively few start-up costs for this type of program since most veterinary clinics are already set up to perform spay/neuter surgeries, although not necessarily in large numbers. Generally, participation by several veterinarians is required in order to serve a considerable number of animals, and the cost per surgery may be more expensive than with other models (ASPCA, 2012c). Some veterinarians are reluctant to participate in subsidy programs because the subsidy may not cover the entire cost of surgery or required vaccinations or preoperative evaluations. Compensation for any surgical



Figure 37.2. Veterinarian preparing to perform feline castration in a stationary spay/neuter clinic. Note active scavenging unit, emergency drug kit, sterile surgical instruments/gloves, and external source of heat. (Photo courtesy K. Makolinski.)

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complications and managing missed appointments are important considerations in this model.

Other Program Models

Many different program models can be utilized to coordinate spay/neuter events. These often allow for a large number of surgeries to be performed in one day and generate community interest in animal care. Partnerships with veterinary colleges or schools that train veterinary technicians provide further opportunities for animals to be spayed/neutered and have the added bonus of training veterinarians and veterinary technicians in the performance of high-quality, high-volume spay/neuter (ASPCA, 2012c). See Table 37.1 for descriptions of various spay/neuter programs.

Considerations for All Spay/Neuter Program Models

Regardless of which program model is utilized for spay/neuter, providing high-quality service, convenient hours of operation, and animal transportation when necessary will optimize its utilization. Establishing strong community partnerships, as well as providing education, effective marketing, and subsidized service for targeted animal populations are valuable components of all programs.

In addition, program coordinators should investigate and ensure compliance with various insurance and licensing requirements. All activities should abide by local regulations, state veterinary practice acts, and Drug Enforcement Agency regulations. Adherence to best practices regarding medical record keeping, client communication, preoperative examinations, anesthetic/analgesic protocols, surgical procedures, patient care, sanitation, and sterilization practices as well as emergency preparedness is vital not only for optimal patient care but also because spay/neuter programs may receive extra scrutiny by local professional associations and state veterinary boards (Looney *et al*., 2008). It is also important to provide follow-up care for any patients who experience complications in the postoperative period. Systematic training of employees and volunteers in addition to the maintenance of up-to-date written standard operating procedures helps to facilitate the implementation of best practices in spay/neuter programs. See Appendices 37.1, 37.2, and 37.3 for examples of consent and medical record forms in use by the ASPCA MSNCs.

THE TIMING OF SPAY/NEUTER

Compliance with agreements to have spay/neuter performed after adoption poses many challenges for adoption organizations. Thus, if animals are healthy enough to undergo anesthesia and surgery, animal shelters and rescue groups are strongly encouraged to have all animals spayed or neutered prior to leaving the organization. Pediatric sterilization enables animals younger than 6 months to leave the shelter in a timely manner.

One study concluded that for felines, increasing the time spent in a shelter increased the risk of developing upper respiratory tract disease (Dinnage, Scarlett and Richards, 2009). In addition, a shelter's limited resources (staff, space, and supplies) are misallocated when an animal's length of stay is unnecessarily lengthened while awaiting sterilization. Therefore, regardless of whether a shelter animal is spayed/neutered prior to being placed as an adoption candidate or after being chosen for adoption, scheduling of the procedure should not increase the animal's length of stay at the facility.

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Table 37.1. A comparison of five spay/neuter program models.

Name/location of program	Program model	General information	Staffing	Targeted animal populations	Statistics
Smoky's Clinic, Richmond SPCA, Virginia (A. Ivey, personal communication, 2011)	Spay/neuter clinic within animal shelter	Opened in 2002. Tracking "no show" rate for privately owned animals helps determine number of appointments to schedule/day. Shelter and privately owned animals are housed separately, but share operating room. Shelter animals are spayed/ neutered before moving to adoption area. Order of surgeries is free-roaming cats, privately owned animals, shelter animals.	Spay/neuter clinic staffed four 10-hour days/week with two veterinarians, two licensed veterinary technicians, four veterinary assistants, three office assistants, and trained volunteers.	Residents within a defined service area may receive free service for Pit Bulls and free roaming cats. From 2004 to 2010, college students, those receiving government assistance, or those who qualified by income also obtained free spay/neuter for their pets. Animal control officers distribute educational material in target locations.	Goal is 65 surgeries/day. In year 2002/2003, clinic spayed/neutered 2684 animals (53% privately owned). In 2009/2010, clinic spayed/neutered 12 875 animals (86% privately owned). Fifty-four percent of total surgeries in most recent year were performed at no charge to pet owners and free-roaming cat caregivers.
Shelter Outreach Services (SOS), Ithaca, New York (L. Appel, personal communication, 2011)	"MASH" spay/neuter program	Program began in 2003. Utilizes animal shelters, vacant boat factory, and former fire station to deliver spay/neuter services. Transports anesthetic machines/oxygen, pulse oximeter, surgical instruments, and medical supplies to various locations. Surgery lights/tables are kept on site. Sites are 30–60 minutes from home base. Partnering with Cornell University's College of Veterinary Medicine to allow each veterinary student the opportunity to rotate through SOS, learn about mission of organization, and perform spays/neuters.	One veterinarian, one licensed veterinary technician, and trained volunteers staff each location. Additional staff includes an executive director and veterinary assistants at home base.	Barn cats, free-roaming cats, cats and dogs from shelters and rescue organizations as well as cats and dogs owned by people of low income. Cats and dogs from a local Native American Indian Reservation are also eligible for sterilization through SOS. Animal welfare partners in each community schedule surgeries based on need.	Goal is 25–30 surgeries/day. In 2010, program spayed/neutered 10 000 cats and dogs.

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ASPCA MSNCs (five units), New York, New York (A. Christian, personal communication, 2011)	MSNC	Program began in 2001. Clinics are custom-made. Serve five boroughs of New York City. Privately owned pets are accepted on first-come/first-served basis. Appointments made for rescue organizations, shelters, trained feral cat caregivers, and owners of Pit Bulls. Postoperative inquiries are triaged by central call center and are rechecked aboard Mobile Clinic or at full service veterinary hospital as needed. Various information is available in Spanish. Comprehensive Standard Operating Procedures Manual directs training activities.	Each clinic has one veterinarian, two licensed veterinary technicians or one licensed veterinary technician and one veterinary assistant. Staff includes vice president, director of spay/neuter surgery, director of operations, managers for veterinary staff, outreach, maintenance, and administration.	Locations are based on greatest intake to Animal Care and Control by zip code and US census data that pinpoints areas with 40% or greater poverty level. Clinics often park near housing complexes and parks. Free spay/neuter is offered to animals whose owners receive public assistance and animals at city shelters. Otherwise service is low cost. Public can view online calendar for clinic locations.	Goal is 25 surgeries/clinic/day. During community events, off-board recovery allows for greater number of spays/neuters. Total number of surgeries in 2002 was just over 4000. In 2010, 28 531 spays/neuters were performed.
Operation PETS: The Spay/Neuter Clinic of Western New York, Blasdell, New York (L. Robinson, personal communication, 2011)	Stationary spay/neuter clinic	Opened in July 2008. Clinic is product of a regional animal alliance. Modeled after Humane Alliance in Asheville, North Carolina. Extensive training provided to staff members by National Spay/Neuter Response Team. Maintains strong partnerships with local animal rescue agencies and feral cat advocacy group.	Open four 10-hour days/week with two Sunday spay/neuter clinics for free-roaming cats/month. Staff includes two part-time veterinarians, two licensed veterinary technicians, two veterinary assistants, executive director, office manager, and trained volunteers.	Generally, clients must receive government assistance or qualify by income. No income requirements apply to free-roaming cats and animals of rescue organizations. Cats also spayed/neutered from location targeted by Geographical Information System (GIS) as area of high cat intake to local shelter. Grants are sought to further subsidize the cost of surgery for free-roaming cats and Pit Bulls.	Goal is 35 surgeries/day. 14 585 cats and dogs have been spayed/neutered since opening of clinic through December 2010. Eighty percent of animals served are cats—either privately owned, free-roaming, or from rescue groups.

(*continued*)

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Table 37.1. (*Continued*)

Name/location of program	Program model	General information	Staffing	Targeted animal populations	Statistics
Hillsborough County, Florida, Spay and Neuter Voucher Program (J. Young, personal communication, 2011)	Government facilitated voucher program where local veterinary clinics provide spay/neuter services.	Resolution to initiate program passed in 2002. Client schedules appointment, presents voucher and $10 to 1 of 24 participating veterinary clinics at time of surgery. Animal receives surgery, rabies vaccination, and tag. Veterinarian receives flat fee for each type of surgery. Program is funded by 50% of the difference between registration/rabies tag fees for sterilized versus intact cats and dogs. Sale of each registration/rabies tag currently generates $10 in revenue for program.	Two full-time employees and two part-time volunteers	Pets of income-qualified residents are targeted for spay/neuter. Applications for service are available online or at veterinary hospitals, libraries, from animal control officers, and other county agencies. Vouchers are mailed to people who qualify via receipt of public assistance or income level. Once issued, vouchers expire after 90 days.	In 2010, 8896 spays/neuters were performed in voucher program. Voucher redemption rate for 2010 was approximately 63%. Consistent funding for program is generally maintained.

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The age at which an owned animal should be spayed or neutered is best determined by consultation with a veterinarian who is familiar with the animal's medical history. One study by Ramon reports that 74% of companion cats were sterilized. However, in this study, of 30 female cats who had a litter, 20 cats had a litter prior to being spayed (Ramón, Slater and Ward, 2010). The study also reports that of 36 litters produced, 85% were accidental rather than planned. Thus, in order to prevent accidental litters and allow sterilization to have the greatest impact on reducing pet homelessness, it is ideal if owned cats and dogs are sterilized prior to puberty. It is also important to provide education, so people realize that the onset of the first estrous cycle can occur as early as three-and-a-half months in cats (Griffin, 2001). Lastly, studies have determined that focusing spay/neuter efforts on dogs and feral cats who are less than 1 year of age has the greatest impact on population growth rate and therefore may provide the most cost-effective means of delivering this service (Di Nardo *et al*., 2007; Budke and Slater, 2009).

CONCLUSION

Over the past 40 years public education regarding spay/neuter combined with greater availability offered through both private practice and subsidized public programs have helped to reduce the numbers of dogs and cats entering shelters and being euthanized. This success has been most evident in animal populations whose caregivers can readily access veterinary services and who have the financial means required to afford spay/neuter services. Continued reductions in homeless animals who enter shelters will require high-quality, high-volume spay/neuter programs that adhere to best practices and are able to target and deliver services to communities where issues of access and affordability place dogs and cats at greatest risk of unplanned reproduction.

REFERENCES

American Society for the Prevention of Cruelty to Animals (2012a) ASPCA Research: GIS Mapping Targets Risk, www.aspcapro.org/aspca-research-gis-mapping-targets-risk.php (accessed August 12, 2012).

American Society for the Prevention of Cruelty to Animals (2012b) *Spay/Neuter: Finding a Solution that Really Works*, www.aspcapro.org/spay-neuter/documents/finding-solutions.pdf (accessed August 12, 2012).

American Society for the Prevention of Cruelty to Animals (2012c), Starting a Program, Spay/Neuter Program Models www.aspcapro.org/starting-a-program (Accessed August 12, 2012)

ASPCA/PetSmart Charities, (2012) *Low-Cost Spay Neuter Database*, www.aspcapro.org/spay-neuter-database.php (Accessed August 12, 2012).

Budke, C. and Slater, M. (2009) Utilization of matrix population models to assess a 3-year single treatment nonsurgical contraception program versus surgical sterilization in feral cat populations. *Journal of Applied Animal Welfare Science*, **12**, 277–292.

Cammisa, H. (2009) *Messaging Spay/Neuter: Lessons from the Gulf Coast Spay/Neuter Campaign. The Humane Society of the United States*, www.animalsheltering.org/how-we-help/work-for-change/spay-neuter-campaign-materials/messaging-spayneuter.pdf (Accessed August 12, 2012).

Chu, K., Anderson, W. and Rieser, M. (2009) Population characteristics and neuter status of cats living in households in the United States. *Journal of the American Veterinary Medical Association*, **234**(8), 1023–1030.

Di Nardo, A., Candeloro, L., Budke, C. *et al*. (2007) Modeling the effect of sterilization rate on owned dog population size in central Italy. *Preventive Veterinary Medicine*, **82**, 308–313.

Dinnage, J., Scarlett, J. and Richards, J. (2009) Descriptive epidemiology of feline upper respiratory tract disease in an animal shelter. *Journal of Feline Medicine and Surgery*, **11**, 816–825.

Griffin, B. (2001) Prolific cats: The estrous cycle. *Compendium*, **23**(12), 1049–1057.

Ipsos Marketing (2009) *PetSmart Charities A+U Barriers*, www.petsmartcharities.org/resources/resources-documents/PetSmartCharities_Research_AUBarriers.pdf (accessed July 6, 2011).

Looney, A., Bohling, M., Bushby, P. *et al*. (2008) The Association of Shelter Veterinarians' veterinary medical care guidelines for spay-neuter programs. *Journal of the American Veterinary Medical Association*, **233**(1), 74–86.

Ramón, M., Slater, M. and Ward, M. (2010) Companion animal knowledge, attachment and pet cat care and their associations with household demographics for residents of a rural Texas town. *Preventive Veterinary Medicine*, **94**(3–4), 251–263.

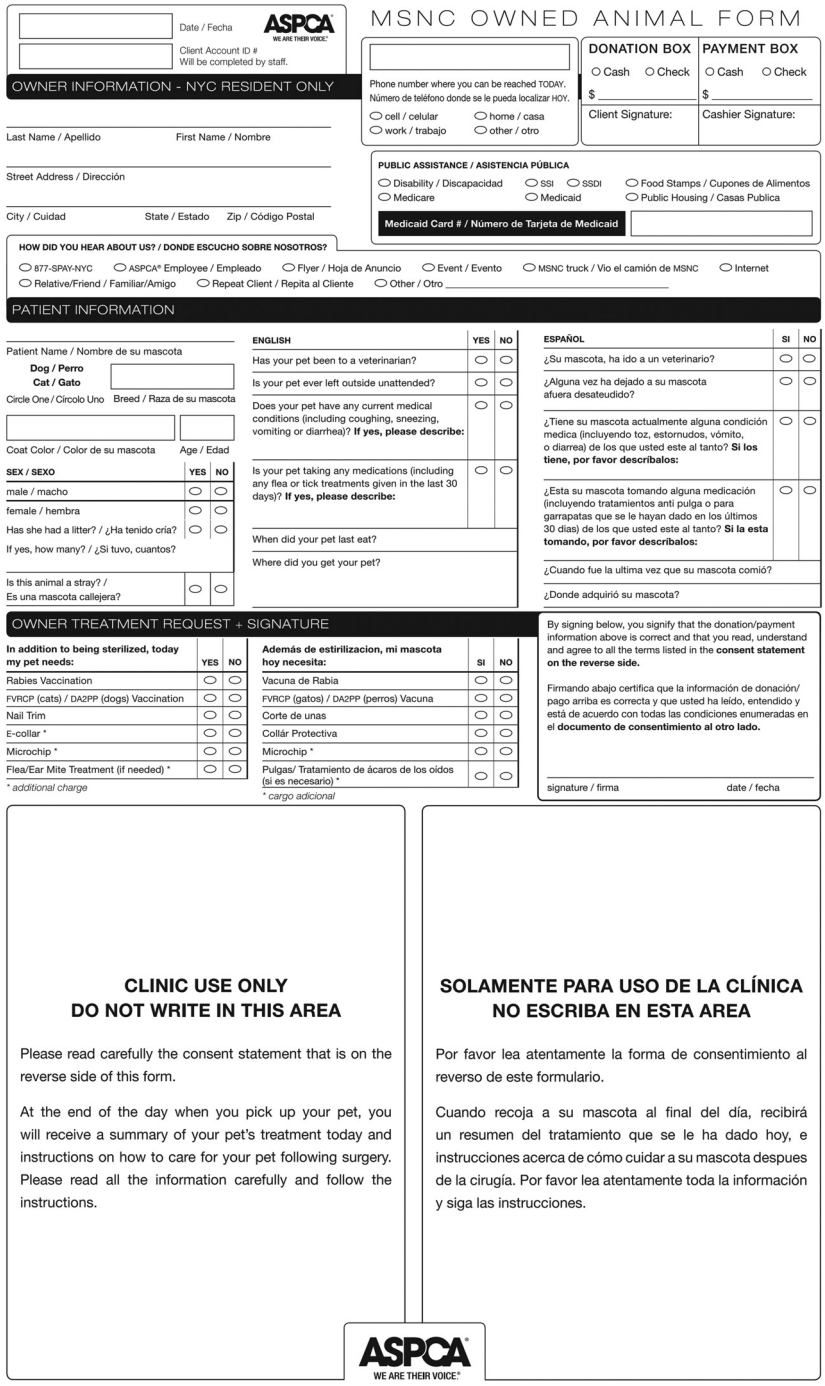
Spay/USA (2012) www.spayusa.org/search.php (accessed August 12, 2012)].

St. Arnaud, A. (2003) *Community Assessment and Planning for the Humane Movement. Best Friends Animal Society*, www.bestfriends.org/nomorehomelesspets/pdf/assessment.pdf (accessed July 6, 2011).

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Appendix 37.1

Example of Consent Statement from ASPCA's Mobile Spay/Neuter Clinic—English/Spanish



Date / Fecha

ASPCA® WE ARE THEIR VOICE.®

Client Account ID #
Will be completed by staff.

MSNC OWNED ANIMAL FORM

OWNER INFORMATION - NYC RESIDENT ONLY

Phone number where you can be reached TODAY.
Número de teléfono donde se le pueda localizar HOY.

○ cell / celular ○ home / casa
○ work / trabajo ○ other / otro

DONATION BOX	PAYMENT BOX
○ Cash ○ Check	○ Cash ○ Check
$ _____	$ _____
Client Signature:	Cashier Signature:

Last Name / Apellido First Name / Nombre

Street Address / Dirección

City / Cuidad State / Estado Zip / Código Postal

PUBLIC ASSISTANCE / ASISTENCIA PÚBLICA

○ Disability / Discapacidad ○ SSI ○ SSDI ○ Food Stamps / Cupones de Alimentos
○ Medicare ○ Medicaid ○ Public Housing / Casas Publica

Medicaid Card # / Número de Tarjeta de Medicaid

HOW DID YOU HEAR ABOUT US? / DONDE ESCUCHO SOBRE NOSOTROS?

○ 877-SPAY-NYC ○ ASPCA® Employee / Empleado ○ Flyer / Hoja de Anuncio ○ Event / Evento ○ MSNC truck / Vio el camión de MSNC ○ Internet
○ Relative/Friend / Familiar/Amigo ○ Repeat Client / Repita al Cliente ○ Other / Otro _____

PATIENT INFORMATION

Patient Name / Nombre de su mascota

Dog / Perro
Cat / Gato
Circle One / Circolo Uno

Breed / Raza de su mascota

Coat Color / Color de su mascota

Age / Edad

SEX / SEXO	YES	NO
male / macho	○	○
female / hembra	○	○
Has she had a litter? / ¿Ha tenido cría?	○	○

If yes, how many? / ¿Si tuvo, cuantos?

Is this animal a stray? / Es una mascota callejera?	○	○

ENGLISH	YES	NO
Has your pet been to a veterinarian?	○	○
Is your pet ever left outside unattended?	○	○
Does your pet have any current medical conditions (including coughing, sneezing, vomiting or diarrhea)? **If yes, please describe:**	○	○
Is your pet taking any medications (including any flea or tick treatments given in the last 30 days)? **If yes, please describe:**	○	○
When did your pet last eat?		
Where did you get your pet?		

ESPAÑOL	SI	NO
¿Su mascota, ha ido a un veterinario?	○	○
¿Alguna vez ha dejado a su mascota afuera desateudido?	○	○
¿Tiene su mascota actualmente alguna condición medica (incluyendo toz, estornudos, vómito, o diarrea) de los que usted este al tanto? **Si los tiene, por favor describalos:**	○	○
¿Esta su mascota tomando alguna medicación (incluyendo tratamientos anti pulga o para garrapatas que se le hayan dado en los últimos 30 dias) de los que usted este al tanto? **Si la esta tomando, por favor describalos:**	○	○
¿Cuando fue la ultima vez que su mascota comió?		
¿Donde adquirió su mascota?		

OWNER TREATMENT REQUEST + SIGNATURE

In addition to being sterilized, today my pet needs:	YES	NO
Rabies Vaccination	○	○
FVRCP (cats) / DA2PP (dogs) Vaccination	○	○
Nail Trim	○	○
E-collar *	○	○
Microchip *	○	○
Flea/Ear Mite Treatment (if needed) *	○	○

* *additional charge*

Además de estirilizacion, mi mascota hoy necesita:	SI	NO
Vacuna de Rabia	○	○
FVRCP (gatos) / DA2PP (perros) Vacuna	○	○
Corte de unas	○	○
Collár Protectiva	○	○
Microchip *	○	○
Pulgas/ Tratamiento de ácaros de los oídos (si es necesario) *	○	○

* *cargo adicional*

By signing below, you signify that the donation/payment information above is correct and that you read, understand and agree to all the terms listed in the **consent statement on the reverse side.**

Firmando abajo certifica que la información de donación/pago arriba es correcta y que usted ha leído, entendido y está de acuerdo con todas las condiciones enumeradas en el **documento de consentimiento al otro lado.**

signature / firma date / fecha

CLINIC USE ONLY
DO NOT WRITE IN THIS AREA

Please read carefully the consent statement that is on the reverse side of this form.

At the end of the day when you pick up your pet, you will receive a summary of your pet's treatment today and instructions on how to care for your pet following surgery. Please read all the information carefully and follow the instructions.

SOLAMENTE PARA USO DE LA CLÍNICA
NO ESCRIBA EN ESTA AREA

Por favor lea atentamente la forma de consentimiento al reverso de este formulario.

Cuando recoja a su mascota al final del día, recibirá un resumen del tratamiento que se le ha dado hoy, e instrucciones acerca de cómo cuidar a su mascota despues de la cirugía. Por favor lea atentamente toda la información y siga las instrucciones.

ASPCA® WE ARE THEIR VOICE.®

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OWNER:

I, being of legal age (18) and lawfully authorized to make decisions on behalf of the animal described above, hereby authorize and give my consent to the ASPCA, its employees, volunteers, and/or agents (collectively, the "ASPCA") to receive, transport, prescribe for, treat and/or perform sterilization surgery and/or administer vaccinations to the animal(s) named above. I understand that modern techniques and trained staff will be used to care for all animals, and reasonable precautions will be used against injury, escape or destruction of the animal. I understand that the animal may receive a small tattoo on his or her underside to show that he or she has been sterilized. I understand the animal shall be administered with a local and/or general anesthesia for surgery. I understand and agree that ASPCA shall not be liable to or held responsible by me in any manner for, or in connection with, the procedure to be performed on the animal, and I hereby hold ASPCA harmless from and against any and all liability and damages that may arise. If, in the course of treatment or during the procedure, a condition is discovered which requires medical attention or an additional procedure(s), the attending veterinarian may in his/her absolute and sole discretion, perform such a procedure without seeking additional authorization or consent from me. I consent to these procedures and agree to pay for them. I will take full responsibility, financial and otherwise, if the animal becomes ill, unless the illness is a postoperative complication caused directly by the surgery. If I suspect that the animal has such postoperative complications, I agree to follow the Aftercare Protocol that has been described to me. I understand that, as long as, in the opinion of the attending veterinarian, the animal is an acceptable surgical and/or vaccination candidate, sterilization procedures and/or vaccinations will be performed regardless of the animal's sex or medical condition (including pregnancy). I understand that the medical staff can refuse to perform any procedure on any animal for any reason. Such refusal is at the sole discretion of the attending veterinarian. I agree to abide by the "Instructions for Client/Caretaker Whose Animal Has Bitten or Scratched an ASPCA Employee, Volunteer, or Independent Contractor," a copy of which is available upon my request. I acknowledge that I have discussed with the mobile clinic staff the risks inherent in this type of surgical procedure and/or vaccine administration, including, without limitation: post-operative infection or death. I understand that all animals shall be picked up from the mobile clinic by me, or by someone authorized on my behalf, at the time designated by the clinic staff, on the same day as surgery/vaccinations. If the animal is not picked up at the designated time on that day, I understand that ASPCA shall have no obligation to wait for or contact me, and that the animal may be considered by ASPCA to be abandoned by me. In that event, I understand that ASPCA shall have discretion to deal with the animal as it deems appropriate. If the animal is returned to me, I agree to pay a $100 hospitalization fee per night and any related costs to medicate or provide for the animal. I understand that this is a legal document; have read it carefully; and fully understand its content. By my signature below, I consent to all of its terms. Medicaid recipients: I certify that I have had no more than a total of 6 animals in my household altered by veterinarians participating in the Maddie's® Spay/Neuter Project in NYC. I authorize transfer of this information to the Mayor's Alliance for NYC's Animals and Maddie's Fund®.

Soy persona de la edad legal de 18 anos y legalmente autorizado en hacer desiciones de parte del animal describido en este documento. Yo, en este día presénte autorizo y doy mi consentimiento al ASPCA, sus empleados, voluntarios o sus agentos (colectivamente, "ASPCA") pra recibir, transportar, recetar o tratar, y realizar una cirugía de esterilización o administrar vacunas a los animales nombrados en este documento. Comprendo que se emplearán técnicas modernas y personal capacitado para cuidar a todos los animales, y se tomarán precauciones razonables para que no se lastimen, no se escapen ni se destruyan. Comprendo que quizas se le colocará un pequeño tatuaje al animal en su parte inferior para mostrar que ya ha sido esterilizado. Comprendo que al animal se le administrará anestesia local o general para la cirugía. Comprendo y acepto que el ASPCA no aceptará responsabilidades de mi parte, de ninguna manera, ni relacionada con el procedimiento que se le realizará al animal. Por el presente, libero de toda responsabilidad al ASPCA de cualquier daño que pueda surgir. Si, durante el curso de tratamiento o durante el procedimiento, se descubre una condición que requiera atención médica u otros procedimientos, es posible que el veterinario a cargo, a su sola y absoluta discreción, realice dicho procedimiento sin autorización adicional, ni mi consentimiento. Acepto estos procedimientos y los costos que surjan. Tomaré completa responsabilidad financiera y de cualquier tipo que surja, si el animal se enferma, a menos que la enfermedad sea consecuencia de una complicación postoperatoria, provocada directamente por la cirugía. Si sospecho que el animal tiene esas complicaciones postoperatorias, acepto seguir el Protocolo de atención postoperatoria que me han explicado. Según la opinión del veterinario a cargo, comprendo que mientras el animal sea un candidato aceptable para cirugía o vacuna, se realizarán los procedimientos de esterilización o de vacunas, independientemente del sexo o condición médica del animal (incluido embarazo). Comprendo que el personal médico puede negarse a realizar un procedimiento en un animal por cualquier razón.icha negación queda a la sola discreción del veterinario a cargo. Concuerdo en respetar "Las Instrucciones para Cliente/Vigilante Cuyo Animal Ha Mordido o Ha Rasguñado a un Empleado, el Voluntario, o Contratista Independiente," una copia de que está disponible sobre mi petición. Reconozco que he conversado con el personal de la clínica móvil sobre los riesgos inherentes en este tipo de procedimiento quirúrgico o administración de vacunas, incluidos entre otros: Infecciones postoperatorias o muerte. Comprendo que, yo o una persona autorizada por mí, debe recoger a todos los animales de la clínica móvil la hora designada por el personal de la clínica, el mismo día de la cirugía o de la colocación de las vacunas. Si no se recoge al animal hasta las a la hora designada de ese día, comprendo que el ASPCA no tiene la obligación de comunicarse conmigo ni de esperarme y que el ASPCA puede considerar que he abandonado al animal. En ese caso, comprendo que ASPCA tendrá la discreción de ocuparse del animal como ellos consideren adecuado. Si me devuelven el animal, acepto pagar una tarifa por hospitalización de $100, por noche y todos los gastos relacionados para medicar o mantener al animal. Comprendo que este documento es legal, que lo he leído cuidadosamente y que entiendo completamente su contenido. Con mi firma a continuación, acepto todos estos términos. Recipientes de Medicaid: Certifico que no tengo más de 6 animales en mi casa alterados por los veterinarios que participan en el proyecto para castración y esterilización de Maddie's®, en Nueva York. Autorizo la transferencia de esta información a Mayor's Alliance for NYC's Animals y a Maddie's Fund®.

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Appendix 37.2

Example of Client Copy of Animal's Medical Record from ASPCA's Mobile Spay/Neuter Clinic—English/Spanish

Date / Fecha

ASPCA® WE ARE THEIR VOICE.

MSNC OWNED ANIMAL FORM 2

Client Account ID #
Will be completed by staff.

OWNER INFORMATION - NYC RESIDENT ONLY

Phone number where you can be reached TODAY.
Número de teléfono donde se le pueda localizar HOY.
○ cell / celular ○ home / casa
○ work / trabajo ○ other / otro

DONATION BOX	PAYMENT BOX
○ Cash ○ Check	○ Cash ○ Check
$ _____	$ _____
Client Signature:	Cashier Signature:

Last Name / Apellido First Name / Nombre

Street Address / Dirección

City / Cuidad State / Estado Zip / Código Postal

PUBLIC ASSISTANCE / ASISTENCIA PÚBLICA

○ Disability / Discapacidad ○ SSI ○ SSDI ○ Food Stamps / Cupones de Alimentos
○ Medicare ○ Medicaid ○ Public Housing / Casas Publica

Medicaid Card # / Número de Tarjeta de Medicaid

HOW DID YOU HEAR ABOUT US? / DONDE ESCUCHO SOBRE NOSOTROS?

○ 877-SPAY-NYC ○ ASPCA® Employee / Empleado ○ Flyer / Hoja de Anuncio ○ Event / Evento ○ MSNC truck / Vio el camión de MSNC ○ Internet
○ Relative/Friend / Familiar/Amigo ○ Repeat Client / Repita al Cliente ○ Other / Otro _____

PATIENT INFORMATION

Patient Name / Nombre de su mascota

Dog / Perro
Cat / Gato
Circle One / Circolo Uno Breed / Raza de su mascota

Coat Color / Color de su mascota Age / Edad

SEX / SEXO	YES	NO
male / macho	○	○
female / hembra	○	○
Has she had a litter? / ¿Ha tenido cría?	○	○

If yes, how many? / ¿Si tuvo, cuantos?

Is this animal a stray? / Es una mascota callejera?	○	○

ENGLISH	YES	NO
Has your pet been to a veterinarian?	○	○
Is your pet ever left outside unattended?	○	○
Does your pet have any current medical conditions (including coughing, sneezing, vomiting or diarrhea)? **If yes, please describe:**	○	○
Is your pet taking any medications (including any flea or tick treatments given in the last 30 days)? **If yes, please describe:**	○	○
When did your pet last eat?		
Where did you get your pet?		

ESPAÑOL	SI	NO
¿Su mascota, ha ido a un veterinario?	○	○
¿Alguna vez ha dejado a su mascota afuera desateudido?	○	○
¿Tiene su mascota actualmente alguna condición medica (incluyendo toz, estornudos, vómito, o diarrea) de los que usted este al tanto? **Si los tiene, por favor describalos:**	○	○
¿Esta su mascota tomando alguna medicación (incluyendo tratamientos anti pulga o para garrapatas que se le hayan dado en los últimos 30 dias) de los que usted este al tanto? **Si la esta tomando, por favor describalos:**	○	○
¿Cuando fue la ultima vez que su mascota comió?		
¿Donde adquirió su mascota?		

OWNER TREATMENT REQUEST + SIGNATURE

In addition to being sterilized, today my pet needs:	YES	NO
Rabies Vaccination	○	○
FVRCP (cats) / DA2PP (dogs) Vaccination	○	○
Nail Trim	○	○
E-collar *	○	○
Microchip *	○	○
Flea/Ear Mite Treatment (if needed) *	○	○

** additional charge*

Además de estirilizacion, mi mascota hoy necesita:	SI	NO
Vacuna de Rabia	○	○
FVRCP (gatos) / DA2PP (perros) Vacuna	○	○
Corte de unas	○	○
Collár Protectiva	○	○
Microchip *	○	○
Pulgas/ Tratamiento de ácaros de los oídos (si es necesario) *	○	○

** cargo adicional*

By signing below, you signify that the donation/payment information above is correct and that you read, understand and agree to all the terms listed in the **consent statement on the reverse side.**

Firmando abajo certifica que la información de donación/pago arriba es correcta y que usted ha leído, entendido y está de acuerdo con todas las condiciones enumeradas en el **documento de consentimiento al otro lado.**

signature / firma date / fecha

TREATMENTS PERFORMED:

SURGERY INFORMATION

Today your pet received the following surgery and/or was identified as checked below:

Hoy su mascota recibió la siguiente cirugía y/o fue identificado como marcado abajo:

	√
Spayed / Esterilizada	
Already Spayed / Ya esterilizada	
Scar seen / Cicatriz visible	
Likely in heat / Probablemente en celo	
Nursing / Lactando	
Pregnant / Preñada	
Neutered / Ya castrado	
Already Neutered / Ya castrado	
Undescended testicle(s) / Testículo(s) no descendido(s)	
Multiple incisions / Paciente tiene múltiple incisiones	
Sutures to remove? / Es necisario quitar la suturas	
Tissue Adhesive / Pegamento de piel	
Abdominal exploratory performed Exploratoria abdominal realizado	
Comments:	

This animal can begin eating and drinking a small amount at the following time / Este animal puede comenzar a comer y beber una cantidad pequeña a la siguiente hora:

PRESURGICAL EXAM

Pet's Weight
Peso de la Mascota

Body Condition Score
Condición Corporal

● NO SIGNIFICANT FINDINGS / NO HUBO HALLAZGOS SIGNIFICATIVOS ○ ABNORMAL / ANORMAL	●	○
General Appearance / Aspecto General		
Mucous Membranes / Membrana Mucosa		
Hydration / Hidratación		
Cardiac/Circulatory (heart sounds) Cardiaco/Circulatorio (sonidos de corazón)		
Respiratory (lung sounds) Respiración (sonidos de pulmón)		
Reproductive / Reproductivo/a		

Additional Remarks / Comentarios Adicionales:

My signature confirms that I performed a presurgical examination (or visual examination for feral cat) and that the patient is an adequate candidate for anesthesia and spay/neuter surgery. I also performed the spay/neuter surgery on this patient.

Veterinarian Signature

SERVICES RECEIVED / SERVICIOS RECIBIDOS

Today your pet received the following vaccines and/or services as checked below:
Hoy su mascota recibió las siguientes vacunas y lo servicios: √

Rabies Vaccination Vacuna contra la Rabia	**Booster Due:**	
FVRCP (cats/gatos) DA2PP (dogs/perros) Vaccination / Vacuna	**Booster Due:**	
Tattooed / Tatué		
Meloxicam SQ		
Nail Trim / Corte de unas		
E-collar / Collár Protectiva		
Microchip		
Flea Treatment / Tratamiento de pulgas		
Cleaned Ears Limpieza de orejas		
Ear mite Treatment / Ácaros de oídos		
Fluids / Fluidos		
Other / Otro:		

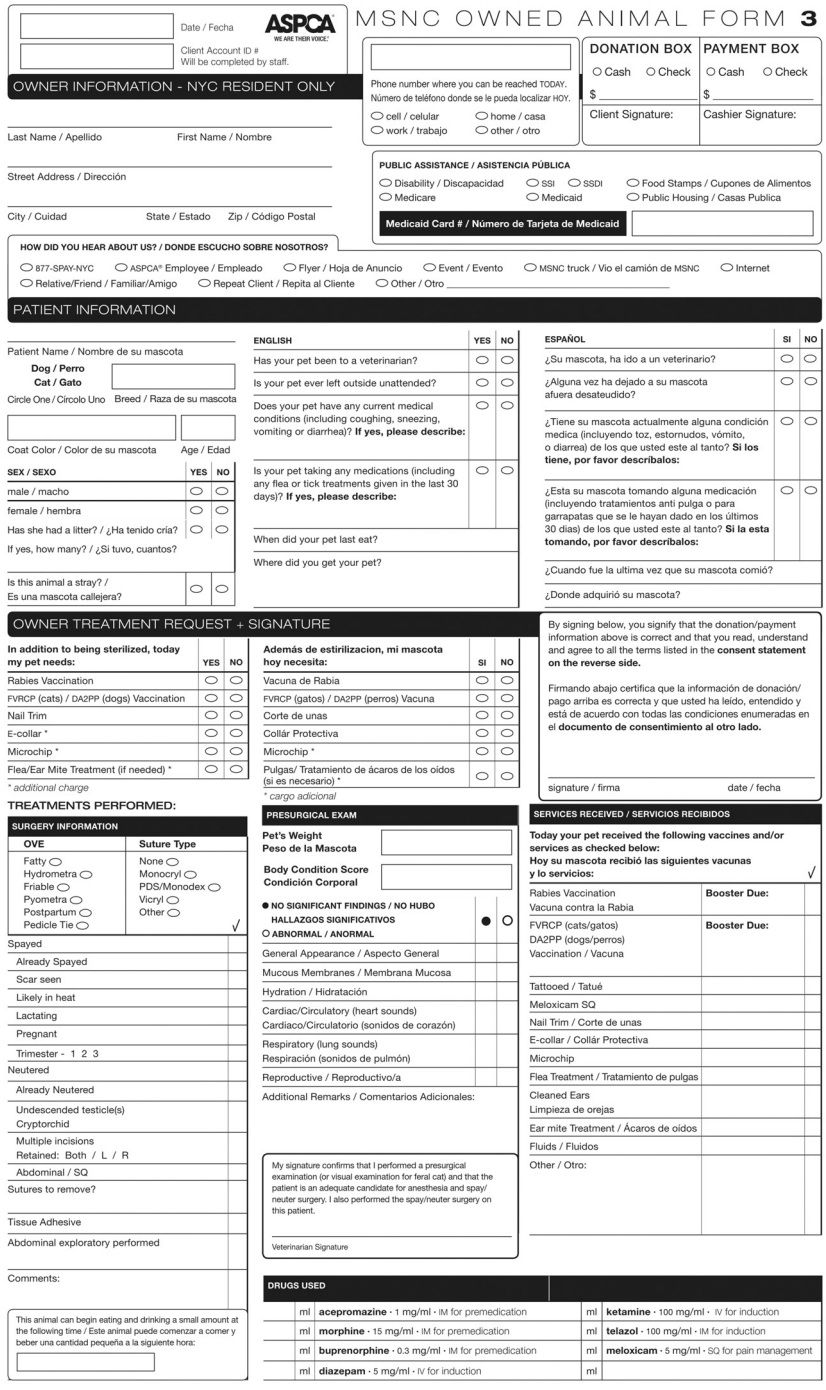
Follow all instructions on accompanying post-operative care instruction sheet.
Siga todas instrucciones del insructivo por post-operatorio que acompana esta forma.

If you have any medical concerns, please call the post operative care line: / Si tiene alguna preocupación médica, por favor llame a la línea de cuido post-operativo:

877-SPAY-NYC (877-772-9692) *Please select the option to speak with a veterinary professional/*

Appendix 37.3

Example of Clinic Copy of Animal's Medical Record from ASPCA's Mobile Spay/Neuter Clinic—English/Spanish



MSNC OWNED ANIMAL FORM 3

Date / Fecha

ASPCA WE ARE THEIR VOICE

Client Account ID # Will be completed by staff.

DONATION BOX ○ Cash ○ Check $ _____ Client Signature:

PAYMENT BOX ○ Cash ○ Check $ _____ Cashier Signature:

OWNER INFORMATION - NYC RESIDENT ONLY

Phone number where you can be reached TODAY. Número de teléfono donde se le pueda localizar HOY.
○ cell / celular ○ home / casa ○ work / trabajo ○ other / otro

Last Name / Apellido First Name / Nombre

Street Address / Dirección

City / Cuidad State / Estado Zip / Código Postal

PUBLIC ASSISTANCE / ASISTENCIA PÚBLICA
○ Disability / Discapacidad ○ SSI ○ SSDI ○ Food Stamps / Cupones de Alimentos ○ Medicare ○ Medicaid ○ Public Housing / Casas Publica
Medicaid Card # / Número de Tarjeta de Medicaid

HOW DID YOU HEAR ABOUT US? / DONDE ESCUCHO SOBRE NOSOTROS?
○ 877-SPAY-NYC ○ ASPCA® Employee / Empleado ○ Flyer / Hoja de Anuncio ○ Event / Evento ○ MSNC truck / Vio el camión de MSNC ○ Internet ○ Relative/Friend / Familiar/Amigo ○ Repeat Client / Repita al Cliente ○ Other / Otro _____

PATIENT INFORMATION

Patient Name / Nombre de su mascota

Dog / Perro Cat / Gato — Circle One / Circolo Uno

Breed / Raza de su mascota

Coat Color / Color de su mascota Age / Edad

SEX / SEXO	YES	NO
male / macho	○	○
female / hembra	○	○
Has she had a litter? / ¿Ha tenido cría?	○	○
If yes, how many? / ¿Si tuvo, cuantos?		
Is this animal a stray? / Es una mascota callejera?	○	○

ENGLISH	YES	NO
Has your pet been to a veterinarian?	○	○
Is your pet ever left outside unattended?	○	○
Does your pet have any current medical conditions (including coughing, sneezing, vomiting or diarrhea)? **If yes, please describe:**	○	○
Is your pet taking any medications (including any flea or tick treatments given in the last 30 days)? **If yes, please describe:**	○	○
When did your pet last eat?		
Where did you get your pet?		

ESPAÑOL	SI	NO
¿Su mascota, ha ido a un veterinario?	○	○
¿Alguna vez ha dejado a su mascota afuera desateudido?	○	○
¿Tiene su mascota actualmente alguna condición medica (incluyendo toz, estornudos, vómito, o diarrea) de los que usted este al tanto? **Si los tiene, por favor describalos:**	○	○
¿Esta su mascota tomando alguna medicación (incluyendo tratamientos anti pulga o para garrapatas que se le hayan dado en los últimos 30 dias) de los que usted este al tanto? **Si la esta tomando, por favor describalos:**	○	○
¿Cuando fue la ultima vez que su mascota comió?		
¿Donde adquirió su mascota?		

OWNER TREATMENT REQUEST + SIGNATURE

In addition to being sterilized, today my pet needs:	YES	NO
Rabies Vaccination	○	○
FVRCP (cats) / DA2PP (dogs) Vaccination	○	○
Nail Trim	○	○
E-collar *	○	○
Microchip *	○	○
Flea/Ear Mite Treatment (if needed) *	○	○

* *additional charge*

Además de estirilizacion, mi mascota hoy necesita:	SI	NO
Vacuna de Rabia	○	○
FVRCP (gatos) / DA2PP (perros) Vacuna	○	○
Corte de unas	○	○
Collár Protectiva	○	○
Microchip *	○	○
Pulgas/ Tratamiento de ácaros de los oídos (si es necesario) *	○	○

* *cargo adicional*

By signing below, you signify that the donation/payment information above is correct and that you read, understand and agree to all the terms listed in the **consent statement on the reverse side.**

Firmando abajo certifica que la información de donación/ pago arriba es correcta y que usted ha leído, entendido y está de acuerdo con todas las condiciones enumeradas en el **documento de consentimiento al otro lado.**

signature / firma date / fecha

TREATMENTS PERFORMED:

SURGERY INFORMATION

OVE	Suture Type
Fatty ○ Hydrometra ○ Friable ○ Pyometra ○ Postpartum ○ Pedicle Tie ○	None ○ Monocryl ○ PDS/Monodex ○ Vicryl ○ Other ○ ✓

Spayed	
Already Spayed	
Scar seen	
Likely in heat	
Lactating	
Pregnant	
Trimester - 1 2 3	
Neutered	
Already Neutered	
Undescended testicle(s) Cryptorchid	
Multiple incisions Retained: Both / L / R	
Abdominal / SQ	
Sutures to remove?	
Tissue Adhesive	
Abdominal exploratory performed	
Comments:	

This animal can begin eating and drinking a small amount at the following time / Este animal puede comenzar a comer y beber una cantidad pequeña a la siguiente hora:

PRESURGICAL EXAM

Pet's Weight / Peso de la Mascota

Body Condition Score / Condición Corporal

	●	○
● NO SIGNIFICANT FINDINGS / NO HUBO HALLAZGOS SIGNIFICATIVOS ○ ABNORMAL / ANORMAL		
General Appearance / Aspecto General		
Mucous Membranes / Membrana Mucosa		
Hydration / Hidratación		
Cardiac/Circulatory (heart sounds) Cardiaco/Circulatorio (sonidos de corazón)		
Respiratory (lung sounds) Respiración (sonidos de pulmón)		
Reproductive / Reproductivo/a		

Additional Remarks / Comentarios Adicionales:

My signature confirms that I performed a presurgical examination (or visual examination for feral cat) and that the patient is an adequate candidate for anesthesia and spay/neuter surgery. I also performed the spay/neuter surgery on this patient.

Veterinarian Signature

SERVICES RECEIVED / SERVICIOS RECIBIDOS

Today your pet received the following vaccines and/or services as checked below:
Hoy su mascota recibió las siguientes vacunas y lo servicios: ✓

Rabies Vaccination Vacuna contra la Rabia	**Booster Due:**	
FVRCP (cats/gatos) DA2PP (dogs/perros) Vaccination / Vacuna	**Booster Due:**	
Tattooed / Tatué		
Meloxicam SQ		
Nail Trim / Corte de unas		
E-collar / Collár Protectiva		
Microchip		
Flea Treatment / Tratamiento de pulgas		
Cleaned Ears Limpieza de orejas		
Ear mite Treatment / Ácaros de oídos		
Fluids / Fluidos		
Other / Otro:		

DRUGS USED

	ml	**acepromazine** · 1 mg/ml · IM for premedication	ml	**ketamine** · 100 mg/ml · IV for induction
	ml	**morphine** · 15 mg/ml · IM for premedication	ml	**telazol** · 100 mg/ml · IM for induction
	ml	**buprenorphine** · 0.3 mg/ml · IM for premedication	ml	**meloxicam** · 5 mg/ml · SQ for pain management
	ml	**diazepam** · 5 mg/ml · IV for induction	ml	

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Anesthesia and Pain Management

Andrea Looney

INTRODUCTION

As a recent ad campaign for general anesthesia stated, "There's a lot more to good anesthesia than simply life and death or waking from the event" (Abbott Animal Health, 2010). In other words, the fact that an animal survives surgery is no longer a good criterion by which to measure adequacy of the anesthetic protocol. It is now understood that pre-, intra-, or postoperative procedures have caused some animals to succumb to disease within weeks or months of the surgery. Despite the advancements of human and veterinary anesthesiology, anesthesia remains a means of "poison" titration, a profound cardiorespiratory depressant event which is capable of causing disease and death. When life-essential body systems are depressed to the point that a patient is unable to feel and respond to pain, the hope is that the resulting central nervous system (CNS) depression and secondary disturbance in organ function is minimal and transient. However, if anesthesia is not performed properly, it can cause significant and permanent organ damage that may manifest as renal insufficiency, pancreatitis, hepatic and myocardial dysfunction, and even sepsis well after the anesthesia and surgery event is complete.

A well-balanced anesthesia protocol, optimal intra- and perioperative care, good surgical technique, and appropriate (minimal stress) handling of patients will result in not only survival, but better yet, long-term health and vitality of the patient. This chapter provides basic guidelines for anesthesia and analgesia used in high-quality, high-volume spay/neuter (HQHVSN) programs. These programs have been developed in recent years out of necessity and fueled by creativity, all in an attempt to reduce the unnecessary euthanasia of companion animals and free-roaming cats. Spay/neuter programs are increasingly being seen as an integral part of a shelter's overall community strategy for dealing with pet population issues and reducing shelter intake.

Although these general anesthesia guidelines were designed to help veterinary professionals safely sterilize a large number of patients within a short time frame, this chapter is meant to provide assistance to achieve successful anesthesia regardless of the clinical setting. It is not intended as a substitute for professional training or the use of a comprehensive surgery or anesthesia text. All decisions regarding anesthesia, patient care, and monitoring remain the responsibility of the veterinarians and technicians.

PATIENT SELECTION FOR ANESTHESIA AND SURGERY

Patient selection will vary depending on the clinic's veterinary staffing/training, anesthetic capabilities and location, as well as population statistics of the animals, and, most importantly, the health of the patients. The veterinarian should make the final decision regarding acceptance of any patient for surgery based on historical and physical examination findings, including patient age, weight, health and anesthetic risk, and on the surgical schedule.

Sterilization of pediatric animals is strongly recommended to prevent the birth of unintentional

Shelter Medicine for Veterinarians and Staff, Second Edition. Edited by Lila Miller and Stephen Zawistowski.
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litters, which commonly occurs when surgery is delayed (New *et al*., 2004; Root Kustritz, 2007). In shelter settings, spay/neuter surgeries are best performed prior to adoption, on animals as young as 6 weeks of age. Most high-volume spay/neuter programs restrict surgery to animals above 1.5–2 pounds, with weight being the determining factor as exact age is frequently unknown; however, body condition and physical examination findings should better indicate which animals should and should not be anesthetized.

To minimize the risk of possible disease transmission, owned pets may best be served by scheduling surgery at the completion of the initial vaccination series, which is generally at 4 months of age (or older) as this allows time for the development of immunity; however, perioperative vaccination is considered acceptable (Fischer *et al*., 2007; Looney, 2008; Reese *et al*., 2008).

Veterinarians must weigh the risks and benefits of selecting shelter patients with mild infectious or noninfectious medical conditions, such as upper respiratory infection, parasite infestation, and asymptomatic heartworm disease. The opportunity to spay or neuter a shelter animal or a free-roaming cat may not present itself again; thus, the benefit of performing sterilization at the time of initial presentation often outweighs the increased risks posed by certain minor medical conditions (Ross and Tinker, 1994). Spays are routinely performed on pregnant and estrual shelter animals, in contrast to in daily general practice where these higher risk surgeries may often be postponed. In addition, animals with pyometra may be routinely spayed successfully in these programs (Looney *et al*., 2008).

If disease testing can be routinely conducted, it is ideal to test cats for feline leukemia/feline immunodeficiency virus and dogs for heartworm disease prior to surgery. The results of these tests may influence surgery, adoption, and euthanasia decisions.

Owner or caregiver consent to both anesthesia and surgery should minimally acknowledge risks inherent to both surgery and anesthesia (including death). If the client gives consent to procedures before the patient is examined, and problems are noted subsequently, an attempt must be made to contact the owner before proceeding with anesthesia and/or surgery.

Before anesthesia or surgery, owners, caregivers, and shelter personnel must be asked about the following:

- Known medical history
- Current or recent medications, including parasiticides
- Characteristics of behavior (i.e., lethargy, depression)
- Appetite, food, and water intake
- Vomiting or diarrhea
- Ability to urinate and defecate
- Sneezing or coughing
- Animal's stress level
- Satisfaction of preoperative fasting requirements
- Any other unusual behaviors or medical concerns

Standardized intake forms with the above questions can expedite this process and dictate whether individual patient risk assessment should be more thoroughly discussed with the client or guardian. At minimum, the above information aids in determining further focus for the physical examination (Looney, 2008).

The Preoperative Physical Examination

All surgical candidates must be screened as thoroughly and efficiently as possible. A physical examination should be performed by a veterinarian, ideally the veterinarian who will be performing the surgery. It should always be *attempted* prior to anesthesia, although fearful, aggressive, or feral behavior may often prevent a thorough pre-anesthesia examination. In these cases, the decision whether the physical examination is performed prior to or after premedication or induction should be at the attending veterinarian's discretion. In the event that the veterinarian is not available, a licensed and/or trained veterinary technician can perform an initial preoperative examination and vital parameter assessment (pulse and respiratory rate); following this, the veterinarian can perform a more complete physical examination prior to administration of any anesthetic or analgesic agents. See Figure 38.1.

Temperature assessment may be performed at the attending veterinarian's discretion. Temperature assessment is especially helpful in determining whether surgery is appropriate in animals with respiratory, gastrointestinal, or cardiac disease. Severe hypothermia (chill) or hyperthermia (fever) in an

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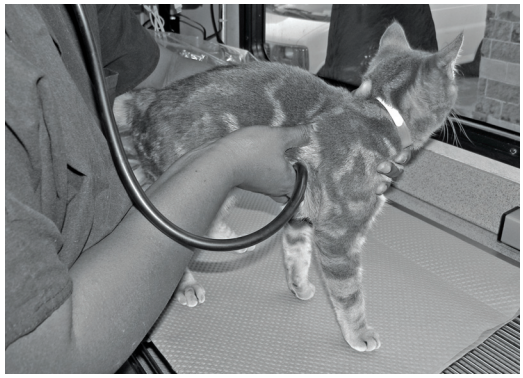


Figure 38.1. Thoracic auscultation during the presurgical examination of a cat. Photo credit: Kathleen Makolinski

awake animal may indicate a possible negative outcome and identifies the need for presurgical stabilization or cancellation of the procedure. The physical exam should include specific attention to the following:

- Thoracic auscultation
- Pulse rate and rhythm
- Respiratory rate and pattern
- Hydration status
- Airway patency or potential sources of non-patency
- Body condition score and body weight
- Oral mucous membrane color
- Ambulation
- Attitude and ability to be handled
- Sexual status (intact or already sterilized)
- Congenital defects which may affect anesthesia or surgical approach (cleft palate, umbilical hernia, retained testicles, pectus excavatum, heart murmurs)
- Abdominal palpation
- Mental and generalized neurologic status.

An ASA (American Society of Anesthesiologists) class should be assigned to each patient (see Table 38.1). If applicable, a baseline subjective pain and anxiety score should also be assigned during

Table 38.1. ASA classification of physical patient status.

Category and associated risk	Physical condition	Examples
Class I, minimal risk	Normal healthy animal, no underlying disease	Ovariohysterectomy/castration, declawing Sedation for radiographs, ear exam, nail trim
Class II, mild risk	Animal with slight to mild systemic disturbance; animal is able to compensate without intervention	Neonatal or geriatric patients, mild obesity Skin mass removal, uncomplicated hernias, abscess or minor wound debridement
Class III, moderate risk	Animal with moderate systemic disturbance, unable to compensate, and is showing clinical signs	Anemia, dehydration, fever, asymptomatic low-grade cardiac murmur, fluid imbalance, renal insufficiency
Class IV, high risk	Animal is significantly systemically ill, with significant disease and compromise	Severe dehydration, shock, high fever, uremia, renal failure, high-grade cardiac disease, clinical pulmonary disease, clinical neuromuscular disease, renal failure, trauma, most endocrinopathies
Class V, grave risk	Animal is moribund or comatose	Animal not expected to survive over 24 hours with or without surgery, advanced case of organ failure, major trauma, terminal cancer, deep shock, advanced endocrine disease

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the preoperative examination or visual evaluation of trapped animals. This score can be a simple subjective or visual analog scale with 0 = no pain to 5 = very painful, and 0 = no anxiety to 5 = very anxious (Looney, 2008) and may be useful in determining the anesthetic and recovery protocols.

Animals should be weighed as close to the time of surgery as possible to determine an accurate body weight to guide selection of drugs and dosages. When weighing a particular animal is not feasible (e.g., intractable or feral animals), body weight should be estimated as carefully as possible. In addition to body weight, it is equally important to determine the animal's body condition score (Laflamme, 1997). A fat animal should be dosed on his or her lean weight or the standard weight most appropriate for his or her primary breed. Obesity compromises the cardiovascular system and may cause restriction of ventilator movement, effects that are exacerbated by anesthesia and recumbency. Both obesity and extreme thinness can interfere with normal drug disposition in the body (Thurmon, 1996; Gleed, 1999) and impact expected outcomes.

An accurate weight taken immediately prior to anesthesia is especially important for pediatric and neonatal animals, as well as exotics, all of whose weights can alter dramatically within hours (Flecknell, 1999). A gram, mail, or exotics scale should be utilized for patients less than 1 kg. A scale accurate to the 0.1 kg should be utilized for patients less than 5 kg. If scales are utilized, they should be zeroed and calibrated/tested at least once daily in busy operations. Regardless of body weight, extreme body condition scores may dictate a change in drug dosages (including inhalants), the use of fluids, efforts to maintain appropriate body temperature, and may be predictive of surgical depth/monitoring difficulties (Thurmon, 1996).

Laboratory tests are not a substitute for a thorough physical examination and anamnesis. A recent prospective study of over 1,000 dogs undergoing anesthesia was conducted to determine whether routine preanesthetic hematological and biochemical screening was justified in dogs. All dogs were assigned an ASA "risk" status (most were assigned elective, low risk, or ASA status 1), had their perioperative needs assessed, and an anesthesia protocol proposed. Blood work was then performed, and the results were used as necessary to redefine the ASA status, alter pre- and intraoperative therapies, and determine suitability of surgery and anesthesia protocols. In over 84% of dogs, blood work was considered unnecessary; of the remaining 16%, in less than 1% would the surgery have been postponed, and the anesthesia protocol would have been altered in only 0.2%. The authors determined that in dogs, routine pre-anesthetic laboratory information is unlikely to yield additional information relative to perioperative care or anesthesia drugs/techniques utilized (Alef, von Praun and Oechtering, 2008).

This certainly does not mean that pre-anesthesia testing in animal populations served by spay/neuter programs is not worthwhile (Ross and Tinker, 1994). Indeed, currently available point-of-care testing (POCT) devices requiring minimal samples of blood make critical and immediate biochemical analyses of surgical patients involved in high-volume programs possible. Outside of POCT devices, inexpensive minimum database tests such as packed cell volume (PCV), total protein (TP), blood urea nitrogen (BUN), and blood glucose (also known as the "Big 4," quick-assessment tests or QATS), and urine specific gravity can be performed if deemed necessary by physical examination findings or patient history. Age should not be the determinant in deciding whether blood work is necessary for a particular animal; rather, concerns about health status, disease potential, and subsequent risk of anesthesia/surgical complications should dictate necessity of preoperative testing (Gaynor *et al*., 1999; Gleed, 1999). Given the mass number of samples processed, time required for individual venipuncture, the fact that many animals cannot be handled prior to anesthesia, plus the added responsibility of interpreting the results, a cost/benefit/risk analysis becomes essential before instituting routine blood testing of all patients in HQHVSN programs.

Reasons to Defer Surgery

Fully realizing that shelter patients are best served by timely sterilization, postponement of elective surgery is only critical for high-risk patients such as those experiencing the following:

- Extreme stress
- Traumatic injuries (e.g., diaphragmatic hernia, etc)
- Severe dermatologic conditions
- Severe dehydration
- Severe debilitation

- Known or suspected intestinal or urinary obstruction
- Malnourishment or starvation
- Severe parasitism
- Severe or life-threatening respiratory disease
- Prolonged vomiting or diarrhea
- Jaundice
- Toxicity or other signs of severe systemic disease.

For patients showing a lesser degree of risk, identifying problem organ systems, establishing a higher ASA class, and obtaining either permission despite risks or pursuing further clinical data (blood work, radiographs, etc.) is advised. From analysis of this data and the severity of the animal's condition, modifying surgical, anesthesia, and patient support protocols is recommended (see higher-risk patients and anesthesia later in this chapter) (Looney, 2008).

PATIENT PREPARATION FOR ANESTHESIA AND SURGERY

Fasting

Preoperative fasting for dogs and cats is ideal, but prolonged fasting for greater than 4–6 hours is not warranted, especially for pediatric animals (Grandy and Dunlop, 1991). Prolonged fasting increases chances of perioperative regurgitation and postoperative renal, myocardial, and thromboembolic disease (Savvas and Raptopoulos, 1997). Pediatric animals generally between 6 and 16 weeks of age should be fed a small liquefied or easily digestible meal 2–4 hours before surgery. Such patients should not be fasted for more than 4 hours prior to surgery. Juvenile and adult animals should be fasted for a maximum of 6–8 hours prior to surgery (Root Kustritz, 2002).

Withholding water preoperatively is neither necessary nor recommended. Subclinical dehydration should be anticipated as a possibility in shelter and free-roaming populations, especially if animals are housed in the shelter for more than 1–2 days prior to the surgery.

Exceptions for preoperative fasting may be made for feral cats in traps because of the safety risk of removing uneaten bait.

Blood Glucose Testing

Simple blood glucose testing once under anesthesia is advocated for animals at risk of poor glycemic control (sick, parasitized, poor body condition, elderly, recently postweaning females) or for those animals undergoing prolonged capture, restraint, stress, and fasting. If blood glucose testing is not possible, causes further undue stress to the patient, or if the patient is less than 6 weeks of age, alternative simple supplementation with 50% dextrose (0.5 mL/10 kg) administered either intravenously (IV) or buccal mucosally (inside cheeks and around gums) is advised. Alternatively, Karo® syrup/molasses can also be administered via buccal mucosa. If IV fluids will be given to the possibly hypoglycemic patient, supplementation with 2.5% dextrose (add 5 mL of 50% dextrose to 100 mL fluids) will similarly improve the outcome (Moon, 1999).

Housing and Identification

For patients to be safe, minimally stressed, and comfortable, appropriate housing should be provided for all animals during their entire stay, as follows (Grandy and Dunlop, 1991; Looney *et al*., 2008):

1. Tractable adult animals should be housed in individual cages or runs that allow for good visibility and adequate turnaround space, as well as for safety at various stages of sedation and anesthesia.
2. At the discretion of the attending veterinarian, pediatric littermates or housemates may benefit from being housed together (Faggella and Aronsohn, 1994).
3. Intractable or feral animals should be housed in appropriately sized traps or other enclosures that allow for the administration of anesthesia without extensive handling and to minimize stress on the animal.
4. Intractable or feral animals should be removed from their enclosures for surgery only after sedation, and returned to the holding enclosure dependent on safety for human interaction or when the animal is considered adequately recovered.
5. Depending on the length of the patient's stay, additional space within the cages/enclosures may also be needed for food and water containers, and/or litter boxes.
6. Exotic pets should not be housed next to (or if possible within sensory perception of) predator species for any period prior to their anesthesia and surgery or during recovery; certainly, elective

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surgeries in these species warrant surgery as soon as possible after admission.

7. Housing must allow for adequate ventilation, temperature control, and stress reduction, and be properly cleaned and disinfected between patients.
8. Dogs and cats should be separated from each other prior to and following anesthesia to avoid visual and auditory stimuli.
9. If possible, the most anxious animals should be afforded "cool down periods" prior to their anesthesia or, at a minimum, should be separated from other preanesthetic patients to avoid pheromone and other inhalant or visual stimuli that are not conducive to anesthesia or surgery.

All tractable dogs and cats should be provided with a sturdy, waterproof form of identification that will remain attached to them for the duration of their stay at the facility. Intractable or feral animals should have identification on their traps or cages and identification on their bodies only during the time they are out of confinement.

ANESTHESIA EQUIPMENT

A variety of equipment is used to intubate patients if needed (dependent on protocol used), deliver inhalation drugs, oxygenate, ventilate, and monitor patients under anesthesia. A detailed discussion of endotracheal tubes (ETs), varieties of laryngoscopes, anesthesia machines, and breathing circuits is well beyond the scope of this chapter. Many anesthesia and surgery textbooks and articles can provide this information. A few details and general considerations pertinent to large-volume operations are worth mentioning however.

Gas Cylinders

All cylinders of compressed gas should be handled carefully, never stored upright without attachment to a wall or other similar sturdy immovable surface. If dropped or knocked over, oxygen cylinders may explode because of high pressure. Cylinders should be stored under cover, preferably inside, not near extremes of hot or cold or exposed to the elements, in well-ventilated areas, and never near stocks of combustible materials. Full and empty cylinders should be marked appropriately.

Vaporizers

Vaporizers are necessary to deliver anesthetic gas to the patient. Most modern day vaporizers are out-of-circuit, agent-specific units. They should not be tilted or jarred to avoid the wick becoming differentially saturated, which can cause dangerously high concentrations of anesthetic during subsequent use (McKelvey, 2000a). Vaporizers should be filled with anesthetic agents at the beginning or the end of the day to minimize exposure to personnel. Vaporizer servicing and calibration is necessary regularly, from every 3 months to annually, and is often performed at the same time the anesthesia machine is serviced (Dorsch and Dorsch, 1999a).

Breathing Circuits

Breathing circuits are designed for safe delivery of inhaled anesthetics and oxygen from the machine to the patient, and for removal of carbon dioxide and excess anesthetic gases. Nonrebreathing systems rely on relatively high fresh gas flows to remove carbon dioxide. Most nonrebreathing circuits require 150–300 mL/kg/min gas flows to remove carbon dioxide and, as such, work best on patients who weigh less than 5–7 pounds. See Figure 38.2

Rebreathing circuits work for patients larger than 4–5 pounds, are supplied in pediatric and adult diameters, and require oxygen flows of 5–30 mL/kg/min depending on open or semiclosed/semiopen system configurations (Hartsfield, 1996). See Figure 38.3.

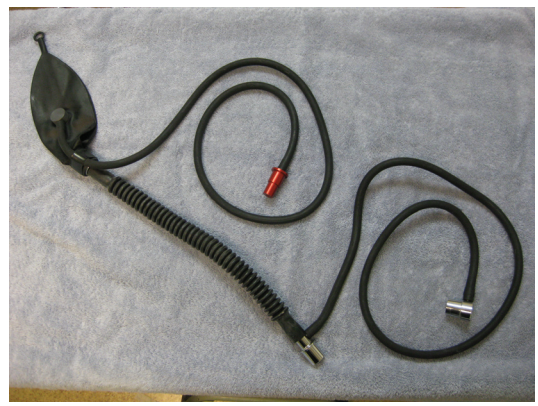


Figure 38.2. Example of common nonrebreathing circuit. Photo credit: Kathleen Makolinski

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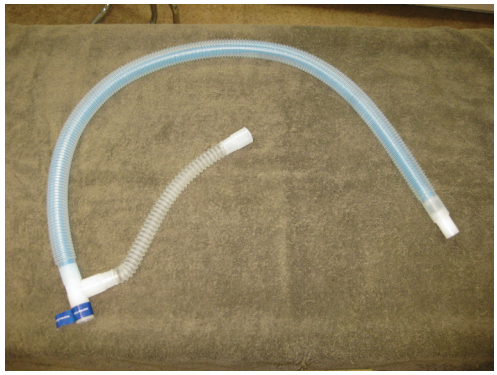


Figure 38.3. F circuit rebreathing system. Photo credit: Kathleen Makolinski

Rebreathing bags range from two to five times the tidal volume of the patient (10–15 mL/kg). Manometers can measure the pressure within the breathing circuit and generally range from <20 to +50 cm H_2O. When a rebreathing bag is squeezed to deliver a breath through a rebreathing circuit, the pressure should not exceed 10–15 cm H_2O when the circuit is attached to a patient's ET (Mason, 1993). Adjustable pressure-limiting (APL) or "pop off" valves should always remain open. A partially closed position can be utilized for manual ventilation. A new prototype of APL valves exists that incorporates automatic opening after manipulation; this is very worthwhile in that it avoids catastrophic injury because of the use of a closed APL valve.

Rebreathing circuits require the use of a carbon dioxide absorbent. This material changes color when no longer effective, but may change back to its original color when at room temperature. (The color change in some newer products is permanent.) When no longer effective, the absorbent also becomes brittle, dusty, and clumps together. In high-volume programs, many absorbents require changing once to twice a week depending on the number of patients using the machine, their size, and oxygen flow rates. It is important to follow the manufacturer's guidelines regarding the use and replacement of absorbents. Capnography is also a useful tool to determine the life span of the absorbent.

Scavenging Systems

Scavenging systems are essential for personnel and patient safety because they remove waste anesthesia gases and deliver them to sites distant from the working environment. Passive systems rely on the combined effects of gas flowing into the breathing system from the machine, expiratory effort of the patient, and the elastic recoil of the rebreathing bag to push excess waste anesthetic gases outside through exhaust hosing which simply exits through a hole in the wall, or into activated charcoal canisters (which must remain unobstructed at the base). Activated charcoal canisters are not recommended for use in HQHVSN operations because of the high numbers of patients using these systems and the inefficiency/short half-life of the charcoal absorbent. Their lifespan typically ranges from 3 to 6 hours total per canister, and exhaustion of the canister is indicated by increased weight as indicated on each canister (Gross and Branson, 1993; ACVA, 1996).

Active systems rely on extractor fans or hospital vacuum systems (whose negative pressure is "broken" by a scavenging interface) to remove waste gases and are very efficient; they are, however, better suited to stationary clinics.

Infection Control

As is appropriate for any surgery, standard procedures for controlling potential infectious disease spread, both in general and via anesthesia equipment, should be practiced (Vasseur *et al*., 1985; AORN, 2006). In particular, surgical programs should include the following protocols:

1. Staff should wash their hands between patients and litters (Bryce, Spencer and Roberts, 2001; Larson *et al*., 2001).
2. Examination surfaces and physical examination equipment should be cleaned and disinfected before handling each patient, using agents known to be effective against common veterinary pathogens.
3. All anesthesia equipments that have direct patient contact (e.g., ETs, laryngoscope blades, pulse oximeter clips, esophageal stethoscope, thermometer, etc.) should be thoroughly cleaned in mild soap and water, disinfected, rinsed, and dried between patient uses (Ludders and Stafford, 1991; Day, 1993).
4. A reasonable hot water and soap cleaning should be performed on all circuits and ETs before soaking in an appropriate disinfectant. *Note: Washing and scrubbing the ETs with soap and*

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water is more critical to cleaning than soaking tubes in a disinfectant.

5. Following the soaking, it is critical to rinse all circuits and ETs with water to remove disinfectant residues known to elicit laryngospasm or tracheal necrosis. All breathing circuits should be thoroughly cleaned, disinfected, rinsed, and dried one to two times per week at minimum.
6. Drying (utilizing forced air or placing in warm, moisture-free environments) of both circuits and ETs is highly recommended to avoid mold contamination.
7. Care should be taken to examine all cuffs daily to determine proper condition and functioning. Cuffs of the ETs should be inflated during cleaning and disinfecting. Avoid aggressive deflation of cuff as this forms rough cuff edges. The cuff should be deflated gently prior to insertion into the trachea (Day, 1993).
8. Laryngoscope blades, breathing circuits, ETs, and bottle or tube brushes ideally should be divided into two to four "sets" and color- or number-coded accordingly. Sets should be rotated through weekly to biweekly uses. Ideally, the set that is utilized for each patient should be noted on the anesthesia record. If an infectious disease problem is suspected, color or number coding can assist in identifying possibly contaminated equipment, and patient contact can be traced from the records (Postlethwait, 1972).
9. Due to the bactericidal effects of CO_2 absorbers, patients rarely contaminate internal parts of the machine with significant levels of bacteria. However, because mold contamination is possible, anesthesia machine unidirectional valves and domes as well as absorbent canisters should be disassembled, cleaned with mild detergent, wiped with alcohol, then left open to dry (Dorsch and Dorsch, 1999b). The author recommends this procedure once per week at a minimum to prevent moisture and humidity buildup and subsequent mechanical difficulties, in addition to contamination by spores.
10. Regular culturing of breathing circuits, carbon dioxide absorbent canisters, and rebreathing bags should be performed to monitor for bacterial and fungal contaminants.
11. Surgery of animals with infections should be performed after that of healthy animals within the day's schedule.

Equipment Maintenance

Recommendations for checking and servicing veterinary machines have been published and are available in a variety of anesthesia manuals and texts (Mason, 1993; Muir *et al*., 2000). Frequency of maintenance will depend on surgical caseload; daily or at minimum weekly machine checklisting is advocated. Checklisting does not take the place of regular, professional vaporizer and machine servicing (Tamse, 1978), which is normally performed by credentialed or certified anesthesia machine technicians on a routine basis. An example of an equipment safety checklist usable for performing regularly scheduled equipment checks is included in Table 38.2.

GENERAL CONSIDERATIONS FOR ANESTHESIA AND PAIN RELIEF

Various patient and environmental factors need to be considered when choosing an appropriate anesthetic protocol. Some risk factors for anesthesia that may be heightened for shelter and free-roaming animals include the following:

- Endo and ecto parasitism
- Subclinical dehydration
- Malnutrition
- Physical and emotional stress
- Infectious disease

However, thousands of animals are safely spayed and neutered in high-volume operations annually, many without the benefit of preoperative physical examinations (often due to feral nature of the patients), or blood work (Root Kustritz, 2002). Excellent perioperative care, good judgment regarding patient selection, modification/titration of drug doses as needed, and responsive patient monitoring lead to a high-quality anesthetic experience.

Regardless of the protocol or surgical setting it should be remembered that *the success of the procedure depends more on what happens around the event (PERIanesthetically) and the familiarity/competence/efficiency of the individuals involved (technicians and veterinarians) than it does with choosing any specific drug combination.*

Table 38.2. Anesthesia machine maintenance checklist.

Categories of inspection	Specific steps to perform
General machine inspection	*Vaporizers*—Fill vaporizers at the end of the workday when fewer personnel are present to avoid vapor inhalation and spills. Tighten filler caps post-filling and ensure that control dials are set to "off" versus "0" position pre- and post-filling. *Circle Breathing System*—Confirm proper function of one-way valves in circle breathing system. • To check the expiratory circuit valve: The expiratory valve should respond to breath being pushed through the breathing circuit. • To check the inspiratory valve in the circuit: With the pop-off valve closed, the inspiratory valve should move with the compression of the rebreathing or reservoir bag. • Open pop-off valve when done checking system. *Ventilators*—If a ventilator is utilized, safety and function checks should be performed according to the manufacturer's suggestions.
Confirmation of oxygen supply	Medical oxygen tanks are green colored and color of tank should be checked at minimum weekly or upon changing of tanks. Note: Nitrous and air tanks are colored differently; however, it may be possible to inadvertently connect such tanks to an anesthesia machine. Check cylinder pressure and amount of gas. Confirm cylinder or gas line connection to machine through correct hanger yoke, reducing and regulating valve. Listen for leaks as the cylinder is opened. Check for a full emergency cylinder and the presence of hand wrench if one is used to open cylinder. Check on central supplies of oxygen if present; pressure should be at 50 psi.
Verification of proper flowmeter function	Bobbin or float should move freely throughout the length of tubing. When the flowmeter is on, air should be felt moving through the patient end of the rebreathing circuit.
Breathing circuit check (in addition to regular inspections, the breathing circuit should also be checked every three to five patients)	Make sure the machine and ET end fittings are proper and tight. To check for leaks in circle systems, close the pop-off valve, occlude the patient end of the *Y* piece, fill the system with oxygen from the flowmeter (not the flush), and turn the oxygen flow to 5 L/min. As the pressure in the system reaches 20 cm of water, reduce the flowmeter flow to 0. The pressure should hold for at least 10 seconds at 20 cm of water; if it does not, a leak is present. To finish the test, open the pop-off valve slowly (vs. releasing the occlusion on the patient end of the circuit) and observe the release of pressure. To check for leaks in nonrebreathing systems, make sure the patient port is occluded, the relief valve is closed, and the reservoir bag distended. The bag should remain distended for 2–3 seconds; if it does not, a leak is present. Additional testing of the inner tube of coaxial systems is required and is done by occluding the inner tube at the patient end (using a pen or pencil tip) while oxygen is flowing at approximately 1–2 L/min. During this short period of occlusion, the float in the oxygen flowmeter should fall; if it does not, a leak is present within the system.

(*continued*)

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Table 38.2. (*Continued*)

Categories of inspection	Specific steps to perform
	Check to be sure the pop-off valve turns appropriately and is OPEN.
	If a possible leak is identified, troubleshoot by applying soapy water around connections and joints; bubbles indicate the site of the leak. If the leak is not found, patient should not be placed on the circuits or machines; anesthesia waste gases may contaminate the environment and the staff.
Waste gas scavenging system check	Confirm that the scavenging system is connected to the exhaust valve of the machine.
	If an active system is utilized, turn on the vacuum pump; if a passive system is utilized, verify patency.
	If a charcoal canister is used, confirm its date and starting weight. Gains of 50 grams or more usually constitute disposal of the canister.
Carbon dioxide absorbent	Check adequacy of carbon dioxide absorbent. Note that color change is not a reliable indicator for exhausted use in most brands of absorbent; the violet color associated with use may revert to white during nonuse. Rather, the hardness of the granules indicates expended chemical trapping potential and serves as a more reliable indicator of the need to change the absorbent.

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ANESTHETIC PROTOCOLS

There are four criteria that always form the basis of safe anesthesia. These criteria should be common to all efficient, humane, and financially viable anesthetic protocols:

- Analgesia or lack of pain
- Anxiolysis or stress reduction
- Immobility or muscle relaxation
- Safe, controlled, reversible depression of the CNS providing unconsciousness (Thurmon, 1996).

One of the most effective ways to meet all four criteria listed above is to use what is known as multimodal analgesia, which uses several agents together in small dosages instead of one or two agents independently at a high dose. This approach often avoids side effects common to the use of high-dose single agents and greatly improves pain and stress control (Gibson, Keizer and Golding, 2002; Tobias, Harvey and Byarlay, 2006).

A thorough discussion of the anesthesia protocols available for high-volume elective surgery is well beyond the scope of this summary; however, multiple veterinary anesthesia and veterinary articles and technical texts exist to give the reader a better understanding of drug combinations and multimodal, safe, effective anesthesia protocols (Kampschmidt, 2006; Corletto, 2007). Specific protocol suggestions (including dosages) used to provide anesthesia and analgesia are provided in the reference section. The author refers the reader to this material and the website www.sheltervet.org for more information about each protocol. (Inclusion of references does not support, nor does exclusion condone the use of any one particular protocol.) It is the responsibility of the veterinarian to verify the appropriate use of any drug and anesthesia protocols contained herein.

ANESTHESIA DRUGS AND AGENTS

Analgesics

Analgesic agents are required for all patients undergoing elective surgery (AAHA/AAFP, 2007; ACVA, 2006). Readily reversible analgesic agents within the anesthetic protocol itself, as well as preemptive analgesia prior to surgical incision, should be used (Lamont, 2002; Dzikiti *et al*., 2006; Corletto, 2007). The surgical technique used is also capable of influencing postoperative pain. Minimizing tissue trauma, careful adherence to hemostasis, and strict aseptic technique will help reduce postoperative pain. Acceptable analgesic classes and common dosages are described below.

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Nonsteroidal Anti-inflammatory Drugs

Injectable forms of many nonsteroidal anti-inflammatory drugs (NSAIDS) now exist for perioperative usage; acceptable choices of injectable NSAIDs include flunixin, ketoprofen, carprofen, meloxicam (Lemke, Runyon and Horney, 2002; Lascelles, McFarland and Swann, 2005; Dzikiti *et al*., 2006). NSAIDS are not only analgesic, but antipyretic and conducive to tissue healing. Oral forms of these agents can be dispensed for home use to provide postoperative analgesia as well; many oral, over-the-counter (OTC) forms, and veterinary-specific products exist (Lobetti and Joubert, 2000; Slingsby and Waterman-Pearson, 2006). It should be emphasized to clients that *OTC drugs should never be administered without prior consultation with the veterinarian*.

In a majority of healthy elective surgery patients, presurgical administration of these injectable agents (following anesthesia induction) is advocated (Al-Gizawiy and Rudé, 2004; Leece, Brearley and Harding, 2005). In patients with questionable health status or anesthesia risk, however, these agents are probably best reserved for late intraoperative or postoperative administration. Some trap/neuter/return (TNR) programs believe that the use of NSAIDS in a population of patients predisposed to subclinical dehydration and unmonitored blood pressure is controversial at best and suggest avoidance of these drugs altogether (J. Levy, personal communication).

Injectable perisurgical NSAID dosages for feline and canine patients include the following:

Flunixin: 1 mg/kg IV, subcutaneous (SQ)
Ketoprofen: 0.5–1 mg/kg IV, SQ
Carprofen: 2.2–4.4 mg/kg IV, SQ
Meloxicam: 0.05–0.1 mg/kg IV, SQ

Postoperative spay/neuter analgesic agents for dogs and cats along with other analgesic agents for out-of-hospital or at-home usage are listed in Table 38.3.

Local Anesthetics

Lidocaine and/or bupivicaine can be used as local blockades for injection of spermatic cords, linea albas, or scrotal/prescrotal incisional splash blocks (Carpenter, Wilson and Evans, 2004; Wilson, Barnes and Hauptman, 2004). Commonly used dosages for both these agents in cats and dogs are noted below; saline can be utilized to dilute the local anesthetic for increased spread of the agent and reduced sting of administration.

Lidocaine: 1–2 mg/kg
Bupivicaine: 0.3–0.5 mg/kg

For most dog spay or prescrotal incisions, a common combination of agents employed is 0.3 mg/kg bupivicaine, 1–2 mg/kg of lidocaine, and 1–2 mL of saline; this amounts to 0.5–1 mL of bupivicaine 0.5%, 0.5–1 mL of lidocaine 2%, and 1–2 mL of saline for the incision of a 30-pound (13-kg) dog. This mixture is "sprayed" with a small-gauge (22–25 g) needle, dripped or "splashed" into scrotal or prescrotal incisions or onto a sutured linea or fascia prior to subcutaneous, subcuticular, or skin closure, or even if skin is not closed. Similarly, a common combination of local anesthetic agents employed for cat spay or neuter incisions is 0.1–0.2 mL of bupivicaine 0.5% (total 0.5–1 mg), 0.1–0.2 mL of lidocaine 2% (total 2–4 mg), and 0.1–0.2 mL of saline per 6–10-pound (3–5 kg) cat, dripped onto the closed linea or into the scrotal incision(s) of the surgical patient (Zilberstein, Moens and Leterrier, 2008; Egger and Love, 2009). Having the surgeon preload a sterile syringe of adequate volume for the total number of surgical patients per setting can save time and avoid the necessity of drug calculation, preparation, and administration per individual animal.

Use of splash, spray, or topical drip of local anesthetics is often easier and more efficient than use of injectable local anesthesia, especially in high-volume programs, and will prevent excessive needle usage, microbial spread between patients, or inadvertent vascular or peritoneal injection of agents. If injection of local anesthetics is used instead of splash anesthesia, then care should be taken to avoid direct vascular injection of either lidocaine or bupivicaine into spermatic cord vessels or mammary vasculature near the linea.

Opioids

Current acceptable choices of injectable surgical opioids include butorphanol, buprenorphine, morphine,

Table 38.3. Canine and feline outpatient oral postsurgical analgesic agents.

Species	Agent	Dosing instructions
Canine	Carprofen	2.2 mg/kg PO (orally) or SQ BID (twice a day) or 4.4 mg/kg PO or SQ SID (once a day) X 1–3 days maximum
	Meloxicam	0.1–0.2 mg/kg PO or SQ SID X 1–3 days maximum
	Acetylsalicylic acid	5–10 mg/kg PO SID-BID X 1–3 days maximum
	Acetaminophen	5–10 mg/kg PO SID-BID X 1–3 days maximum
	Firocoxib	5 mg/kg PO SID X 1–3 days maximum
	Deracoxib	1–2 mg/kg PO SID X 1–3 days maximum
	Tepoxalin	10 mg/kg PO SID X 1–3 days maximum
	Tramadol	1–5 mg/kg PO BID-TID (three times a day) X 1–3 days maximum
	Dextromethorphan	1–4 mg/kg with or without guaifenesin 5–10 mg/kg PO BID
	Ketoprofen	1–2 mg/kg PO, SQ, IV SID X 1–3 days maximum
	Flunixin meglumine	0.5–1 mg/kg SQ, IV SID X 1–3 days maximum
Feline[a]	Carprofen	1–2.2 mg/kg PO, SQ EOD (every other day) X 1–2 doses maximum
	Meloxicam	0.05–0.1 mg/kg PO, SQ EOD X 1–2 doses maximum
	Acetylsalicylic acid	5–7 mg/kg PO EOD X 1–2 doses maximum
	Ketoprofen	0.5–1 mg/kg PO, SQ EOD X 1–2 doses maximum
	Flunixin meglumine	0.5–1 mg/kg SQ EOD X 1–2 doses maximum
	Buprenorphine transmucosal	0.02 mg/kg SID-BID

[a]Cats do not possess the same metabolic pathways for these agents as dogs. Accordingly, the dosage and frequency of administration of these agents are much different than that for dogs! (E.g., a dog may receive a nonsteroidal anti-inflammatory drug twice a day, whereas a cat often receives a nonsteroidal agent every other day.) Meloxicam should not be used with the manufacturer's dosing syringe for administration to feline patients, but instead should be dosed via milligram amounts as described above.

oxymorphone, and hydromorphone (Campbell, Drobatz and Perkowski, 2003; Taylor *et al*., 2010). Use of morphine and other pure mu agonist opioids (oxy or hydromorphone) will provide for more potent (and ironically, often more economical) analgesia than mixed agonist-antagonist opioids (butorphanol). An exception to this is buprenorphine, a partial agonist, which appears to provide excellent analgesia in feline patients (Robertson *et al*., 2005; Giordano *et al*., 2010). Many of the mu agonist receptor opioids are capable of causing emesis or vomition in healthy patients, especially if not combined with a form of anxiolytic agent (dexmedetomidine, acepromazine, benzodiazepines).

Dosages for use in cats and dogs of commonly used opioid agents are given below. Preoperative and postoperative doses are similar among the opioid agents.

Butorphanol: 0.2–0.3 mg/kg IV, intramuscularly (IM), SQ
Buprenorphine: 0.02–0.03 mg/kg IV, IM, SQ
Hydromorphone: 0.05–0.1 mg/kg IV, IM, SQ
Oxymorphone: 0.05–0.1 mg/kg IV, IM, SQ
Morphine: 0.1–0.3 mg/kg IM, SQ

Alpha 2 Agonists

Acceptable choices of alpha 2 agonists for use in spay/neuter operations include medetomidine, dexmedetomidine, and xylazine. Alpha 2 agonists constitute a unique class of agents that have both analgesic and stress-reducing properties. These agents are thus known as "sedative analgesics" and have become a center point for multimodal anesthesia because they provide three essential

features—pain relief, muscle relaxation, and stress reduction—of well-balanced regimens with one drug. Additionally, alpha 2 agonist drugs provide synergistic analgesia with all opioids, including butorphanol (Looney and Moses, 2005; Girard, Leece and Cardwell, 2010).

However, all alpha 2 agonists provide profound sympatholytic effects, which include profound bradycardia, variable vasoconstriction, and reduced cardiac output (Ko *et al*., 2000; Benson *et al*., 2000). They require different monitoring techniques, and often a "training period" for staff to become accustomed to such potent cardiorespiratory depressant signs (Murrell and Hellebrekers, 2005; Ko *et al*., 2007a and 2007b). Xylazine, medetomidine, and dexmedetomidine not only provide analgesia but obtund anxiety, blunting the neurohormonal release of stress hormones that are nonconducive to quality anesthesia, surgery, and recovery. Doses for commonly used alpha 2 agonists are provided below.

Medetomidine and dexmedetomidine

- Premedication (mini dose): 3–10 mcg/kg for dogs and 5–15 mcg/kg for cats IM
- Postmedication (micro dose): 1–2 mcg/kg for both cats and dogs IV or IM

Xylazine

- Premedication: 0.2–0.3 mg/kg IM for both cats and dogs

Anxiolytics

Anxiolytic agents used for stress reduction include minor or major tranquilizers such as phenothiazine (acepromazine), benzodiazepines (midazolam and diazepam), and alpha 2 agonists (medetomidine, dexmedetomidine, and xylazine). These drugs can be delivered with analgesics within minutes or hours of the induction agent (Muir *et al*., 2000), or they can be delivered IV immediately prior to or with the induction agent. Advantages of premedication with anxiolytics include stress reduction, muscle relaxation, and anxiolysis, which are all aspects of solid, well-balanced general anesthesia.

Among the benzodiazepines, midazolam is water soluble and devoid of propylene glycol, the carrier of diazepam. Because of this, it can be given IM or SQ, is more miscible with other agents, and will not cause muscle necrosis or vasculitis. It is safer than diazepam in terms of adverse reactions and tends to cause less cardiovascular depression (Cole, Brozinsky and Isenberg, 1983; Cook, Davis and Ing, 2005). Reversal agents for benzodiazepines exist although the practical benefit in companion animals is questionable (Smith and Volmer, 2005). Dosages for commonly used minor and major tranquilizers in both cats and dogs, for use as part of multimodal anesthesia regimens, are provided below.

Medetomidine, Dexmedetomidine, Xylazine
(see doses for alpha 2 agonists above)
Diazepam: 0.2–0.5 mg/kg IV
Midazolam: 0.2–0.5 mg/kg IV, IM, SQ
Acepromazine: 0.02–0.05 mg/kg IV, IM, SQ

Anticholinergics

Although historically part of premedication regimes, the routine use of anticholinergics (atropine and glycopyrrolate) has decreased due to their induction of increased myocardial work, myocardial oxygen consumption, hypertension, tenacity of many body fluids (urinary, gastric, pancreatic, and salivary secretions), and mydriasis as well as delirium and anxiety (atropine) (Erhardt, Bohn and Ehmann, 1990; O'Hare *et al*., 1997; Parlow, van Vlyman and Odell, 1997; Burger, Wiestner and Hubler, 2006). Atropine is best reserved for cardiopulmonary resuscitation (CPR) use only; glycopyrrolate can be utilized if absolutely necessary, but it is better to avoid anticholinergics entirely. If they are used, it may be best to use lower than published doses, especially in debilitated, unstable cardiovascular patients, and cats (Ko, Fox and Mandsager, 2001; Johr, 1999). An anticholinergic such as glycopyrrolate might still be included in protocols for neonatal (preweaning or less than 4 weeks of age) patients, as their cardiac output is more dependent on increased heart rate (Pascoe and Moon, 2001; Kampschmidt, 2006), animals with increased vagal tone (foreign bodies, ocular trauma, or disease) and brachycephalics with clinical symptoms (Greene, 2002). If utilized, the suggested dose of glycopyrrolate is 0.003–0.005 mg/kg IM.

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Training technical staff to become less alarmed about bradycardia is sometimes difficult. In many healthy patients, perfusion, blood pressure, and postoperative anxiety can improve without the use of either atropine or glycopyrrolate. To facilitate staff compliance, the author suggests reducing the dosage of glycopyrrolate by one-third every month, and noting how monitoring parameters (respiratory rate, pulse oximetry, blood pressure) improve or stabilize better in most patients.

Induction Agents

Induction agents take a patient from an awake or a subdued state, to a fully compromised depressed state that is suitable for surgery. Induction agents do not provide long-lasting analgesia or anxiolysis however; hence their need to be preceded or accompanied by premedication with opioids, NSAIDs, alpha 2 agonists, anxiolytics, etc. Routes of administration of induction agents should be limited to IV and IM routes, avoiding intraperitoneal and subcutaneous routes entirely. The choice of which class of agent to utilize is based on cost, technical skill level for administration, the animal's level of consciousness following premedication, diversion (illegal misuse) potential, and schedule of surgeries.

Administering a single injection of multiple drugs combined in one syringe while the patient is awake often significantly reduces patient pain and stress response; combining a "premed" and an "induction" agent into a single injection is known as "injectable anesthesia" (Williams *et al*., 2002; Wiese, 2007). Dissociative agent, opioid, and alpha 2 agonist combinations provide one-injection sedation, analgesia, immobility, muscle relaxation, and CNS depression suitable for tattooing, vaccinating, spaying, or neutering.

Dissociatives

Ketamine and tiletamine are dissociative induction anesthetics which can be given IV and IM to provide a cataleptic state suitable for general anesthesia. When used alone, they often allow swallowing reflexes to remain intact, muscles to become more rigid, and salivation/lacrimation (tearing) is common (Lin, 1996; Slingsby and Waterman-Pearson, 2003; Corletto, 2007). High doses of these drugs used as solitary injectable agents result in hyperesthesia and psychosomatic hallucinatory effects; they do not provide analgesia sufficient for ovariohysterectomy and neuter. To counterbalance these side effects, ketamine and tiletamine are often administered in conjunction with opioids and/or alpha 2 agonists to premedicate, induce, and provide analgesia with a single injection. Depending on doses utilized, the animal may or may not need supplementation with inhalant anesthetics. Dissociative agents should be used with caution in animals with known renal dysfunction. The following drug doses are appropriate for cats and dogs.

Ketamine:
IM doses range from 2 to 8 mg/kg
IV doses range from 0.3 to 5 mg/kg
Ketamine 3 mg/kg with midazolam or diazepam 0.5–1 mg/kg IV
Tiletamine is commercially available as Telazol® (with zolazepam, a benzodiazepine): 1–5 mg/kg IM or IV

Thiobarbiturates

Thiobarbiturates (thiopental, thiamylal) are sodium salts of barbiturates that are inherently unstable and require preparation and IV injection to induce anesthesia. Although CNS depression is less severe than that caused by dissociative drugs, laryngeal reflexes are blunted, cardiac arrhythmias are common, blood pressure changes are significant, and abdominal visceral enlargement (splenic) is common. (Because of the degree of enlargement of the spleen, extra care must be taken to avoid accidental laceration of that organ when first entering the abdomen.)

Multiple doses of barbiturates should not be given due to their cumulative effects. Concentrated solutions (above 2.5%) often cause vasculitis and may cause hemolysis; mild perivascular "slips" or subcutaneous injections of solution can cause massive tissue destruction that renders many animals "sensitized" over areas of cellulitis for prolonged periods of time. Because of all these issues, barbiturates are rarely utilized in high-volume or shelter settings. The following drug doses are appropriate for cats and dogs.

Thiopental, thiamylal: 5–10 mg/kg IV titrated to effect

Propofol

Propofol is a rapid-acting, nonbarbiturate phenol anesthetic. It can only be administered IV (as of 2011), and has organ system effects very similar to thiobarbiturates (reduced cranial blood flow, reduced cardiac output) but is noncumulative, faster acting, and more quickly metabolized than thiopental or thiamylal. Metabolism also occurs relatively independent of hepatic and renal function, which is a big advantage compared to ketamine and thiopental (Marik, 2002; Posner, Asakawa and Erb, 2008). Due to its fast action and metabolism, it is thought of as a relatively "safe" induction agent. However, blood pressure changes with propofol are significant, and repetitive dosing in cats can cause self-limiting, reversible anemias (Thurmon, Tranquilli and Benson, 1996; Redondo, Rubio and Soler, 2007; Posner, Asakawa and Erb, 2008). The following drug doses are appropriate for cats and dogs.

Propofol dose: 2–6 mg/kg IV titrated to effect

Inhalant Anesthetic Gases

Sevoflurane and isoflurane are the most common inhalant gases used for general anesthesia in most spay/neuter operations that utilize anesthesia machines and vaporizers. Inhalation anesthetic drugs are used to maintain general anesthesia; hence, they are commonly referred to as "maintenance agents." Both utilize agent-specific vaporizers as part of anesthesia machines, and, through them, personnel are able to maintain the unconsciousness produced by the induction agents via titration of the vapor in oxygen.

Inhalants are lipid-soluble agents, absorbed from the alveoli into the bloodstream and carried by the blood to the brain. Because of the relatively rapid uptake (dependent on solubility of agent), depth of anesthesia can be controlled effectively and relatively easily, but constant vigilance is required. Cardiovascular and cerebral depression, as well as changes in all organ system functions, is very severe with all modern inhalants; as such, inhalant anesthetics are the most potent poisons that anesthetists titrate. Elimination of both isoflurane and sevoflurane is basically via ventilation, as very little of either agent is metabolized by the liver. However, in any anesthesia event, respiration and cardiovascular function is depressed and, hence, ventilation is limited; herein lies the relatively inaccurate concept of them being "safe" agents (Steffey, 1996; Keegan, 2002).

Isoflurane has an obnoxious pungent odor and is capable of causing bronchoconstriction and airway irritation (particularly noticeable with certain species). It produces rapid induction and recovery from anesthesia, progressive severe vasodilation and hypotension, profound generalized CNS depression, and excellent muscle relaxation. Maintenance doses range from 0.5 to 2%.

Sevoflurane is similar to isoflurane in its organ system effects but is not considered a respiratory irritant, and will provide ultrafast induction and waking from anesthesia, and, additionally, very fine-tuned, immediate titrability through vaporizer control. Maintenance doses range from 2 to 4% (Terriet, Desouza and Jacobs, 2000; Greene, 2002; Sidarov *et al*., 2006).

ACCURATE DRUG CALCULATION AND ADMINISTRATION

Given the high volume of these sterilization programs, veterinarians may be tempted to use predetermined or standard drug doses, a "one size fits all" approach that does not take individual patient weight or health into consideration. These types of calculations and assumptions can overdose small and sick patients while being insufficient for large patients. For example, using 0.25 mL of dexmedetomidine per cat is not recommended; instead, the dose should be 60 mcg/kg. An exception to this is administration of agents in an aggressive patient where obtaining an accurate weight is not possible.

Categorized doses of drugs for various size patients (such as X mcg/kg of drug for patients weighing 1–2 kg and Y mcg/kg for patients weighing 2–4 kg) may be utilized for high-volume programs requiring quick drug retrieval and/or those with less experienced technical personnel. Charts of weight categories and drug volumes are helpful in these situations to avoid inappropriate dosing.

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Additionally, the administration of "hub" volumes of drugs should be avoided. This is the practice of estimating the drug dosage by simply filling the hub of the needle. Drugs should be of appropriate concentration and volume for patients within the program. If the manufacturer's drug concentrations do not accommodate accurate dosing, a more diluted concentration of drug can be created via dilution of the parent compound with saline for the day's cases. Diluted stock concentrations that are properly labeled with the new concentration, dosage, date prepared, and expiration date allow for more easily and accurately measured dosing and safe administration.

There are some programs (for example, TNR programs) in which accurate weight cannot always be obtained prior to drug administration. Safety is increased by using readily and safely reversible agents and by less frequent use of cardiorespiratory depressant drugs. Safety is further increased by obtaining best-guess estimates of body weight to facilitate a compensatory increase or decrease of anesthetic doses. (See the chapter on management of stray and feral community cats for more information.)

SPECIAL CASES

Pregnant Animals

Pregnancy imposes several physiologic changes on an animal's body that are beyond the scope of this chapter to describe.

Complications that can be expected include lower cardiac output and, hence, blood pressures, 25–40% decreases in anesthetic requirements, increased heart rates, mild anemias, increased renal blood flows and filtration rates, inconsistent planes of anesthesia, hypoxia, hypercarbia, hemorrhage, and orthostatic hypotension (collapse secondary to relatively simple changes in body position (Thurmon, Tranquilli and Benson, 1996; Pascoe and Moon, 2001). To minimize the effects of anesthesia and surgery in pregnant animals, the following steps have to be carried out:

1. Dose the patient's anesthetic drugs on ideal body weight, not pregnant weight.
2. Keep the patient's front end elevated as compared to the hind end. This will allow for a shift in the abdominal contents away from the diaphragm, and more room for the lungs to expand when breathing.
3. If possible, shift dorsally recumbent animals to the slight left, allowing the right side of the mother to have less abdominal cavity weight (and increased vena cava preload) compared to the left.
4. Use less inhalant anesthetic via utilization of mild premedications and epidurals.
5. Reduce the time from induction to removal of the uterus by clipping and prepping the animal in the preinduction period.
6. Place a catheter and administer IV or SQ fluids (preferably prior to anesthesia) to help the patient compensate for the blood loss.
7. Maintain an airway via endotracheal intubation to prevent hypoxia and silent regurgitation.
8. Provide supplemental oxygen via ET (or mask supplementation if ET placement is not possible).
9. Use impeccable hemostasis, and assure secure uterine and ovarian pedicle ligation.

If delivery of puppies or kittens is desirable (vs. euthanasia of newborns), then use of a different anesthetic protocol is recommended. It should include anticholinergics, minimal opioids and alpha 2 agonists, preoxygenation, propofol induction, avoidance of "top off" or additional doses of any induction agent, epidural administration, use of nitrous oxide if available, oxygenation and ventilation with low-inhalant usage, fluid therapy, and temperature control to prevent hypothermia.

Obese and Emaciated Patients

Obesity imposes a number of physiologic changes in an animal that can have a huge bearing on premedication and anesthesia. Obesity decreases the ventilation of patients by impairing the diaphragm, and creates increased work for all breathing muscles. Negative pressure is maximal at the larynx and may even cause hiatal herniation of the stomach fundus into the esophagus in morbidly obese animals. Pharyngeal tissues often obstruct the animal's airway if sedation is too deep and the airway is unprotected (Clutton, 1988; Ko and Galloway, 2002; Quandt, 2006). Cardiac work is often increased, and concurrent diseases such as Cushing's disease, hypothyroidism, diabetes mellitus, and pancreatitis are all more common in obese animals. Gastric emptying is also delayed in obese animals (Grimm, 2002).

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Complications expected include excessive respiratory depression from injectable and inhalant agents, resultant hypoxemia and hypercarbia, increased chance of regurgitation and airway obstruction, and lengthier sleep times due to the use of fat soluble agents (almost all anesthetic drugs) (Short, 1987; Clutton, 1988; Greene, 2002). The following are suggestions to assist in the care of an obese animal:

1. Base drug dose on ideal body weight.
2. Always give obese animals IV drugs "to effect."
3. Place the front end of the patient slightly higher than the hind end to allow less diaphragmatic pressure from the abdominal cavity contents.
4. Once obese patients are sedated, monitor closely for inadequate respiration.
5. Once induced, intubate and, if possible, supply oxygen.

Debilitated, poorly conditioned, nutritionally deprived, and starved animals are also problematic under anesthesia. The biggest perianesthetic concerns with emaciated animals are heat loss, electrolyte abnormalities (hypokalemia and hypocalcemia), decreased cardiac output, poor perfusion due to dehydration, and easily achieved depths of injectable and inhalant anesthesia (hence relative overdose) (Nagelhout and Plaus, 2010). It is not uncommon for shelter animals to have poor nutrition and ecto- and endoparasites; these problems can lead to dehydration very quickly. Blood pressure may be suboptimal in dehydrated animals. However, chilling occurs regularly with routine fluid administration, so caution is advised in speed of administration and total volume of the fluids. Fluids should be warmed if used.

Low body weight is accompanied by low body fat and loss of body heat. It is very important to keep these patients warm with external heating devices; however, extreme caution is advised because certain heating devices can cause severe burns in animals with little body fat and poor circulation. For further information, see the section on peri- and intraoperative thermoregulation.

Upper Respiratory Tract Disease

Certain precautions should be taken when anesthetizing a patient with upper airway disease.

1. Avoid undue stress or excitement perioperatively since this increases respiratory efforts.
2. Oxygen supplementation (via mask or flow by) should be provided prior to induction to allow for oversaturation of hemoglobin in the event of apnea following administration of induction agents (Pascoe, 1988).
3. Because of its effects on sludging of respiratory secretions, anticholinergic administration is not recommended unless severe vagal tone is induced by upper respiratory negative pressure generation.
4. Premedication is indicated to alleviate stress. Following premedication, control of the airway via quick IV induction and intubation followed by oxygen supplementation is best. If intubation is performed, liberal use of lidocaine spray on the pharynx, larynx, and arytenoids is recommended. Multiple attempts to intubate should be avoided as the larynx becomes extremely irritable and prone to laryngospasm, especially in animals with preexisting upper airway problems or disease (i.e., brachycephalics and upper respiratory tract infections).
5. Reversal of agents is not required, but recoveries should be monitored for laryngospasm, reverse sneezing, or gagging.
6. If patient is severely dyspneic, heavy sedation may cause obstruction; the procedure should *not* be performed.

While the gold standard of airway maintenance with endotracheal intubation was historically advisable in patients with upper airway disease, patients with irritable laryngeal and pharyngeal disease usually fare better with earlier ET removal and close scrutiny for re-obstruction or regurgitation during recovery (Greene and Harvey, 1996).

Observation of the breathing pattern, oxygenation, and ventilation status as well as ET patency needs to be checked frequently peri- and intraoperatively to avoid mucus plugging and obstruction.

High-Risk Patients

A separate protocol for higher-risk patients requiring sterilization during illness should be available to provide safe and humane surgeries. Since most shelter patients are likely ASA class I patients, drug combinations as outlined above can be utilized for

Table 38.4. Sample feline and canine protocol for ASA status II/III patients.

- Premedicate with hydromorphone or oxymorphone (0.1 mg/kg IM, SQ) *or* morphine (0.3–0.5 mg/kg IM) and midazolam (0.4–0.5 mg/kg IM, SQ)
- Establish IV access
- Preoxygenate
- Induce with midazolam 0.2 mg/kg IV, followed immediately by propofol 2–4 mg/kg IV
- Intubate and place on isoflurane or sevoflurane in oxygen
- Administer IV fluids at 5–10 mL/kg/h during surgery
- Provide warmth, and maintain oxygenation and ventilation via monitoring
- Use local anesthetics on the closed linea or scrotal incisions intraoperatively
- For postoperative analgesia, administer one-half of same opioid dosage used preoperatively in the premed IM; NSAIDs can also be administered unless gross evidence of renal dysfunction is present

healthy patients (see Table 38.1 for ASA classification system).

Higher-risk patients, however, often fit into ASA status category II or III patients, necessitating use of different, usually more intensive anesthesia protocols. These protocols often include the selection of highly safe and reversible agents, less reliance on cardiorespiratory depressant agents, supplementation of oxygen and fluids, and intubation if airway patency is questionable (Greene, 2002; Quandt, 2006; Looney, 2008). Table 38.4 provides a sample anesthetic protocol that can be utilized for patients with increased anesthetic and operative risk in terms of pregnancy, pyometras, otherwise reduced cardiopulmonary function, renal and hepatic function, and those with *extreme* poor body condition scores.

PATIENT MONITORING

The most reliable means of patient assessment and safety during anesthesia is the essential task of vigilant monitoring, which should be performed on each patient to ensure an adequate plane of anesthesia (ACVA, 2009). The determination and assessment of trends in vital parameters is critical for an accurate assessment of the plane of anesthesia (Haskins, 1996). Regardless of what monitors are utilized, monitoring requires vigilance regarding the level of CNS depression, circulation, oxygenation, and ventilation; enhances recognition of worrisome trends; and provides a legal record regarding significant events. No equipment can replace a sound, well-trained, cognizant anesthesia technician, the surgical patient's true advocate.

Reliance on any single variable can lead to inadequate planes of anesthesia or, conversely, to increased depth of anesthesia with accompanying risk leading to emergencies. Reliance on trends of variables such as heart rate decreasing over the last 10 minutes and respiratory rate increasing over the last 5 minutes is more apt to detect impending emergencies or overall safety concerns; focus on any one variable at any one time is not able to detect such issues. Subjective and objective parameters should be recorded regularly for each surgery; how often monitoring and recording of variables occurs will depend on speed of surgery, number and ability of technical or nursing staff, and available monitoring equipment. Five-minute checks of variables is desirable, but in a high-volume spay/neuter program where total surgery time may be less than 5–10 minutes, objective measures can be captured electronically via monitoring device or simply noted at regular intervals.

In addition to assessing the anesthetic plane and facilitating informed, flexible, and timely responses to changes in patient status, monitoring should also provide reliable objective data for judging the global quality (or lack thereof) of anesthesia so that there can be a continual assessment of the appropriateness of drug usage and improvement of techniques (Holden, 1999; Robertson, 2002).

Monitoring can be accomplished by observing and recording any combination of the following variables.

Heart Rate/Rhythm, Pulse Quality, and Oxygenation Status

Heart rate and rhythm can be determined via direct auscultation of the heart. Pulse can be manually

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palpated at the radial, dorsal metatarsal, femoral, lingual, or facial artery, and/or jugular furrow. Although manual pulse palpation does provide assessment of bradycardia and tachycardia, sadly it provides no objectivity in evaluation of anesthesia safety.

Electrocardiographs should not be the sole monitors in any anesthetic setting (Muir, 2000). They are not considered suitable monitoring devices because they can demonstrate normal electrical conductance in a mechanically dead heart. Additionally, older models may calculate the heart rate inaccurately.

Esophageal stethoscopes have limitations because they allow pathways for esophageal reflux, provide a false sense of security based on heart sounds without any peripheral pulse perception, and allow for the possibility of abnormal external pressure on the trachea causing obstructed airflow in a patient with an unprotected airway (nonintubated patients). However, if positioned appropriately in an intubated patient, they do provide an inexpensive means of ausculting mechanical cardiac function and thus obtaining the pulse rate at its origin. Esophageal stethoscopes should not be used in a nonintubated patient.

Pulse oximetry, as opposed to an electrocardiograph, allows accurate measurement of pulse rate, perfusion, and patient oxygenation status (Burns *et al*., 2006). A pulse oximeter is one of the most affordable monitors for all types of surgical settings, and is simple to use, portable, often battery operated, and noninvasive. Pulse oximetry has provided a revolutionary way for easy, objective, noninvasive monitoring of both awake and especially anesthetized patients.

The pulse oximetry pulsatile signal is reduced by hypotension, hypothermia, and altered vascular resistance, all of which limit determination of SpO_2. The only drawback to this monitor is that most anesthetized patients on 100% oxygen (the normal carrier gas for inhalants) have excellent SpO_2 readings due to the high oxygen carrier gas content. However, consecutive low readings indicate that something is wrong but provide no qualitative analysis of what is wrong and very little time to react (compare to capnography monitoring below). If the SpO_2 reading is below 90% in an intubated patient on 100% oxygen, measures to determine the cause should be taken immediately (Pascoe, 1988; Robertson, 2002).

Blood Pressure

Arterial blood pressure is one of the most useful measures of cardiovascular function available. Unfortunately, it cannot be evaluated without monitoring equipment of some kind. Indirect blood pressure readings using oscillometric techniques (cuffs that occlude blood flow via inflation and then detect return of pulsatile flow via movement in the arterial wall, ultrasonic flow probe, or distal pulse oximetry) are now readily available, often combined with electrocardiographs or pulse oximetry in affordable multiparameter monitors.

Sadly, cuff size, applicability of some oscillometric monitors to veterinary patients versus human pediatric and neonatal patients, and pressure reference ranges frequently limit the usefulness of some of the units. However, once fitted properly, blood pressure oscillometric cuffs provide an indication of the adequacy of cardiovascular function, making this monitoring modality extremely useful for patients with compromised perfusion (Haskins, 1996; Perkowski, 2000).

Trends of blood pressure readings in anesthesia patients offer clear clues to hidden blood loss, the need for titration of inhalant gases as well as administration of fluids, or the need to terminate the surgery.

Respiratory Rate and Pattern

Respiratory rate and pattern monitoring is an important means of diagnosing early anesthetic problems. The respiratory rate can be assessed by observing chest excursions (movements) or ausculting breaths through a stethoscope positioned on the chest. Respiratory or apnea monitors may provide for early detection of decreased breathing rate or apnea; however, surgical manipulation within the abdomen (and resultant diaphragmatic motions) may interfere with accuracy of readings (Haskins, 1987; Moon and Camporesi, 1990). In-stream respiratory or apnea monitors may also add resistance to expiration as well as increased dead space, and are a potential source of contamination between patients.

Sole reliance on rebreathing-bag movement is the usual means of assessing ventilation in patients. However, anesthetists must be aware that false movements such as abdominal cavity manipulations by the surgeon or even diaphragm "hiccups" can result in inaccuracies. Along with simple observation of chest

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or rebreathing-bag excursion counting, monitoring of the respiratory pattern (vs. rate) is a clear and effective means of diagnosing early anesthetic difficulties that may lead to true anesthetic emergencies. For instance, tachypnea with shallow breathing may imply pain of surgical manipulation versus tachypnea with deep, lengthy breathing, which may imply hypoxia or hypercarbia.

Capnography

One of the most useful tools for monitoring anesthetized patients is capnography, or the analysis of expired carbon dioxide concentration. This gives an accurate indication of a patient's respiratory function. End-tidal carbon dioxide ($ETCO_2$) concentrations are related to the balance between CO_2 production, circulation to bring the CO_2 to the alveoli, and CO_2 removal via lung and muscular function. Low CO_2 readings are often indicative of either hyperventilation, low perfusion states, or hypothermia. High CO_2 readings are more indicative of hypoventilation, excessive metabolism or heat, or buildup of CO_2 within the machine (Hackett, 2002a).

More important than simply monitoring respiratory patterns is the ability of the capnograph to monitor trends in circulatory and metabolic patterns. A sudden fall in $ETCO_2$ can indicate a sudden circulatory disturbance such as pulmonary embolism or myocardial infarct. Complete loss of $ETCO_2$ can indicate apnea or a disconnection from the machine. More subtle alterations in both respiratory and anesthesia machine function can also be detected (Swedlow, 1986). New models of capnographs are lightweight, ultra-efficient, and may fit in at the termination of the ET.

Jaw Tone Assessment

Loosened jaw or weakened masticatory muscle strength often indicates deep planes of anesthesia, while tight tone of the same muscles may indicate light or inadequate planes of anesthesia. Moderately relaxed tone is indicative of a more appropriate surgical plane of anesthesia (Thurmon, Tranquilli and Benson, 1996).

Eye Position and Pupil Size

In general, central eye position with dilated pupils indicates a potentially life-threatening depth of anesthesia. However, central eye position and pupillary dilation can occur in dogs and cats anesthetized with high doses of ketamine and may not be associated with complications (Hromadkova, Rehurek and Anton, 1990). Moderately ventrally rotated strabismus in both eyes often indicates adequate surgical plane of anesthesia in most species, but is also dependent on drug combinations utilized (Thurmon, Tranquilli and Benson, 1996).

Palpebral Reflex

Palpebral reflexes are tested by lightly touching the skin at the inner canthus of the eye to elicit a blink. A mild, sluggish, or slow palpebral reflex indicates an adequate surgical plane of anesthesia in most patients. A brisk palpebral reflex indicates light planes of anesthesia that may be inadequate for surgical manipulation. The palpebral reflex, however, may be absent with the use of some injectable protocols, especially those including ketamine as an anesthetic agent (Haskins, 1987, 1996; Thurmon, Tranquilli and Benson, 1996).

Capillary Refill Time and Mucous Membrane Color

Mucous membrane color (normal is pink) and capillary refill time (CRT) are inadequate for assessing depth of anesthesia or recovery from anesthesia. Capillary refill is tested by pressing on the gingival mucosa until blanching occurs, then noting the length of time for return of original color. Normal CRT is less than roughly 2 seconds. While many animals have slow CRTs during anesthesia, normal CRTs and mucous membrane colors can be observed in individuals who have recently suffered cardiac arrest dependent on age, pre-existing health conditions, and decreased body temperature (Schrigger and Baraff, 1988; Leonard and Beattie, 2004). Depending on where the mucus membrane color is assessed, the gingiva of older animals will be congested, and decreased body temperature and certain health conditions can cause poor perfusion of mucus membranes.

ANESTHESIA RECOVERY

Providing a smooth transition for patients from an anesthetized state to wakeful comfort for return to their home environments and normal behaviors requires practiced vigilance. Successful recoveries can be measured by minimal adverse patient events,

staff contentment, and satisfaction of owners and caregivers. Prompt attention and open client communication regarding problem cases can minimize negative consequences.

For best anesthetic recovery, a designated area that allows for continuous, direct observation of each patient and separation of species should be used whenever possible. The area should be clean, dry, and warm, and noise should be minimized. Caution is advised to avoid patient airway restriction (which is usually a result of simple head malpositioning) and sudden emergence delirium with subsequent caretaker injury; it is recommended to allow recovery on flat, steady surfaces such as floors or cages. Recovery with siblings is recommended for pediatric patients when possible to provide warmth and familiarity with surroundings.

Postoperative Complications

Complications of the postoperative period include, but are not limited to, the following: continued cardiorespiratory depression or compromise; continual drop in body temperature or hyperthermia; slow, distressed, or anxious recovery; and vomiting/regurgitation with risk of aspiration (Tracy, 2000; Hackett, 2002b; Salmeri, 2002). At a minimum, parameters that should be assessed include the following:

- Heart rate and pulse quality (except for feral animals)
- Unobstructed airway (make sure nose and mouth are unobstructed by patient's tongue, lips, and pharyngeal tissue in addition to blankets or padding)
- Respiratory rate and character
- Pain and anxiety
- Temperature, especially for at-risk patients
- Degree of arousal or sedation
- Movement.

If NSAIDs were not administered pre- or intraoperatively, they can be administered parenterally or orally once adequate swallowing reflexes have returned and provided that hydration status is considered as normal as possible in these patients.

In all but hyperthermic patients, body temperature should be preserved in recovery (as in all other phases of anesthesia), with individual surface and body coverage with paper, towels, or blankets (Armstrong, Roberts and Aronsohn, 2005; Insler and Sessler, 2006). If needed, options for supplemental heat sources exist and are discussed further in the section on Peri- and Intraoperative Thermoregulation. To protect against hypoglycemia, pediatric, geriatric, frail, or at-risk patients should be offered small amounts of food or should be supplemented with high-calorie/glucose pastes such as Nutrical® or Karo syrup when conscious and mentally alert as determined by adequate righting and swallowing reflexes. Small amounts of water should be offered to all patients as soon as they are ambulatory. Caution should be taken with postoperative feeding of brachycephalic patients as airway obstruction is more likely in this group of animals; regurgitation happens frequently and esophageal motility may not be optimum in these patients.

Once ambulatory, all animals should be allowed to urinate and defecate. Cats should be provided litter boxes and dogs should be walked briefly with care. Postsurgical hematuria is not uncommon in animals with active reproductive tracts.

Incisions should be evaluated and patients monitored to see if they bother them. Use of Elizabethan collars may cause significant stress, especially in cats (where they prevent normal grooming behavior necessary for surgical recovery) and very young animals. For this reason, this author recommends only utilizing these on individual cases as needed.

ANESTHESIA REVERSAL

At the surgeon's discretion, sedative, analgesic, and anesthetic agents (such as xylazine, medetomidine, dexmedetomidine, midazolam, diazepam, and opioids) may be reversed if necessary for patients experiencing an anesthesia emergency and in high-volume programs in which the patients must be promptly returned to the owner, caregiver, or environment. However, it should be remembered that the reversal of analgesia and sedative agents may result in a return to or cause pain and anxiety. In fact, IV reversal of sedative and pain-relieving agents is commonly associated with sudden and severe catecholamine release, and may even cause seizures. Hence, IV administration of reversal agents should be avoided if at all possible except in anesthetic emergencies, and the pros/cons of reversal weighed heavily for each patient. Should administration of

reversal agents be needed, the following is recommended:

- Only partially reverse the sedative or analgesic agents.
- Utilize careful and slow IV or IM titration of reversal agents (e.g., atipamezole, naloxone) to avoid induction of sudden anxiety and pain.

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COMMON SHELTER/TNR/SPAY/NEUTER ANESTHESIA AND PERIOPERATIVE ISSUES

Mask Inhalants for Induction and Maintenance

While it is recognized that there will be times when masking with inhalant anesthetics is required for HQHVSN patients, the use of inhalant agents through mask induction should be avoided, and mask maintenance should be minimized. Mask induction of patients differs from mask maintenance or supplementation. Definitions are as follows:

- Mask or chamber induction causes unconsciousness through inhalant delivery via a mask on the face of a patient, or via inhalant delivered in high concentration "around" the patient in a larger enclosed container (chamber) at the commencement of general anesthesia.
- Mask maintenance or supplementation continues the previously attained level of anesthesia for a period of time through inhalant delivered via a mask (this is used to maintain general anesthesia).

Mask induction should not be routinely performed because of unnecessary stress to the patients, uncontrolled entrance into unconsciousness, and unnecessary waste gas contamination to the staff and environment. Masking awake patients into anesthesia is considered to be very sympathomimetic and bronchoirritating (especially if isoflurane is used), risks inspiration of gastric contents through an unprotected airway, and often creates potentially high inhalant concentrations that may be deleterious for the patient and the staff (Doi and Ikeda, 1993; Reuss-Lamky, 2006).

Chamber induction, a corollary to mask induction, is often performed in a large glass or plastic tank or even within a plastic bag; it is even more likely to result in severe waste gas accumulation, and prolonged and excessive sympathomimetic windup as well as potentially lethal high inhalant concentrations. Chamber induction results in the most significant waste gas environmental contamination known within the veterinary profession (Reuss-Lamky, 2006) and should be avoided at all costs unless heavy risk/benefit analysis for both patient and staff is performed for each event.

Mask maintenance or supplementation during the surgical procedure should also be minimized to avoid gas embolization to the gastrointestinal tract, aspiration of gastric contents in an unprotected airway, dangerously high concentrations of inhalants, environmental contamination, and bronchoirritation (Bateman *et al*., 2005).

Within a busy HQHVSN operation, mask inhalant supplementation on a few animals (less than 10–15% of total animal population) for short periods is often necessary and appropriate. If mask supplementation becomes too frequent or regular, these other options should be considered for patient and staff safety:

1. Utilize a protocol that does not employ inhalant anesthesia, such as dissociative, opioid, alpha 2 agonist combinations.
2. If inhalant anesthetic needs to be used, instead of masking, utilize an anesthesia protocol that requires intubation, which is safer for the patient (it bypasses the bronchoirritation receptors and cells in the nose, nasopharynx, and trachea, and inhibits aspiration of gastrointestinal contents) and avoids environmental contamination.
3. Consider alternative anesthesia protocols that employ better analgesics and sedatives, thus steadying the plane of surgical anesthesia and avoiding the need for additional mask inhalant supplementation.
4. Eliminate issues that contribute to unsteady states of anesthesia, including hypothermia, hypoxia, hypotension, hypercarbia, and hypoglycemia.

Intubation

Intubation is not necessarily required as part of all HQHVSN anesthesia regimens but should be available for all surgical patients if needed for an emergency. If intubation is chosen as part of an anesthesia protocol, having an anesthesia team skilled in proper

placement and management of the ET is critical (Ti *et al*., 2009). Intubation does not necessarily indicate the use of oxygen or inhalant anesthesia; rather, intubation simply indicates that the patient is provided with an artificial, patent, readily usable airway.

Although intubation with a cuffed ET was historically the gold standard for maintaining a protected airway in the surgical patient, proper intubating requires training, practice, time, patience, and the proper anesthetic depth. In fact, with some anesthetic regimens, intubation may complicate the work flow routine and even compromise patient care if it is not performed with skill, care, and efficiency (Sawyer, 1984). Hence, the pros and cons of intubation must be weighed against the historical benefits of "airway protection."

The benefit of intubation is that a protected airway is always maintained. This is important since general anesthesia, regardless of whether it is administered via injectable or inhalant (or both) agents, causes severe obtundation in reflexes, most importantly esophageal sphincter, laryngeal, and gag reflexes, which are protective reflexes for preventing airway obstruction. With endotracheal intubation, regardless of the plane of anesthesia, the airway is protected, especially if a cuffed ET is utilized.

However, the drawbacks of intubation are readily evident to those learning its "art." This "protected airway" may give a false sense of security. Intubation requires an appropriate deep plane of anesthesia capable of obtunding autonomic responses, yet deep planes of anesthesia can often be deleterious for the patient. Unless the proper plane of anesthesia is present, gagging can occur, which not only makes it difficult for intubation to occur, but also stimulates regurgitation and vomiting, stress hormone release, increased intracranial and ocular pressure, and increased vagal tone, all of which can cause significant problems intra- and postoperatively (Sawyer, 1984; Kushner, 2002).

Intubation can also create other problems. Regardless of proper placement and solid cuff seal, gastric contents can be regurgitated and still "leak" into the trachea, even around the cuff, and cause injury. Performed incorrectly, the ET may be placed into the esophagus instead of the trachea, may not be inserted far enough, may be inserted too far (into a mainstem bronchus), or placed with an inflated cuff; all of these mistakes may allow for devastating consequences and will void the gold standard "maintenance of airway" that ET placement theoretically seeks to provide (Hardie *et al*., 1999; McKelvey, 2000b; Mitchell, McCarthy and Rudloff, 2000). If not performed properly, tracheal damage, lacerations, and strictures can occur, threatening the life of the patient weeks to months postsurgery.

Generalities Regarding Intubation

- Most unfasted dogs or those with an unknown fasting status should be intubated.
- Patients with severe upper respiratory nasal or pharyngeal disease should be intubated.
- Patients with questionable regurgitation or vomiting potential would benefit from intubation.
- Overweight dogs should be intubated (Greene, 2002).
- Most brachycephalic animals, including Chow Chows, Shar Peis, Burmese and Persian cats, should be intubated (Short, 1987; Greene, 2002).

Thermoregulation

Patient thermoregulation is critically important for any surgery (Beal, Brown and Shofer, 2000). Hypothermia is a common occurrence with use of any sedative or anesthetic agent, but is also a leading cause of intraoperative emergency (Armstrong, Roberts and Aronsohn, 2005). Usually considered one of the first problems to occur (along with hypoxia and hypovolemia), it is actually easy to prevent. Warmth should be consistent and continual, since contact with any cold(er) surface after premedication allows decreases in body temperature not easily reversed during surgery.

Warmth is best preserved initially by reducing contact with cold surfaces and limiting body cavity exposure. During hair clipping and prepping, care should be taken to minimize conductive heat loss from heavily sedated or anesthetized animals by placing paper or cloth between the patient and the cold surface. The use of excessive clipping, alcohol, moistening of the hair coat around the surgical site, and aggressive scrubbing should be avoided in order to preserve the patient's body temperature (Beal, Brown and Shofer, 2000; Tracy, 2000). Heat can be conserved by using low oxygen flow rates with rebreathing circuits. Most nonrebreathing circuits are inappropriate for low oxygen flow rates.

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Limited body cavity exposure also preserves heat. Body temperature should be preserved in recovery with individual surface and body coverage with paper, towels, or blankets.

Heat loss can be prevented through contact with circulating warm water and protected (stand-off) contact with heated containers or rice bags (all very carefully monitored). Forced hot air or convective warming is the most efficient and is useful for returning and maintaining intraoperative body temperature (Machon, Raffe and Robinson, 1999), but appropriate equipment and disposables must be utilized because these warmers are capable of severe burns if they are not used appropriately with manufacturer-specified blankets. Products that make use of a conductive polymer fabric can also be used.

Direct contact with electric heating pads, inappropriately close blow dryers or heat lamps, and direct (vs. stand-off) contact with heated water containers must be avoided to prevent thermal injury. This is especially important in pediatric, debilitated, and frail geriatric patients whose low TP and/or low fat stores may easily result in burns (Harvey, 2002).

Oxygen Supplementation and Use of Ventilators

Oxygen supplementation is especially helpful to debilitated, dehydrated, undernourished, pregnant, or traumatized patients. Oxygenating will help reduce cellular hypoxia, which is common because vasoconstriction, low blood flow states, hypothermia, and acidosis are typical in anesthetized patients with a poor health status (Pascoe, 1988). While endotracheal rates of oxygen flow range from 10 mL/kg/min to 300 mL/kg/min based on rebreathing or nonrebreathing circuits, simple flow-by or "mask" rates of oxygen supplementation range from 2 to 5 L/min depending on the size of the animal, the breathing system being employed, and mask closure (Carpenter, Pettifer and Tranquilli, 2005). Caution must be exercised when using oxygen in an environment where electrocautery is utilized due to explosion or fire potential. Similar potential for harm also exists in dry, heated environments with high static electricity.

Ventilation is the process whereby the body exhales or is otherwise rid of carbon dioxide. This is a very different process from oxygenation, although the two are often grouped together. Many inhalant anesthesia machines, especially older machines, have ventilators supplied as part of the anesthesia machine. While obese animals or those in the late stages of pregnancy occasionally might require regular controlled, mechanical ventilation, most patients do not, and indeed such ventilation may severely decrease cardiac output, especially in debilitated patients. Accordingly, this author believes that automated mechanical ventilation of every surgical patient should be avoided.

Fluid Therapy

At-risk patients (heavily parasitized, pregnant, suffering from pyometra, debilitated, recently traumatized, malnourished) are often dehydrated, which can cause volume depletion, vasoconstriction, acidosis, and overall low perfusion states. This may not only severely compromise anesthesia safety but add to long-term renal and cardiac compromise (Hughes, 2001; Kudnig and Mama, 2002). If surgery can be postponed, stabilization would ideally include administration of subcutaneous or IV fluid therapy. Balanced crystalloid solutions (LRS, Normosol®, Plasmalyte®, and 0.9% NaCl) can all be utilized at greater than maintenance rate (multiples of 60 mL/kg/day).

If surgery is imminent or already in progress, and volume replacement therapy is necessary, subcutaneous or IV fluid therapy can be utilized; however, subcutaneous routes will certainly chill the patient and not afford immediate volume relief for hypotension compared to IV administration. IV routes of administration are preferred and include cephalic, saphenous, jugular, and even lingual (ventral side of tongue) veins. Intraperitoneal administration should be avoided. Fluids should be mildly warmed prior to administration, particularly with pediatric, sick, pregnant, and geriatric animals (Thurmon, 1996; Day, 2002; Kudnig and Mama, 2002). For intraoperative IV administration, a combination of colloids (Hetastarch) (1–2 mL/kg/hour) and crystalloids (2–10 mL/kg/hour) can be helpful.

ANESTHESIA AND SURGERY RECORDS

Record keeping should comply with state veterinary practice acts, policies of the Drug Enforcement Administration, and may also be guided by state and national veterinary medical associations (Short,

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1987; VASG, 2008). A medical record should be prepared for each animal and should include the following:

- Owner, guardian, or caretaker contact information and consent
- Signalment
- Brief history, if known and current vaccination status
- Physical examination and vital parameter findings
- Body weight
- The dosages and routes of all drugs administered and/or prescribed, including vaccines, supportive care (antibiotics and fluids), sedative, analgesic and anesthetic agents, and postoperative treatments
- Documentation of monitoring during anesthesia
- Description of the surgical procedure performed, including any abnormalities
- Any other pertinent information regarding the animal's condition.

PREPARATION FOR EMERGENCIES

Several important practices must be considered to prepare for any emergency that might occur during surgery. Standard emergency drugs and reversal drugs must be available in ample supply and easily accessible, and frequent/regular monitoring, perusal, and documentation of expiration dates and volumes remaining is important. A simple weight and volume emergency chart should be clearly posted or readily available to allow for the "quick draw" of drugs in emergency situations.

A useful premade emergency drug chart can be accessed quickly from the following websites: www.vasg.org and http://www.cvmbs.colostate.edu/clinsci/wing/emdrughp.html; if standard weights are entered, print offs can be obtained with instantaneous volumes of emergency drugs in milliliters for each weight class patient. Other additional charts are available for cost through http://www.aahanet.org and http://www.ivecss.org, or simple CPR drug weight dosage charts can be designed.

Technical and assistant staff should be fully prepared for emergency situations; regular drills or "rounds" are necessary, particularly in regard to identifying true arrests versus normal anesthetic respiratory and cardiovascular depression. Rounds may also include equipment checks, as well as review of the ABCs of CPR and record keeping for emergencies, difficult cases, and morbidity/mortality statistics (Wingfield, 2002; Cole, Otto and Hughes, 2003; Muir, 2007). A sample emergency equipment and drug list is given in Table 38.5.

Table 38.5. Sample shelter anesthesia emergency equipment and drug list.

Equipment list
- ETs of various sizes
- Laryngoscope or working penlight
- Oxygen supply (E tank with proper reducing and regulating valve, necessary tubing to provide flow by oxygen)
- Ventilatory equipment such as an Ambu bag or rebreathing circuit
- Emergency drug administration records to record arrest events and CPR efforts
- Standard dosing charts for weights of patients and appropriate drug volumes
- Suction apparatus (a bulb syringe and catheter is acceptable)
- IV catheters of various sizes
- Syringes of various sizes
- Fluid bags and lines

Recommended reversal and emergency agents
- Reversal agents for the drugs commonly used in both premeds and induction: atipamezole, naloxone, butorphanol, and flumazenil
- Atropine
- Epinephrine and/or vasopressin
- Dexamethasone
- Dextrose
- Diphenhydramine
- Lidocaine or xylocaine spray
- Karo syrup

Emergency agents no longer recommended[a]
- Parenteral lidocaine
- Doxapram
- Bicarbonate
- Calcium

[a]The above drugs are no longer recommended for routine response to cardiac arrhythmias, arrest, or respiratory depression. An evaluation of the patient should be conducted to determine the cause of the problem and proper corrective action taken.

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In a recent large representative study, overall risks of anesthetic and sedation-related death for elective surgery in dogs were 0.17% (1 in 601), in cats 0.24% (1 in 419), and in rabbits 1.39% (1 in 72) within 48 hours of the procedure. In healthy dogs, cats, and rabbits, the risks were estimated to be 0.05% (1 in 1849), 0.11% (1 in 895), and 0.73% (1 in 137), respectively. In sick dogs, cats, and rabbits, the risks were 1.33% (1 in 75), 1.40% (1 in 71), and 7.37% (1 in 14), respectively (Brodbelt *et al*., 2008). Maintaining similar morbidity and mortality statistics for shelter and spay/neuter programs allows important trends to be identified and necessary revisions in protocols to be made. It also provides an opportunity for comparison of statistics to other similarly structured organizations.

HANDLING EMERGENCY SITUATIONS

The most common issues surrounding perioperative death include sudden airway obstruction or hypoxia, injectable or inhalant anesthetic overdose, electrolyte abnormalities, hypotension, hypothermia, hypoglycemia, malfunctioning anesthesia equipment, vagal responses, occult heart, pulmonary, or diaphragmatic disease (Wingfield, 2002; Muir, 2007). It is beyond the scope of this chapter to provide guidelines for methods of dealing with these emergencies, but please see Table 38.6 for a summary of methods of minimizing their occurrence.

A sample emergency (ABCs of basic CPR) protocol is included in Table 38.7.

CONCLUSION

It is beyond the scope of this chapter to provide detailed anesthesia or troubleshooting protocols for spay/neuter programs. This overview is an attempt to highlight some basic principles and guidelines for providing effective and safe anesthesia in high-volume sterilization programs. In addition to utilizing a well-trained professional team of veterinarians and technicians, successful anesthesia requires use of well-maintained anesthesia and monitoring equipment. A number of useful tools for anesthesia and analgesia exist as part of the website www.sheltervet.org. The Association of Shelter Veterinarians assembled a task force in 2006 to develop minimum standards for high-volume high-quality spay/neuter programs that were published in the *Journal of the American Veterinary Medical Association* in 2008 (Looney, 2008). Troubleshooting facts, equipment, and cleaning schedules, diversion information, and examples of many anesthesia protocols utilized in high-volume elective surgery venues are available under the section entitled "Veterinary Task Force to Advance Spay and Neuter," Supplemental Information to Guidelines.

Table 38.6. Methods of minimizing anesthetic emergencies.

- Monitor patients frequently for airway patency (especially if patient is not intubated) and respiratory and cardiovascular function (capnography is excellent)
- Check anesthesia equipment and machines regularly.
- Maintain and calibrate machines and vaporizers regularly.
- Examine each patient prior to anesthesia.
- Avoid high-dose induction and maintenance agents (using premedications is a great way to reduce need for higher doses of induction and maintenance agents).
- Use appropriate drugs for debilitated or questionably healthy patients. There should be two protocols available for use: one is for 95% of the healthy patients, and the other is for the few (5%) "sick" animals who absolutely must go to surgery that day.
- Use circulating warm water and convective warm air to warm patients.
- Fast animals appropriately, especially pediatric and debilitated patients.

Table 38.7. Emergency plan for cardiopulmonary resuscitation.

1. **Evaluate the Patient**: Before initiating CPR **make certain the animal is in cardiac arrest**!!
   (cardiopulmonary depression of anesthesia can closely mimic arrest!).
   Feel for peripheral pulse or auscultate for heart sounds.
   Check ocular signs (is there a palpebral response?) and jaw tone (is it lax?).
   Check mucous membrane color: (is it pale, blue, grey?).
2. **If animal is on inhalant anesthesia**
   Turn off inhalant, disconnect ET from rebreathing circuit, flush circuit, reattach breathing circuit and confirm appropriate oxygen flow, check anesthesia equipment for technical problems.
3. **Reverse any sedation or anesthetic drug that has been administered (give antisedan, yohimbine, flumazenil).**
4. **If cardiac arrest is confirmed**
   A. Airway: If animal is already intubated, assure correct ET placement via capnography if possible.
      If animal is not intubated, properly intubate with ET of the widest lumen appropriate for the animal.
   B. Breathing: Administer 2 breaths of 100% oxygen.
      Then start 1 breath every 3–5 seconds using the rebreathing bag on the anesthesia machine with 100% oxygen or an AMBU bag.
      Be cautious with force of inflation (it is easy to cause a pneumothorax in small patients during CPR).
   C. Cardiac: Confirm whether or not the heart is beating.
      If there is no pulse, initiate cardiac compressions at a rate of 1–2 times per second.
      Monitor success of compressions with Doppler ultrasound, pulse oximetry, or pulse palpation.
      Place an IV catheter (central or peripheral).
   D. Drugs: If no heartbeat, give epinephrine (0.02–0.1 mg/kg) or vasopressin (0.3–0.8 U/kg) (IV or IT (intratracheal)).
      If bradycardic, give atropine (0.02 mg/kg) or glycopyrrolate (0.01 mg/kg)(IV or IT).
      Give further drugs as dictated by the initiating event or responses to above steps.
   E. Equipment: All available monitoring equipments should be utilized.
      Doppler blood flow probe and capnograph are the most useful to monitor return of cardiorespiratory function.
   F. Fluids: Administer fluids at a dose of 20 mL/kg/20 min (cats) or 40 mL/kg/20 min (dogs).
      Reassess after initial bolus given to determine continuation rate.

REFERENCES

AAHA/AAFP (American Animal Hospital Association & American Association of Feline Practitioners, AAHA/AAFP Pain Management Guidelines Task Force) (2007) AAHA/AAFP pain management guidelines for dogs & cats. *Journal of the American Animal Hospital Association*, **43**(5), 235–248.

Abbott Animal Health website (2010) www.abbott animalhealth .com/static/cms_workspace/pdfs/Veterinary_Professionals/AAH-125_R1_Good_Anesthesia_Life_and_ Death.pdf (accessed December 2011).

ACVA (American College of Veterinary Anesthesiologists) (1996) Commentary and recommendations on control of waste anesthetic gases in the workplace. *Journal of the American Veterinary Medical Association*, **209**(1), 75–77.

ACVA (2006) *American College of Veterinary Anesthesiologists' Position Paper on Treatment of Pain in Animals*, http://www.acva.org/docs/Pain_Treatment (accessed December 2011).

ACVA (2009) *ACVA Monitoring Guidelines, Update 2009*, www.acva.org/docs/Position_Statements (accessed December 30, 2011).

Alef, M., von Praun, F. and Oechtering, G. (2008) Is routine pre-anaesthetic haematological and biochemical screening justified in dogs? *Veterinary Anaesthesia and Analgesia*, **35**(2), 132–140.

Al-Gizawiy, M.M. and Rudé, E.P. (2004) Comparison of pre-operative carprofen and postoperative butorphanol as postsurgical analgesics in cats undergoing ovariohysterectomy. *Veterinary Anaesthesia and Analgesia*, **31**(3), 164–174.

VetBooks.ir

AORN (Association of Operating Room Nurses) (2006) Recommended practices for sterilization in the perioperative practice setting. *Association of Operating Room Nurses Journal*, **83**(3), 700–722.

Armstrong, S.R., Roberts, B.K. and Aronsohn, M. (2005) Perioperative hypothermia. *Journal of Veterinary Emergency and Critical Care*, **15**(1), 32–37.

Bateman, L., Ludders, J.W., Gleed, R.D. *et al*. (2005) Comparison between facemask and laryngeal mask airway in rabbits during isoflurane anesthesia. *Veterinary Anaesthesia and Analgesia*, **32**(5), 280–288.

Beal, M.W., Brown, D.C. and Shofer, F.S. (2000) The effects of perioperative hypothermia and the duration of anesthesia on postoperative wound infection rate in clean wounds: A retrospective study. *Veterinary Surgery*, **29**(2), 123–127.

Benson, G.J., Grubb, T.L., Neff-Davis, C. *et al*. (2000) Perioperative stress response in the dog: Effect of preemptive administration of medetomidine. *Veterinary Surgery*, **29**(1), 85–91.

Brodbelt, D.C., Blissitt, K.J., Hammond, R.A., *et al*. (2008). The risk of death: The confidential enquiry into perioperative small animal fatalities. *Veterinary Anesthesia and Analgesia*, **35**, 365–373.

Bryce, E.A., Spencer, D. and Roberts, F.J. (2001) An in-use evaluation of an alcohol-based pre-surgical hand disinfectant. *Infection Control and Hospital Epidemiology*, **22**, 635–639.

Burger, D.M., Wiestner, T. and Hubler, M. (2006) Effect of anticholinergics (atropine, glycopyrrolate) and prokinetics (metoclopramide, cisapride) on gastric motility in beagles and Labrador retrievers. *Journal of Veterinary Medicine Series A*, **53**(2), 97–107.

Burns, P.M., Driessen, B., Boston, R. *et al*. (2006) Accuracy of a third vs. first generation pulse oximeter in predicting arterial oxygen saturation and pulse rate in the anesthetized dog. *Veterinary Anaesthesia and Analgesia*, **33**(5), 281–295.

Campbell, V.L., Drobatz, K.J. and Perkowski, S.Z. (2003) Postoperative hypoxemia and hypercarbia in healthy dogs undergoing routine ovariohysterectomy or castration and receiving butorphanol or hydromorphone for analgesia. *Journal of the American Veterinary Medical Association*, **222**(3), 330–336.

Carpenter, R.E., Wilson, D.V. and Evans, A.T. (2004) Evaluation of intraperitoneal and incisional lidocaine or bupivicaine for analgesia following ovariohysterectomy in the dog. *Veterinary Anaesthesia and Analgesia*, **31**(1), 46–52.

Carpenter, R.E., Pettifer, G.R. and Tranquilli, W.J. (2005) Anesthesia for geriatric patients. *Veterinary Clinics of North America Small Animal Practice*, **35**(3), 571–580.

Clutton, R.E. (1988) The medical implications of canine obesity and their relevance to anaesthesia. *British Veterinary Journal*, **144**(1), 21–28.

Cole, S.G., Brozinsky, S. and Isenberg, J.I. (1983) Midazolam, a new more potent benzodiazepine, compared with diazepam: A randomized, double-blind study of preendoscopic sedatives. *Gastrointestinal Endoscopy*, **29**(3), 219–222.

Cole, S.G., Otto, C.M. and Hughes, D. (2003) Cardiopulmonary cerebral resuscitation in small animals: A clinical practice review. Part II. *Journal of Veterinary Emergency and Critical Care*, **13**(1), 13–23.

Cook, D.R., Davis, P.J. and Ing, R.J. (2005) Pediatric anesthesia pharmacology, in *Pediatric Cardiac Anesthesia*, 4th edn (eds C.L. Lake and P.D. Booker), Lippincott Williams and Wilkins, Philadelphia, Pennsylvania, pp. 66–67.

Corletto, F. (2007) Multimodal and balanced analgesia. *Veterinary Research Communications*, **31**(Suppl. 1), 59–63.

Day, T.K. (1993) Endotracheal tubes and ancillary equipment for intubation. *Seminars in Veterinary Medicine and Surgery (Small Animal)*, **8**(2), 115–118.

Day, T.K. (2002) Anesthesia of patients with cardiac disease, in *Veterinary Anesthesia and Pain Management Secrets* (ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania, pp. 157–164.

Doi, M. and Ikeda, K. (1993) Airway irritation produced by volatile anaesthetics during brief inhalation: Comparison of halothane, enflurane, isoflurane and sevoflurane. *Canadian Journal of Anaesthesia*, **40**(2), 122–126.

Dorsch, J.A. and Dorsch, S.E. (1999a) Controlling trace gas levels, in *Understanding Anesthesia Equipment*, 4th edn (eds J.A. Dorsch and S.E. Dorsch), Williams and Wilkins, Baltimore, Maryland, pp. 369–372.

Dorsch, J.A. and Dorsch, S.E. (1999b) Cleaning and sterilization, in *Understanding Anesthesia Equipment*, 4th edn (eds J.A. Dorsch and S.E. Dorsch), Williams and Wilkins, Baltimore, Maryland, pp. 969–1013.

Dzikiti, T.B., Joubert, K.E., Venter, L.J. *et al*. (2006) Comparison of morphine and carprofen administered alone or in combination for analgesia in dogs undergoing ovariohysterectomy. *Journal of the South African Veterinary Association*, **77**(3), 120–126.

Egger, C. and Love, L. (2009) Local and regional anesthesia techniques, part 1: Overview and five simple techniques. *Veterinary Medicine*, **104**(1), 24–40.

Erhardt, W., Bohn, F.K. and Ehmann, H. (1990) Anticholinergic medication in the dog before and during

VetBooks.ir

anaesthesia. *Berliner und Münchener Tierärztliche Wochenschrift*, **103**(2), 42–49.

Faggella, A.M. and Aronsohn, M.G. (1994) Evaluation of anesthetic protocols for neutering 6- to 14-week-old pups. *Journal of the American Veterinary Medical Association*, **205**, 308–314.

Fischer, S., Quest, C., Dubovi, E. *et al*. (2007) Response of feral cats to vaccination at the time of neutering. *Journal of the American Veterinary Medical Association*, **230**(1), 52–58.

Flecknell, P. (1999) Rabbits, rodents and ferrets, in *Manual of Small Animal Anaesthesia and Analgesia* (eds C. Seymour and R. Gleed), British Small Animal Veterinary Association, Cheltenham, UK, pp. 295–296.

Gaynor, J.S., Dunlop, C.I., Wagner, A.E. *et al*. (1999) Complications and mortality associated with anesthesia in dogs and cats. *Journal of the American Animal Hospital Association*, **35**, 13–17.

Gibson, K.L., Keizer, K. and Golding, C. (2002) A trap, neuter, and release program for feral cats on Prince Edward Island. *Canadian Veterinary Journal*, **43**(9), 695–698.

Giordano, T., Steagall, P.V.M., Ferreira, T.H. *et al*. (2010) Postoperative analgesic effects of intravenous, intramuscular, subcutaneous or oral transmucosal buprenorphine administered to cats undergoing ovariohysterectomy. *Veterinary Anaesthesia and Analgesia*, **37**(4), 357–366.

Girard, N.M., Leece, E.A. and Cardwell, J.M. (2010) The sedative effects of low-dose medetomidine and butorphanol alone and in combination intravenously in dogs. *Veterinary Anaesthesia and Analgesia*, **37**(1), 1–6.

Gleed, R. (1999) Preoperative assessment, in *Manual of Small Animal Anaesthesia and Analgesia* (eds C. Seymour and R. Gleed), British Small Animal Veterinary Association, Cheltenham, UK, pp. 10–11.

Grandy, J.L. and Dunlop, C.I. (1991) Anesthesia of pups and kittens. *Journal of the American Veterinary Medical Association*, **198**, 1244–1249.

Greene, S.A. (2002) *Veterinary Anesthesia and Pain Management Secrets*, Hanley and Belfus, Philadelphia, Pennsylvania.

Greene, S.A. and Harvey, R.C. (1996) Airway disease, in *Lumb & Jones' Veterinary Anesthesia*, 3rd edn (eds J.C. Thurmon, W.J. Tranquilli and G.J. Benson), Williams and Wilkins, Baltimore, Maryland, pp. 807–811.

Grimm, K.A. (2002) Obesity, in *Veterinary Anesthesia and Pain Management Secrets* (ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania.

Gross, M.E. and Branson, K.R. (1993) Reducing exposure to waste anesthetic gas. *Veterinary Technology*, **14**(3), 175–177.

Hackett, T.B. (2002a) Pulse oximetry and end tidal carbon dioxide monitoring. *Veterinary Clinics of North America Small Animal Practice*, **32**(5), 1021–1029.

Hackett, T.B. (2002b) *The Postoperative Cat–Monitoring, Analgesia and Nursing Care*. Proceedings of the Western Veterinary Conference, Las Vegas, NV.

Hardie, E.M., Spodnik, G.J., Gilson, S.D. *et al*. (1999) Tracheal rupture in cats 16 cases (1983–1998). *Journal of the American Veterinary Medical Association*, **214**(4), 508–512.

Hartsfield, S.M. (1996) Anesthetic machines and breathing systems, in *Lumb & Jones' Veterinary Anesthesia*, 3rd edn (eds J.C. Thurmon, W.J. Tranquilli and G.J. Benson), Williams and Wilkins, Baltimore, Maryland, pp. 365–408.

Harvey, R.C. (2002) Hypothermia, in *Veterinary Anesthesia and Pain Management Secrets* (ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania, pp. 149–152.

Haskins, S.C. (1987) Monitoring the anesthetized patient, in *Principles and Practice of Veterinary Anesthesia* (ed C.S. Short), Williams and Wilkins, Baltimore, Maryland, pp. 455–477.

Haskins, S.C. (1996) Monitoring the anesthetized patient, in *Lumb & Jones' Veterinary Anesthesia*, 3rd edn (eds J.C. Thurmon, W.J. Tranquilli and G.J. Benson), Williams and Wilkins, Baltimore, Maryland, pp. 409–424.

Holden, D. (1999) Postoperative care, in *Manual of Small Animal Anaesthesia and Analgesia* (eds C. Seymour and R.D. Gleed), British Small Animal Veterinary Association, Cheltenham, UK, pp. 17–18.

Hromadkova, L., Rehurek, J. and Anton, M. (1990) The effect of general anesthesia on the position of the eye. *Ceskoslovenska Oftalmalogie*, **46**(6), 422–427.

Hughes, D. (2001) Fluid therapy with artificial colloids: Complications and controversies. *Veterinary Anaesthesia and Analgesia*, **28**(2), 111.

Insler, S.R. and Sessler, D.I. (2006) Perioperative thermoregulation and temperature monitoring. *Anesthesiology Clinics*, **24**(4), 823–837.

Johr, M.R. (1999) Is it time to question the routine use of anticholinergic agents in paediatric anaesthesia? *Paediatric Anaesthesia*, **9**(2), 99–101.

Kampschmidt, K. (2006) *Drug Use in the Neonatal Pediatric Small Animal Patient*. Proceedings of the Western Veterinary Conference, Las Vegas, NV.

Keegan, R.D. (2002) Inhalant anesthetics, in *Veterinary Anesthesia and Pain Management Secrets*

VetBooks.ir

(ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania, pp. 97–103.

Ko, J.C. and Galloway, D.S. (2002) Anesthesia of geriatric patients, in *Veterinary Anesthesia and Pain Management Secrets* (ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania, pp. 215–219.

Ko, J.C., Fox, S.M. and Mandsager, R.E. (2001) Effects of preemptive atropine administration on incidence of medetomidine-induced bradycardia in dogs. *Journal of the American Veterinary Medical Association*, **218**(1), 52–58.

Ko, J.C., Mandsager, R.E., Lange, D.N. *et al.* (2000) Cardiorespiratory responses and plasma cortisol concentrations in dogs treated with medetomidine before undergoing ovariohysterectomy. *Journal of the American Veterinary Medical Association*, **217**(4), 509–514.

Ko, J.C.H., Abbo, L.A., Weil, A.B. *et al.* (2007a) A comparison of anesthetic and cardiorespiratory effects of tiletamine-zolazepam-butorphanol and tiletamine-zolazepam-butorphanol-medetomidine in cats. *Veterinary Therapeutics*, **8**(3), 164–176.

Ko, J.C., Payton, M., Weil, A.B. *et al.* (2007b) Comparison of anesthetic and cardiorespiratory effects of tiletamine-zolazepam-butorphanol and tiletamine-zolazepam-butorphanol-medetomidine in dogs. *Veterinary Therapeutics*, **8**(2), 113–121.

Kudnig, S.T. and Mama, K. (2002) Perioperative fluid therapy. *Journal of the American Veterinary Medical Association*, **221**(8), 1112–1121.

Kushner, L.I. (2002) Respiratory diseases, in *Veterinary Anesthesia and Pain Management Secrets* (ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania, pp. 169–178.

Laflamme, D.P. (1997) Development and validation of a body condition score system for dogs. *Canine Practice*, **22**, 10.

Lamont, L.A. (2002) Pre-emptive analgesia, in *Veterinary Anesthesia and Pain Management Secrets* (ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania, pp. 331–333.

Larson, E.L., Aiello, A.E., Heilman, J.M. *et al.* (2001) Comparison of different regimens for surgical hand preparation. *Association of Operating Room Nurses Journal*, **73**, 412–432.

Lascelles, B.D.X., McFarland, J.M. and Swann, H. (2005) Guidelines for safe and effective use of NSAIDs in dogs. *Veterinary Therapeutics*, **6**(3), 237–251.

Leece, E.A., Brearley, J.C. and Harding, E.F. (2005) Comparison of carprofen and meloxicam for 72 hours following ovariohysterectomy in dogs. *Veterinary Anaesthesia and Analgesia*, **32**(4), 184–192.

Lemke, K.A., Runyon, C.L. and Horney, B.S. (2002) Effects of preoperative administration of ketoprofen on anesthetic requirements and signs of postoperative pain in dogs undergoing elective ovariohysterectomy. *Journal of the American Veterinary Medical Association*, **221**(9), 1268–1275.

Leonard, P.A. and Beattie, T.F. (2004) Is measurement of capillary refill time useful as part of the initial assessment of children? *European Journal of Emergency Medicine*, **11**(3), 158–163.

Lin, H.C. (1996) Dissociative anesthetics, in *Lumb & Jones' Veterinary Anesthesia*, 3rd edn (eds J.C. Thurmon, W.J. Tranquilli and G.J. Benson), Williams & Wilkins, Baltimore, Maryland, pp. 241–296.

Lobetti, R.G. and Joubert, K.E. (2000) Effect of administration of nonsteroidal anti-inflammatory drugs before surgery on renal function in clinically normal dogs. *American Journal of Veterinary Research*, **61**(12), 1501–1507.

Looney, A.L. (2008) Preoperative evaluation and anesthetic protocols, in *Handbook of Small Animal Practice*, 5th edn (ed R.H. Morgan), Saunders Elsevier, St. Louis, Missouri, pp. 1–10.

Looney, A.L., Bohling, M.W., Bushby, P.A. *et al.* (2008) The association of shelter veterinarians veterinary medical care guidelines for spay-neuter programs. *Journal of the American Veterinary Medical Association*, **233**(1), 74–86.

Looney, A.L. and Moses, L.M. (2005) (unpublished data). MSPCA/Angell Animal Medical Center, Boston.

Ludders, J.W. and Stafford, K.L. (1991) Basic equipment for small animal anesthesia; use and maintenance, part II. *Compendium on Continuing Education for the Practicing Veterinarian*, **12**(1), 35–40.

Machon, R.G., Raffe, M.R. and Robinson, E.P. (1999) Warming with a forced air warming blanket minimizes anesthesia induced hypothermia in cats. *Veterinary Surgery*, **28**(4), 301–310.

Marik, P.E. (2002) Propofol: Therapeutic indications and side effects. *Current Pharmaceutical Design*, **10**(29), 3636.

Mason, D.E. (1993) Anesthesia machine checkout and troubleshooting. *Seminars in Veterinary Medicine and Surgery (Small Animal)*, **8**, 104–108.

McKelvey, D. (2000a) Anesthetic equipment, in *Small Animal Anesthesia and Analgesia*, 2nd edn (eds D. McKelvey and K.S. Hollingshead), Mosby, St Louis, Missouri, pp. 147–190.

McKelvey, D. (2000b) Anesthetic problems and emergencies, in *Small Animal Anesthesia and Analgesia*, 2nd edn (eds D. McKelvey and K.S. Hollingshead), Mosby, St Louis, Missouri, pp. 225–251.

VetBooks.ir

VetBooks.ir

Mitchell, S.L., McCarthy, R. and Rudloff, E. (2000) Tracheal rupture associated with intubation in cats, 20 cases (1996–1998). *Journal of the American Veterinary Medical Association*, **216**(10), 1592–1595.

Moon, P.F. (1999) Fluid therapy and blood transfusion, in *Manual of Small Animal Anaesthesia and Analgesia* (eds C. Seymour and R.D. Gleed), British Small Animal Veterinary Association, Cheltenham, UK, pp. 119–121.

Moon, R.E. and Camporesi, E.M. (1990) Respiratory monitoring, in *Anesthesia*, 3rd edn (ed R.D. Miller), Churchill Livingstone, New York, pp. 1165–1184.

Muir, W.W. (2000) Anesthesia machines and breathing systems, in *Handbook of Veterinary Anesthesia*, 3rd edn (eds W.W. Muir, J.A.E. Hubbell, R.T. Skarda *et al*.), Mosby, St Louis, Missouri, pp. 210–229.

Muir, W.W. (2007) Cardiovascular emergencies, in *Handbook of Veterinary Anesthesia*, 4th edn (eds W.W. Muir, J.A.E. Hubbell and R.M. Bednarski), Mosby, St Louis, Missouri, pp. 557–575.

Muir, W.W., Hubbell, J.A.E., Skarda, R.T. *et al*. (2000) *Handbook of Veterinary Anesthesia*, 3rd edn, Mosby, St Louis, Missouri.

Murrell, J.C. and Hellebrekers, L.J. (2005) Medetomidine and dexmedetomidine: A review of cardiovascular effects and antinociceptive properties in the dog. *Veterinary Anaesthesia and Analgesia*, **32**(3), 117–127.

Nagelhout, J.J. and Plaus, K.L. (2010) Malnutrition, in *Handbook of Nurse Anesthesia*, 4th edn (eds J.J. Nagelhout and D.C. Plaus), Saunders & Elsevier, St Louis, Missouri, pp. 224–225.

New, J.C., Kelch, W.J., Hutchison, J.M. *et al*. (2004) Birth and death rate estimates of cats and dogs in US households and related factors. *Journal of Applied Animal Welfare Science*, **7**, 229–241.

O'Hare, E., Weldon, D.T., Bettin, K. *et al*. (1997) Serum anticholinergic activity and behavior following atropine sulfate administration in the rat. *Pharmacology Biochemistry and Behavior*, **56**(1), 151–154.

Parlow, J.L., van Vlyman, J.M. and Odell, M.J. (1997) The duration of impairment of autonomic control after anticholinergic drug administration in humans. *Anaesthesia and Analgesia*, **84**, 155–159.

Pascoe, P.J. (1988) Oxygen and ventilatory support for the critical patient. *Seminars in Veterinary Medicine and Surgery (Small Animal)*, **3**(3), 202–209.

Pascoe, P.J. and Moon, P.F. (2001) Periparturient and neonatal anesthesia. *Veterinary Clinics of North America Small Animal Practice*, **31**(2), 315–340.

Perkowski, S.Z. (2000) Anesthesia for the emergency small animal patient. *Veterinary Clinics of North America Small Animal Practice*, **30**(3), 509–530.

Posner, L.P., Asakawa, M. and Erb, H.N. (2008) Use of propofol for anesthesia in cats with primary hepatic lipidosis: 44 cases (1995–2004). *Journal of the American Veterinary Medical Association*, **232**(12), 1841–1843.

Postlethwait, R.W. (1972) Principles of operative surgery: Antisepsis, technique, sutures, and drains, in *Textbook of Surgery* (ed D.C. Sabiston), WB Saunders, Philadelphia, Pennsylvania, pp. 300–318.

Quandt, J. (2006) Preparing the critical patient for anesthesia. Oral Presentation at 12th International Veterinary Emergency and Critical Care Symposium, San Antonio, Texas.

Redondo, J.I., Rubio, M. and Soler, G. (2007) Normal values and incidence of cardiorespiratory complications in dogs during general anaesthesia: A review of 1281 cases. *Journal of Veterinary Medicine Series A–Physiology Pathology & Clinical Medicine*, **54**(9), 470–477.

Reese, M., Patterson, E., Tucker, S. *et al*. (2008) Effects of anesthesia and surgery on serologic responses to vaccination in kittens. *Journal of the American Veterinary Medical Association*, **233**(1), 116–121.

Reuss-Lamky, H. (2006) *Waste Anesthetic Gases-The Invisible Threat*. Proceedings of the 24th Annual American College of Veterinary Internal Medicine Conference, Louisville, KY.

Robertson, S.A. (2002) Oxygenation and ventilation, in *Veterinary Anesthesia and Pain Management Secrets* (ed S.A. Greene), Hanley and Belfus, Philadelphia, Pennsylvania, pp. 15–20.

Robertson, S.A., Lascelles, B.D.X., Taylor, P.M. *et al*. (2005) PK-PD modeling of buprenorphine in cats: Intravenous and oral transmucosal administration. *Journal of Veterinary Pharmacology and Therapeutics*, **28**(5), 453–460.

Root Kustritz, M.V. (2002) Early spay-neuter: Clinical considerations. *Clinical Techniques in Small Animal Practice*, **17**, 124–128.

Root Kustritz, M.V. (2007) Determining the optimal age for gonadectomy of dogs and cats. *Journal of the American Veterinary Medical Association*, **231**(11), 1665–1675.

Ross, A.F. and Tinker, J.H. (1994) Anesthesia risk, in *Anesthesia*, 4th edn (ed R.D. Miller), Churchill Livingstone, New York, p. 791.

Salmeri, K.R. (2002) Post Operative Care of the Small Animal Surgical Patient. Proceedings of the 15th Atlantic Coast Veterinary Conference, Atlantic City, NJ.

Savvas, I. and Raptopoulos, D. (1997) *The Effect of Fasting and Type of Food on the Gastric Content Volume and pH at Induction of Anaesthesia in the Dog*. Proceedings of the 6th Annual International Congress of Veterinary Anesthesiology, Thessaloniki, Greece.

Sawyer, D.C. (1984) Canine and feline endotracheal intubation and laryngoscopy. *Compendium on Continuing Education for the Practicing Veterinarian*, **11**, 973–984.

Schrigger, D.L. and Baraff, L. (1988) Defining normal capillary refill: Variation with age, sex, and temperature. *Annals of Emergency Medicine*, **17**(9), 932–935.

Short, C.E. (1987) *Principles and Practice of Veterinary Anesthesia*, Williams and Wilkins, Baltimore, Maryland.

Sidarov, V.A., Korotkova, P.V., Mikhel'son, V.A. *et al*. (2006) Induction of anesthesia with halogen-containing anesthetic agents in children. *Anesteziologiia i Reanimatologiia*, Jan–Feb (1), 23–27.

Slingsby, L.S. and Waterman-Pearson, A.E. (2000a) Postoperative analgesia in the cat after ovariohysterectomy by use of carprofen, ketoprofen, meloxicam or tolfenamic acid. *Journal of Small Animal Practice*, **41**(10), 447–450.

Slingsby, L.S. and Waterman-Pearson, A.E. (2000b) The post-operative analgesic effects of ketamine after canine ovariohysterectomy–a comparison between pre- or post-operative administration. *Research in Veterinary Science*, **69**(2), 147–152.

Smith, J.P. and Volmer, P.A. (2005) Flumazenil. *Compendium on Continuing Education for the Practicing Veterinarian*, **27**(5), 356–360.

Steffey, E.P. (1996) Inhalation anesthetics, in *Lumb & Jones' Veterinary Anesthesia*, 3rd edn (eds J.C. Thurmon, W.J. Tranquilli and G.J. Benson), Williams & Wilkins, Baltimore, Maryland, pp. 297–329.

Swedlow, D.B. (1986) Capnometry and capnography: The anesthesia disaster early warning system. *Seminars in Anesthesia*, **5**, 194–205.

Tamse, J.G. (1978) Preventive Maintenance of Medical and Dental Equipment. Proceedings: Association for the Advancement of Medical Instrumentation 13th Annual Meeting, Washington DC.

Taylor, P.M., Kirby, J.J., Robinson, C. *et al*. (2010) A prospective multi-centre clinical trial to compare buprenorphine and butorphanol for postoperative analgesia in cats. *Journal of Feline Medicine and Surgery*, **12**(4), 247–255.

Terriet, M.F., Desouza, G.J. and Jacobs, J.S. (2000) Which is most pungent: Isoflurane, sevoflurane or desflurane? *British Journal of Anaesthesia*, **85**(2), 305–307.

Thurmon, J.C. (1996) Considerations for general anesthesia—dogs and cats, in *Lumb & Jones' Veterinary Anesthesia*, 3rd edn (eds J.C. Thurmon, W.J. Tranquilli and G.J. Benson), Williams and Wilkins, Baltimore, Maryland, pp. 5–34.

Thurmon, J.C., Tranquilli, W.J. and Benson, G.J. (1996) Injectable anesthetics, in *Lumb & Jones' Veterinary Anesthesia*, 3rd edn (eds J.C. Thurmon, W.J. Tranquilli and G.J. Benson), Williams and Wilkins, Baltimore, Maryland, pp. 210–240.

Ti, L.K., Chen, F.G., Tan, G.M. *et al*. (2009) Experiential learning improves the learning and retention of endotracheal intubation. *Medical Education*, **43**(7), 654–660.

Tobias, K.M., Harvey, R.C. and Byarlay, J.M. (2006) A comparison of four methods of analgesia in cats following ovariohysterectomy. *Veterinary Anaesthesia and Analgesia*, **33**(6), 390–398.

Tracy, D.L. (2000) Small animal surgery, in *Small Animal Surgical Nursing*, 3rd edn (ed D.L. Tracy), Mosby, St. Louis, Missouri, pp. 259–322.

Vasseur, P.B., Paul, H.A., Enos, L.R. *et al*. (1985) Infection rates in clean surgical procedures: A comparison of ampicillin prophylaxis vs. a placebo. *Journal of the American Veterinary Medical Association*, **187**, 825–827.

VASG (Veterinary Anesthesia and Analgesia Support Group) (2008) www.vasg.org (accessed March 2008).

Wiese, A.J. (2007) Anaesthetic and cardiopulmonary effects of intramuscular morphine, medetomidine and ketamine administered to telemetered cats. *Journal of Feline Medicine and Surgery*, **9**(2), 150–156.

Williams, L.S., Levy, J.K., Robertson, S.A. *et al*. (2002) Use of the anesthetic combination of tiletamine, zolazepam, ketamine, and xylazine for neutering feral cats. *Journal of the American Veterinary Medical Association*, **220**(10), 1491–1495.

Wilson, D.V., Barnes, K.S. and Hauptman, J.G. (2004) Pharmacokinetics of combined intraperitoneal and incisional lidocaine in the dog following ovariohysterectomy. *Journal of Veterinary Pharmacology and Therapeutics*, **27**(2), 105–109.

Wingfield, W.E. (2002) Cardiopulmonary arrest, in *The Veterinary ICU Book* (eds W.E. Wingfield and M.R. Raffe), Teton New Media, Jackson Hole, Wyoming, pp. 421–452.

Zilberstein, L.F., Moens, Y.P. and Leterrier, E. (2008) The effect of local anaesthesia on anaesthetic requirements for feline ovariectomy. *Veterinary Journal*, **178**(2), 214–218.

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39
Surgical Techniques for Spay/Neuter

Philip A. Bushby

INTRODUCTION

The health benefits of ovariohysterectomy (spay) and castration (neuter) in dogs and cats have been well documented in the veterinary literature. In the female, complete ovariohysterectomy (removal of the ovaries and uterus) not only prevents pregnancy and any complications associated with pregnancy and parturition, but also eliminates pyometra, ovarian tumors, metritis and false pregnancy, and significantly reduces the incidence of mammary neoplasia. In the male, complete castration (removal of the testicles) eliminates the incidence of testicular tumors, decreases the incidence of benign prostatic hypertrophy, prostatitis and injuries associated with roaming.

In addition to the health benefits, ovariohysterectomy and castration reduce or eliminate most behaviors associated with sexual activity in the dog and cat. Although research is ongoing to develop nonsurgical sterilants (see the chapter on nonsurgical sterilization of cats and dogs) currently, ovariohysterectomy and castration remain the most effective methods of reducing the numbers of unwanted dogs and cats. Shelters and adoption agencies are strongly encouraged to have all animals sterilized prior to adoption, and the American Veterinary Medical Association (AVMA) supports a position that all dogs and cats be sterilized prior to adoption. In fact, AVMA policy specifically supports "prohibiting the sale or adoption of intact dogs and cats by humane organizations and animal control agencies" (http://www.avma.org).

PREOPERATIVE PATIENT CARE AND EVALUATION

In order to meet the demand for safe and efficient neutering of large numbers of animals, many shelters, humane societies, and practitioners have developed techniques and protocols that are used in high-quality, high-volume spay/neuter clinics (HQHVSN). The Association of Shelter Veterinarians (ASV) Veterinary Medical Care Guidelines for Spay–Neuter Programs, published in 2008, documents appropriate patient care and requirements for patient evaluation in these and other spay/neuter settings. The guidelines deal in detail with patient selection, recordkeeping, vaccination, withholding food, physical examination, housing, surgical and anesthetic protocols and infectious disease control (Looney *et al*., 2008). The selection and preoperative evaluation of patients for analgesia/anesthesia and surgery are covered in the chapter on anesthesia and pain management and will not be discussed here.

Determining Gender and Reproductive Status

Prior to surgery, it is important to determine the gender and reproductive status of the animal to determine which surgical procedure is to be performed. Animal owners, caregivers, or shelter personnel do not always know the correct gender. In the male, it is important to determine if both testicles are present in the scrotum and, if not, whether the animal has a retained testicle (referred to as cryptorchidism) or has previously been castrated. In the female, it is important to determine if the patient has previously been spayed.

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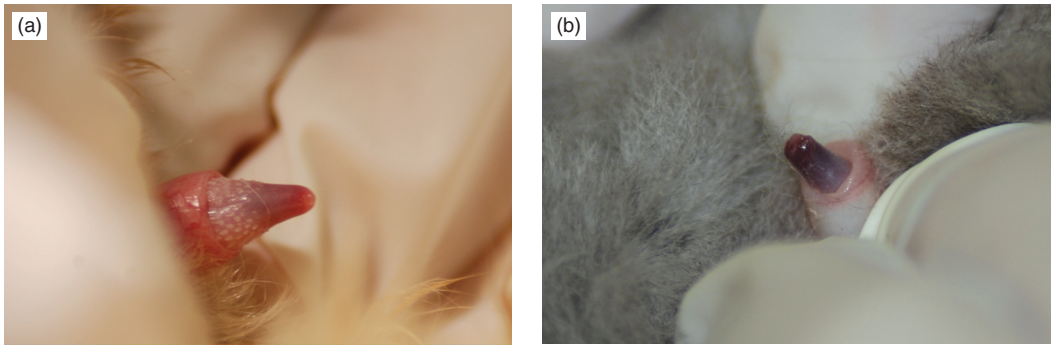


Figure 39.1. Penile barbs are subject to the effect of testosterone. They are present in the intact male cat (a) and absent in the castrated male cat (b). Photos courtesy Dr. Kimberly Woodruff.

Determining Reproductive Status in the Male Animal

In the dog, palpation of the scrotum will reveal the presence or absence of the testicles. Absence of one testicle from the scrotum generally indicates that the dog is a unilateral cryptorchid (also known as monorchid). The undescended testicle may be located in the subcutaneous tissue between the external inguinal ring and the scrotum, in the abdominal cavity, or trapped in the inguinal canal.

Absence of both testicles from the scrotum indicates either previous castration or bilateral cryptorchidism. Physical examination findings in the male dog will not always allow differentiation between bilateral cryptorchidism and previous castration. Clipping the hair from the prescrotal area may reveal a scar or a tattoo indicating previous castration surgery. Close examination of the scrotum may reveal a scar from a scrotal castration. With no physical evidence of previous castration, the animal's response to administration of gonadotropin-releasing hormone (GnRH) will confirm the presence or absence of testosterone. The test is conducted by measuring testosterone levels in blood samples taken prior to and 60 minutes after intramuscular administration of 2 μg/kg GnRH. An increase in testosterone in the post-GnRH blood sample is diagnostic for the presence of testicular tissue (Puswell and Wilcke, 1993).

In the cat, the presence of penile barbs is testosterone dependent. Penile barbs will atrophy within 6 weeks of castration. The absence of penile barbs in males over 3–4 months of age indicates that the cat has been castrated. The presence of penile barbs indicates that testicular tissue is present or that the cat has only recently been castrated (Memon *et al*., 1992) (Figure 39.1).

Determining Reproductive Status in the Female

Determining by physical examination if a dog has been spayed is dependent on finding evidence of a scar from a spay incision or by palpating the fibrous reaction to a previous incision or sutures in the abdominal wall. The hair on the ventral abdominal midline should be clipped, and the area between the umbilicus and pubic bone should be closely examined and palpated. The presence of a tattoo on or just off the ventral abdominal midline is a strong indicator of a previous spay. The presence of a visual or palpable scar caudal to the umbilicus indicates previous abdominal surgery and is highly suggestive, but not conclusive evidence of a prior spay. In addition, the spayed animal will generally have underdeveloped genitalia and mammary tissue.

If it is not possible to determine if an animal has been spayed from physical examination, a luteinizing hormone (LH) test can be performed. In most cases, high LH values indicate that the animal has been spayed; however, intact dogs have brief episodic surges in serum LH concentrations at intervals of 1–8 hours throughout their estrous cycle. These surges are generally 20–60 minutes in duration. Therefore, if a high LH result is obtained, it is recommended that the veterinarian repeat the test, taking samples about 2 hours apart. A single low LH test result confirms the dog is intact (Lofstedt and Vanleeuwen, 2002). In cats, a negative result suggests that the queen is intact, and a positive result is indicative of an ovariohysterectomized cat; however, false positives occasionally occur. Results of such

testing should be interpreted in relation to physical findings, and repeat testing may be beneficial in cases where false-positive results are suspected (Griffin, 2006).

If the reproductive status of a healthy female cat or dog cannot be otherwise determined, it is best to perform an exploratory laparotomy to confirm the presence or absence of ovaries and uterus (Appel and Hart, 2004).

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SURGICAL SUITE

All spays and adult dog castrations should be performed in a surgical suite using aseptic technique. Many different facilities may be used for the performance of spays and castrations, but strict adherence to a few basic guidelines is essential to conduct aseptic surgery. The operating room should be dedicated to surgery and should be restricted to essential personnel. Ideally, it will be located away from heavily trafficked areas in order to reduce distractions and disease transmission. The room must be equipped for the maintenance and monitoring of anesthesia and for dealing with any emergencies that may arise during surgery. Protocols must be in place for the proper cleaning and disinfection of the room and equipment; separate sterile instruments should be used for each patient (Looney *et al*., 2008). Sterile suture is to be used on each patient and suture should not be soaked in disinfectant and reused. Careful adherence to these protocols should help create an environment in the surgical suite where the routine use of antimicrobials is not indicated. Use of antimicrobials should be restricted to specific conditions such as preexisting infection or breaks in aseptic technique. Successful surgery also depends on having appropriate and well-maintained instruments. See Appendix 39.1 for a list of recommended surgical instruments for spay and neuter packs.

EFFICIENCY OF SPAY/NEUTER PROGRAMS

An experienced surgeon using efficient surgical techniques as described later in this chapter and working with a well-trained support staff can be expected to perform as many as 40 sterilization surgeries a day. Efficient performance of spay and neuter surgeries, however, requires more than just streamlined surgical technique. Systems should be in place to allow thorough yet efficient intake of animals, preoperative evaluation of patients, induction of anesthesia, patient preparation, transport to the surgical suite, and patient monitoring during surgery and recovery. (Looney *et al*., 2008).

Efficient, well-trained technical support is essential for a high-quality, high-volume spay/neuter program to be successful. In accordance with state veterinary practice acts, veterinary technicians and assistants can assist with preoperative evaluations, induce anesthesia, prepare patients for surgery, position patients on the surgery tables, and monitor anesthesia and patient recovery. Ideally, the surgery suite should have two surgery tables per surgeon, allowing setup and positioning of the next patient while the surgeon is completing surgery on the first patient. This allows the surgeon to move from one table to the next, change into sterile surgery gloves, and start surgery with a new sterile instrument pack.

PREPARATION OF PATIENT

Several factors must be balanced in preparing the patient for surgery. The goal of patient preparation is to allow aseptic surgery to be performed quickly and efficiently, with minimal tissue trauma and minimal loss of body temperature. Shortcuts in patient preparation to try to save time may result in more problems later (infections, having to clip more hair in an emergency, etc.).

Once the patient is anesthetized, the urinary bladder should be gently expressed in females and in male patients who have been diagnosed with abdominal cryptorchidism. Expressing the urinary bladder reduces its size and helps prevent the bladder from interfering with locating either the uterus in females or the retained testicle(s) in males. Care should, however, be taken to avoid trauma to the bladder. If excessive pressure is required to express the bladder, wait until the animal is in a deeper plane of anesthesia, or do not express the bladder at all.

Sufficient hair should be clipped from the surgical site to allow the placement of sterile drapes and to avoid contamination of the surgical site with hair. In female dogs and cats, hair should be clipped from cranial to the umbilicus to the anterior brim of the pubis. Enough hair should be clipped to allow extension of the normal incision in case of surgical complications. (See the chapter on management of stray and community cats for a description of a flank approach for a cat spay.) In the male dog, the hair in the prescrotal area should be clipped for a prescrotal castration; for a scrotal castration hair on

the scrotum should be clipped. In all cases, clipping should be carefully performed in a manner that does not cause iatrogenic trauma to the skin. In the male cat, the hair on the scrotum can be either plucked or clipped. Following clipping and vacuuming, a lint roller should be used to remove any additional hair that may have adhered to the animal's skin.

In all cases, an appropriate surgical scrub agent should be used to remove dirt and debris from the skin and reduce bacterial contamination of the skin. A preoperative scrub should be performed aseptically, beginning at the intended incision site and proceeding in a circular motion out to the hairline. As with clipping, care should be taken to avoid traumatizing the skin. There are many acceptable surgical scrub agents, and the manufacturer's recommendations should be followed regarding the length of time the surgical scrub should be in contact with the skin (Fossum, 2007).

PREPARATION OF THE SURGEON

As in all aseptic surgery, the surgeon should wear a clean surgical scrub suit and scrub his or her hands and arms with an appropriate surgical scrub agent. Contact time with the scrub agent is the most important aspect of the surgeon's scrub and should follow manufacturer's recommendations.

For all sterilization surgeries except cat and pediatric puppy castrations, the surgeon should wear a cap and mask. A sterile gown is recommended but may be omitted on the basis of surgeon experience and preference as long as asepsis is maintained (Looney *et al*., 2008). Single-use sterile surgical gloves are required for all spay/neuter surgeries except for routine cat castrations. In routine cat castrations, sterile surgical gloves are recommended but at the surgeon's discretion, single-use examination gloves may be substituted (Looney *et al*., 2008). Sterile gloves should be changed between surgeries and if any contamination occurs, the surgeon should re-scrub, re-gown, and re-glove prior to proceeding to the next surgical procedure.

EFFICIENT SURGICAL TECHNIQUE

There are several practical techniques that will improve efficiency in performing ovariohysterectomies and castrations, reducing both time and cost of the procedures. Some of those techniques are described below.

Positioning of the Patient

A simple restraint device that can be made out of aluminum rods allows positioning the female patient with the front legs along her side rather than pulled forward past her head (Figure 39.2). Pulling the legs



Figure 39.2. A simple restraint device (a) when positioned under the patient with the patient's front legs positioned next to the thoracic wall (b) will minimize tilting of the patient and will make it easier to exteriorize ovaries during a spay.

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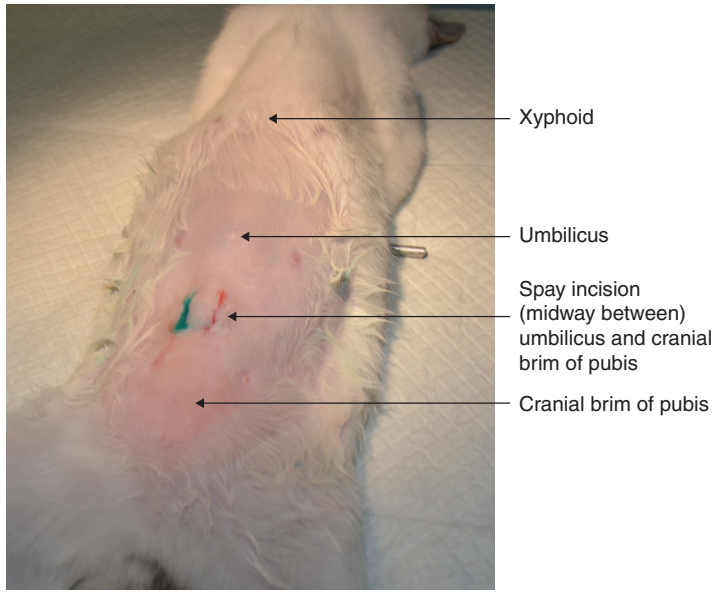


Figure 39.3. The skin incision in a cat spay is exactly midway between the umbilicus and the cranial brim of the pubis.

cranially, which is commonly done, may tighten the muscles of the back and the suspensory ligaments of the ovaries, making it more difficult to exteriorize the ovaries. Placing the limbs alongside the patient's thorax will relax the suspensory ligaments and make delivery of the ovaries through an abdominal incision easier.

Incision Size and Placement

The experienced surgeon is able to perform a spay through very small incisions without endangering the patient's well-being. While most surgery instructors recommend long incisions and maximum exposure, these incisions are more time-consuming to close. Small incisions have the same advantages in ovariohysterectomies as in other minimally invasive surgical procedures. Small incisions that are appropriately placed significantly decrease surgical and healing time and decrease the likelihood of wound dehiscence. The location of the incision varies with the species and the patient's age.

The ideal location for the incision in spay surgeries is influenced by which tissue is the most difficult to exteriorize. In the cat, the body of the uterus is more difficult to exteriorize, so the ventral abdominal incision should be midway between the umbilicus and the cranial brim of the pubis (Figure 39.3).

In an adult dog, the ovaries are more difficult to exteriorize, so the skin incision should ideally be made just caudal to the umbilicus (Figure 39.4).

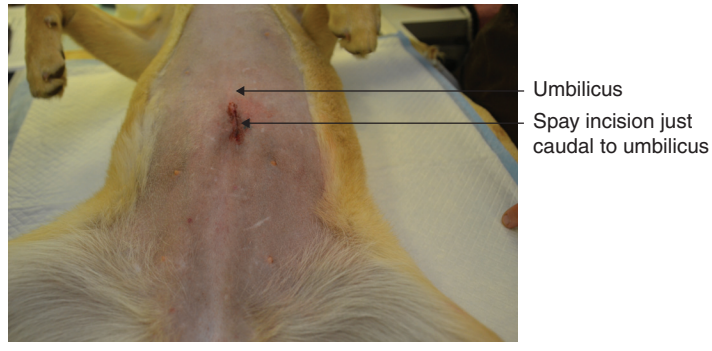


Figure 39.4. The skin incision in an adult dog spay is just caudal to the umbilicus.

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Pedicle Tie (Cat Spays)

In cat spays, a self-ligature can be used on the ovarian pedicles in a manner similar to that of the cord tie in cat castrations. The ovarian pedicle in the cat contains virtually no fatty tissue. This allows isolation of the ovarian vessels, making them ideal for the pedicle tie.

There are several variations of the pedicle tie that depend on surgeon preference and whether the surgeon is right- or left-handed. In one technique, after delivery of the ovary through the abdominal incision, the suspensory ligament is cut, and an opening is torn in the broad ligament just caudal to the ovarian vessels. The surgeon holds the ovary in his nondominant hand and gently pulls the ovary toward himself. Using his dominant hand, he crosses a curved hemostat over the ovarian vessels into the opening and behind the vessels. The hemostat is held closed with its tip facing away from the surgeon. The tip of the hemostat is directed above the vessels as the instrument is rotated counterclockwise to end up facing the surgeon. The hemostat is then opened and used to clamp the ovarian vessels. The vessels are cut or torn between the hemostat and the ovary, and the knot can be gently pushed off the tip of the hemostat. The knot should be pulled tight before the hemostat is released (Figure 39.5). At release of the hemostat, the vessels should be examined for a few seconds for any hemorrhage.

Cord Tie (Cat Castrations)

The cord tie is a self-ligature that can be used on the spermatic cords in cat castrations. It is virtually identical to the pedicle tie described above. There are several variations of the cord tie that depend on surgeon preference and whether the surgeon is right- or left-handed. In one technique, after exteriorization of the testicle through the scrotal incision, the surgeon holds the testicle in his nondominant hand and gently pulls the testicle toward himself. Using his dominant hand, he crosses a curved hemostat over the spermatic cord and places it behind the cord. The hemostat is held closed with its tip facing away from the surgeon. The tip of the hemostat is directed above the cord as the instrument is rotated counterclockwise to end up facing the surgeon. The hemostat is then opened and used to clamp the cord. The spermatic cord is cut between the hemostat and the testicle, and the knot can be gently pushed off the tip of the hemostat. The knot should be pulled tight before the hemostat is released. At the release of the hemostat, the cord should be examined for a few seconds for any hemorrhage.

Figure 8 Knot (Cat Castrations, Puppy Castrations)

The Figure 8 knot is another self-ligature that can be used on the spermatic cords in cat and puppy castrations. The knot is diagramed in Fossom's *Small Animal Surgery* (Hedlund, 2007). To tie the Figure 8 knot once the testicle is exposed, place a curved hemostat on top of and in front of the spermatic cord, wrap the cord once around the hemostat, and then proceed as if performing a pedicle tie (Figure 39.6). The Figure 8 knot provides enhanced security when used in these procedures.

Ligation Techniques

Most students are taught how to perform spays and castrations at a stage of their education when they are very inexperienced surgeons. Early in surgical training, knot security is often questionable, integrity of ligatures may be less than desirable, and tissue handling may be more traumatic than preferred. Accordingly, many surgical instructors teach students to double ligate everything and to always place ligatures prior to transecting ovarian pedicles. With experience, however, surgeons learn how to tie secure knots, place effective ligatures, and minimize tissue handling and trauma. This makes double ligation and delaying transection until after ligation unnecessary in most situations. It is much more efficient to single ligate ovarian pedicles and the uterine stump and to transect ovarian pedicles prior to placing ligatures.

Miller's Knot

The Miller's knot is an exceptional knot to use when placing a ligature around thick or friable tissues. Start the Miller's knot by passing the suture around the tissue twice, creating a loop. Then pass the needle holder through the loop and tie a standard square knot. Elevating the strands of suture as the knot is pulled tight ensures that both loops are tightened evenly. Complete the knot by

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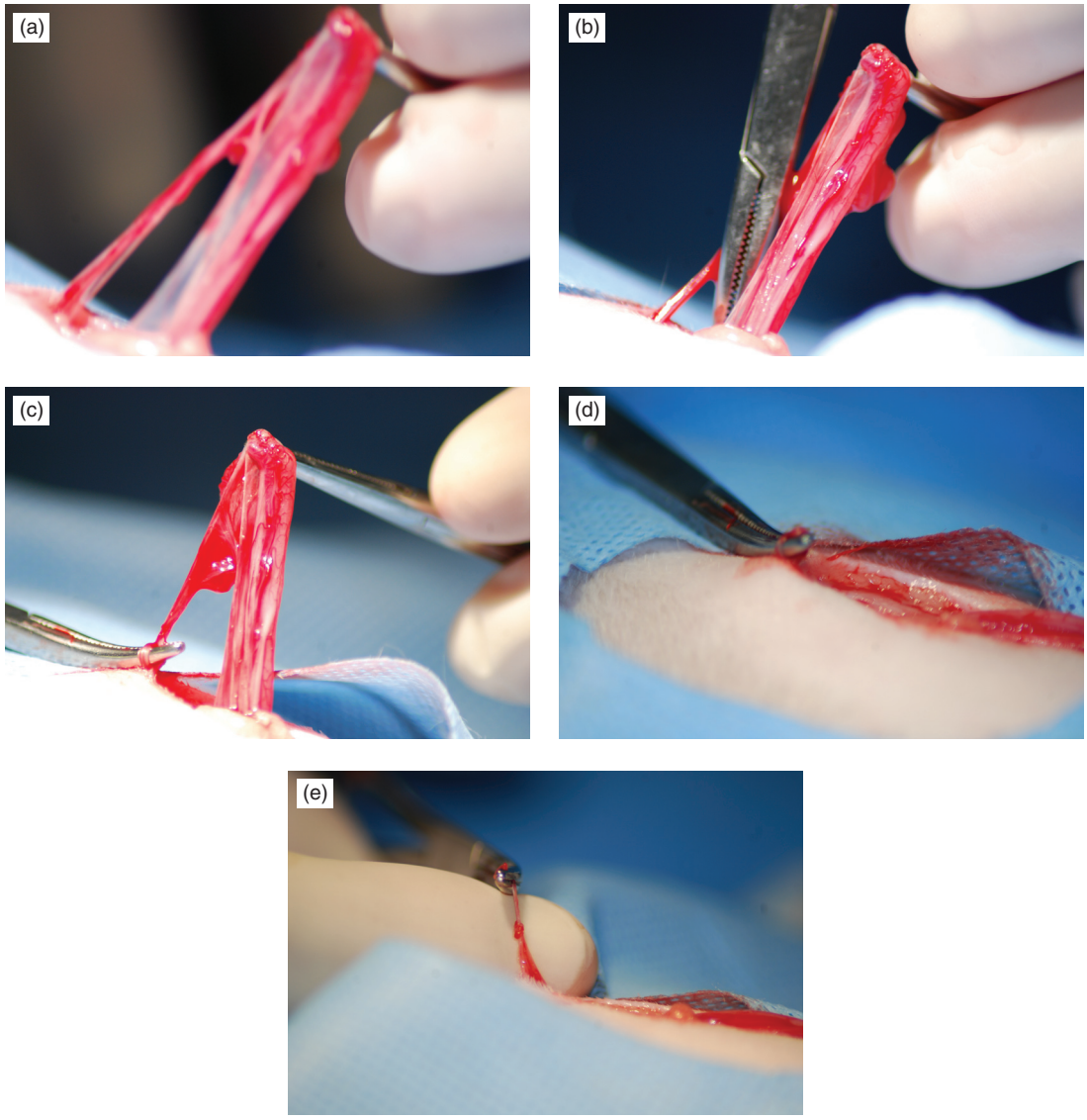


Figure 39.5. The pedicle tie. (a) The suspensory ligament has been cut and an opening torn in the broad ligament caudal to the ovarian vessels, thereby isolating the vessels. (b) A curved hemostat is placed to begin the pedicle tie. (c) Rotation of the hemostat above the vessels and toward the surgeon allows clamping of the ovarian vessels. (d) The vessels are cut or torn distal to the clamp and proximal to the ovary allowing the knot to be pushed off the end of the hemostat. (e) The finished knot. Photos courtesy Dr. Kimberly Woodruff.

placing an additional three to four square-knot throws. (For a video of the Miller's Knot, see Veterinary Seminars in Spay/Neuter Surgery: Pediatrics [http://www.humanealliance.org].)

SPECIFIC SURGICAL TECHNIQUES

There are many variations of the surgical techniques for dog and cat ovariohysterectomies and castrations. Surgeons will discover those specific techniques that

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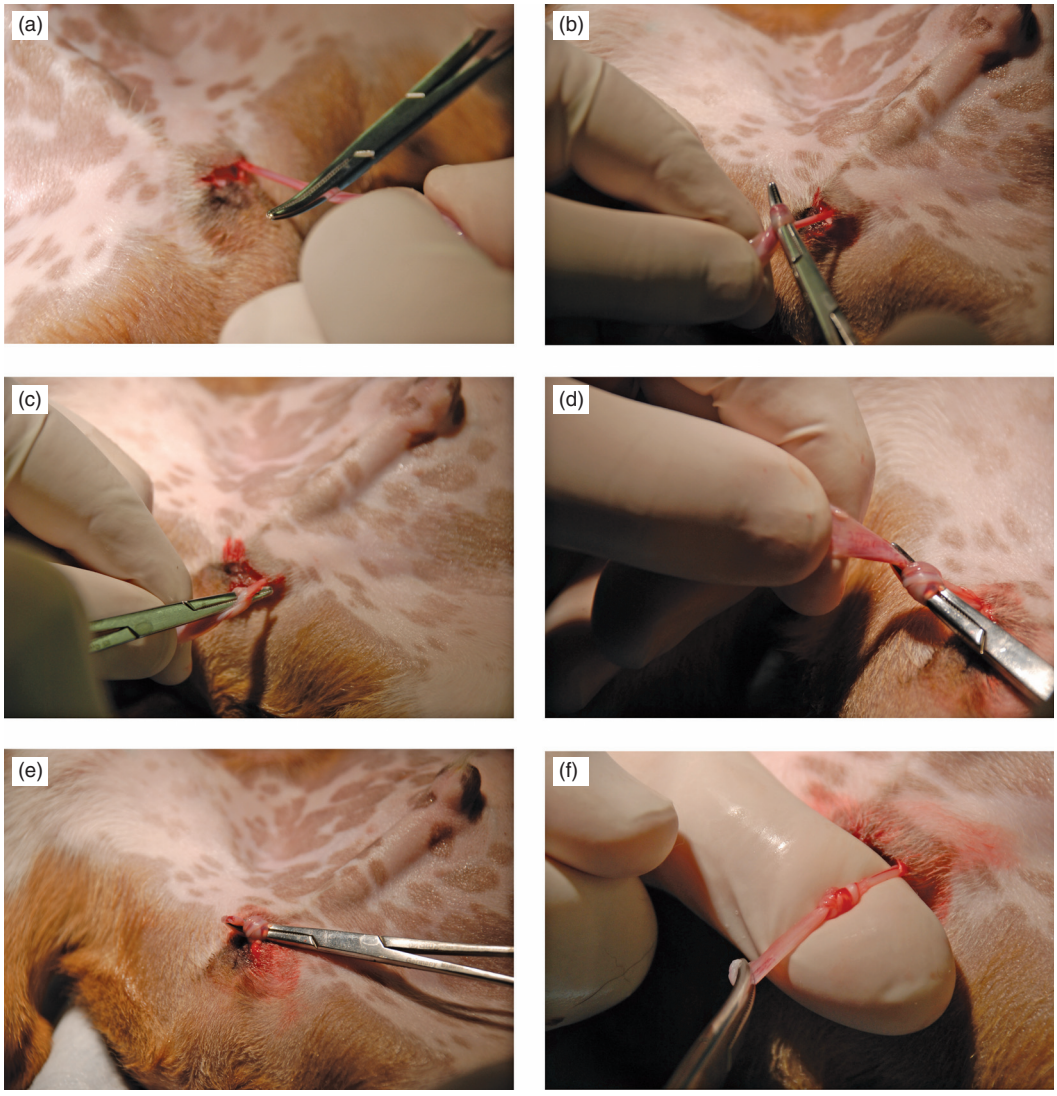


Figure 39.6. Figure 8 tie. To tie the Figure 8 knot once the testicle is exposed, place a curved hemostat on top of and in front of the spermatic cord (a) and wrap the cord once around the hemostat (b). The hemostat is passed underneath the spermatic cord to begin the knot (c). Rotation of the hemostat above the spermatic cord and toward the surgeon allows clamping of the spermatic cord (d). The cord is then cut distal to the hemostat and proximal to the testicle allowing the knot to be pushed off the end of the hemostat (e). The finished knot (f). Photos courtesy Dr. Kimberly Woodruff.

they are most comfortable with and should use them every time. To become efficient in surgery, it is important to be consistent with how each technique is performed. It is important to note that regardless of technique, in female patients, complete removal of both ovaries is essential to prevent recurrence of estrus cycles and to prevent stump pyometra. In male patients, removal of both testicles is crucial to eliminate the possibility of testicular tumors and to decrease testosterone-associated behaviors.

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There are many surgical textbooks that describe and illustrate routine ovariohysterectomies and castrations in detail. The ligation techniques described previously and techniques described below are those preferred by the author for high-volume spay/neuter programs.

Ovariohysterectomy of the Adult Dog

The already prepped patient should be placed in dorsal recumbency with her forelimbs alongside the lateral thoracic wall (Figure 39.2). An incision is made in the ventral abdominal skin on the midline just caudal to the umbilicus (Figure 39.4). The length of the incision is based on the size and condition of the patient and the experience and comfort level of the surgeon.

The traditional approach into the abdomen is an incision on the midline through the linea alba (Hedlund, 2007). However, a right paramedian entry into the abdominal cavity equalizes the difficulty of exteriorizing the right and left ovaries and may facilitate performing the surgery through a smaller incision. After the skin incision is made, sharply undermine the skin to the right of the incision, exposing the external rectus fascia for a distance of 1–2 cm from the linea alba. With a scalpel, incise the fascia, being careful not to incise the rectus muscle itself as this will cause hemorrhage. It will take some practice to determine just how much pressure to apply with the scalpel to make this cut without cutting into the muscle. Once the muscle is exposed, gently pass a closed hemostat through the muscle and then open the hemostat to separate muscle fibers and expose the peritoneum. Elevate the peritoneum with a thumb forceps and cut it with a Metzenbaum scissors to enter the abdominal cavity. Careful use of a spay hook will allow delivery of a uterine horn through the abdominal incision. Pass the spay hook carefully through the incision and direct it along the right lateral abdominal wall in a slightly caudal and dorsal direction. When the spay hook reaches the dorsal lateral abdominal wall, turn the hook toward the midline and use a gentle medial sweep of the hook to capture the right uterine horn or broad ligament. With experience, surgeons can tell by the amount of tension when attempting to exteriorize the spay hook whether they have captured the uterine horn/broad ligament or other tissue. Care must be taken when using a spay hook not to damage mesentery, mesenteric vessels, intestine, or other abdominal tissues. Passing the spay hook along the right lateral abdominal wall is recommended to avoid any potential trauma to the spleen. Failure to find the uterus in the adult dog with a spay hook will necessitate extending the incision caudally and visually locating the uterus between the bladder and the colon.

Once the right uterine horn is located and exteriorized, gentle caudal traction on the horn will expose the right ovary. The ovarian suspensory ligament can be either torn digitally or cut, depending on the surgeon's preference, and the ovary can be exteriorized. A three-clamp technique is used on the ovarian pedicle, with the first hemostat/carmalt placed on the pedicle as far proximally as possible, a second clamp placed several millimeters distal to the first clamp but proximal to the ovary, and a third clamp placed just distal to the ovary and between it and the uterine horn. Close the most proximal hemostat with just one click of the ratchet to avoid the possibility of cutting through or tearing the ovarian pedicle. In placing the second clamp, hold the ovary between the thumb and index finger. This helps digitally identify the extent of the ovary and ensures placement of the second clamp in a manner that avoids leaving ovarian remnants. The ovarian pedicle is transected just distal to the second clamp and proximal to the ovary, and the ovary and uterine horn are reflected caudally. Transection prior to ligation simplifies the placement of the ligature and minimizes the amount of tissue manipulation necessary in placing the ligature. A single ligature of absorbable suture is placed using a square, surgeon's, or Miller's knot depending on the size of the ovarian pedicle and the surgeon's preference. The ligature is placed in the crushed area from the most proximal hemostat, ideally leaving a tag of tissue at least 0.5 cm in length distal to the ligature. The one remaining hemostat is then removed and the pedicle observed for any hemorrhage prior to the ovarian pedicle being returned to the abdominal cavity.

Gentle cranial traction on the right uterine horn will lead to the uterine body, which can be exteriorized to expose the left uterine horn. Caudal traction on the left uterine horn will allow delivery of the left ovary into the incision site; the left ovarian pedicle is clamped, transected, and ligated in the same manner as the right ovarian pedicle.

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Caudal traction on the two uterine horns will exteriorize the uterine body to the level of the cervix. The most efficient method for ligation and transection of the uterine body is to simply place a ligature with Miller's knot around the uterine body at the junction of the uterine body and the cervix. This is done without placing any hemostats or carmalts on the uterine body as they may tear the uterine tissue. A single ligature tied with a Miller's knot is generally sufficient for ligation of the uterine body and uterine vessels. A clamp is then placed on the uterine body between the ligature and the bifurcation, and the uterus is transected just distal to the clamp. The clamp is removed and the uterine stump observed for hemorrhage and returned to the abdominal cavity.

Closure of the incisions is generally performed in three layers. Closure of the rectus fascia is with absorbable suture in the pattern preferred by the surgeon. Simple interrupted, cruciate, and simple continuous patterns are all acceptable. Care should be taken to avoid entrapping any muscle tissue in the closure. The rectus fascia is the holding layer of the abdominal wall, and entrapping rectus muscle can damage muscle tissue, cause increased discomfort to the patient, and can delay healing if muscle tissue is interposed between the cut edges of the rectus fascia. The subcutaneous tissue is the second layer of closure, and it can be closed with a simple continuous pattern. In fact, an efficient method of closing the subcutaneous and subcuticular tissues is to begin a subcutaneous tissue closure by passing the suture deep to superficial in the subcutaneous tissue at one end of the incision, leaving a short strand of suture. Without tying this suture, proceed to close subcutaneous tissue by taking a bite in the subcutaneous tissue on one side of the incision, a bite in the muscle fascia (to close dead space), and a bite in the subcutaneous tissue on the opposite side of the incision. Continue this pattern until the other end of the incision is reached and then, without tying a knot, proceed back down the incision using a subcuticular pattern the full length of the incision. This is done by alternating bites, paralleling the incision on one side of the wound and then the opposite side of the incision for the full length of the skin incision. The last bite of the subcuticular pattern is then placed superficial to deep and tied to the initial short strand left when starting the subcutaneous pattern. Skin glue may be placed on the surface of the incision to protect the incision from the environment.

In some countries, ovariectomy, or removal of the ovaries only, is the procedure of choice for surgical sterilization of healthy female animals. A recent article by De Tora and McCarthy (2011) concluded that ovariectomy provides an equally effective technique for elective sterilization of female dogs and cats with no recognized disadvantages. Another recent study supports ovariectomy as the preferred technique for sterilizing female dogs (Goethem, Schaefers-Okkens, and Kirpensteijn, 2006). The Association of Shelter Veterinarians Veterinary Medical Care Guidelines for Spay–Neuter Programs states that the choice between ovariohysterectomy and ovariectomy should be based on surgeon's preference (Looney *et al*., 2008).

Ovariohysterectomy of the Adult Cat

Much of the procedure for a cat ovariohysterectomy is similar to the procedure for a dog, and some of that description will not be repeated. The already prepped patient should be placed in dorsal recumbency with the forelimbs alongside the lateral thoracic wall. An incision is made in the ventral abdominal skin on the midline midway between the umbilicus and the cranial brim of the pubis (Figure 39.3). The subcutaneous fat is elevated with a thumb forceps and excised with a Metzenbaum scissors. Once the linea alba is visualized, it is elevated with a thumb forceps, and a careful stab incision is made with a scalpel blade. Once the abdomen has been entered, a spay hook is used as previously described to locate the uterus.

Alternatively, the uterus can be located by exteriorizing the urinary bladder, reflecting the bladder caudally, and visualizing the uterine body or uterine horns between the bladder and the colon. The more caudal location of the spay incision in the cat allows for easy visualization and exteriorization of the urinary bladder.

Once the right uterine horn is located and exteriorized, the procedure is similar to that for a canine ovariohysterectomy except that an ovarian pedicle tie is utilized to ligate ovarian vessels. As for closure, if the incisions are very short (1–2 cm in length), the body wall can be closed with one or two cruciate sutures, and the subcuticular and subcutaneous tissue can be closed with a

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single layer of simple interrupted sutures, burying the knots.

Castration of the Adult Dog

While the prescrotal approach has been traditionally taught as the preferred method of approach for canine castration in the United States, scrotal castration was described in 1974 (Johnston and Archibald, 1974) and is listed as an acceptable alternative to the prescrotal castration in The Association of Shelter Veterinarians Veterinary Medical Care Guidelines for Spay–Neuter Programs (Looney *et al*., 2008).

Scrotal castration offers several advantages over the prescrotal approach. These include smaller incisions, less surgical time, and less tendency for scrotal hematomas to form.

The prescrotal castration will not be described here as it has been described in many surgical textbooks. For a scrotal castration, the patient is prepped and positioned in dorsal recumbency. The surgeon grasps one testicle and positions it in a manner that elevates and exposes the median raphe. An incision is made through the skin and subcutaneous tissue along the median raphe over the displaced testicle. The incision should be continued through the spermatic fascia exteriorizing the testicle. In the closed technique, care is taken not to incise the parietal vaginal tunic and tunica albuginea. Gentle traction is used to exteriorize the testicle, and the surgeon reflects fat and fascia from the parietal tunic of the spermatic cord using a gauze sponge. In dogs weighing more than 18 kg (40 pounds), clamp the spermatic cord with three hemostats, transect distal to the most distal hemostat, and place a ligature using a Miller's knot in the area of the spermatic cord crushed by the most proximal hemostat and a transfixation ligature in the area of the spermatic cord crushed by the second hemostat. In dogs weighing less than 18 kg, clamp the spermatic cord with two hemostats, transect distal to the most distal hemostat, and place a ligature using a Miller's knot in the area of the spermatic cord crushed by the most proximal hemostat. The second testicle is exteriorized through the same scrotal incision. An incision is made in the subcutaneous tissue and spermatic fascia over the second testicle to allow exteriorization, and ligation and transection of the second spermatic cord is accomplished identical to the first. If the surgeon prefers, an open technique may be used. Ligation and scrotal closure are the same whether an open or closed technique is used.

When a scrotal incision is made, the technique for closure is the surgeon's preference. Incisions can be left open to heal by second intention, partially closed with one buried subcutaneous suture of absorbable suture material, or closed fully with skin glue. All three of these techniques are considered acceptable.

Precautions must be taken to avoid self-trauma after any castration. Tendency for self-trauma can be minimized by avoiding trauma to the scrotal skin while performing the surgical preparation and by avoiding the use of skin sutures in the scrotum. Patients should be observed closely postoperatively to determine if the use of an Elizabethan collar is necessary. Owners should be warned that viable sperm could remain in the male reproductive tract for as long as 30 days following castration and that male dogs therefore should be kept away from females in estrus for at least 1 month following surgery.

Castration of the Cat

The patient should be positioned in dorsal recumbency with the rear legs pulled cranially. The entire scrotum should be gently clipped and prepped for surgery. Drapes are considered optional depending on the skill and comfort level of the surgeon (Looney *et al*., 2008). The surgeon grasps one testicle and incises the overlying scrotal skin and subcutaneous tissue. (Alternatively, one incision may be made over the median raphe, and each testicle exteriorized through that incision.) The incision is continued through the spermatic fascia to exteriorize the testicle. To maintain a closed technique, care is taken not to incise the parietal vaginal tunic and tunica albuginea. The testicle is exteriorized using gentle traction, and the surgeon reflects fat and fascia from the parietal tunic of the spermatic cord using a gauze sponge. A Figure 8 knot or cord tie is used to ligate the spermatic cord, and the cord is transected, leaving a 4–5 mm tag to ensure the knot does not untie. Prior to releasing the cord, the knot is tightened, and hemostasis is verified. The procedure is repeated for the second testicle. After removal of both testicles, the surgeon gently elevates the scrotal skin on either side of the incision(s) to ensure the ligated cords retract inside. Any tags of tissue protruding from the scrotum should be excised. The incisions are left open to heal by second intention.

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An open technique in which the scrotal incision is continued through the parietal vaginal tunic is acceptable for cat castrations, and the choice between open and closed is left to the surgeon preference. Ligation is the same in open or closed castrations, and incisions are left open to heal by second intention.

TUBAL LIGATIONS AND VASECTOMIES

Tubal ligation (tying off the Fallopian tubes in females) and vasectomy (tying off the vas deferens in males) are options being explored to sterilize dogs and cats while leaving reproductive hormones intact. These procedures may be an alternative to ovariohysterectomy and castration for those pet owners who oppose the removal of the ovaries/testicles yet do not wish for their pets to reproduce. People who choose these options must understand that female cats and dogs will be at much greater risk for mammary neoplasia and pyometra than their spayed counterparts. When compared to castrated dogs, vasectomized dogs will have higher risk for prostatic enlargement, and the urine of vasectomized cats will retain its objectionably strong odor. Additionally, vasectomized cats and dogs will maintain their desire to roam and find and fight over females in heat. It will also be more difficult to find surgeons in the United States who have experience with the procedures, and using inexperienced surgeons may lead to longer surgical time and a greater possibility of complications.

MEANS OF IDENTIFYING PATIENTS AS STERILIZED

Scoring Tattoos

Tattoos indicate that an animal has been spayed or castrated and help prevent unnecessary surgery in the future. In order to make a scoring tattoo, a small skin incision is made that only penetrates a partial thickness of the dermis. Tattoo ink is placed in the incision (green tattoo ink shows up best) with the blunt end of a sterile scalpel blade or the sterilization indicator strip from the surgical pack to avoid contaminating the ink. The wound edges are then apposed and skin glue applied on the surface of the skin to seal the wound.

In the case of a spay, the tattoo is placed just off the abdominal midline adjacent to the spay incision.



Figure 39.7. Ear tipping. Cutting the tip off the left ear of a feral cat during sterilization surgery will help identify the cat as sterilized should that same cat ever be trapped again. The ear tip is becoming the universal indicator that a feral cat has been sterilized and helps prevents unnecessary handling, anesthesia, and surgery of a feral cat. Photo courtesy of Dr. Kimberly Woodruff.

In the cat castration, the tattoo is placed on the ventral abdominal midline where a spay incision would be made. In the dog castration, the tattoo is placed beside the prepuce where an incision would be made if the castrated dog were ever mistaken for an abdominal cryptorchid.

Ear Tipping

Ear tipping is a method of identifying free-roaming cats as having been sterilized and should be considered the universal standard for identifying them. This procedure is described in the chapter on the management of stray and feral community cats (Figure 39.7).

POSTOPERATIVE CARE

Postoperative Analgesia

The use of postoperative analgesics is covered in the chapter on anesthesia and pain management. It is considered a required standard of care to use

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preoperative, intraoperative, and postoperative analgesic agents in sterilization surgeries (Looney *et al*., 2008). Determination of specific agents, dosages, and routes of administration vary depending on many factors, including the temperament of the patient, the type of anesthesia protocol used during the surgery, the degree of postoperative discomfort, surgeon's discretion, etc.

Postoperative Instructions

Following surgery, patients must be monitored closely as they recover from anesthesia. Airway patency, respiratory rate, heart rate, pulse quality, and body temperature should be monitored. Patients should also be observed for signs of pain or discomfort. Neurological status should be monitored until the patient is able to ambulate (Looney *et al*., 2008). See the chapter on anesthesia and pain management for more information regarding the monitoring of patients as they first recover from anesthesia and surgery.

Most patients can be discharged the day of surgery; the owners, shelters, or caregivers should be provided with both verbal and written instructions on postoperative care in language that is easily understood. The instructions should be clear and concise and should minimally include:

1. information on when and how much food and water to provide
2. keeping the patient quiet and in a clean environment for a minimum of 7 days (castration) and up to 14 days (spay)
3. observing the incision for swelling, discharge, hemorrhage, pain, or odor and whether the patient is leaving it alone
4. administration of postoperative analgesics (Appel and Hart, 2004)
5. contact information for emergency veterinary services in case of complications, questions, or problems related to the surgery (Looney *et al*., 2008)

All animals should be bright, alert, and ambulatory prior to release, and cooperative patients should have their incision sites assessed (Looney *et al*., 2008). Instructions regarding the recovery of free-roaming cats are described in the chapter on stray and community feral cat management.

COMPLEX SPAY/NEUTER

Complex spay or neuter procedures may be slightly more challenging to the novice surgeon, and the risk benefit to the patient must always be considered. In the shelter or high-volume spay/neuter clinic, the surgeon must take into consideration that this might be the only opportunity available to spay or neuter that particular animal (Looney *et al*., 2008).

Estrus

The surgical procedure for spaying a dog or cat in estrus is virtually the same as that for a patient not in estrus. Ovarian and uterine tissues will be more vascular, and uterine tissue may be more turgid or friable. This necessitates the use of the same meticulous tissue handling and good hemostasis that should be practiced in all surgeries.

Ligation of ovarian pedicles in both the dog and the cat is the same as in those animals who are not in estrus. The surgeon must be sure of the integrity of ligatures and the security of knots. The cervix generally will be enlarged, and the single Miller's knot ligature should be placed on the uterine body just cranial to the junction with the cervix, and as in the animal not in estrus, placed without using hemostatic clamps. Since tissues are more vascular it is important, especially in the dog, to have IV fluids available in case of significant blood loss.

Pregnancy

The pregnant dog or cat can be spayed up until parturition (Appel and Hart, 2004). The technique is essentially the same as in a nonpregnant animal except the incisions need to be larger to allow removal of the gravid uterus. Depending on the stage of gestation, the blood supply will be significantly increased, and caution should be taken to ensure ligature integrity and knot security. Uterine vessels may be so large that individual ligation of each uterine vessel is warranted in addition to ligation of the uterine body.

In late-term pregnancy, the fetuses may still be viable when the uterus is removed from the abdomen. The handling of viable fetuses from animals spayed in the latter stages of pregnancy is a complex topic that is beyond the scope of this chapter; more information can be found in the chapter on euthanasia.

In late-term pregnancy in both the dog and cat, it is advisable to administer IV fluids during surgery.

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Pyometra

Animals may be presented with either an open or closed pyometra (infection of the uterus). Clinical signs may include inappetance, depression, polyuria, polydipsia, and dehydration. In an open pyometra, the cervix is open, allowing a malodorous brownish-red purulent discharge to drain from the vulva. In a closed pyometra, the cervix is closed, preventing drainage and allowing the buildup of toxins in the uterus. The animal with a closed pyometra may be more debilitated than one with an open pyometra and more difficult to diagnose because of the absence of a discharge. An animal with a closed pyometra may present with a swollen abdomen that inexperienced staff may mistake for a pregnancy. Care must be taken to avoid deep palpation in an attempt to diagnose pregnancy, as it may rupture a swollen and friable uterus. In either case, the patient should be stabilized with IV fluids prior to surgery, and fluids should be administered during surgery. If possible, electrolyte and acid–base imbalances should be corrected prior to surgery, and intravenous antibiotics effective against *E. coli* should be administered. This surgery is considered an emergency and should not be delayed more than a few hours while the patient is being stabilized (Hedlund, 2007).

The surgical technique is the same as in the animal without pyometra except the incisions may need to be longer to allow removal of the enlarged uterus. Extreme caution must be taken to avoid rupturing the uterus and to prevent leakage of contaminated fluids into the abdomen; extensive abdominal lavage is required if the abdominal cavity becomes contaminated.

Mammary Gland Tumors

Mammary gland tumors in the dog can be excised at the time of the ovariohysterectomy. If possible, chest radiographs are strongly advised to evaluate for metastasis. Although roughly half of mammary tumors in dogs are malignant (Root Kustritz, 2007), in the absence of chest radiographs it is still recommended to excise the tumors. The ovariohysterectomy should be performed first, and only after closing the abdominal wall should the tumors be excised. Tumors should be submitted for histological evaluation in order to provide a more accurate prognosis.

In the cat, more than 90% of mammary tumors are malignant (Root Kustritz, 2007), and a full metastasis workup including radiographs of the chest should be performed prior to surgery (Appel and Hart, 2004).

Mammary Hyperplasia/Lactating Queens

Cats with mammary hyperplasia (also known as hypertrophy) and lactating queens are both ideal candidates for flank spays. Performing a flank spay will avoid damage to mammary tissue and prevent abscessation or infection due to leakage of milk into the tissues. The technique for performing a flank spay is described in the chapter on management of stray and feral community cats.

Cryptorchidism

Cryptorchidism is defined as the failure of one or both testicles to descend into the scrotum (Memon and Tibary, 2001). A cryptorchid testicle can be located in the abdominal cavity, inguinal canal, or the subcutaneous tissue between the external inguinal ring and the scrotum.

Testicles should be easily palpated in the scrotum of dogs and cats older than 2–4 months of age. If neither one or both testicles are located in the scrotum, careful palpation will usually reveal which testicle(s) are involved and whether the testicle(s) are located in the subcutaneous tissue. The inability to palpate a testicle in the scrotum or the subcutaneous tissue leads to a presumptive diagnosis of abdominal cryptorchidism, whereas palpation of the testicle in the subcutaneous tissue leads to a diagnosis of subcutaneous cryptorchidism. Surgery should not be delayed to wait for the testes to descend in kittens more than 8 weeks of age or puppies more than 16 weeks, as this is unlikely to occur. For more information about cryptorchidism in very young animals, see the chapter on pediatric spay/neuter.

Subcutaneous Cryptorchidism

If the cryptorchid testicle is palpated in the subcutaneous tissue, an incision made directly over the testicle will allow exteriorization and excision of the testicle.

Abdominal Cryptorchidism

Locating an abdominal testicle is generally very easy. The critical factor to remember is that both ductus deferens enter the urethra at the level of the prostate. If the ductus deferens is traced from the prostatic

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urethra cranially, it is located dorsal to the bladder until it passes the junction of the ureter and the bladder. Cranial to the point where the respective ureter enters the bladder, the ductus deferens turns laterally on its course to the testicle. This anatomical feature makes it extremely easy to find an abdominal testicle (Boothe, 1993).

In the dog with a unilateral abdominal cryptorchid testicle, an incision is made in the caudal abdominal skin just lateral to the prepuce on the side of the cryptorchid testicle. If possible, avoid incising the caudal superficial epigastric artery. After removal of subcutaneous fat, a paramedian approach is made through the body wall and peritoneum. A spay hook is inserted into the abdomen, just lateral to the bladder, and swept in a cranial lateral motion. Frequently, the involved ductus deferens can be exteriorized in this manner, and the abdominal testicle can easily be delivered through the incision and excised. With a bilateral abdominal cryptorchid, undermine the subcutaneous tissue under the prepuce to the midline. Entry into the abdomen is made through the linea alba. Incising the linea alba allows exposure of the urinary bladder. Caudal reflection of the urinary bladder will allow visualization of both ductus deferens. Gentle retraction of the ductus of the cryptorchid testicles will allow delivery of the testicles into the surgical site, ligation of the testicular vessels, and excision of the testicles.

In the cat, the skin incision is made in the caudal abdominal skin on the midline. Entry into the abdomen is on the midline through the linea alba and allows exposure of the urinary bladder, facilitating either the spay hook or bladder reflection techniques described earlier. Infrequently cryptorchid testicles are trapped between the muscle layers in the inguinal canal. When this occurs, gentle tension on the ductus deferens will allow its visualization as it enters the inguinal canal. Gently teasing apart the musculature of the internal inguinal ring with a blunt instrument (hemostat) is often enough to allow delivery of the testicle back into the abdomen for excision. Care should be taken to avoid damaging the internal spermatic artery and vein.

Cryptorchid testicles are often smaller than normal, descended testicles, and it is possible that the cryptorchid testicle may be in the subcutaneous tissue yet not be palpable. Entry into the abdomen, assuming abdominal cryptorchidism, would, therefore, fail to reveal the cryptorchid testicle. Gentle tension on the ductus deferens would confirm that the ductus deferens passes through the inguinal canal. In both dogs and cats, the caudal abdominal skin incision is of value here, as from that incision the skin between the incision and the external inguinal ring can be undermined. Gentle traction on the abdominal ductus will facilitate locating the ductus deferens as it exits the inguinal canal and will lead to the cryptorchid testicle.

Once the cryptorchid testicle is located, whether in the abdomen or the subcutaneous tissue, it can be excised using any standard technique. For testicles found in the abdomen, it may be necessary to ligate the ductus and the testicular vessels independently. For very small testicles with small vessels and a small ductus deferens, the Figure 8 knot can be used to ligate the spermatic cord.

Uterus Unicornis

Uterus unicornis, the congenital absence of one horn of the uterus, occurs in both dogs and cats. Both ovaries are always present, and the surgeon must search for the second ovary if only one uterine horn is found. It will be in the normal location and, if a broad ligament is present, it is rather easy to find. If no broad ligament is present on the involved side, use of the "biological retractors", as described below, will help localize the ovary. Reflection of the descending duodenum toward the left side of the abdomen will displace intestinal contents to the left, allowing better exposure and visualization of the trough on the right side. Reflection of the descending colon toward the right side of the abdomen will displace intestinal contents to the right, allowing better exposure and visualization of the trough on the left side.

Ovarian Remnant

An ovarian remnant occurs when ovarian tissue is left in the abdomen during an ovariohysterectomy. This can be avoided by fully exteriorizing the ovaries to ensure their complete removal. Cutting the suspensory ligament, proper placement of the incision, and positioning the animals with their front legs placed alongside the thoracic wall all assist in getting good exposure of the ovaries. When placing hemostats (or carmalts) on the ovarian pedicle, in addition to visually identifying the entire ovary, surgeons should grasp the ovary between a thumb and index finger

in order to feel where the ovary ends, thereby preventing the clamping of the ovary with a surgical instrument.

If an ovarian remnant occurs, it must be surgically removed. Performing the surgery while the animal is in heat will make locating the remnant easier. Using the "biological retractors" for exposure and grasping with fingers are the best methods to expose and exteriorize the ovarian pedicles and find the ovarian remnant. It may be necessary to perform an abdominal exploratory as the remnants are not always located near the ovarian pedicle. Once the remnant is exteriorized, place two clamps proximal to the remnant, transect between the ovarian remnant and the more distal hemostat, and ligate in the crushed area of the most proximal clamp.

Hermaphroditism

Hermaphroditism is the presence of both ovarian and testicular tissue in the same gonad or the same individual. Most frequently, hermaphrodites are presented as a female for ovariohysterectomy. The patient often has female genitalia with an enlarged clitoris. The "ovariohysterectomy" is performed routinely.

Heartworm-Positive Dogs

Shelters and high-volume spay/neuter clinics frequently are presented with heartworm-positive dogs for spay or neuter. As long as the dogs are asymptomatic, it is safe and best to perform the surgery prior to heartworm treatment. If the dog is positive and symptomatic, it may be safest to wait until the dog is asymptomatic after treatment.

PREVENTION AND MANAGEMENT OF COMPLICATIONS RELATED TO SPAY/NEUTER SURGERY

Complications are possible in any surgical procedure, and the surgeon and technical staff must always be prepared to deal with a potential complication. Prevention of a serious complication is always better than management after the complication occurs. Surgical techniques, operating room procedures, and patient and surgeon preparation should all be directed toward minimizing complications. Good knowledge of anatomy and strict attention to aseptic technique, meticulous tissue handling, careful attention to hemostasis, placing secure ligatures and sutures, using appropriate suture materials of the appropriate size with appropriate needles, and short surgical times all contribute to minimizing surgical complications.

Hemorrhage

Hemorrhage can occur from many different sources during an ovariohysterectomy: subcutaneous tissue, the rectus abdominis muscle (if muscle fibers are cut), ovarian pedicles, uterine vessels, broad ligament, and, unfortunately, structures that should not even be involved in an ovariohysterectomy (spleen, mesentery, and bladder).

Prevention of hemorrhage is always preferable to controlling hemorrhage once it has occurred. Care should be used to avoid inadvertent trauma to abdominal organs while entering the abdomen. Safe entry techniques have been described previously.

Splenic lacerations caused by too aggressive abdominal entry or careless manipulation with a spay hook can be managed by carefully suturing the splenic capsule using 4-0 absorbable sutures with a taper needle in a simple continuous pattern. The splenic wound is then covered with absorbable hemostatic sponge. Take extreme care when suturing the splenic capsule to prevent making the splenic laceration worse. The splenic capsule is easily torn, so great care is necessary when placing sutures.

Bladder lacerations are often caused by aggressive abdominal entry. Expressing the bladder to reduce its size prior to entry into the abdomen will help reduce the risk of this occurring. Lacerations should be managed by suturing the bladder wall with 3-0 absorbable sutures on a taper needle in a simple interrupted or simple continuous pattern.

Lacerations that involve mesenteric vessels are managed by ligating the damaged vessel(s) and suturing the tear in the mesentery with 3-0 or 4-0 absorbable sutures in a continuous pattern. If one or more mesenteric vessels must be ligated, check the color of the involved intestines prior to abdominal closure to make sure the intestine remains viable. Loss of intestinal viability will necessitate an intestinal resection and anastomosis.

An ovarian pedicle is the most common source of abdominal hemorrhage in a spay. Secure ligature placement as described previously will prevent hemorrhage from the ovarian pedicle. The critical factor is making certain that the ligature is placed

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several millimeters away from any crushing instrument (hemostat or carmalt) that is in place and leaving a tag of tissue at least 0.5 cm in length distal to the ligature.

If an ovarian pedicle tears and retracts back into the abdominal cavity prior to ligation, it must be retrieved and ligated. Using the "biological retractors" improves the chances of finding the bleeding pedicle quickly. If the right ovarian pedicle is bleeding, locate the descending duodenum and reflect it to the left, exposing the caudal pole of the right kidney and the pedicle. If the left ovarian pedicle is bleeding, find the descending colon, reflect it to the right, exposing the caudal pole of the left kidney and the pedicle. The safest way to exteriorize a bleeding ovarian pedicle is to reach in with two fingers, grasp the pedicle, and exteriorize it. Once the pedicle is exteriorized, place two hemostats and ligate in the crushed area of the most proximal hemostat. It is critical to remember the ureters are located just deep and medial to the ovarian pedicles, so reaching in and clamping a bleeding ovarian pedicle with a hemostat can cause injury to or result in ligation of a ureter.

Hemorrhage from the broad ligament can be prevented by carefully evaluating the size of any vessels in the broad ligament prior to incising or tearing it. Any vessels of substantial size should be ligated prior to cutting/tearing the broad ligament.

Careful monitoring of the patient following a spay will help identify the patient who is bleeding internally. Delayed recovery from anesthesia, pale mucous membranes, tachycardia, weak pulses, slow capillary refill time, and hemorrhage from the incision site all indicate the potential for intra-abdominal hemorrhage. If conservative therapy that includes IV fluids and a snug belly bandage fail to resolve the tachycardia or restore mucous membrane color and pulse quality, exploratory surgery should be performed.

Incisions for an exploratory should be liberal, allowing easy exposure of both ovarian pedicles and the uterine stump. Most commonly, the hemorrhage will be from one of those three sites, and all three should be evaluated. Use of the "biological retractors" as described earlier will allow visualization of the ovarian pedicles. Caudal reflection of the bladder allows visualization of the uterine stump. Any bleeding pedicle should be ligated and observed for continued bleeding. If the hemorrhage is not from either of the ovarian pedicles or the uterine stump, the broad ligaments, the spleen, and the mesenteric vessels must be examined and any bleeders ligated.

Hemorrhage from a castration is generally due to insecure ligatures. If a ligature slips from the spermatic cord in a castration, the cord will retract into the scrotum and potentially into the abdominal cavity. Significant hemorrhage from the scrotum (or prescrotal incision) should be explored. It may be necessary to extend a scrotal or prescrotal incision in order to locate the bleeding cord. It the cord cannot be located, and the patient is showing continued signs of hemorrhage (tachycardia, pale mucous membranes, and weak femoral pulse) unresponsive to conservative therapy, it may be necessary to explore the animal's abdomen to locate the bleeding spermatic cord.

Surgical Site Infection

In the healthy patient, surgical site infections generally are the result of a break in aseptic technique during surgery or wound contamination following surgery. Good aseptic technique is essential in all surgical procedures, and breaks in asepsis should be detected, corrected immediately, and the patient should be treated with antibiotics. Postoperative instructions should stress keeping the patient in a clean environment and closely observing the surgical wound.

Regardless of the cause, any surgical site infection must be treated aggressively. Treatment consists of allowing drainage, keeping the wound clean, and using appropriate antibiotics as determined by culture and sensitivity.

Surgical Site Seroma

A seroma is a collection of serosanguineous fluid in the subcutaneous tissue. It is generally associated with excessive undermining of the skin, excessive tissue trauma, failure to control hemorrhage from skin bleeders, and/or failure to close dead space. Excessive activity by the animal in the postoperative period may contribute to seroma formation.

Prevention of a seroma is accomplished by reducing dead space by minimizing undermining of the skin and completely closing the subcutaneous tissue and tacking it to the body wall as described in closure of the spay above.

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Seromas are generally self-limiting, and management of a seroma can be very conservative, ranging from doing nothing and allowing the fluid to resorb on its own to drainage with a large gauge needle and placement of a snug abdominal wrap.

Surgical Site Suture Reaction

Surgical site suture reactions generally appear as extensive inflammation of the surgical site with or without draining tracks. Using only medical-grade suture materials and aseptic technique will minimize the incidence of such reactions. However, some animals will react to sutures placed in closing the body wall, subcutaneous tissue, or skin. Treatment is to resect the inflamed tissue, perform a culture and sensitivity, resuture with a different suture material, and administer appropriate antibiotics.

Scrotal Hematoma

Scrotal swelling or scrotal hematomas can occur after a canine castration with either the prescrotal or scrotal approaches. It is much more common in castration of adult dogs than in puppies. Atraumatic tissue handling and thorough hemostasis can minimize the incidence of these complications (Kyles, Aronsohn, and Stone, 1996). The scrotal castration technique described previously allows for drainage from the scrotal incision if the incision is not closed or only partially closed; this also minimizes the incidence of hematomas. However, owners must be made aware that some drainage may occur from the surgical site.

Often in older male dogs, the spermatic fascia has more vasculature. In these patients, careful hemostasis will help reduce the incidence of postoperative hemorrhage. If postoperative swelling is expected, the application of an ice pack immediately following surgery may helpful. The placement of a scrotal wrap for 10–15 minutes following surgery may also be helpful.

Dehiscence

Perhaps the most devastating complication of an ovariohysterectomy, short of terminal hemorrhage, is an abdominal wound dehiscence. Management of an abdominal dehiscence, if caught in time, involves cleaning the exposed abdominal contents with sterile saline, repairing any damaged tissue, thorough lavage of the abdominal cavity, secure closure of the abdominal wall and skin, and administration of appropriate antibiotics.

Prevention of abdominal dehiscence is a far better option than treatment. The critical elements for a secure abdominal closure are apposition of the holding layer–the ventral rectus fascia–and the skin in a manner that is secure, maintains blood supply, and minimizes self-trauma. The mistakes that are most likely to result in dehiscence are using suture material that is too small, placing insecure knots, suturing the body wall on one side of the incision to subcutaneous tissue on the opposite side, and taking bites in the body wall that are too small. To prevent these, make sure that knots are true square or surgeon's knots. Apply even tension to both the long and short strands of the suture and avoid any upward tension. Uneven or upward tension can easily turn a square knot into a slipknot. To ensure appropriate apposition of the linea alba or the rectus fascia, there must be good exposure. Undermining slightly on either side of the linea alba (on ventral abdominal midline spays) will provide clear visualization of the holding layers on both sides of the abdominal incision. If the abdomen is entered through a paramedian incision, clean exposure of the rectus fascia provides good visualization of the fascia as the body wall is closed. Bites in the body wall, or rectus fascia, should be no less than 3 mm on both sides of the incision.

The most common mistake made in abdominal wall closure is placing the abdominal sutures too tightly. There is a real difference between ligating and suturing; sutures tied too tightly, especially sutures that incorporate some of the rectus muscle, compromise blood supply to the very tissue that needs to heal, resulting in increased pain and an increased tendency for self-trauma. With increased self-trauma, there is an increased chance of wound dehiscence. Sutures should appose wound edges without strangulating tissue. A good technique is to place the first throw of the knot with only enough tension to appose wound edges. The second throw should have the same amount of tension. This creates tissue apposition without compromising blood flow. Four more throws (depending on the suture material) can then be placed and pulled tightly to create a secure knot.

Uterine Stump Pyometra

A uterine stump pyometra can occur if both ovaries are not fully excised, and a portion of the uterine body

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remains after an ovariohysterectomy (Kyles, Aronsohn, and Stone, 1996). Prevention is accomplished by always completely removing both ovaries. Treatment of a stump pyometra is the same as any pyometra: stabilizing the patient with IV fluids, administration of antibiotics, and surgical removal of the uterine stump and, most importantly, the ovarian remnant.

Uterine Stump Granuloma

Uterine stump granulomas are a consequence of contamination during surgery or use of improper suture materials. Careful attention to aseptic technique, use of only medical-grade suture, and gentle tissue handling are the key factors in preventing uterine stump granulomas. Treatment consists of excision of the involved portion of the uterine stump and appropriate antibiotic therapy.

Ligation of the Ureter

Inadvertent ligation of one or both ureters is a serious complication that must be addressed aggressively. In the dog, ureteral ligation most commonly occurs in the proximal ureter near the kidneys and in the cat it is more common distally as the ureter enters the bladder due to the proximity of the uterine body to the bladder. Good visualization of ovarian pedicles and uterine body prior to ligation will prevent ureteral ligation.

Management options for the ligation of a ureter include nephrectomy of the involved kidney, ureteral resection and anastomosis, and ureteroneocystostomy (Kyles, Aronsohn, and Stone, 1996). Simply removing the ligature from the ureter will not resolve the problem.

Postoperative Bleeding from Vagina

A small amount of hemorrhagic discharge from the vagina can be expected after an ovariohysterectomy. Discharge consisting of frank blood and persisting for more than 2–3 days is not normal and should be investigated. A localized infection of the uterine stump or erosion of a uterine vessel should be considered, and an exploratory should be performed (Kyles, Aronsohn, and Stone, 1996). Excision of a portion of the uterine stump and/or ligation of the uterine body and uterine vessels may be necessary.

RABBIT SPAY/NEUTER

The unique aspects of anatomy and physiology must be considered when performing an ovariohysterectomy or castration in the rabbit. This overview of the surgeries is not intended to teach the procedures but to give a general idea of their complexity. Rabbits are easily stressed and must be kept in a quiet and comfortable environment. They will become anorexic with pain or fear, so administration of adequate analgesia is important. Careful handling including constant support of the hindquarters is necessary during preoperative evaluation and anesthetic induction as rabbits will kick to escape and can easily fracture vertebrae. Rabbits are hindgut fermenters so antibiotics administration should be restricted to those antibiotics that only minimally disturb intestinal microflora and used on an "as needed" basis only. If food is withheld at all, it should be for no more than 2 hours prior to surgery. Rabbit skin is very thin and friable, and considerable care must be taken to avoid inadvertently tearing the skin when preparing the rabbit for surgery (Jenkins, 2000).

The reproductive tract of the female rabbit is considerably different from that of the dog or cat. The rabbit has a bicornate uterus, with each uterine horn having a cervix and no uterine body. The mesometrium is a major fat storage organ, and the uterine vessels are not adjacent to the uterine horns but are contained in the mesometrium. The oviduct and infundibulum of the rabbit are much larger than those of the dog (Jenkins, 2000).

In the male rabbit, the testicles can move freely through the inguinal canals (Jenkins, 2000).

Ovariohysterectomy of the Rabbit

An ovariohysterectomy of a rabbit is performed through a ventral midline abdominal incision midway between the umbilicus and anterior brim of the pubis. The subcutaneous tissue and fat should be sharply dissected to reveal the linea alba. The linea alba is elevated and incised in the same manner as in the cat. The cecum lies just to the right of midline and must be avoided when incising the linea. The linea incision is extended with a scissors. The intestines in a rabbit are friable and easily torn so a spay hook should not be used to locate the uterus. The uterine horns can be easily identified cranial and dorsal to the urinary bladder. The three-clamp techniques are recommended for transecting and ligating the ovarian pedicles, just as in the dog. Care must be taken to remove the entire ovary, oviduct, and infundibulum. Since the uterine vessels are located in the mesometrium, and the mesometrium is a

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fat-storage organ, it is best to ligate the mesometrium independently on both sides of the uterus. In addition, ligation and transection of the cranial vaginal vault, just caudal to cervices, can be performed with a single Miller's knot as in the cat and dog uterus. Closure of the abdominal incision should be in three layers, simple continuous in the linea alba, and simple interrupted in the subcutaneous and subcuticular layers, with buried knots. Avoid placing skin sutures as rabbits tend to chew at and remove them. Rabbits respond to foreign material with an intense inflammatory reaction. Because of this, catgut should be avoided; relatively nonreactive absorbable monofilament suture, such as PDS®, is recommended for ligatures and closures (Jenkins, 2000).

Castration of the Rabbit

Since the testicles move freely through the inguinal canals in the rabbit, it is common for the testicles to move back into the abdomen during patient preparation. Gentle digital pressure on the caudal abdomen will generally push the testicles back into the scrotum. Castration is performed through two incisions, one through the scrotal skin directly over each testicle. A closed castration is recommended. Gentle blunt dissection will allow removal of the testicle from the scrotum. Fat and fascia are stripped from the spermatic cord just as in the dog and cat. A triple-clamp technique is used to transect and ligate each spermatic cord, and the scrotal incisions can be closed with skin glue (Jenkins, 2000).

Postoperative Care

Rabbits should be confined for at least a week following surgery. As in the dog and cat, postoperative analgesics should be provided. Metoclopramide may be indicated to stimulate intestinal peristalsis. Antibiotics are only indicated in the case of breaks in asepsis or ongoing infection (Appel and Hart, 2004).

CONCLUSION

Efficiency in spays and neuters is not obtained by taking short cuts that jeopardize the well-being of the patients. Rather, it is the result of close adherence to basic surgical principles and good surgical technique. Minimizing incision size, careful handling of tissues, single secure ligatures, and attention to detail with minimal wasted motion will allow the spay/neuter surgeon to become very efficient while minimizing both surgical and postsurgical complications.

REFERENCES

Appel, L.E. and Hart, R.C. (2004) Spay and neuter surgical techniques for the animal shelter, in *Shelter Medicine for Veterinarians and Staff* (eds L. Miller and S. Zawistowski), Blackwell Publishers, Ames, Iowa. Available online at http://www.avma.org/issues/policy/animal_welfare/population_control.asp (accessed December 29, 2011).

Boothe, H.W. (1993) Testes and epididymides, in *Textbook of Small Animal Surgery*, 2nd edn, Vol. 2 (eds D. Slatter and E.A. Stone), Saunders Company, Philadelphia, Pennsylvania, pp. 1325–1336.

De Tora, M. and McCarthy, R.J. (2011) Ovariohysterectomy versus ovariectomy for elective sterilization of female dogs and cats: Is removal of the uterus necessary? *Journal of the American Veterinary Medical Association*, **239**(11), 1409–1412.

Fossum, T.W. (2007) Preparation of the operative site, in *Small Animal Surgery*, 3rd edn, Mosby Elsevier, St. Louis, MO.

Goethem, B.V., Schaefers-Okkens, A., and Kirpensteijn, J. (2006) Making a rational choice between ovariectomy and ovariohysterectomy in the dog: A discussion of the benefits of either technique. *Veterinary Surgery*, **35**, 136–143.

Griffin, B. (2006) Feline reproductive hormones: Diagnostic usefulness and clinical syndromes, in *Consultations in Feline Internal Medicine V* (ed J.R. August), pp. 217–226.

Hedlund, C.S. (2007) Surgery of the reproductive and genital systems, in *Small Animal Surgery*, 3rd edn, Mosby Elsevier, St. Louis, Missouri. Available online at http://www.humanealliance.org, Veterinary Seminars in Spay/Neuter Surgery: Pediatrics (DVD) (accessed December 29, 2011).

Jenkins, J.R. (2000) Surgical sterilization in small mammals: Spay and castration. *Veterinary Clinics of North America: Exotic Animal Practice*, **3**(3), 617–627.

Johnston, D.E. and Archibald, J. (1974) Male genital system, in *Canine Surgery*, 2nd edn (ed J. Archibald), American Veterinary Publications, Inc., Santa Barbara, CA, pp. 703–749.

Kyles, A.E., Aronsohn, M., and Stone, E.A. (1996) Urogenital surgery, in *Complications in Small Animal Surgery: Diagnosis, Management, Prevention* (eds A.J. Lipowitz, D.D. Caywood, C.D. Newton *et al.*), William & Wilkins, Baltimore, Maryland, pp. 496–511.

Lofstedt, R.M. and Vanleeuwen, J.A. (2002) Evaluation of a commercially available luteinizing hormone test for its ability to distinguish between ovariectomized and sexually intact bitches. *Journal of the American Veterinary Medical Association*, **220**(9), 1331–1335.

Looney, A.L., Bohling, M.W., Bushby, P.A. *et al.* (2008) The association of shelter veterinarians veterinary medical care guidelines for spay-neuter programs. *Journal of the American Veterinary Medical Association*, **233**, 74–86.

Memon, M.A., Ganjam, V.K., Pavletic, M.M. *et al.* (1992) Use of human chorionic gonadotrophin stimulation test to detect a retained testis in a cat. *Journal of the American Veterinary Medical Association*, **201**, 1602.

Memon, M. and Tibary, A. (2001) Canine and feline cryptorchidism, in *Recent Advances in Small Animal Reproduction* (eds P.W. Concannon, G. England, J. Verstegen III *et al.*), International Veterinary Information Service, Ithaca, New York.

Puswell, B.J. and Wilcke, J.R. (1993) Response to gonadotrophin-releasing hormone by intact male dog: Serum testosterone, luteinizing hormone and follicle-stimulating hormone. *Journal of Reproduction and Fertility, Supplement*, **47**, 335–341.

Root Kustritz, M.V. (2007) Determining the optimal age for gonadectomy *of dogs* and cats. *Journal of the American Veterinary Medical Association*, **231**(11), 1665–1675.

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Appendix 39.1
Surgery Pack List

Cat/Puppy Neuter Pack
- Gauze sponges
- 1 curved mosquito hemostat
- 1 scalpel handle

Dog Neuter Pack
- Gauze sponges
- 3 curved mosquito hemostats
- 1 Metzenbaum scissors
- 1 general operating scissors
- 1 scalpel handle
- 1 paper drape 3 ft
- 1 needle holder
- 1 brown Adson forcep

Cat/Puppy Spay Pack
- Gauze sponges
- 5 straight mosquito hemostats
- 1 curved mosquito hemostats
- 1 Metzenbaum scissors
- 1 general operating scissors
- 1 scalpel handle
- 1 needle holder
- 1 spay hook
- 1 paper drape 3 ft
- 1 brown Adson forcep

Dog Spay Pack
- Gauze sponges
- 6 straight hemostats
- 2 carmaults
- 1 Metzenbaum scissors
- 1 general operating scissors
- 1 scalpel handle
- 1 needle holder
- 1 brown Adson forcep
- 1 rat tooth forcep
- 1 spay hook
- 1 paper drape 3 ft

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Pediatric Neutering

Leslie Appel and Janet Scarlett

INTRODUCTION

For at least four decades, the traditional age of ovariohysterectomy/orchiectomy of dogs and cats in the United States has been 6 months or older (Leighton, 1975; Stein, 1975; Jackson and Johnson, 1980). Interestingly, evidence that 6 months of age is the minimum "ideal" age is lacking. In fact, in the early 1900s, many female dogs underwent ovariohysterectomy as early as 3 months of age, and male puppies were castrated as early as 4 weeks (White, 1935; Smithcors, 1957). Six months of age probably became established as the minimum age of choice in the mid-twentieth century because veterinarians became comfortable that major surgical and anesthetic complications were minimal at this age or older. In 1982, appalled by the large number of dogs and cats being euthanized in animal shelters, Dr. Leo Lieberman, a private practitioner in Florida, described his experience with neutering more than 100 8- to 10-week-old puppies and kittens that he followed postoperatively for 2 years (Lieberman, 1982). In his study and in other nonpeer-reviewed studies described in a special commentary in 1987, adverse effects were not reported, prompting Dr. Leiberman to call for open discussion of lowering the minimum age for neutering (Lieberman, 1987). Some shelters had already begun neutering puppies and kittens in the 1970s, and as data began to suggest that spay/neuter contracts that required neutering postadoption were often ineffective, interest in neutering before 6 months of age grew in the humane community. Not surprisingly, the question of risks and benefits was raised. Before proceeding with a discussion of the literature addressing the risks and benefits of neutering before 6 months of age and a discussion of the procedures, however, some terms require definition.

Definitions

A variety of terms have been used to describe the techniques and effects (risks and benefits) of neutering, which is broadly defined as ovariohysterectomy (removal of both the ovaries and uterus) or orchiectomy (removal of the testes). The commonly used nonmedical terms "spay" and "neuter" for dogs and cats refer to ovariohysterectomy in females and orchiectomy or castration in males, respectively. (Although more commonly performed in countries other than the United States, ovariectomy, or removal or the ovaries only, is another acceptable method of neutering a female.) Terminology such as pediatric gonadectomy (or neutering) or prepubertal gonadectomy have been used in the literature. Since the age at which dogs and cats reach puberty is variable and may not occur until the animal is older than 6 months, gonadectomy at 6 months of age or older may or may not be prepubertal (meaning that prepubertal neutering has been practiced in the United States for many years).

The scientific literature is sparse in comparing the risks/benefits of pre- to postpubertal gonadectomy. Since the terminology has been variously defined by different authors, it is imperative that reports of scientific studies be scrutinized carefully to identify how particular studies define the groups being evaluated. For purposes of this chapter, the

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terminology "pediatric neutering" will be used to refer to ovariohysterectomy or castration before 6 months of age because much of the literature investigates this dichotomy. (Please note, however, that many veterinarians prefer to define pediatric neutering as occurring in the 6–16 weeks of age interval.) Traditional-age neutering will refer to ovariohysterectomy or orchiectomy (castration) at 6 months of age or older. As individual studies are discussed, the age groups evaluated will be identified. Conclusions drawn from reviews of studies of the effects of pediatric neutering without clarifying the age groups studied must be viewed with caution (Zink, 2005). Of course, the results of any study are only as valid as the study is well designed and conducted.

The purpose of this review is to describe the published studies evaluating risks and benefits associated with pediatric neutering. All surgical procedures have risks. The question is not whether pediatric neutering has risks, but rather how those risks compare to the benefits gained (the risk/benefit ratio), and how the risks/benefits compare to the risks and benefits of traditional-age neutering.

CRITICAL REVIEW OF THE SCIENTIFIC LITERATURE

Assessing the quality of particular studies depends on many factors. Common issues diminishing the internal validity of observational studies of the risks and benefits of pediatric neutering include small sample sizes, weak associations, lack of a control group, insufficient follow-up time to observe important outcomes, inappropriate statistical analyses, failure to include possible confounding variables, and measurement error (especially in outcomes). Consumers of the literature must be critical of these important features affecting study validity when reading the literature and assessing its implications. For a more complete review of how to read the literature regarding risks or benefits, numerous references are available (Dahoo and Waltner-Toews, 1985; Straus *et al*., 2005).

LITERATURE REVIEW

Characteristics including sample size, comparison groups, and geographic location of the study are included in Table 40.1 to facilitate the reader's study of the literature.

Perioperative Risks

Data regarding the perioperative risks associated with pediatric neutering result primarily from university researchers evaluating these procedures performed on puppies and kittens from shelters. In the early and mid-1990s, researchers at the University of Florida, working with the Massachusetts Society for the Prevention of Cruelty to Animals (MSPCA), published a series of papers describing anesthetic approaches and surgical techniques used to spay or castrate puppies and kittens (Salmeri *et al*., 1991; Aronsohn and Fagella, 1993; Faggella and Aronsohn, 1993, 1994). All complications, minor or severe, were monitored and reported. Complications during surgery and shortly after were minor or nonevident. Deaths and serious complications during anesthesia were similarly not observed (Salmeri *et al*., 1991; Faggella and Aronsohn, 1993, 1994).

Immediate Postoperative Complications

Surprisingly, data are sparse regarding postsurgical complications associated with neutering at traditional ages (6 months or older), both in dogs and in cats. Most studies of postoperative complications associated with neutering have been conducted in academic settings with veterinary students performing all or some of the surgeries (Pollari, Bonnet, and Bamsey, 1996; Howe, 1997; Burrow, Batchelor, and Cripps, 2005). Major complications have generally been defined as death, dehiscence, drug overdose, or infection. Minor complications have included mild incisional or scrotal swelling, suture reactions, and sutures placed too tightly. Differences have not been found in the risk of major or minor complications following neutering of dogs or cats when surgeries performed on animals neutered before 6 months were compared to those neutered at 6 months of age or older (Pollari, Bonnet, and Bamsey, 1996; Howe, 1997; Burrow, Batchelor, and Cripps, 2005).

One study of complications occurring in five private practices among dogs and cats neutered at ≥5–6 months of age revealed that rates varied widely among hospitals, some higher than that reported among the veterinary students and some lower (Pollari and Bonnet, 1996).

Based on studies to date, complication rates (minor and major) in pediatrically neutered dogs and cats are no higher (and may be lower) than those observed in animals neutered at traditional ages.

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Table 40.1. Comparative studies of the effects of pediatric neutering in dogs and cats as of March 2010.[a]

Authors and date	Type of study	Source of animals	Species	Length of follow-up	Comparison groups	Number of animals		Source of outcome information	Location
Howe,	Prospective cohort	Two animal shelters	Cats Dogs	7 days postsurgery	Neutered at: <12 wk 12–23 wk ≥24 wk	**Cats** 291 218 270	**Dogs** 432 314 463	Investigators	TX
Salmeri *et al.*, 1991	Randomized trial	Purpose-bred litters	Dogs	Total: 15 mo in time	Neutered at: 7 wk 7 mo Sexually intact	**Males** 7 4 4	**Females** 7 4 6	Investigators	FL
Stubbs *et al.*, 1996	Randomized trial	Purpose-bred litters	Cats	Total: 12 mo of age	Neutered at: 7 wk 7 mo Sexually intact	Total = 31 NA NA NA		Investigators	FL
Howe *et al.*, 2000	Prospective cohort	Two animal shelters	Cats	Median: 37 mo	Neutered at: < 24 wk ≥ 24 wk	**Males** 108 NA NA	**Females** 155 NA NA	Owners, veterinary records	TX
Howe *et al.*, 2001	Prospective cohort	Two animal shelters	Dogs	Median: 48 mo	Neutered at: <24 wk ≥24 wk	175 94		Owners, veterinary records	TX
Spain, Scarlett, and Houpt, 2004b	Retrospective cohort	One animal shelter	Cats	3.9 yr	Neutered at: <3.5 mo 3.5–< 5.5 mo ≥5.5 mo	**Males** 342 155 304	**Females** 361 129 369	Owners, veterinary records	NY
Spain, Scarlett, and Houpt, 2004a	Retrospective cohort	One animal shelter	Dogs	4.5 yr	Neutered at: <5.5 mo ≥5.5 mo	**Males** 499 410	**Females** 499 484	Owners, veterinary records	NY

(*continued*)

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Table 40.1. (*Continued*)

Authors and date	Type of study	Source of animals	Species	Length of follow-up	Comparison groups	Number of animals		Source of outcome information	Location
Root and Johnston, 1995; Root *et al.*, 1996; Root, Johnston, and Olson, 1997	Randomized trial	Purpose-bred	Cats	Total: 24 mo of age	Neutered at: 7 wk 7 mo Intact	**Males** 6 6 6	**Females** 6 6 6	Investigators	MN
Crenshaw and Carter, 1995	Prospective	One animal shelter	Dogs	18 mo	Neutered at: 2 mo 7 mo	22 pairs		Researchers	TX
Thrusfield, Holt, and Muirhead, 1998	Prospective cohort	Veterinary practices	Dogs	5 yr	Neutered Intact	346 395		Owners, medical records	UK
Duerr *et al.*, 2007	Case control	Veterinary practices/teaching hospital	Dogs	NA	Cases: CCLD/TPA > 35° Controls: CCLD/TPA < 30°	43 43		Owners, medical records	Many states
Stocklin-Gautschi *et al.*, 2001	Retrospective cohort	Veterinary practices	Dogs	At least 3 yr	Neutered before puberty Sexually intact	206 78		Owners, medical records	Switzerland
Wright and Amoss, 2004	Randomized trial	One animal shelter	Cats	1 yr of age	Neutered at: 6–13 wk 5–7 mo	63 63		Owners	TX
Schneider, Dorn, and Taylor, 1969	Case control	Cancer registry	Dogs	NA	Cases: Mammary cancer Controls: Other diseases	93 105		Owners, medical records	CA
Overly *et al.*, 2005	Case control	Biopsy service	Cats	NA	Cases: Mammary carcinoma Controls: Other diseases	308 389		Owners, medical records, biopsy records	PA

[a]The comparison groups are defined for each study.

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Short- and Long-Term Risks

As pediatric neutering became widely performed in animal shelters, concerns were expressed not only regarding the perioperative safety of these procedures, but also about the possible short- and long-term risks and benefits associated with them. Since many questions were asked about specific effects (e.g., skeletal growth and obesity), the following section is arranged by the issues of concern.

Skeletal Growth

Dogs

Early concerns were voiced regarding the possibility of stunted growth and about other skeletal abnormalities in dogs and cats undergoing pediatric neutering. To assess the effect of age at neutering on skeletal growth (and other factors), Salmeri *et al*. (1991) randomized mixed-breed puppies from each of six litters into three groups: males and females neutered at age 7 weeks, neutered at age 7 months, and left sexually intact. Using the radius and ulna as examples of the effects on long bones, these researchers found that physeal closure of the distal radius and ulna were significantly delayed in puppies neutered at 7 weeks of age compared to those at 7 months of age, and age at physeal closure of those neutered at 7 months was significantly delayed compared to intact puppies. Significant delays in physeal closure resulted in small, but statistically significant differences in radial length measured at 54 weeks of age.

Other studies on skeletal growth were performed by Crenshaw and Carter (1995) and Glickman, Glickman, and Thorpe (1999). Crenshaw and Carter found no difference in the length of the radius (checked at 18 months of age) between puppies neutered at 2 and 7 months of age. In contrast, purebred Golden Retriever owners reported that their dogs neutered at less than 1 year of age were significantly taller than those neutered at over 1 year of age, and taller than those animals who were never neutered (Glickman, Glickman, and Thorpe, 1999). Both studies suffer from serious methodological flaws, however.

Cats

Stubbs *et al*. (1996) examined the effect of age at neutering on skeletal development at 12 months of age among cats neutered at 7 weeks, 7 months, and left intact. The mean time to closure of the physeal plate did not differ significantly between the two neutered groups, but times to closure were significantly delayed in both neutered groups compared to that of intact cats. Despite the difference in physeal closure times, the radial lengths were not statistically different across the three groups.

Root, Johnston, and Olson (1997) conducted a similar study to evaluate time to physeal closure and radial length in cats neutered at 7 weeks, 7 months, and remaining sexually intact, measuring the cats monthly up to 24 months of age. Time to physeal closure was delayed for both neutered groups compared to intact cats, but time to closure did not differ significantly between the two neutered groups. These results were similar for male and female cats. As a consequence, radial length was significantly longer in the two neutered groups compared to the intact cats. Other studies of castrated tom cats revealed delayed time to physeal closure, although the exact age at castration was not reported (May, Bennett, and Downham, 1991; Houlton and McGlennon, 1992).

The data strongly suggest that pediatric neutering delays the closure of the growth plate of the radius in dogs and perhaps cats (compared to sexually intact animals), resulting in small but statistically significant differences in radial length. This is probably true of other long bones (e.g., femur) whose growth plates also close postpuberty. The data are less clear as to whether there is a significant difference in radial length between dogs and cats neutered before 6 months of age compared to those neutered at or after 6 months of age. It probably depends on whether those neutered at 6 months of age or older are postpubertal. In any case, the clinical significance of slightly taller stature and lengthened time to growth plate closure of the long bones has not been established. Some researchers have hypothesized that risk for fractures at these growth plates may be elevated, as well as for cranial cruciate ligament injuries and hip dysplasia.

Salter Fractures

Dogs

Two follow-up studies and a case series provide some data addressing the risk of fractures at the growth plate in dogs. Of the 1213 dogs neutered in two animal shelters (Howe, 1997), follow-up information

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for 269 was obtained by questionnaire from their adoptive owners (Howe *et al*., 2001). The authors found no growth plate fractures in any of the three groups studied (neutered at <12 weeks, 12–23 weeks, and ≥24 weeks) after following these dogs for a median of 48 months. Similarly, in a larger retrospective cohort study in one shelter by Spain, Scarlett, and Houpt (2004a), 948 dogs neutered at <5.5 months and 894 neutered at ≥5.5–12 months of age were followed for a median of 4.5 years (range: 0.3–12.2 years). Health and behavioral information were collected by questionnaire from owners, and medical data were abstracted from veterinary records when available. These researchers reported no growth plate fractures in either age group.

Cats

McNichols *et al*. (2002) reported that cats with physeal fractures from three referral centers were all neutered, the highest proportion of these being neutered before 4 months of age. Unfortunately, the study did not include a control group (without physeal fractures), making it impossible to assess comparative risks of experiencing physeal fractures associated with age at neutering in these centers. As was true for dogs, there were no growth plate fractures reported among the 263 cats neutered at <24 weeks and ≥24 weeks of age followed for a median of approximately 3.1 years by Howe *et al*. (2000) or in the 1,660 cats neutered before and after 5.5 months of age followed for a median of 3.9 years by Spain, Scarlett, and Houpt (2004b).

Cranial Cruciate Ligament Disease

Cranial cruciate ligament injuries in humans are more common in women than men. Numerous studies have also demonstrated that the incidence of cranial cruciate ligament disease (CCLD) is not equally distributed across the phases of the menstrual cycle (Slauterbeck *et al*., 2004), suggesting that sex hormones affect the anterior cruciate ligament's material properties, size, or both in humans. At least one study in dogs demonstrated an increased risk of CCLD among females as compared to males (Duval *et al*., 1999), but increased risk of CCLD with neutering (among both females and males) has been more consistently reported (Whitehair, Vasseur, and Willits, 1993; Slauterbeck *et al*., 2004).

Tibial plateau angles (TPAs) ≥35° have been demonstrated in a small proportion of legs affected with CCLD and may play a role in risk for CCLD in some dogs (Morris and Lipowitz, 2001; Wilke *et al*., 2002). Duerr *et al*. (2007) reported a statistically significant association between pediatric neutering (≤6 months of age) and increased risk of TPA ≥35° in dogs with CCLD who were 40 pounds or larger in a case-control study. The authors concluded, however, that more studies are needed to examine the association of pediatric neutering with CCLD.

How pediatric neutering affects the risk of CCLD in dogs compared to traditional-age neutering is not clear. The two largest and longest longitudinal studies of the effects of pediatric neutering have failed to find evidence of a change in risk following pediatric neutering compared to traditional-age neutering (Howe *et al*., 2001; Spain, Scarlett, and Houpt, 2004a).

Hip Dysplasia

The retrospective cohort study of 1892 dogs by Spain, Scarlett, and Houpt (2004a) found pediatric-neutered animals to be at 1.7 times greater risk of hip dysplasia than dogs neutered between 6 and 12 months of age. Interestingly, the pediatric-neutered dogs were diagnosed earlier (median age: 33 months) compared to dogs neutered at traditional ages (median age: 44 months), but were three times less likely to be euthanized for the condition. Howe *et al*. (2001) failed to demonstrate a similar association. Both of these investigations included predominantly mixed-breed dogs of variable size, and the diagnosis of hip dysplasia was reported by owners or abstracted from medical records. At least one other study has implicated neutering (age at the time of surgery was not specified) as a risk factor for development of hip dysplasia (Van Hagen *et al*., 2005). The biological significance of these results is unclear and requires further investigation in breeds of dogs where the incidence of hip dysplasia is high.

Body Condition, Body Fat, and Metabolic Rate

Dogs

Overweight or obese body condition is affected by many factors including breed, age, health, activity level, and diet, as well as reproductive status in both

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dogs and cats. Several cross-sectional studies have suggested that dogs and cats neutered at traditional ages are at higher risk of being overweight than their sexually intact counterparts (Edney and Smith, 1986; Scarlett *et al*., 1994; McGreevy *et al*., 2005). The results of prospective studies have varied somewhat, with one study reporting that neutered females gained a small but significantly greater amount of weight at 90 days postsurgery compared to intact controls (Houpt *et al*., 1979). In contrast, no differences or changes in body mass or work performance were demonstrated among working dogs who underwent ovariectomy, ovariectomy with ovarian autographs, or sham-operated controls after 55 weeks of study (LeRoux, 1983).

Few studies address the comparative risks of obesity by age at neutering among dogs and cats. Salmeri *et al*. (1991) found no differences in growth rate, food intake, weight gain, or depth of back fat after a 15-month follow-up period among dogs neutered at 7 weeks, neutered at 7 months of age, or left sexually intact. Similarly, Crenshaw and Carter (1995) found no significant differences in weight at 7 and 18 months of age among puppies neutered at 2 months or at 7 months of age. Body condition was assessed by owners at the time of questionnaire completion in both of the previously described cohort studies. Howe *et al*. (2001) reported that body condition of dogs with a median of 48 months of follow-up was similar in both age-at-neutering groups. Using the Purina body condition scoring system (Laflamme, 1997), the prevalence of overweight and obese dogs decreased with decreasing age at neutering in the study by Spain, Scarlett, and Houpt (2004a). These data suggest that dogs neutered at less than 6 months of age are less likely than dogs neutered at 6–12 months of age to be overweight or obese years after the surgery. This result requires replication in future studies, however, as the body condition assessment was provided by owners only at one point in time and pertains only to dogs still alive and retained in their adoptive homes at the time of the study. More research is needed to assess the long-term effect of age of neutering on canine body condition.

Cats

The data for cats suggest that neutering lowers their basal metabolic rate. Flynn, Hardie, and Armstrong (1996) studied the basal metabolic rate of cats who underwent ovariohysterectomy compared to those undergoing laparotomy. To maintain their body weight, researchers had to reduce significantly the caloric intake of the neutered cats (during the period of up to 25 weeks postsurgery) compared to intact animals. Neutered cats tended to eat all that was offered, whereas intact cats self-regulated their food intake. Activity levels were judged to be equal between the groups. The authors concluded that it was inadvisable to feed neutered female cats ad libitum (Flynn, Hardie, and Armstrong, 1996).

In a study of cats neutered at 7 weeks of age, neutered at 7 months, or left sexually intact, Root and Johnston (1995) found that body condition scores and body mass indices (assessed at 24 months of age) were similar between the two neutered groups, but were significantly higher in both neutered groups compared to the intact group. While neutered cats were more likely to be overweight, they were not morbidly obese. Heat coefficient values (indicative of metabolic rates) were significantly lower in both neutered groups compared to intact cats, but no differences were seen between the two neutered groups (Root *et al*., 1996). Data from this study suggested that castrated males (regardless of age at neutering) required 28% fewer calories and spayed females required 33% fewer calories than intact males or females, respectively. Stubbs *et al*. (1996) found slightly different results; cats neutered at 7 weeks and 7 months of age did not differ in body weight at 1 year of age, but those neutered at 7 months were significantly heavier than the sexually intact cats. Falciform fat thickness measurements of the two groups of neutered cats were significantly greater than those of intact cats, but did not differ from each other.

Based on owner perceptions when questioned at one point in time (i.e., time of interview), both long-term studies of cats failed to find a difference in the proportion of overweight cats between those neutered before and after 6 months of age (Howe *et al*., 2000; Spain, Scarlett, and Houpt, 2004b).

Evidence from studies in dogs and cats strongly suggest that neutering increases the risk for animals becoming overweight or obese compared to their sexually intact counterparts if intake and exercise levels are not adjusted to maintain body weight. Data suggest that body condition is unlikely to vary significantly by age at neutering in cats, however, and probably does not vary in dogs as well.

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Secondary Sex Characteristics

As would be expected, gonadal hormones influence the development of the external genitalia of dogs and cats.

Dogs

Among male dogs in the study by Salmeri *et al.* (1991), those neutered at 7 weeks of age had significantly smaller penile diameters, and the prepuce and os penis were more infantile compared to dogs neutered at 7 months of age and to those left intact. The external genitalia (measured at 15 months postsurgery) of the dogs neutered at 7 months were intermediate in maturity between those neutered at 7 weeks and those left intact. Similarly, among females, the vulvas of the dogs spayed at 7 weeks and 7 months of age were small and infantile compared with those left intact.

Small, infantile vulvas have been associated with perivulvular dermatitis, particularly in overweight dogs, raising concerns that pediatric-neutered females might be at high risk of this condition. None of the studies to date have documented an increased risk for perivulvular dermatitis or juvenile vaginitis among early-neutered bitches compared to those neutered at traditional ages (Howe *et al*., 2001; Spain, Scarlett, and Houpt, 2004a).

Cats

In male cats, penile spines were absent at 1 year of age in those castrated at 7 weeks, atrophied in those castrated at 7 months, and fully developed in a sexually intact group (Stubbs *et al*., 1996). The penis of all cats, regardless of group, could be exteriorized at 1 year of age in this study. The ability to extrude the feline penis has not been consistently noted. Herron (1971) reported persistent preputial adhesions in 40% (4/10) of cats castrated at 5 months of age. Similarly, Root *et al*. (1996) reported that the penis could be extruded at 22 months of age in 0% (0/6) of cats castrated at 7 weeks, in 60% (3/5) of cats castrated at 7 months, and in 100% (5/5) of the sexually intact cats. Difficulty catheterizing a cat whose penis cannot be extruded has been reported anecdotally, but the frequency and ultimate clinical significance of this effect has not been documented.

Subjectively, female cats in both neutered groups (7 weeks and 7 months) had smaller vulvas than sexually intact cats (Stubbs *et al*., 1996), but adverse effects of these differences have not been reported. To date, there is no evidence of clinically adverse effects on secondary sex characteristics different from those described in animals neutered at traditional ages.

Urinary Tract Health

Acquired Urinary Incontinence in Dogs

It has long been observed that acquired urinary incontinence (AUI) occurs with higher frequency in females neutered at traditional ages compared to sexually intact female dogs (Thrusfield, 1985; Holt and Thrusfield, 1993). Estimates of the incidence of AUI following ovariohysterectomy (or ovariectomy) have varied between 5.1% and 20.1% (Arnold *et al*., 1989; Thrusfield, Holt, and Muirhead, 1998; Stocklin-Gautschi *et al*., 2001; Angioletti *et al*., 2004). This broad range of incidence estimates is probably attributable to methodological differences across studies, follow-up time from surgery, size and breed of dogs, and other factors. Several studies include data relating to the question of differences in risk of AUI by age at neutering. Some relate to before and after first estrus and others relate to age at the time of neutering, regardless of the age of first estrus. In a prospective cohort study of neutered and intact female dogs in the United Kingdom, Thrusfield, Holt, and Muirhead (1998) reported that dogs neutered before their first estrus were 2.4 times more likely to develop AUI than those neutered after the first estrus. In a Swiss study, Stocklin-Gautschi *et al*. (2001) reported a significantly higher incidence (9.7%) of AUI among dogs neutered before their first estrus compared to intact dogs (0%). Although this latter study did not include dogs who were neutered after their first estrus, these authors did compare their results to those of another study reporting an incidence of 20.1% among dogs neutered after their first estrus (Arnold *et al*., 1989). On the basis of this comparison, they concluded that the risk of urinary incontinence was lower in early-spayed bitches than in dogs spayed after their first heat. Unfortunately, neither of these last two studies accounted for differential follow-up times in their cohorts, and other differences in methodology between these studies make direct comparisons problematic.

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In the largest retrospective cohort study of pediatric neutering to date, Spain, Scarlett, and Houpt (2004a) found an increasing risk of urinary incontinence associated with decreasing age at neutering (measured on a continuous scale). When age at neutering was divided into two groups (< 3 months versus 3–12 months), females neutered before 3 months of age were 3.5 times more likely to develop urinary incontinence compared to those neutered at 3–12 months of age. The approximate incidence of urinary incontinence in bitches up to 6 years of age who were neutered at <3 months was 12.9% compared to 5.0% among females neutered at 3–12 months of age. In a smaller cohort study of 153 female dogs (some pediatric neutered and some traditional-age neutered), Howe *et al*. (2001) failed to find a difference in the incidence of urinary incontinence. The statistical power to detect a difference of modest magnitude, however, was low since only three total cases of AUI were observed in both groups.

Given that AUI is a relatively common sequela to ovariohysterectomy, and may be more likely to occur among bitches neutered before 6 months of age, more research is required, not only to quantify relative risks but also to identify other factors (e.g., size of dog, breed, and vaginal position) that may modify risk (Arnold *et al*., 1989; Gregory *et al*., 1999; Angioletti *et al*., 2004). As a conservative approach, some shelters have postponed neutering female puppies less than 3 months of age in light of the Spain, Scarlett, and Houpt (2004a) study. This approach seems prudent, but the results of one observational study must not be regarded as definitive and should be replicated to confirm (or refute) these findings.

Fortunately, most dogs with AUI can be treated successfully with sympathomimetics (e.g., ephedrine and phenylpropanolamine) or estrogen-replacement therapy, and other approaches are being explored (Reichler *et al*., 2003). Despite the higher risk of pediatric-neutered dogs developing AUI in the Spain, Scarlett, and Houpt study (2004a), the rates of return to shelter and euthanasia were not higher among pediatric-neutered compared to traditional-age-neutered dogs.

Neutering of female dogs elevates the risk of AUI compared to intact animals. Whether and to what extent pediatric neutering affects risk compared to traditional-age neutering is less clear. If there is an effect, it may be that the difference is between pre- and postpubertally neutered dogs, not between females neutered before and after 6 months of age. Unfortunately, most studies to date address a mixture of these two questions. Before sound shelter policies can be developed, more research is necessary.

Urinary Infections

Dogs. Results from studies evaluating gender and neuter status and their relationship to risk of urinary tract infections (UTIs) have been mixed. Some have associated neutering of females with higher risk of UTI (Ling *et al*., 1998) and others have not (Freshman *et al*., 1989). At least one study of recurrent or persistent UTIs has demonstrated an association between neutered female dogs and heightened risk of these conditions (Seguin *et al*., 2003). The strength of the association was fairly strong in one study for both conditions combined, with an odds ratio of 4.2. In light of these observations, the incidence of cystitis and recurrent bladder infections was investigated by age of neutering. Howe *et al*. (2001) failed to find a difference in risk for cystitis in their cohort study, while Spain, Scarlett, and Houpt (2004a) reported that early-neutered female dogs were approximately 2.7 times more likely to have developed cystitis after a median of 4.5 years compared to those neutered at 6–12 months of age. There was no evidence, however, of a difference in recurrent UTIs.

Cats. When pediatric castration in male cats was first suggested, concern was expressed that it would result in smaller penile urethral diameters and increased risk for urethral obstruction. In 1972, Herron reported no differences in penile urethral diameter among cats neutered at 5 months of age compared to intact cats. Two subsequent studies have confirmed these findings. Root, Johnston, and Olson (1996) reported no differences in preprostatic urethral diameters as well. Root did find that the diameter of the prepelvic urethra of female cats neutered at 7 weeks of age was significantly smaller at 22 months of age when compared to that of intact cats, but no different than in cats neutered at 7 months of age. In addition, Stubbs and Bloomberg (1995) reported that urethral pressure profiles were similar among dogs and cats neutered at 7 weeks and 7 months of age.

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Behavior

As is true for many of the medical conditions described above, the literature is more extensive regarding the behavioral effects of neutering at traditional ages compared to intact animals, as opposed to comparisons of pediatric to traditional-age neutering. Not surprisingly, ovariohysterectomy and orchiectomy influence behavior in dogs and cats, particularly those behaviors that are sexually dimorphic (i.e., that differ between intact males and females). For example, behaviors such as urine marking, mounting, and fighting among males, or tail flagging and rump raising among females, are less likely or absent in neutered compared to intact animals (Hart, 1991). Other behavioral changes have also been associated with neutering, particularly in dogs. Several studies have reported that neutered female dogs exhibit more aggression than intact females (O'Farrell and Peachey, 1990; Podbercsek and Serpell, 1996; Guy *et al*., 2001). Neutered working female German Shepherds were found to be more behaviorally reactive than their intact female littermates (Kim *et al*., 2006), leading Overall (2007) to speculate that behavioral differences are hormonally mediated through complex mechanisms. In contrast to observations in female dogs, castration of male dogs was associated with a decrease in inter-male aggression with other dogs (Maarschalkerweerd *et al*., 1997; Neilson, Eckstein, and Hart, 1997). Neutered male and female dogs with preexisting mild cognitive impairments had an increased risk of progression of impairments among dogs 11–14 years of age compared to sexually intact males (Hart, 2001). Possible differences in behavior between dogs and cats undergoing pediatric neutering compared to neutering at traditional ages have not been as extensively researched, but several studies have been conducted.

Dogs

Salmeri *et al*. (1991) studied several behaviors and found that excitability and general activity were the only behaviors that varied significantly between dogs neutered at 7 weeks, neutered at 7 months, and left sexually intact. Male puppies neutered at 7 weeks of age had significantly higher excitability scores compared to intact males, and all neutered dogs, regardless of sex, had general activity scores significantly higher than the intact dogs. Behaviors of dogs neutered at 7 weeks and 7 months did not differ.

Behavior problems, both major and minor, were reported by adopters of dogs neutered before 6 months and at 6 months of age or older in the cohort study of shelter dogs by Howe *et al*. (2001). Major problems were defined as those that resulted in, or could potentially result in, removal of a dog from the household or banishment to an outdoor existence; minor behavioral problems were defined as those reported by owners that did not threaten the dog's status as a household member. The incidence of behavioral problems between the two cohorts did not differ significantly.

In the Spain, Scarlett, and Houpt (2004a) cohort study of shelter dogs, the risk of eight behaviors was initially demonstrated to be associated with age at neutering. Decreasing age at neutering was associated with increased risk of barking/growling at visitors, excessive barking bothering household members, and aggression to household members in male (but not female) dogs. These three behaviors were also significantly associated with each other. Among dogs not showing aggression, there was no association between age at neutering and excessive barking. The authors speculated that the association between pediatric neutering and aggression was spurious, since aggressive dogs in the 6- to 12-month age group may have been euthanized by the shelter before neutering more frequently than dogs 5 months of age or younger. Dogs in the pediatric-neutered group were less likely to undergo temperament evaluation because of their young age when admitted to the study shelter.

Both male and female dogs showed increasing rates of noise phobias and sexual behaviors with decreasing age at neutering, whereas rates of escaping behaviors considered serious by their owners declined with decreasing age at neutering. Other behaviors such as separation anxiety and urination when frightened were significantly less frequent among male and female dogs neutered before 6 months of age.

Barking and growling at visitors, barking that bothered household members, noise phobias, sexual behaviors, and urination when frightened were no longer associated with age at neutering when only behaviors considered serious by owners were evaluated. Four behaviors were associated with increased

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risk of relinquishment: aggression toward family members, escaping considered a serious problem, separation anxiety, and urination when frightened. Aggression toward family members increased the risk of euthanasia.

Cats

Excitability, playfulness, activity level, vocalization, affection, and intraspecies aggression were evaluated (beginning at 8 weeks of age) among cats neutered at 7 weeks, neutered at 7 months, and those left sexually intact until the cats were 1 year of age. The only behavioral differences were significantly greater intraspecies aggression and less affection toward the observer among the intact cats compared to both neutered groups (Stubbs *et al*., 1996).

In a prospective study of kittens adopted from a Florida shelter and followed for up to 1 year postadoption, Wright and Amoss (2004) found no differences in the occurrence of housesoiling and aggression toward people or toward other cats between pediatric-neutered and traditional-age-neutered cats. Pediatric neutering was defined as occurring at 6–13 weeks of age and traditional-age neutering as occurring at 5–7 months of age.

In the Spain, Scarlett, and Houpt (2004b) cohort study, male and female cats neutered before 5.5 months of age were significantly more likely to exhibit shyness around strangers compared to those neutered at 5.5–12 months of age, and among males, they were more likely to hide frequently. On the other hand, those neutered before 5.5 months were less likely to exhibit hyperactivity and sexual behaviors, and males were less likely to spray urine and show aggression to veterinarians (compared to those undergoing traditional-age neutering).

Studies of purported risk factors such as pediatric neutering and behavior are challenging to design and conduct for a variety of reasons. The behavior of animals is fluid and affected by many factors. Some behaviors may be present for part of an animal's lifetime and then disappear, or the frequency may change over time. Behavior can also be difficult to assess, especially by owners who have no formal behavior training or variable awareness of their pet's actions. Standardization of reporting among owners is impossible to achieve, and the validity of responses is questionable in studies using questionnaires asking whether a pet has *ever* displayed a behavior over years of ownership, or the behavior assessment is made only at one point in time. Hart (1991) has also cautioned that owners (anticipating changes in their animal's behavior following neutering) may change their own behavior toward their pet, inducing behaviors in their animals not directly attributable to neutering. Before causal associations can be established, proposed associations must be replicated in multiple studies, preferably some of which involve assessments by behaviorists.

Cancer

Mammary tumors occur less frequently in dogs and cats neutered at an early age. Bitches neutered before their first estrous cycle had a 99.5% reduction in the risk of mammary tumors (benign and malignant) compared to intact females; if neutered after the first heat but before the second, the risk reduction was 92%, and after two but before approximately four heat cycles, the reduction was 74% compared to intact dogs. Beyond about 2.5 years of age (or four heat cycles), no protective effect was noted (Schneider, Dorn, and Taylor, 1969). A similar relationship exists in cats. Using age at neutering rather than number of estrus cycles (because of the difficulty of accurately counting cycles retrospectively), Overly *et al*. (2005) demonstrated that cats neutered before 6 months of age had a 91% reduction and those neutered at 6–12 months of age had a 86% reduction in the risk of mammary tumors (most of which were malignant) compared to intact queens. No statistical evaluation was made, however, comparing the risk among cats spayed before 6 months of age to the risk among those having surgery at 6–12 months of age. An additional sparing effect may be gained by neutering earlier, especially since pediatric neutering will occur before most queens reach puberty. Neither of the cohort studies found differences in the risk of mammary tumors between the pediatric- and traditional-age-neutered groups, but one study had follow-up only until approximately 4 years of age (Howe *et al*., 2001) and the other had relatively small numbers of dogs or cats followed up to 10 years postsurgery (Spain, Scarlett, and Houpt, 2004a, 2004b). Schneider (1970) reported a cumulative incidence of mammary tumors of approximately 145 new cases per 100 000 dogs of all ages in a population, with an approximately 50% neuter rate among female dogs. In light of the low expected incidence of

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mammary tumors in both the traditional- and pediatric-neutered groups, it seems likely that the statistical power to detect significant differences in mammary risk between the two neuter groups was low in the two cohort studies.

Since ovarian and uterine tumors are rarer than mammary tumors in dogs and cats, the cohort studies were probably unable to evaluate any elevation in risk associated with pediatric compared to traditional-age neutering. It seems highly likely, however, that the risk of these tumors (and risk of testicular tumors) will be eliminated by pediatric neutering. The risk for prostatic cancer may be an exception. Traditional-age neutering appears to elevate the risk for prostatic cancer in dogs with odds ratios in the range of 2.4–4.3 times higher in neutered compared to intact dogs (Bell *et al*., 1991; Teske *et al*., 2002; Sorenmo *et al*., 2003). Despite these results from observational studies, however, a causal relationship has yet to be established. It is unclear what effect pediatric neutering has on the relative risk of prostatic cancer compared to neutering at traditional ages. Since prostatic cancer is very rare in traditional-age-neutered dogs, even if pediatric neutering were to increase that risk, it seems unlikely that the absolute risk would be very high. Neither of the cohort studies detected differences in risk by age at neutering, but these studies probably lacked the statistical power to detect a clinically relevant difference.

Neutering at traditional ages has been implicated in the etiologies of several other tumors, including those of the bladder, urethra, and heart. The risk of canine lower urinary tract tumors (bladder and urethral tumors) was found to be approximately two times more common in neutered compared to intact dogs (after controlling for age) (Norris *et al*., 1992). In another retrospective study, cardiac tumors (including hemangiosarcomas, aortic body tumors, ectopic thyroid carcinomas, and cardiac lymphomas) were more than four times more likely in neutered compared to intact female dogs (Ware and Hopper, 1999). A cause-and-effect relationship between neutering and these tumors has similarly not been established. The cohort studies of early neutering found no evidence of increased risk of these tumors, but these tumors have a low incidence, and the comments made above regarding other tumors are likely to apply to these as well.

Osteosarcomas are relatively rare in dogs, but occur more frequently in giant- and large-breed dogs than in smaller breeds. Neutered dogs were reported to have a higher risk of osteosarcoma compared to intact dogs in two retrospective studies, one involving only Rottweilers (Ru, Terracini, and Glickman, 1998; Cooley *et al*., 2002). A causal relationship between neutering and risk of osteosarcoma, however, has not been established.

Studying whether a particular exposure (pediatric neutering) raises or lowers the risk of tumors compared to another exposure (e.g., neutering at traditional ages) is difficult. Tumors have a low incidence and a relatively long induction period. Therefore, evaluating relative risks (or benefits) is difficult with cohort studies unless large numbers of animals are followed for disease occurrence over a long period of time. Assessing these associations is best done with case-control studies, but this design produces less convincing evidence of a causal relationship. Multiple studies identifying the same associations in several populations are necessary to provide strong evidence of an association. Such a body of studies does not yet exist for risk of tumors and pediatric neutering.

Other Conditions Potentially Associated with Neutering

Studies have produced mixed results regarding the risk of neutering and hypothyroidism in dogs (Milne and Hayes, 1981; Panciera, 1994; Dixon, Reid, and Mooney, 1999), and at least two studies have reported an increased risk of diabetes mellitus in neutered compared to intact cats (McCann *et al*., 2007; Prahl *et al*., 2007). Neither of the two cohort studies of pediatric neutering to date, however, has demonstrated an association between age at neutering and risk of these diseases. Unlike in the ferret, there are no data associating adrenal gland disease in dogs and cats with neutering.

Benefits of Neutering

Since most new procedures or changes to traditional practice are met with questions and fear about risks, the literature regarding potential adverse effects was addressed first. The impetus to reexamine old dogma, however, originated from people perceiving the benefits of lowering the recommended age for neutering of dogs and cats. Veterinarians and others in the humane community recognized the value of neutering all shelter animals before adoption in reducing companion animal birth rates. They believed that

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the benefits offset the risks. Data suggested that spay/neuter contracts were only marginally effective, and they realized that neutering all animals before adoption would keep the progeny of former shelter residents from entering shelters. With 3 to 4 million deaths of shelter dogs and cats annually, animal shelters and rescue groups believed that the risk/benefit ratio tipped strongly in the direction of the benefits of pediatric neutering. As a consequence, many shelters now neuter as early as 6–8 weeks of age or when the animal weighs at least 2 pounds. In contrast, private practitioners can recommend neutering at the end of the vaccination series (at ~4–5 months of age), well before most dogs and cats reach sexual maturity (rather than recommending waiting until at least 6 months of age). By neutering privately owned female dogs and cats before 6 months of age, practitioners can prevent the 15–20% of animals who will have litters before they are eventually neutered (Manning and Rowan, 1992; Petsmart Charities, 2009).

The intake of dogs into shelters in parts of the country has been declining for decades (Zawistowski *et al*., 1998). Much of this decline has been attributed to the ongoing large-scale neutering of the community and shelter dog populations. While cats now outnumber dogs in most shelters, cat intake has also declined over the decades. Neutering not only diminishes births, but also reduces relinquishments for sex hormone-related behaviors (e.g., tomcat aggression and urine spraying), estrous bleeding, and unwanted litters in both species. In trap/neuter/return programs, where there may be only one opportunity to neuter trapped cats, young and old cats can be spayed and neutered before they reproduce. (See the chapter on stray and feral community cats for more information about trap/neuter/return programs.)

Numerous positive health effects (besides those mentioned already) are realized after neutering regardless of age, such as decreased risk for pyometra (dogs and cats), prostatic hypertrophy (dogs), prostatitis (dogs), and cat-bite abscesses (Root Kustritz, 2007).

TECHNIQUES FOR PEDIATRIC SPAY/NEUTER

There are many reported anesthetic protocols and surgical techniques for performing pediatric spay/neuter. This chapter only describes the methods preferred by the authors. The reader is advised to consult the references at the end of the chapter for other anesthetic and surgical protocols. In addition to the references, the reader is also advised to consult the other chapters in this spay neuter section. Pediatric spay/neuter is well within the ability of any veterinarian who performs routine spay/neuter on young adult patients. The surgery is shorter and easier and has minimal hemorrhage, and the patients recover rapidly.

Preoperative Evaluation

As for any surgical patient, regardless of age, a complete physical examination should be performed first. Presurgical blood work is at the discretion of the surgeon and can consist of quick assessment tests (QATs) (packed cell volume [PCV], total protein, blood glucose, and blood urea nitrogen). The PCV of a puppy or kitten is normally lower than that of the adult animal, ranging from 28% to 35% in the pediatric patient. In accordance with the recommendations of the American Association of Feline Practitioners (AAFP) that all cats be tested, the feline leukemia (FeLV) test is recommended in the feline pediatric patient. It must be remembered, however, that there are limitations to the use of the test in a shelter environment, and no healthy animal should be euthanized based on the results of a single positive test. (See the chapters on feline care, management of stray and feral community cats, and disease recognition and diagnostic testing for more information.) Once the puppy or kitten is assessed as healthy, an anesthetic protocol can be determined.

Anesthetic Considerations

Providing anesthesia for pediatric animals is safe and effective as long as some of their special physiologic considerations are understood. Pediatric patients have immature hepatic enzyme systems, decreased protein binding of drugs, and a decreased glomerular filtration rate (Root Kustritz, 1999). These factors can lead to altered drug metabolism and excretion, and anesthetic protocols should be chosen carefully. Due to decreased glycogen stores secondary to a small liver size and small skeletal muscle mass, the pediatric animal is prone to hypoglycemia, and steps should be made to maintain euglycemia or normal blood glucose levels (Root Kustritz, 1999). Pediatric patients also are at risk for hypothermia during anesthesia, as they have a larger surface area to volume ratio, a lower percentage of body fat, and a decreased

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ability to shiver (Grandy and Dunlop, 1991). Further, these young animals have a higher rate of oxygen consumption than the adult animal and, subsequently, higher respiratory rates. The pediatric cardiovascular system also differs from that of adult animals. Cardiac output is mostly dependent on heart rate, so bradycardia should be prevented (Grandy and Dunlop, 1991). Hypotension is also a greater problem in anesthetized pediatric patients, and anesthetic agents that can cause hypotension should be avoided. Blood loss should be limited by meticulous hemostasis to further prevent hypotension. Intravenous (IV) administration of fluid may help correct hypotension, but the cardiac ventricles in the pediatric patient are less compliant, and therefore the puppy or kitten has a limited ability to increase cardiac output in response to volume loading (Grandy and Dunlop, 1991).

The following guidelines should be followed to account for the concerns mentioned above. Prior to anesthesia, the pediatric patient should be housed with littermates and kept in a quiet environment with minimal handling, because preanesthetic disposition has a significant effect on response to anesthetic drugs (Aronsohn and Fagella, 1993; Theran, 1993). Water should not be withheld prior to anesthesia. The pediatric patient should not be fasted for more than 4 hours; ideally, they should be fed a small meal 2–4 hours before surgery to prevent hypoglycemia. Hypothermia can be minimized by providing a supplemental heating source such as a circulating warm water blanket, by clipping the minimal amount of hair from the surgical site, and by using warmed surgical scrub (Root Kustritz, 1999). The use of alcohol should be avoided because of its cooling effects on the skin.

Anticholinergics are no longer recommended for routine use in most pediatric anesthetic protocols; bradycardia should be prevented by maintaining a proper anesthetic depth level. Anticholinergics can be kept on hand for emergency situations (Looney, personal communication, 2011).

Tranquilization is usually not needed as these animals are typically calm when kept in the quiet environment mentioned above. Barbiturates, such as thiopental, should not be used because of the immature hepatorenal system in the pediatric patient. Isoflurane is the gas anesthetic agent of choice. If propofol is used, the patient should be preoxygenated.

The authors use the anesthetic protocols in Tables 40.2, 40.3, and 40.4. Induction via IV injection of ketamine/valium is the authors' preferred method. While it may occasionally be necessary to mask patients with isoflurane, mask administration of inhalant anesthetics should be minimized (Looney *et al*., 2008).

Intraoperative IV fluid administration is seldom necessary because the procedure is short and hemorrhage should be minimal. A fluid administration rate of 10 ml/kg/h IV can be used if needed. Intubation is best for pediatric patients as seen in the tables below, and a nonrebreathing circuit can be used for delivering anesthetic gas and oxygen for patients weighing

Table 40.2. Anesthetic protocol for pediatric canine ovariohysterectomy and castration.

Premedication	Butorphanol (10 mg/ml) 0.2 mg/kg SQ or IM
	Acepromazine (1 mg/ml) 0.05 mg/kg SQ or IM
	(Maximum dose of acepromazine for dogs is 1.5 mg total.)
Induction	Ketamine (100 mg/ml)/Valium (5 mg/ml) 1.0 ml/20 pounds in a 1:1 ratio IV to effect
	(Example: A 10-pound puppy would receive a total of 0.5 ml, which is 0.25 ml ketamine and 0.25 ml Valium IV, given to effect.)
	Midazolam (5 mg/ml) can be used as a substitute for Valium at the same volume
Maintenance	Isoflurane in 100% oxygen via endotracheal tube (ET)
Maintenance	Isoflurane in 100% oxygen via ET

Note: These recommendations are not intended as a substitute for professional training or use of a comprehensive anesthesia text. All decisions regarding anesthesia, patient care, and monitoring remain the responsibility of the veterinary staff (doctors and technicians).

Table 40.3. Anesthetic protocol for pediatric feline ovariohysterectomy and castration.

Premedication	Dexdomitor (500 mcg/ml) 5 mcg/kg IM Butorphanol (10 mg/ml) 0.2 mg/kg IM
Induction	Ketamine (100 mg/ml)/Valium (5 mg/ml) 1.0 ml/20 pounds in a 1:1 ratio, IV to effect (Example: A 4-pound kitten would receive a total of 0.2 ml, which is 0.10 ml ketamine and 0.10 ml Valium IV, given to effect.) Midazolam (5 mg/ml) can be used as a substitute for Valium at the same volume
Maintenance	Isoflurane in 100% oxygen via endotracheal tube (endotracheal tube not needed for routine feline castrations)
Reversal	Give Antisedan at 3/4 volume of the Dexdomitor IM if needed
For kittens less than 2 kg	The above protocol is utilized with Dexdomitor (500 mcg/ml) given at 7 mcg/kg IM

Note: These recommendations are not intended as a substitute for professional training or use of a comprehensive anesthesia text. All decisions regarding anesthesia, patient care, and monitoring remain the responsibility of the veterinary staff (doctors and technicians).

less than 2.5 kg. However, pediatric rebreathing circuits are also available. Postoperative analgesia is generally not administered for either pediatric spays or castrations, as the procedures are so short the preoperative analgesia is still effective. Recovery from anesthesia is rapid for both male and female puppies and kittens. All pediatric patients should be fed within the first hour from anesthesia recovery. If recovery is slow, and hypoglycemia is suspected or diagnosed, 50% dextrose or corn syrup can be given orally. Pediatric patients should be kept warm in recovery as well and can be recovered on a circulating warm water blanket, with multiple towels to cover the patient. If a circulating warm water blanket is not available, warm water bottles or heated "rice socks" (socks filled with rice that can be heated in a

Table 40.4. Anesthetic protocol for pediatric feral/aggressive feline ovariohysterectomy and castration.

For female kittens and cryptorchid male kittens	
Injectable protocol (premedication and induction agents in single injection)	Dexdomitor (500 mcg/ml) 35 mcg/kg IM Butorphanol (10 mg/ml) 0.3 mg/kg IM Ketamine (100 mg/ml) 5.0 mg/kg IM Mix in 1 syringe and give IM, takes 10–12 minutes to become anesthetized
Maintenance	Isoflurane in 100% oxygen via face mask or endotracheal tube if needed
Reversal	Give Antisedan at 3/4 volume of the Dexdomitor IM if needed
For male kittens (noncryptorchid)	
The above protocol uses Dexdomitor (500 mcg/ml) given at 25 mcg/kg IM	

Note: These recommendations are not intended as a substitute for professional training or use of a comprehensive anesthesia text. All decisions regarding anesthesia, patient care, and monitoring remain the responsibility of the veterinary staff (doctors and technicians).

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microwave) can also be used. If warm water bottles or rice socks are used, care should be taken to reheat the water or rice as they cool, so that heat will not be inadvertently taken away from the patient. Care should also be taken to prevent burns to the patient by layering towels between the patient and the warm water bottle, hot rice sock, or circulating warm water blanket.

Surgical Considerations

The surgical procedures of ovariohysterectomy and castration in the pediatric patient are faster and easier than in the adult. The basic principles of pediatric surgery are to minimize surgery time, perform careful tissue handling, and implement meticulous hemostasis. No significant changes in the surgical techniques used for the young adult animal are necessary, but a few adjustments must be made for the pediatric patient.

Pediatric Canine and Feline Ovariohysterectomy

The procedure of ovariohysterectomy is nearly identical for the puppy and kitten. The abdominal incision is made caudal to the umbilicus in both species. This positioning of the incision is different in the canine pediatric patient when compared to the adult patient. The incision does not have to start at the umbilicus, because pediatric patients do not have tight suspensory ligaments and the ovaries are therefore easy to exteriorize. In the pediatric patient, visualization of the reproductive tract is very good as there is minimal abdominal fat. However, these structures are fragile in the pediatric patient; tissue must be handled gently and excessive traction avoided to prevent tearing the reproductive tract and/or associated vessels. Also different than in the adult patient, there is an increased amount of free abdominal fluid present. The uterus is very small, and the ovaries are large relative to the size of the uterus. As in the adult, care must be taken to remove the entire ovary on each side. Double ligatures are not necessary on any pedicle, as the pedicles are small and contain very little fat. Most often, only a single clamp is placed on the pedicle, and the vessels are ligated below the clamp. Two clamps can be used in the larger pediatric patients, if necessary, to create a crush mark for the placement of the suture ligature. Before the ovarian pedicle is cut proximal to the clamp, another clamp should be placed across the proper ligament to prevent back bleeding of the uterine artery. As with adult patients, hemorrhage should be avoided. Meticulous hemostasis is even more important in pediatric patients, as they have a smaller blood volume than adult patients, so even minimal hemorrhage can be significant. Also, pediatric patients are prone to hypotension as previously discussed, so blood loss must be minimized. The same procedure is followed for the uterine pedicle. The use of absorbable suture (usually 3-0 PDS®) on all the pedicles and especially on the uterine pedicle is preferred by the authors. Hemoclips have been used successfully (Faggella and Aronsohn, 1994; Aronsohn and Fagella, 1993), but are unlikely to be used in the shelter due to expense. Another technique for ligating the ovarian pedicles is the "ovarian pedicle tie," which is described in the chapter on surgical techniques for spay/neuter.

During closure of the abdomen, the linea can be apposed in a suture pattern that is the surgeon's preference. One of the authors (Appel) prefers a simple continuous suture pattern using absorbable suture material of 3-0 size if the animal is less than 10 lbs (2-0 can be used in a larger puppy). Other suture patterns include simple interrupted or cruciate patterns, but they do result in more knots and suture material being left in the abdomen. In the subcutaneous tissue, a few simple interrupted absorbable sutures of 3-0 or 4-0 size are placed to close dead space. Then, the skin is apposed with a continuous subcuticular pattern burying the knot, using absorbable suture on a cutting needle. The selection of suture material should be the surgeon's preference. Although both polyglactin 910 (Vicryl®) in 4-0 size and PDS® are commonly used by many surgeons with good results for closing this layer, both have been associated with suture reactions. There have been reports by Davidson, Schulz, and Wisner (1998) and Kirby *et al*. (1989) that PDS® suture may be associated with calcinosis circumscripta in young dogs. Surgeons should be aware of these concerns when selecting the suture material to use and be prepared to adjust their protocols if these arise. Skin sutures should be avoided as the puppies and kittens often chew these out.

Pediatric Canine and Feline Castration

The pediatric castration in the dog and cat is similar to the procedure done for the adult cat castration. A

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scrotal approach and incision is used in both species. This is different than the prescrotal approach commonly used for the adult dog castration. In the puppy, a sterile surgical procedure is performed. A puppy can be castrated from a single small scrotal incision. A closed castration is recommended. One testicle is held in place, and a 1–2 cm scrotal incision is made over the testicle. The testicle is removed from the incision, and the spermatic cord stripped with a gauze sponge as is done in the adult canine patient. The cord is then ligated using the technique of tying the cord in a knot on itself. Instead of using mosquito hemostats, a larger clamp such as a Kelly or Crile clamp or a carmalt can be used if necessary, because of the increased size of the cord. Sutures or hemoclips are other options for pedicle ligation. The second testicle is removed through the same scrotal incision (this incision does not have to be on the median raphe, it can be just to one side of the midline) and tied off in the same manner. No subcuticular or skin sutures are used, and the incision is left open to heal by second intention. Although some surgeons do use tissue glue, it is generally not needed or recommended.

The pediatric feline castration is clean but not a sterile procedure, performed in a similar manner to the adult cat. After anesthesia is induced, the fur is plucked from the scrotum, and chlorhexidine scrub is used to prepare the site for surgery. Each testicle is removed via a separate scrotal incision. The technique of tying the cord in a knot on itself can be safely and successfully used, although some surgeons do not recommend this because of the small size and fragility of the spermatic cord. As long as careful tissue handling is performed, there should be little problem. Suture or hemoclips may be used alternatively. The scrotal incisions are not sutured.

The pediatric castration should not be performed unless both testicles can be removed. If one or both testicles are not present in a kitten by 8 weeks of age, it is highly unlikely that they will descend. For puppies, descent is possible up to 16 weeks of age or so. However, an animal is not truly considered cryptorchid until he or she is 6 months of age (Robert Gilbert, personal communication, 2011). If only one testicle is palpated in the scrotum, castration should be delayed until the second testicle descends into the scrotum, or until 6 months of age, when a cryptorchid castration can be performed. However, in the context of a shelter neutering program, if this is the only opportunity to neuter the animal, the procedure should be performed regardless of the age at presentation. Sometimes an inguinal or prescrotal testicle can be found and easily pushed down into the scrotum for castration.

Postoperative Considerations

Postoperative complications are rare in pediatric spay/neuter. As previously stated, the pediatric patient should be fed a small meal within the first hour after anesthetic recovery (Faggella and Aronsohn, 1993). Animals with prolonged recovery may be hypoglycemic and can be given 50% dextrose or corn syrup orally in the early postoperative period (Root Kustritz, 1999).

Animals can be released on the same day that surgery is performed. Pediatric patients not only recover quickly from anesthesia, but they heal rapidly as well. Tattooing of pediatric patients is especially important (see the chapter on techniques for spay/neuter). When animals are sterilized as puppies and kittens, scars may be difficult to see or feel later in life.

CONCLUSION

Pediatric puppies and kittens can safely and effectively be spayed and neutered as long as special anesthetic and surgical considerations are followed. Pediatric spay/neuter is essential for shelters in an effort to ensure all animals are spayed/neutered before leaving the shelter. Data to date suggest that the perioperative complication rate for pediatric neutering is no larger (and may be smaller) than that observed for traditional-age neutering. Studies of the possible effects (negative and positive) of pediatric compared to traditional-age neutering have produced varying results, but three general associations, very likely to be causal between age at neutering and risks/benefits, have been established. These include good evidence that pediatric neutering (compared to traditional-age neutering) leads to (1) a significantly reduced risk of mammary tumors in both dogs and cats; (2) a delay in the physeal closure of long bones and a subsequent minor increase in long bone length in dogs and probably in cats; and (3) more juvenile secondary sex characteristics in both dogs and cats. The last two associations have yet to be associated with any verified adverse health effect.

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Several other possible adverse and beneficial associations with health and behavior have been suggested in the literature, but the evidence is weaker. These statistical associations require further investigation, as they may or may not be causal in nature. A body of evidence must be accumulated with studies in various populations conducted by numerous researchers, backed up by the elucidation of the basic biological mechanisms before causal links with age at neutering can be established.

Pediatric neutering has become widespread and has been performed successfully since the 1980s, particularly in shelter populations, because the benefits to saving lives appear to far exceed the risks. Current scientific data support the use of these procedures. Pediatric neutering after completion of the juvenile vaccination series is also recommended to prevent accidental breeding in client-owned animals.

For interested readers, several other reviews of the pediatric risk/benefit literature have been written (Salmeri, Olson, and Bloomberg, 1991; Howe, 2006; Root Kustritz, 2007). Also, a resource list of neutering studies that includes pediatric studies has been compiled by the American Veterinary Medical Association (AVMA) and can be found at http://www.avma.org/avmacollections/spay_neuter/default.asp.

REFERENCES

Angioletti, A., De Francesco, I., Vergottini, M. *et al*. (2004) Urinary incontinence after spaying in the bitch: Incidence and oestrogen-therapy. *Veterinary Research Communications*, **28**, 153–155.

Arnold, S., Arnold, P., Hubler, M. *et al*. (1989) Urinary incontinence in spayed bitches: Prevalence and breed disposition. *Schweizer Archiv für Tierheilkunde*, **131**, 259–263.

Aronsohn, M.G. and Fagella, A.M. (1993) Surgical techniques for neutering 6- to 14-week-old kittens. *Journal of the American Veterinary Medical Association*, **202**, 53–55.

Bell, F.W., Klausner, J.S., Hayden, D.W. *et al*. (1991) Clinical and pathologic features of prostatic adenocarcinoma in sexually intact and castrated dogs: 31 cases (1970–1987). *Journal of the American Veterinary Medical Association*, **199**, 1623–1630.

Burrow, R., Batchelor, D., and Cripps, P. (2005) Complications observed during and after ovariohysterectomy of 142 bitches at a veterinary teaching hospital. *The Veterinary Record*, **157**, 829–833.

Cooley, D.M., Beranek, B.C., Schittler, D.L. *et al*. (2002) Endogenous gonadal hormone exposure and bone sarcoma risk. *Cancer Epidemiology, Biomarkers and Prevention*, **11**, 1434–1440.

Crenshaw, W.E. and Carter, C.N. (1995) Should dogs in animal shelters be neutered early? *Veterinary Medicine*, **August**, 756–760.

Dahoo, I.R. and Waltner-Toews, D. (1985) Interpreting clinical research: Part III. Observational studies and interpretation of results. *Compendium on Continuing Education for the Practicing Veterinarian*, **7**, S605–S613.

Davidson, E.B., Schulz, K.S., Wisner, E.R. *et.al*. (1998) Calcinosis circumscripta of the thoracic wall in a German shepherd dog. *Journal of the American Animal Hospital Association*, **34**, 153–156.

Dixon, R.M., Reid, S.W., and Mooney, C.T. (1999) Epidemiological, clinical haematological and biochemical characteristics of canine hypothyroidism. *Veterinary Record*, **145**, 481–487.

Duerr, F.M., Duncan, C.G., Savicky, R.S. *et al*. (2007) Risk factors for excessive tibial plateau angle in large-breed dogs with cranial cruciate ligament disease. *Journal of the American Veterinary Medical Association*, **231**, 1688–1691.

Duval, J.M., Budsberg, S.C., Flo, G.L. *et al*. (1999) Breed, sex, and body weight as risk factors for rupture of the cranial cruciate ligament in young dogs. *Journal of the American Veterinary Medical Association*, **215**, 811–814.

Edney, A.T.B. and Smith, P.M. (1986) Study of obesity in dogs visiting veterinary practices in the United Kingdom. *The Veterinary Record*, **118**, 391–396.

Faggella, A.M. and Aronsohn, M.G. (1993) Anesthetic techniques for neutering 6- to 14-week-old kittens. *Journal of the American Veterinary Medical Association*, **202**(1), 56–62.

Faggella, A.M. and Aronsohn, M.G. (1994) Evaluation of anesthetic protocols for neutering 6- to 14-week-old puppies. *Journal of the American Veterinary Medical Association*, **205**(2), 308–314.

Flynn, M.F., Hardie, D.M., and Armstrong, J. (1996) Effect of ovariohysterectomy on maintenance energy requirement in cats. *Journal of the American Veterinary Medical Association*, **209**, 1572–1581.

Freshman, J.L., Reif, J.S., Allen, T.A. *et al*. (1989) Risk factors associated with urinary tract infection in female dogs. *Preventive Veterinary Medicine*, **7**, 59–67.

Glickman, L., Glickman, N., and Thorpe, R. (1998–1999) The Golden Retriever Club of America national health survey. Available online at The Golden Retriever Club of America http://www.grca.org/pdf/health/healthsurvey.pdf (accessed February 12, 2010).

VetBooks.ir

Grandy, J.L. and Dunlop, C.I. (1991). Anesthesia of pups and kittens. *Journal of the American Veterinary Medical Association*, **198**(7), 1244–1249.

Gregory, S.P., Holt, P.E., Parkinson, T.J. *et al*. (1999) Vaginal position and length in the bitch: Relationship to spaying and urinary incontinence. *Journal of Small Animal Practice*, **40**, 180–184.

Guy, N. C., Luescher, U.A., Dohoo, S.E. *et al*. (2001) Demographic and aggressive characteristics of dogs in a general veterinary caseload. *Applied Animal Behaviour Science*, **74**, 15–28.

Hart, B.L. (1991) Effects of neutering and spaying on the behavior of dogs and cats: Questions and answers about practical concerns. *Journal of the American Veterinary Medical Association*, **198**, 1204–1205.

Hart, B.L. (2001) Effect of gonadectomy on subsequent development of age-related cognitive impairment in dogs. *Journal of the American Veterinary Medical Association*, **219**, 51–56.

Herron, M.A. (1971) A potential consequence of prepubertal feline castration. *Feline Practice*, **1**, 17–19.

Holt, P.E. and Thrusfield, M.V. (1993) Association in bitches between breed, size, neutering and docking, and acquired urinary incontinence due to incompetence of the urethral sphincter mechanism. *The Veterinary Record*, **133**, 177–180.

Houlton, J.E.F. and McGlennon, N.J. (1992) Castration and physeal closure in the cat. *The Veterinary Record*, **131**, 466–467.

Houpt, K.A., Coren, B., Hintz, H.E. *et al*. (1979) Effect of sex and reproductive status on sucrose preference, food intake, and body weight of dogs. *Journal of the American Veterinary Medical Association*, **174**, 1083–1085.

Howe, L.M. (1997) Short-term results and complications of prepubertal gonadectomy in cats and dogs. *Journal of the American Veterinary Medical Association*, **211**, 57–62.

Howe, L.M. (2006) Surgical methods of contraception and sterilization. *Theriogenology*, **66**, 500–509.

Howe, L., Slater, M.R., Boothe, H.W. *et al*. (2000) Long-term outcome of gonadectomy performed at an early age or traditional age in cats. *Journal of the American Veterinary Medical Association*, **217**, 1661–1665.

Howe, L., Slater, M.R., Boothe, H.W. *et al*. (2001) Long-term outcome of gonadectomy performed at an early age or traditional age in dogs. *Journal of the American Veterinary Medical Association*, **218**, 217–221.

Jackson, W.F. and Johnson, S.D. (1980) Pregnancy prevention, in *Current Veterinary Therapy VII* (ed R.W. Kirk), WB Saunders Company, Philadelphia, Pennsylvania, pp. 1239–1240.

Kim, H.H., Yeon, S.C., Houpt, K.A. *et al*. (2006) Effects of ovariohysterectomy on reactivity in German Shepherd dogs. *The Veterinary Journal*, **172**, 154–159.

Kirby, B.M., Knoll, J.S., Manley, P.A. *et al*. (1989) Calcinosis circumscripta associated with polydioxanone suture in two young dogs. *Veterinary Surgery*, **18**(3), 216–220.

Laflamme, D. (1997) Development and validation of a body condition score system for dogs. *Canine Practice*, **22**, 10–15.

Leighton, R.L. (1975) Ovariohysterectomy, in *Feline Medicine and Surgery II* (ed E.J. Catcott), American Veterinary Publications, Santa Barbara, California, p. 567.

LeRoux, P.H. (1983) Thyroid status, oestradiol level, work performance and body mass of ovariectomised bitches and bitches bearing autotransplants in the stomach wall. *Journal of South African Veterinary Association*, **54**, 115–117.

Lieberman, L.L. (1982) Advantages of early spaying and neutering. *Journal of the American Veterinary Medical Association*, **181**, 420–422.

Lieberman, L.L. (1987) A case for neutering pups and kittens at two months of age. *Journal of the American Veterinary Medical Association*, **191**, 518–521.

Ling, G.V., Franti, C.E., Johnson, D.L. *et al*. (1998) Urolithiasis in dogs III: Prevalence of urinary tract infection and interrelations of infection, age, sex, and mineral composition. *American Journal of Veterinary Research*, **59**, 643–549.

Looney, A.L., Bohling, M.W., Bushby, P.A. *et al*. (2008) The Association of Shelter Veterinarians veterinary medical care guidelines for spay-neuter programs. *Journal of the American Veterinary Medical Association*, **233**, 74–86.

Maarschalkerweerd, R.J., Endenburg, N., Kirpensteijn, J. *et al*. (1997) Influence of orchiectomy on canine behavior. *Veterinary Record*, **140**, 617–619.

Manning, A.M. and Rowan, A.N. (1992) Companion animal demographics and sterilization status: Results from a survey in four Massachusetts towns. *Anthrozoos*, **3**, 192–200.

May, C., Bennett, D., and Downham, D.Y. (1991) Delayed physeal closure associated with castration in cats. *Journal Small Animal Practice*, **32**, 326–328.

McCann, T.M., Simpson, K.E., Shaw, D.J. *et al*. (2007) Feline diabetes mellitus in the U.K.: The prevalence within an insured cat population and a questionnaire-based putative risk factor analysis. *Journal of Feline Medicine and Surgery*, **9**, 289–299.

McGreevy, P.D., Thomson, P.C., Pride, C. *et al*. (2005) Prevalence of obesity in dogs examined by Australian veterinary practices and the risk factors involved. *Veterinary Record*, **156**, 695–702.

McNichols, W.T., Wilkens, B.E., Blevins, W.E. *et al*. (2002) Spontaneous femoral capital physeal fractures in adult cats: 26 cases (1996–2001). *Journal of the American Veterinary Medical Association*, **221**, 1731–1736.

Milne, K.L. and Hayes, H.M. Jr. (1981) Epidemiologic features of canine hypothyroidism. *Cornell Veterinarian*, **71**, 3–14.

Morris, E. and Lipowitz, J.J. (2001) Comparison of tibial plateau angles in dogs with and without cranial cruciate ligament injuries. *Journal of the American Veterinary Medical Association*, **218**, 363–366.

Neilson, J.C., Eckstein, R.A., and Hart, B.L. (1997) Effects of castration on problem behaviors in male dog with reference to age and duration of behavior. *Journal of the American Veterinary Medical Association*, **211**, 180–182.

Norris, A.M., Laing, E.J., Valli, V.E.O. *et al*. (1992) Canine bladder and urethral tumors: A retrospective study of 115 cases (1980–1985). *Journal of Veterinary Internal Medicine*, **6**, 145–153.

O'Farrell, V. and Peachey, E. (1990) Behavioral effects of ovariohysterectomy on bitches. *Journal of Small Animal Practice*, **31**, 595–598.

Overall, K.L. (2007) Working bitches and the neutering myth: Sticking to the science. *The Veterinary Journal*, **173**, 9–11.

Overly, B., Shofer, F.S., Goldschmidt, M.H. *et al*. (2005) Association between ovariohysterectomy and feline mammary carcinoma. *Journal of Veterinary Internal Medicine*, **19**, 560–563.

Panciera, D.L. (1994) Hypothyroidism in dogs: 66 cases (1987–1992). *Journal of the American Veterinary Medical Association*, **204**, 761–767.

Petsmart Charities (2009) Motivations and barriers for pet adoption and spay/neuter. Available online at http://petsmartcharities.org/research (accessed July 7, 2010).

Podbercsek, A.L. and Serpell, J. (1996) The English cocker spaniel: Preliminary findings in aggressive behaviour. *Applied Animal Behaviour Science*, **47**, 75–89.

Pollari, F.L. and Bonnet, B.N. (1996) Evaluation of postoperative complications following elective surgeries in dogs and cats at private practices using computer records. *The Canadian Veterinary Journal*, **37**, 672–678.

Pollari, F.L., Bonnet, B.N., and Bamsey, S.C. (1996) Postoperative complications of elective surgeries in dogs and cats determined by examining electronic and paper medical records. *Journal of the American Veterinary Medical Association*, **208**, 1882–1886.

Prahl, A., Guptill, L., Glickman, N.W. *et al*. (2007) Time trends and risk factors for diabetes mellitus in cats presented to veterinary teaching hospitals. *Journal of Feline Medicine and Surgery*, **9**, 351–358.

Reichler, I.M., Hubler, M., Jochle, W. *et al*. (2003) The effect of GnRH analogs on urinary incontinence after ablation of the ovaries in dogs. *Theriogenology*, **60**, 1207–1216.

Root, M.V. and Johnston, S.D. (1995) The effect of early spay-neuter in the development of feline obesity. *Veterinary Forum*, **12**, 38–43.

Root, M.V., Johnston, S.D., Johnston, G.R. *et al*. (1996) The effect of prepubertal and postpubertal gonadectomy on penile extrusion and urethral diameter in the domestic cat. *Veterinary Radiology & Ultrasound*, **37**, 363–366.

Root, M.V., Johnston, S.D., and Olson, P.N. (1996) Effect of prepubertal and postpubertal gonadectomy on heat production measured by indirect calorimetry in male and female domestic cats. *American Journal of Veterinary Research*, **57**, 371–374.

Root, M.V., Johnston, S.D., and Olson, P.N. (1997) The effect of prepubertal and postpubertal gonadectomy on radial closure in male and female domestic cats. *Veterinary Radiology & Ultrasound*, **38**, 42–47.

Root Kustritz, M.V. (1999) Early spay-neuter in the dog and cat. *Veterinary Clinics of North America: Small Animal Practice*, **29**, 935–943.

Root Kustritz, M.V. (2007) Determining the optimal age for gonadectomy of dogs and cats. *Journal of the American Veterinary Medical Association*, **231**, 1665–1675.

Ru, G., Terracini, B., and Glickman, L.T. (1998) Host related risk factors for canine osteosarcoma. *The Veterinary Journal*, **156**, 31–39.

Salmeri, K.R., Bloomberg, M.S., Scruggs, S.L. *et al*. (1991) Gonadectomy in immature dogs: Effects on skeletal, physical, and behavioral development. *Journal of the American Veterinary Medical Association*, **198**, 1193–1203.

Salmeri, K.R., Olson, P.N., and Bloomberg, M.S. (1991) Elective gonadectomy in dogs: A review. *Journal of the American Veterinary Medical Association*, **198**, 1183–1192.

Scarlett, J.M., Donoghue, S., Saidla, J. *et al*. (1994) Overweight cats: Prevalence and risk factors. *International Journal of Obesity*, **18**(Suppl 1), 522–528.

Schneider, R. (1970) Comparison of age, sex and incidence rates in human and canine breast cancer. *Cancer*, **26**, 419–426.

VetBooks.ir

Schneider, R., Dorn, C.R., and Taylor, D.O.N. (1969) Factors influencing canine mammary cancer development and postsurgical survival. *Journal of the National Cancer Institute*, **43**, 1249–1261.

Seguin, M.A., Vaden, S.L., Altier, C. *et al.* (2003) Persistent urinary tract infections and reinfections in 100 dogs (1989–1999). *Journal of Veterinary Internal Medicine*, **17**, 622–631.

Slauterbeck, J.R., Pankratz, K., Xu, K.T. *et al.* (2004) Canine ovariohysterectomy and orchiectomy increases the prevalence of ACL injury. *Clinical Orthopedics and Related Research*, **429**, 301–305.

Smithcors, J.F. (1957) *Evolution of the Veterinary Art*, Veterinary Medicine Publishing Company, Kansas City, pp. 54–57.

Sorenmo, K.U., Goldschmidt, M., Shofer, F. *et al.* (2003) Immunochemical characterization of canine prostatic carcinoma and correlation with castration status and castration time. *Veterinary and Comparative Oncology*, **1**, 48–56.

Spain, C.V., Scarlett, J.M., and Houpt, K.A. (2004a) Long-term risks and benefits of early-age gonadectomy in dogs. *Journal of the American Veterinary Medical Association*, **224**, 380–387.

Spain, C.V., Scarlett, J.M., and Houpt, K.A. (2004b) Long-term risks and benefits of early-age gonadectomy in cats. *Journal of the American Veterinary Medical Association*, **224**, 372–379.

Stein, B.S. (1975) Castration, in *Feline Medicine and Surgery II* (ed E.J. Catcott), American Veterinary Publications, Santa Barbara, California, p. 347.

Stocklin-Gautschi, N.M., Hassig, M., Reichler, M. *et al.* (2001) The relationship of urinary incontinence to early spaying in bitches. *Journal of Reproduction and Fertility*, *Suppl.* **57**, 233–236.

Straus, S.E., Richardson, W.S., Glasziou, P. *et al.* (2005) *Evidence-based Medicine: How to Practice and Teach EBM*, Elsevier, Churchill Livingstone, Edinburgh, pp. 177–197.

Stubbs, W.P. and Bloomberg, M.S. (1995) Implications of early neutering in the dog and cat. *Seminars in Veterinary Medicine and Surgery (Small Animal)*, **10**, 8–12.

Stubbs, W. P., Bloomberg, M.S, Scruggs, S.L. *et al.* (1996) Effects of prepubertal gonadectomy on physical and behavioral development in cats. *Journal of the American Veterinary Medical Association*, **209**, 1864–1871.

Teske, E., Naan, E.C., van Dijk, E.M. *et al.* (2002) Canine prostatic carcinoma: Epidemiological evidence of an increased risk in castrated dogs. *Molecular and Cellular Endocrinology*, **197**, 251–255.

Theran, P. (1993) Early-age neutering of dogs and cats. *Journal of the American Veterinary Medical Association*, **202**, 914–917.

Thrusfield, M.V. (1985) Association between urinary incontinence and spaying in bitches. *The Veterinary Record*, **116**, 695.

Thrusfield, M.V., Holt, P.E., and Muirhead, R.H. (1998) Acquired urinary incontinence in bitches: Its incidence and relationship to neutering practices. *Journal of Small Animal Practice*, **39**, 559–566.

Van Hagen, M.A.E., Ducro, B.J.H., van den Brock, J. *et al.* (2005) Incidence, risk factors, and heritability estimates of hind limb lameness caused by hip dysplasia in a birth cohort of Boxers. *American Journal of Veterinary Research*, **66**, 307–311.

Ware, W.A. and Hopper, D.L. (1999) Cardiac tumors in dogs: 1982–1995. *Journal of Veterinary Internal Medicine*, **13**, 95–103.

White, G.R. (1935) *Animal Castration*, 2nd edn (ed A. Eger), Alexander Eger, Chicago, Illinois, pp. 1–222.

Whitehair, J.G., Vasseur, P.B., and Willits, N.H. (1993) Epidemiology of cranial cruciate ligament rupture in dogs. *Journal of the American Veterinary Medical Association*, **203**, 1016–1019.

Wilke, V.L., Conzemius, M.G., Besancon, M.F. *et al.* (2002) Comparison of tibial plateau angle between clinically normal Greyhounds and Labrador Retrievers with and without rupture of the cranial cruciate ligament. *Journal of the American Veterinary Medical Association*, **221**, 1426–1429.

Wright, J.C. and Amoss, R.T. (2004) Prevalence of house soiling and aggression in kittens during the first year after adoption from a humane society. *Journal of the American Veterinary Medical Association*, **224**, 1790–1795.

Zawistowski, S., Morris, J., Salman, M.D. *et al.* (1998) Population dynamics, overpopulation and the welfare of companion animals: New insights on old and new data. *Journal of Applied Animal Welfare Science*, **1**, 193–206.

Zink, C. (2005) Early spay-neuter considerations for the canine athlete: One veterinarian's opinion. Available online at http://www.caninesports.com/SpayNeuter.html (accessed January 11, 2012).

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41
Management of Stray and Feral Community Cats

Julie K. Levy and Christine L. Wilford

INTRODUCTION

The domestic cat has increased in popularity as a household pet in recent decades, surpassing the dog to become America's most numerous pet. Definitions of various cat populations defy universal acceptance, focusing variably on ownership status, lifestyle, and level of socialization. Cats may be defined as "free roaming" if they are not confined to a yard or house, a definition based on lack of confinement of the animal rather than ownership or socialization status. Strictly speaking, feral cats are defined as untamed and evasive, a definition based on socialization status. They are either born in the wild and lack socialization to people or are returned to the wild and become untrusting of humans. Although feral kittens can be tamed and become acceptable pets if captured at a very young age, enormous effort often is required to tame older feral cats. Stray cats may be defined as homeless cats who remain socialized and friendly toward humans. The lines between loosely owned outdoor cats, stray cats, and feral cats are often blurred. Owned outdoor cats who wander or become lost may become stray cats. Stray cats who have lived in the wild for an extended time may become feral. Thus, individual cats may be included in different categories at various stages of their lives (see Figure 41.1).

Debate about the true impact of free-roaming cats on the environment, on feline health, and as a reservoir of both feline and zoonotic diseases is ongoing, often emotional, and fueled largely by a lack of sound scientific data on which to form credible conclusions. Separating the impacts of owned cats from those of unowned ones is also difficult. Of primary concern is the welfare of the cats themselves.

Increasing social awareness about unowned free-roaming cats has resulted in a new concept: community or village cats. This terminology describes how cats (and dogs) are regarded in much of the world outside of the United States. In addition to cats who clearly have an identified owner and residence, most communities are also populated by colonies of free-roaming cats occupying a wide spectrum of socialization levels and interactions with human society. These cats are "owned" by the community and the community is their "home." This terminology denotes the reality that the cats belong to and are cared for by the community. The National Animal Control Association (NACA) recognizes these community cats as an integral component of the overall cat population and promotes the development of comprehensive management practices that encompass both owned and community cats (NACA, 2008). Controlling the reproduction of both owned and community cats is recognized as a cornerstone strategy for reducing the number of unwanted cats in animal shelters.

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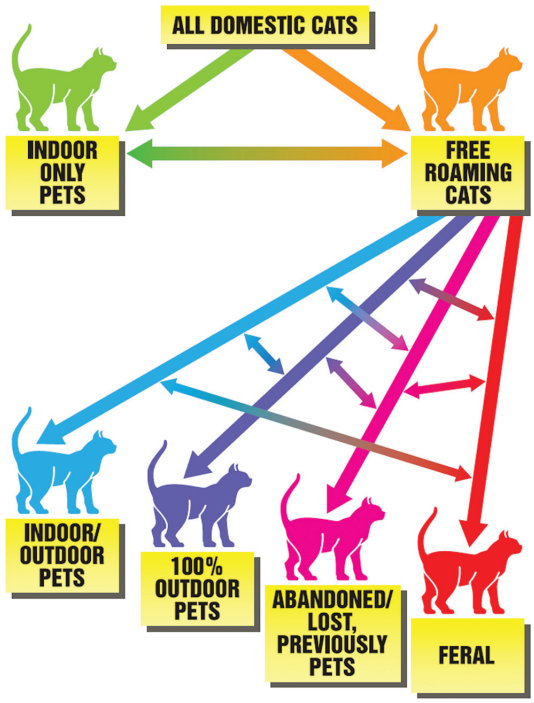


Figure 41.1. The Cat Web depicts the dynamic nature of cat lifestyles. Depending on the physical and social environment, domestic cats adapt to changing circumstances. A single cat may fit into several or all categories on the spectrum during its lifetime. Courtesy of Christine Wilford.

CHARACTERISTICS OF COMMUNITY CATS

Impact on Domestic Cat Population

The number of pet cats in the United States was estimated between 82 and 88 million in 2007 (Chu, Anderson and Rieser, 2009). Although an actual figure is unknown, feral cat numbers are suspected to be similar (Levy *et al*., 2003a). Without consideration of kitten mortality rates, any reproduction projection seriously overestimates annual kitten production. A study using methods to assess wildlife employed by biologists evaluated reproductive capacity and kitten survival of community cats under ideal conditions (provision of food, water, shelter, vaccination, deworming) in North Carolina (Nutter, Levine, and Stoskopf, 2004; Stoskopf and Nutter, 2004). Under natural breeding conditions, female cats averaged 1.4 litters per year. The median litter size was three live births per litter. The mortality rate of kittens was 75%, similar to that of other small carnivores, but higher than the 26% mortality reported in pet kittens (New *et al*., 2004). Although reproduction and survival statistics vary greatly among colonies and geographic regions, the impact of unaltered community cats on increasing the domestic cat population remains impressive. Cat owner surveys consistently reveal that roughly 80–85% of pet cats are surgically sterilized (Levy *et al*., 2003b; Chu, Anderson and Rieser, 2009) while only 2% of community cats are sterilized (Scott, Levy, and Crawford, 2002; Levy and Crawford, 2004; Wallace and Levy, 2006). Using these figures, community cats likely represent the single most important source of cat overpopulation as well as the single greatest source of kitten deaths (Table 41.1).

Interactions with Humans

A telephone survey conducted in 2007 queried people about community cats living on the street. Given only two options from which to choose, 81% chose to leave the cat on the street while 14% opted to trap the cat and have it killed. Given a second scenario hypothesizing that if they knew the cat would die in 2 years, 72% of respondents still chose to let the

Table 41.1. Projection of annual kitten births and kitten survival based on different rates of sterilization between pet and community cat populations.

US cat population	Pet cats 85 million	Community cats 85 million
Female	50%	50%
Sterilization rate	85%	2%
Litters/year	1.4	1.4
Live births/litter	3	3
Kittens born/year	27 million	175 million
Kitten survival	74%	25%
Total kittens	20 million	44 million

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cat live on the streets while 21% chose to have it euthanized immediately (Chu and Anderson, 2007). Public opinion indicates that even superficial contact with community cats produces compassionate responses toward them (Lord, 2008).

Feeding homeless cats is a common activity practiced by both pet owners and those without pets of their own. In the suburban southern community of Alachua County, Florida, one in eight households acknowledged feeding an average of 3.6 cats they did not own, or approximately 36 000 community cats (Centonze and Levy, 2002). County residents also owned an estimated 45 000 pet cats. This indicates that community cats comprise at least 46% of the local cat population, but this does not include cats who are not fed by residents. Another study in Ohio indicated that 26.2% of households fed free-roaming cats (Lord, 2008). These and other studies concluded that community cats comprised at least 36–41% of the total cat population. Feeding of community cats is a widespread activity that crosses many socioeconomic strata. Almost half of cat feeders do not own pets, implying that attempts to involve cat feeders in control strategies should extend beyond the pet-owning public typically served by veterinarians, animal control agencies, and animal welfare organizations (Levy *et al.,* 2003b). For purposes of estimating the size of a community's unowned cat population, it is reasonable to divide the community's human population by six (Levy *et al.,* 2003b). County population data are available at http://www.census.gov.

Although provision of food for unowned cats is a common activity, few cat feeders take action to have the cats sterilized. Sterilization of pet cats owned by feeders of community cats was common (90.1%) in Alachua County, indicating high compliance with veterinary and animal welfare recommendations for neutering of pets not intended for breeding (Levy *et al.,* 2003b). This is consistent with previous reports that 82–91% of pet cats were sterilized, although not always before producing a litter of kittens (Manning and Rowan, 1992; Johnson, Lewellen, and Lewellen, 1993; Johnson and Lewellen, 1995; Chu, Anderson and Rieser, 2009). In contrast, only eight out of 70 households (11%) pursued neutering of unowned free-roaming cats (Levy *et al*., 2003b).

In Alachua County, most (61%) cat colonies consist of a small group of 3–10 cats and are usually described as a female with kittens and an occasional wandering male (Centonze and Levy, 2002). This is consistent with the results of a national survey (Clifton, 1992) that reported a mean colony size of 4–12 cats and a Hawaii study (Zasloff and Hart, 1998), which reported that 65% of the colonies consisted of 1–10 cats. In most cases, cat colonies are located on private property, particularly at the feeder's residence or workplace. Although large cat colonies on public property such as parks and institutions (Levy *et al.,* 2003a) often comprise the most visible and controversial cat populations, it appears that the vast majority of community cats associated with humans live in small groups near their feeder's home.

Caregivers report a strong bond with the cats they care for even though they do not consider these cats to be their pets (Centonze and Levy, 2002). This is different from the traditional image of the human–animal bond, as many of the cats cannot be touched or held and do not live indoors with the caregiver. Nevertheless, the cooperation of caregivers is imperative if cat population control programs are to be effective.

Physical Characteristics

Data collected from community cats undergoing sterilization provide information about their physical condition but might not accurately reflect all groups of cats, such as young kittens or cats not associated with caregivers. Data compiled on over 103,000 cats from seven regions of the United States ranging from as far south as Hawaii to as far north as Seattle revealed 53% of cats presented for sterilization were female (Wallace and Levy, 2006). In Florida and California, approximately 57% of more than 20,000 cats admitted for sterilization were females (Scott, Levy, and Crawford, 2002). This contrasts with the findings of feral cats in the field. Cats caught on Marion Island ($n = 857$) near South Africa were equally distributed between males and females, and those caught on Macquarie Island ($n = 246$) near Australia included more males than females (56% vs. 44%, respectively). Cats in central Rome ($n = 301$) included fewer males than females (44% vs. 56%, respectively) (Scott, Levy, and Crawford, 2002), whereas 55% of community cats on an urban Florida university campus ($n = 155$) were males (Levy et al., 2003a). The frequent finding of equal to higher numbers of males in populations observed in the field versus the predominance of females referred for

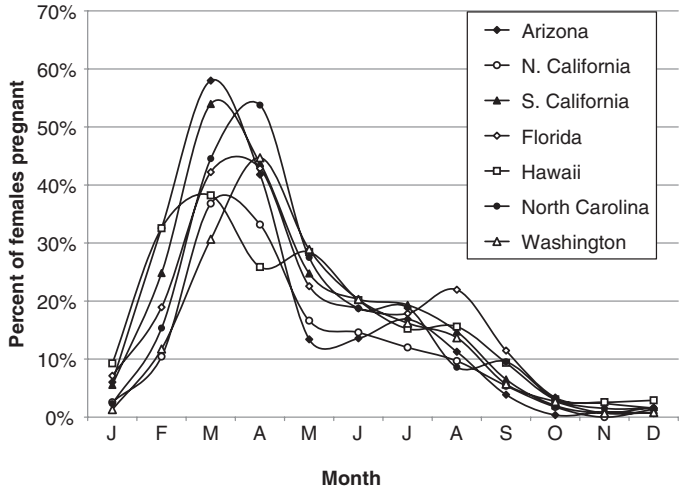


Figure 41.2. Pregnancy is highly seasonal in free-roaming cats. Resumption of estrous cycling is triggered each year by increasing day length in late winter, leading to pregnancy rates that may exceed 50% of female cats presented for sterilization in the spring. A second smaller increase in pregnancy may be observed in the late summer.

neutering suggests that females may be easier to capture or that caregivers may preferentially select females for neutering.

In Florida, the first pregnancies of the breeding season appear in January (Scott, Levy, and Crawford, 2002). This is consistent with the first occurrence of the minimum day length required to induce estrus in cats at this latitude. Regardless of the geographic region, pregnancy is highly seasonal and peaks between March and April, with a pregnancy rate of 36.8–58.0% of the cats presenting for spaying (Wallace and Levy, 2006) (see Figure 41.2). A second smaller peak in the summer in some regions suggests second pregnancies during the same breeding season for some females, or first pregnancies for late-born kittens from the previous year. The lowest pregnancy rate was observed in all regions during October through December. Depending on the geographic location, annual pregnancy rates in community cats have been reported to range from 0.98 to 2.0 and to produce four to five fetuses per pregnancy (Scott, Levy, and Crawford, 2002). In the multiregional study of more than 103 000 cats, the average prenatal fetus count was 4.1 (Wallace and Levy, 2006). In North Carolina, 334 pregnant community cats undergoing ovariohysterectomy had an average of 4.2 feti per pregnancy, whereas 50 cats in colonies produced an average of three live births per litter (Nutter, Levine, and Stoskopf, 2004). Smaller litter size compared to prenatal feti count may indicate late gestational or neonatal losses that were not observed. Pyometra was diagnosed in 0.4% of female cats presented for spaying in Florida (Scott, Levy, and Crawford, 2002).

The frequency (2%) and clinical findings of cryptorchid (retained testicle) community cats are similar to those reported for pet cats undergoing castration (Scott, Levy, and Crawford, 2002). In the multiregional study, cryptorchidism ranged from 0.8% to 1.8% (Wallace and Levy, 2006). Most cats have unilaterally retained testicles that occur with equal frequency on the left and right sides and equally in inguinal and abdominal locations. Bilaterally retained testicles were more likely to be found in the abdomen than in the inguinal region. The scrotum of bilaterally cryptorchid males may resemble that of castrated cats, so procedures should be established for confirmation of the true reproductive status, such as examination for penile barbs (see the chapter on surgical techniques for spay neuter). Although retained testicles are usually infertile, they are still capable of producing testosterone, which contributes to objectionable territorial behavior, aggression, and urine odor. They also have a higher risk of becoming cancerous or twisted. Thus, retained testicles should always be removed.

A study of adult community cats found that the cats were generally lean but not emaciated at the time of sterilization (Scott *et al*., 2002). One year later, cats were significantly fatter than they were at the time of neutering, indicating that they experienced enhanced fat accumulation following neutering,

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similar to their owned counterparts. In the multiregional study, only 0.4% of more than 103,000 community cats presented for sterilization were euthanized for humane reasons (Wallace and Levy, 2006).

Infectious Diseases

Rabies

The threat that community cats pose to both feline and human public health is a topic of much debate. Rabies is of particular concern to public health officials because it is zoonotic and still almost invariably fatal once clinical signs appear. Although the dog is the primary vector of rabies worldwide, widespread vaccination of dogs and reduction of the stray dog population in the United States since the 1940s has eliminated canine rabies variant and greatly reduced the number of dogs infected with wildlife variants here. Today, more than 90% of confirmed U.S. rabies cases occur in wildlife, primarily in raccoons, skunks, coyotes, foxes, and bats. Since 1981, rabid cats have outnumbered rabid dogs in the United States, with 294 feline cases reported in 2008 compared to 75 canine cases (Blanton *et al.,* 2009). Most feline rabies cases are associated with the epizootic of raccoon rabies in the eastern United States (Moore *et al.,* 2000). Although dogs account for three-quarters of reported animal bites to humans, rabies postexposure prophylaxis is more commonly administered as a result of stray cat bites (Hensley, 1998;Moore *et al.,* 2000; Blanton *et al.,* 2005). Most cat bites are reportedly provoked from stray cats, with adult women more likely to be bitten than children and men (Wright, 1990; Hensley, 1998; Patrick and O'Rourke, 1998). This suggests that human exposure to bites and to rabies can be limited by reducing the stray cat population via trap-neuter-return (TNR) and by avoiding direct handling of stray cats (Moore *et al.,* 2000). This is in contrast to dog bites, which are more likely to occur when pet dogs bite children. Even when rabies is not involved, cat bite wounds are often serious. They most frequently occur on the hands, and the risk of infection is highest when puncture wounds occur (Dire, 1992). Public health recommendations include immediate cleansing of the wound, medical attention, and prophylactic treatment with amoxicillin/clavulanate (Manning *et al.,* 2008).

Feline Leukemia Virus and Feline Immunodeficiency Virus

The American Association of Feline Practitioners (AAFP) recommends testing of all cats for feline leukemia virus (FeLV) and feline immunodeficiency virus (FIV), but cautions that a single positive test result should not be used as the sole criteria for euthanasia (Levy *et al.,* 2008; Levy, 2009). The AAFP further recommends that all positive screening test results undergo confirmation. Large epidemiological studies indicate that FeLV and FIV are present in approximately 4% of feral cats, which is not substantially different than the infection rate reported for pet cats allowed outdoors (Levy *et al.,* 2006). As expected, male cats are four times more likely to carry FIV than female cats, due to biting as the primary mode of transmission. FeLV, which is most commonly spread from infected queens to their kittens, occurs at approximately the same rate in males and females. Testing recommendations for pet cats are difficult to apply to community cats for several reasons. Of primary importance is the cost–benefit ratio of testing a large number of cats in order to detect the small percentage of seroreactors. Resources for treating community cats are limited, and many programs have decided to focus on mass sterilization as the primary goal. For example, Operation Catnip in Gainesville, Florida, provides sterilization and vaccination for 3,000 cats a year at a cost of $30 per cat. Adding retroviral testing would increase the cost per cat by 50%, reducing the number of cats who could be sterilized by a third. Even if retroviral-infected cats were euthanized at the time of testing, some infected cats would be left intact to produce more infected kittens or to spread infections via fighting. Assuming that 6% of cats in the program were infected with FeLV or FIV, the total cost of testing would amount to $250 for each infected cat identified. More importantly, the decrease in sterilization surgeries performed as a result of implementation of the testing program would result in an estimated 2,000 additional kitten births. A model projecting the impact of diversion of resources from sterilization to testing on the prevalence of FeLV and the total cat population is shown in Table 41.2.

Because the accuracy of positive test results decreases when prevalence is low, as is the case for FeLV and FIV, up to 50% of positive test results in healthy cats may be false-positives. Confirmatory

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Table 41.2. Projected sterilization capacity, FeLV prevalence, and population control in programs that do or do not provide retroviral testing with euthanasia of infected cats at the time of TNR.

	No TNR No testing	TNR Testing	TNR No testing
TNR program cost ($30/cat)	$0	$90 000	$90 000
Total cats (50% female)	3000	3000	3000
4% FeLV+	120	120	120
Adult cats sterilized	0	2000	3000
Adult cats left intact	3000	1000	0
FeLV+ cats euthanized	0	80	0
FeLV+ cats left intact	120	40	120
Kittens born (4/queen/year)	6000	2000	0
Kittens born to FeLV+ queens	240	80	0
Total remaining FeLV+ adult cats + exposed kittens	360	120	120
Total number of cats at the end of year	9000	5000	3000

The model assumes that the annual budget is fixed at $30/cat and that the addition of retroviral testing will reduce clinic capacity by one-third.

testing is often impractical, since recommended confirmatory tests require the use of a reference laboratory, and results may not be available for several days. The availability of an FIV vaccine has added an additional complication to testing due to false-positive results in the currently available tests that react to FIV antibodies induced by the vaccine. For these reasons, and because sterilization reduces the behaviors (fighting, biting, and reproduction) most associated with viral transmission, most large sterilization programs for community cats do not routinely test for FeLV and FIV (Wallace and Levy, 2006).

Parasitism and Other Infections

Parasitism is the most common infectious problem of community cats. In Florida during the summer, 92% of cats presented for sterilization were infested with fleas and 37% had ear mites (Akucewich *et al.,* 2002).

A study of 80 feral cats and 70 pet cats in California revealed that 54% of the feral cats carried intestinal ascarids, compared with only 4% of the pet cats (Levy *et al.,* 1999). Tapeworms and coccidia were found in 26% and 13% of feral cats, compared with 4% and 0% of pet cats, respectively. The same study identified a higher rate of seropositivity to *Toxoplasma gondii* in feral cats (20%) compared with pet cats (3%), which may represent exposure via hunting in feral cats. Interestingly, feral cats were significantly less likely to have antibodies against coronavirus (4%) than were pet cats (59%). Coronavirus is primarily transmitted via a fecal–oral route. The behavior of feral cats of burying their feces may reduce the risk of transmission compared to pet cats sharing a litter box in a multicat household. FeLV (0–1%) and FIV (3–5%) were uncommon in both feral and pet cats.

Bartonella henselae (34%) was the most common infection identified in 553 community cats in Florida (Luria *et al.,* 2004), similar to 22% seropositivity to *Bartonella* spp. found in 146 active feline blood donors nationwide (Hackett *et al.,* 2006). In the Florida study, two organisms formerly grouped under the classification of *Haemobartonella felis*, *Mycoplasma haemominutum*, and *M. haemofelis* were present in 12% and 8% of cats, respectively. A North Carolina study of 100 feral cats and 76 pet cats revealed significantly higher rates of seropositivity against *Bartonella henselae* in feral cats (93%) compared to pet cats (75%) as well as seropositivity against *Toxoplasma gondii* (63% in feral cats; 34% in pet cats) likely due to greater exposure to fleas and hunting behavior. No significant difference was found between feral cats and pet cats for the

incidence of *Cryptosporidium* spp. (7% and 6%), *Giardia* spp. (6% and 5%), and *Toxocara cati* ova (21% and 18%) in feces (Nutter *et al*., 2004).

Control of Community Cats

The control of community cats has emerged as one of the most controversial issues in animal control and welfare. Historically, community cats have been largely ignored by both governmental and humane agencies. Often, specific cats who have been declared a nuisance may be removed, but few agencies have comprehensive programs designed to decrease the number of cats in their communities.

What constitutes an acceptable quality of life for the domestic cat and whether different standards should exist for cats in homes, in shelters, or in community cat colonies is a topic of much debate among animal welfare professionals and veterinarians. Minimum standards of care for animal shelters have only recently been developed (ASV, 2010), whereas standards for pet cats tend to focus primarily on the provision of food and shelter. Standards for free-living homeless cats are nonexistent. Some agencies believe that a free-roaming lifestyle is too fraught with risk and discomfort to be acceptable. Others believe that the lives of community cats should be judged no differently than those of other species existing in a "wild" state.

Historically, large numbers of healthy animals, including community cats, have been euthanized by animal protection agencies for population control as well as to prevent the possibility of *potential* suffering at some time in the future. As public awareness of this practice has grown, more people question whether euthanasia of healthy animals is compatible with the values of a humane society. Some who seek alternatives to mass euthanasia have established sanctuaries for the long-term confinement of community cats. A disturbing trend is the increasing number of hoarding investigations of such facilities when the number of cats accumulated outstripped the resources of those responsible for the humane care of the cats. Recent cases involve the seizure of 800 cats from the FLOCK sanctuary in Nevada in 2007, 750 cats from the Tiger Ranch Sanctuary in Pennsylvania in 2008, 600 cats from the 10th Life Sanctuary in 2009, and 700 cats from the Haven Acres Sanctuary in Florida in 2011. These cases illustrate the challenge of identifying sustainable nonlethal management options for cats following their removal from the community in which they live.

Feral cats have been completely removed from several small uninhabited islands as a result of decades of intensive control measures including poisoning, hunting, trapping, and introduction of infectious feline diseases (Nogales *et al*., 2004). Despite the success of eradication campaigns on geographically isolated islands, logistic barriers and opposition from resident citizens would likely make the application of such lethal strategies in populated mainland areas unfeasible. Cat control programs in populated areas must incorporate safety considerations for nontarget animals and humans, be affordable for participating municipal agencies or charitable organizations, include plans to curtail continuous cat immigration and reproduction, and be aesthetically acceptable to the public. Clearly, any realistic plan to control community cats must recognize the magnitude of the cat population, the need to engage in continuous control efforts, and the significance of the public's affection for the cats. The most successful examples of enduring community-wide animal control have incorporated high-profile, nonlethal community cat control programs into integrated plans to reduce animal overpopulation.

FERAL CATS IN ANIMAL SHELTERS

Currently, many animal shelters are struggling with rising cat intake rates and low live-release rates compared to dogs. One contributing factor to these trends is impoundment of feral cats. Once feral cats are admitted to the shelter, options for live outcomes become limited, particularly if a community-based program for feral cat management does not exist. Since feral cats are uncommonly rehabilitated into adoptable family pets, they are often euthanized once admitted to animal shelters.

As already noted, 12% of Alachua County households acknowledged feeding approximately 36,000 community cats they did not own (Levy *et al.,* 2003b). Residents also delivered 2,000–3,500 feral cats to a TNR program each year (Wallace and Levy, 2006). In contrast, residents brought 400–700 feral cats to the animal control shelter annually. Taken together, these findings suggest that the prevailing "community standard" is to allow feral cats to remain in the neighborhoods where they have made their

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homes, regardless of whether they are enrolled in managed colonies or not.

If cats who appear to be feral must be impounded, it is essential to house them in a manner that minimizes fear and distress and protects both the cats and staff from injury. Terrorized pet cats may exhibit behavior that is indistinguishable from truly feral cats when placed in the stressful environment of the shelter. Frightened cats should be given an opportunity to calm down prior to attempting to assess their true personality, but some cats may never adjust to the shelter. They should be kenneled in an area separate from other cats, elevated from the floor, free from exposure to dogs and their noise, and in a quiet area with minimal human traffic. Although all sheltered cats should be provided with a hiding space, it is essential for feral cats. Feral cats have the same floor space requirements as friendly cats (minimum of 11 square feet) in short-term housing, although they may leave their hiding spaces only at night when they are not observed (ASV, 2010). Cages with two compartments connected by a closable porthole allow for secure confinement during cleaning and feeding. A special "feral cat den" can be purchased with access holes that may be latched closed after the cat has hidden in the box (http://www.livetrap.com). These serve as multipurpose units providing a hiding space, perching surface, confinement for safe cage cleaning, and transport carrier. They also have a guillotine door that can be used to transfer cats between a trap and carrier with minimal risk of escape (Figure 41.3).

Attempts to catch a feral cat by hand or with a blanket are extremely dangerous for personnel and very stressful for cats. Catchpoles or nooses are very dangerous for cats, only serve to cause more panic, and should never be used. Cat tongs should be reserved for extracting cats from crevices when other techniques have failed. The frequent use of tongs indicates a breakdown in humane cat handling. When feral cats escape from their cages, the safest method of capture is with a net on a pole. An ideal capture net is the Freeman Cage Net (Animal Care Equipment & Services, Inc.; animalcare.com/nets) that can be opened and quickly closed by the use of a sliding handle. By rolling the net onto the pole, cats are easily and safely restrained for transportation or for intramuscular sedation (Figure 41.4a,b).



Figure 41.3. If a feral cat must be housed for several days in a shelter or in a clinic, a commercially available "feral cat handler" can be placed in the cage. Feral cats invariably hide in the den and exit to eat and use a litter box only when people are not present. When it is time to transport the cat, the sliding side porthole cover can be closed without disturbing the cat. To transfer the cat to a different container, a guillotine panel on the front of the box can be opened after the den is aligned with the opening of a trap or carrier. Hiding areas are essential for confined feral cats to reduce stress. Photo by Julie Levy.

TRAP-NEUTER-RETURN

A growing grassroots movement has promoted the control of community cat populations through sterilization. TNR seeks to sterilize large numbers of cats and return them to their colonies. Some programs are quite elaborate, including extensive veterinary care, colony registration, monitoring, and adoption of tame cats, while others focus solely on sterilization and release (return). Whereas many programs are run by small volunteer groups dependent on donations for operating costs, a growing number are operated with public funds by municipal animal control agencies or by large private shelters on the premise that sterilization is ultimately more efficient and cost-effective than extermination. The Animal Services Department of Orange County, Florida, reported decreased complaints about cats, decreased cat admissions to the shelter, and decreased operating costs following the development of a free

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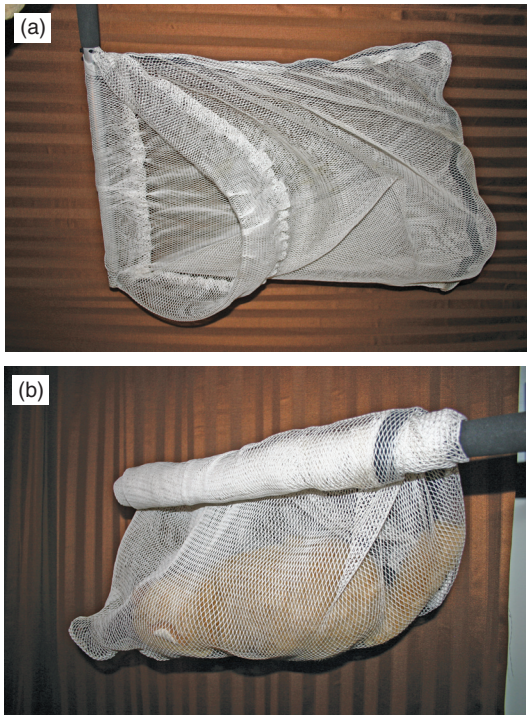


Figure 41.4. The Freeman Cage Net allows safe capture of escaped cats as well as restraint for injection. The opening of the net is adjusted by a sliding handle on the pole to open (a) and then close once the cat is inside. Then the net can be rolled up around the handle to immobilize the cat (b) for injection. Photos by Christine Wilford.

sterilization program for feral cats funded by the county (Hughes, Slater, and Haller, 2002). Other agencies reporting fewer cat-related complaints since the introduction of TNR programs in their regions are Indianapolis Animal Care and Control; the Animal Rescue Fund of the Hamptons, Long Island; Burlington County Health Department, New Jersey; and the mayor of Tabernacle township, New Jersey. The National Animal Control Association guidelines include the role of animal control agencies in "community cat management," citing that TNR programs may be effective and should be assessed in individual communities. Alley Cat Allies, a national organization advocating TNR for the control of community cats, grew from 6,000 individuals in its database in 2003 to 240,000 supporters worldwide in 2009. Also in its database are more than 480 groups dedicated to effectively implementing TNR. Accompanying growing awareness of community cats is increased controversy about their impacts, welfare, and place in society.

The concept of TNR as a humane method for cat population control is endorsed by the AAFP, the American Animal Hospital Association, the Association of Shelter Veterinarians, the American Society for the Prevention of Cruelty to Animals, the Humane Society of the United States, the National Animal Control Association, and many other humane organizations. Increasingly, veterinarians are asked to participate in nonlethal control of community cats, frequently by providing free and low-cost veterinary services. More than 1,000 members of the California Veterinary Medical Association sterilized approximately 168,000 cats between July 1999 and May 2002, in a $12 million project funded by Maddie's Fund.

A TNR program at the University of Central Florida was highly successful in reducing its free-roaming cat population during an 11-year period (Levy *et al.*, 2003a). Before the initiation of the program, cats were considered by campus authorities to constitute a nuisance. Periodic trap and removal efforts were made when excessive cat numbers prompted complaints about on-site noise and odor, but employees and students openly violated policies against feeding the cats and interfered with trapping efforts by university officials during removal campaigns. The TNR program instituted in 1991 incorporated neutering, euthanasia of sick animals, and adoption of friendly cats and feral cats who eventually became tame enough to become pets. With the exception of one male cat, all original study cats were neutered between 1991 and 1995, and no kittens were known to be born on campus after 1995. As a result of deaths, disappearances, and adoptions, the known maximum cat population of 68 cats in 1996 gradually decreased to 23 cats at the end of the recording period and to fewer than 10 cats in 2010. Adoptions accounted for 47% of the decrease in the cat population, even among feral cats. Reportedly, feral cats become less aggressive toward each other and friendlier toward their caregivers following neutering; this may have facilitated adoption of previously feral cats. Cats were often transferred to private homes after several years of feral status.

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Despite widespread concern about the welfare of community cats, most of the cats in this study survived for many years. Most cats (19/23, 83%) still remaining on site at the end of the observation period had been present for more than 6 years. Most cats (24/39, 61%) who disappeared, died, or were euthanized for debilitating conditions had been present for at least 3 years. In general, the cats were in adequate physical condition, and only 4% were euthanized for humane reasons. Newly arriving sexually intact, socialized cats periodically joined the colonies; their presence could have undermined the control program had they not been promptly captured and neutered. Migration of cats between colonies was common, and resident cats did not necessarily prevent the immigration of new members.

These results indicate that long-term reduction of community cat numbers is feasible by TNR. However, the extended survival of cats following sterilization indicates that natural attrition would be expected to result in a slow rate of population decline. Adoption of socialized cats accelerates population reduction. These results also refute an oft-cited claim that an established colony of cats defends its territory and prevents the immigration of new arrivals and are confirmed by more recent research (Gunther, Finkler, and Terkel, 2011). Immigration or abandonment of new cats in sterilized colonies may be a frequent event, and neutered cats do not appear to have sufficient territorial activity to prevent new arrivals from permanently joining colonies. These new arrivals could substantially limit the success of TNR if an ongoing surveillance and maintenance program is not effective.

While numerous examples of TNR success exist when the effort is focused on a relatively small or isolated area, it has proven harder to manage larger-scale cat populations. The most likely explanation is that TNR programs have insufficient capacity to sterilize a critical proportion of the cat population when the effort is diluted over large areas. The proportion of cats who must be sterilized to reverse population growth is not known. Mathematical models frequently predict that at least 70% of females must be sterilized (Foley *et al.,* 2005), but a TNR program in Rome witnessed a fall in cat numbers when only 66% of cats were sterilized (Natoli *et al.,* 2006). A recent project in Florida used TNR, adoption, and complaint mediation in an attempt to reduce cat impoundments within a single zip code. A total of 2,226 cats were enrolled in the study. This number was estimated to be approximately 55% of the community cats residing in the zip code. At the end of the 2-year study, shelter intake of cats from the study zip code was down 68% compared to a decrease of only 13% in the rest of the county zip codes.

In 2008, a major metropolitan area in Florida adopted a pilot program in which the vast majority of community cats admitted to the animal control facility would be diverted to TNR instead of impoundment. The previous year, the shelter impounded more than 13,000 cats and adopted out only 521. The overall live-release rate for cats was 7%. In the pilot program known as Feral Freedom, cats received an intake number upon arrival at the shelter, but in order to protect them against exposure to shelter-acquired infections, they were not admitted into the general population. The cats were picked up twice daily by a nonprofit spay/neuter clinic for surgery, vaccines, and ear tipping. The clinic staff returned the cats to their original trapping sites the day following surgery. Informational brochures were left with neighbors near the release site. This program is unique in that TNR has replaced impoundment as the most common municipal response to concerns regarding community cats. The reasoning is that if cats are thriving in their environment, there is no humane mandate to remove them, even if a caregiver is not identified. In the first 6 months of the program, the live-release rate for cats increased to 72%. (Figure 41.5)

Failures of TNR to control cat colonies also exist. A 1-year study of TNR programs in two southern Florida parks revealed that the presence of highly visible, well-fed cat colonies encouraged illegal abandonment of additional cats (Castillo, 2001). While the original population of 81 cats declined 20% during one year, the arrival of new cats prevented the reduction of the colonies and 88 cats were present at the end of the study. Minimal territorial activity or predation by the cats was observed, and aggressive encounters between cats were usually limited to enforcement of feeding order.

Veterinary Procedures for Community Cats

There are many approaches to delivering veterinary care to community cats. This discussion focuses on techniques for large-scale sterilization, with the goal of reducing the community cat population (Figure 41.6).

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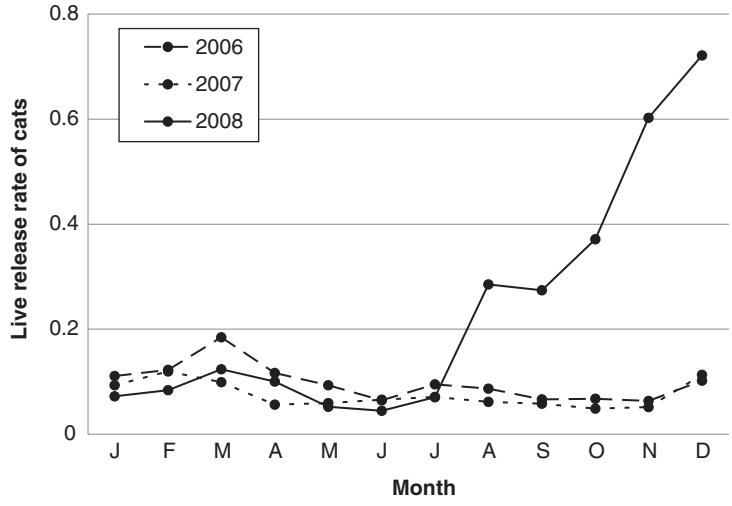


Figure 41.5. A large metropolitan municipality in Florida initiated a pilot program to perform trap-neuter-return on stray and feral cats instead of impoundment. As a result, the live-release rate increased from an average of 7% the previous 2 years to 72% in 6 months.



Figure 41.6. Using a system of a fixed treatment station through which feral cats rotate to receive anesthesia, ear tipping, preparation, surgery, vaccination, and parasite treatment, this volunteer-based clinic specializing in feral cat surgery is capable of sterilizing more than 250 cats in a single day. Photo by Julie Levy.

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Safety First

One of the predominant concerns about working with feral cats is safety. Feral cats have an uncanny ability to escape during handling and can inflict serious injury during recapture attempts. A loose cat can thoroughly damage a clinic in his or her frantic efforts to escape. Anyone who works with stray animals, including feral cats, should receive prophylactic rabies immunizations. Gloves should be worn at all times to reduce exposure to body secretions from cats. The most common health risks for individuals working with feral cats are bites and scratches. Even semi-tame and pet cats may bite defensively in fear during handling, such as when their owners attempt to place them in a carrier for transportation. For these reasons, safe cat handling techniques must be developed and enforced. Not only does this guarantee the safety of personnel, but also prevents the unfortunate situation in which public health officials require euthanasia for rabies testing of cats who have bitten people. The safest method for handling community cats is to require that all cats be contained in wire humane traps. The traps are escape proof, and anesthetic is easily injected through the wire mesh. A trap designed specifically for trapping and safely holding cats while permitting safe access for cleaning and changing dishes has been developed and employs a trap-divider "comb" to confine the cat to one side of the trap (Tomahawk Live Traps, http://www.livetrap.com). When cats are presented in wire traps, the comb can be used to gently restrain the cat at one end of the trap for accurate anesthetic injection (Figure 41.7).

The traps should not be opened until the cats are recumbent. At the completion of surgery, the cats are returned to their traps before awakening. With this system, cats are never handled while awake. Handling systems that involve transferring cats from one enclosure to another or opening an enclosure to restrain a cat only invite escapes and injuries. If feral cats do escape or if they must be housed for a few days, they should be managed as described above.



Figure 41.7. Use of a commercially available metal trap divider comb to isolate a cat to one end of the humane wire box trap facilitates safe hands-free and low-stress restraint of feral cats during injection of anesthetic drugs. Photo by Julie Levy.

Admissions

Caregivers of community cats should be informed in advance where to obtain traps and how to safely capture and transport a cat. It is not possible to reliably assess temperament during a high-quality, high-volume TNR clinic. Release forms should be used to assure that the cats are believed to be unowned and that the caregivers are aware of the risks of anesthesia and surgery in cats of unknown health status. An agreement should be reached at the time of admission about how to proceed if unanticipated health problems are detected once the cat is anesthetized. Veterinarians, caregivers, and cats benefit greatly from preestablished protocols for unexpected findings, such as pregnancy, cryptorchidism (retained testicles), pyometra (infection of the uterus), illnesses, and injuries. Caregivers should be advised not to leave food in the traps, if possible. However, veterinarians must recognize that food is required to bait the traps; thus, some cats may have eaten within a few hours of surgery. A practical system for identifying the cats is to place two identical numbered stickers on the trap at admission. One of the stickers is placed on the cat when he or she is removed from the trap. This allows cats to be matched back to their original traps following surgery.

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Anesthesia

Many standard anesthetic protocols used in private practice are inappropriate for use in feral cats. The anesthetic protocol must be uncomplicated to prepare as well as easy to administer to conscious feral cats in traps. Induction must be rapid while duration and plane of analgesia and anesthesia are predictable in every cat. Complication rate and cost must be low, while safety to cats and people must be high.

Injectable anesthetics are preferred, because they can be administered to cats still in their traps, and there are no waste anesthetic gases. A drug cocktail of Telazol (1 vial of dry powder) reconstituted with ketamine (100 mg/mL, 5.5 mL) and large animal xylazine (100 mg/mL, 1 mL) (TKX) instead of water is just one of many that have been used in feral cats. TKX has several advantages for large-scale cat anesthesia. A small injection volume (0.25 mL for average adult cats, 0.15 mL for kittens) can be administered "intracat" through the wire of the trap, eliminating the need to handle conscious cats (Figure 41.7). Time to recumbency is generally 3–5 minutes, and vomiting is uncommon. Alternatively, a dosing chart by weight can be developed to tailor doses to estimated weights or for cat weights determined by subtracting predetermined trap weight from total weight. Conscious feral cats should not be removed from traps for weighing or anesthesia administration. The general anesthesia provided by the TKX cocktail is adequate for abdominal surgery. The xylazine component of the cocktail is reversed with yohimbine (2 mg/mL) administered intravenously at the same volume as the total TKX dose. Cats generally return to sternal position within 2 hours, but frequently are not fully recovered from anesthesia until the following morning. The cost for a dose of 0.25 mL in 2009 was $2.50 per cat. The major disadvantages of TKX include hypothermia, prolonged recovery time, and poor postoperative analgesia. If clinic flow is rapid and surgical time is short, faster recovery times may be achieved by using a lower dose of TKX. Alternatively, cats may be immobilized with lower doses of TKX and then supplemented with gas anesthesia by mask or endotracheal tube for a surgical plane. Buprenorphine is an ideal analgesic to add to TKX. Cost per cat is low, and safety is high. To preempt surgical pain, cats can receive an intramuscular injection either in combination with the TKX or as a separate mucosal application after the cat is recumbent. If given after sedation, cats can be weighed and dosed more accurately (0.01–0.03 mg/kg). At higher doses, analgesia lasts 10–12 hours, does not contribute appreciably to sedation, can be given to cats with unknown or questionable health, and does not have the potential to cause gastrointestinal or renal injury.

TKX has been used by the authors on more than 80,000 community cats with a remarkable safety record. One published study of more than 7,500 community cats anesthetized with TKX cited a mortality of 0.23% (17/7502 cats) due to anesthesia (Williams *et al.,* 2002). Considering that community cats can be unthrifty, parasitized animals of unknown background, highly stressed, and unsuited for preanesthetic examination, the observed rate of two to three perioperative deaths per 1,000 cats compares favorably with reports of anesthetic death rates of pet animals in private practices. A large-scale study of more than 79,000 pet cats reported 0.24% risk of anesthetic or sedation-related death, citing intubation, intravenous fluid therapy, increased age, poor health status, and extremes of weight as factors that increased odds. Pulse monitoring and pulse oximetry were associated with reduced odds of problem occurring (Brodbelt *et al.,* 2007). Prospective studies revealed 0.14% (2/1,459 pet cats) anesthetic mortality in private practice and 0.43% (3/683 pet cats) at a veterinary teaching hospital (Williams *et al.,* 2002). Even though complications are uncommon, procedures should be in place for the management of surgical and medical emergencies.

A cocktail of dexmedetomidine, ketamine, and buprenorphine (MKB) has also been used in community cats (Cistola *et al.,* 2002). MKB offers the advantages of improved blood pressure and oxygenation compared to TKX, rapid recovery following reversal with atipamezole (brand name Antisedan), and good analgesia, but some cats experience extreme excitement and hyperthermia following recovery from this combination. A similar combination of Telazol, butorphanol, and dexmedetomidine (TTD) has also been reported (Ko and Berman, 2010).

The use of NSAIDs (nonsteroidal anti-inflammatory drugs) for analgesia in TNR programs is controversial due to the risk of toxicity developing in cats who may be predisposed to dehydration during the trapping process or to undetected hypotension during injectable anesthesia.

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Physical Examination

A physical examination should be performed after sedation is complete but prior to surgical preparation. A preoperative examination allows for identifying abnormalities that may benefit from additional procedures, such as treating a deep set or ingrown polydactyl nail, amputating a traumatized tail, or lancing an abscess. The examination may also reveal that a cat is already sterilized or has problems that could preclude surgery and warrant euthanasia instead. Euthanasia prior to surgery saves time and resources and promotes efficient clinic flow. Community cats presented for sterilization typically have adequate general body condition (Scott *et al*., 2002), and the euthanasia rate (0.4%) for humane reasons in large TNR programs is quite low (Wallace and Levy, 2006).

Surgical Preparation and Surgery

Upon recumbency, cats are removed from their traps and identified. Long-acting antibiotics may be administered preoperatively to cats with obvious or suspected infections. If infections are discovered during surgery, for example, pyometra, or if a break in aseptic technique occurs, then perioperative administration is recommended. Although the routine use of perioperative antibiotics is believed to be contraindicated in routine clean surgeries (Looney *et al*., 2008), special circumstances exist in community cat TNR clinics that lead some programs to routinely administer perioperative antibiotics. Until more evidence-based medicine is available to clarify the most appropriate choices, program directors must rely on extrapolations from related literature. In a study of postoperative wound infections in a teaching hospital, 2.5% of 1,100 wounds from clean surgeries became infected; antibiotics reduced wound infections in clean surgeries performed by veterinary students but not by veterinarians (Vasseur *et al*., 1988). In a systematic review of meta-analysis studies of postoperative wound infections in more than 20,000 human patients undergoing clean surgery, routine perioperative antibiotics were associated with significantly reduced risk of infection (Bowater, Stirling, and Lilford, 2009). Cats in TNR programs have several unique risk factors that may affect the incidence and consequence of wound infections. Compared to socialized pets, community cats may experience increased risk of infections associated with hypothermia induced by prolonged injectable anesthesia and due to being returned to the environment shortly after surgery. Wound infection consequences may be more severe due to the inability to monitor wound condition following release and or to treat wound infections that occur, even if uncommon. Unfortunately, there are no published reports of postoperative wound infection rates in cats undergoing TNR, reports comparing infection rates in cats who do or do not receive perioperative antibiotics, or reports documenting adverse effects of perioperative antibiotic use such as induction of antibiotic resistance.

The eyes should be lubricated with plain ophthalmic ointment. Cats have been reported to suffer anaphylaxis associated with ophthalmic ointment containing antibiotic as an uncommon idiosyncratic reaction. Since anaphylaxis would be difficult to recognize and treat in anesthetized cats, it is recommended to avoid antibiotic-containing eye lubricants. Tying females to "spay boards" facilitates preparation and transportation of cats between stations (Figure 41.8). Routine preparation for aseptic surgery is performed. Ideally, the pace of the clinic should be controlled so that there is always a cat ready to be spayed, and veterinarians never have to wait for the next surgery.

Cats may be spayed by either a midline or flank approach (Krzaczynski, 1974; Dorn, 1975). The midline approach is most commonly used in the United States and will not be described here. The flank approach offers slightly increased surgical efficiency and reduced risk of evisceration should an incisional complication occur following release. It is ideal for lactating cats, but cats with advanced pregnancy are more easily spayed via a midline approach. The flank incision can also be monitored easily by the caregiver following release to the colony. Flank incisions have been described from both the left and right approaches. An area approximately 10 cm square is aseptically prepared, using the greater trochanter as the landmark for the dorsocaudal corner of the square. Following draping of the area, the surgical site is identified lying approximately midway between the dorsum and the ventrum and approximately 3–4 cm cranial to the greater trochanter. A 1–2 cm skin incision is made either vertically or horizontally. The body wall is tented with forceps

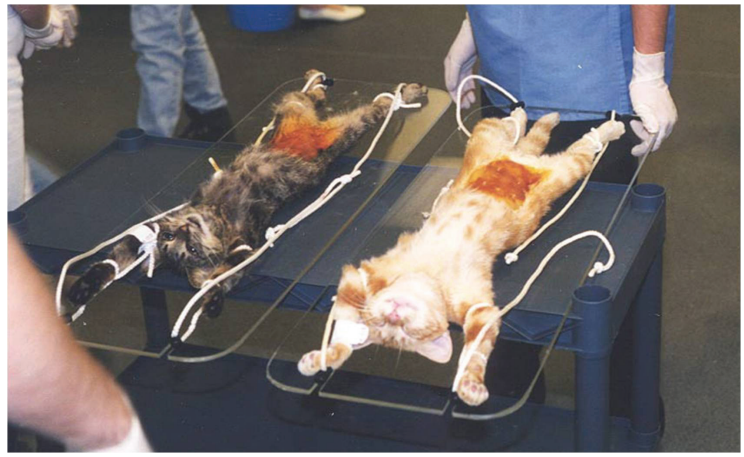


Figure 41.8. Homemade plastic "spay boards" facilitate surgical preparation and transportation between treatment stations without contamination of the surgical site. Photo by Julie Levy.

and entered using blunt dissection with scissors or forceps. Sharp dissection of the muscle wall should be minimized to avoid bleeding. The spleen may underlie the incision on the left side, and care should be taken to avoid laceration of the organ when the abdomen is entered from the left. The uterine horn lies just beneath the body wall and is retrieved with a spay hook. The ureter is more easily accessed from this approach and may be mistaken for the uterine horn, so care must be taken to identify the ovary before the structure is clamped. From this point forward, the spay is performed similarly to the midline approach. If the incision is properly placed, it is possible to remove both ovaries and as much of the body of the uterus as with the midline procedure. The body wall is closed with absorbable suture, as is the subcutaneous tissue. In community cats, the skin is best closed with a buried suture pattern using absorbable suture. The major disadvantage of the flank spay is the inability to explore the abdomen in the event of intraoperative complications or to confirm previous ovariohysterectomy.

Because of the sheer number of community cats and the high euthanasia rate of cats at shelters, it is difficult to rationalize not sterilizing pregnant cats. Releasing a pregnant cat or confining it in a foster home to have kittens may add unnecessarily to cat overpopulation and suffering. Once trapped, many cats are extremely difficult to trap a second time. For this reason, lactating cats should also be sterilized when trapped and returned to their colonies as quickly as possible. Because cats will be released to their colony soon after surgery, incisions should be as small as possible and skin sutures should not be used.

Ear Tipping

Community cats may interact with a variety of caregivers, veterinarians, and animal control personnel during their lives, so a universal method of identifying sterilized animals from a distance is vital. Ear tipping is the most reliable method and is recognized internationally (Cuffe *et al.,* 1983). With this procedure, a straight hemostat is clamped across the distal centimeter of the pinna, and the tip is removed by cutting straight across with scissors (Figure 41.9a). Using scissors results in less hemorrhage than the use of a surgical blade. If the ear is tipped before surgery, the hemostat may be left in place until the cat is returned to its trap. Tipping is preferred over notching, because notches may be confused with pinna damage by fight wounds, frostbite, and ear mite infestation, whereas the tipped ear creates an unmistakable characteristic silhouette (Figure 41.9b). Cats must be ear tipped even if tattoos or microchips are used to identify individual cats. Neither chips nor tattoos can be read without handling the cat, whereas the ear tip allows identification from afar. If tattoos are used, equipment should be sterilized between each cat to avoid the inadvertent transmission of blood-borne infectious diseases. This can be problematic in large-scale operations that are processing many cats at a time. Several types of identification tags and studs designed for use in the ears of mice

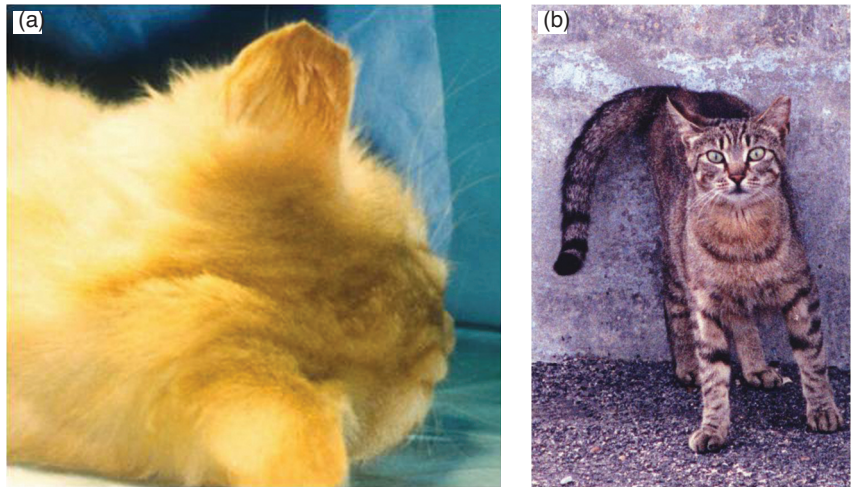


Figure 41.9. The internationally recognized identification mark of a sterilized feral cat is "ear tipping." The distal centimeter of an ear tip is removed while the cat is under anesthesia for sterilization (a). Cutting the tip straight across leaves a characteristic silhouette recognizable from a distance (b). Photos by Julie Levy (a) and Phil Hill (b).

and rabbits have been used in cats, but these are associated with a high rate of loss and infection.

Some caregivers and veterinarians have objected to ear tipping as an unnecessary and disfiguring practice. Ear tipping is performed painlessly under anesthesia and is much less invasive than the accompanying sterilization procedure. Identifying sterilized cats in the field by an ear tip protects the cats by allowing them to avoid the trauma and risk of unnecessary transport and surgery. In many jurisdictions, animal shelters routinely release ear-tipped cats back to their colonies, making ear tipping a life-saving procedure as well. Ear tipping is the standard of practice accepted by animal welfare organizations and community cat advocacy groups for the best interest of the cats. The tipped ear signifies only that the cat is sterile, not necessarily feral, and does not appear to reduce the adoptability of cats in the future.

Vaccination

The AAFP recommends providing core vaccines (rabies, panleukopenia, herpesvirus, and calicivirus) to all cats, including ferals in TNR programs (Richards *et al.,* 2006). For community cats, decisions about which vaccines to use and which cats to vaccinate are often made based on perceived cost–benefit ratios and program resources but AAFP guidelines should be followed whenever possible. Rabies occurs in wildlife throughout much of the world, and community cats may form an interface between wildlife reservoirs and humans. For this reason, rabies vaccines should be administered to all cats undergoing TNR, regardless of whether local regulations require rabies vaccination of cats. Not only does this provide increased safety for the cats and their caregivers, but rabies vaccination also makes TNR programs more acceptable to public health officials. A rabies product with 3–4 years duration of immunity should be used, even for the cat's first vaccine. Many cats are difficult to retrap for booster vaccines, but a single rabies vaccine has been shown to protect cats against virulent challenge for more than 3 or 4 years (Soulebot *et al.,* 1981; Intervet, 2006). Some TNR programs only admit cats 3 months of age and older so that the rabies vaccine is recognized by local authorities as valid. A canary pox-vectored rabies vaccine that is labeled for 1-year duration of immunity was approved for kittens as young as 8 weeks of age but that approval was changed in 2011 to 3 months of age. Continued use of this vaccine in kittens under 3 months of age would be considered extra label use and may not be recognized by local authorities, although it is likely to still be safe and protective against the disease. A recent study showed that a high proportion of community cats lack protective

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antibodies against panleukopenia virus, herpesvirus, and calicivirus (Fischer *et al.,* 2007). Cats should be vaccinated against these infections at the time of surgery if possible. Community cats are frequently unavailable for booster vaccines, but still benefit from a single immunization. Anesthesia and surgery were shown not to interfere with serologic responses of community cats to vaccination when tested at the time of surgery and again approximately 10 weeks later. Vaccinating once against feline panleukopenia virus, feline herpes virus, feline calicivirus, and rabies resulted in protective antibody titers in a majority of cats (Fischer *et al.,* 2007). In contrast, the efficacy of a single FeLV or FIV vaccine is believed to be poor, and most TNR programs do not include these vaccines in their programs.

Parasite Control

Community cats are frequently returned to their original multicat environment, and the advantage of a single treatment for parasites at the time of sterilization is uncertain. Parasiticides can be mixed in food for ongoing treatment of parasitism, but this is usually not practical on a large scale. Kittens are most severely affected by parasites and are likely to benefit more from treatment than are adult cats. Depopulating parasites in kittens, even transiently, may reduce the physical stress they experience following weaning. Adult cats are more naturally resistant to parasitism and are less likely to develop severe complications such as anemia, diarrhea, and weight loss. Because feral cats should only be handled after they are anesthetized, treatment of parasites at the time of sterilization is limited to topical and injectable products. Product selection should be based on safety, spectrum, cost, and ease of treatment. Cats with heavy flea infestation can be sprayed with a cat-safe flea spray prior to surgical preparation for immediate control. Another option is rectal administration of nitenpyram (Capstar®). There are numerous topical products available for flea control with longer duration. Many products also have activity against intestinal worms and ear mites. Selamectin, moxidectin, and ivermectin should be avoided in young debilitated kittens, as neurological side effects and mortality have been reported in this group. Single-dose ear mite treatments, such as otic milbemycin and extended-action ivermectin, are ideal for community cats who cannot be retreated following recovery from anesthesia. An overview of products is provided in Table 41.3.

Fluid Administration

Subcutaneous fluid administration can benefit some patients. Warm fluids should be used for patients at risk for subnormal body temperature, such as cats undergoing prolonged procedures, thin cats and late gestational spays. Others who benefit from rehydration with subcutaneous fluids include cats with pyometra, lactating queens, cats with diarrhea, and those with dehydration from stress and confinement. In the event of cats becoming overheated during trapping, housing, or transport, room temperature subcutaneous fluid administration may be beneficial.

Recovery

If xylazine or dexmedetomidine have been used for anesthesia, recovery can be hastened by administration of specific antagonists. Prior to awakening, cats should be returned to their traps to recover in a quiet, warm place and monitored until fully awake. Placing the cat on his or her side with the tipped ear up can reduce bleeding from the incised pinna. All cats should be left in their traps in a warm, quiet area overnight following surgery. The optimal time for returning cats to their environment following surgery is unknown. In wildlife field surgery, advantages of early release (as soon as recovered from anesthesia) include reducing stress of captivity, which may inhibit normal behaviors such as eating and drinking, and reclaiming their place in the colony's social structure. Advantages of confinement of cats for several days postoperatively include an opportunity to monitor for complications and to provide additional analgesics. Caregivers should be instructed in advance where to seek veterinary help for emergent and nonemergent conditions in the event of postoperative complications.

CONCLUSION

The nonlethal management of community cats is one of the greatest challenges in animal welfare. Cats' ability to thrive in almost any environmental niche, large population size, early reproductive maturity, and high fecundity outpace the resources for their care in most communities and underlie persistently high euthanasia rates for cats in many shelters. Unsocialized feral cats are particularly difficult to save once they have entered the shelter system.

Table 41.3. Products used for control of common ectoparasites and gastrointestinal parasites of feral cats.

Product	Active ingredient	Minimum age (Per manufacturer)	Application/ Duration	Activity
Acarexx	Ivermectin	4 wk	Topical otic, one to two times	Ear mites
Advantage	Imidacloprid	8 wk	Topical; monthly or weekly	Adult fleas
Advantage multi	Imidacloprid Moxidectin	9 wk	Topical; monthly	Adult fleas, hookworms, roundworms, ear mites, scabies mites, possibly demodectic mites
Capstar	Nitenpyram	4 wk/ 2 lbs	Oral; daily, PRN (as needed): no residual activity	Adult fleas
Frontline plus	Fipronil s-Methoprene	8 wk	Topical; monthly	Adults fleas and eggs, ticks
MilbeMite	Milbemycin oxime	4 wk	Topical otic, one to two times	Ear mites
Revolution	Selamectin	8 wk	Topical; monthly	Adult fleas, roundworms, hookworms, ear mites, sarcoptic mites, *Dermacentor* ticks
Vectra	Dinotefuran Pyriproxyfen	8 wk	Topical; monthly	Adult and immature fleas

The increasing interest in TNR as a method to avoid shelter intake and to involve citizens in the management of cats in situ provides communities with a tool to improve cat welfare, reduce the impact of free-roaming cats on the environment, and protect public health.

REFERENCES

Akucewich, L.H., Philman, K., Clark, A., *et al*. (2002) Prevalence of ectoparasites in a population of feral cats from north central Florida during the summer. *Veterinary Parasitology*, **109**, 129–139.

ASV (2010) *Guidelines for Standards of Care for Animal Shelters*. Available online at http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29 (accessed January 12 2012).

Blanton, J.D., Bowden, N.Y., Eidson, M., *et al*. (2005) Rabies postexposure prophylaxis, New York, 1995–2000. *Emerging Infectious Diseases*, **11**, 1921–1927.

Blanton, J.D., Robertson, K, Palmer, D., *et al*. (2009) Rabies surveillance in the United States during 2008. *Journal of the American Veterinary Medical Association*, **235**, 676–689.

Bowater, R.J., Stirling, S.A, and Lilford, R.J. (2009) Is antibiotic prophylaxis in surgery a generally effective intervention? Testing a hypothesis over a set of meta-analyses. *Annals of Surgery*, **249**, 551–556.

Brodbelt, D.C., Pfeiffer, D.U., Young, L.E., *et al* (2007) Risk factors for anaesthetic-related death in cats: Results from the confidential enquiry into perioperative small animal fatalities (CEPSAF). *British Journal of Anaesthesia*, **99**, 617–623.

Castillo, D. (2001) *Population Estimates and Behavioral Analyses of Managed Cat (Felis catus) Colonies Located in Miami-Dade County, Florida Parks*. MS thesis, Department of Environmental Studies, Florida International University, Miami, FL.

Centonze, L.A. and Levy, J.K. (2002) Characteristics of feral cat colonies and their caregivers. *Journal of*

the American Veterinary Medical Association, **220**, 1627–1633.

Chu, K. and Anderson, M.W. (2007) U. S. public opinion on humane treatment of stray cats. Alley Cat Allies. Law & Policy Brief.

Chu, K., Anderson, W.M., and Rieser, M.D. (2009) Population characteristics and neuter status of cats living in households in the United States. *Journal of the American Veterinary Medical Association*, **234**, 1023–1030.

Cistola, A.M., Golder, F.J., Levy, J.K., *et al*. (2002) *Comparison of Two Injectable Anesthetic Regimes in Feral Cats at a Large Volume Spay Clinic*. Proceedings of the American College of Veterinary Anesthesiologists, 27th Annual Meeting, Orlando, FL, October 10–11.

Clifton, M. (1992) Seeking the truth about feral cats and the people who help them. *Animal People*, November, **1**, 7–10.

Cuffe, D.J., Eachus, J.E., Jackson, O.F., *et al*. (1983) Ear-tipping for identification of neutered feral cats. *Veterinary Record*, **112**, 129.

Dire, D.J. (1992) Cat bite wounds: Risk factors for infection. *Annals of Emergency Medicine*, **21**, 1008.

Dorn, A.S. (1975) Ovariohysterectomy by the flank approach. *Veterinary Medicine/Small Animal Clinic*, **70**, 569–573.

Fischer, S.M., Quest, C.M., Dubovi, E.J., *et al*. (2007) Response of feral cats to vaccination at the time of neutering. *Journal of the American Veterinary Medical Association*, **230**, 52–58.

Foley, P., Foley, J.E., Levy, J.K., *et al*. (2005) Analysis of the impact of trap-neuter-return programs on populations of feral cats. *Journal of the American Veterinary Medical Association*, **227**, 1775–1781.

Gunther, I., Finkler, H., and Terkel, J. (2011) Demographic differences between urban feeding groups of neutered and sexually intact free-roaming cats following a trap-neuter-return procedure. *Journal of the American Veterinary Medical Association*, **238**(9), 1134–1140

Hackett, T.B., Jensen, W.A., Lehman, T.L., *et al*. (2006) Prevalence of DNA of *Mycoplasma haemofelis, Candidatus Mycoplasma haemominutum*, *Anaplasma phagocytophilum,* and species of *Bartonella, Neorickettsia*, and *Ehrlichia* in cats used as blood donors in the United States. *Journal of the American Veterinary Medical Association*, **229**, 700–705.

Hensley, J.A. (1998) Potential rabies exposures in a Virginia County. *Public Health Reports*, **113**, 258–262.

Hughes, K.L., Slater, M.R., and Haller, L. (2002) The effects of implementing a feral cat spay/neuter program in a Florida county animal control service. *Journal of Applied Animal Welfare Science*, **5**, 285–298.

Intervet/Schering-Plough Animal Health. (2006) Continuum Rabies. *Product insert*.

Johnson, K.J., Lewellen, L., and Lewellen, J. (1993) National Pet Alliance survey report on Santa Clara County's pet population. *Cat Fanciers' Almanac*, January, 71–77.

Johnson, K. and Lewellen, L. (1995) *San Diego County Survey and Analysis of the Pet Population*. Available online at http://www.fanciers.com/npa/sandiego.html (accessed on June 20, 2012).

Ko, J. and Berman, A. (2010) Anesthesia in shelter medicine, in *Topics in Companion Animal Medicine*, Vol. 25, Issue 2, Elsevier, pp. 92–97. Available online at http://www.sciencedirect.com/science/article/pii/S193897361000019X (accessed January 12, 2012)

Krzaczynski, J. (1974) The flank approach to feline ovariohysterectomy (an alternate technique). *Veterinary Medicine/Small Animal Clinician*, **69**, 572–574.

Levy, J.K. (2009) Feline leukemia virus and feline immunodeficiency virus, in *Infectious Diseases in Animal Shelters* (eds L. Miller and K. Hurley), Wiley-Blackwell, Ames, Iowa, pp. 307–317.

Levy, J.K. and Crawford, P.C. (2004) Humane strategies for controlling feral cat populations. *Journal of the American Veterinary Medical Association*, **225**, 1354–1360.

Levy, J.K., Crawford, C., Hartmann, K., *et al*. (2008) 2008 American Association of Feline Practitioners' feline retrovirus management guidelines. *Journal of Feline Medicine and Surgery*, **10**, 300–316.

Levy, J.K., Gale, D.W., and Gale, L.A. (2003a) Evaluation of the effect of a long-term trap-neuter-return and adoption program on a free-roaming cat population. *Journal of the American Veterinary Medical Association*, **222**, 42–46.

Levy, J.K., Woods, J.E., Turick, S.L., *et al*. (2003b) Number of unowned free-roaming cats in a college community in the southern United States and characteristics of community residents who feed them. *Journal of the American Veterinary Medical Association*, **223**, 202–205.

Levy, J.K, James, K.M., *et al*. (1999) *Infectious Diseases of Feral Cats in Central California*. Proceedings of 80th Annual Meeting of the Conference of Animal Disease Research Workers, Chicago, Illinois.

Levy, J.K., Scott, H.M., Lachtara, J.L., *et al*. (2006) Seroprevalence of feline leukemia virus and feline

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immunodeficiency virus infection among cats in North America and risk factors for seropositivity. *Journal of the American Veterinary Medical Association*, **228**, 371–376.

Looney, A.L., Bohling, M.W., Bushby, P.A., *et al.* (2008) The Association of Shelter Veterinarians veterinary medical care guidelines for spay-neuter programs. *Journal of the American Veterinary Medical Association*, **233**, 74–86.

Lord, L.K. (2008) Attitudes toward and perceptions of free-roaming cats among individuals living in Ohio. *Journal of the American Veterinary Medical Association*, **232**, 1159–1167.

Luria, B.J., Levy, J.K., Lappin, M.R., *et al.* (2004) Prevalence of infectious diseases in feral cats in northern Florida. *Journal of Feline Medicine and Surgery*, **6**, 287–296.

Manning, A.M. and Rowan, A.N. (1992) Companion animal demographics and sterilization status: Results from a survey in four Massachusetts towns. *Anthrozoos*, **5**, 192–201.

Manning, S.E., Rupprecht, C.E., Fishbein, D., *et al.* (2008) Human rabies prevention–United States, 2008 recommendations of the Advisory Committee on Immunization Practices. *Morbidity and Mortality Weekly Report*, **57** (May), 1–28.

Moore, D.A., Sischo, W.M., Hunter, A., *et al.* (2000) Animal bite epidemiology and surveillance for rabies postexposure prophylaxis. *Journal of the American Veterinary Medical Association*, **217**, 190–194.

NACA (National Animal Control Association) (2008) Policy statement: Community cat management. *NACA News*, November, 23.

Natoli, E., Maragliano, L., Cariola, G., *et al.* (2006) Management of feral domestic cats in the urban environment of Rome (Italy). *Preventive Veterinary Medicine*, **77**, 180–185.

New, J.C., Kelch, W.J., Hutchison, J.M., *et al.* (2004) Birth and death rate estimates of cats and dogs in the US households and related factors. *Journal of Applied Animal Welfare Science*, **7**, 229–241.

Nogales, M., Martin, A., Tershy, B.R., *et al.* (2004) A review of feral cat eradication on islands. *Conservation Biology*, **18**, 310–319.

Nutter, F.B., Dubey, J.P., Levine, J.F., *et al.* (2004) Seroprevalences of antibodies against *Bartonella henselae* and *Toxoplasma gondii* and fecal shedding of *Cryptosporidium* spp, *Giardia* spp, and *Toxocara cati* in feral and pet domestic cats. *Journal of the American Veterinary Medical*, **225**, 1394–1398.

Nutter, F.B., Levine, J.F., and Stoskopf, M.K. (2004) Reproductive capacity of free-roaming domestic cats and kitten survival rate. *Journal of the American Veterinary Medical*, **225**, 1399–1402.

Patrick, G.R. and O'Rourke, K.M. (1998) Dog and cat bites: Epidemiologic analyses suggest different prevention strategies. *Public Health Reports*, **113**, 252–257.

Richards, J.R., Elston, T.H., Ford, R.B., *et al.* (2006) The 2006 American Association of Feline Practitioners feline vaccine advisory panel report. *Journal of the American Veterinary Medical Association*, **229**, 1405–1441.

Scott, K.C., Levy, J.K., Gorman, S.P., *et al.* (2002) Body condition of feral cats, and the effect of neutering. *Journal Applied Animal Welfare Science*, **5**, 203–213.

Scott, K.C., Levy, J.K., Crawford, P.C. (2002) Characteristics of free-roaming cats evaluated in a trap-neuter-return program. *Journal of the American Veterinary Medical*, **221**, 1136–1138.

Soulebot, J.P., Brun, A., Chappuis, G., *et al.* (1981) Experimental rabies in cats: Immune response and persistence of immunity. *Cornell Veterinarian*, **71**, 311–325.

Stoskopf, M.K. and Nutter, F.B. (2004). Analyzing approaches to feral cat management—one size does not fit all. *Journal of the American Veterinary Medical*, **225**, 1361–1364.

Vasseur, P.B., Levy, J., Dowd, E., *et al.* (1988) Surgical wound infection rates in dogs and cats in a veterinary teaching hospital. *Veterinary Surgery*, **17**(2), 60–64.

Wallace, J.L. and Levy, J.K. (2006) Population characteristics of feral cats admitted to seven trap-neuter-return programs in the United States. *Journal of Feline Medicine and Surgery*, **8**, 279–284.

Williams, L.S., Levy, J.K., Robertson, S.A., *et al.* (2002) Use of the anesthetic combination of tiletamine, zolazepam, ketamine, and xylazine for neutering feral cats. *Journal of the American Veterinary Medical*, **220**, 1491–1495.

Wright, J.C. (1990) Reported cat bites in Dallas: Characteristics of the cats, the victims, and the attack events. *Public Health Reports*, **105**, 420–424.

Zasloff, R.L. and Hart, L.A. (1998) Attitudes and care practices of cat caregivers in Hawaii. *Anthrozoos*, **11**, 242–248.

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42
Nonsurgical Sterilization of Cats and Dogs

Brenda Griffin

INTRODUCTION

For more than 40 years, researchers have studied nonsurgical methods to control reproduction in both humans and animals. Tremendous advances have been made, and there have been many successes in the human and wildlife fields. During this time, a few scientists began to apply these technologies to cats and dogs. With goals contrary to those of wildlife and human subjects, where reversible contraception that preserves libido and breeding behaviors is desirable, these scientists recognized that the goals of contraception for cats and dogs were distinct and warranted special focus. They sought to develop long-lasting, preferably permanent, single-dose sterilants that would inhibit not only fertility, but breeding behaviors whenever possible. In 2000, some of these scientists established the Alliance for Contraception in Cats and Dogs (ACC&D), with the goal of expediting the development and successful introduction of contraceptive drugs and vaccines specifically designed for cats and dogs. Today, ACC&D is a highly respected nonprofit agency that serves as the world's leading authority on and advocate for research and implementation of nonsurgical methods of sterilization for cats and dogs (http://www.acc-d.org/).

THE NEED FOR NONSURGICAL STERILIZATION

The surplus of cats and dogs is a worldwide problem, affecting diverse geographic regions and cultures with very few exceptions. In the United States alone, an estimated 3–4 million cats and dogs are euthanized annually in animal shelters (ASPCA, 2010). In some cases, stray cat and dog populations may represent a threat to public health, and the welfare of the animals themselves is also a concern. In most societies throughout the world, the availability of affordable, accessible sterilization is crucial for population control. In the United States, pets from low-income communities and feral/free-roaming cats are recognized as major sources of animals whose reproduction frequently remains unchecked, contributing substantially to shelter intake and euthanasia (Salman *et al*., 1998; Levy and Crawford, 2004). In developing countries, adequate resources are lacking to humanely address the surplus of cats and dogs. Tragically, crude and cruel methods, including poisoning, shooting, drowning, and electrocution, are still employed in attempts to quell stray populations.

Surgical sterilization remains the gold standard for preventing reproduction of cats and dogs, but its delivery is often limited by its cost and the availability of the facilities, equipment, and qualified personnel required to carry it out. The development of nonsurgical methods of sterilization provides a practical alternative to surgical sterilization. Indeed, such products have the potential to greatly increase the numbers of cats and dogs who are sterilized since they will not require the infrastructure, technical

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expertise, general anesthetic drugs, equipment, and time that surgical sterilization requires. In addition, they have the potential to be more cost-effective than surgery. In its position statement on Dog and Cat Population Control, the American Veterinary Medical Association encourages research, development, and the use of nonsurgical methods of sterilization (AVMA, 2009).

The ideal contraceptive product would rapidly induce permanent sterilization, eliminate breeding behavior, and provide at least as many health benefits as surgical sterilization while requiring only a single dose. Furthermore, the ideal product would be effective in dogs and cats of both sexes and all ages while being safe and easy to manufacture, store, and administer (Griffin, 2005). At this time, no single product is able to fulfill all of these criteria; however, several promising products are under development. Even if the ideal formulation cannot be produced, safe products that induce sterility in dogs or cats, male or female, will be valuable tools for population control. Even products that confer infertility for a defined period of time (e.g., at least 3 years) have the potential to be effective aids for controlling feral populations since the reported life spans of these animals are frequently much shorter than those of owned pets (Nutter, Levine, and Stoskopf, 2004; Subacz, 2008). ACC&D defines a list of priorities for contraceptive products for pet population control that is reproduced in Table 42.1 (http://www.acc-d.org/About; accessed on June 20, 2012).

Table 42.1. The Alliance for Contraception in Cats and Dogs' Priorities for nonsurgical products for pet population control.

- Approval by regulatory agencies as safe (for animals and for the humans administering) and effective
- Permanent, although there may be some opportunity for long-term (3+ years) products
- Deliverable in a single injection or treatment
- Products available for effective use in both male and female dogs and cats
- Documented effects on behavior and health
- Can be provided at affordable cost for use in indigent or low-income client populations

ACCEPTANCE AND USE BY VETERINARIANS

Veterinary acceptance of contraceptive technologies is critical to the success of new products; therefore, it is crucial that practitioners remain open to these surgical alternatives (ACC&D, 2007, 2008). The value of sterility is great, and even if products do not fully mimic surgical sterilization, they will provide affordable, accessible options that will enable more animals to be humanely sterilized. Nonsurgical sterilization is an essential component of a comprehensive, humane approach to cat and dog population control. In addition, nonsurgical approaches offer many potential advantages for individual animals and their owners.

For veterinary practitioners, the availability of safe and effective contraceptive products will create opportunities to meet the desires of pet owners who decline the use of general anesthesia, refuse to leave their pet for surgery, or are otherwise averse to surgery. The ability to provide the most technologically advanced and least invasive interventions may be an attractive option to many clients. It may also offer an important advantage for those animals deemed to be at high risk for anesthesia. Because nonsurgical contraceptives can be administered more quickly and easily, and potentially less expensively than surgery, these alternatives may also enhance the practitioner's efficiency and result in a higher profit margin. Cultural acceptance may be another benefit of products that result in control of reproduction without requiring removal of the gonads, particularly in male animals.

CONTRACEPTIVE DRUGS AND VACCINES

Contraceptive drugs and vaccines work by exerting a targeted pharmacological effect or by prompting an immune response that inhibits or blocks some component of the animal's reproductive system, resulting in infertility. A brief review of the normal mammalian reproductive hormone cascade is helpful in order to understand the science behind contraceptive technologies. Gonadotropin-releasing hormone (GnRH), a peptide hormone, resides at the pinnacle of this cascade (Figure 42.1). Produced by the brain's hypothalamus, GnRH is responsible for the release of gonadotropic hormones from the anterior pituitary that stimulate testosterone production and

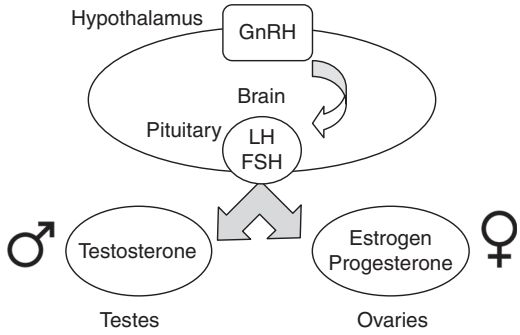


Figure 42.1. The reproductive hormone cascade.

spermatogenesis in the male, and estradiol and progesterone production in the female, which are responsible for ovulation and corpora lutea function, respectively. When GnRH binds to its receptors in the pituitary gland, synthesis and secretion of luteinizing hormone (LH) and follicle-stimulating hormone (FSH) result. In turn, these hormones stimulate the production of testosterone by the testes and estradiol and progesterone by the ovaries.

Old Approaches to Contraception: Hormone-Based Drugs

Traditional approaches to contraception in cats and dogs have been based on the administration of steroid hormones including progestins and androgens, which inhibit the release of gonadotrophs from the pituitary. Megestrol acetate (a progestin) (Ovaban®, Intervet/Schering-Plough Animal Health, Kenilworth, NJ) and mibolerone (an androgen) (Cheque® Drops, Pharmacia & Upjohn, Bridgewater, NJ) were introduced in the 1970s and were used by many practitioners to inhibit estrous cycling in bitches and queens via hormonal down-regulation. These products require frequent oral administration from attentive owners for success, and many adverse side effects have been reported with their use. Weight gain, pyometra, induction of mammary hyperplasia and carcinoma, diabetes mellitus, adrenal suppression, and behavior changes have all been associated with progestin administration, although their occurrence and frequency may vary substantially depending on dosage and duration of treatment. Side effects associated with chronic administration of androgenic compounds include clitoral hypertrophy, vaginitis, weight gain, behavior changes, and liver disease (Johnston, Root Kustritz, and Olson, 2001a, 2001b). These hormone-based products have not been a popular means of estrus suppression for veterinary patients in the United States, although they have been used more extensively in Europe.

FeralStat®

In 2008, a veterinary practitioner began marketing a product called FeralStat® (Tait's Every Animal Matters, Westbrook, CT), which contains a low dose of megestrol acetate in powdered form (ACC&D, 2009). The product is designed to be mixed into canned cat food weekly and fed to feral cats for the purpose of pregnancy prevention. Anecdotal reports suggest successful results with this product (e.g., no pregnancies and no apparent ill effects from treatment); however there are no published data on the use of FeralStat® to date. Aside from the obvious safety and efficacy concerns, practical and ethical concerns about this product also exist. Ensuring administration only to target animals (e.g., nonpregnant, reproductively intact feral cats) is difficult to achieve. Unintended ingestion by pet cats and other species, including wildlife, are likely in most instances, and colony caregivers may be held liable in such cases. For these reasons, the use of FeralStat® is not generally recommended (ACC&D, 2009). However, as with any product, the risks and benefits of use should be carefully weighed in the context of the individual situation. In some instances, megestrol acetate may be useful for short-term control of cat reproduction until permanent sterilization can be achieved (McDonald, 1980).

New Approaches

The focus of new contraceptive technologies has shifted away from steroid hormone-based products as researchers have sought to develop safe, long-acting contraceptive drugs and vaccines. Within the last decade, a few new contraceptive products have been granted regulatory approval, and many others are currently under development.

Approved Products

New pharmaceutical agents that have received regulatory approval for contraception in one

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or more countries include Neutersol® (Addison Biologic Laboratory, Fayette, MO), Esterilsol™ (Mexico) and Zeuterin™ (United States) (Ark Sciences, LLC, Baltimore, MD), Infertile® (Rhobifarma Pharmaceutical Industry Ltd.), Suprelorin® (Peptech Animal Health Limited, NSW, Australia), and Gonazon® (Intervet/Schering Plough, Paris, France). Although these products may also be effective in cats, they are currently only labeled for use in dogs.

Neutersol®

Neutersol® (Addison Biologic Laboratory) was the first permanent sterilant developed for the small animal veterinary market. More than 20 years of research led to its development, and the product was approved by the FDA and introduced in the United States in 2003. Licensed for use for chemical castration of puppies 3–10 months of age, it has also been shown to be effective in adult dogs and cats as well (Wang, 2002, 2004). The product is an intratesticular injection of a zinc compound (zinc gluconate neutralized by arginine), which results in sclerosis of the testes and permanent sterility. It is greater than 99% effective and very safe. The precise mechanism of action is unknown; the testicles atrophy over weeks to months following injection, resulting in a 70–90% reduction in testicular size in very young puppies and 50% in older dogs (atrophy may not be symmetrical). Sterility may take up to 60 days to occur in postpubescent males (Wang, 2002, 2004; Addison, 2003).

This product is a useful option in veterinary practice as well as in animal shelters. The obvious advantage is that it eliminates the need for anesthesia and surgery and saves substantial time. When it was available, Neutersol® was used successfully by programs in the United States (including one event in which 200 dogs were sterilized in one day) and abroad (including a 10 000-dog study conducted by the head of the Mexican Veterinary Medical Association which demonstrated safety and efficacy of Neutersol® use in dogs over 10 months of age) (Esquivel-LaCroix, 2006; Hawkins, 2006). Unfortunately however, the product was not widely embraced by veterinary practitioners despite its well-documented efficacy and safety. Originally introduced by Addison Laboratories, the product became unavailable in 2005.

Esterilsol™ and Zeuterin™

Esterilsol™ (Ark Sciences) is the exact same formulation as Neutersol® (zinc gluconate neutralized by arginine), manufactured by a different company under a different name initially for distribution and use in Mexico. Since its introduction in 2008, it has been used as a practical and cost-effective means of castration of dogs in Mexico. It has since received regulatory approval in Colombia, Panama, and Bolivia.

As this text goes to press, Ark Sciences is preparing to launch an identical product in the United States in the second half of 2012 under the name Zeuterin. Pending final determination by the FDA, it will be labeled for use in dogs of all ages.

In most cases, "zinc neutering" with Esterisol™ or Zeuterin™ can be performed without sedation, although many clinicians prefer to administer mild sedatives to their patients prior to injection. With the patient positioned in dorsal recumbency, a single injection of the product is administered into each testicle. Product instructions should be consulted to determine the type of needle/syringe to use and the volume of product to inject. The dosage volume of product to use is based on testicular width, which is easily measured using standard calipers (Addison, 2003) (see Figures 42.2a,b). Patient discomfort is minimal. Since the testicles are not removed, some form of standard identification is recommended to denote that the animal has been neutered. Various programs have used tattooing of the caudolateral ventral abdomen, inner pinna of the ear, placement of a small metal ear band, or microchipping for this purpose.

FDA studies demonstrate that these products reduce but do not abolish testosterone production, and their effects on hormone-dependent diseases and behaviors have not been established. However, studies have revealed a significant decrease in prostate size in injected dogs versus controls (Wang, 2002, 2004). The only significant safety concern, which was reported in field use, is the development of scrotal ulcers at the injection site in a very small percentage of dogs (Levy *et al*., 2008). This appears to be most commonly observed in large adult dogs and may be related to poor injection technique, allowing some of the chemical to contact the scrotal skin and connective tissues. Current recommendations for product use include using one needle to draw the

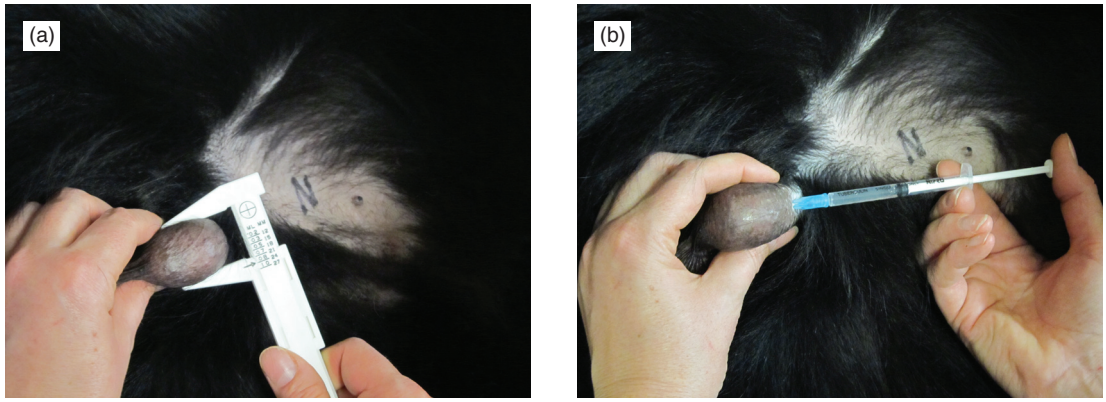


Figure 42.2. Technique for intratesticular injection. (a) Testicular width is measured using calipers. (b) Corresponding dosage is injected into each testicle. Note the letter N tattooed on the caudolateral abdomen to identify the dog as neutered.

product from the vial and a second for the injection. Injection site reaction rates are similar to rates of wound complications in surgically castrated dogs, and even though the reactions may be severe in a very small percentage of cases, zinc neutering avoids adverse events such as death that are associated with the use of general anesthesia. To ensure the product is administered correctly and minimize risks associated with poor injection technique, Ark Sciences is providing veterinarians with professional training on proper injection technique.

Infertile®

Infertile® (Rhobifarma Pharmaceutical Industry Ltd.) is a similar product which was launched in Brazil in 2009. This injectable sterilant combines dimethyl sulfoxide (DMSO) with zinc gluconate neutralized by arginine for chemical castration of dogs.

Suprelorin®

Suprelorin® (originally introduced by Peptech Animal Health Limited; now available from Virbac, Fort Worth, TX) is a deslorelin implant that is approved and available for use for temporary contraception in male dogs. It first became available in 2004 in Australia, followed by New Zealand, and most recently, Europe. Deslorelin is a GnRH agonist. When GnRH agonists are given continually at low doses, downregulation of GnRH receptors occurs in the anterior pituitary, blocking the production and release of LH and FSH, which in turn block the production of testosterone and thus spermatogenesis. The Suprelorin implant, similar in size to a microchip, is easily administered via injection subcutaneously between the shoulder blades where it slowly releases deslorelin over time in a predictable, well-defined pattern. Implants are available in two dosages that provide contraception for 6 and 12 months, respectively. Treatment can be safely repeated. This technology can also be used in female patients and may offer longer-term contraception in cats. However, GnRH agonists may initially trigger a single estrous cycle due to an initial stimulatory effect on GnRH receptors before receptor downregulation occurs (Trigg *et al*., 2001, 2006; Herbert and Trigg, 2005; Peptech, 2010).

Gonazon®

Gonazon® (Intervet/Schering Plough) is also a GnRH agonist (azagly-nafarelin). This product received approval in the European Union in 2006 as a 1-year, reversible contraceptive implant for female dogs; however, it has not been released on the market to date (Driancourt *et al*., 2006; Rubion *et al*., 2006; Rhodes, 2010).

Even though the approval of GnRH agonists for contraception is encouraging in many regards, these products are generally expensive to manufacture and provide only temporary contraception; thus, their

current utility as tools for population control is not promising. This is also true of the GnRH antagonists that have been explored to date (Valiente *et al*., 2007, 2009).

Other New Approaches

Many other contraceptive and sterilant technologies are being investigated. These include the development of contraceptive vaccines targeted against components of the reproductive system including: GnRH, LH receptor, zona pellucida, and sperm and egg antigens among others (ACC&D, 2002, 2004, 2006, 2010, Kutzler and Wood, 2006; Cathey and Memon, 2010). In addition, the targeted delivery of cell-specific cytotoxins and gene-silencing technology is also being explored. Perhaps the most exciting new technologies are the ones we know the least about since the most promising research is often kept strictly confidential during the discovery phase.

FUNDING FOR RESEARCH AND DEVELOPMENT

Thorough investigation of products is time consuming and expensive and requires substantial investment not only from the scientists but also from pharmaceutical companies and investors. Until recently, the sources of ongoing funding required for research and development were very limited, creating a substantial barrier for many researchers and discouraging work in the field. However, this situation changed in 2008 thanks to the generosity of a visionary individual, Dr. Gary Michelson, who sought to encourage researchers to pursue a "breakthrough" product for pet contraception. To this end, Dr. Michelson's Found Animals Foundation announced the Michelson Prize and Grants in Reproductive Biology. The Michelson Prize offers $25 million to the first entity to provide an effective single-dose sterilant for male and female cats and dogs. The Michelson Grants program offers up to $50 million to support promising research in this area (http://michelson.foundanimals.org/).

CONCLUSION

Existing and future nonsurgical methods of sterilization will offer safe, effective alternatives to surgical sterilization that can be used to increase the number of cats and dogs sterilized. It is of paramount importance that these products be accepted by veterinarians, animal welfare organizations, government animal control authorities, and the public in order for them to have a far-reaching impact. The scientists, pharmaceutical companies, and funding agencies behind these products are to be applauded. For the latest information on emerging technologies, readers are encouraged to visit the website of ACC&D at http://www.acc-d.org.

REFERENCES

Addison Biological Laboratory, Inc. (2003) Neutersol® (package insert), Fayette, MO.

ACC&D (2002) *Proceedings of the 1st International Symposium on Non-surgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/ACCD percent20Symposia (accessed February 12, 2010).

ACC&D (2004) *Proceedings of the 2nd International Symposium on Non-surgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/ACCD percent20Symposia (accessed February 12, 2010).

ACC&D (2006) *Proceedings of the 3rd International Symposium on Non-surgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/ACCD percent20Symposia (accessed February 12, 2010).

ACC&D (2007) *ACC&D Non-surgical Sterilization Study Veterinarian Attitude and Awareness Survey*. Available online at http://www.acc-d.org/ACCDpercent20docs/VetResearchWebReport.pdf (accessed December 13, 2011).

ACC&D (2008) *Online Survey with Shelter Veterinarians: Nonsurgical Alternatives to Spaying and Neutering*. Available online at http://www.acc-d.org/ACCD percent20docs/ASVResearchwebreport.pdf (accessed December 13, 2011).

ACC&D (2009) *Feralstat® Product Profile and Position Paper*. Available online at http://www.acc-d.org/About (accessed February 12, 2010).

ACC&D (2010) *Proceedings of the 4th International Symposium on Nonsurgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/ACCD%20Symposia (accessed May 29, 2010).

ASPCA (2010) *American Society for Prevention of Cruelty to Animals Pet Statistics*. Available online at http://www.aspca.org/about-us/faq/pet-statistics.html (accessed April 3, 2010).

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American Veterinary Medical Association (2009) *Policy Statement on Dog and Cat Population Control*. Available online at http://www.avma.org/issues/policy/animal_welfare/population_control.asp (accessed April 3, 2010).

Cathey, M. and Memon, M.A. (2010) Non-surgical methods of contraception in dogs and cats: Where are we now? *Veterinary Medicine*, January, 12–17.

Driancourt, M.A., Rubion, S., Desmoulins, P.O. *et al*. (2006) Treatment with a subcutaneous Gn-RH-agonist containing implant reversibly prevents bitches and queens from displaying puberty, heat and ovulation, in *Proceedings of the 3rd International Symposium on Nonsurgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/2006%20Proceedings (accessed February 12, 2010).

Esquivel-LaCroix, C. (2006) Report on field use in 10,000 dogs in Mexico, in *Proceedings of the 3rd International Symposium on Nonsurgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/2006 percent20 Proceedings (accessed February 12, 2010).

Griffin, B. (2005) What's New with spay-neuter? in *Proceedings of the 23rd Annual Forum of the American College of Veterinary Internal Medicine*, Baltimore, MD.

Hawkins, S. (2006) Case study: Outreach in the U.S. and Mexico, in *Proceedings of the 3rd International Symposium on Nonsurgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/2006%20Proceedings (accessed February 12, 2010).

Herbert, C.A. and Trigg, T.E. (2005) Applications of Gn-RH in the control and management of fertility in female animals. *Animal Reproduction Science*, **88**, 141–153.

Johnston, S.D., Root Kustritz, M.V., and Olson, P.N.S. (2001a) Prevention and termination of canine pregnancy, in *Canine and Feline Theriogenology* (ed S.D. Johnston, M.V. Root Kustritz, and P.N.S. Olson), W.B. Saunders Co., Philadelphia, PA, pp. 168–192.

Johnston, S.D., Root Kustritz, M.V., and Olson, P.N.S. (2001b) Prevention and termination of feline pregnancy, in *Canine and Feline Theriogenology* (ed S.D. Johnston, M.V. Root Kustritz, and P.N.S. Olson), W.B. Saunders Co., Philadelphia, PA, pp. 447–452.

Kutzler, M. and Wood, A. (2006) Non-surgical methods of contraception and sterilization. *Theriogenology*, **66**, 514–525.

Levy, J.K. and Crawford, P.C. (2004) Humane strategies for controlling feral cat populations. *Journal of the American Veterinary Medical Association*, **225**(9), 1354–1360.

Levy, J.K., Crawford, P.C., Appel, L.D. *et al*. (2008) Comparison of intratesticular injection of zinc gluconate versus surgical castration to sterilize male dogs. *Journal of the American Veterinary Medical Association*, **69**(1), 140–143.

McDonald, M. (1980) Population control of feral cats using megestrol acetate. *Veterinary Record*, February 9, 129.

Nutter, F.B., Levine, J.F., and Stoskopf, M.K. (2004) Reproductive capacity of free-roaming domestic cats and kitten survival rate. *Journal of the American Veterinary Medical Association*, **225**(9), 1399–1402.

Peptech Animal Health Limited (2010) Suprelorin® web page. Available online at http://www.peptech.com/HTML/Animal_Health/Superlorin_general.html (accessed May 27, 2010).

Rhodes, L. (2010) An overview of existing contraceptives and non-surgical sterilants, in *Proceedings of the 4th International Symposium on Nonsurgical Contraceptive Methods for Pet Population Control*. Available online at http://www.acc-d.org/4th SymposiumProceedings (accessed May 29, 2010).

Rubion, S., Desmoulins, P.O., Riviere-Godet, E. *et al*. (2006) Treatment with a subcutaneous Gn-RH agonist containing controlled release device reversibly prevents puberty in bitches. *Theriogenology*, **66**, 1651–1654.

Salman, M.D., New, J.G. Jr., Scarlett, J.M. *et al*. (1998) Human and animal factors related to the relinquishment of dogs and cats in 12 selected animal shelters in the United States. *Journal of Applied Animal Welfare Science*, **1**(3), 207–226.

Subacz, K.B. (2008) *Impact Assessment of a Trap-Neuter-Return Program on Selected Features of Auburn, Alabama Feral Cat Colonies*. Graduate thesis. Auburn University, AL. Available online at http://etd.auburn.edu/etd/handle/10415/1101.

Trigg, T.E., Doyle, A.G., Walsh, J.D. *et al*. (2006) A review of advances in the use of the Gn-RH agonist deslorelin in control of reproduction. *Theriogenology*, **66**, 1507–1512.

Trigg, T.E., Wright, P.J., Armour, A.F. *et al*. (2001) Use of a Gn-RH analogue implant to produce reversible long-term suppression of reproductive function in male and female domestic dogs. *Journal of Reproduction and Fertility Supplement*, **57**, 255–261.

Valiente, C., Corrada, Y., de la Sota, P.E. *et al*. (2007) Effect of the Gn-RH antagonist, acyline, on canine

testicular characteristics. *Theriogenology*, **68**, 687–692.

Valiente, C., Corrada, Y., de la Sota, P.E. *et al*. (2009) Comparison of two doses of the GnRH antagonist, acyline, for pregnancy termination in bitches. *Reproduction in Domestic Animals*, **44** (Suppl 2), 156–159.

Wang, M. (2002) Neutersol: Intratesticular injection induces sterility in dogs, in *Proceedings of the 1st International Symposium on Nonsurgical Methods of Pet Population Control*. Available online at http://www.acc-d.org/ACCD%20docs/2002%20Sym (accessed February 17, 2010).

Wang, M. (2004) Neutersol: From the laboratory to the market, in *Proceedings of the 1st International Symposium on Nonsurgical Methods of Pet Population Control*. Available online at http://www.acc-d.org/ACCD%20docs/2002%20Sym (accessed February 17, 2010).

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Appendix 1
Resources for Veterinary and Shelter Professionals

This appendix provides a partial list of a few of the resources that are available to assist shelter and veterinary professionals with shelter medicine information and resources. It should be used to complement and expand on the information provided in each chapter.

ANIMAL WELFARE ACT

www.aphis.usda.gov/animal_welfare

ANIMAL WELFARE ORGANIZATIONS

These organizations provide advice, publications, training, funding, and other support for the shelter animal care professional.

American Humane Association (AHA)
www.americanhumane.org

American Society for the Prevention of Cruelty to Animals (ASPCA)
www.aspcapro.org

Animal Rescue League of Boston
www.centerforshelterdogs.org

Humane Society of the United States (HSUS)
www.hsus.org

International Fund for Animal Welfare
www.ifaw.org

National Animal Control Association (NACA)
www.nacanet.org

Society of Animal Welfare Administrators (SAWA)
www.sawanetwork.org

Veterinarians for Equine Welfare
www.vetsforequinewelfare.org

World Society for the Protection of Animals (WSPA)
www.wspa-international.org/

OTHER ORGANIZATIONS

Alliance for Contraception in Cats and Dogs
http://www.acc-d.org/

Feral Cat Spay/Neuter Project
http://www.feralcatproject.org/ocm/ocm.aspx

Humane Alliance
Offers high-volume, high-quality spay/neuter training
www.humanealliance.org

Maddie's Fund
www.maddiesfund.org/

Petfinder.com
www.petfinder.com

PetSmart Charities
www.petsmartcharities.org

Spay USA
www.spayusa.org

CONTINUING EDUCATION OPPORTUNITIES

ASPCA/Maddie's Shelter Medicine Conference at Cornell University
California Animal Control Care Director's Association
www.animalcareconference.org/about.html

Humane Society of the United States
www.animalsheltering.org/training-events

Humane Society University
www.humanesocietyuniversity.org

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North American Veterinary Conference
www.navc.com/conference

Midwest Veterinary Conference
www.mvcinfo.org

Veterinary Information Network (VIN)
www.vin.com

Western Veterinary Conference
www.wvc.org

Webinars by ASPCApro.org, PetSmart Charities, and university shelter medicine programs

DISEASE CONTROL INFORMATION

American Heartworm Society
www.heartwormsociety.org

Centers for Disease Control
www.cdc.gov

Companion Animal Parasite Council
www.capcvet.org

LEGAL INFORMATION

Michigan State University College of Law
www.animallaw.info

International Institute for Animal Law
www.animallaw.com

International Animal-Law
www.animal-law.biz

Animal Legal Defense Fund
www.aldf.org

Drug Enforcement Administration (DEA) Regulations on Controlled Substances
www.deadiversion.usdoj.gov/21cfr/21usc/index.html

PAIN, QUALITY-OF-LIFE, AND BODY CONDITION ASSESSMENTS

bestfriendsvet.com/pdffiles/Pain3pgs.pdf

Colorado State University pain scales
www.ivapm.evetsites.net/refId,20471/refDownload.pml
www.ivapm.evetsites.net/refId,20467/refDownload.pml

Purina Body Condition Scoring
www.purina.com/dogs/health/bodycondition.aspx

Tufts Animal Care and Condition Scale
www.tufts.edu/vet/hoarding/pubs/tacc.pdf

Quality of Life Scale
www.pawspice.com/qualityoflifescale.html

RELEVANT TEXTBOOKS AND PUBLICATIONS

Ascione, F. (2008) *The International Handbook of Animal Abuse and Cruelty*, Purdue University Press, West Lafayette, Indiana.

Barr, C. and Bowman, D. (2006) *The 5-Minute Veterinary Consult Clinical Companion Canine and Feline Infectious Diseases and Parasitology*, Blackwell, Ames, Iowa.

Figley, C. and Roop, R. (2006) *Compassion Fatigue in the Animal-Care Community*, Humane Society Press, Washington, DC.

Greene, C. (ed) (2011) *Infectious Diseases of the Dog and Cat*, Saunders Elsevier, St. Louis, Missouri.

Maddie's Infection Control Manual. Accessible at www.cfsph.iastate.edu/Products/maddies-infection-control-manual-for-animal-shelters-resources.php

Merck, M. (2007) *Veterinary Forensics: Animal Cruelty Investigations*, Wiley Blackwell, Ames, Iowa.

Miller, L. and Hurley, K. (eds) (2009) *Infectious Disease Management in Animal Shelters*, Wiley Blackwell, Ames, Iowa.

Munro, R. and Munro, H. (2008) *Animal Abuse and Unlawful Killing: Forensic Veterinary Pathology*, W.B. Saunders, Oxford, UK.

Rhoades, R. (2002) *The Humane Society of the United States Euthanasia Training Manual*, Humane Society Press, Washington, DC.

Sinclair, L., Merck, M., and Lockwood, R. (2006) *Forensic Investigation of Animal Cruelty: A Guide for Veterinary and Law Enforcement Professionals*, Humane Society Press, Washington, DC.

VETERINARY COLLEGES WITH SHELTER MEDICINE PROGRAMS (AS OF 2012)

Colorado State University

Cornell University (www.sheltermedicine.vet.cornell.edu)

Cummings School of Veterinary Medicine at Tufts University

Iowa State University (http://www.maddiesfundisu.org/)

Louisiana State University

Mississippi State University

Ohio State University

Purdue University (www.vet.purdue.edu/vs./Maddies Fund)

University of California at Davis (www.sheltermedicine.com)

University of Florida (www.ufsheltermedicine.com)

University of Pennsylvania

University of Tennessee

University of Wisconsin

Oregon State University

VETERINARY ORGANIZATIONS

American Association of Equine Practitioners
www.aaep.org

American Association of Veterinary State Boards (AAVSB)
State board information
www.aavsb.org

American Animal Hospital Association (AAHA)
Pain assessments, shelter vaccination guidelines
www.aahanet.org

American Association of Feline Practitioners (AAFP)
Shelter vaccination and retro-testing guidelines
www.catvets.com

American Veterinary Medical Association (AVMA)
Euthanasia report, rabies compendium, companion animal care guidelines, etc.
www.avma.org

Association of Shelter Veterinarians (ASV)
Shelter medicine resources, employment opportunities, guidelines for standards of care in animal shelters, and spay/neuter resources
www.sheltervet.org

Humane Society Veterinary Medical Association
www.hsvma.org

International Veterinary Forensic Sciences Association
www.ivfsa.org/

OTHER

Microchip lookup
www.petmicrochiplookup.org/

Animal hoarding
www.vet.tufts.edu/hoarding

Animal Sheltering magazine
www.animalsheltering.org

ANIMAL BEHAVIOR RESOURCES

A trainer learns his or her craft through apprenticing, assisting in group classes, volunteering at animal shelters, attending seminars, and working with as many dogs as possible. While thousands of people call themselves trainers, this is an unlicensed profession in most states, so quality and methodology vary tremendously.

Canine trainers offer group classes, private lessons, or board-and-train sessions. All manner of canine etiquette and dog sports are taught in group classes. Private lessons are best for solving in-home problems or for obedience instruction when owners have erratic schedules. Board-and-train allows someone else to train the dog without owner supervision. For this to be effective, the caretakers must be brought up to speed on what the dog was taught and how, as well as how to reinforce it.

Applied animal behaviorists have an advanced degree in animal behavior and may also be certified by the Animal Behavior Society. They work with the client's veterinarian to rule out any physical causes for behavior problems, and treatment can include drug therapy. The field is well suited for solving severe fears and phobias, obsessive/compulsive disorders, and aggression.

Veterinary behaviorists are the newest members of the problem-solving triad, as the specialty just became available for board certification by the American Veterinary Medical Association's Behavior College in 1995. These professionals may perform the diagnostic tests needed to rule out physical sources for a problem behavior (or, more likely, refer you to your own veterinarian) and then recommend appropriate behavior modification techniques, coupled with nutritional and drug therapies, if needed. For more information, contact the following organizations.

American Veterinary Society of Animal Behavior
www.avsabonline.org

Animal Behavior Society
http://animalbehaviorsociety.org

Association of Pet Dog Trainers
www.apdt.com

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Appendix 2
Association of Shelter Veterinarians (ASV) Guidelines for Standards of Care in Animal Shelters

The Association of Shelter Veterinarians' Guidelines for Standards of Care in Animal Shelters was written by a group of shelter medicine experts to improve the quality of life and care of animals in shelters. A task force of 14 veterinarians with experience both in the animal sheltering field and in academia was assembled in 2008 to review the veterinary literature for preexisting guidelines and standards of care for dogs and cats being held in confinement in kennels, catteries, and laboratories. After two years of research and writing, the final document was released in December 2010, recognizing that it was the first veterinary guidelines document to deal exclusively with the care of animals in shelters and that it would have to be continually revised and updated as new questions and answers were uncovered.

The guidelines attempt to balance animal welfare science with practical recommendations that meet the needs of animals, recognizing that although shelters have different missions and resources, animal needs do not change. The guidelines are based upon the Five Freedoms proposed for farm animals by the Brambell Commission in the United Kingdom in 1965. The Five Freedoms are freedom from hunger and thirst, freedom from discomfort, freedom from pain, injury or disease, freedom to express normal behavior, and freedom from fear and distress (Farm Animal Welfare Council, 2009). The document does not provide shelters with operational guidelines for providing the Five Freedoms. The decision is left to the individual shelter on how to implement the recommendations based on their mission and resources.

The 65-page document has been endorsed by the major animal welfare organizations in a foreword, including the National Federation of Humane Societies (NFHS), the Society of Animal Welfare Administrators (SAWA), the National Animal Control Association (NACA), the American Society for the Prevention of Cruelty to Animals (ASPCA), and the Humane Society of the United States (HSUS). It is divided into 12 sections and also includes an introduction, suggestions on how to use the document, glossary, conclusions, and an extensive reference list. Each section has a series of recommendations regarding "unacceptable" practices that should be corrected as soon as possible and practices that the authors believe "should" or "must" be implemented in order to provide a humane environment and care. Practices that are identified as "ideal" are intended to enhance the care of animals but may not be possible in all settings.

The twelve sections include

1. Management and record keeping
2. Facility design and environment
3. Population management
4. Sanitation
5. Medical health and physical well-being
6. Behavioral health and mental well-being
7. Group housing
8. Animal handling
9. Euthanasia
10. Spaying and neutering
11. Animal transport
12. Public health

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The guidelines are intended to be used as a positive tool for shelters and communities to assess and improve the care provided for shelter animals, enabling them to determine the best use of their resources to optimize animal welfare and prevent animal suffering. The ASV Guidelines for Standards of Care in Animal Shelters can be accessed at http://www.sheltervet.org/displaycommon.cfm?an=1&subarticlenbr=29

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REFERENCES

Farm Animal Welfare Council. Five Freedoms. (2009) Available online at http://www.fawc.org.uk/freedoms.htm (accessed August 18 2012).

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