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Abstract

Like other companion animals, pet pigs require appropriate diets, housing, husbandry, and preventive care as core components of their care. This article provides a general overview of husbandry practices, common medical disorders, recommendations on when to refer, and a formulary for pet pigs. Many of the drugs referenced in this article are not approved for use in pigs, and knowledge of extra-label drug use regulations is imperative. Contacting the Food Animal Residue Avoidance Databank for withdrawal interval advice is highly recommended when using drugs in this way.

CONTINUING EDUCATION

PREVENTIVE MEDICINE

The General Practitioner's Guide to Pet Pigs

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Over the past several decades, the number of pet pigs in North America has grown exponentially; some estimate the number of pet pigs has increased to more than 1 million in recent years.[1] Nonetheless, there remains an undesirable disparity between the popularity of pet pigs and availability of educational materials and peer-reviewed literature on pet pigs. As pigs continue to rise in popularity as companion and rescue animals, veterinary comprehension of the nuances of their lifestyle, housing, diet, and client expectations is essential. Unfortunately, lack of basic husbandry and preventive veterinary care often results in a pet pig undergoing its initial veterinary evaluation in an emergency.

One of the main features that distinguishes pet pigs from production swine is that they are not intended for human consumption. Veterinarians who treat pet pigs are challenged with providing veterinary care comparable to small animal medicine while being compliant with extra-label drug use (ELDU) in a major food-producing species. Many of the U.S. Food and Drug Administration (FDA)–approved medications for swine, and those not FDA approved for swine, are used in an extra-label manner in pet pigs (**TABLE 1**). The veterinarian must provide the client with a meat withdrawal time for any medication used; the Food Animal Residue Avoidance Databank (FARAD; **farad.org**) is the best resource for advice on withdrawal intervals following ELDU.

Take-Home Points

- Clinical examination of pet pigs is inherently challenging and may require chemical restraint.
- Obesity is a common problem and can lead to other comorbidities, ultimately reducing a pig's health and lifespan.
- Gastrointestinal issues in pet pigs are a common reason why owners seek veterinary care; the most common causes are obstipation and foreign body ingestion.
- Neoplastic conditions, particularly of the reproductive and gastrointestinal systems, are increasing in geriatric pet pig populations.
- Neurologic diseases are common, and diagnosis often requires advanced diagnostic imaging (e.g., magnetic resonance imaging).
- All swine, including pet pigs, are considered a major food-producing species by the U.S. Food and Drug Administration (FDA).
- Although there are many FDA-approved drugs for use in commercial swine, there are few approved for the conditions in pet pigs described in this article; thus, extra-label drug use is often necessary.

TABLE 1 Formulary for Commonly Used Drugs in Pet Pigs

DRUG	FDA-APPROVED FOR SWINE	INDICATION	DOSAGE
ANTIMICROBIALS			
Ceftiofur sodium (Naxcel)[a]	Y	• Swine respiratory disease complex	• 3–5 mg/kg IM q24h for 3 consecutive days
Ceftiofur crystalline-free acid (Excede)[a]	Y	• Swine respiratory disease complex	• 5 mg/kg IM in postauricular region of neck
Penicillin G procaine[2]	Y	• *Erysipelothrix rhusiopathiae*	• 33 000–66 000 units/kg IM q24h
Oxytetracycline injection 200 (Liquamycin LA-200)	Y	• Colibacillosis • Pneumonia caused by *Pasteurella multocida* • Leptospirosis caused by *Leptospira pomona*	• **Treatment:** 9 mg/lb IM in neck q24h • **Control:** 3–5 mg/lb IM in neck q24h • **Note:** Drug label uses lbs for weight.
Florfenicol (Nuflor)	Y	• Swine respiratory disease complex	• 15 mg/kg IM q48h in neck, not to exceed 2 doses
Enrofloxacin (Baytril)[b]	Y	• Swine respiratory disease complex • Colibacillosis	• 7.5 mg/kg IM or SC in postauricular region of neck, single dose
Tulathromycin (Draxxin)	Y	• Swine respiratory disease complex	• 2.5 mg/kg IM in postauricular region of neck, single dose
Gentamicin sulfate (Gentamicin Piglet Injection)	Y	• Colibacillosis (in piglets <3 days of age)	• 5 mg IM per piglet, single injection
Amoxicillin/clavulanate potassium (Clavamox)[3]	N	• N/A	• 20 mg/kg PO q8–12h
NONSTEROIDAL ANTI-INFLAMMATORY DRUGS			
Flunixin meglumine (Banamine)	Y	• Pyrexia associated with respiratory disease	• 2.2 mg/kg IM in neck, single injection
Meloxicam[a,4,5]	N	• N/A	• 0.1–0.4 mg/kg PO or IM q24h
Maropitant (Cerenia)[6]	N	• N/A	• 1 mg/kg IM • 2 mg/kg PO
Omeprazole[7]	N	• N/A	• 0.4 mg/kg PO q24h
Ondansetron[8,9]	N	• N/A	• 0.08–0.1 mg/kg PO, SC, or IV
FLUIDS			
Intravenous crystalloid (constant-rate infusion)[10,11]			• 1–6 mL/kg/h (median, 2.5–3 mL/kg/h)
Fluid per rectum (constant-rate infusion)[10,11]			• 3–15 mL/kg/h (median, 7–11 mL/kg/h)
CHEMICAL RESTRAINT			
Butorphanol[12]	N	• N/A	• 0.2–0.3 mg/kg IM
Midazolam[12]	N	• N/A	• 0.2–0.3 mg/kg IM or IN
Dexmedetomidine (Dexdomitor)[13]	N	• N/A	• 0.01–0.02 mg/kg IM
Atipamezole hydrochloride (Antisedan)[14]	N	• N/A	• 240 µg/kg IM

FARAD = Food Animal Residue Avoidance Databank; FDA = Food and Drug Administration; N = no; N/A = not applicable; Y = yes.
[a]FARAD, Group II: drugs with restricted extra-label uses in food-producing animal species.
[b]FARAD, Group I: drugs with no allowable extra-label uses in any food-producing animal species.

	WITHDRAWAL TIME
	4 days when used per label instruction
	14 days when used per label instruction
	Consult FARAD (dose is extra label)
	28 days when used per label instruction
	11 days when used per label instruction
	5 days when used per label instruction
	5 days when used per label instruction
	40 days when used per label instruction
	Consult FARAD
	12 days when used per label instruction
	Consult FARAD
	Consult FARAD
	Consult FARAD
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	Consult FARAD

HUSBANDRY PRACTICES

Nutrition

Appropriate and adequate nutrition plays a significant role in a pig's long-term health. Daily food intake is typically a combination of commercial pet pig feed, vegetables, fruits, and grass/hay. Commercial feeds are formulated for specific life stages and activity levels to maintain adequate nutrition throughout a pig's life.

Commercial feed formulations for production swine have a higher protein and fat content than pet pig feeds and are intended for rapid growth and weight gain; specific formulations for pregnant and lactating sows are also available. These types of rations are inappropriate for pet pigs and will contribute to excessive weight gain. Commercial pet pig feeds are formulated with lower protein and fat content and higher fiber content. Pet pigs should consume 1% to 2.5% of their ideal body weight daily, but this percentage can vary significantly according to the animal's body composition.[15]

Appropriate water consumption can help prevent relatively common conditions like urolithiasis and salt poisoning[15]; however, pigs have unique behaviors that may inadvertently lead to reduced water intake. Pigs may create messy environments by moving back and forth from their food to water containers, which may provoke an owner to restrict water. In addition, pigs may upturn their water containers to soak and play; heavy, no-tip bowls may prevent this behavior. Water used for soaking and playing should be kept separately from drinking water.

Vaccination

Although there is not a published consensus of recommended vaccines for pet pigs, suggested vaccines include rabies, erysipelas, leptospirosis, and tetanus. Vaccine recommendations have been published for production swine and can be used as guidelines for pet pigs; however, these practices of commercial swine operations will likely vary from appropriate vaccination practices for pet pigs.[16] Vaccine decisions should be based on a pig's age, environment, and geographic location; vaccination status of the sow; future breeding potential; and other individual risk factors. Strict adherence to the manufacturer's recommendations regarding target tissue, injection site, and meat withdrawal time is imperative.

Dental Care and Tusk Trimming

To perform a thorough oral examination, sedation or anesthesia is required. The same prophylactic dental care that companion animals receive is appropriate for most pet pigs. Aging increases the risk for dental disease in pigs. Also, as pigs age, they grow tusks. Excessive tusk growth can interfere with normal dental alignment and mastication. Tusks can also pose safety risks to other pets, family members, and the pig itself if the tusks get caught in fencing or between objects. Tusks can be surgically removed, but they are generally trimmed, usually with Gigli wire, throughout a pig's life to maintain a desirable length.

MANAGEMENT OF COMMON HEALTH CHALLENGES

Clinical Examination

Pet pigs can be difficult to handle; thus, performing a thorough clinical examination is notoriously challenging. Restraint techniques commonly used in production swine, such as snares, are often not well-suited for pet pigs. In addition, many of these restraint techniques are bothersome to clients. Chemical restraint is often necessary to facilitate examination, venipuncture, collection of diagnostic samples and images, and short procedures. (Heavy sedation may be necessary for pet pigs to tolerate handling.) Because venous access is limited in the conscious, nonsedated pig, administration of an intramuscular sedative may be considered. Anesthesia complications such as cardiopulmonary arrest, apnea, prolonged sedation, and unpredictable recovery may occur, especially in patients with comorbidities.

A thorough review of restraint, venipuncture, and catheterization techniques has been recently published and may be referenced for additional information.[17]

Tusks can be surgically removed, but they are generally trimmed, usually with Gigli wire, throughout a pig's life to maintain a desirable length.

Obesity

Phenotypes vary among breeds, yet a pig at a healthy weight should generally have a visible waistline when viewed from the dorsum and an abdomen that does not contact the ground. In an obese pig, excess adipose deposits may surround the upper eyelids and brows, leading to entropion, or "fat blindness."

A variety of factors can lead to obesity, including, but not limited to, improper nutrition, lack of exercise, and preexisting comorbidities. Maintaining a healthy weight and body condition is easier than encouraging weight loss and achieving a healthy body condition in an already obese pig. Similar to obesity in small animals, weight loss can be achieved by improving nutrition (quantity and quality) and increasing exercise.

Indoor housing may inadvertently restrict a pig's natural tendency to root. Instead of searching and rooting for food, a pet pig is often provided small daily meals, thus minimizing its daily activity, and possibly contributing to obesity.[15] An owner can increase a pig's activity level by scattering feed to encourage natural rooting and grazing behavior. Alternatively, "slow feeder" toys may be used to increase activity levels during feeding.

There are no peer-reviewed studies investigating the negative effects of obesity on the quality of life or health of pet pigs, but comparable correlations can be extrapolated from other species (e.g., decreased life span, osteoarthritis, heart disease, kidney failure).[15]

Gastrointestinal Parasitism

Gastrointestinal parasites are common in swine but thought to be of minimal issue for pet pigs. Pigs housed in high-density areas or with frequent exposure to feces are at an increased risk for infection. Common gastrointestinal parasites are large roundworm (*Ascaris suum*), nodular worm (*Oesophagostomum* species), and whipworm (*Trichuris suis*).[18] There are many commercially available anthelminthic products that can be administered via oral, injectable, or topical routes. Parasite control plans should be made according to environmental and individual risk factors. Healthy pigs should be dewormed at an early age, typically beginning around 8 to 12 weeks of age. Components of a preventive healthcare plan include regular fecal egg counts using the modified McMaster technique and anthelmintic treatment as needed.

Gastrointestinal Obstructions

Gastrointestinal obstructions are common in pet pigs, most often resulting from an accumulation of ingesta (obstipation) or ingestion of a foreign object/material. Clinical signs often include a combination of anorexia, lack of fecal production, lethargy, abdominal pain/colic, bruxism, abdominal distension, and nausea as indicated by vomiting or hypersalivation. Diagnostic imaging modalities used to evaluate gastrointestinal obstructions are radiography, ultrasonography, and computed tomography. In general, radiographic evidence of a foreign body in a small animal is gastric distension, whereas in pigs, constipation and distension of the large colon and spiral colon are more typical.[10,11]

Clinical examination and clinicopathologic findings for pigs with gastrointestinal obstructions, and subsequent loss of gastrointestinal wall integrity, may indicate systemic inflammation (e.g., hyperthermia/fever, tachycardia, tachypnea, abnormal leukogram [leukopenia or leukocytosis], neutropenia or neutrophilia, morphologic toxic changes of neutrophils, hyperfibrinogenemia). Plasma biochemistry abnormalities may include hypoglycemia or hyperglycemia, hypochloremia, hypokalemia, hyperglobulinemia, and hypoalbuminemia.[10,11]

If illness is of short duration, the patient shows no systemic decline, and the obstruction is mild, these cases can be successfully managed at home by the owner or veterinarian. Indications for referral include:

- failure to sufficiently respond within 24 to 48 hours to supportive care at home and/or at the clinic
- clinical deterioration at any time during treatment
- evidence of severe dehydration, systemic inflammation, electrolyte impairment, or organ dysfunction
- preexisting conditions or comorbidities (e.g., obesity, pneumonia)

Recently published retrospective literature on obstipation and foreign body ingestion in pet pigs indicates that the median time since last defecation before going to a referral hospital for treatment is 48 to 60 hours.[10,11] Successful management of such cases can be challenging and is influenced by a variety of factors including causative lesion, systemic clinical condition, preexisting comorbidities, clinician expertise, client expectations and finances, and patient amenability to treatment.

The mainstay of treatment is fluid therapy, not only to correct any dehydration and electrolyte imbalances but also to hydrate ingesta (in cases of obstipation) and encourage gastrointestinal motility. Fluids may be administered orally, intravenously, rectally, or by a combination of these routes. Due to the difficulty of placing and maintaining a nasogastric tube, oral fluid therapy can be challenging. Thus, oral fluid intake is often limited to what a pig will voluntarily consume. Water, fruit juice, flavored electrolyte fluids, and noncaffeinated carbonated beverages can be given orally to facilitate hydration of ingesta and break down gastric impactions.[10,11] Intravenous catheterization and fluid therapy can be very beneficial, but catheterization and catheter maintenance can be challenging, therefore limiting the feasibility of fluid replacement by this route. Fluids are often administered to pigs rectally when other routes are not feasible. Rectal administration can be inexpensive and is often very well tolerated. The exact dose for pet pigs is unknown but can be extrapolated from other species and ranges from 3 to 15 mL/kg/h.[10,11,19]

Due to the difficulty of placing and maintaining a nasogastric tube, oral fluid therapy can be challenging. Thus, oral fluid intake is often limited to what a pig will voluntarily consume.

In humans, small animals, and equids, gastrointestinal stasis can cause systemic inflammation and infection from the translocation of intestinal bacteria secondary to compromised intestinal wall. Because of these clinical signs in other species, many clinicians choose to empirically treat gastrointestinal stasis in pigs with systemic antimicrobials. Recent retrospective studies note that antibiotics were given to most pigs with gastrointestinal stasis, selected by clinicians and justified by presence of leukogram abnormalities, fever, or other comorbidities such as pneumonia or pyometra.[10,11] Although several FDA-approved antimicrobial products are labeled for swine dysentery, no antimicrobials are labeled for obstipation or foreign bodies in pigs. Judicious ELDU of antimicrobials is key. Nonsteroidal anti-inflammatory drugs (NSAIDs) may be indicated to combat inflammation and produce analgesia. Currently, no NSAIDs are FDA labeled for use in swine for anti-inflammatory or analgesic

purposes. The use of NSAIDs in pigs may cause adverse symptoms similar to those in other species (e.g., vomiting, diarrhea, gastrointestinal ulcers, organ dysfunction). Additional medications that may be administered to pigs with gastrointestinal obstruction include an antiemetic, antinausea, proton pump inhibitor, and gastroprotectant, all of which are used off label.

For patients with feed impaction, an exploratory laparotomy may entail an intraluminal injection of saline and manual reduction, enterotomy, and/or resection and anastomosis.[10]

For patients suspected of having a foreign body or feed impaction or failing to respond to medical treatment, an exploratory laparotomy may be indicated. For patients with feed impaction, an exploratory laparotomy may entail an intraluminal injection of saline and manual reduction, enterotomy, and/or resection and anastomosis.[10] Possible complications of a gastrointestinal foreign body are gastrointestinal rupture and peritonitis.[11]

After medical or surgical treatment, a pig's appetite can vary. Depending on the lesion and necessary treatment, appetite can take more than 72 hours to return, typically after the passage of feces. Pigs that fail to return to normal fecal production in a timely manner are more likely to not survive.

The prognosis for gastrointestinal obstruction is fair to good. Treatment time from admission to discharge is dictated by the individual case, ranging from 1 to 8 days.[10,11] When a specific cause of obstipation cannot be identified, prevention of additional episodes involves assessing the pig's diet, eating practices, fluid intake, and exercise/activity.[10]

Neoplasia

Because veterinary care continues to advance and pigs' lifespans subsequently extend, neoplasia has become increasingly more prevalent, especially in geriatric pigs. As in other species, neoplastic conditions can be benign, malignant, locally invasive, or multiple and simultaneous.

The most common neoplastic conditions originate from the gastrointestinal system or reproductive tract (in pigs of both sexes). Retrospective studies frequently identify hepatic and intestinal (gastric, small intestinal, and colonic) carcinomas. In pet pigs, genital tract tumors most commonly involve the uterus or ovary. Many smooth muscle tumors of female pet pigs are locally invasive rather than malignant, metastasizing neoplasms.[20] Neoplastic and inflammatory conditions of the female reproductive tract seem to be more common in pigs older than 6 years of age. A complete ovariohysterectomy should be considered for pet pigs that are not intended for breeding. Detection of a neoplastic lesion at the time of ovariohysterectomy may decrease the likelihood the pig will survive.[21]

Common clinical signs of neoplasia are loss of appetite, vomiting, constipation, and abdominal distension.[21-24] A diagnosis can be made by surgical biopsy and histopathology, diagnostic imaging (radiography and/or computed tomography), or necropsy. Retrospective studies identify the median age at diagnosis to be from 11.3 through 16.6 years.[20,22]

Unfortunately, successful treatment of neoplastic conditions in pet pigs lags behind that of traditional companion animals. Immunohistochemistry can be used to guide treatment and determine prognosis. Wide-margin excision of some tumor types can result in positive outcomes.[24] For 1 female spayed pet pig with diffuse cutaneous squamous cell carcinoma, electrochemotherapy was successfully used.[25] Consideration of chemotherapy should include written consent from the owner and be stated in the medical record that the pig will never enter the food chain.

Neurologic Disorders

Pigs may exhibit a variety of neurologic deficits involving the brain and/or spinal cord. A relatively common neurologic sign is an inability to rise, which can be acute or chronic and progressive or nonprogressive. Affected pigs can also show clinical signs of ataxia, paresis (paraparesis or tetraparesis), musculoskeletal disease, and/or pain. A complete neurologic examination is often limited by patient compliance, yet it is imperative that all feasible

components of a neurologic examination be performed to localize the lesion.

Radiography may facilitate the diagnosis of some conditions; however, advanced diagnostic imaging, such as computed tomography and magnetic resonance imaging (MRI), is usually necessary to accurately diagnose a neurologic lesion. MRI is the imaging modality of choice for diagnosing most neurologic conditions in human and veterinary patients.

Cerebrospinal fluid analysis is a valuable diagnostic that should be part of a neurologic disorder workup. Normal cerebrospinal fluid parameters published for production swine can be extrapolated to pet pigs.[26] When the patient has an appropriate body condition in which anatomic landmarks can be palpated, lumbosacral puncture of the subarachnoid space is easily accomplished. Atlanto-occipital puncture is another option, especially if the patient's body condition precludes accurate lumbosacral palpation.[27] Atlanto-occipital puncture may provide a more representative sample of a cranial neurologic lesion but increases risk for spinal cord puncture.

A variety of myelopathic lesions have been diagnosed in pigs (e.g., vascular conditions such as fibrocartilaginous embolic myelopathy and embolism of nonfibrocartilage material, acute noncompressive nucleus pulposus extrusion, traumatic intervertebral disk extrusion, compressive intervertebral disk extrusion, infection, trauma, neoplasia, non-neoplastic lesions [abscess, granuloma, hematoma, cyst]).[28,29] Referral is indicated for most of these patients to perform advanced diagnostics, which ultimately determine treatment recommendations and provide information on prognosis.

Vestibular disease is not uncommon and is characterized by head tilt, head turn, circling, turning, falling to one side, and nystagmus. Conditions that cause vestibular disease can originate from the peripheral (bacterial otitis media and interna) or central (bacterial meningitis) nervous system. Bacterial meningitis can result in a variety of clinical signs, including lethargy, fever, anorexia, incoordination, unusual posture, cervical stiffness, head pressing, reluctance to stand, and recumbency. A diagnosis of bacterial meningitis is supported by cerebrospinal fluid cytology and culture, which may show *Streptococcus suis*, an emerging zoonotic pathogen.[30,31] Empiric treatment with a broad-spectrum antimicrobial that penetrates the central nervous system is often initiated, but antimicrobial susceptibility testing should guide treatment.

Salt toxicosis can occur in pigs due to excess salt ingestion or water deprivation. Most clients feed a commercially available ration formulated for pet pigs, which makes excessive salt ingestion unlikely. A history of water deprivation followed by unrestricted water access is often responsible for salt toxicity; this may occur when a pig inadvertently dumps over its water bowl and then rapidly consumes free-choice water. Clinical signs associated with salt toxicosis include lethargy, blindness, head pressing, recumbency, and/or seizures. Diagnosis is supported by hypernatremia and/or high sodium in cerebrospinal fluid analysis. The objective of treatment is a gradual normalization of peripheral sodium concentration, which can be particularly challenging due to difficulties acquiring venous access. The time frame in which this normalization is done is dependent on the chronicity of the condition.

A history of water deprivation followed by unrestricted water access is often responsible for salt toxicity; this may occur when a pig inadvertently dumps over its water bowl and then rapidly consumes free-choice water.

SUMMARY

Pet pigs are classified as a major food animal species and share many physiologic similarities to their counterparts, production swine. Regardless of the pathology, pet pigs often display nonspecific clinical signs (e.g., lethargy, anorexia, reduced fecal output) that precipitate emergency veterinary evaluation. ELDU is necessary in many instances, and attention must be given to withdrawal times. The current breadth of pet pig literature is lacking; thus, extrapolation from commercial swine, companion animals, and human publications is often necessary. The increasing popularity of pet pigs as companion animals makes veterinary treatment of this population

unique and evolving. Conscientious husbandry practices and veterinary knowledge are imperative to provide pet pigs with an optimal level of care. TVP

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CONTINUING EDUCATION

The General Practitioner's Guide to Pet Pigs

TOPIC OVERVIEW

This article provides a general overview of husbandry practices, common medical disorders, recommendations on when to refer, and a formulary for pet pigs. Many of the drugs commonly used in pet pigs are not approved for use in pigs, and knowledge of extra-label drug use regulations is imperative.

LEARNING OBJECTIVES

After reading this article, general practitioners should be able to educate clients on husbandry best practices, recognize and treat common health challenges, and implement use of extra-label drugs as well as advise the client on appropriate withdrawal times.

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1. **_____ is a common clinical sign of gastrointestinal obstruction in nonsurviving pigs.**
   a. Failure of return of appetite
   b. Failure of normalized bloodwork
   c. Failure of return to drinking water
   d. Failure to produce feces

2. **Which of the following drugs is prohibited for extra-label drug use in pigs?**
   a. Enrofloxacin
   b. Ceftiofur sodium
   c. Florfenicol
   d. Oxytetracycline

3. **Which of the following is a potential indication for antimicrobial use in a pet pig with gastrointestinal obstruction or foreign body?**
   a. Azotemia
   b. Neutropenia
   c. Anemia
   d. Hypokalemia

4. **Which of the following are consistent with typical commercial pet pig feed formulations (compared with those indicated for commercial swine)?**
   a. High protein
   b. High fiber
   c. High fat
   d. All of the above

5. **Which clinical sign often accompanies the diagnosis of a neoplastic condition in pet pigs?**
   a. Increased appetite
   b. Abdominal distension
   c. Lack of fecal output
   d. Diarrhea

6. **_____ should be included in a neurologic disease workup.**
   a. Computed tomography
   b. Magnetic resonance imaging
   c. Cerebrospinal fluid analysis
   d. Electroencephalogram

7. **Which of the following drugs can be used (extra label) to reverse sedation in pigs?**
   a. Dexmedetomidine
   b. Xylazine
   c. Atipamezole
   d. Butorphanol

8. **_____ would *not* be considered an appropriate differential diagnosis for seizures in pet pigs.**
   a. Bacterial meningitis
   b. Salt toxicity
   c. Noncompressive nucleus pulposus extrusion
   d. Trauma

9. **Which of the following is considered a primary pathogen of pet pigs that is also an emerging zoonotic pathogen?**
   a. *Streptococcus zooepidemicus*
   b. *Streptococcus suis*
   c. *Actinobacillus pleuropneumoniae*
   d. *Erysipelothrix rhusiopathiae*

10. **Which of the following is considered a common anatomic location of neoplasia in pet pigs?**
    a. Reproductive tract
    b. Bladder
    c. Oral cavity
    d. Bone marrow