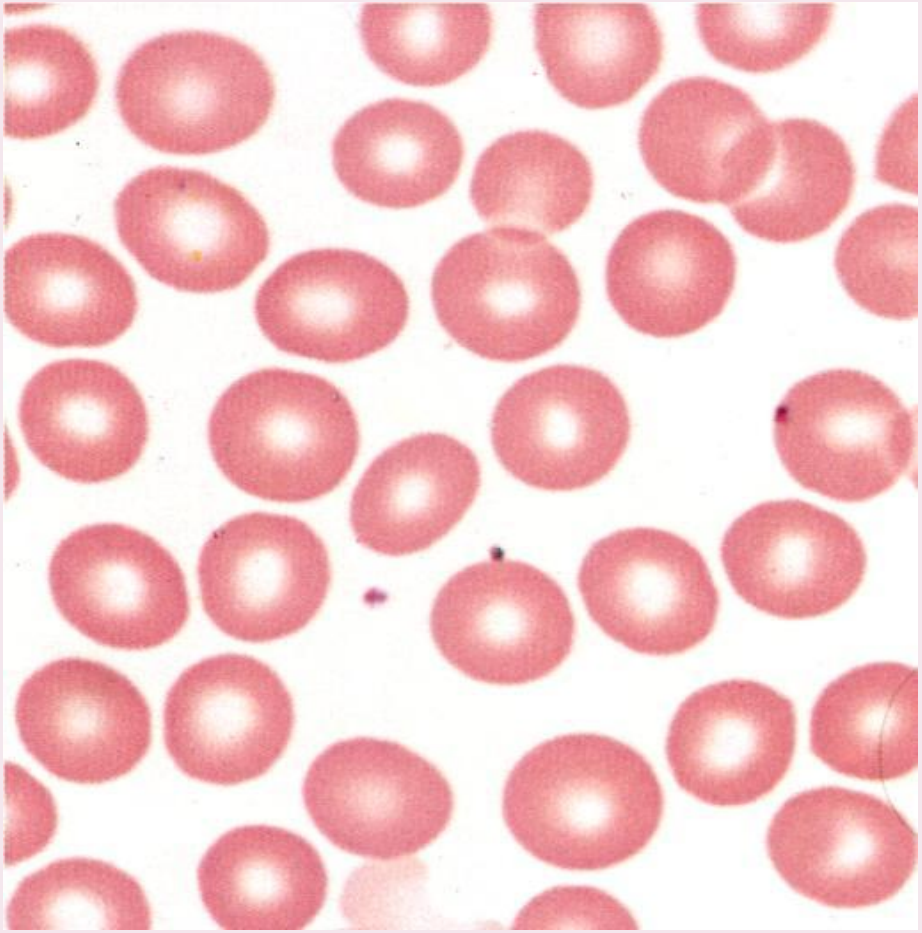
HEMATOLOGY ATLAS

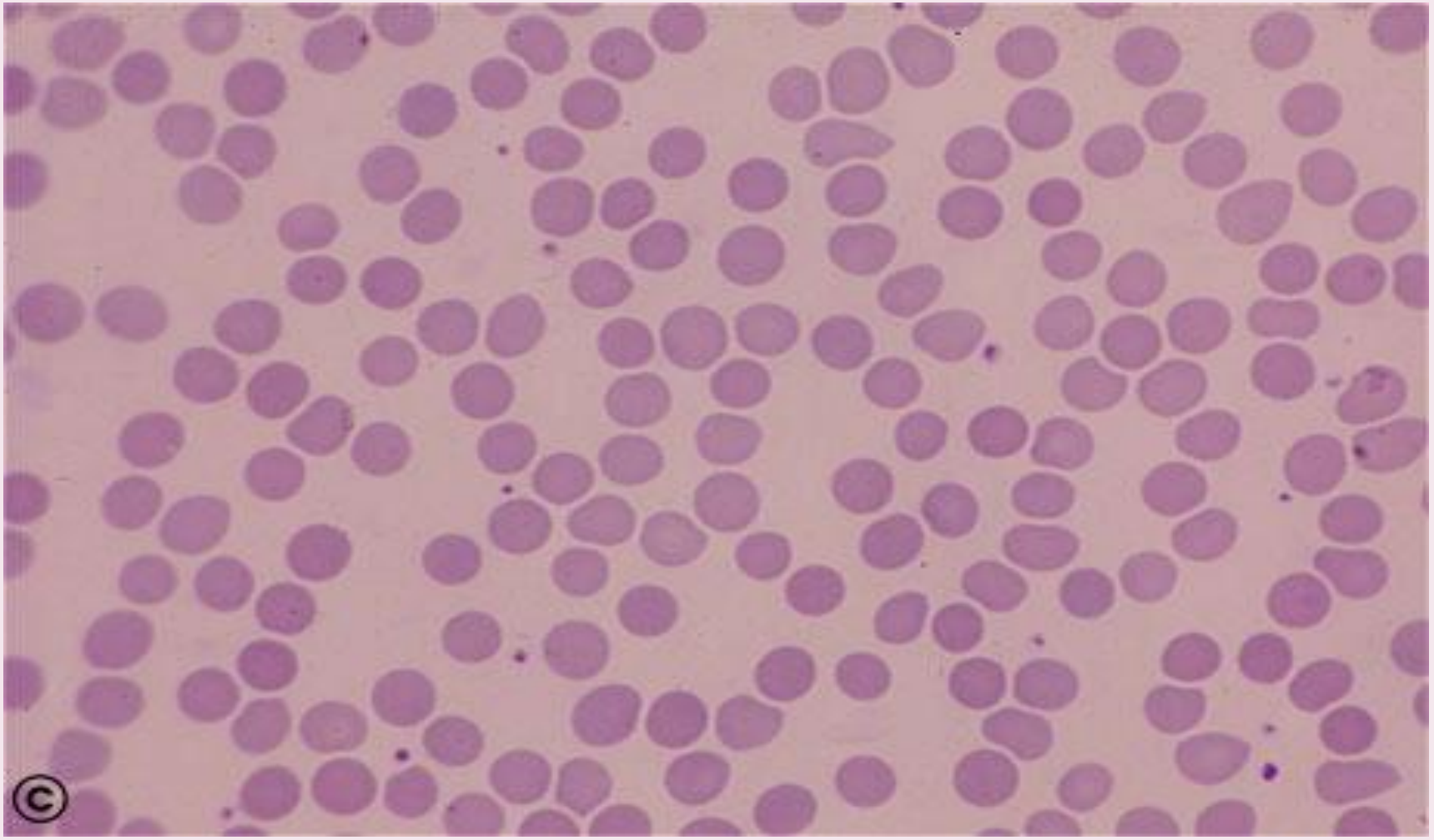
DR.BABAK SADRNOURI

December 2011

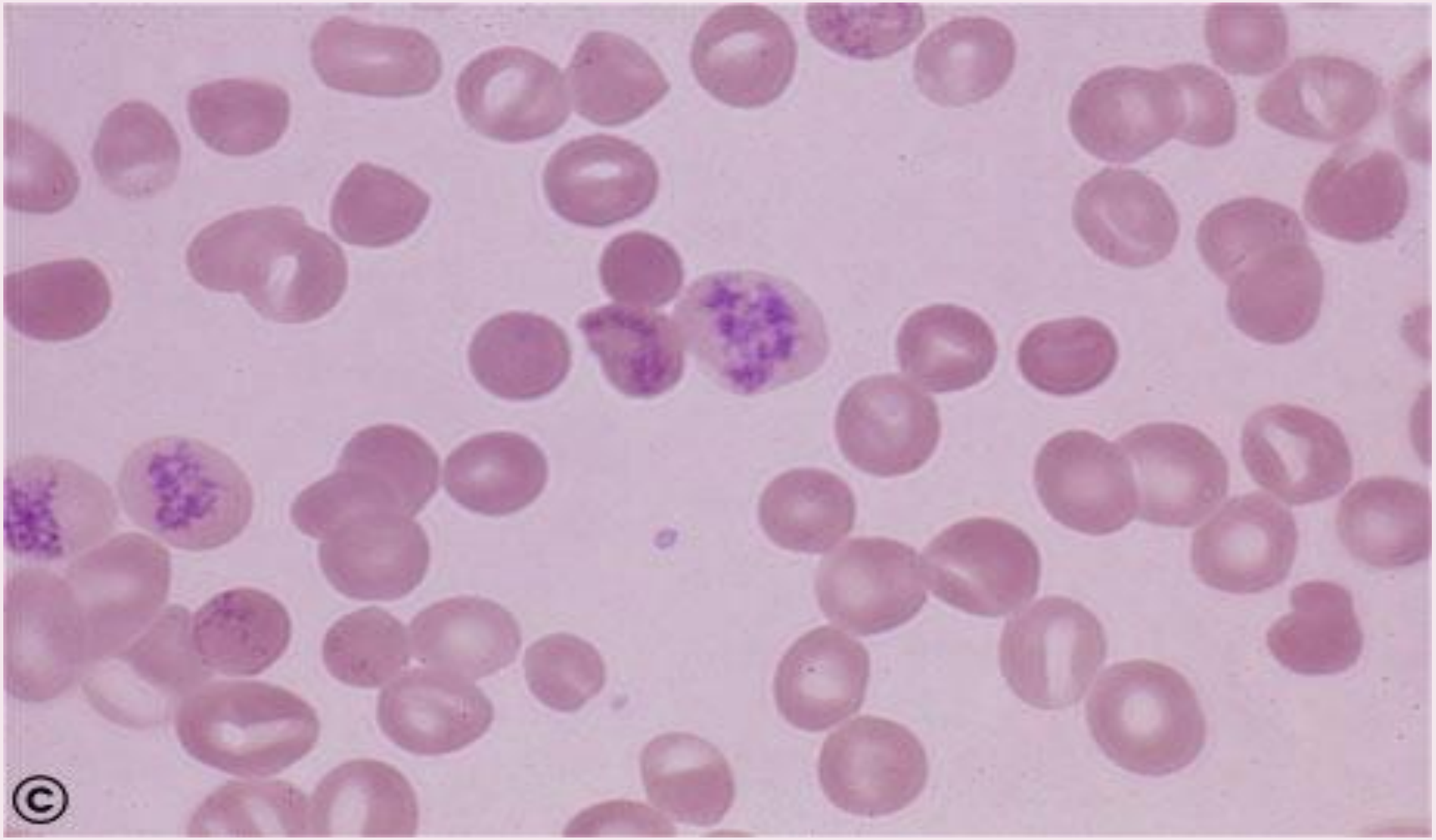
Normal RBC



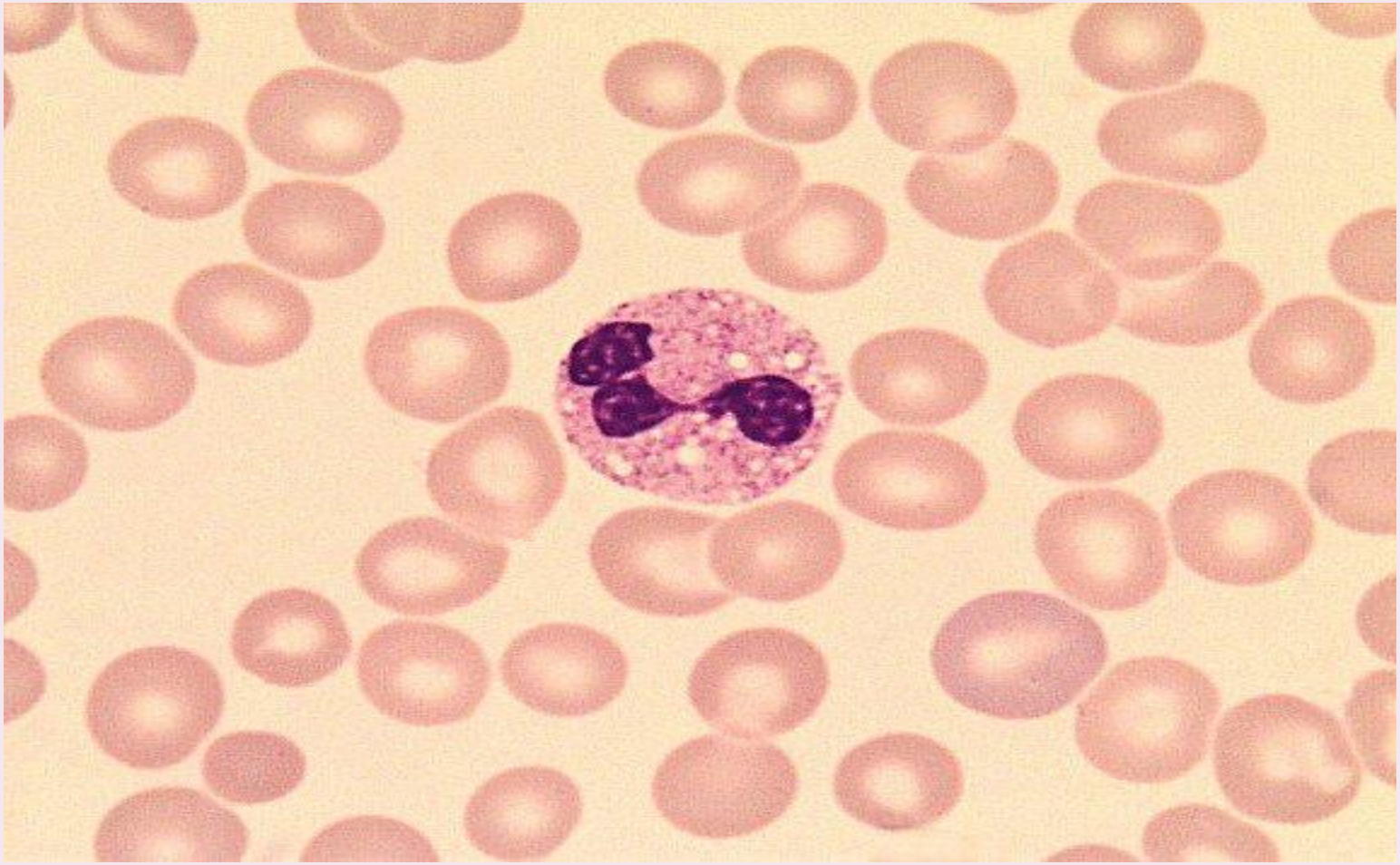
ERYTHROCYTES



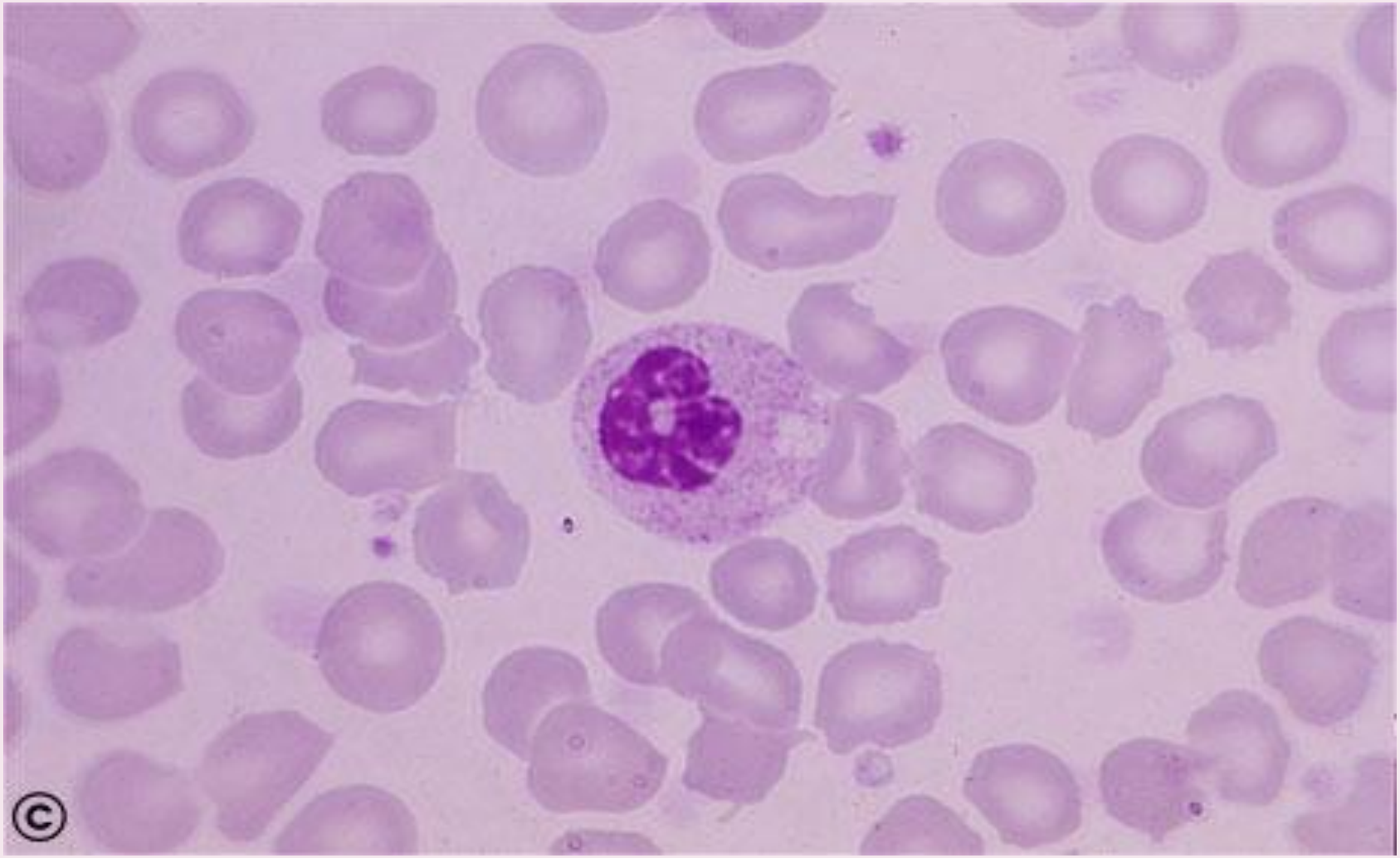
RETICULOCYTES

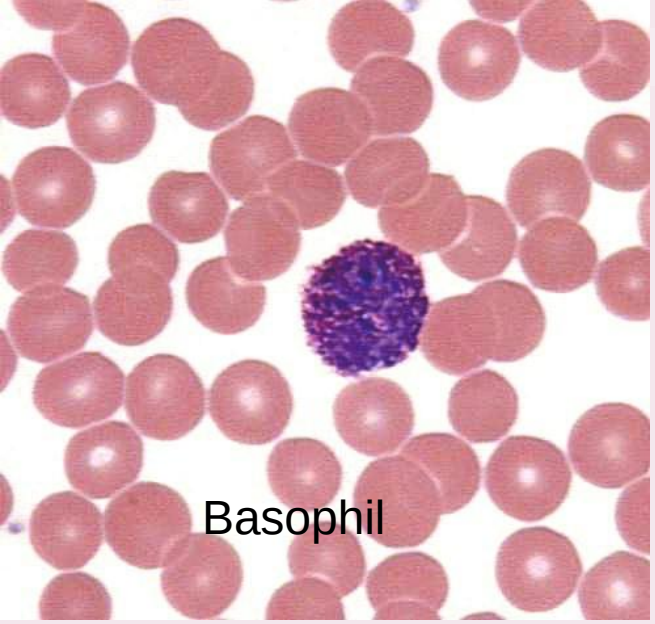


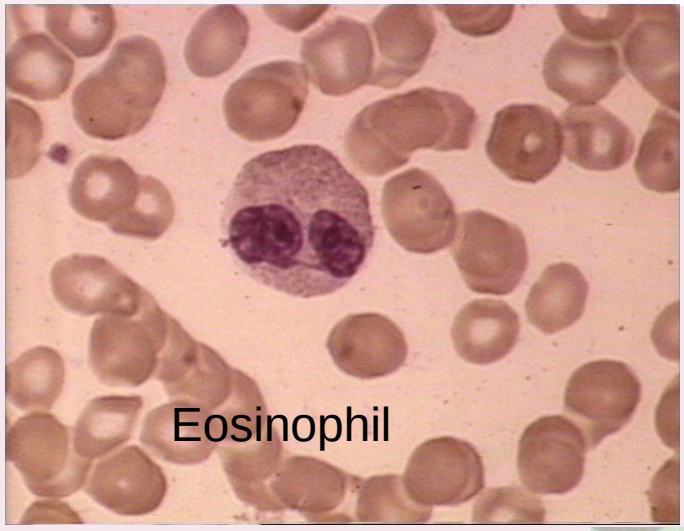
NEUTROPHIL

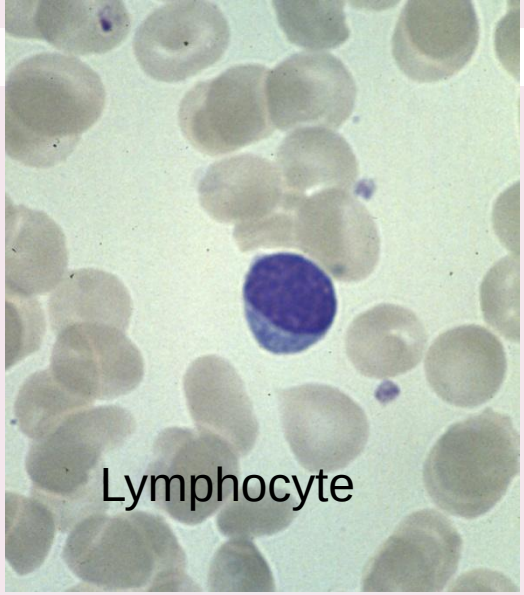


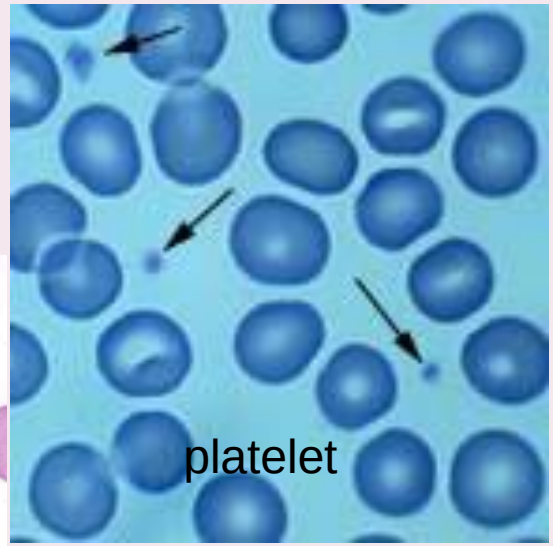
NEUTROPHIL BAND

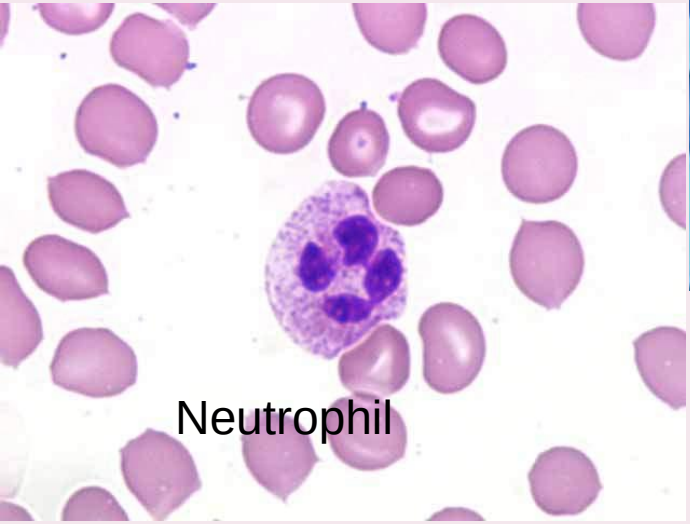



Basophil


Eosinophil

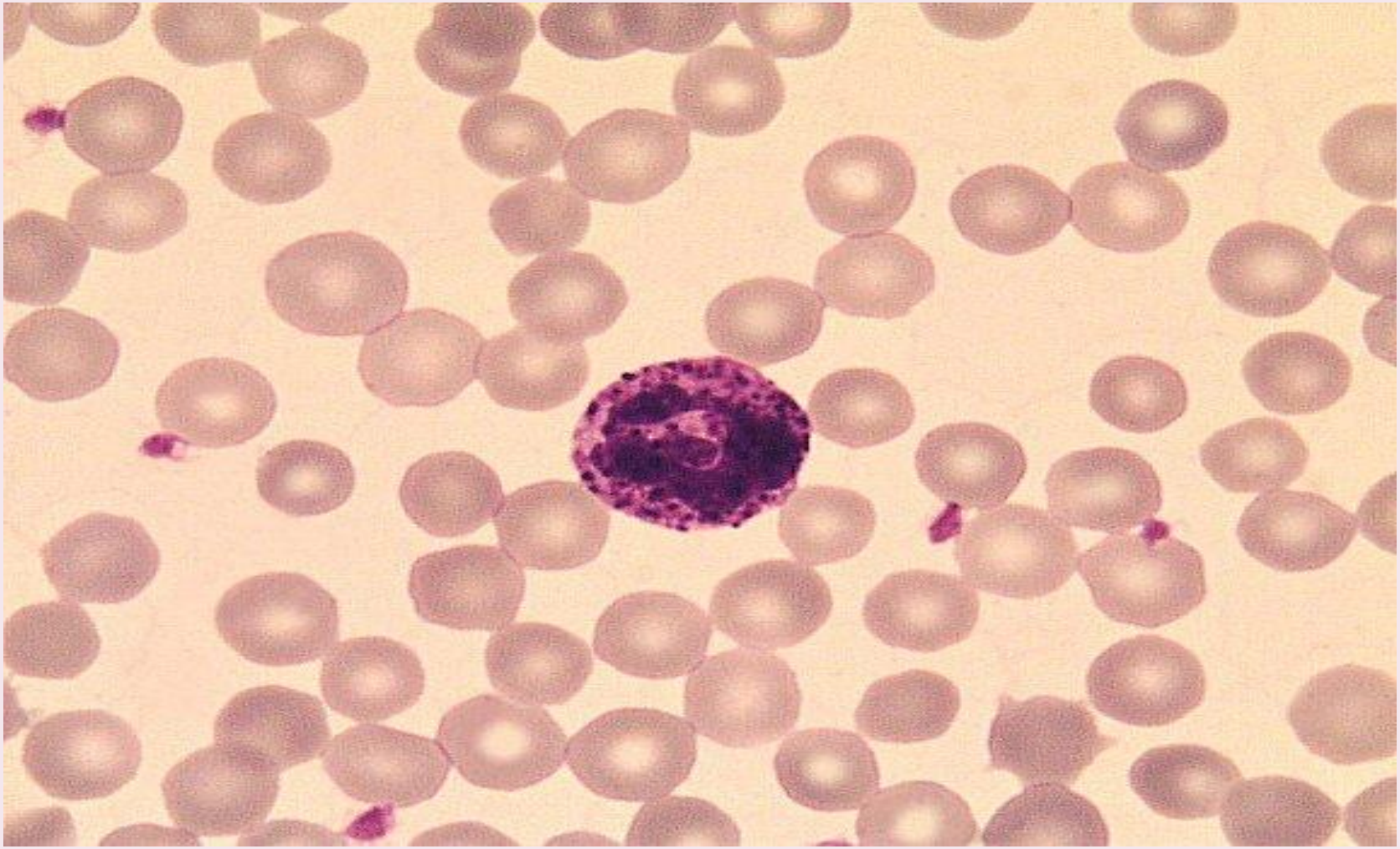

Lymphocyte


platelet

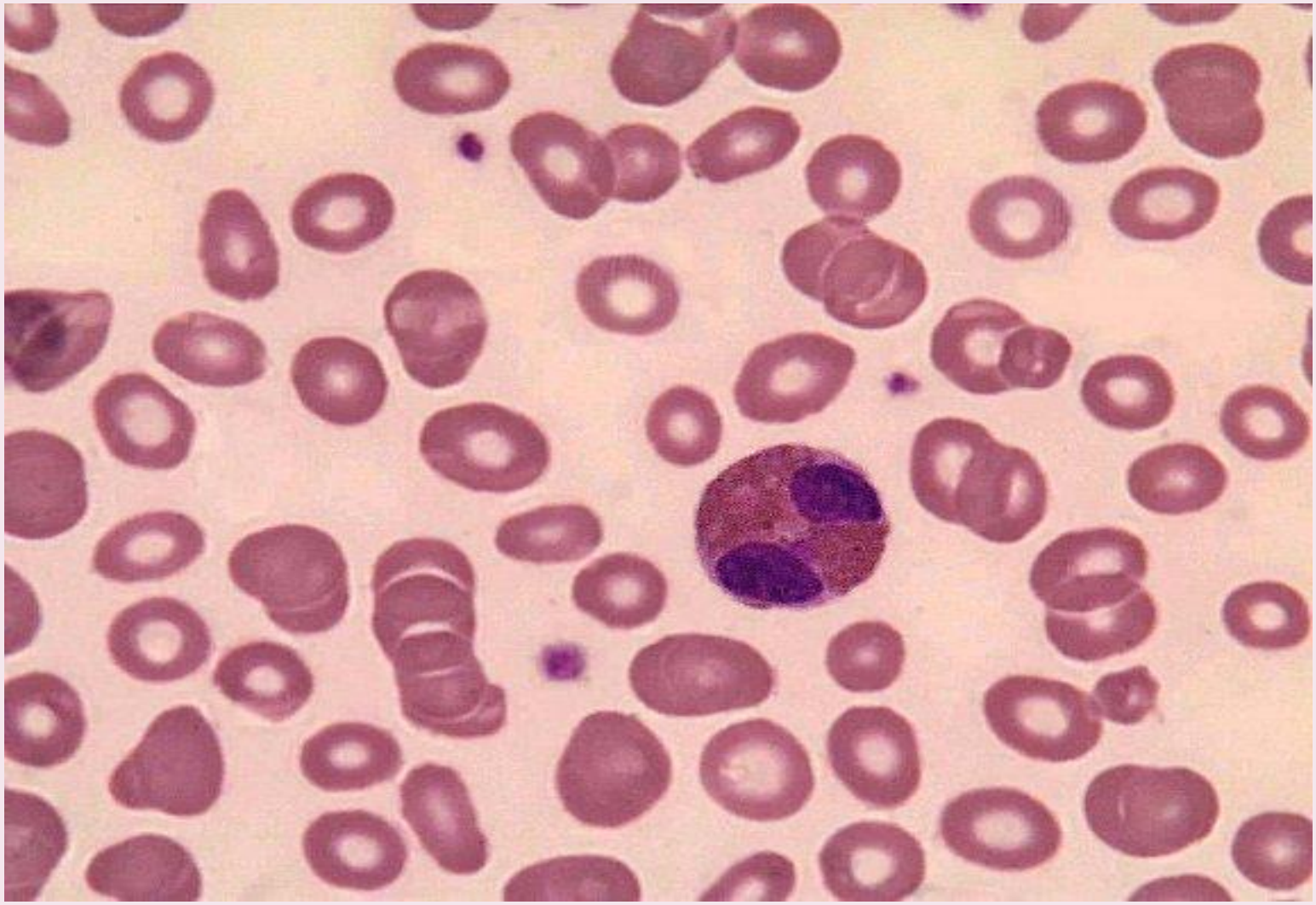

Neutrophil


Monocyte

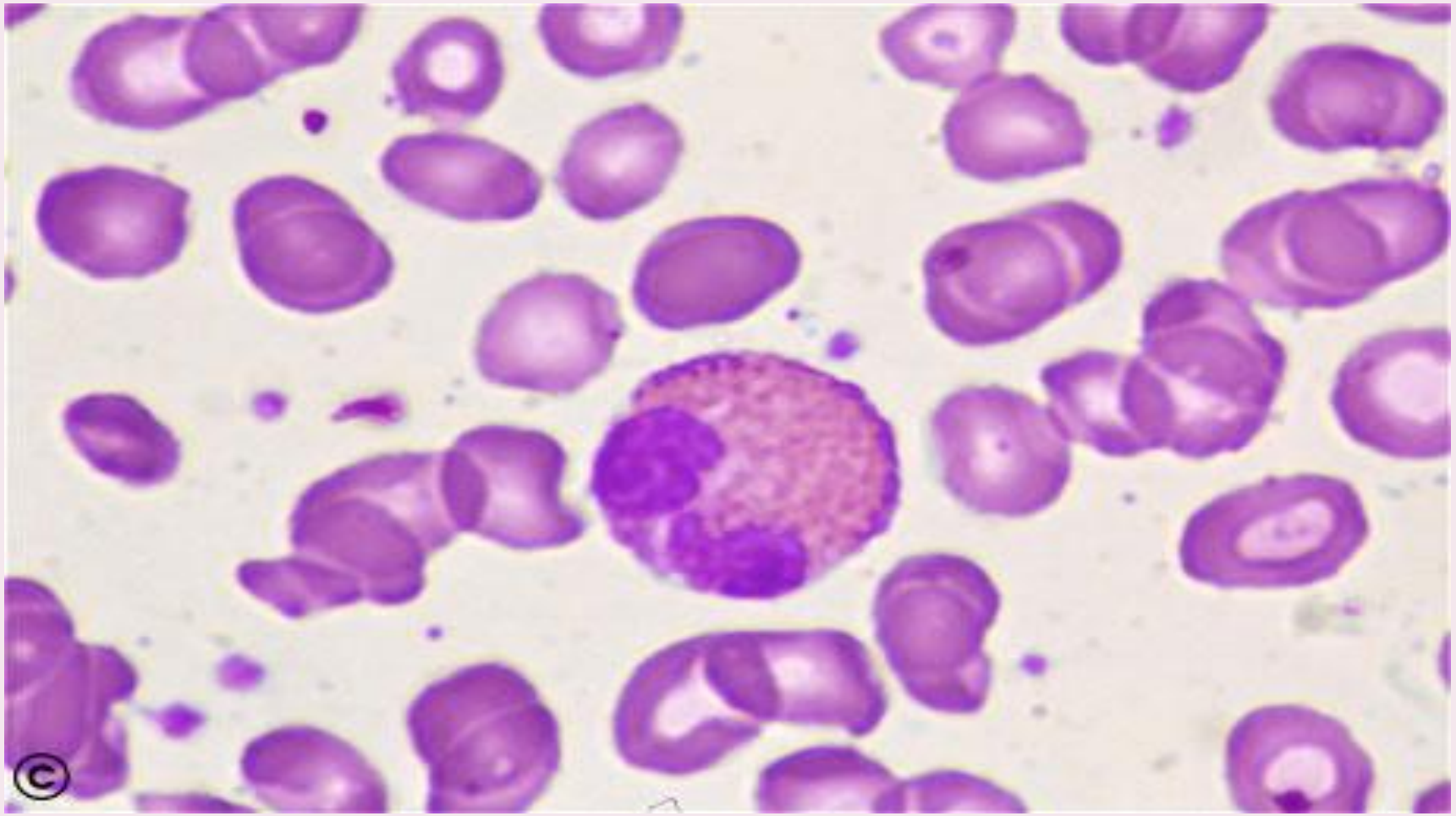
BASOPHIL



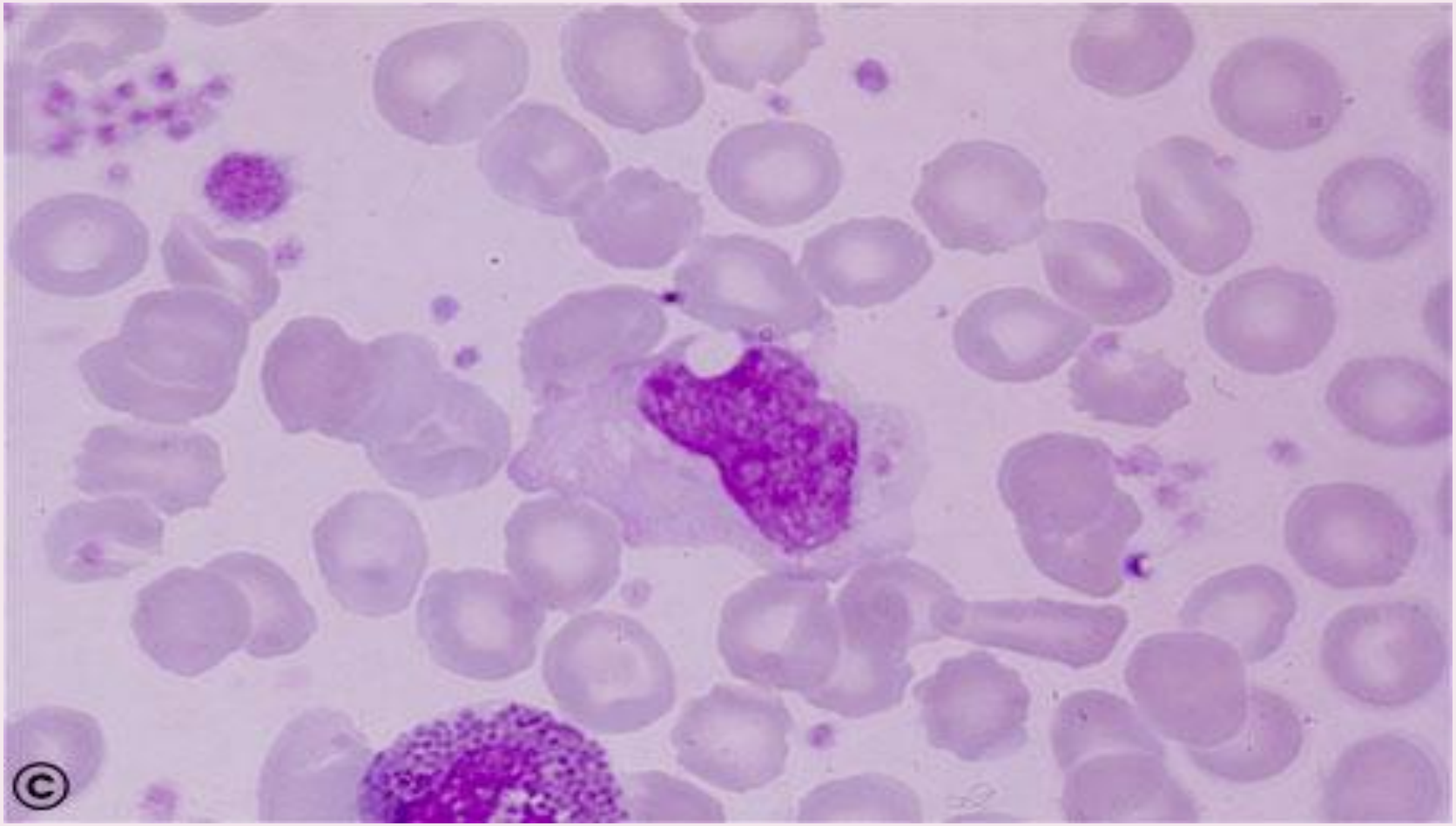
EOSINOPHIL



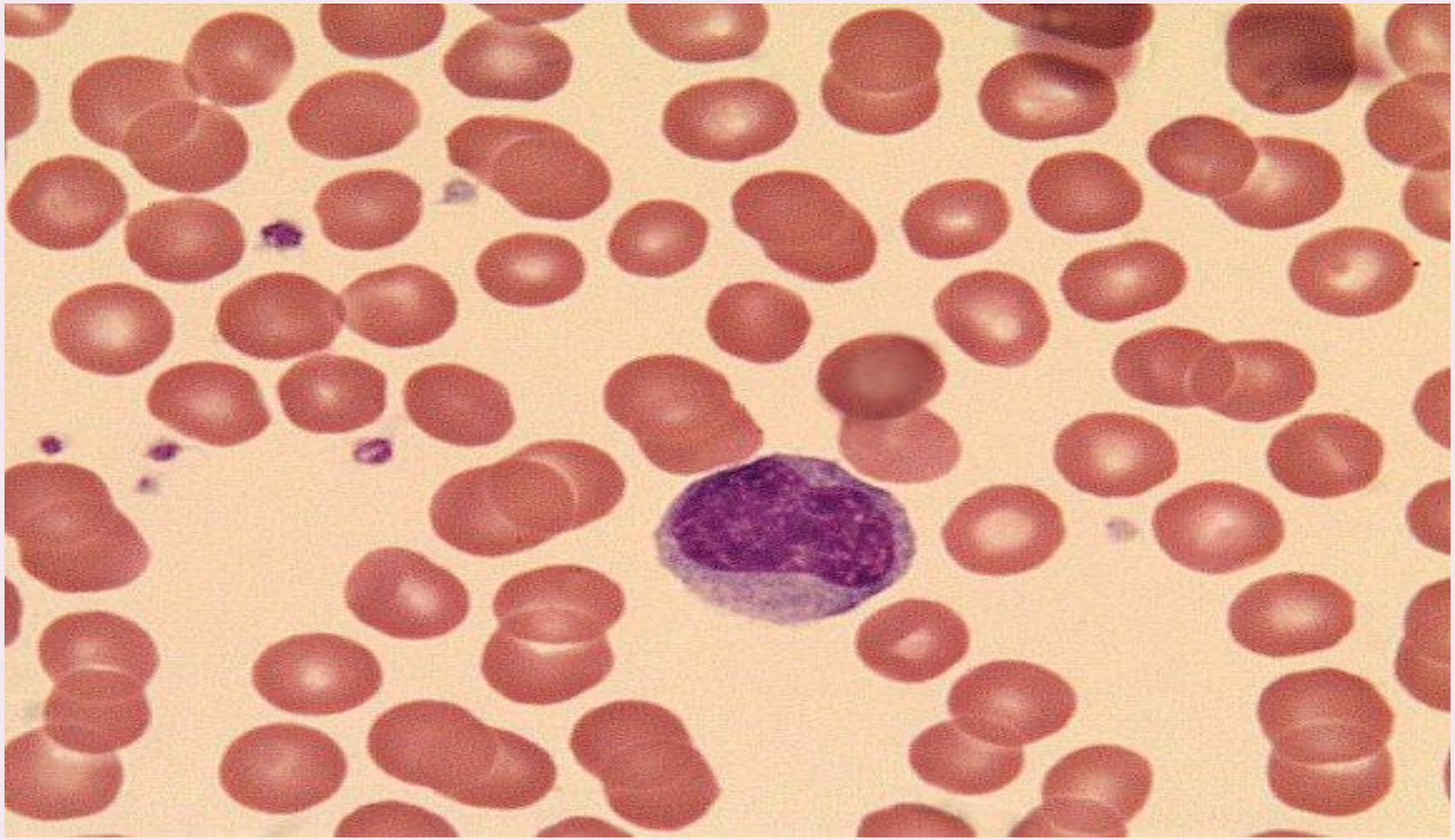
EOSINOPHIL SEGMENTED



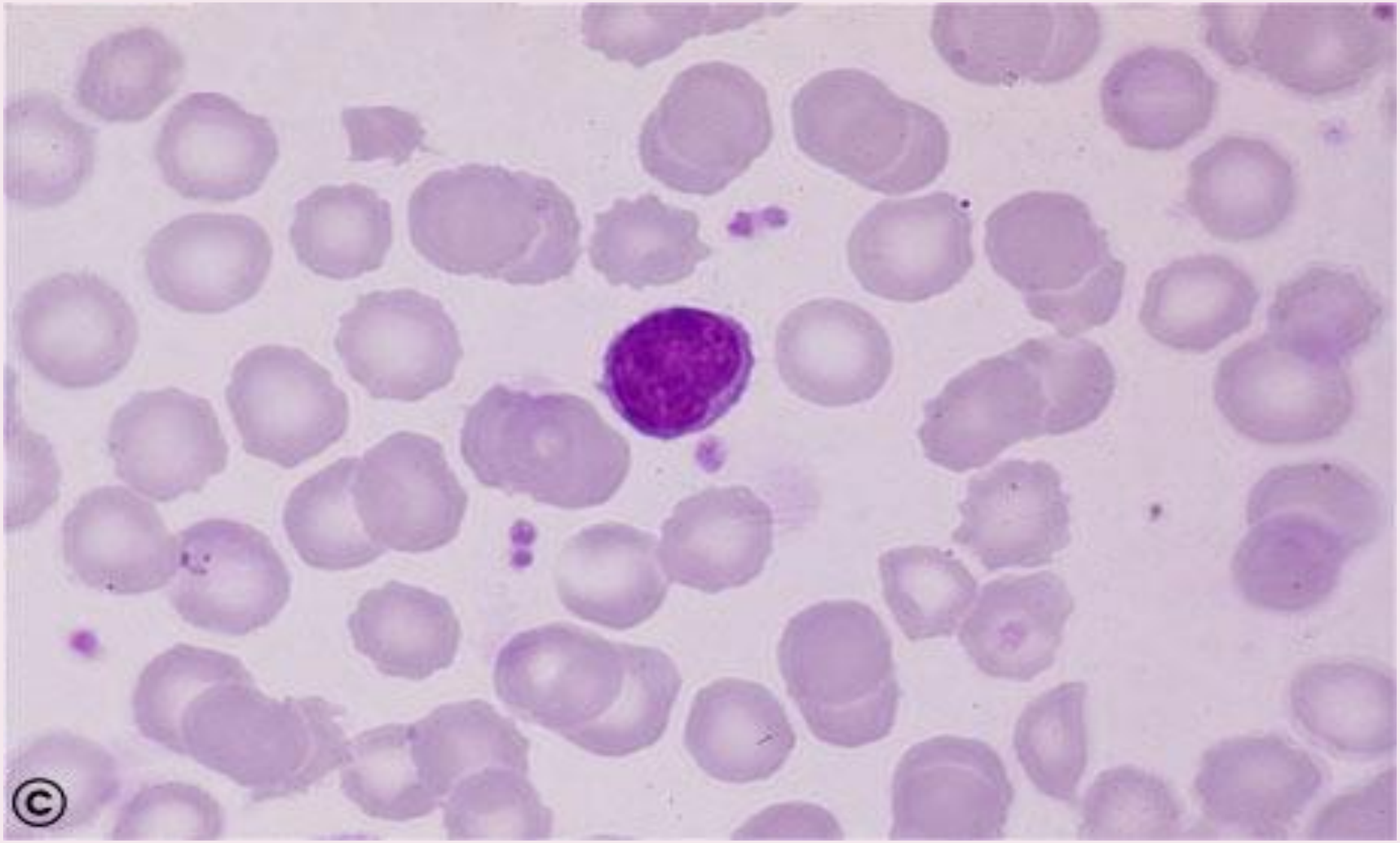
MONOCYTE



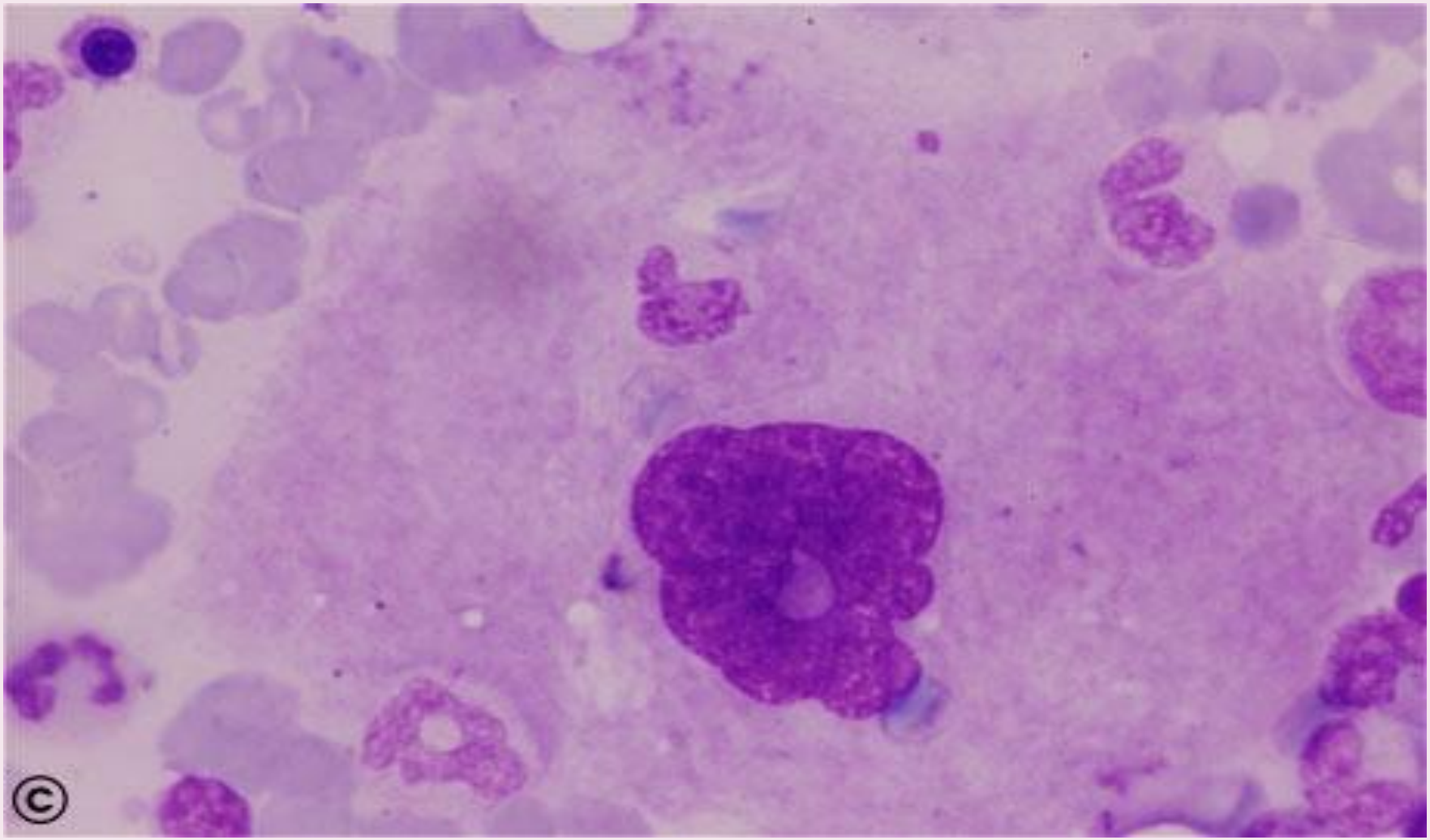
MONOCYTE



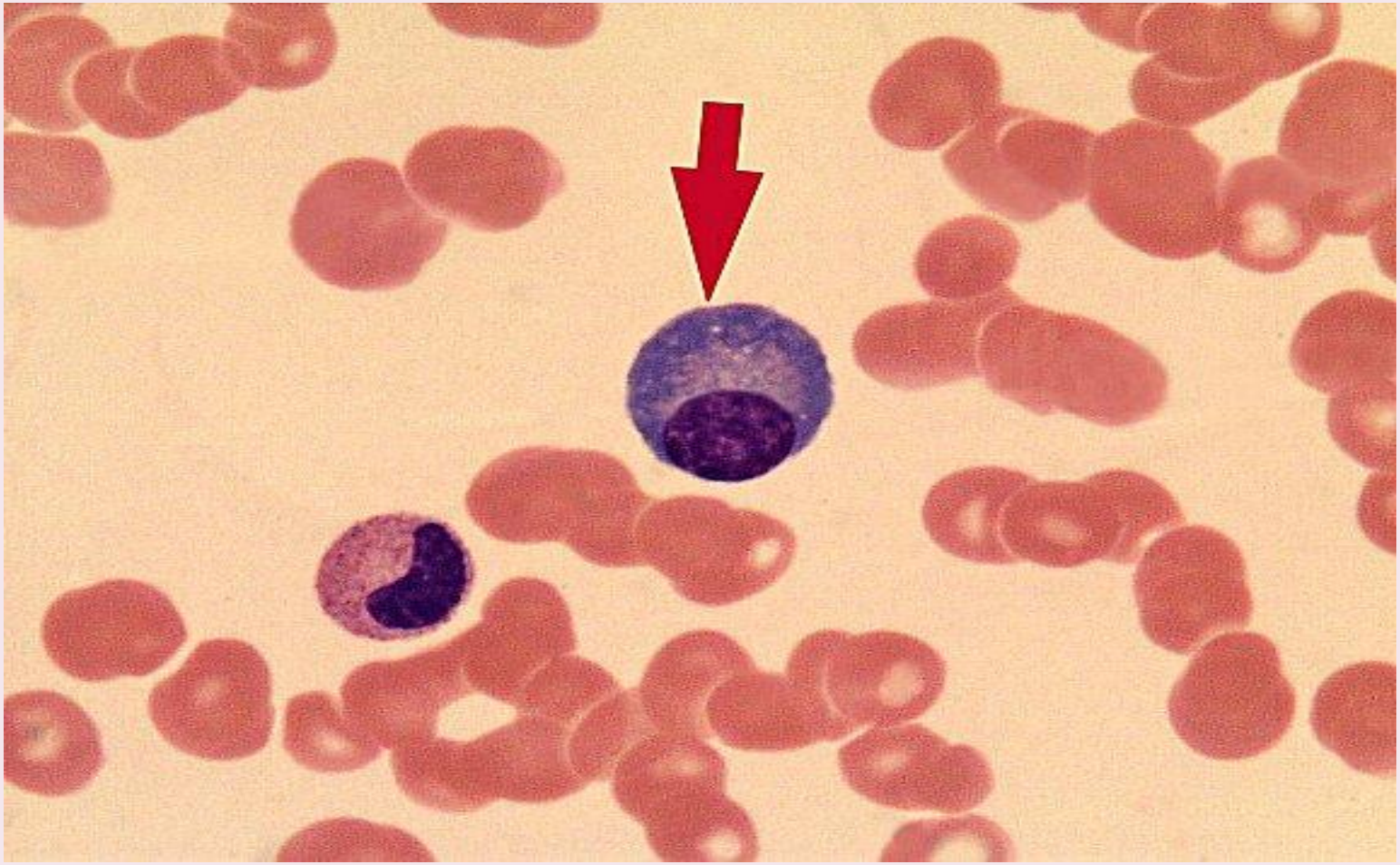
LYMPHOCYTE



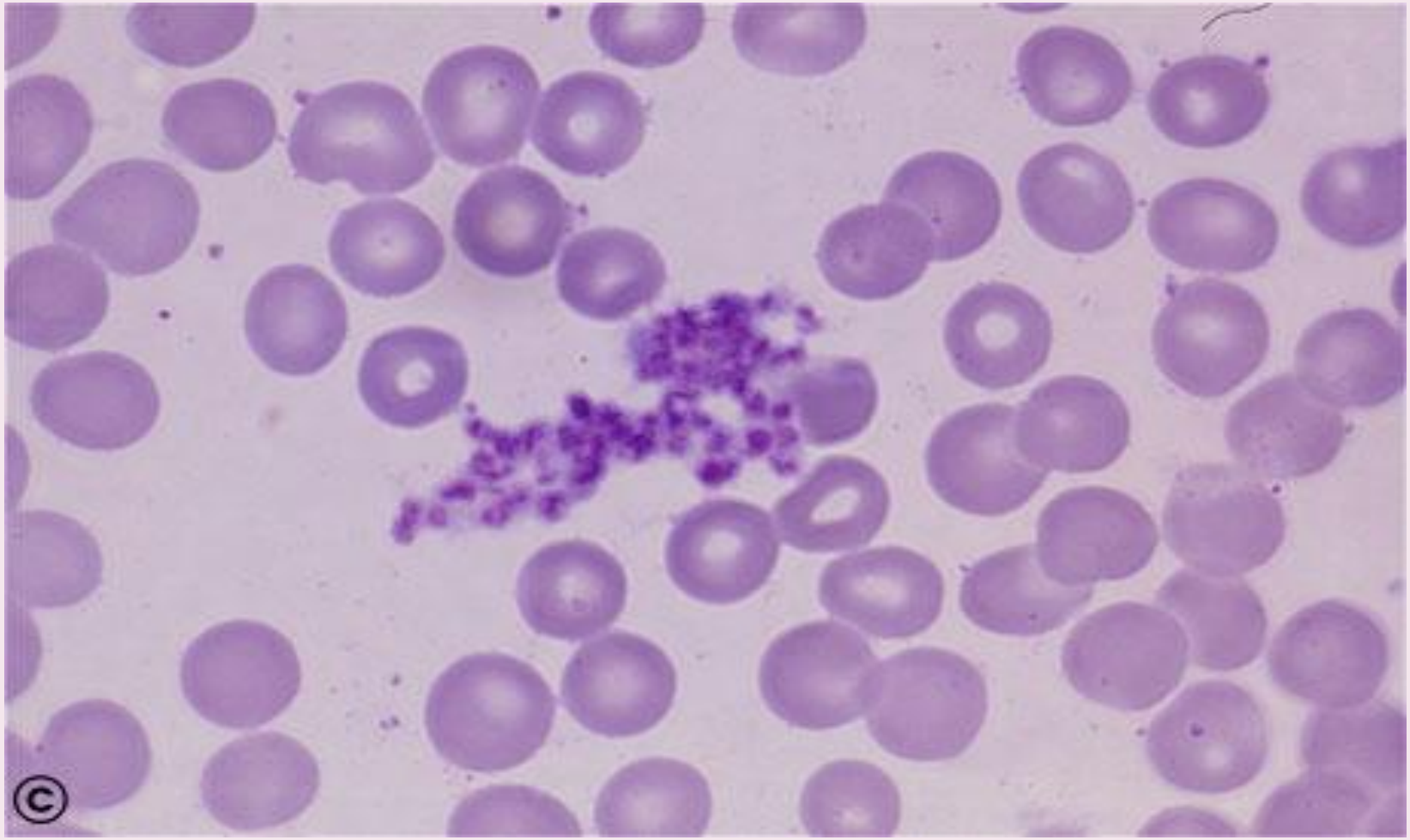
MEGACARIOCYTE



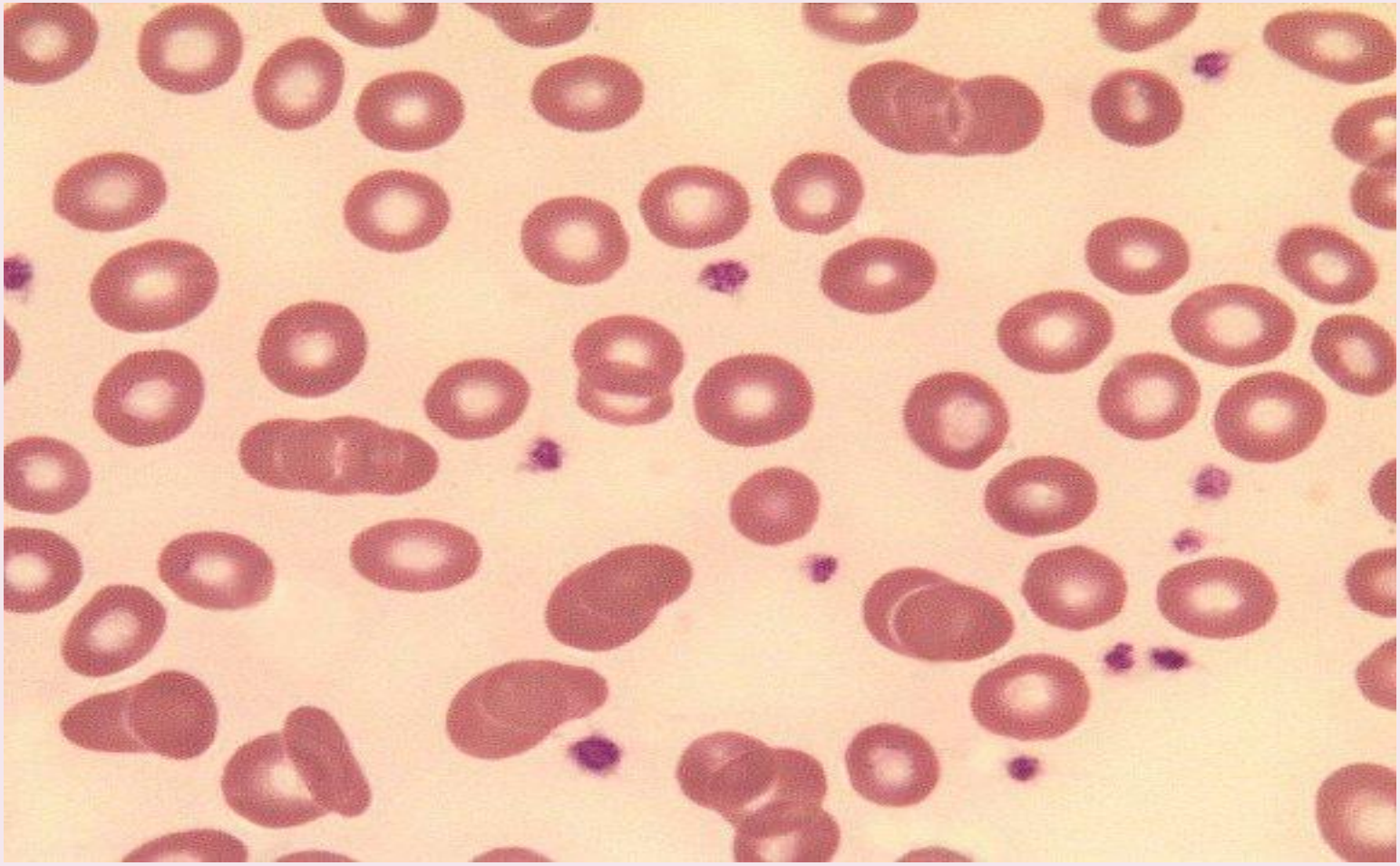
PLASMOCYTES



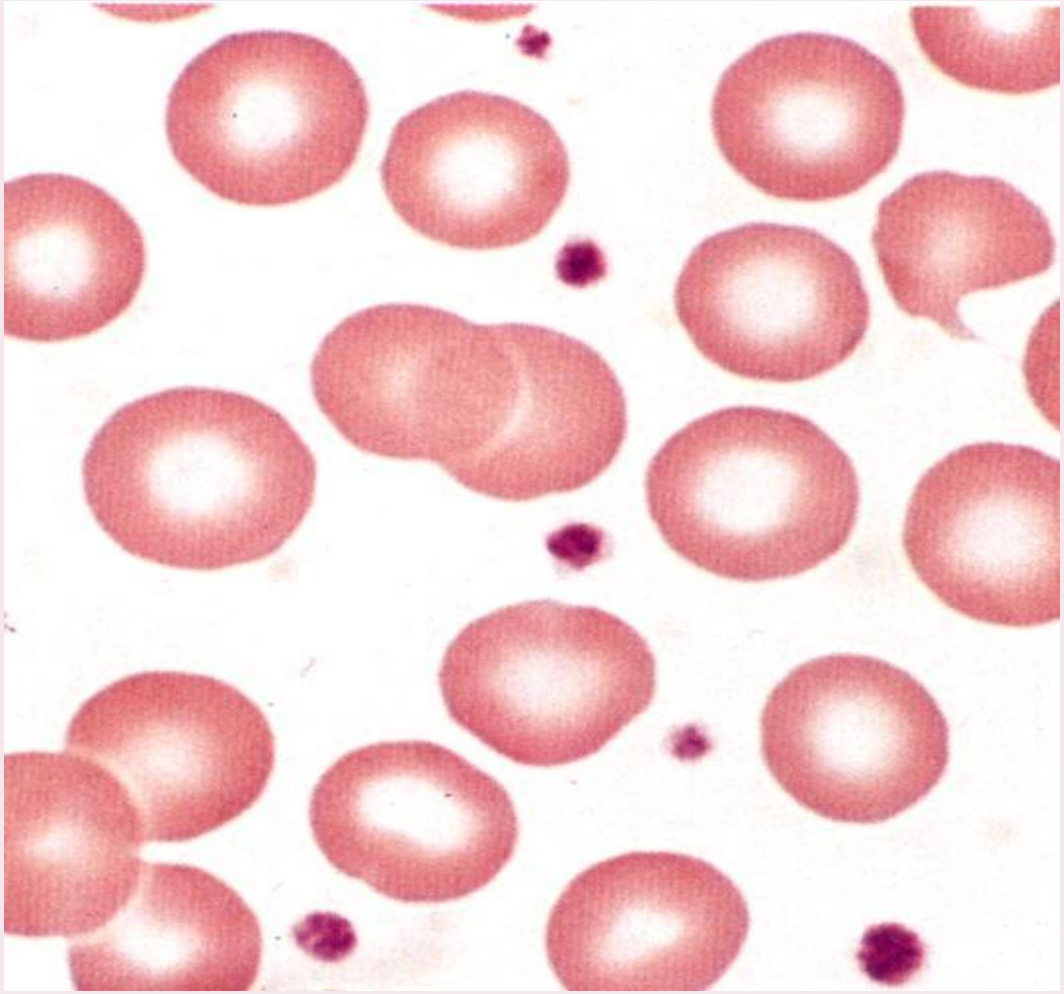
PLATELETS



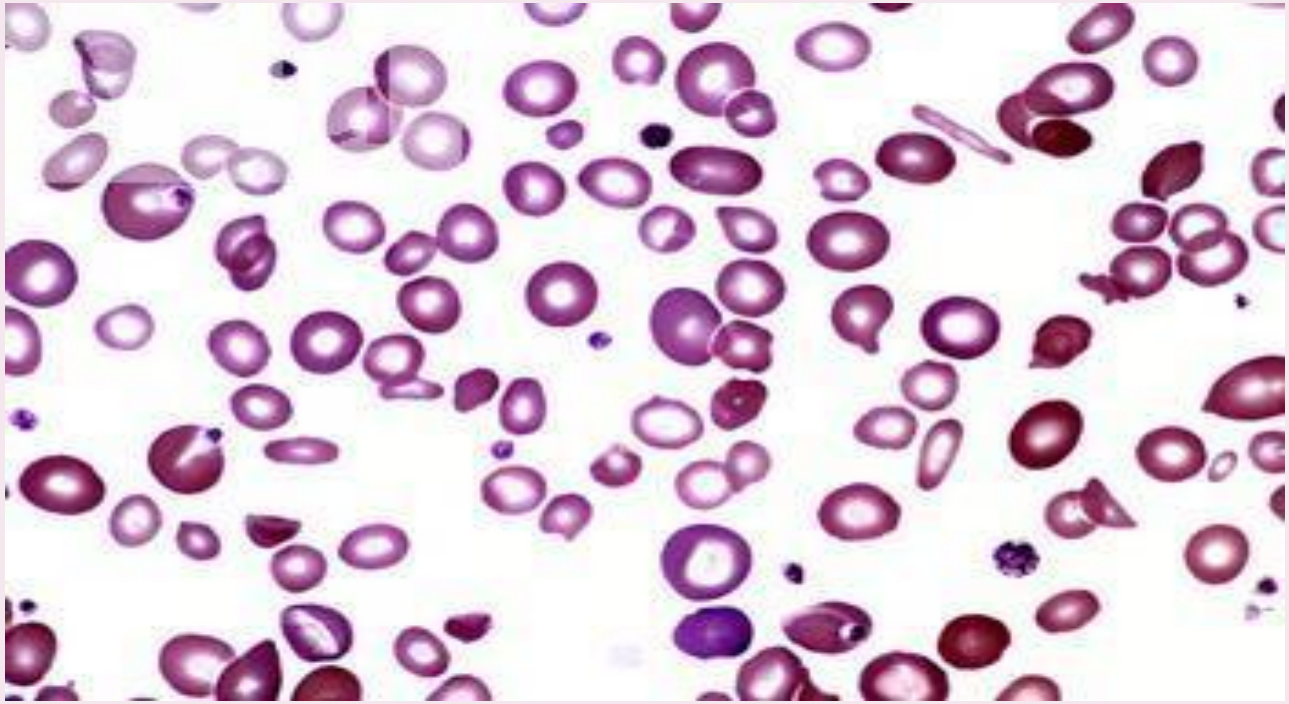
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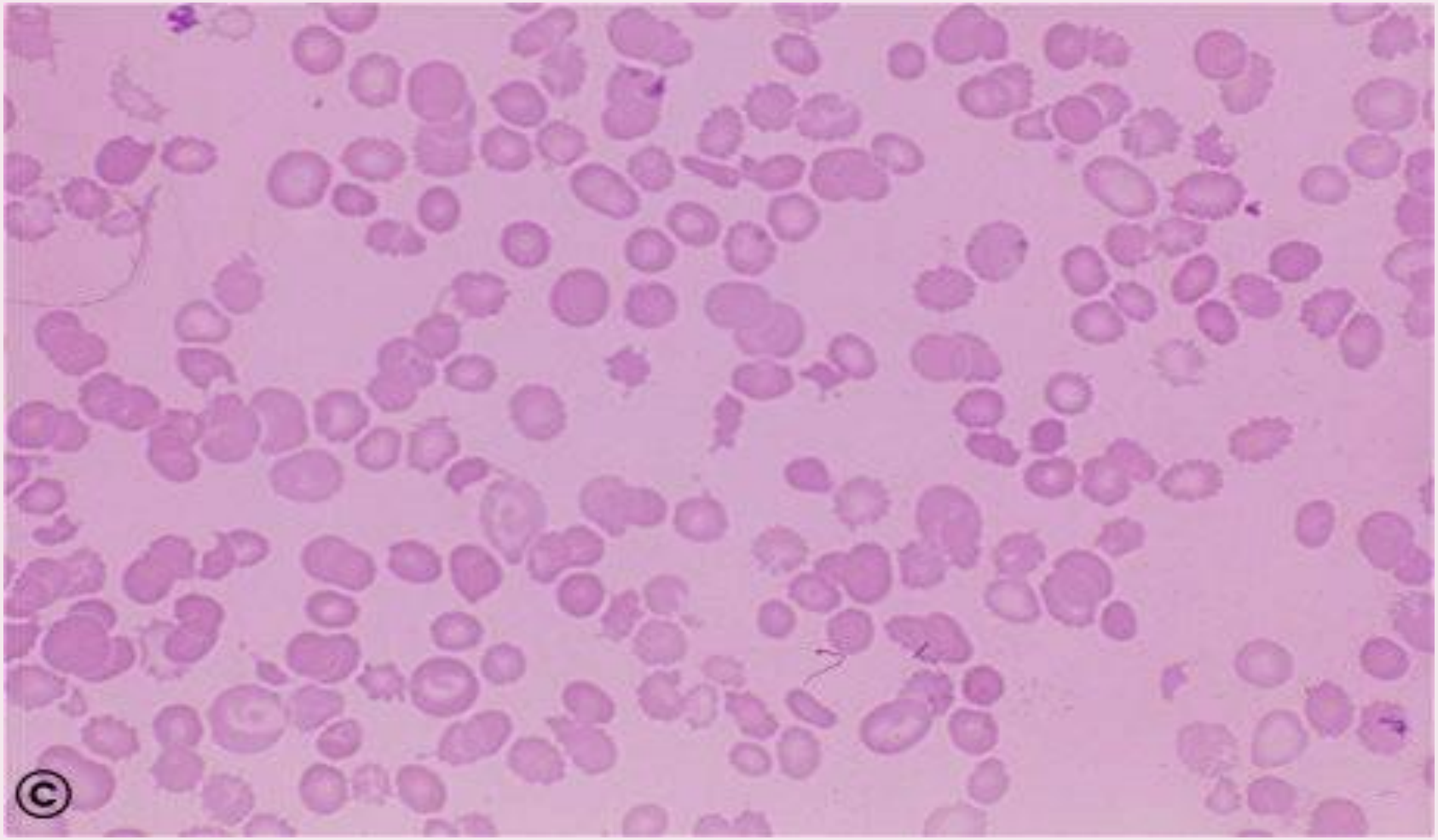
Platelets



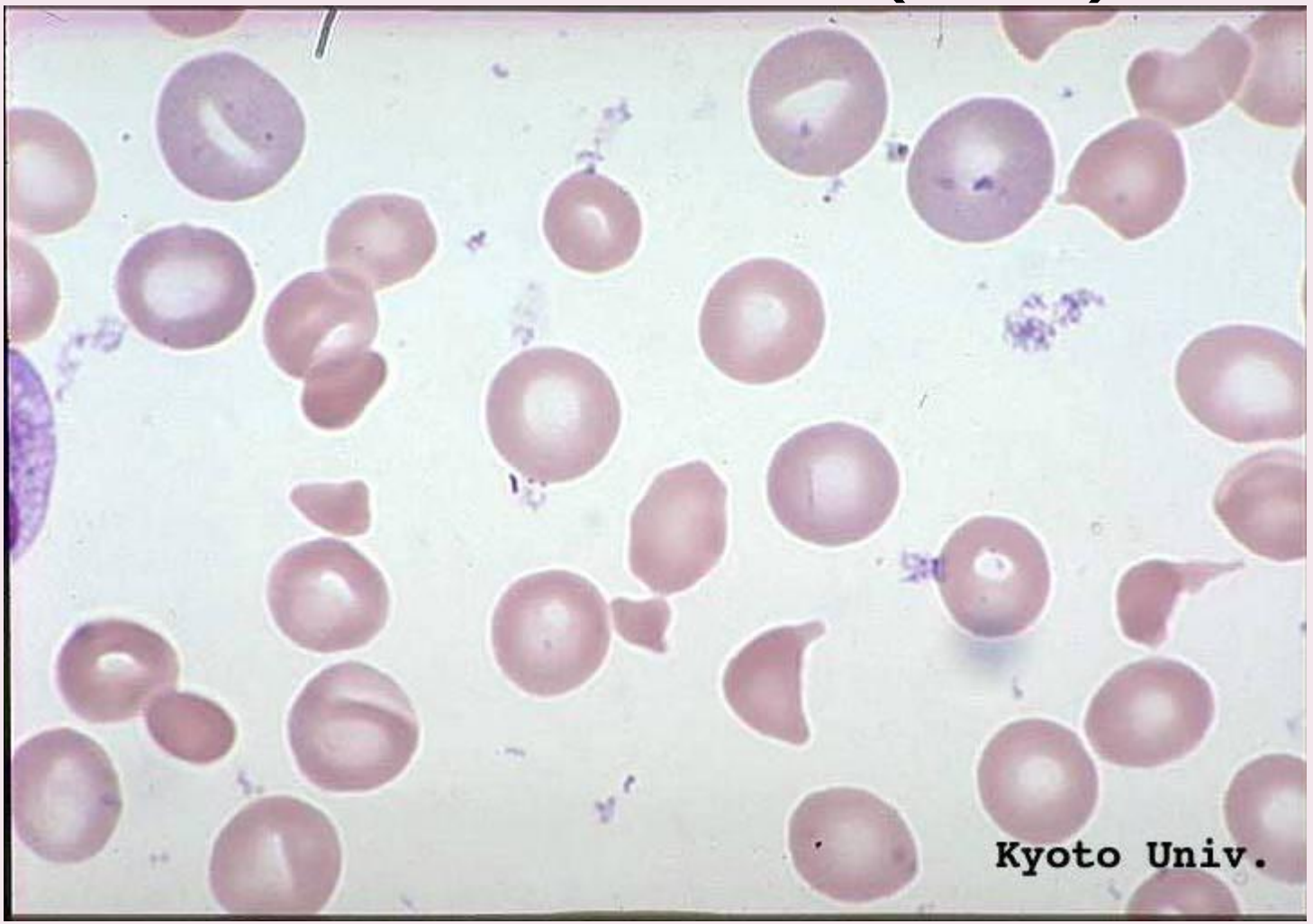
Iron deficiency anemia



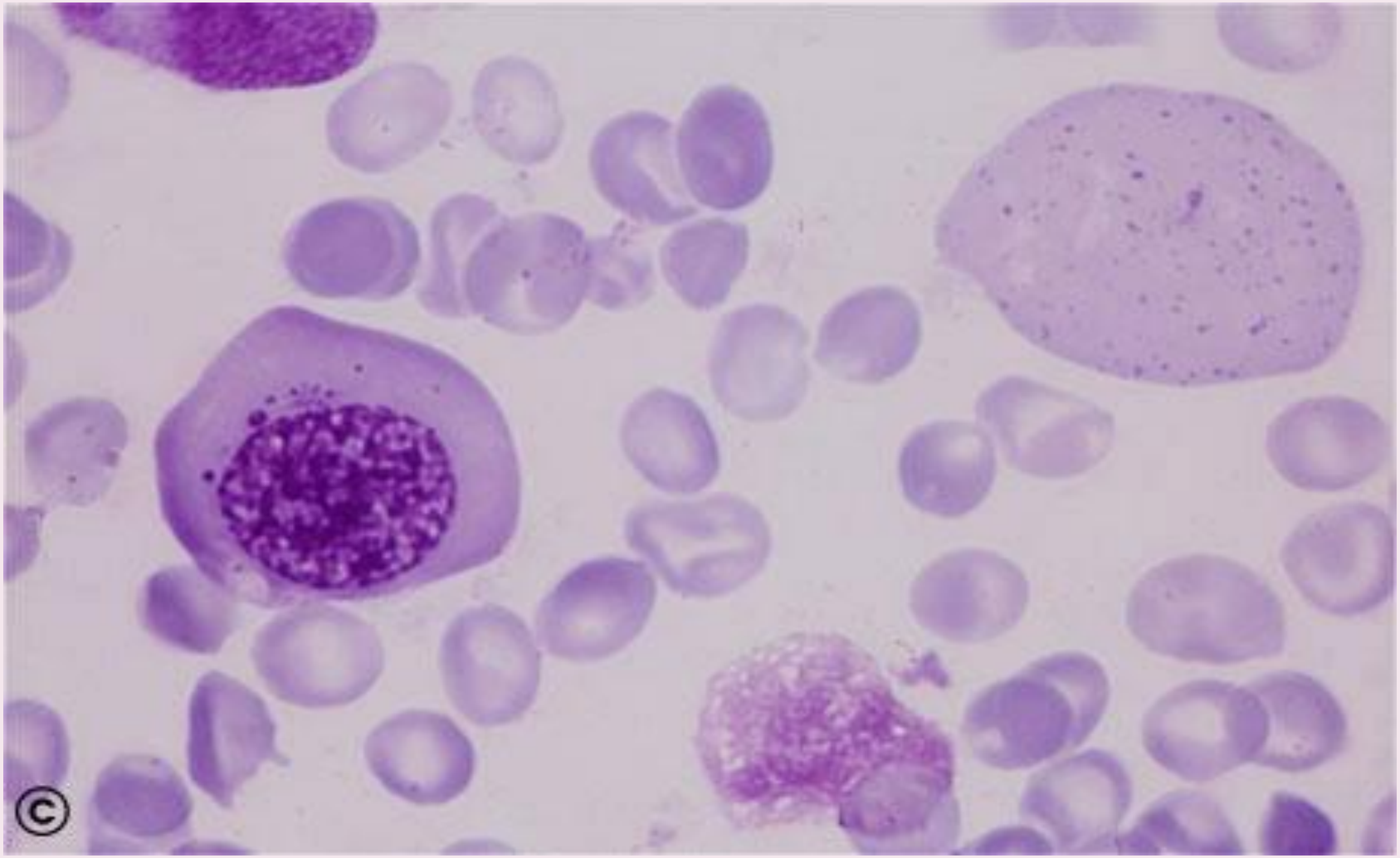
ANISICYTOSIS



POIKILOCYTE(DIC)



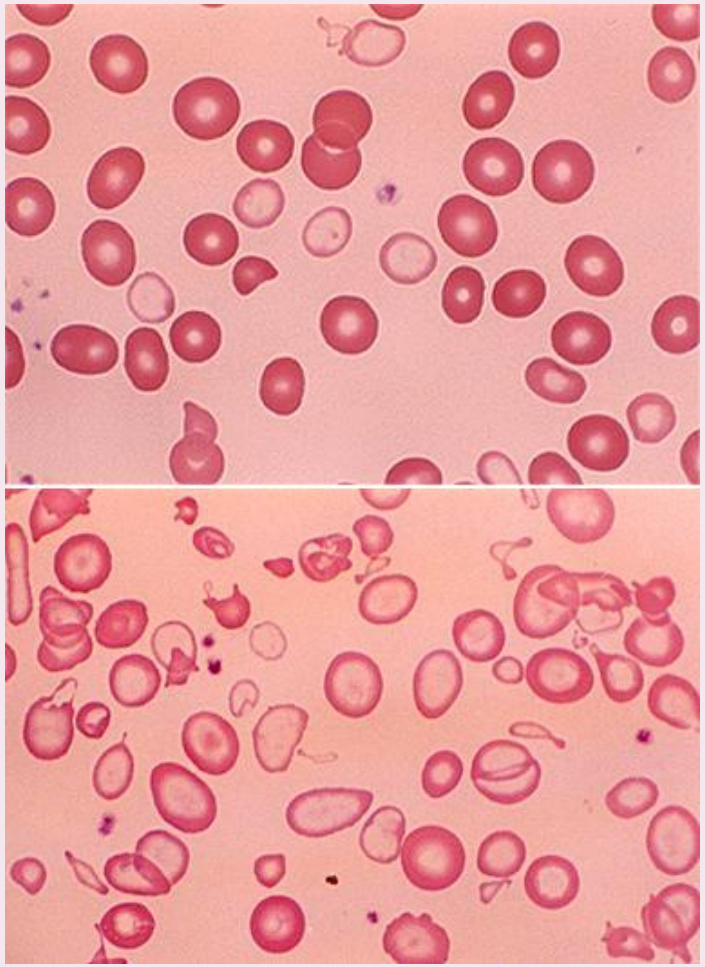
MEGALOCYTE



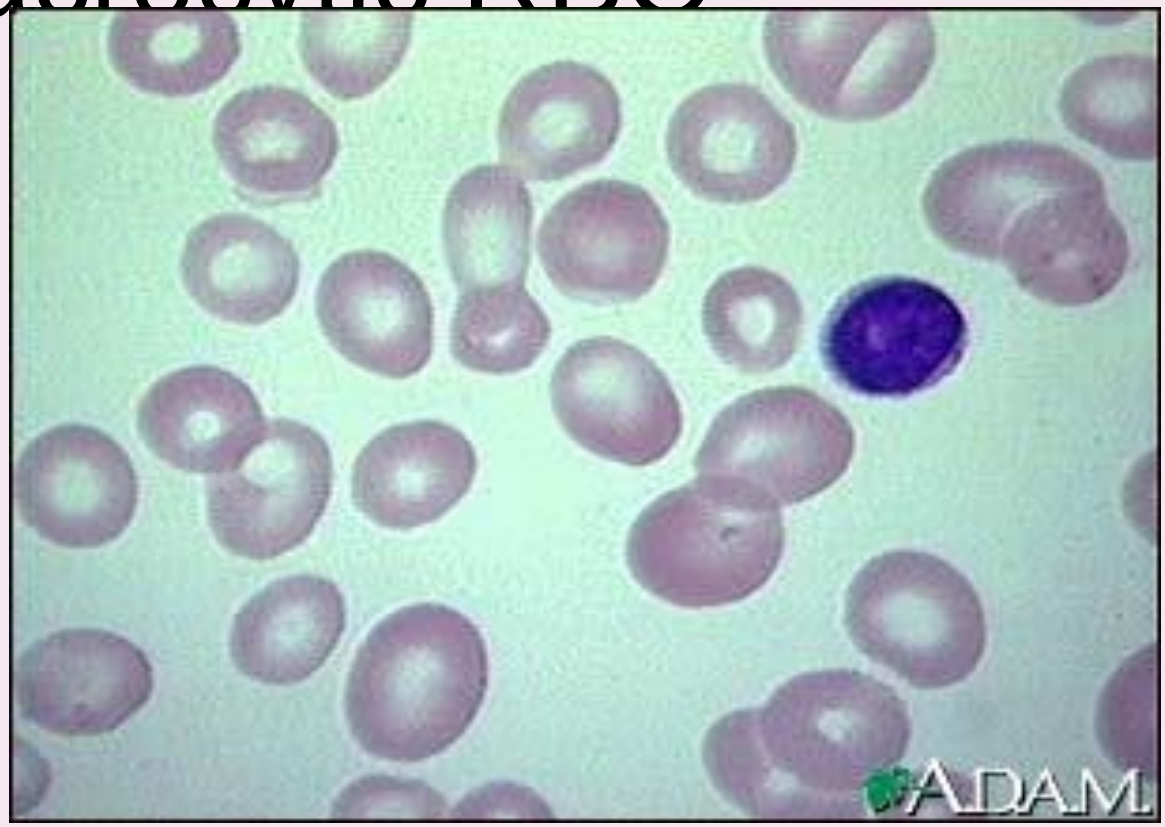
RBC Target Cells



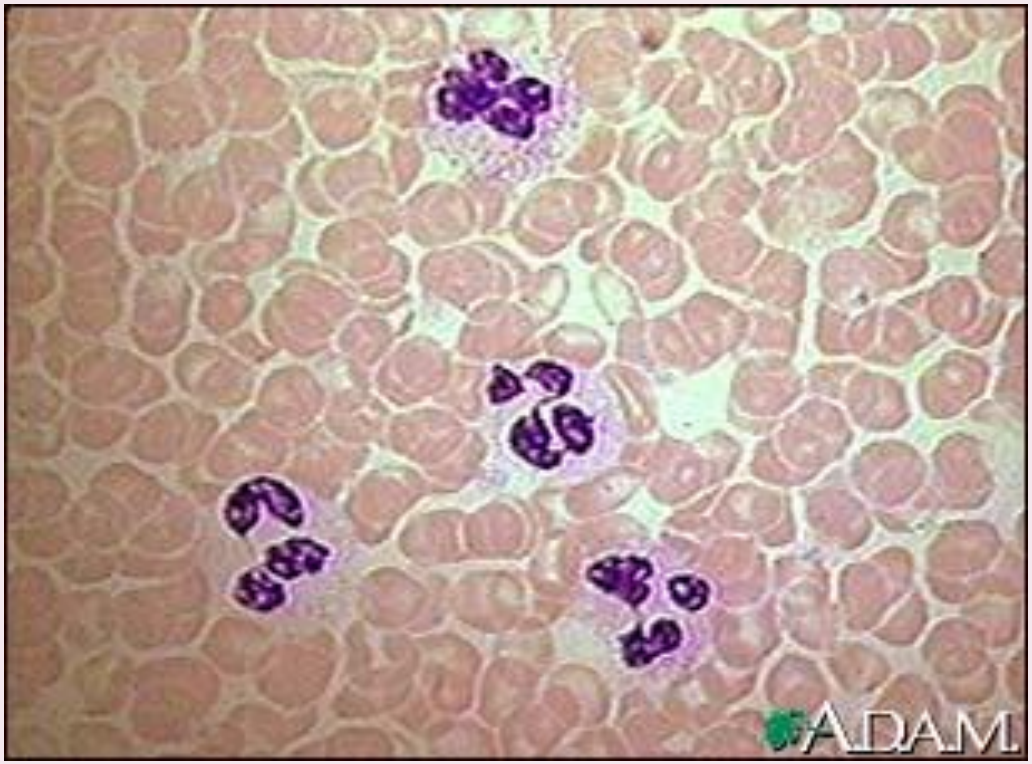
Sideroblastic anemia



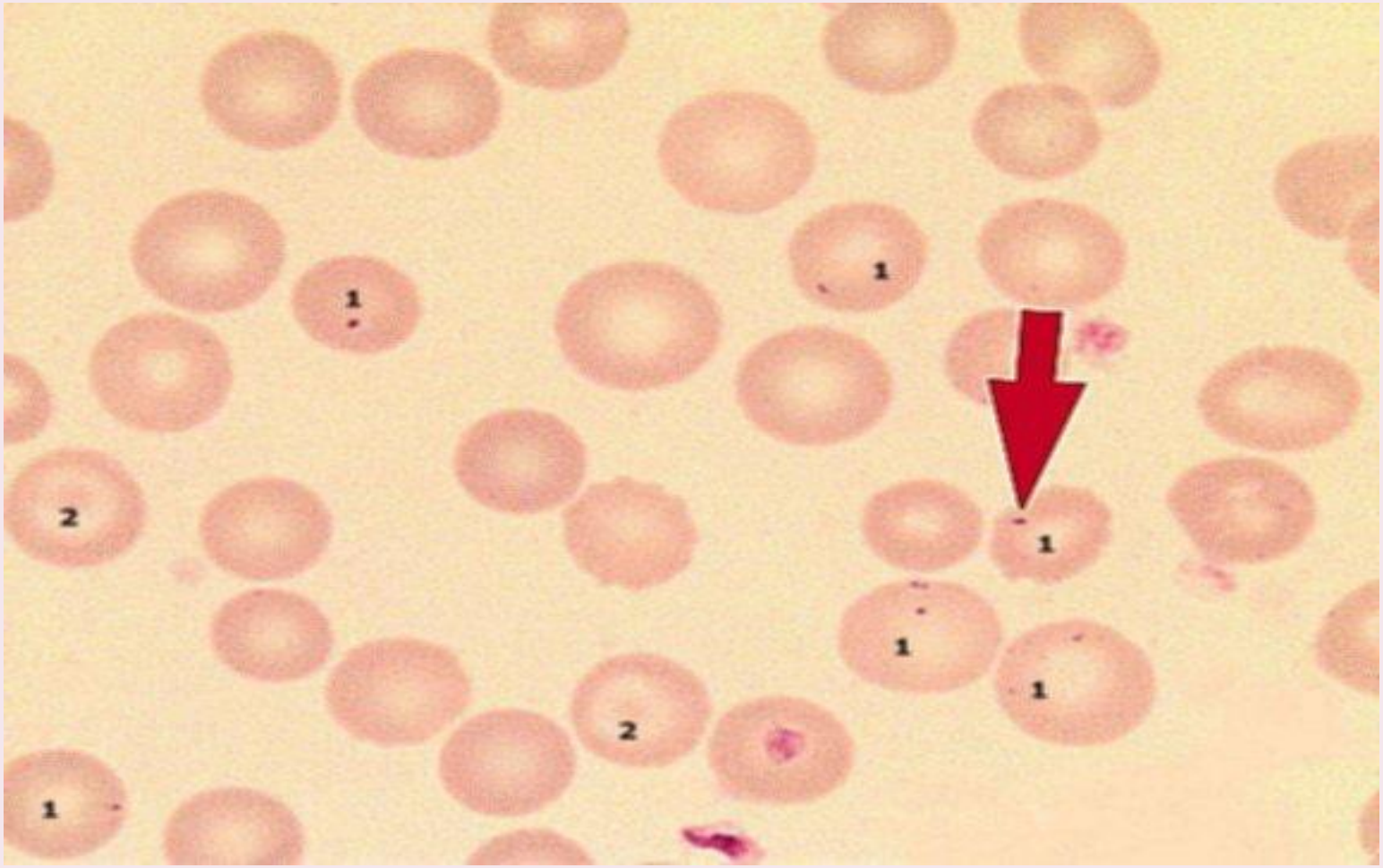
Macrocytic RBC



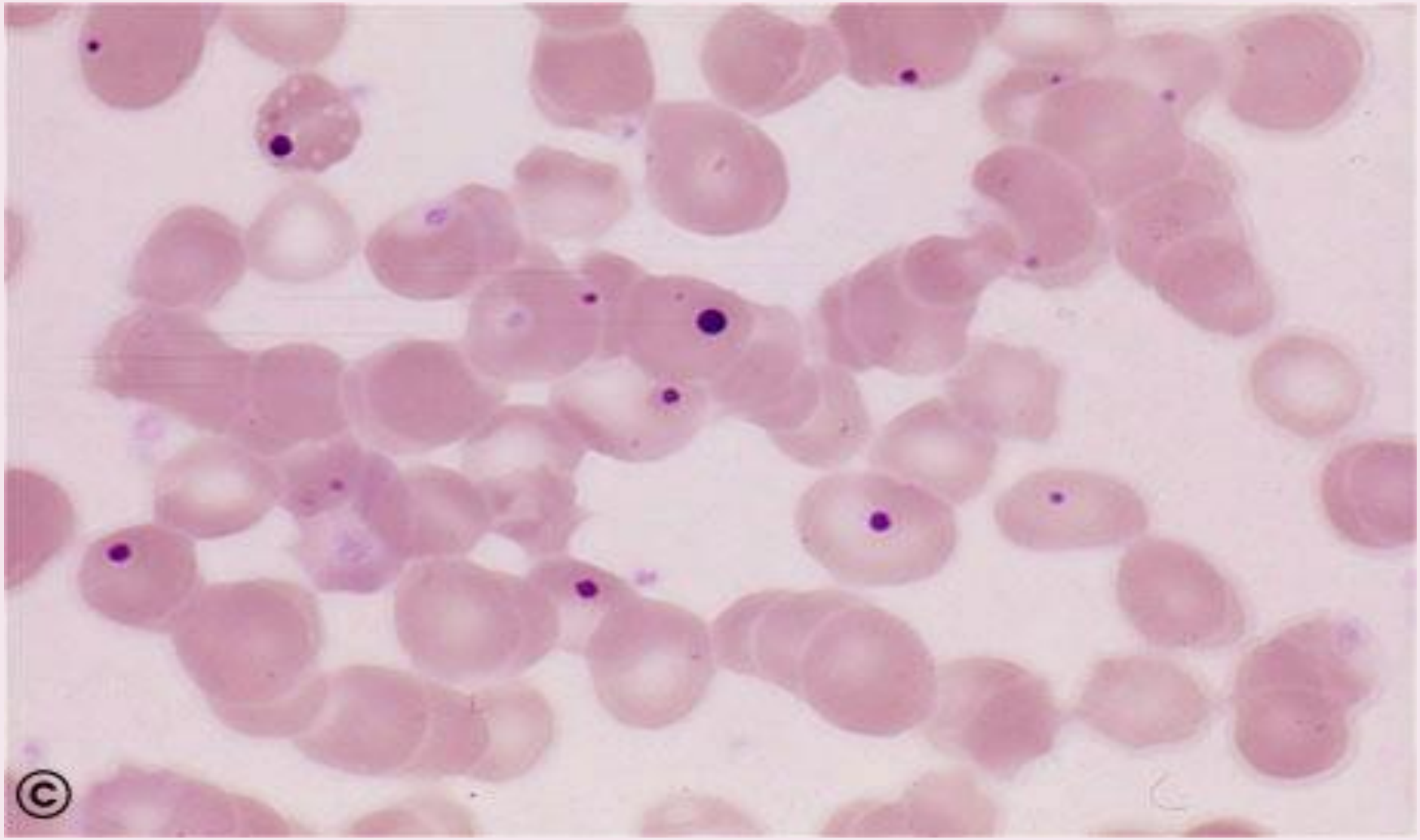
Polycythemia



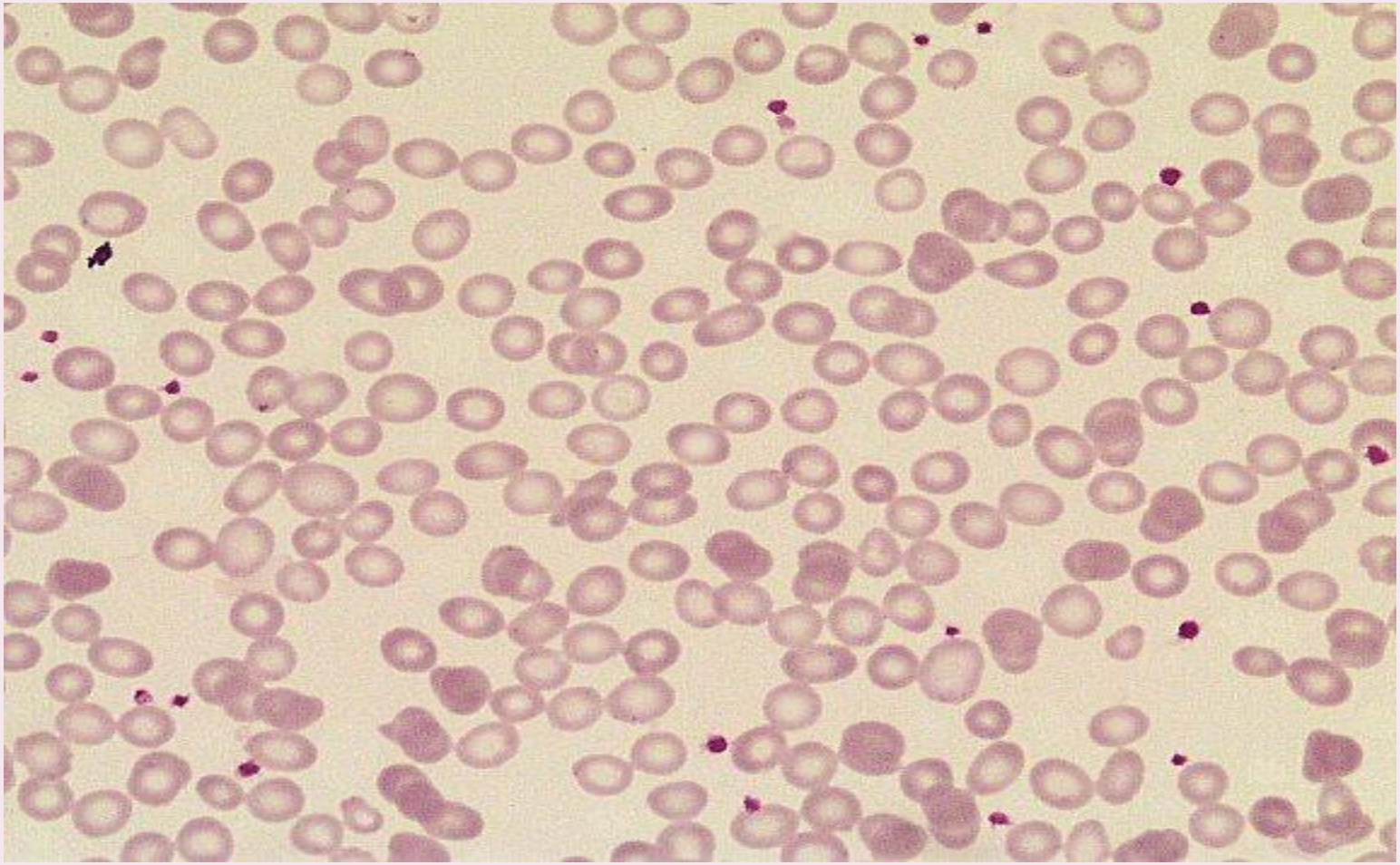
PAPPENHEIMER BODIES



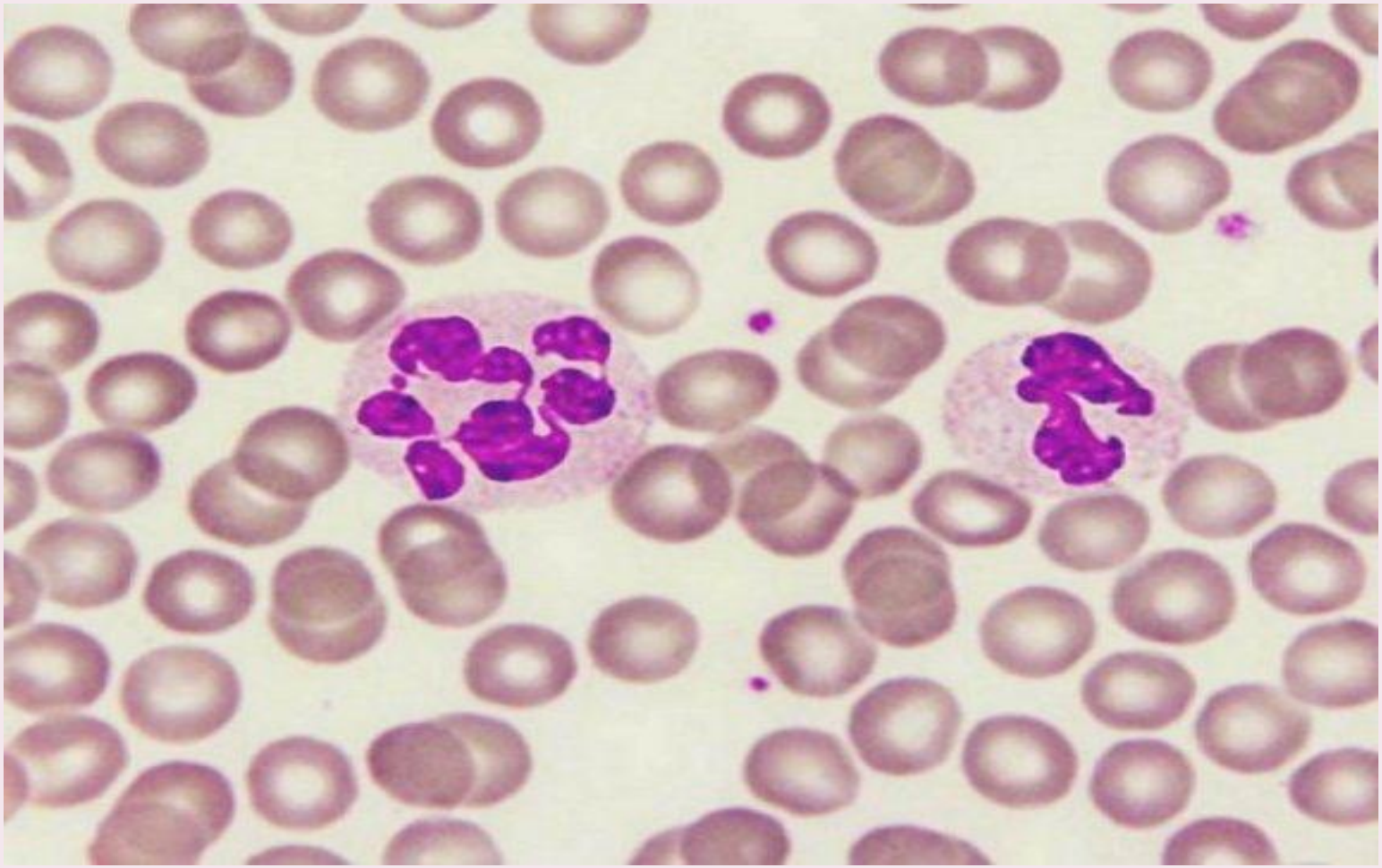
HOWELL-JOLLY BODIES



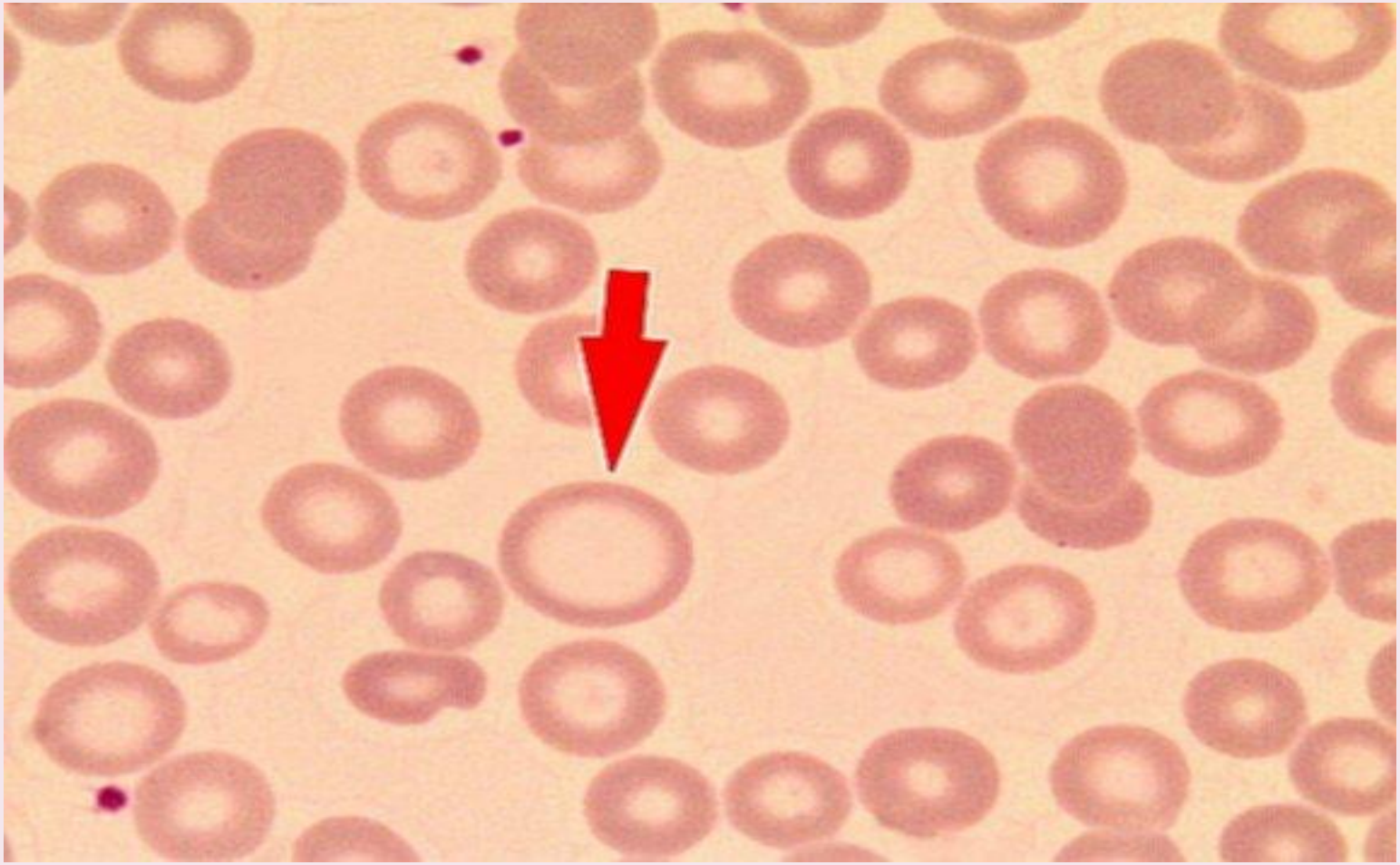
HYPECHROMIA



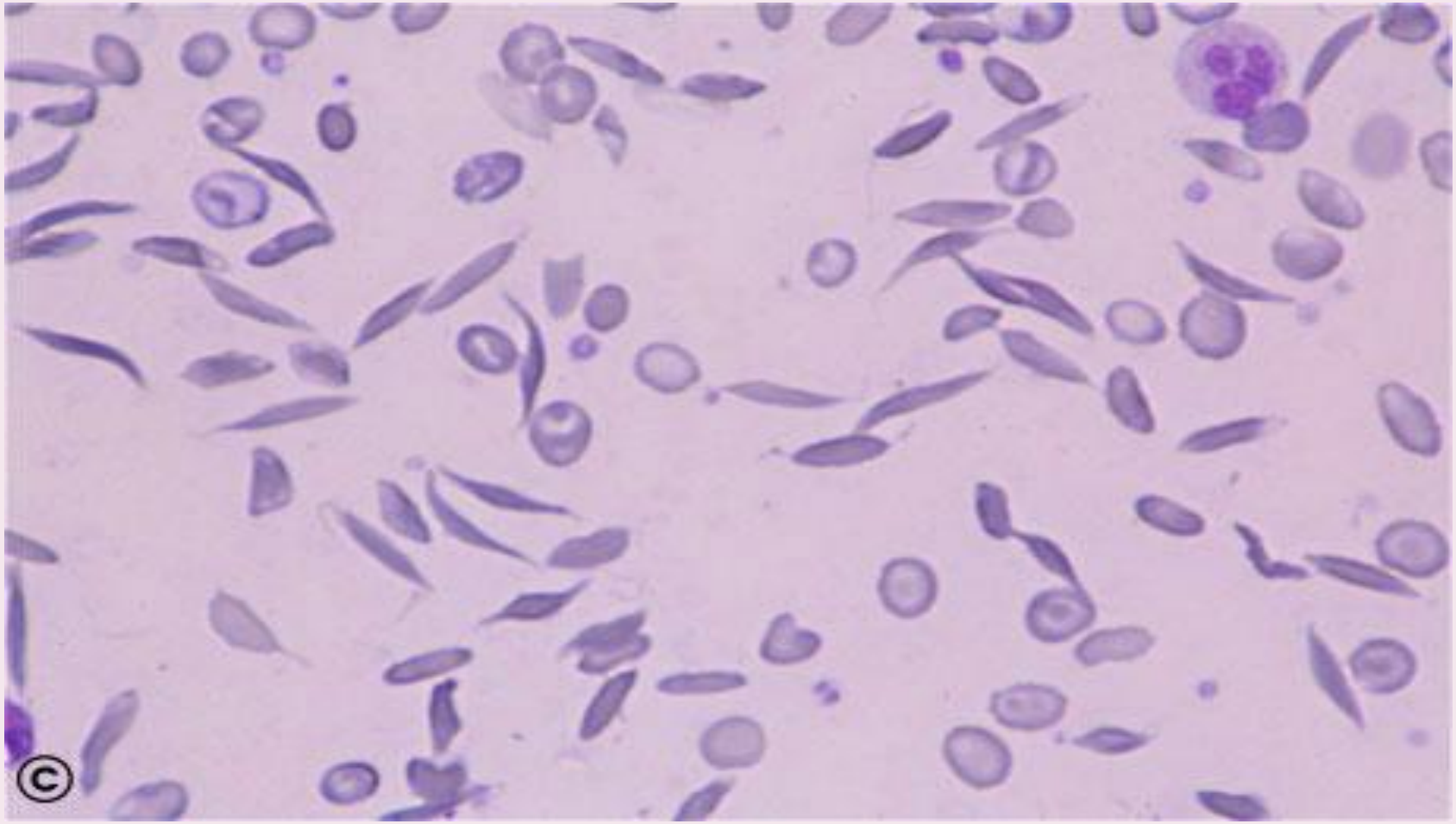
HYPERSEGMENTATION



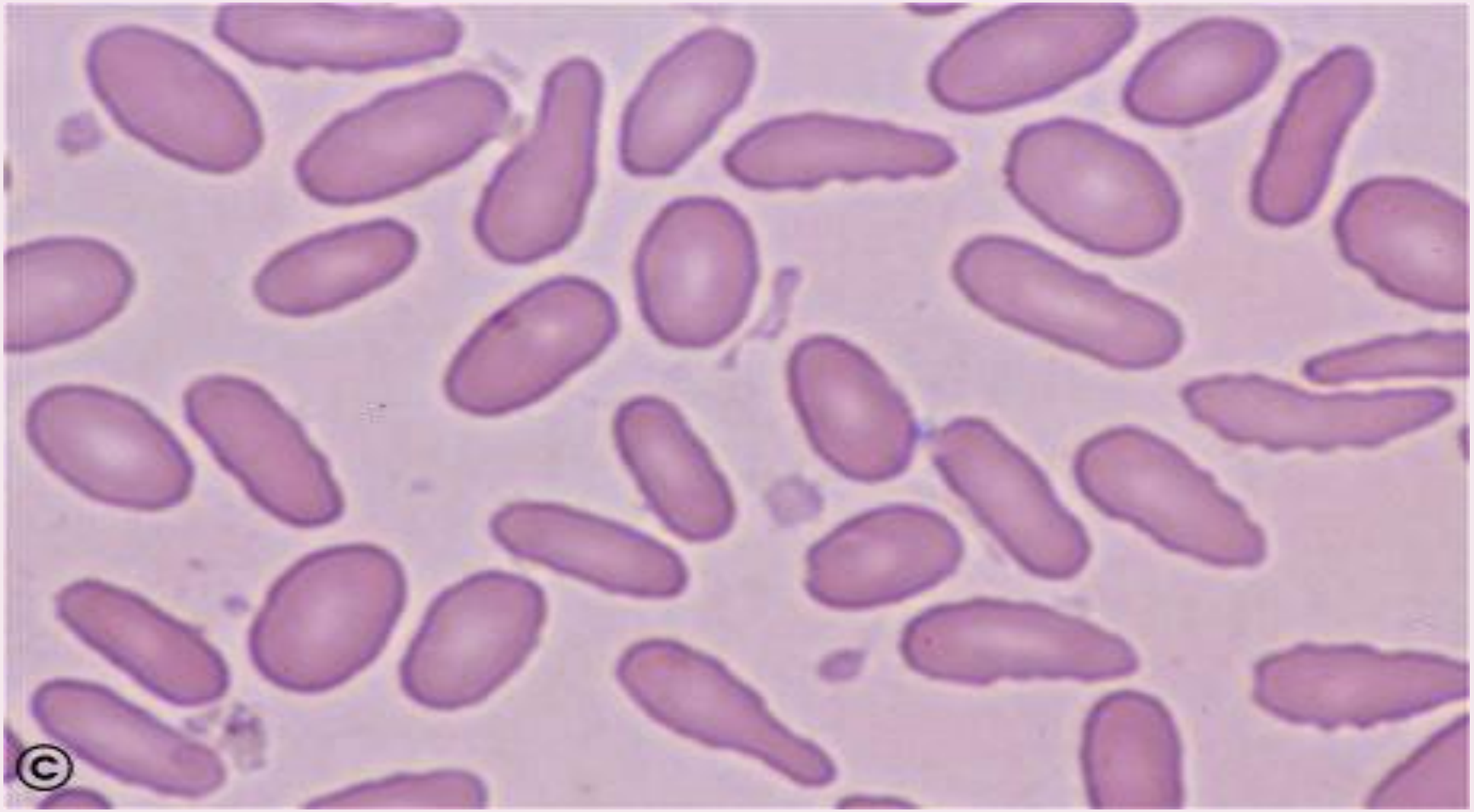
LEPTOCYTES



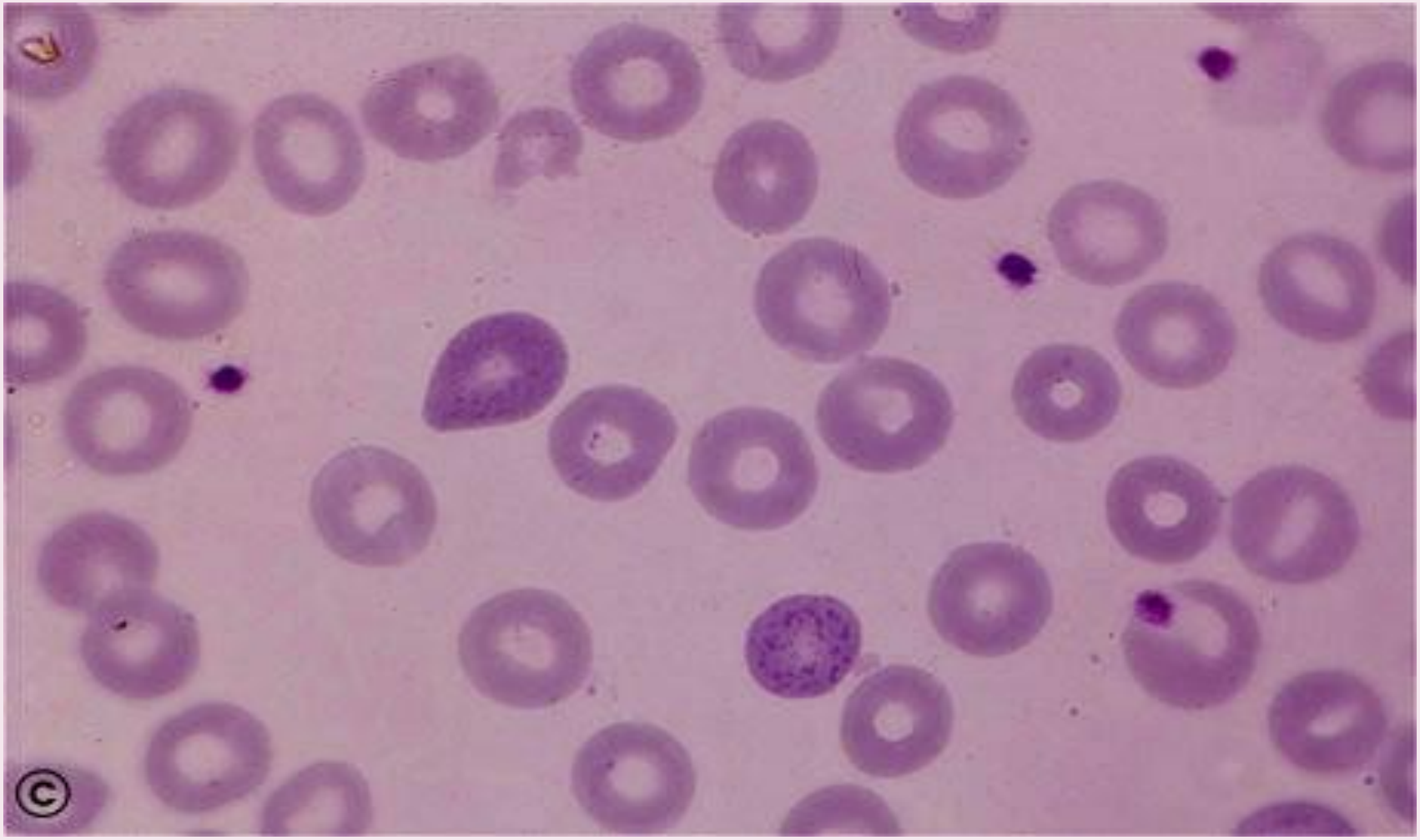
DREPANOCYTES



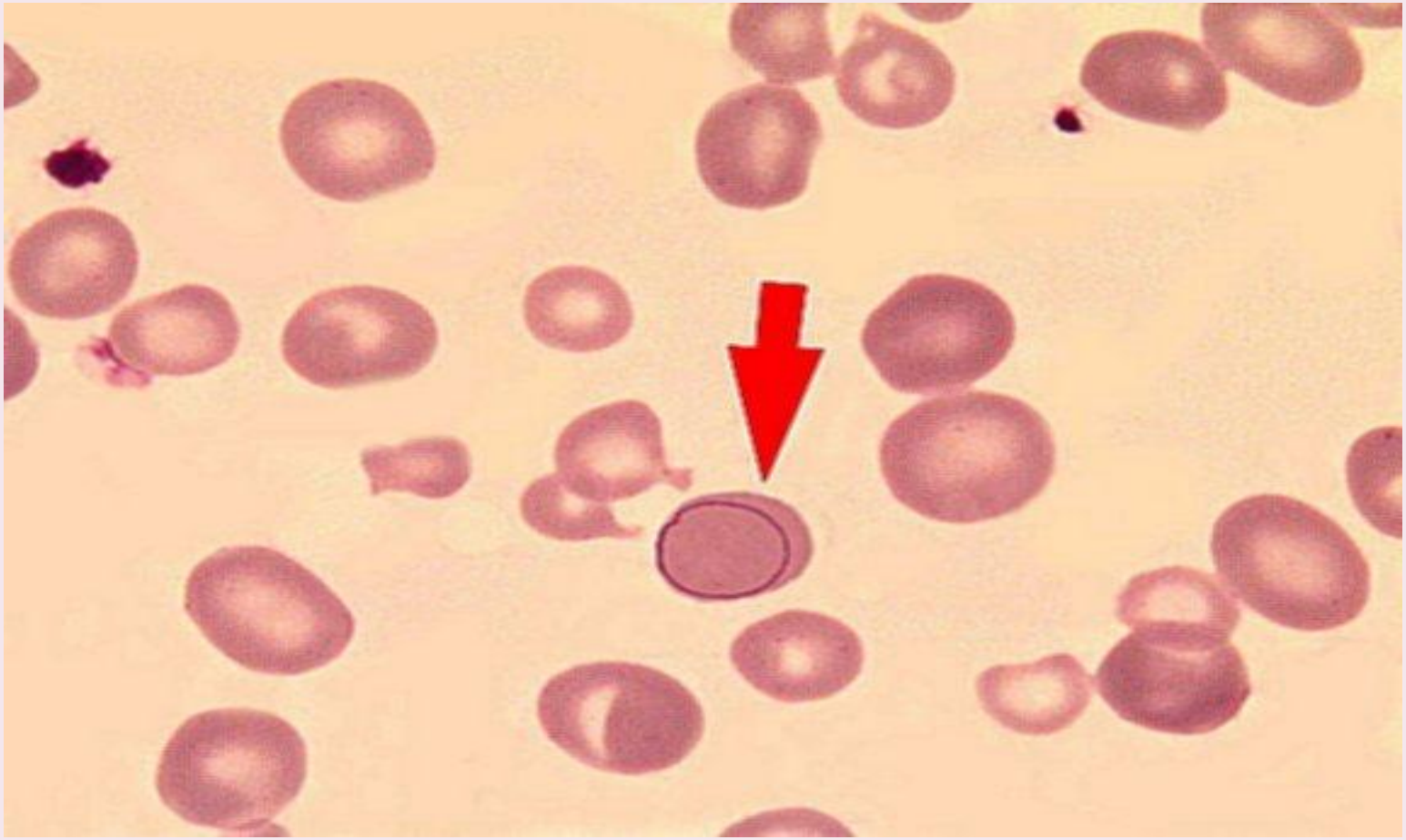
ELLIOCYTES



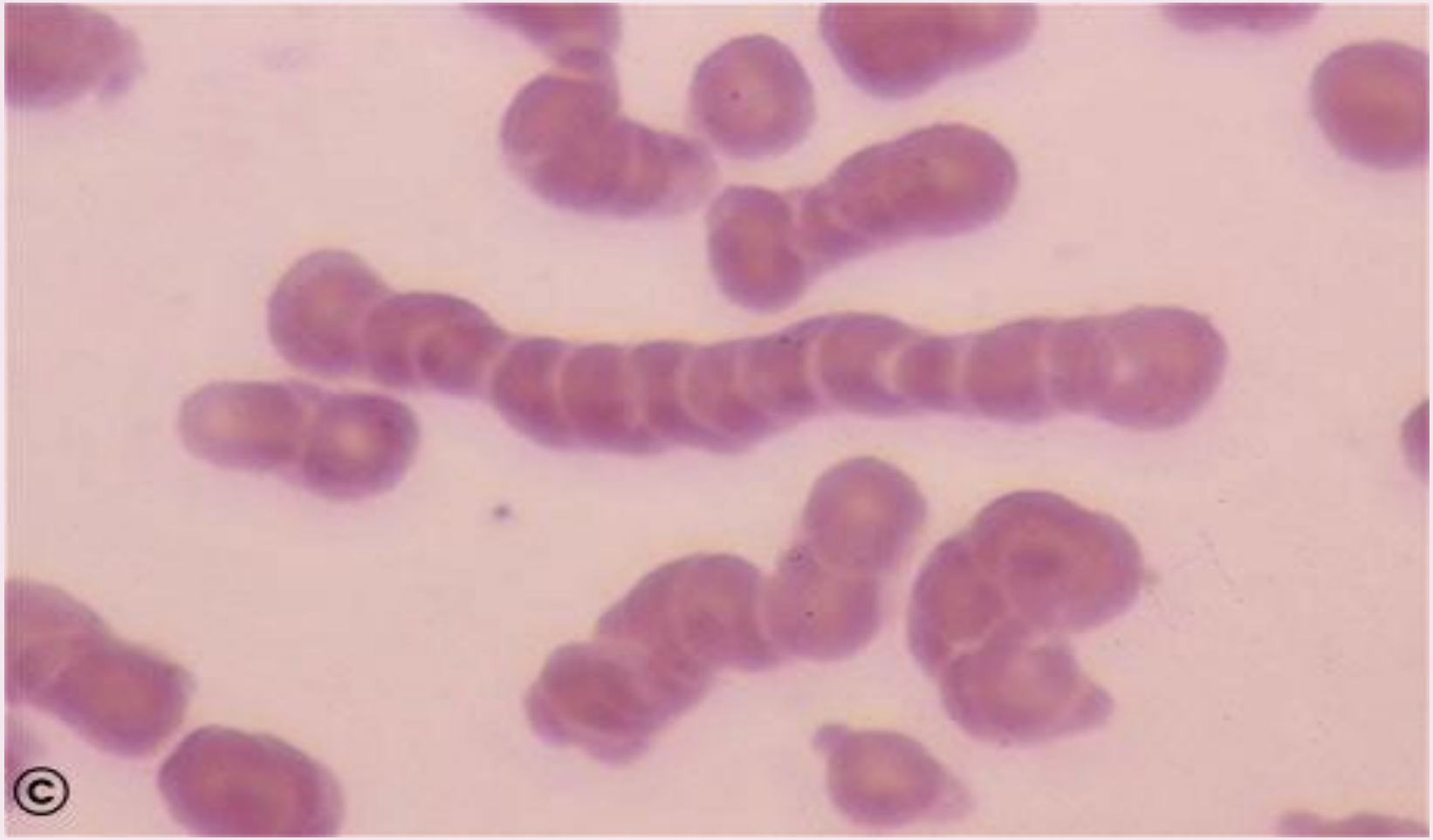
BASOPHILIC STIPPLING



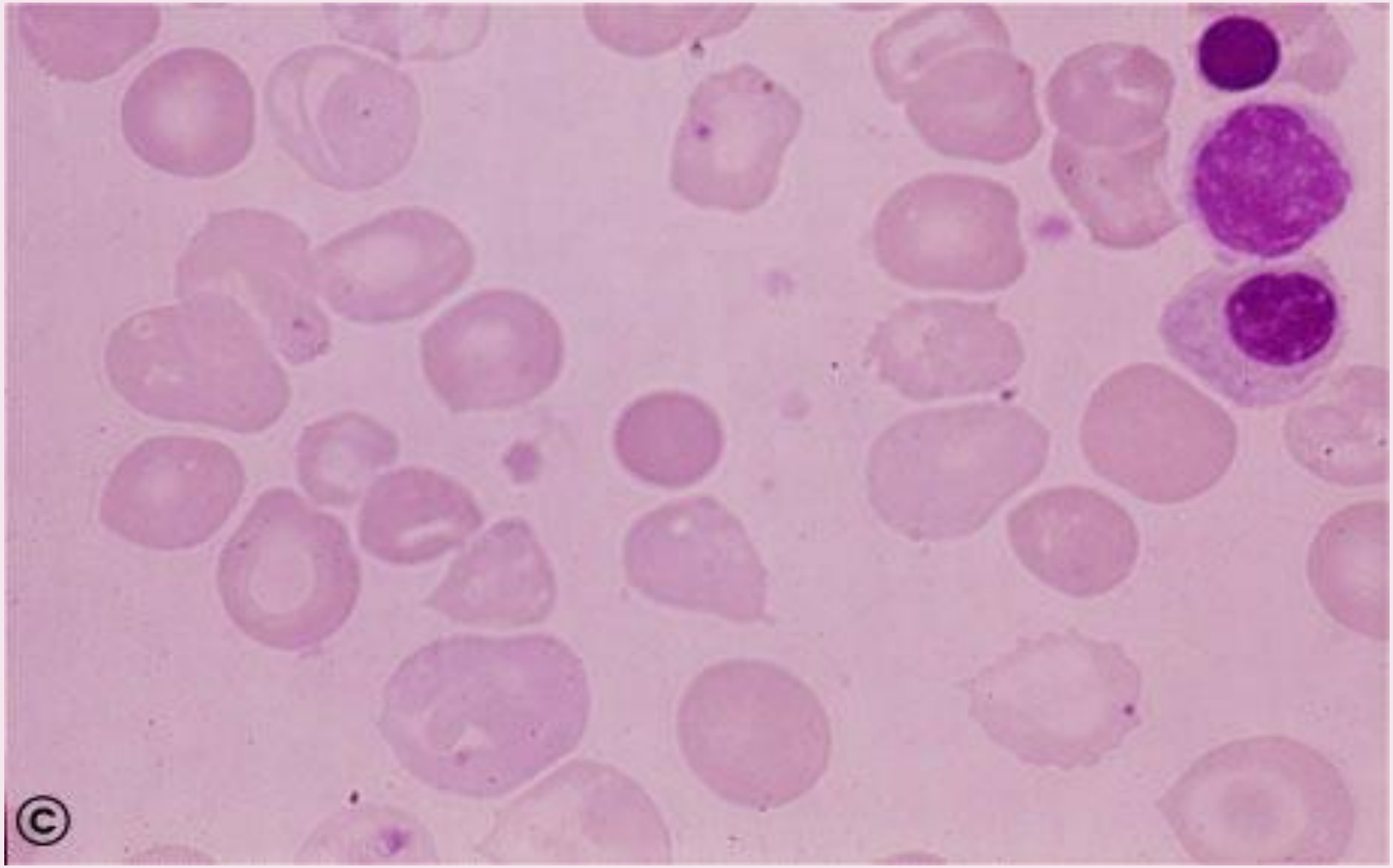
CABOT RING



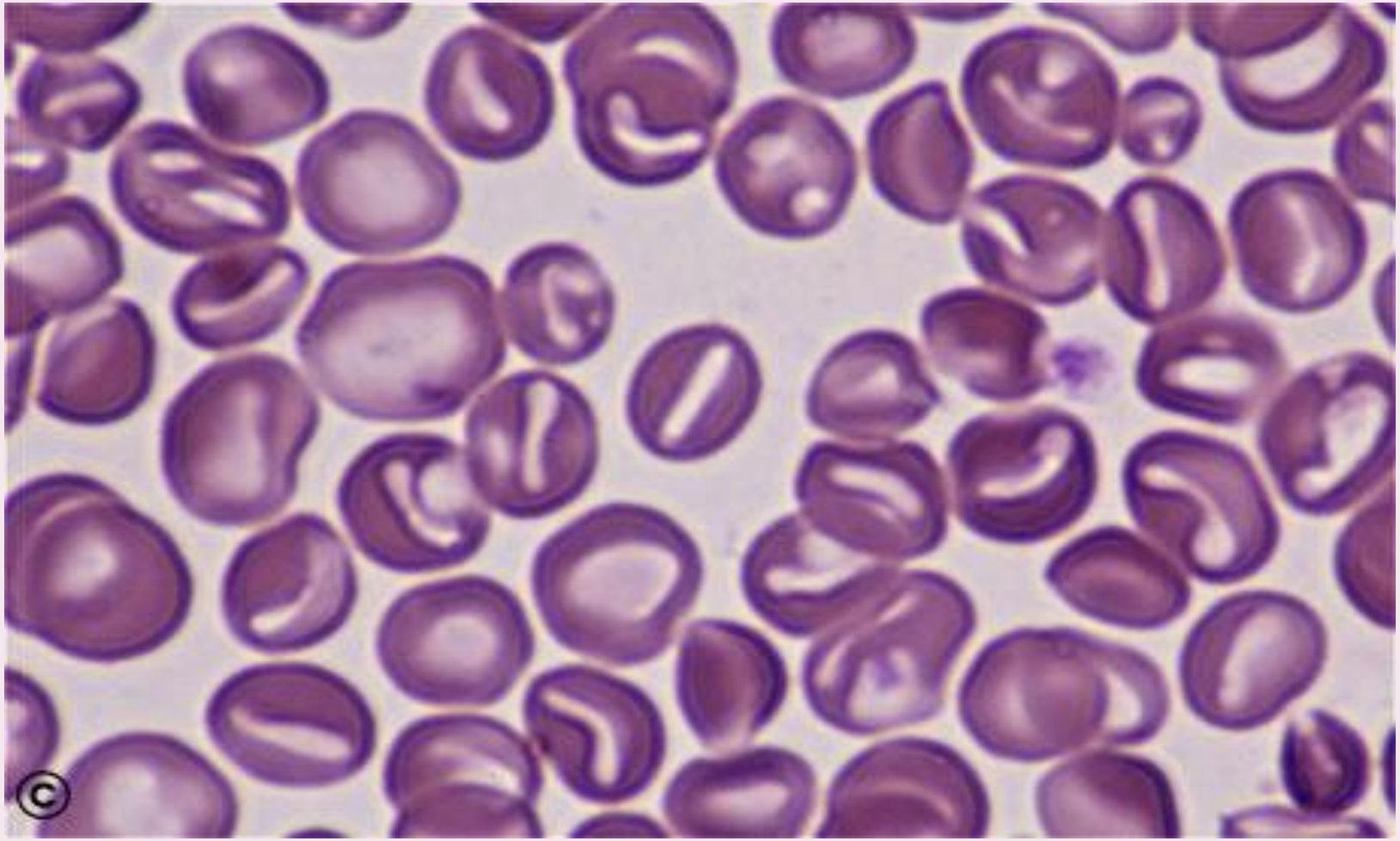
POULEAUX



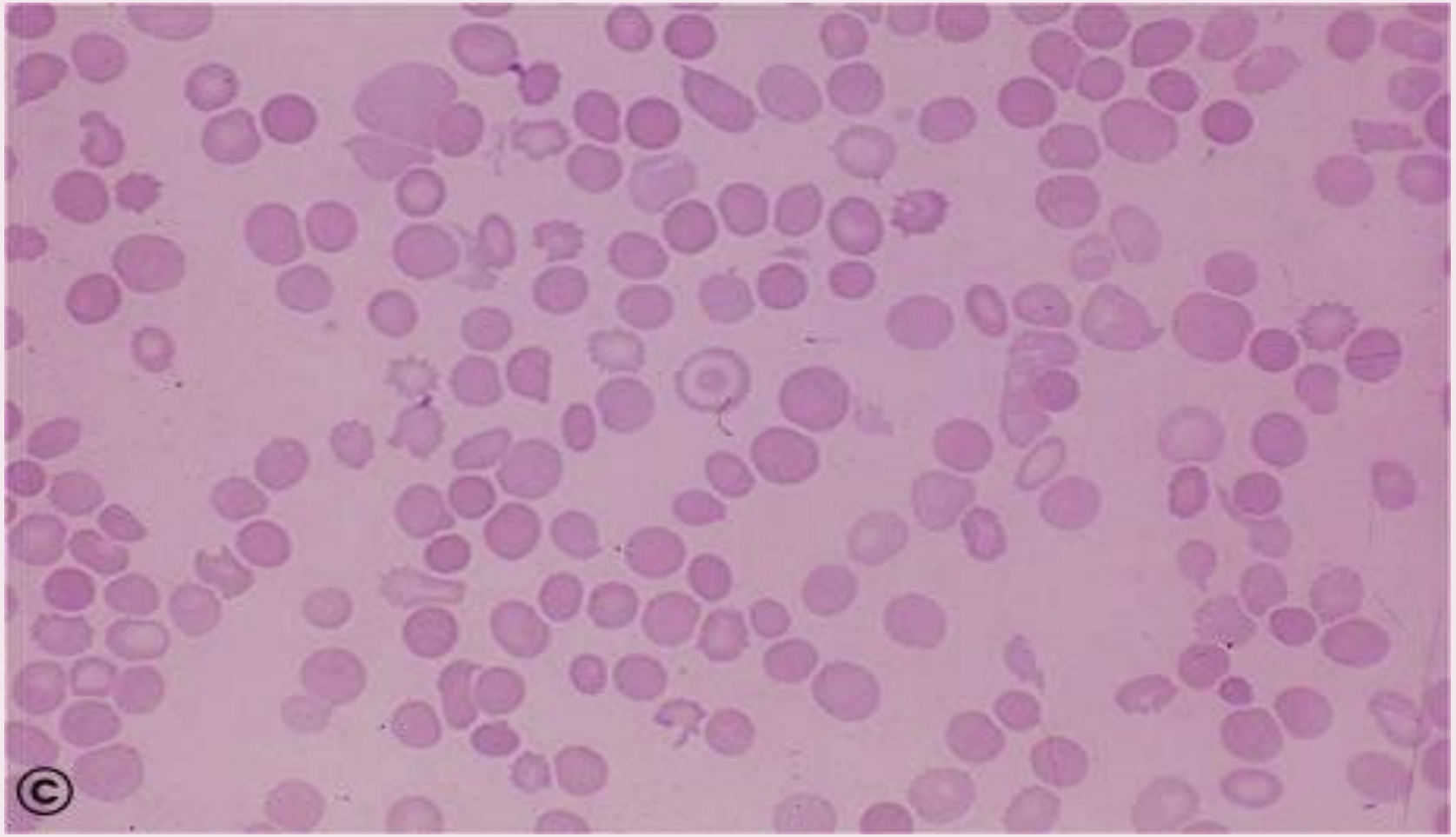
SPHEROCYTES



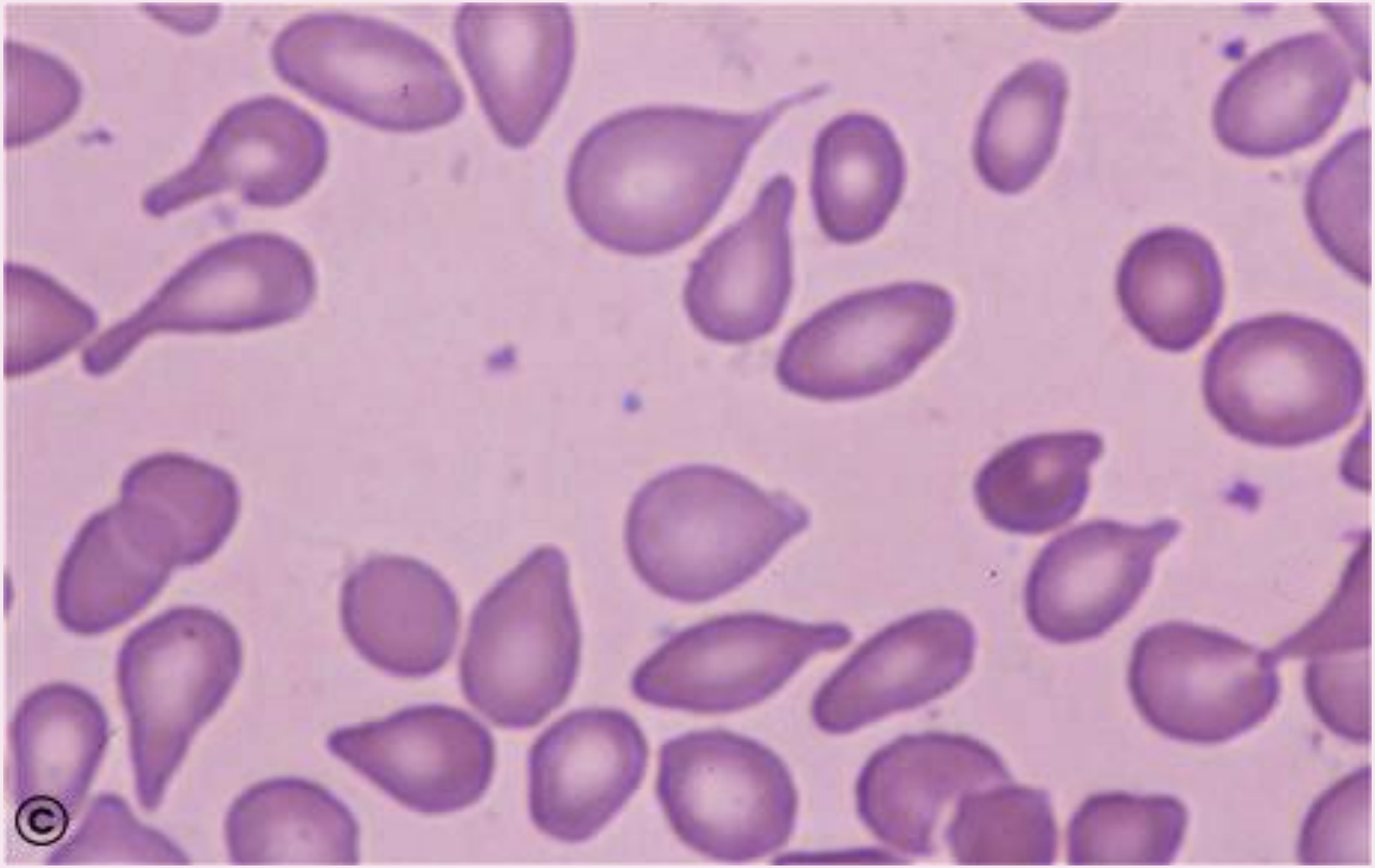
STEOMATOCYTES



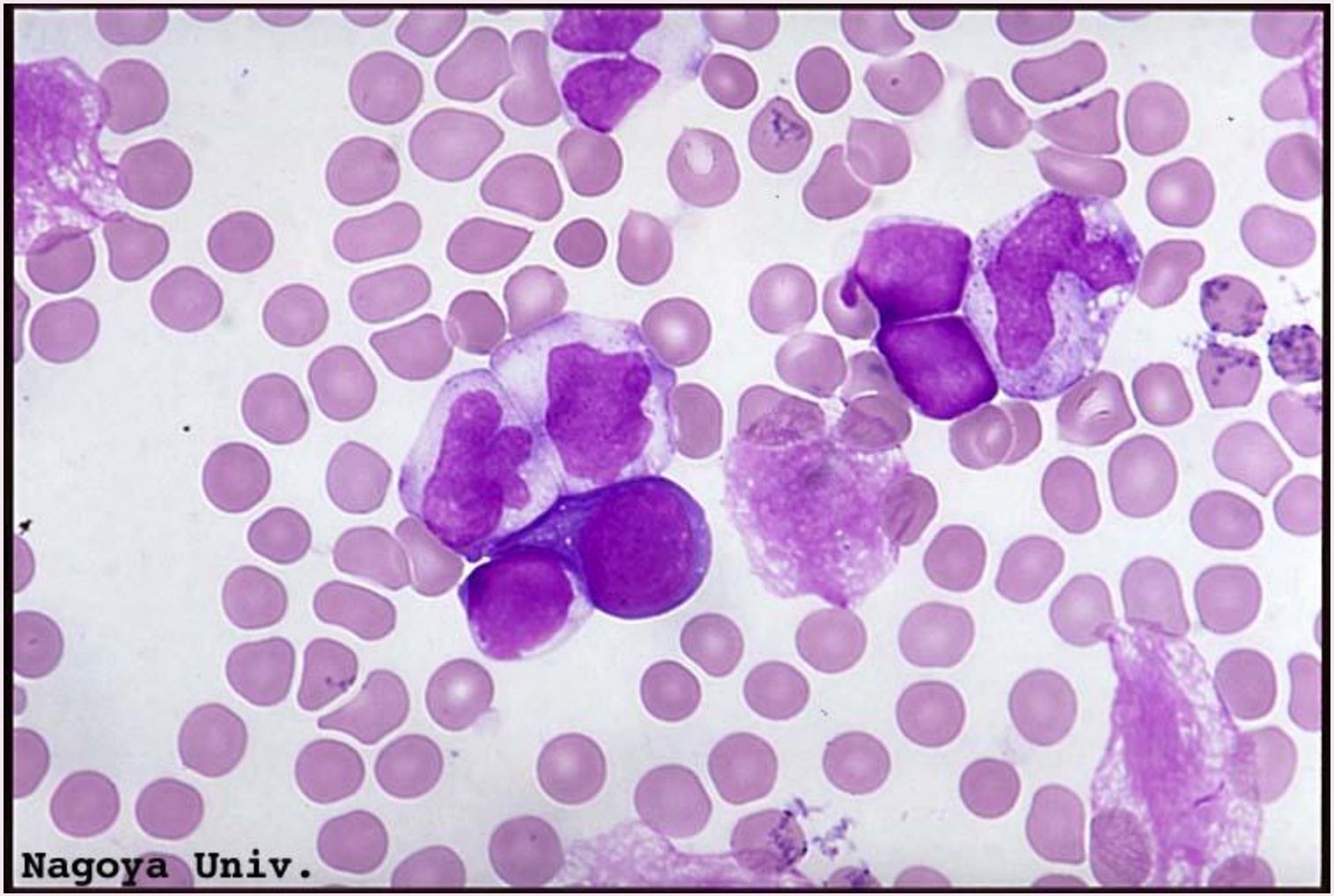
TARGET CELL



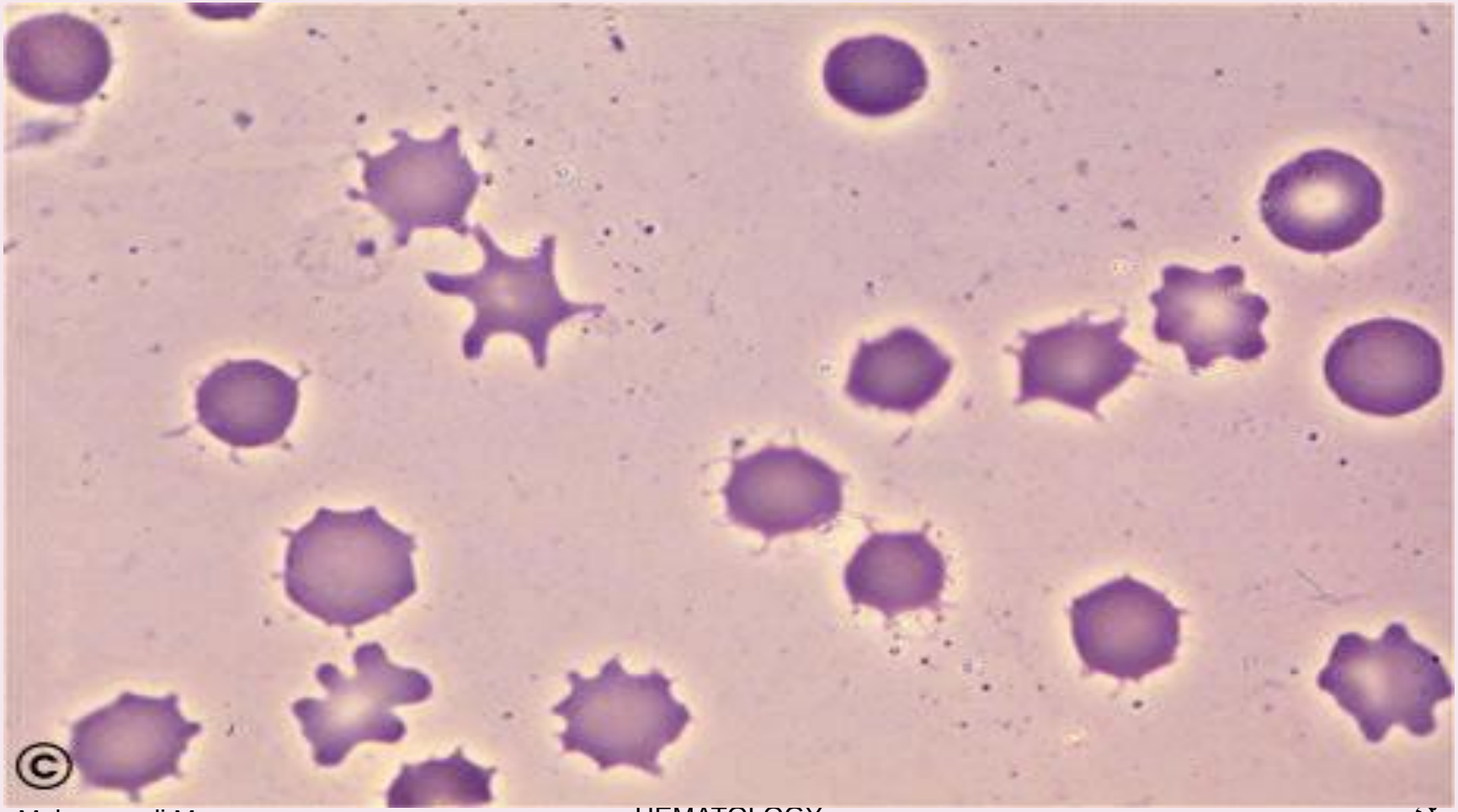
TEARDROP CELL



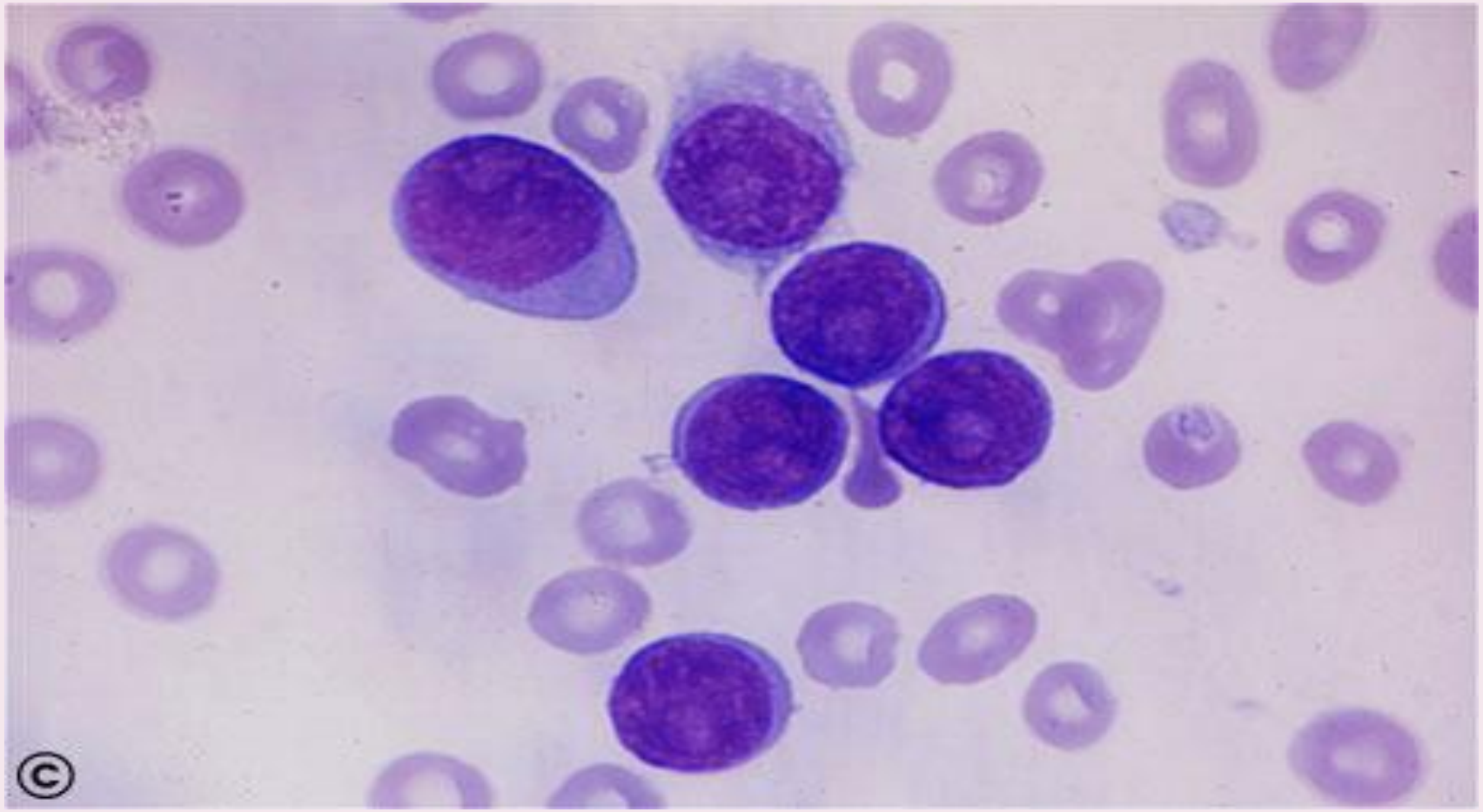
MALIGNANT HISTOCYTOSIS



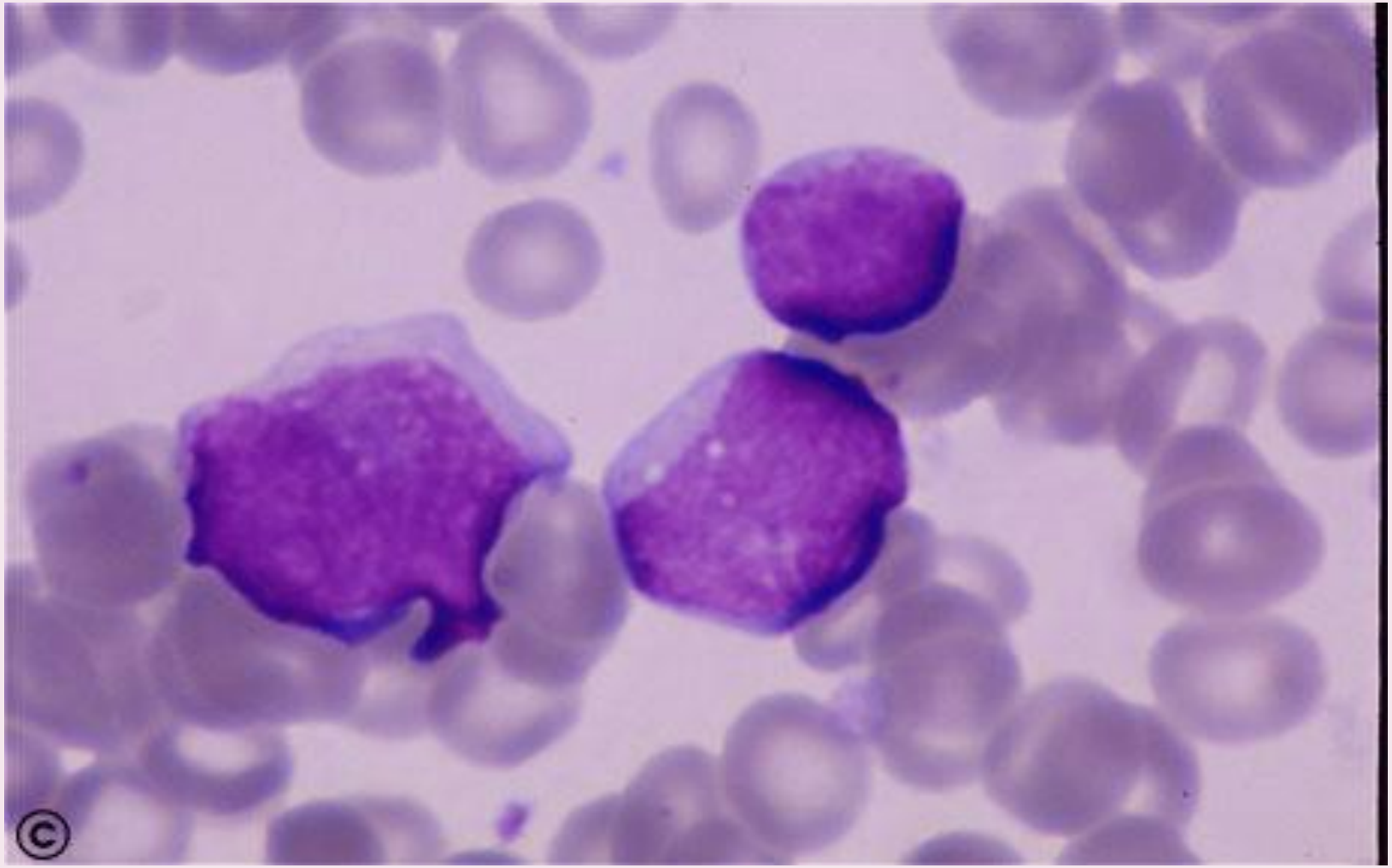
acanthocytes



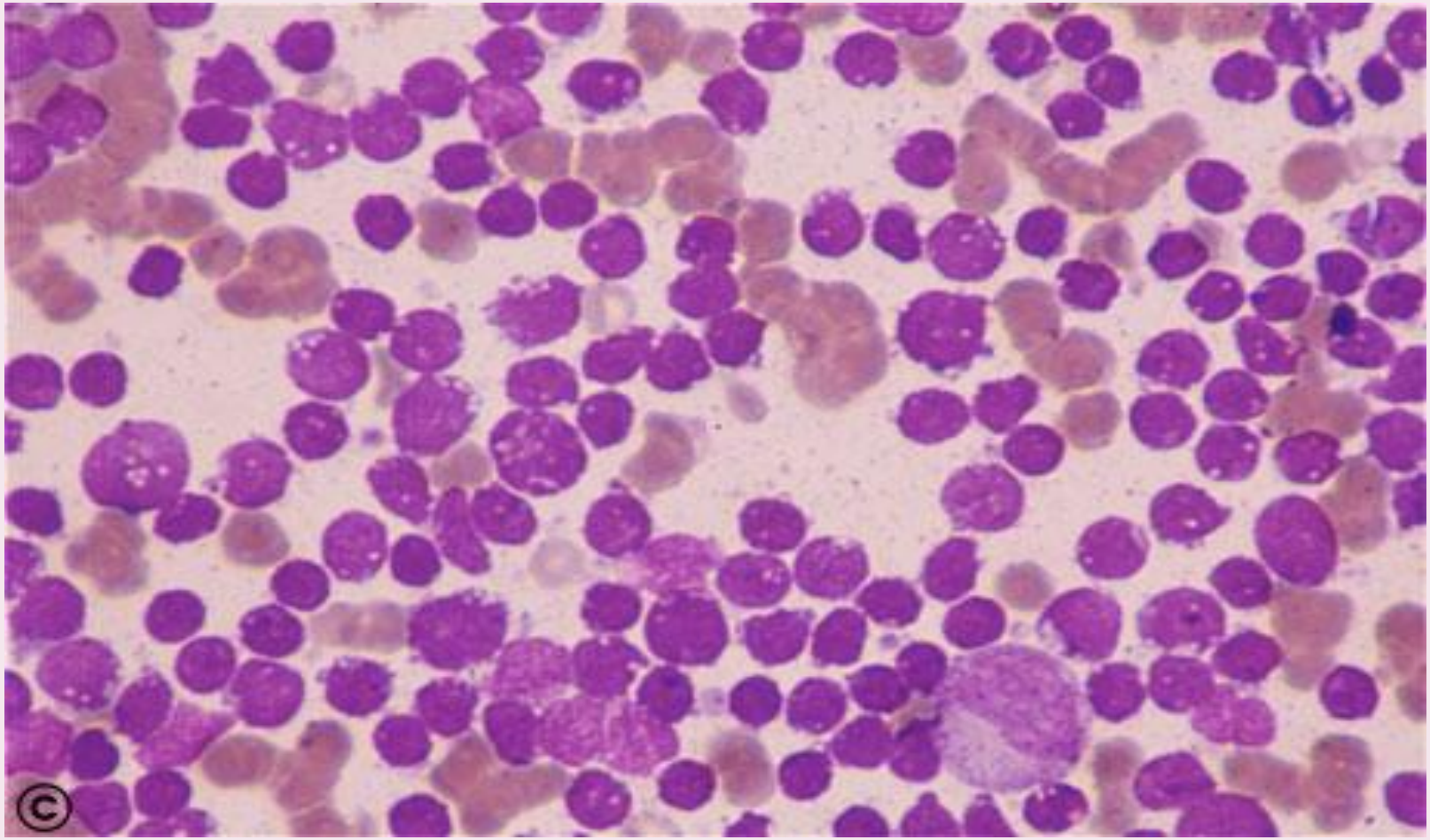
Acute lymphatic leukemia ALL-L1



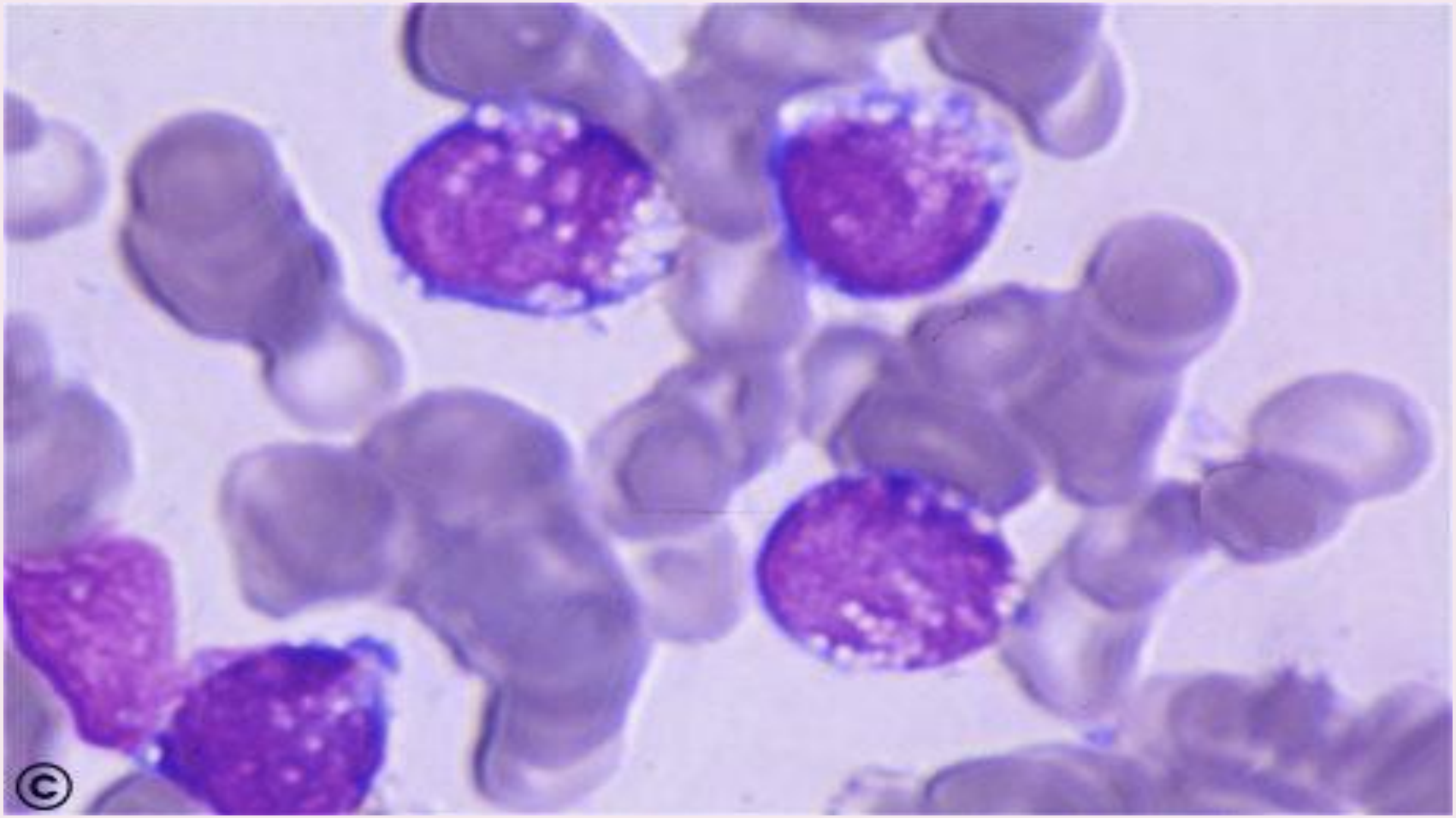
Acute lymphatic leukemia ALL-L2



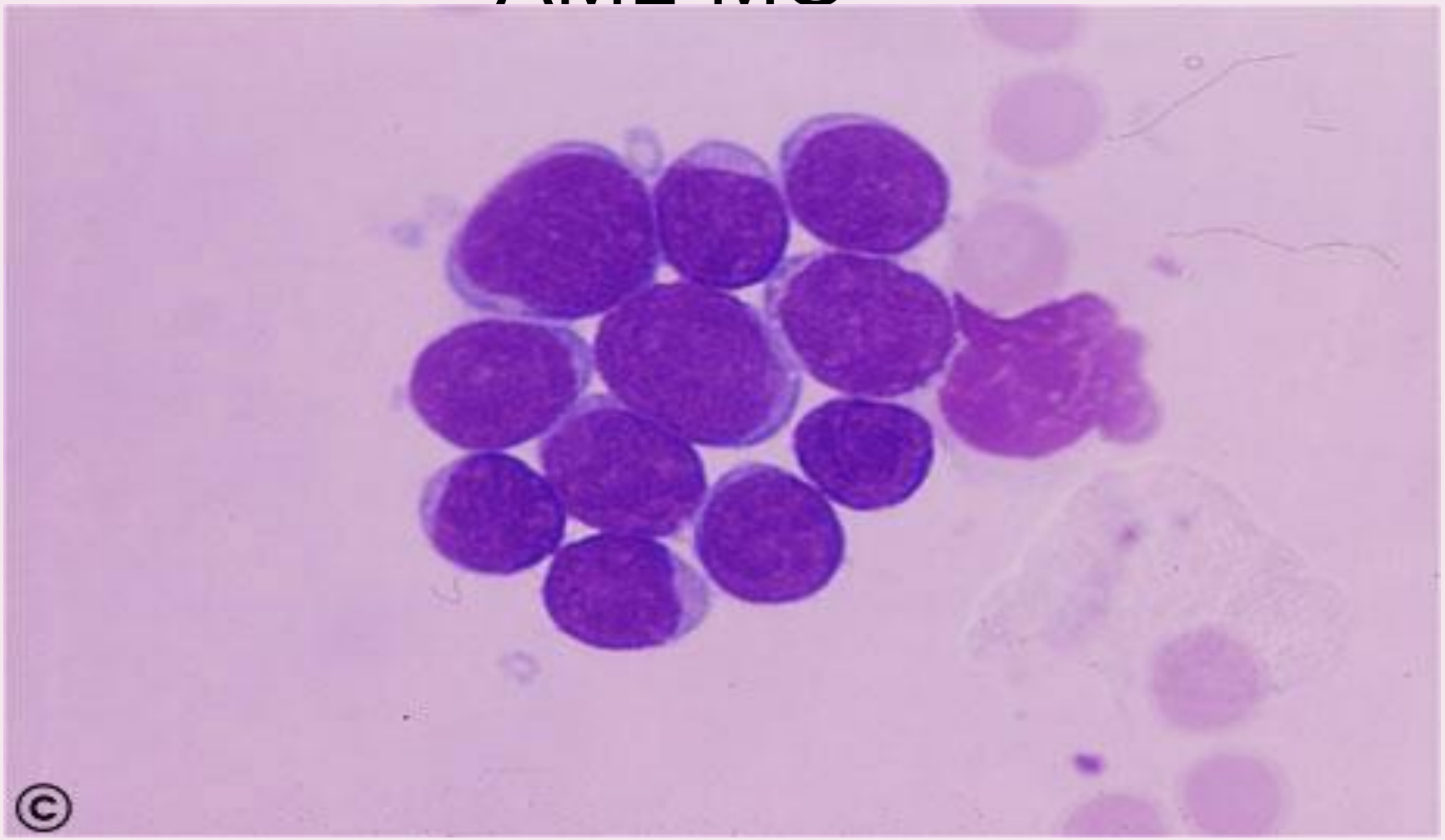
Acute lymphatic leukemia ALL-L3



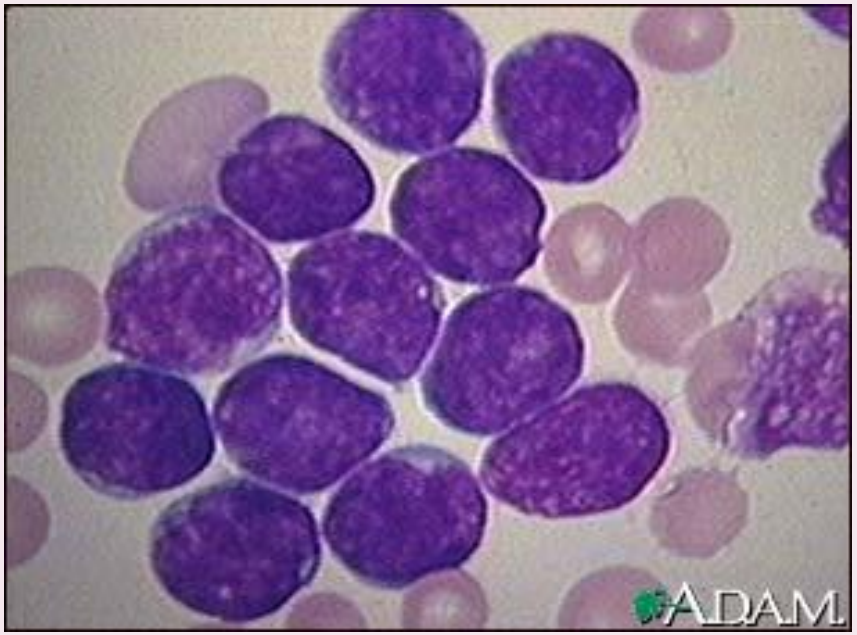
Acute lymphatic leukemia ALL-L3



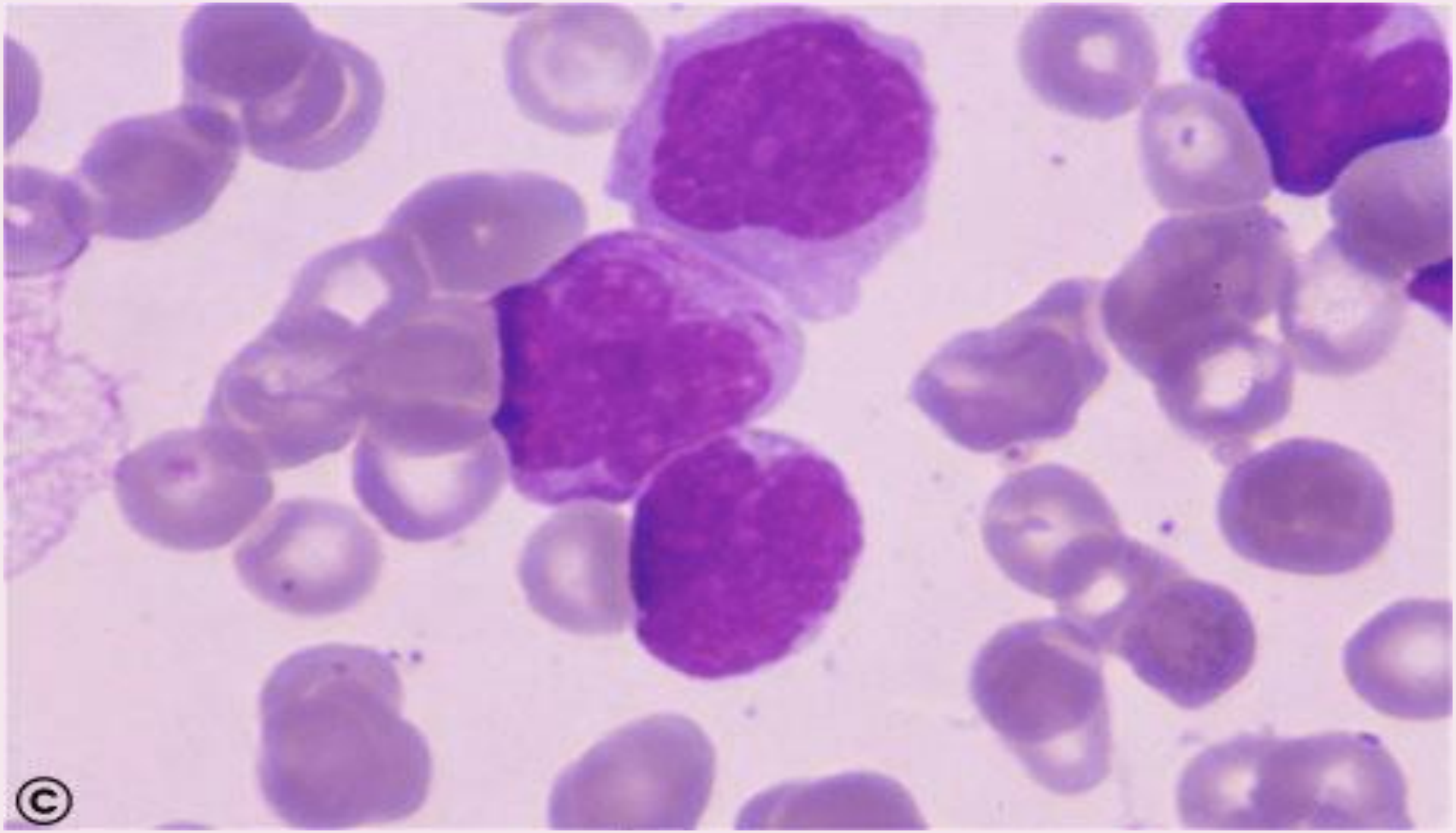
ACUTE MYELOID LEUKEMIA AML-MO



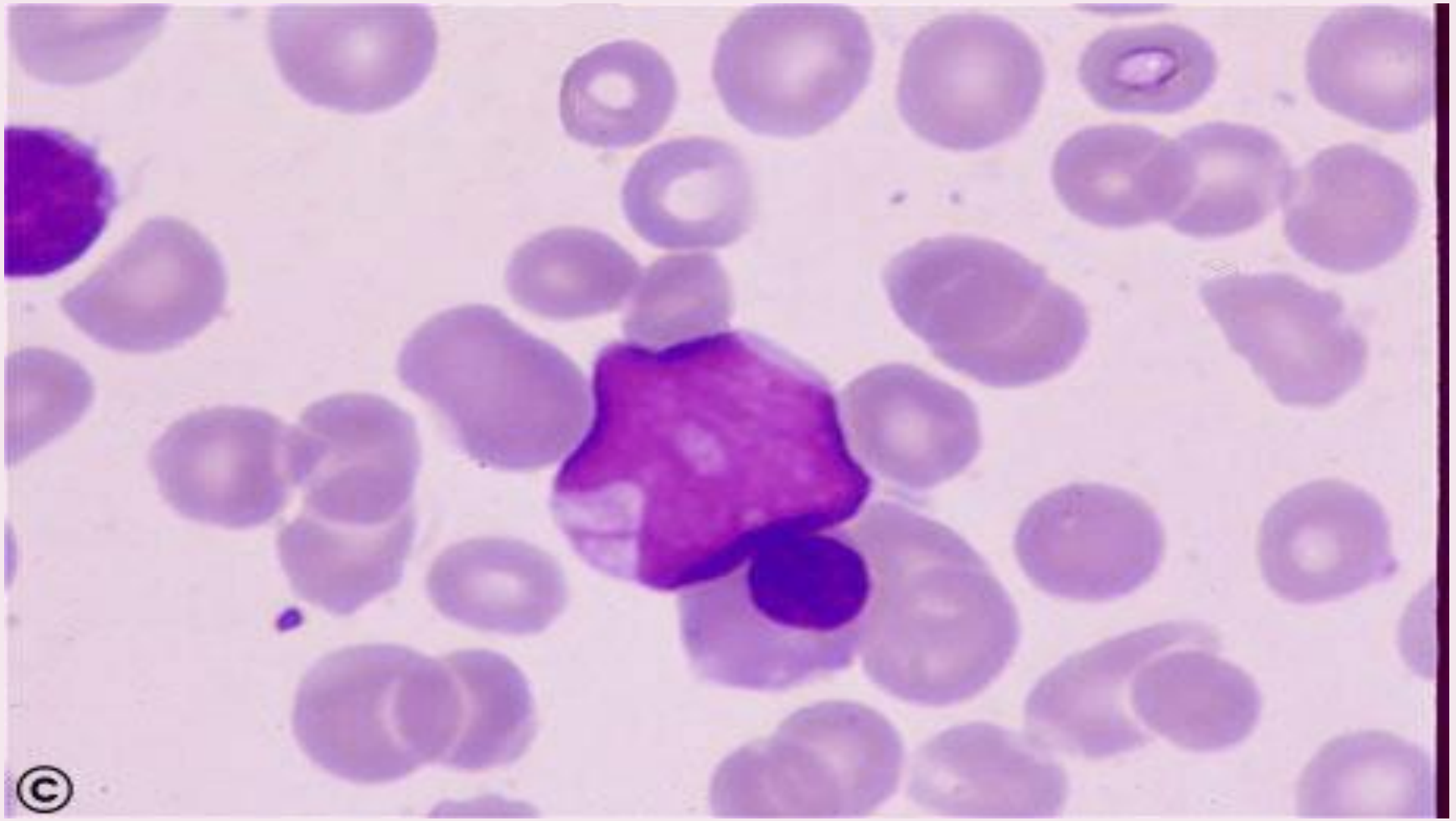
Acute Leukemia



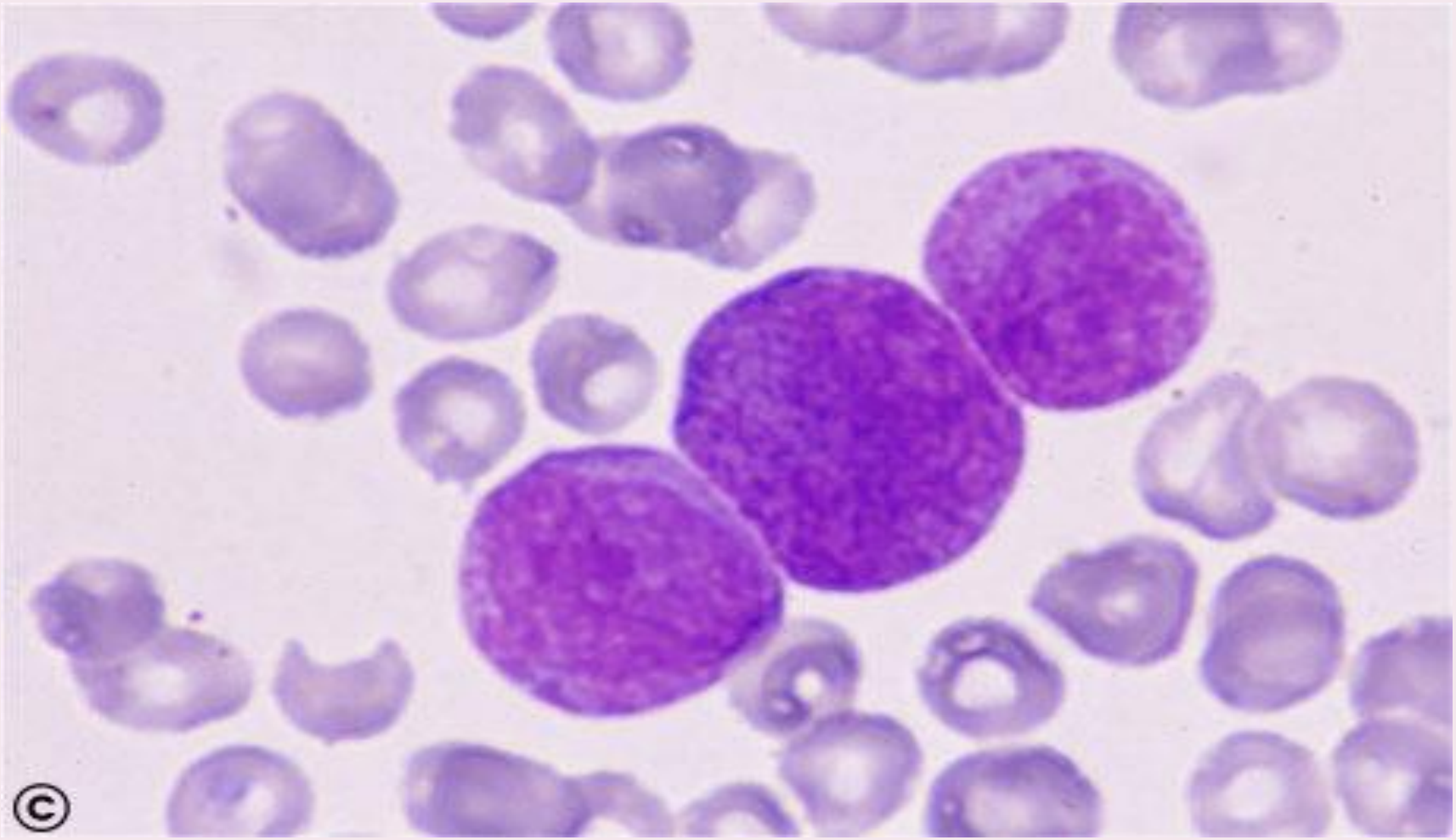
ACUTE MYELOID LEUKEMIA AML-M1



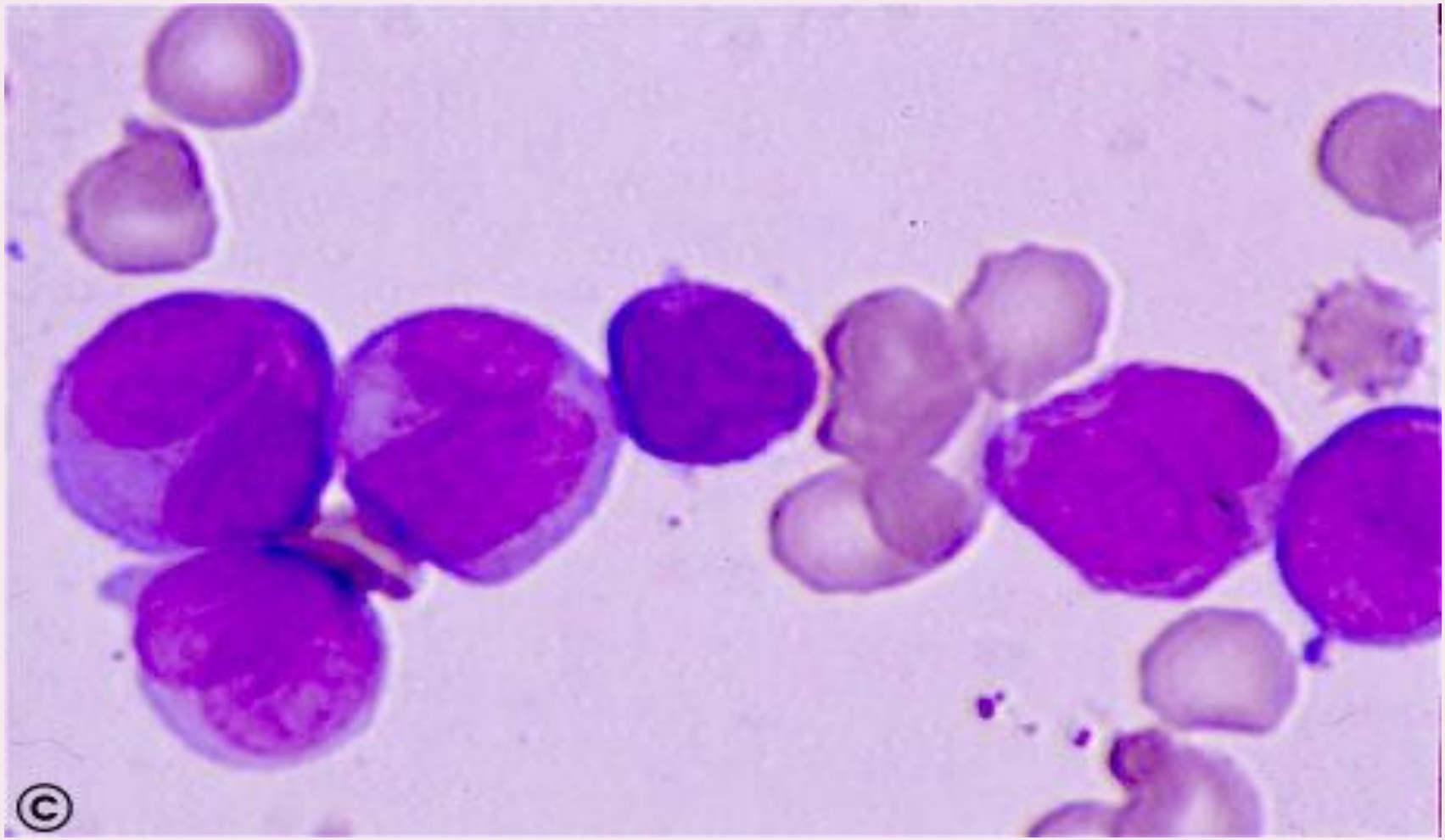
ACUTE MYELOID LEUKEMIA AML-M2



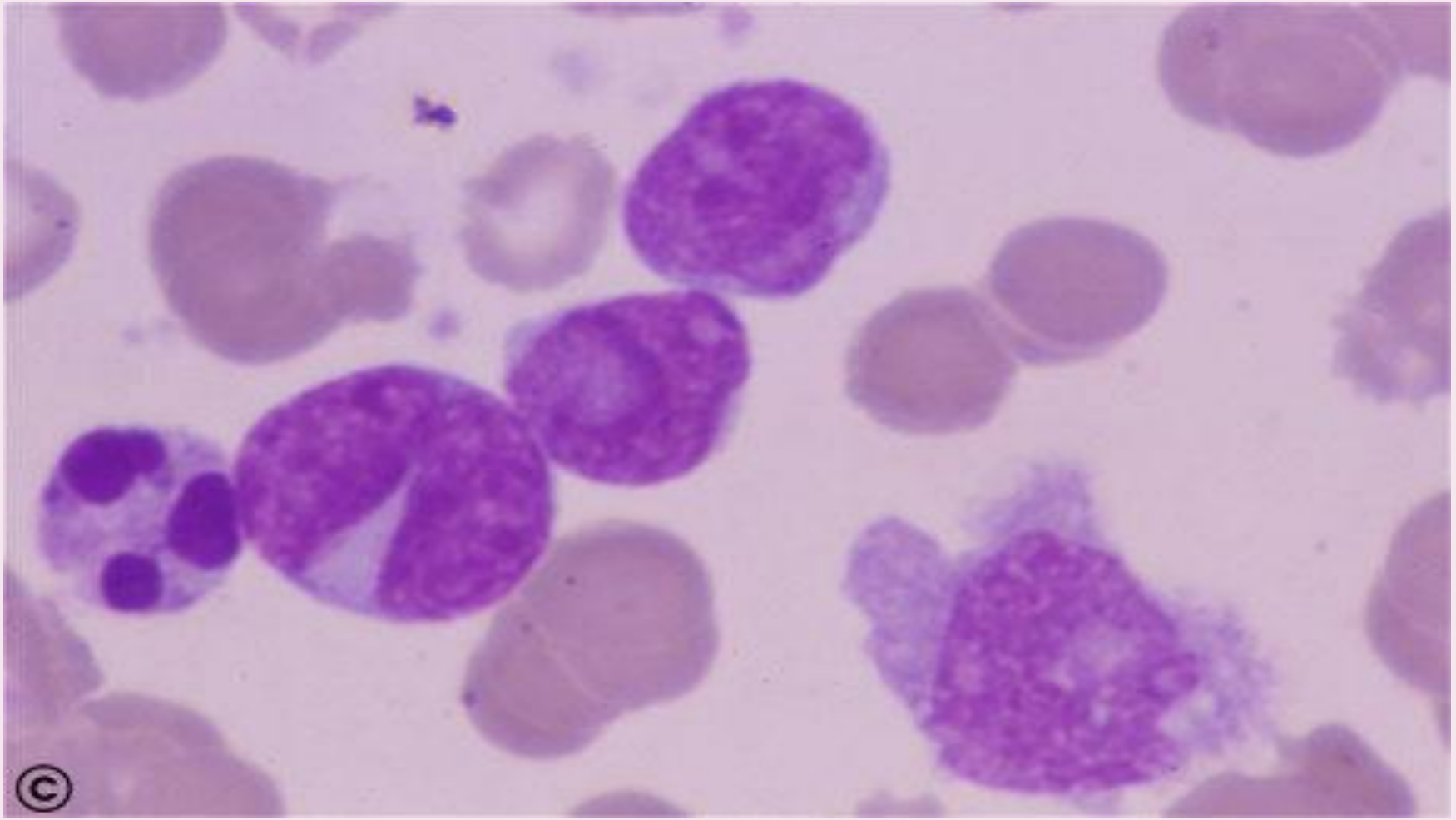
ACUTE MYELOID LEUKEMIA AML-M3



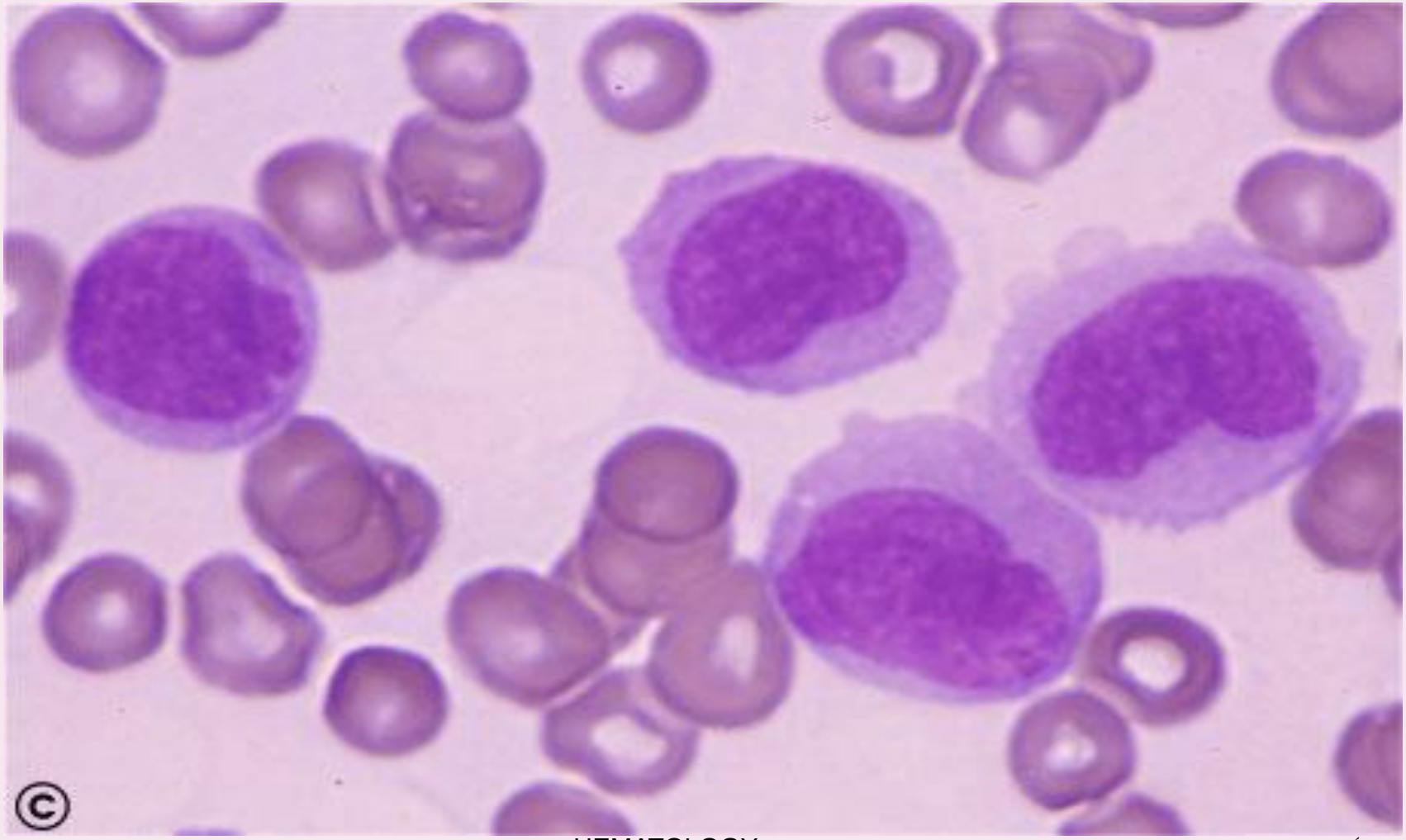
ACUTE MYELOID LEUKEMIA AML-M3(HYPOGRANULAR)



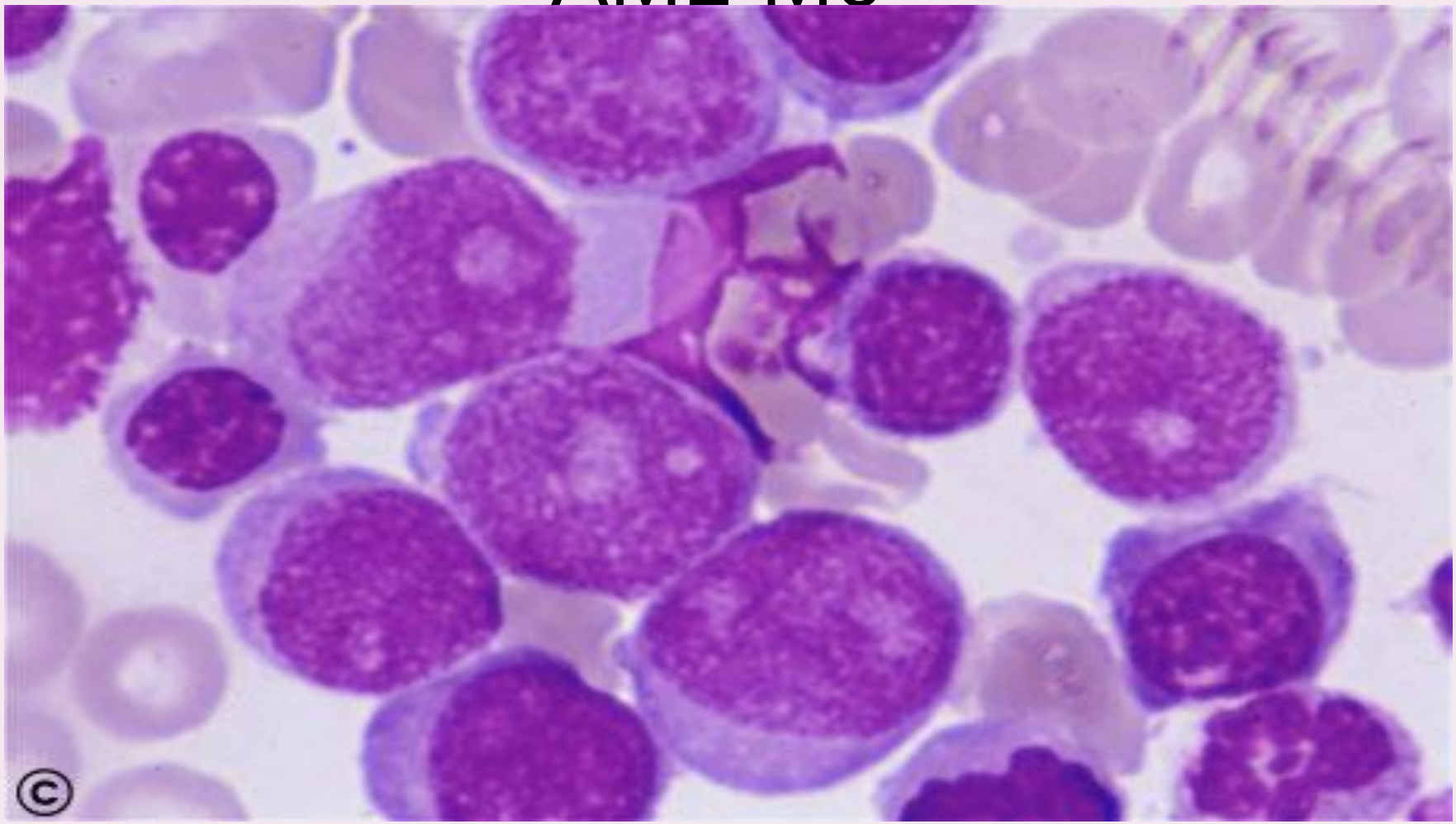
ACUTE MYELOID LEUKEMIA AML-M4



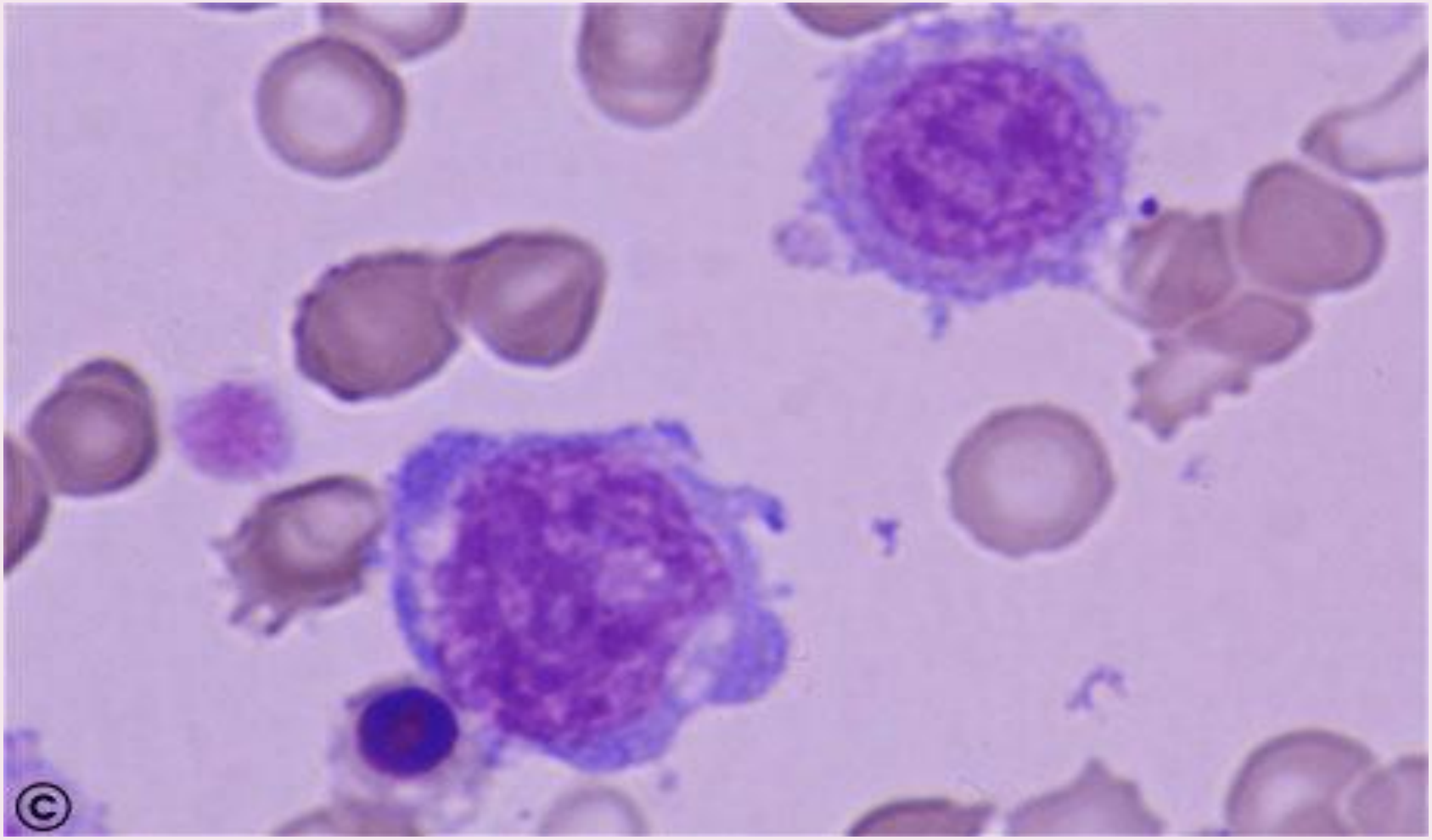
ACUTE MYELOID LEUKEMIA AML-M5



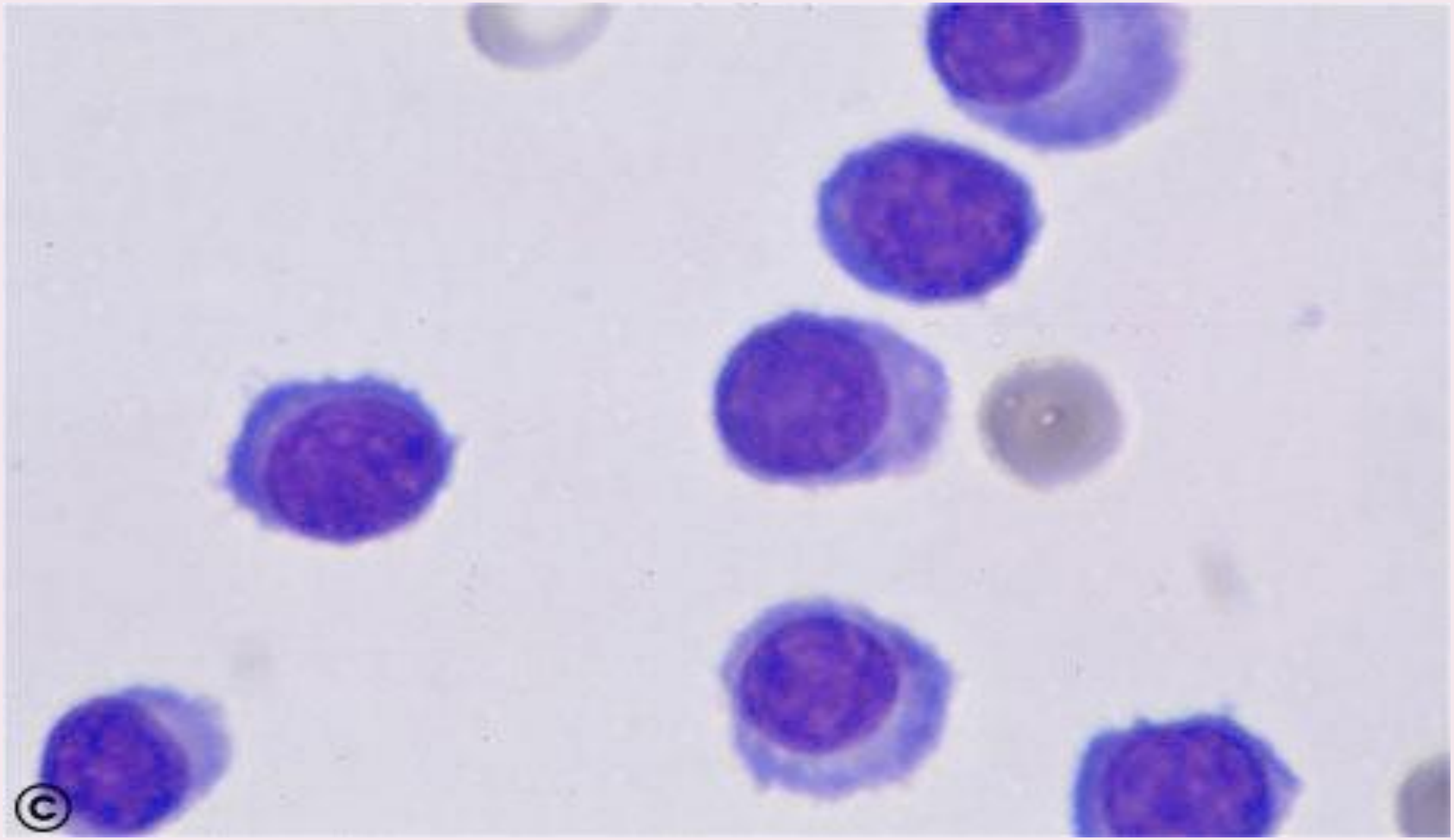
ACUTE MYELOID LEUKEMIA AML-M6



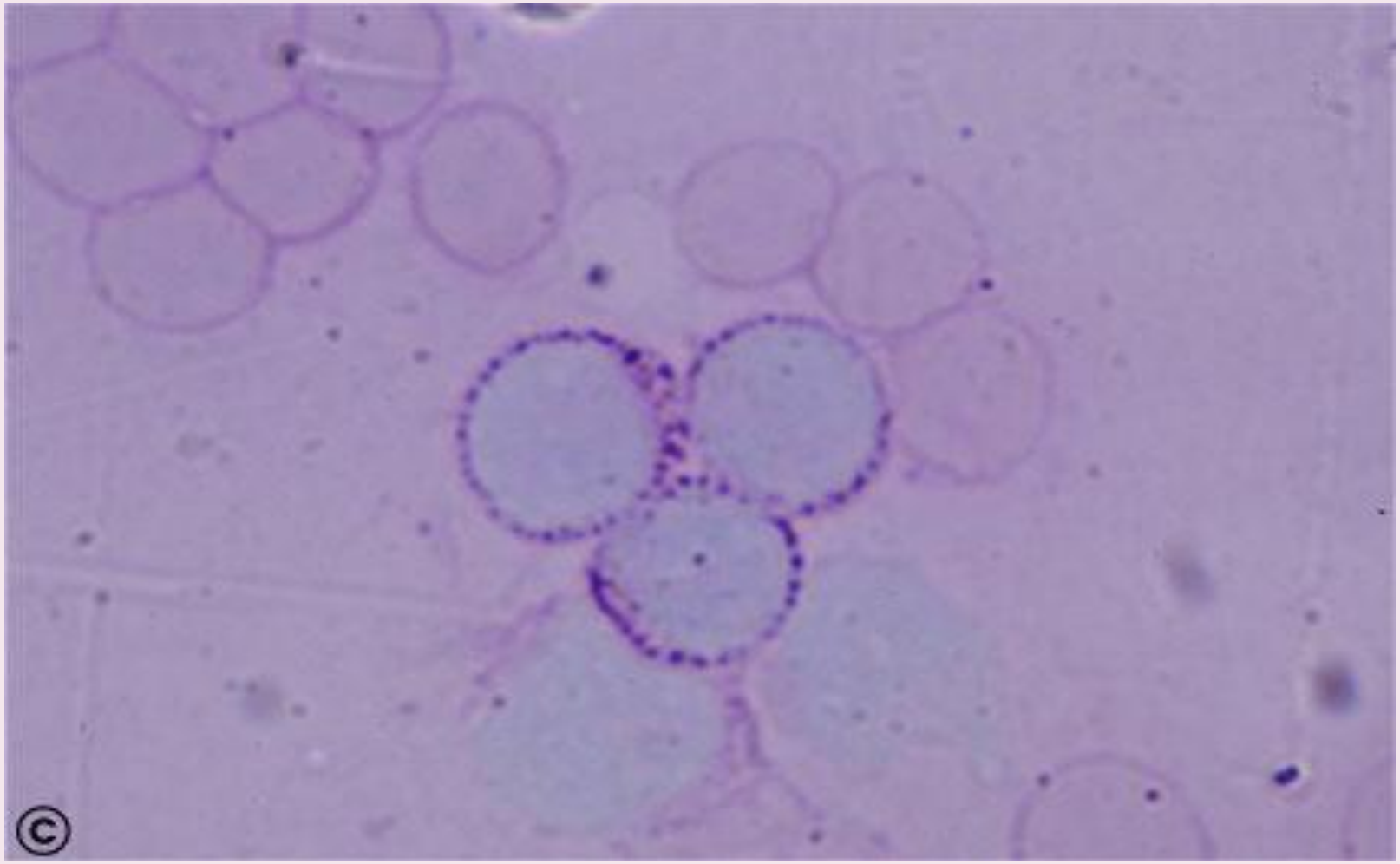
ACUTE MYELOID LEUKEMIA AML-M7



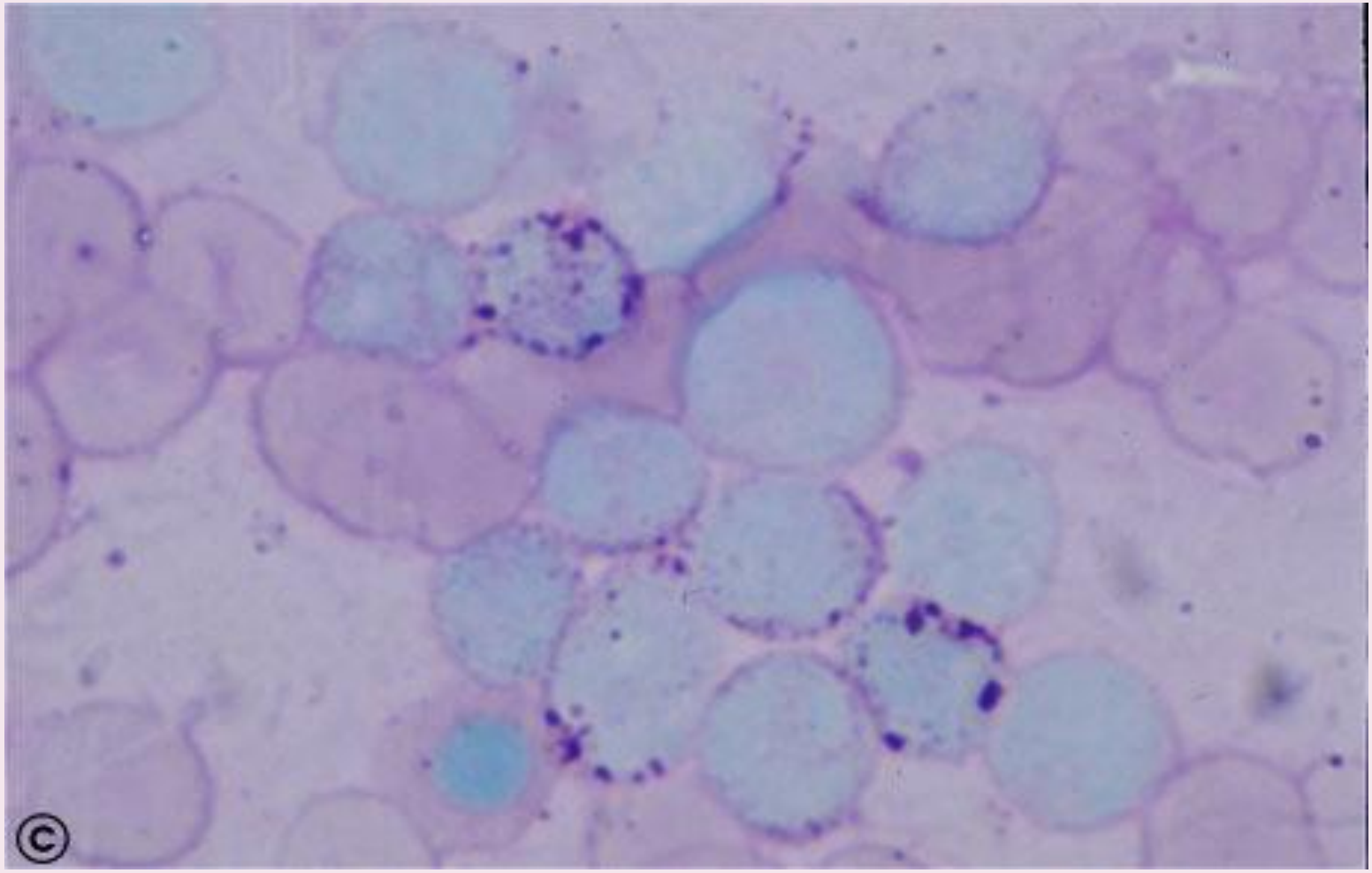
ACUTE PLASMOCUTIC LEUKEMIA



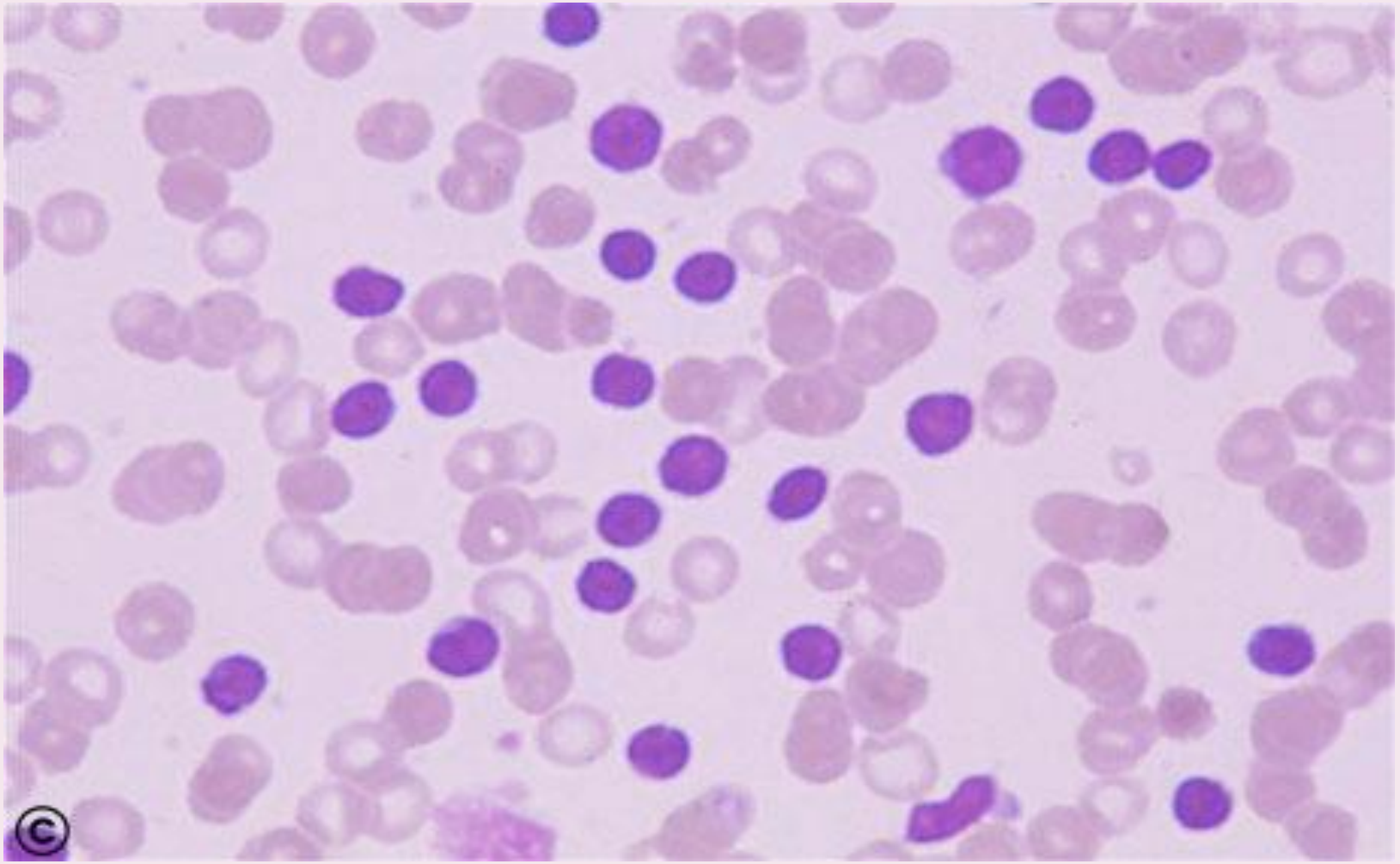
ALL-L1 POSITIVE-PAS



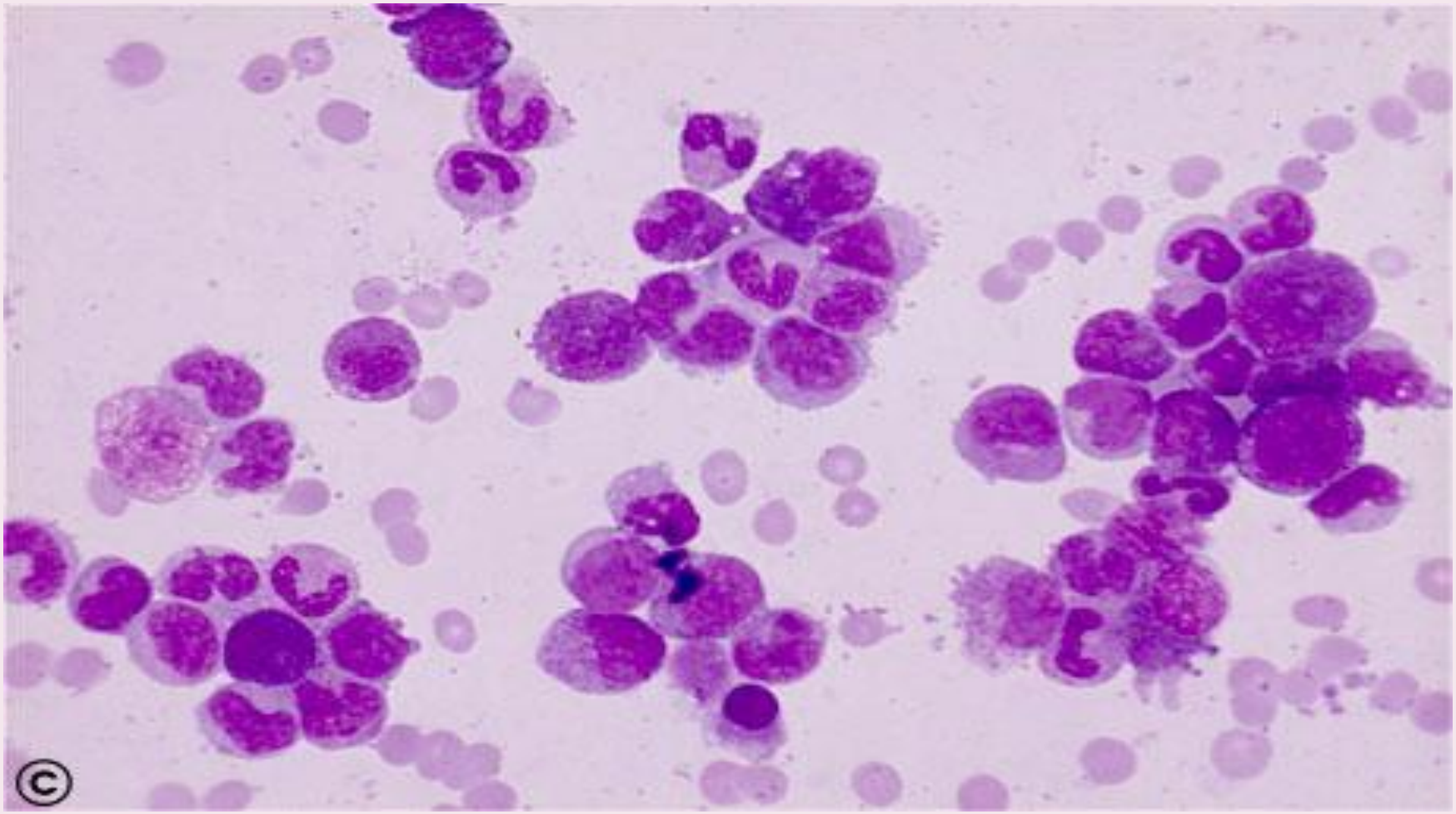
ALL-L2 POSITIVE-PAS



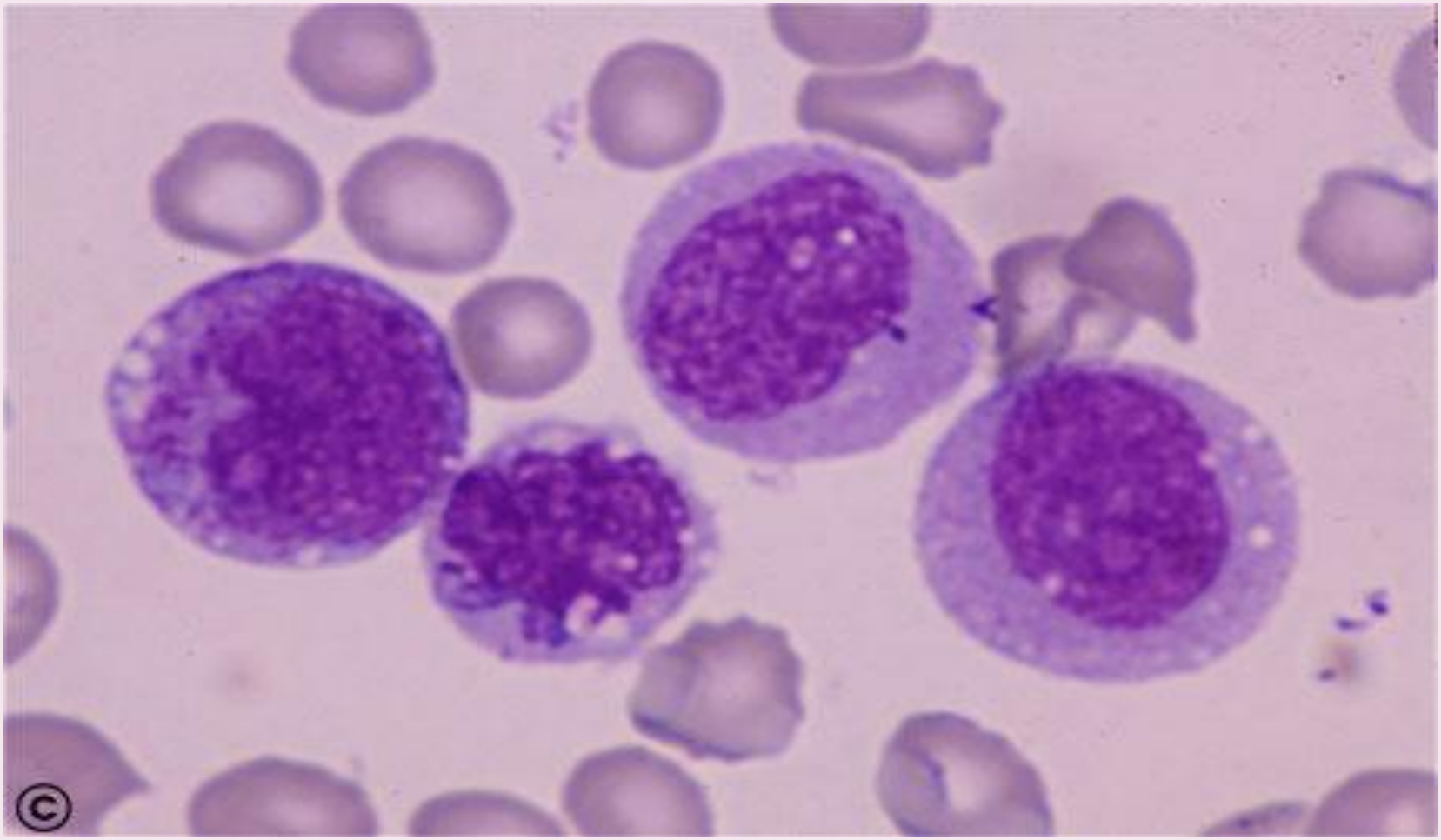
CHORNIC LYMPHATIC LEUKEMIA



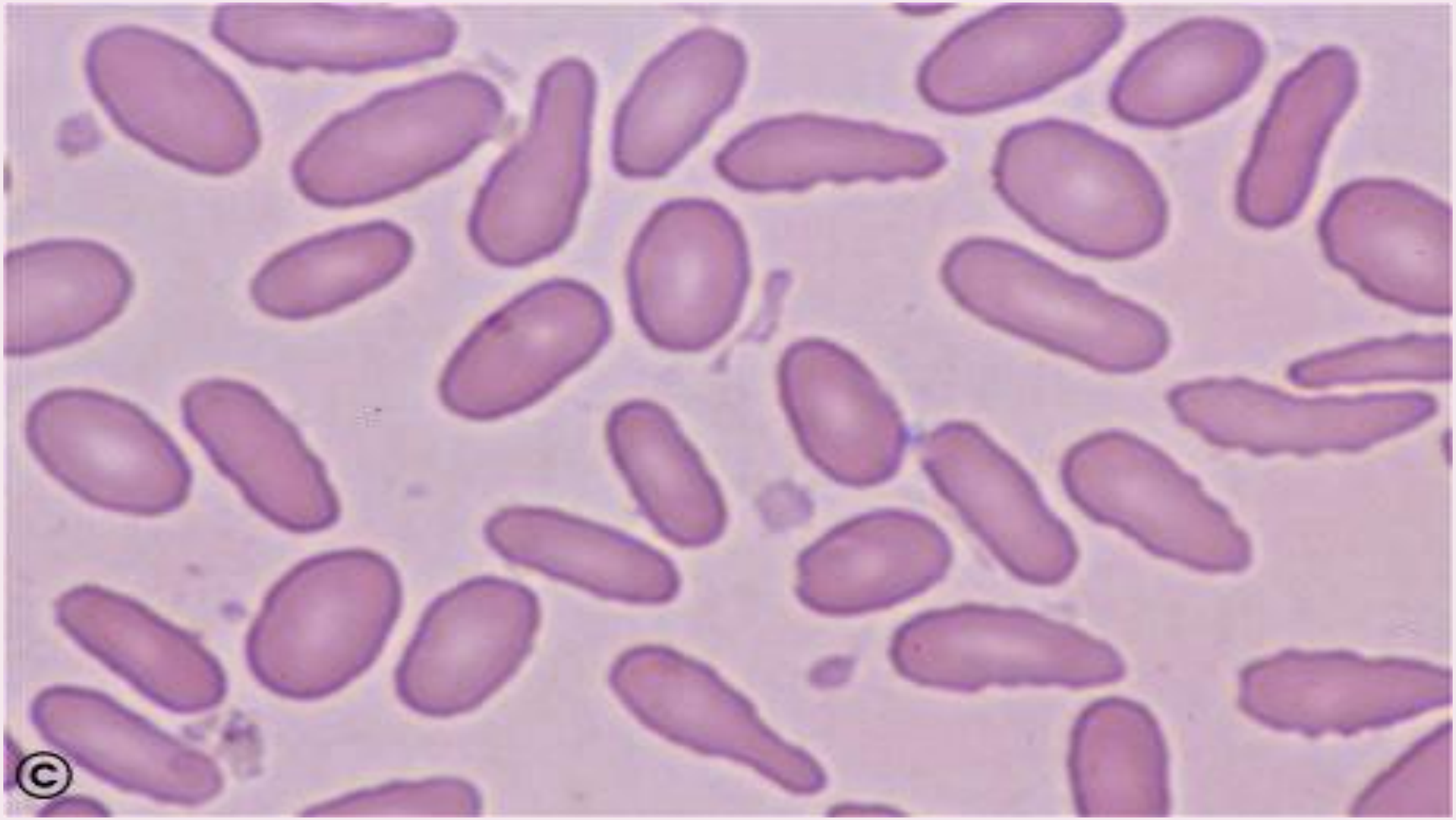
CHORNIC MYELOID LEUKEMIA



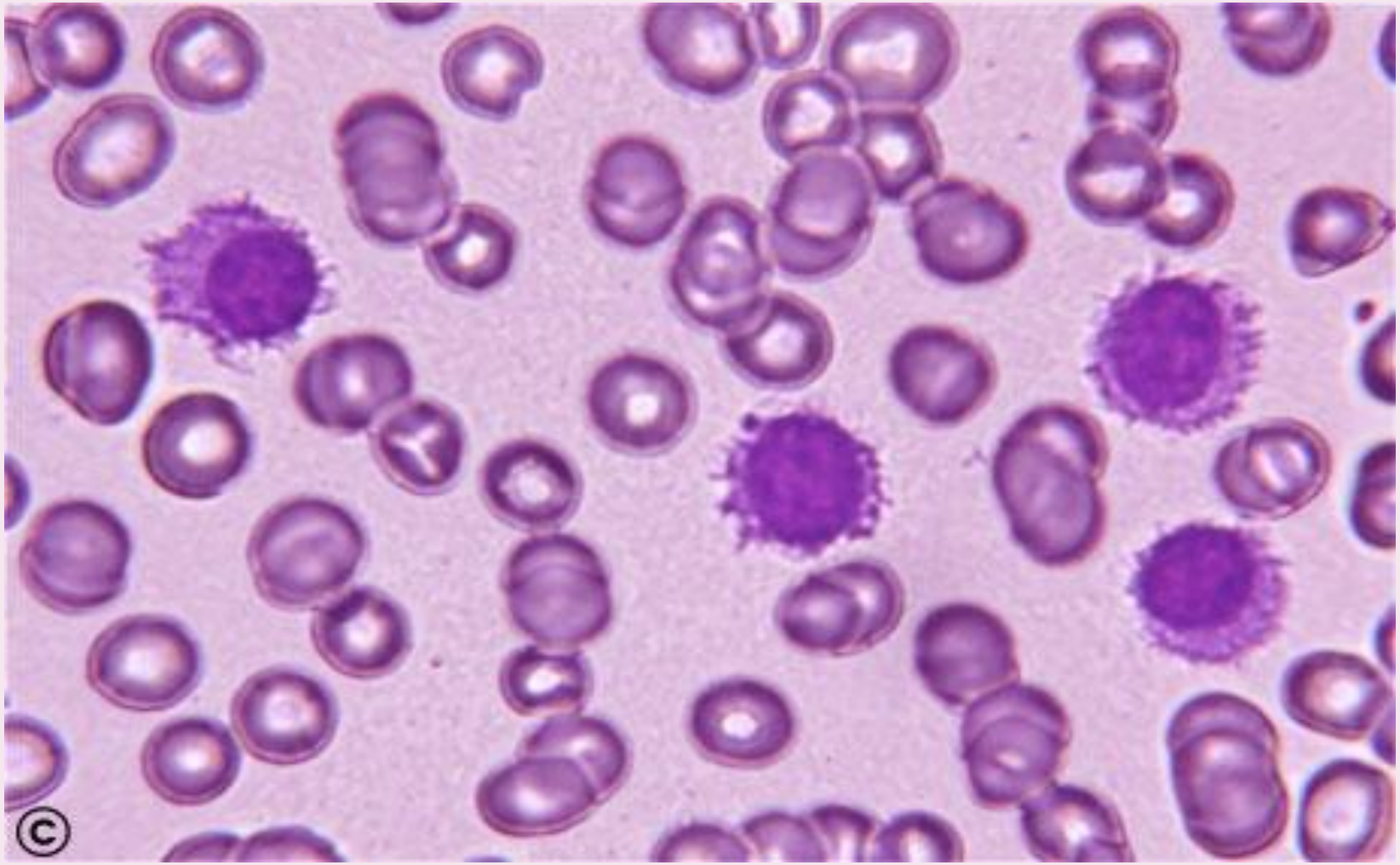
CHORNIC MYEO-MONOCYTIC LEUKEMIA



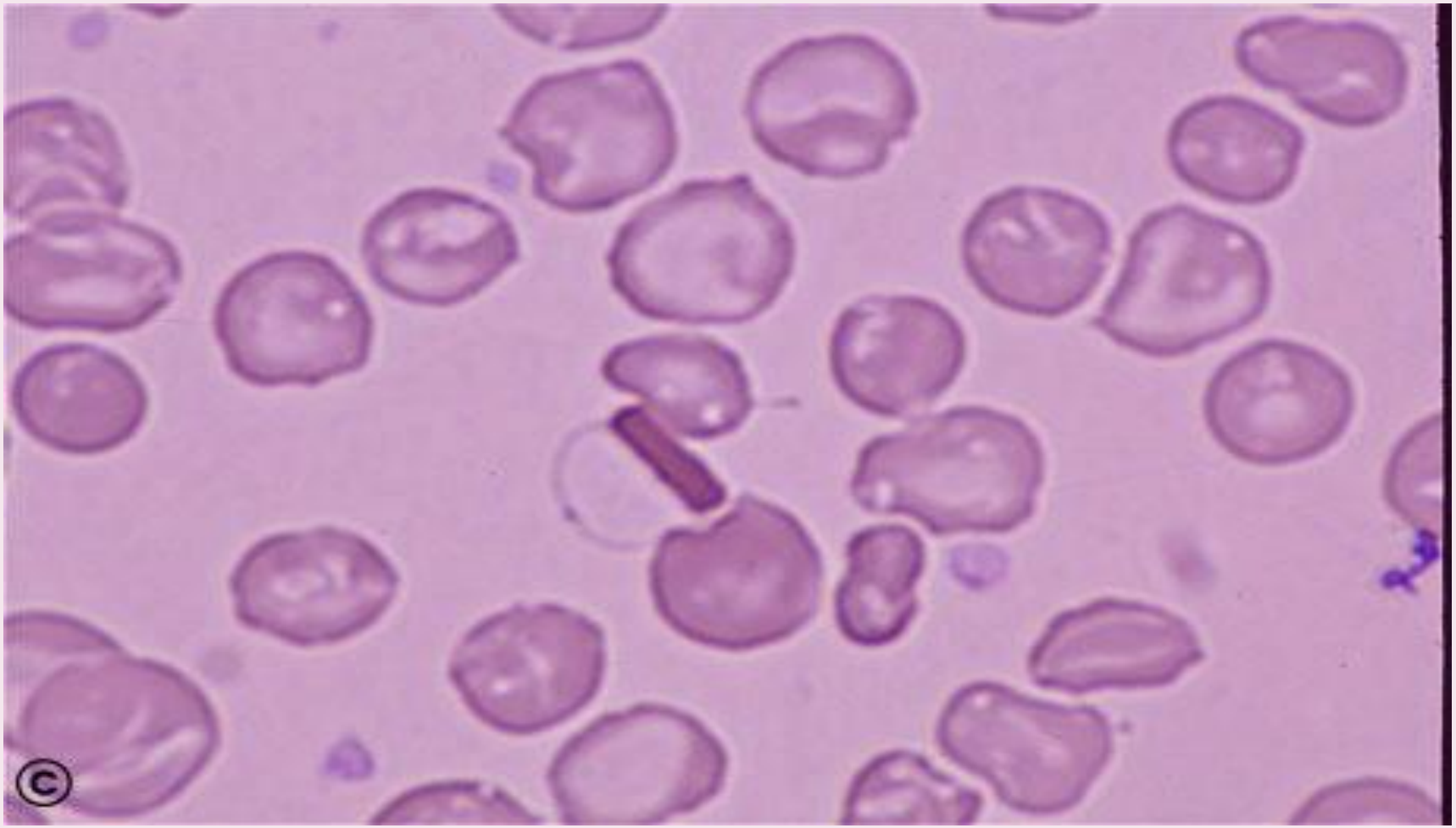
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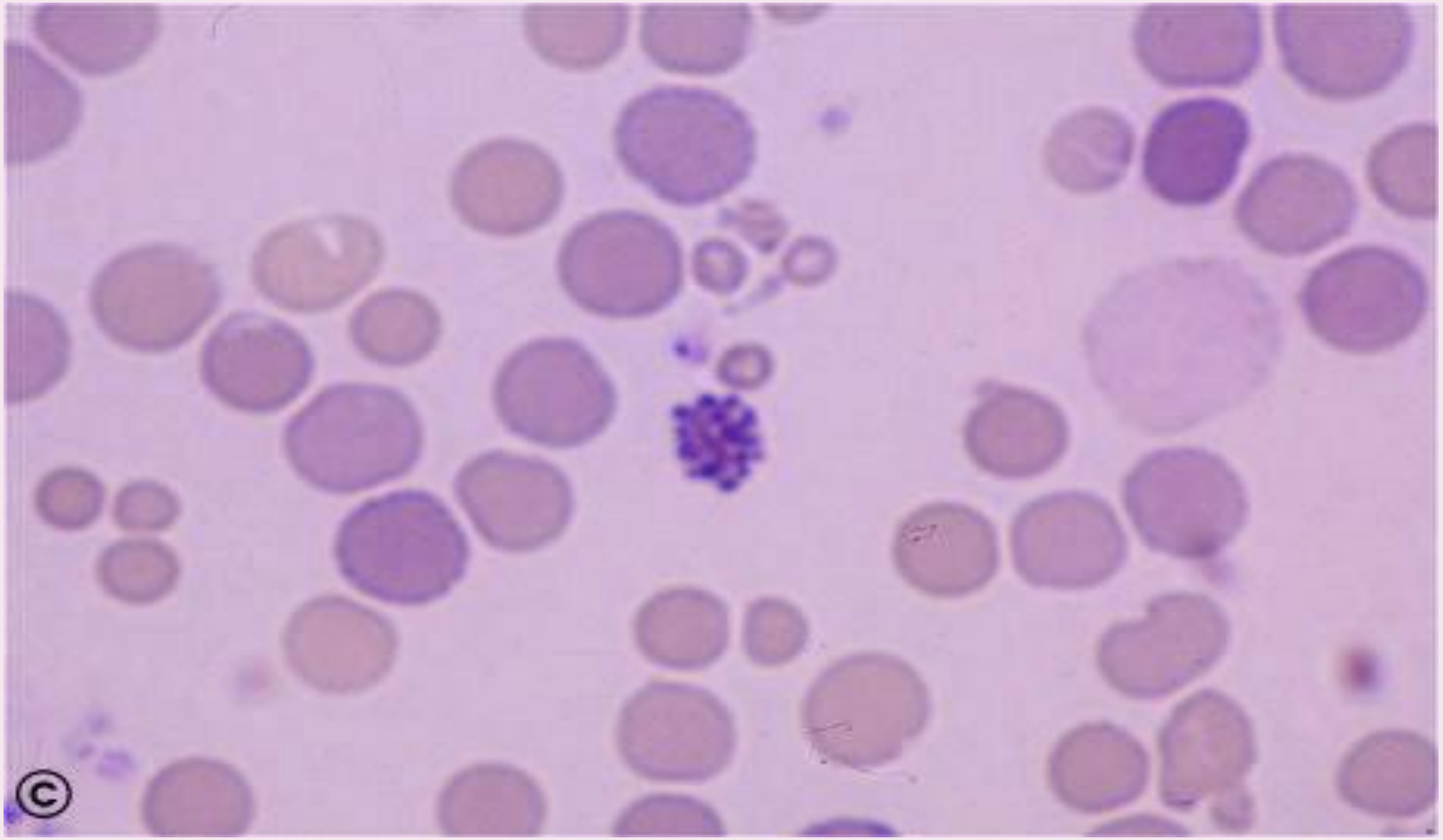
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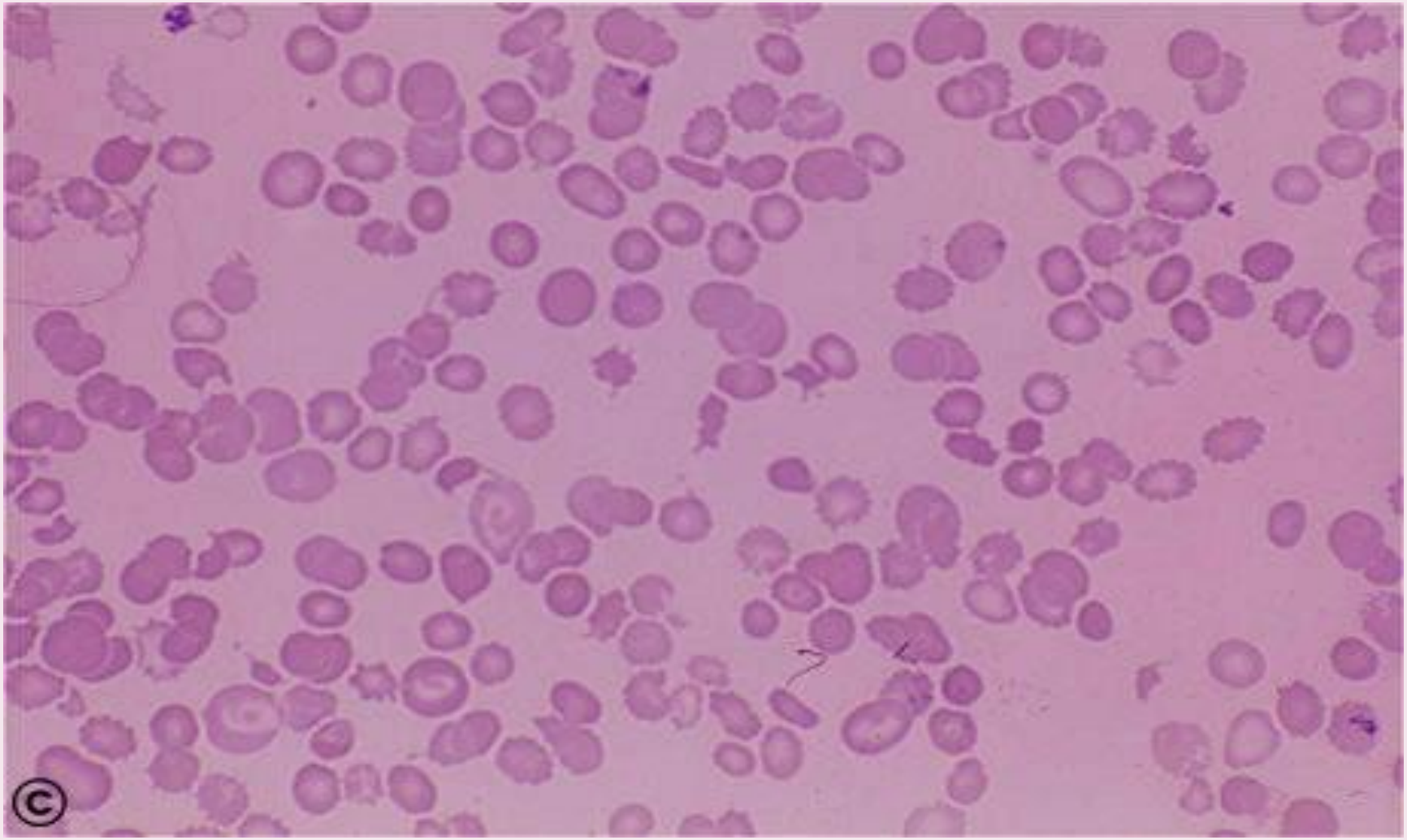
HEMOGLOBIN C CRYSTALES



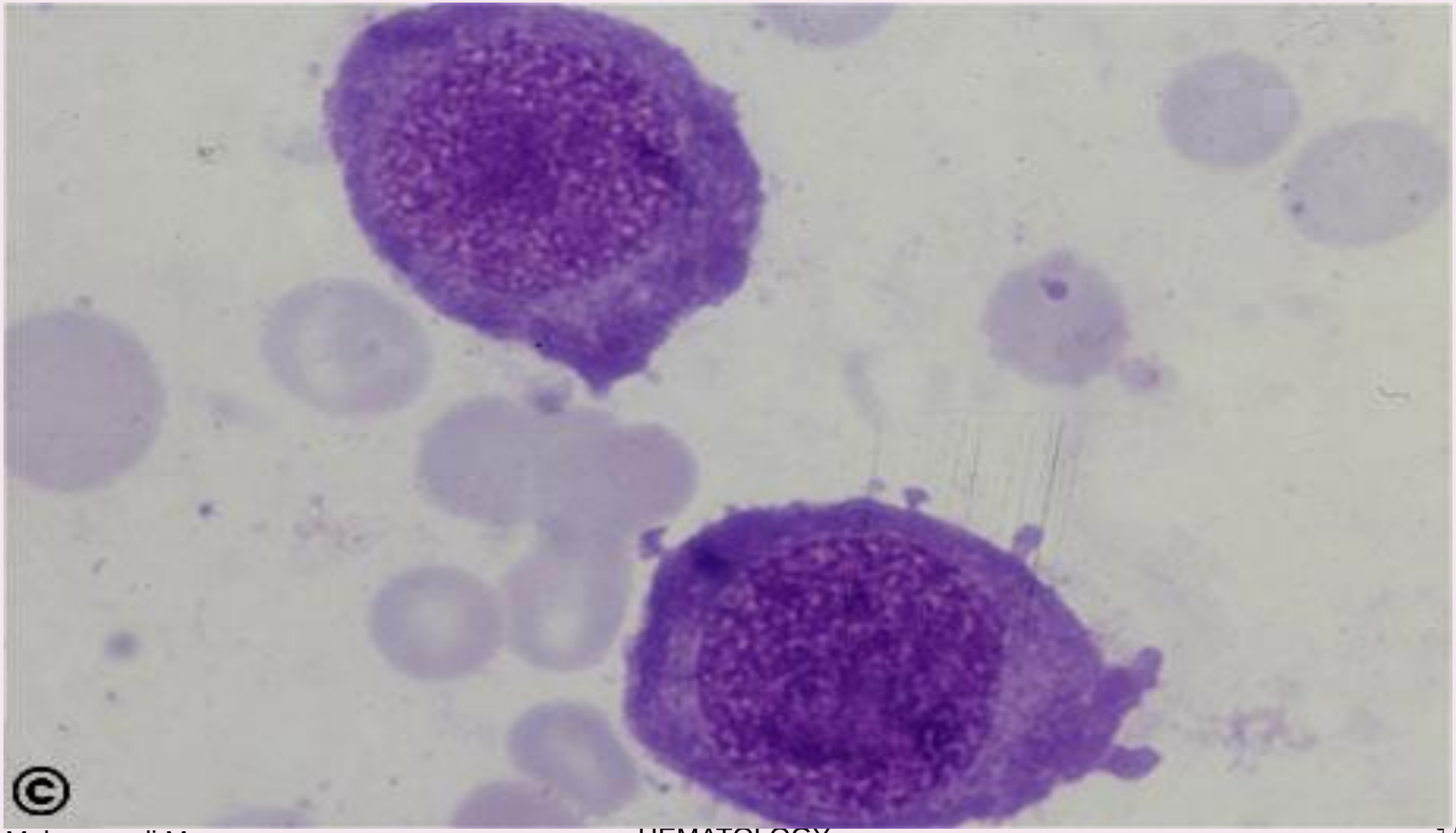
HEMOGLOBIN H



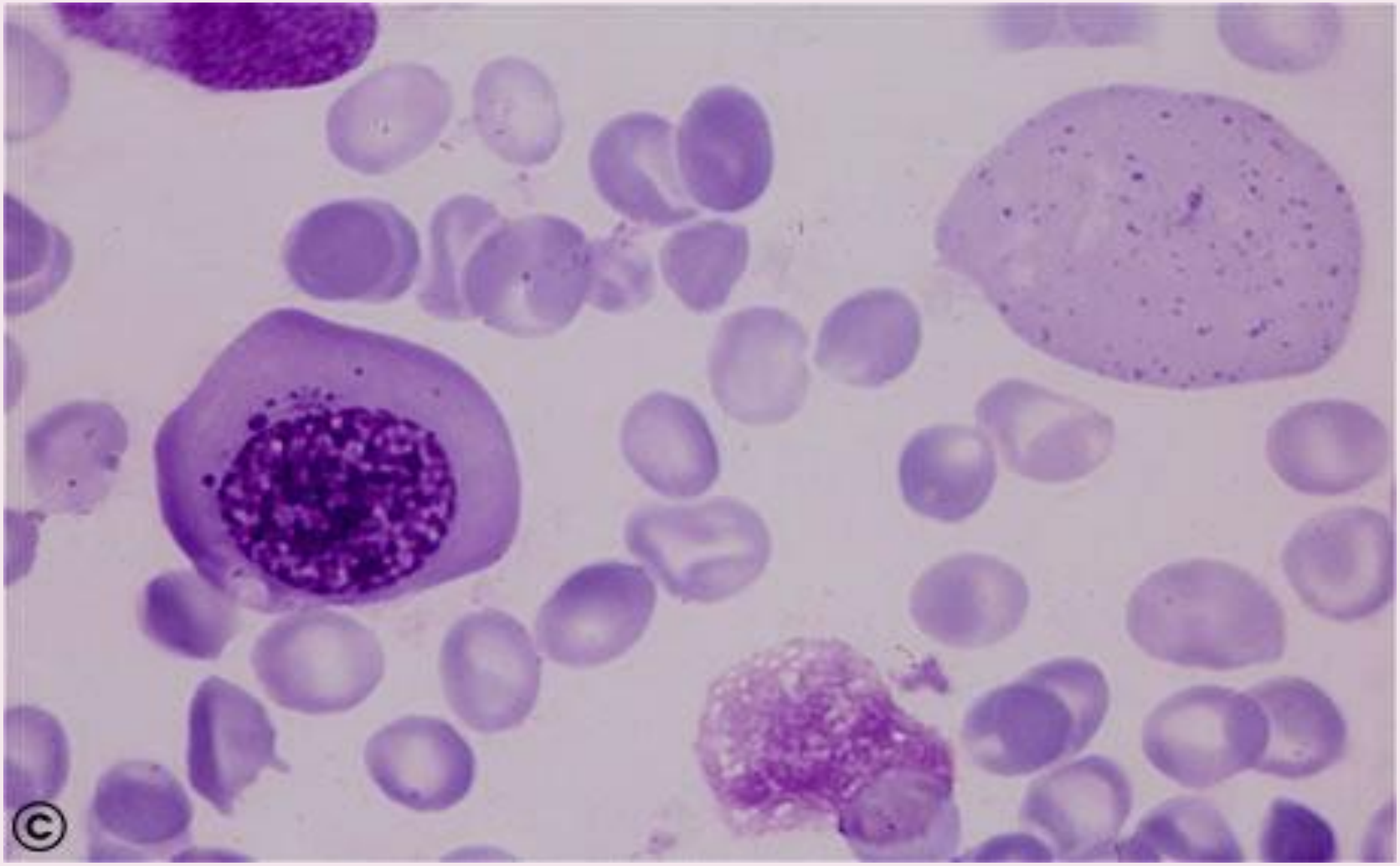
HYPOCHROMIC ANEMIA



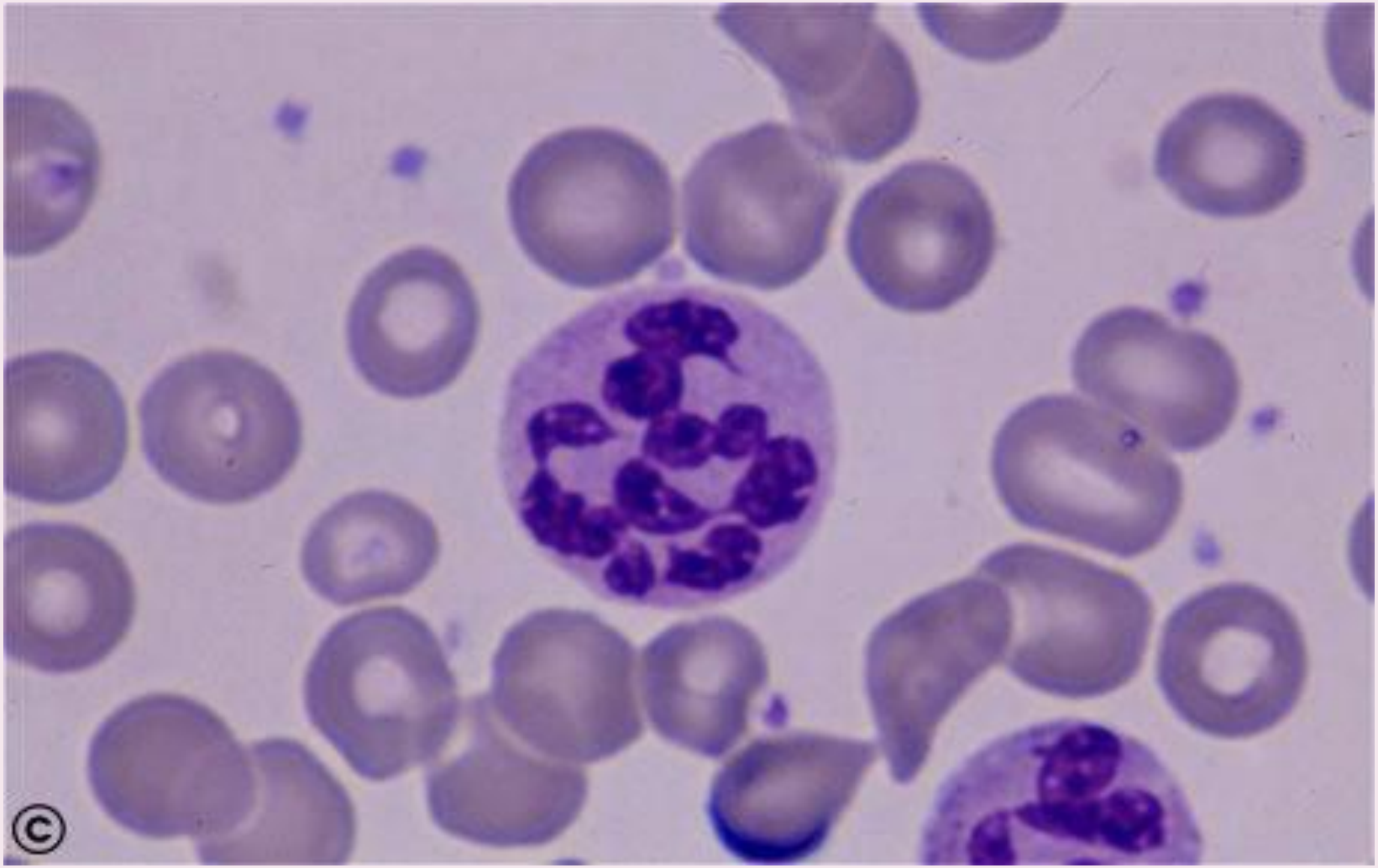
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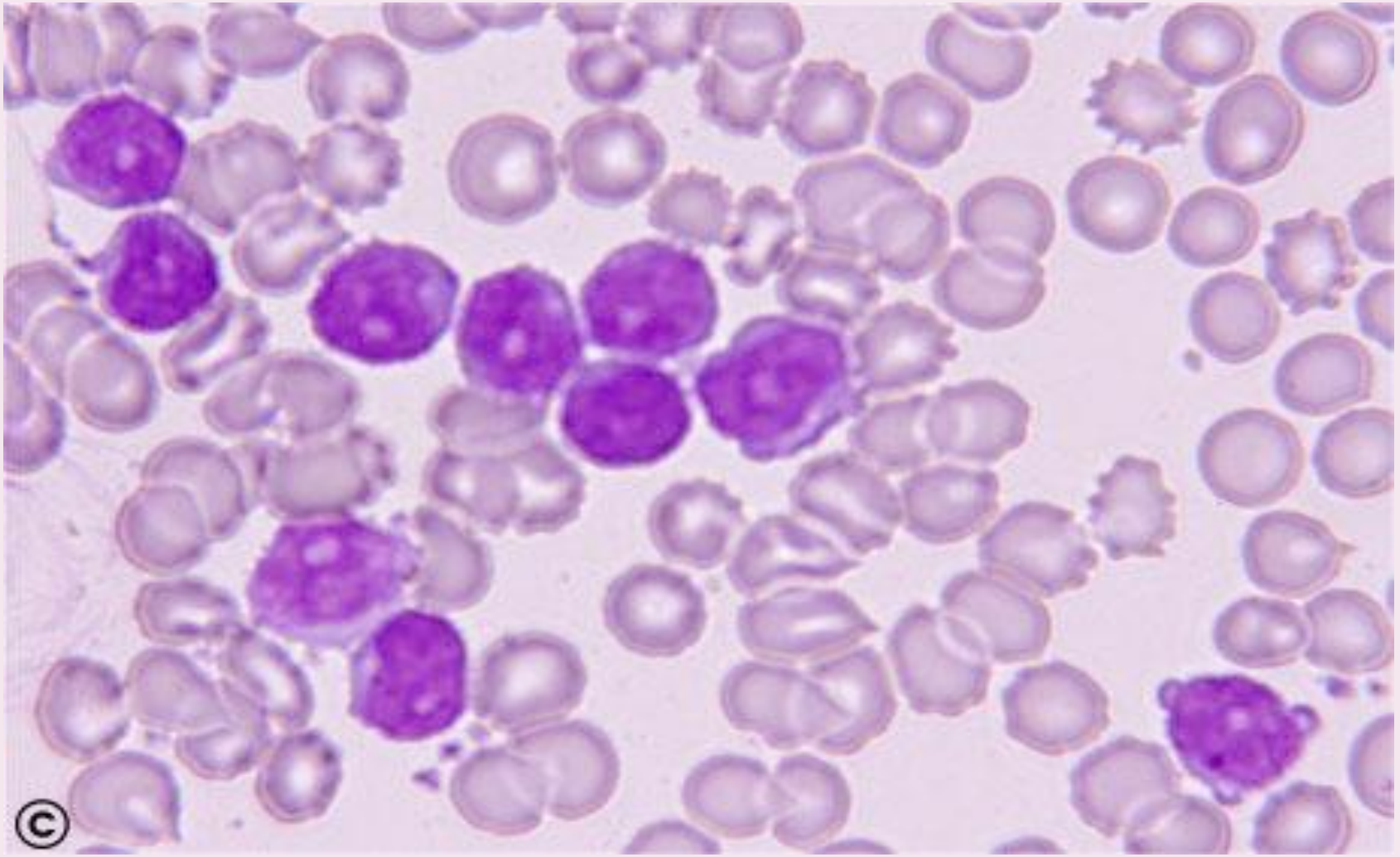
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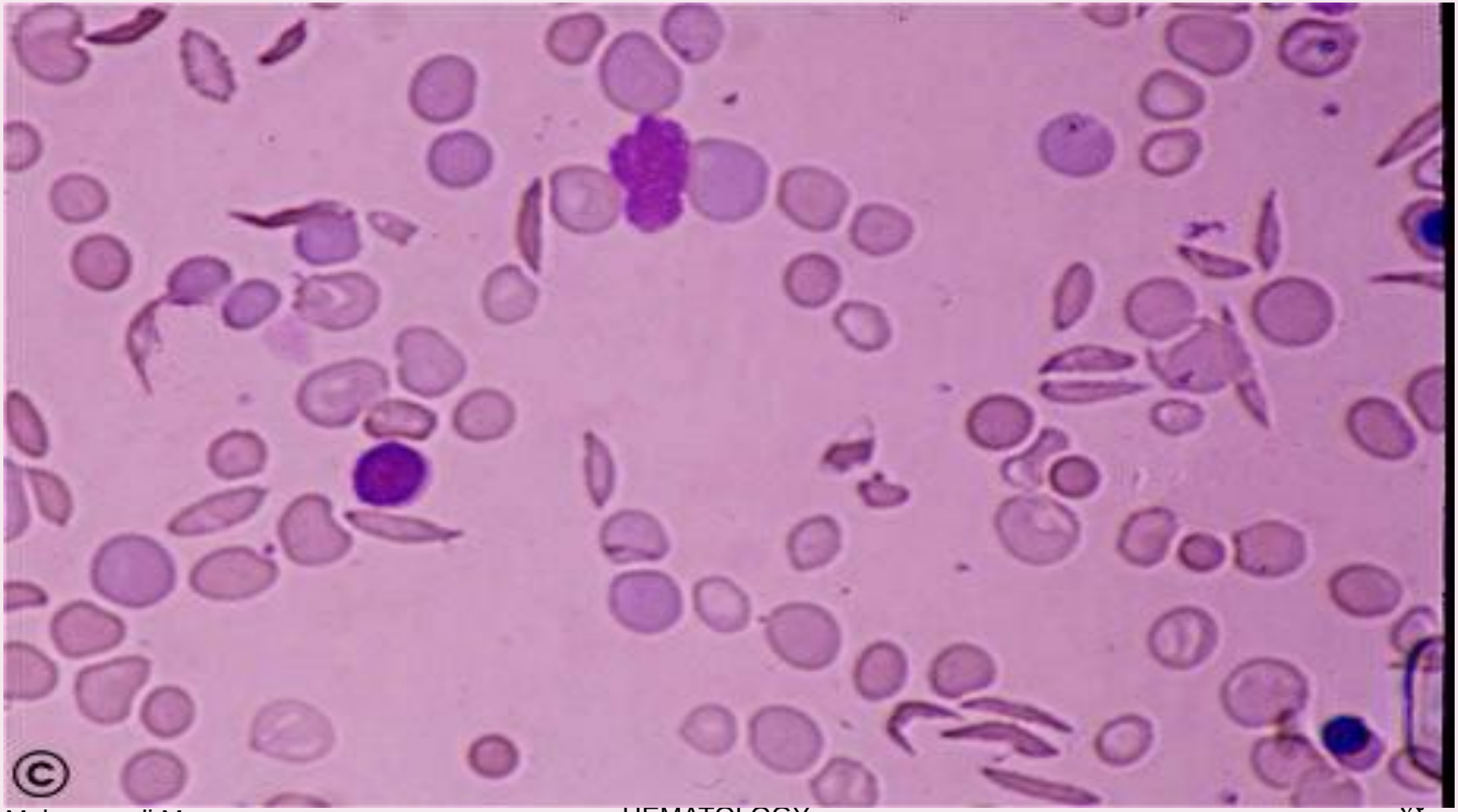
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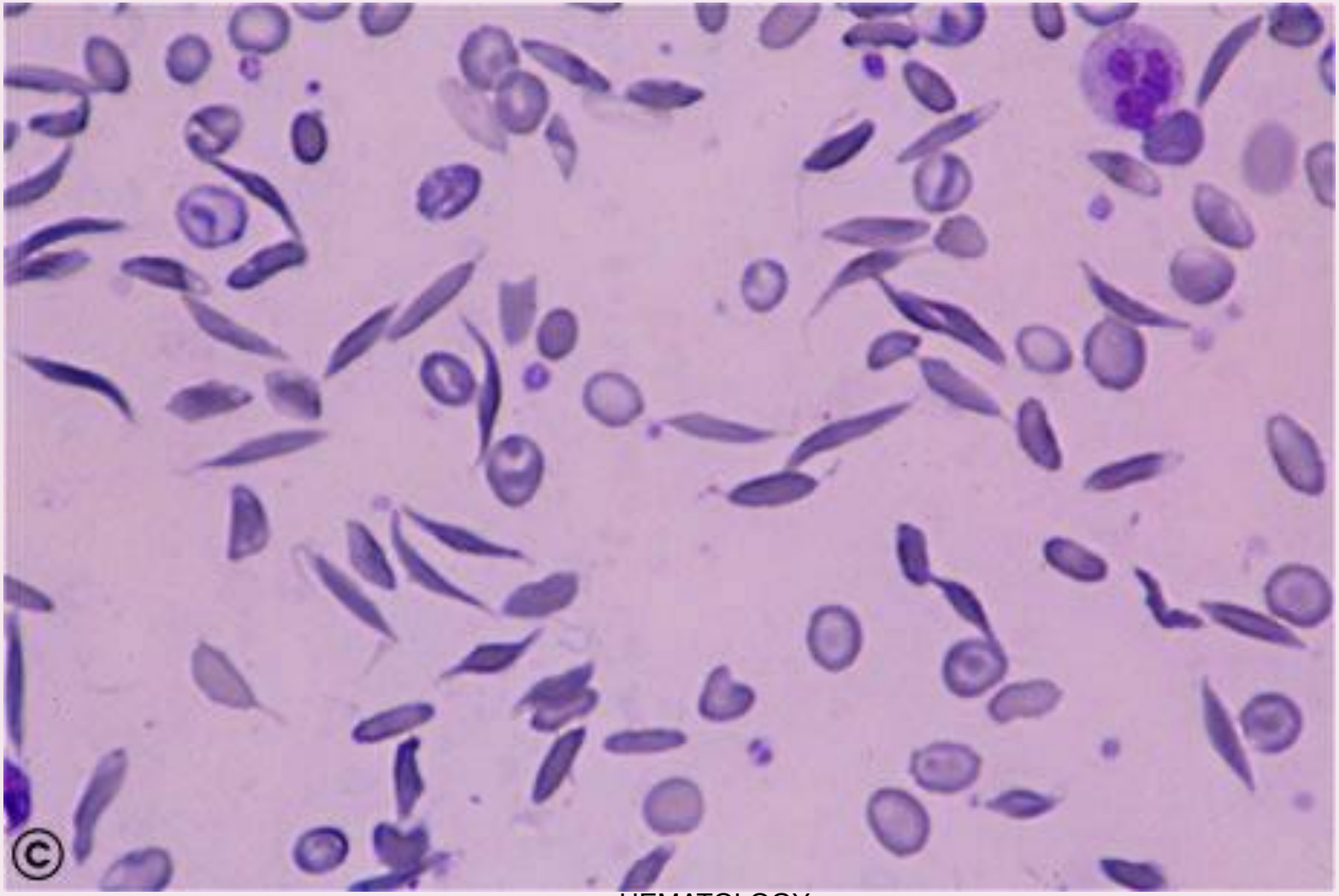
PRO-LYMPHOCYTIC LEUKEMIA



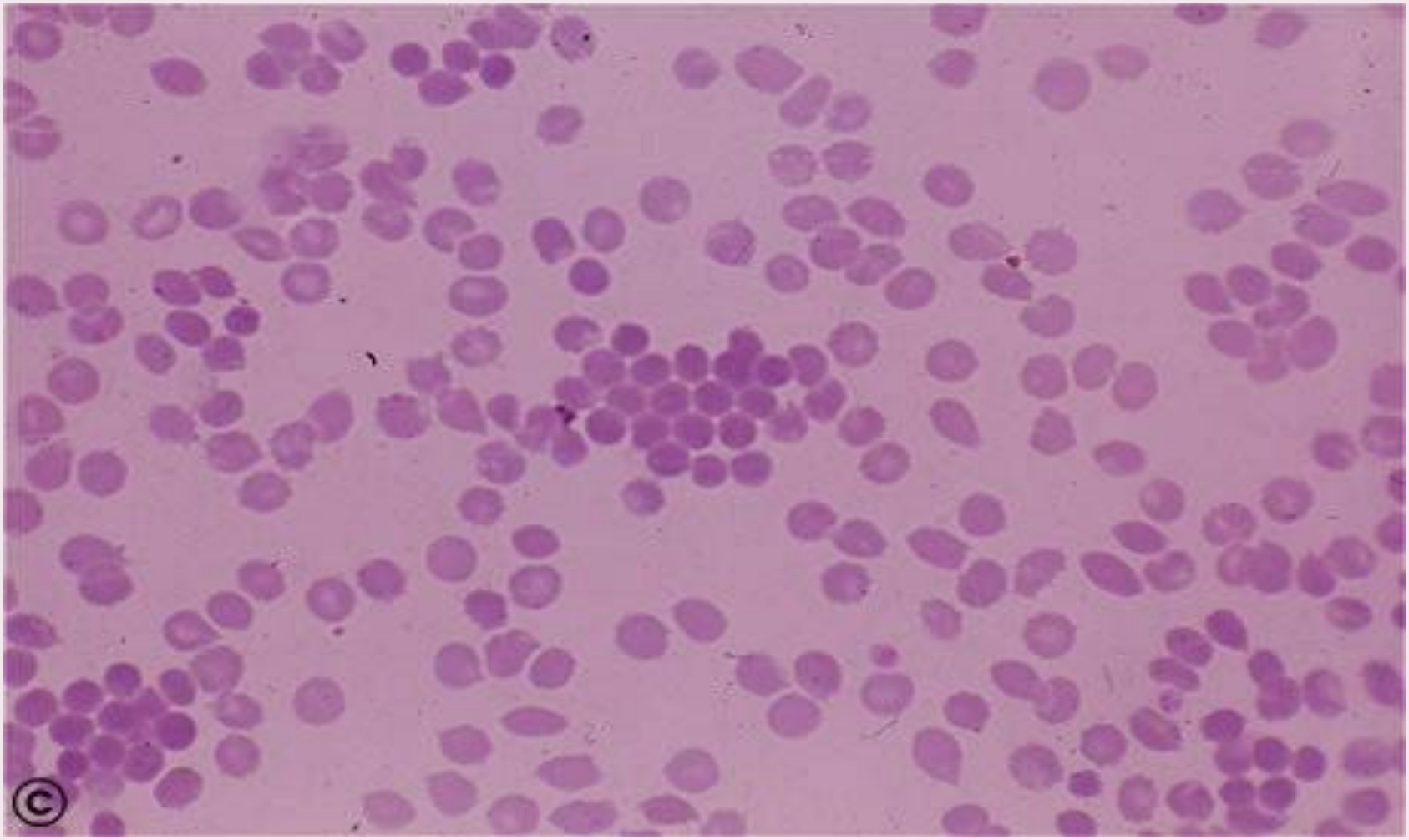
SICKLE CELL ANEMIA



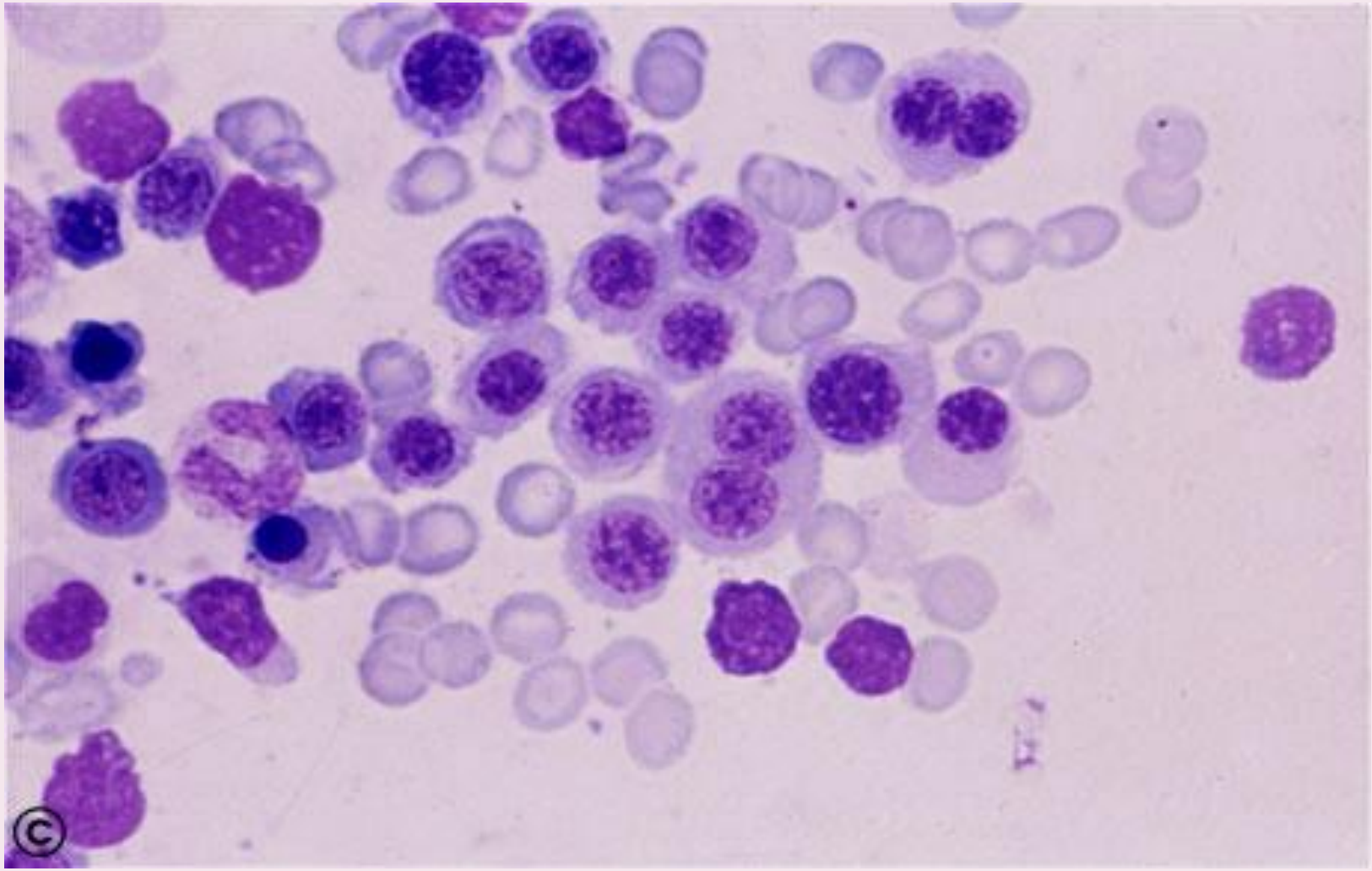
SICKLE CELL ANEMIA



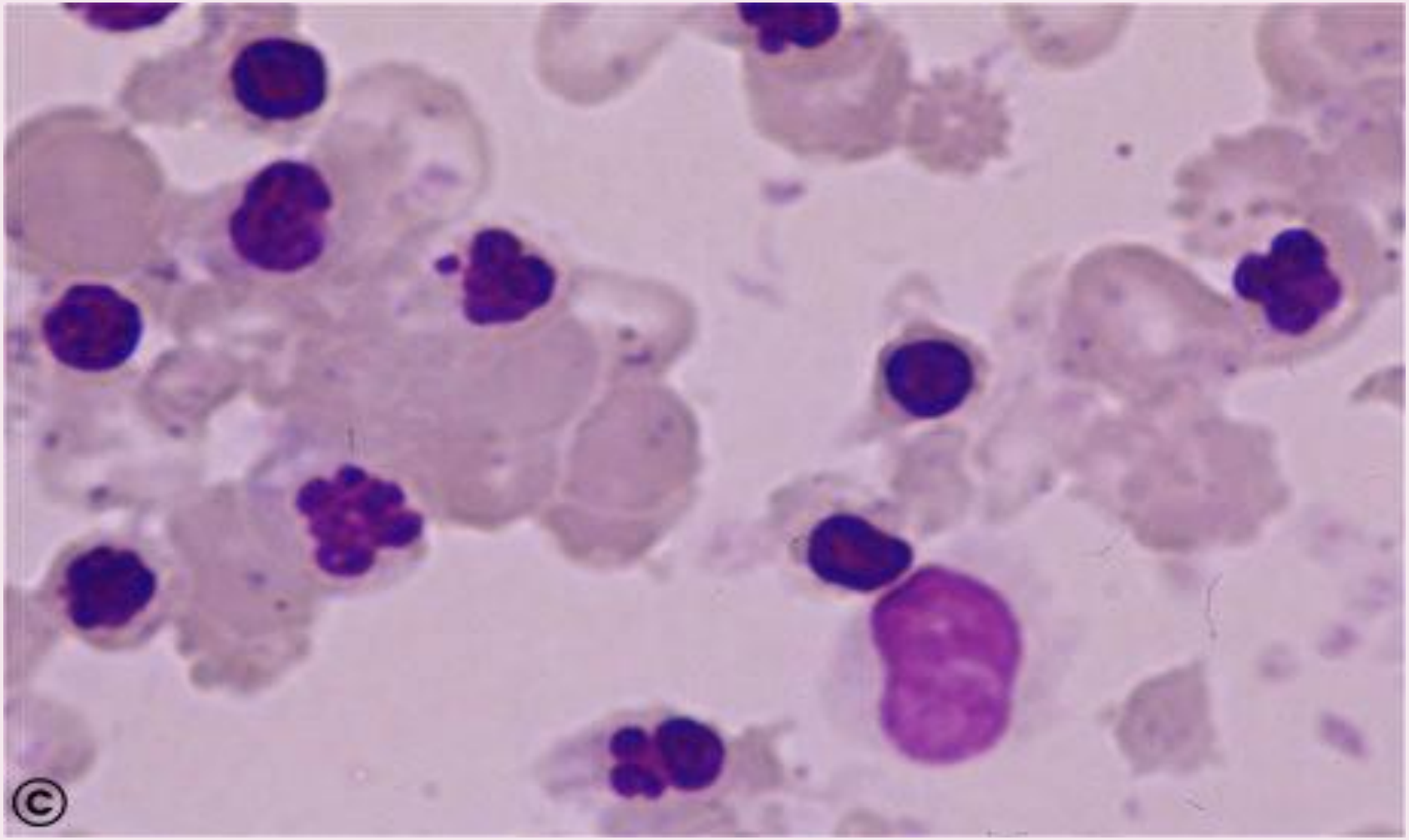
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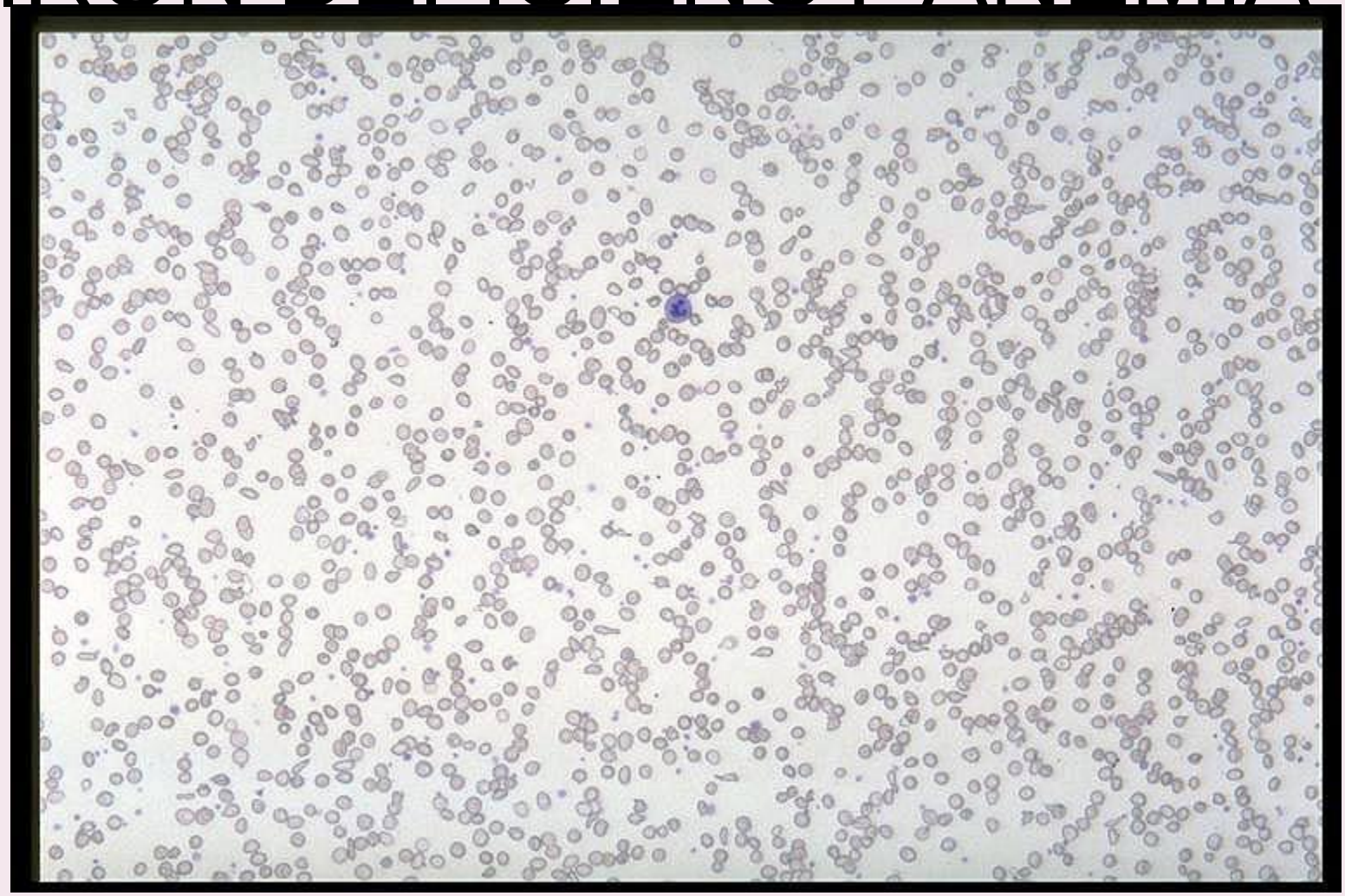
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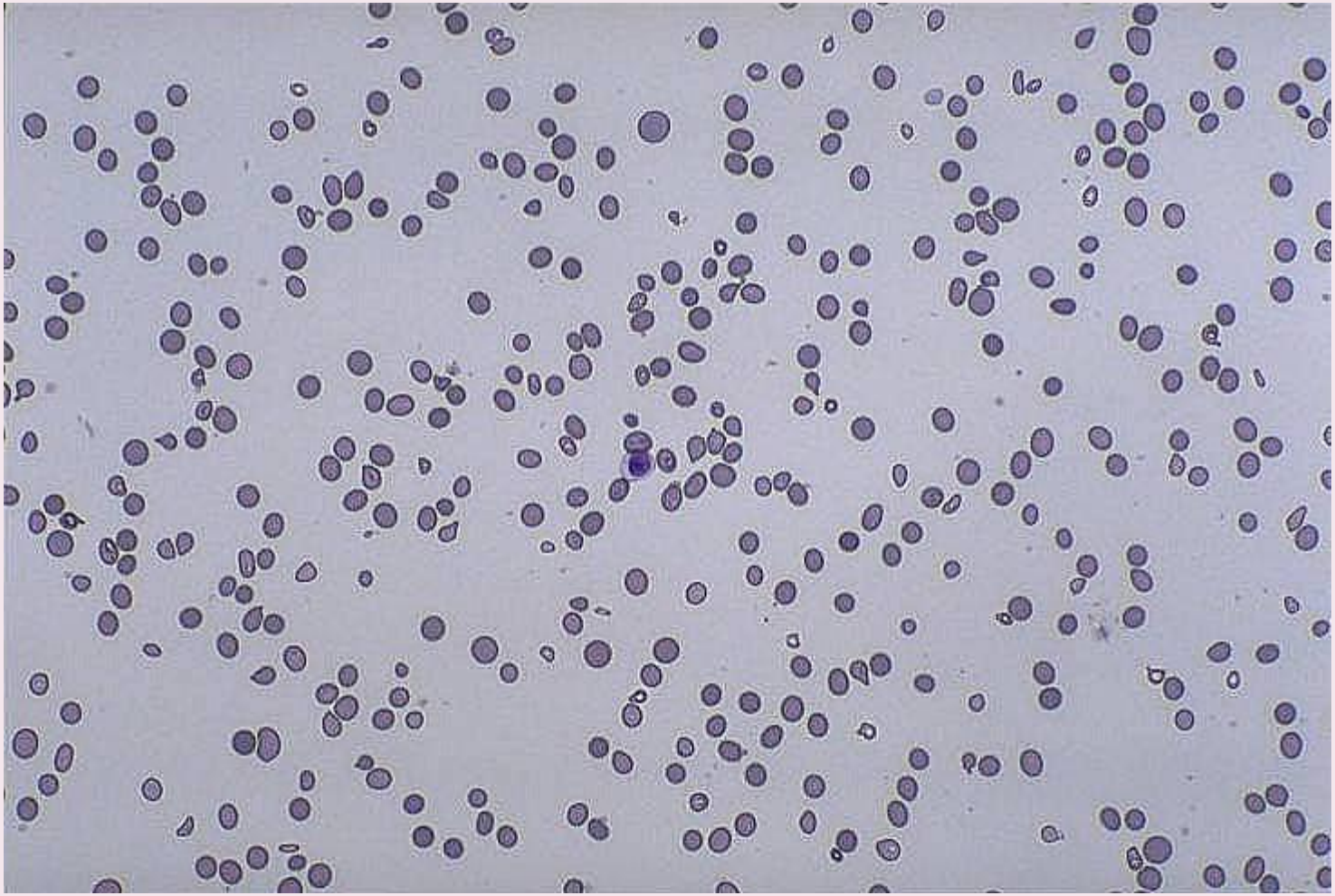
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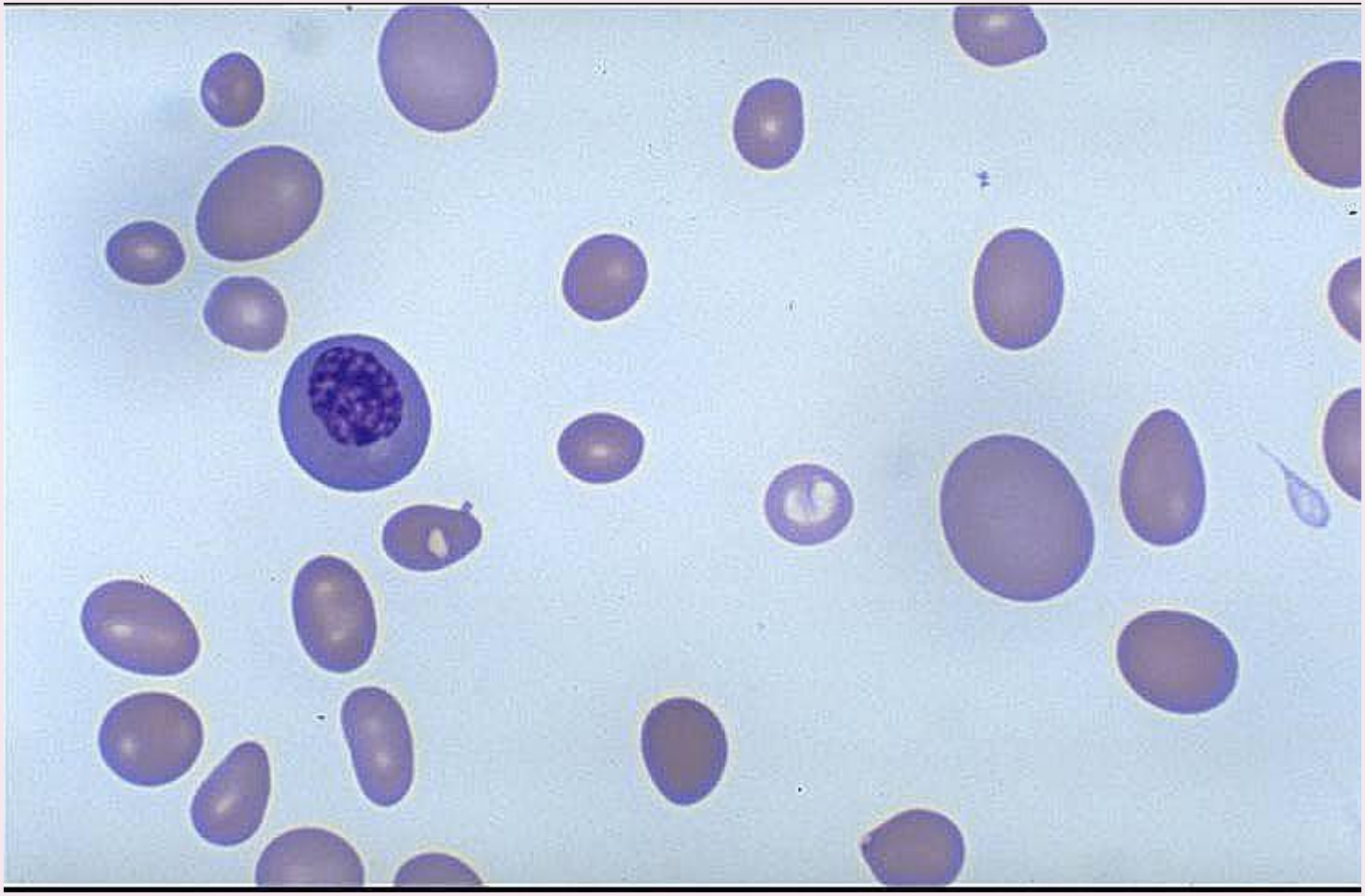
IRON DEFICIENCY ANEMIA



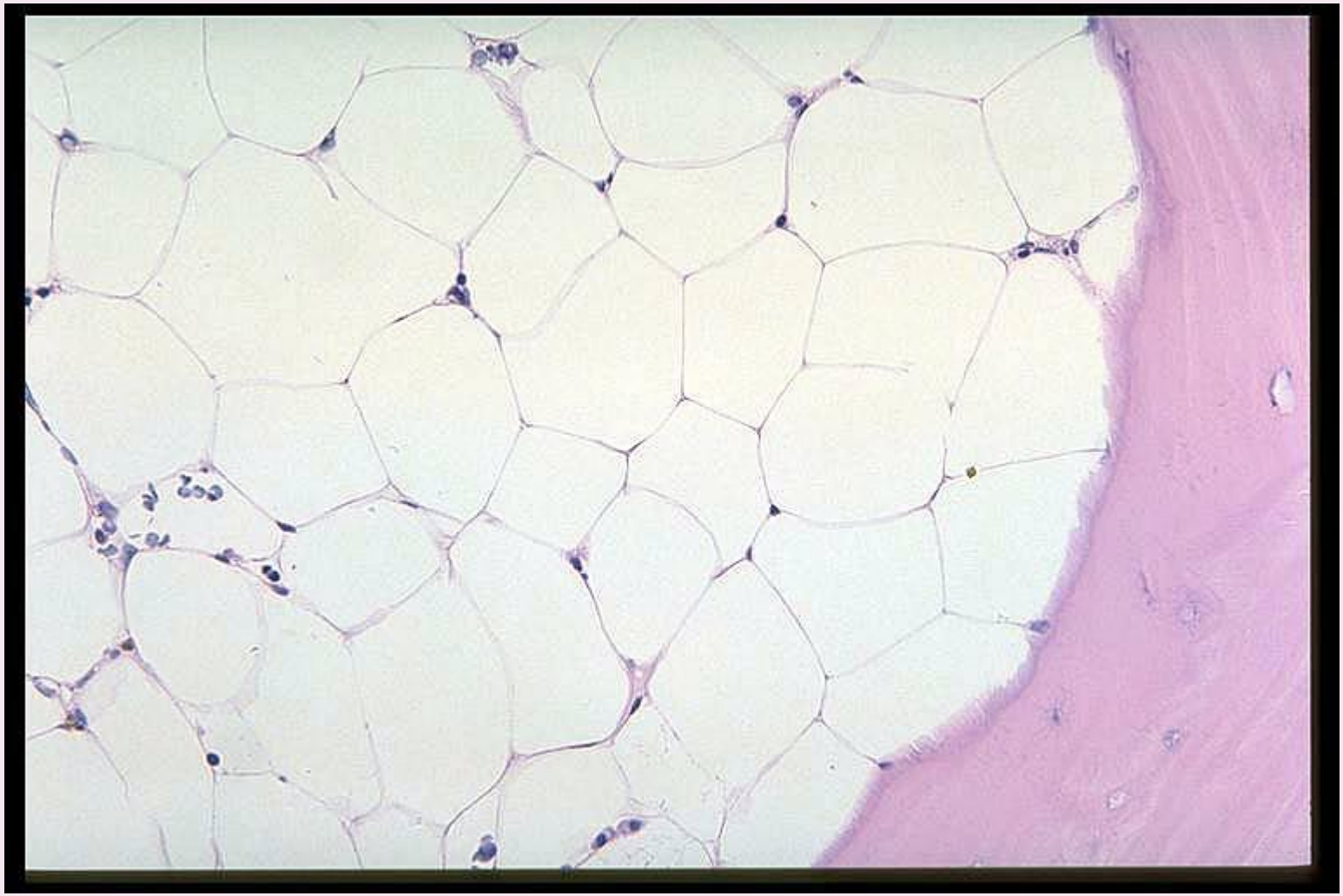
MEGALOBLASTIN ANEMIA VIT B12 DEFICIENCY



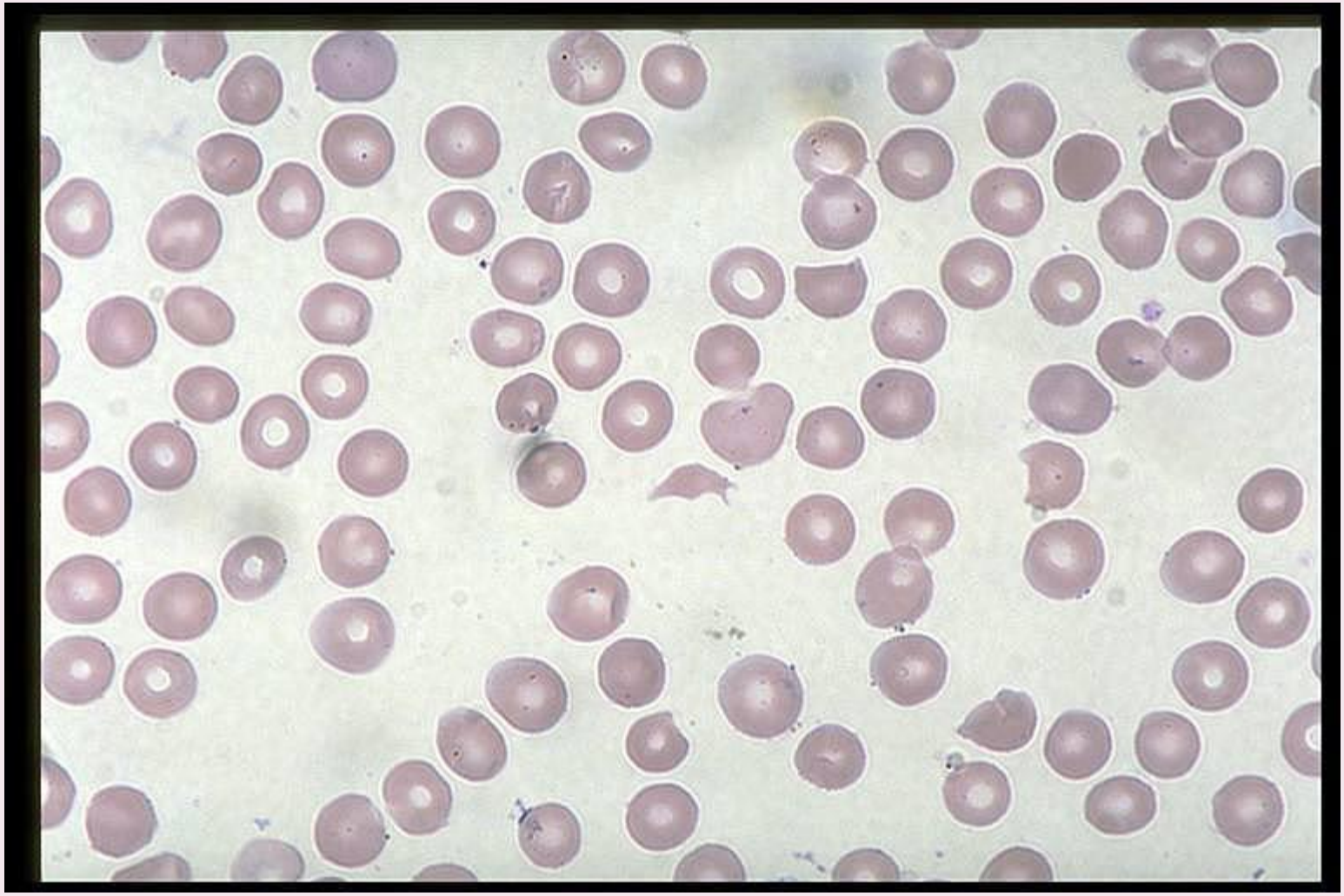
MEGALOBLASTIN ANEMIA VIT B12 DEFICIENCY



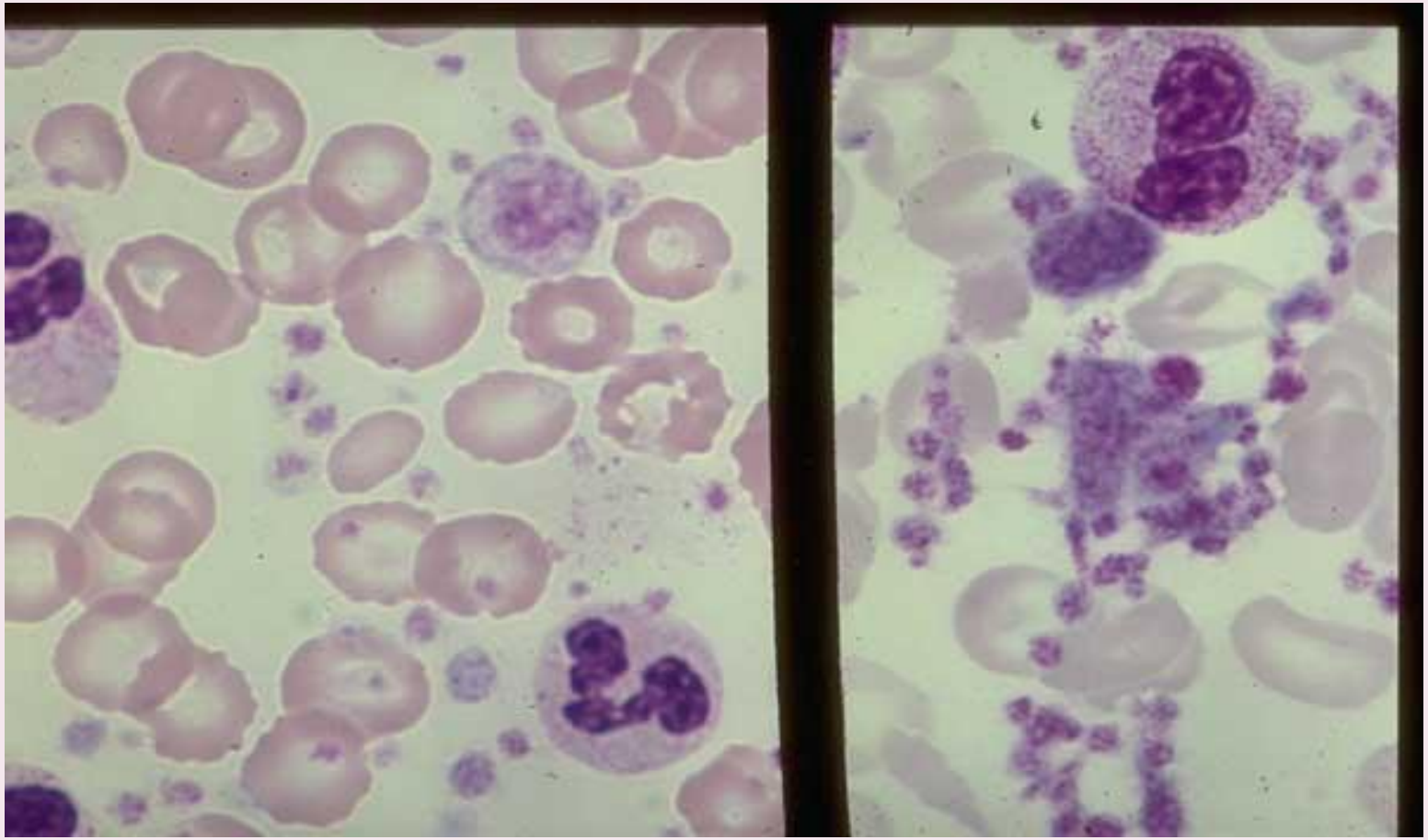
APLASTIC ANRMIA



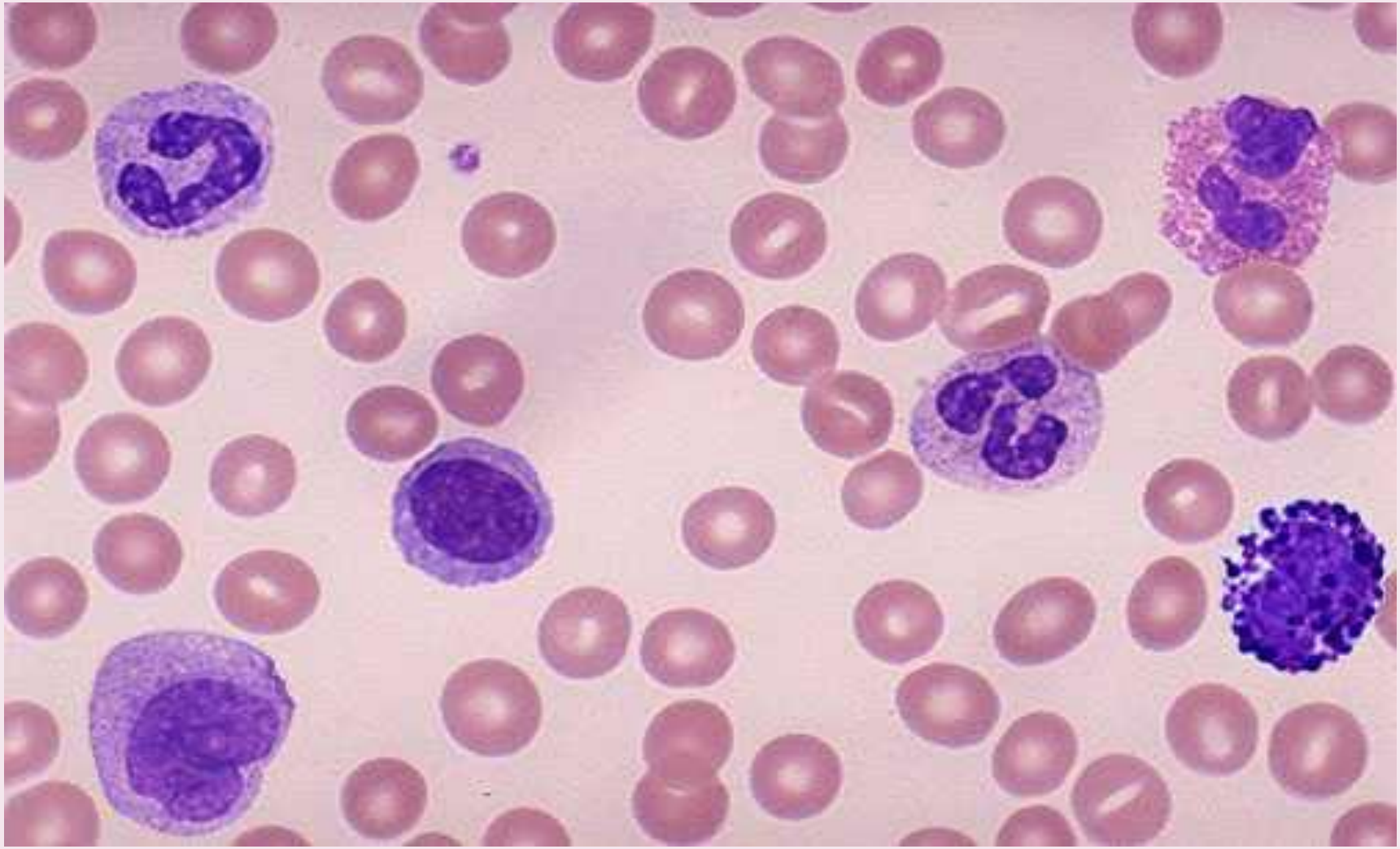
HAEMOLYTIC URAEMIC ANEMIA



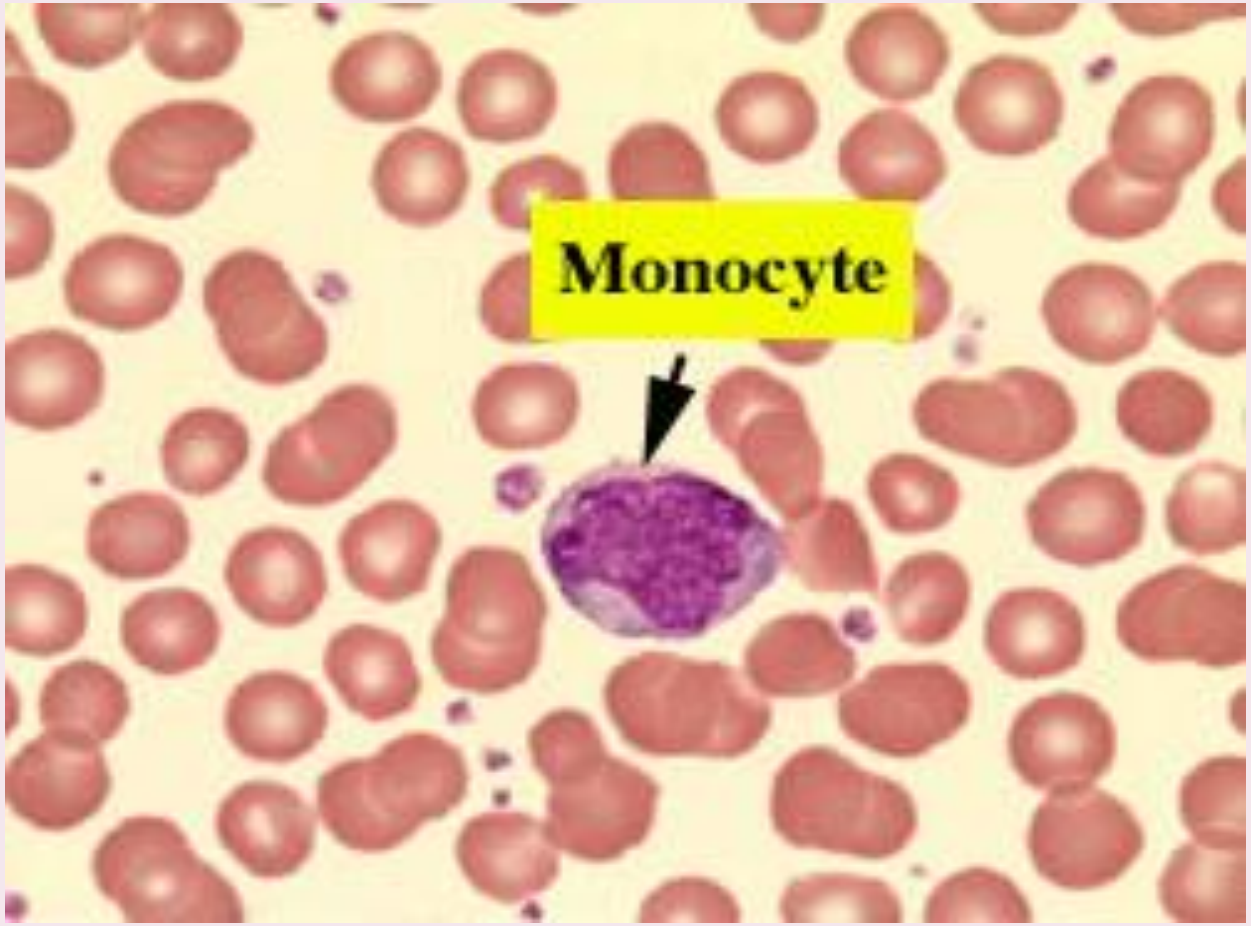
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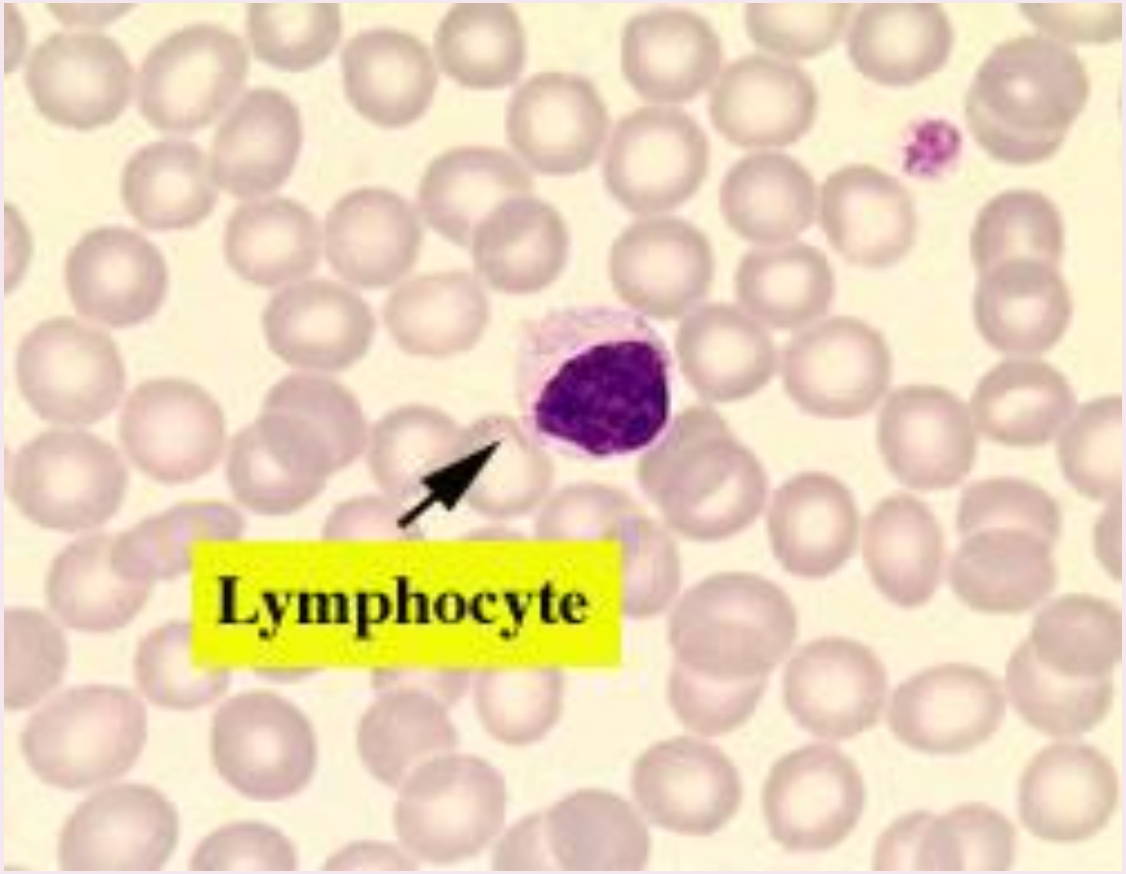
Normal Blood Cells:

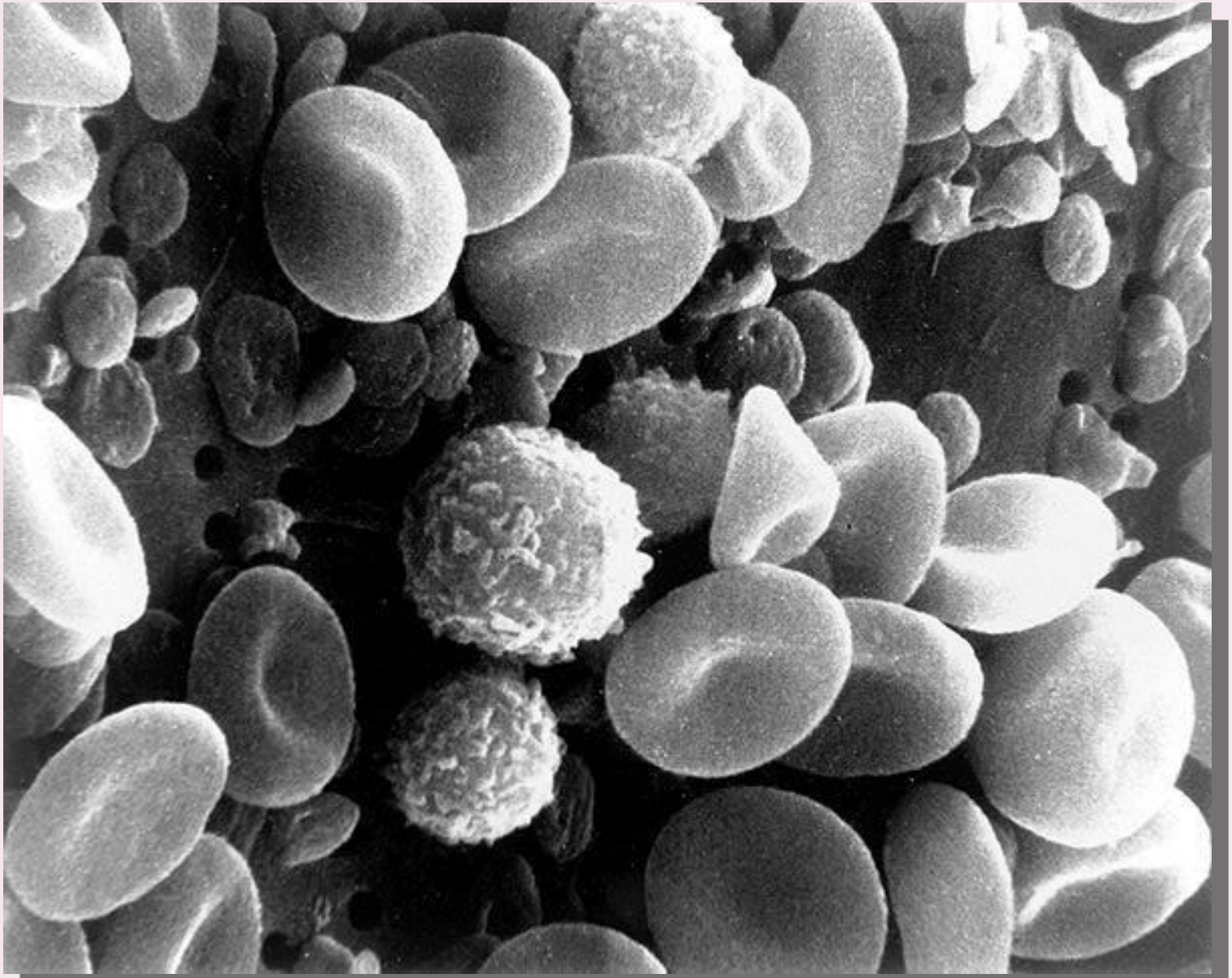


Monocytes

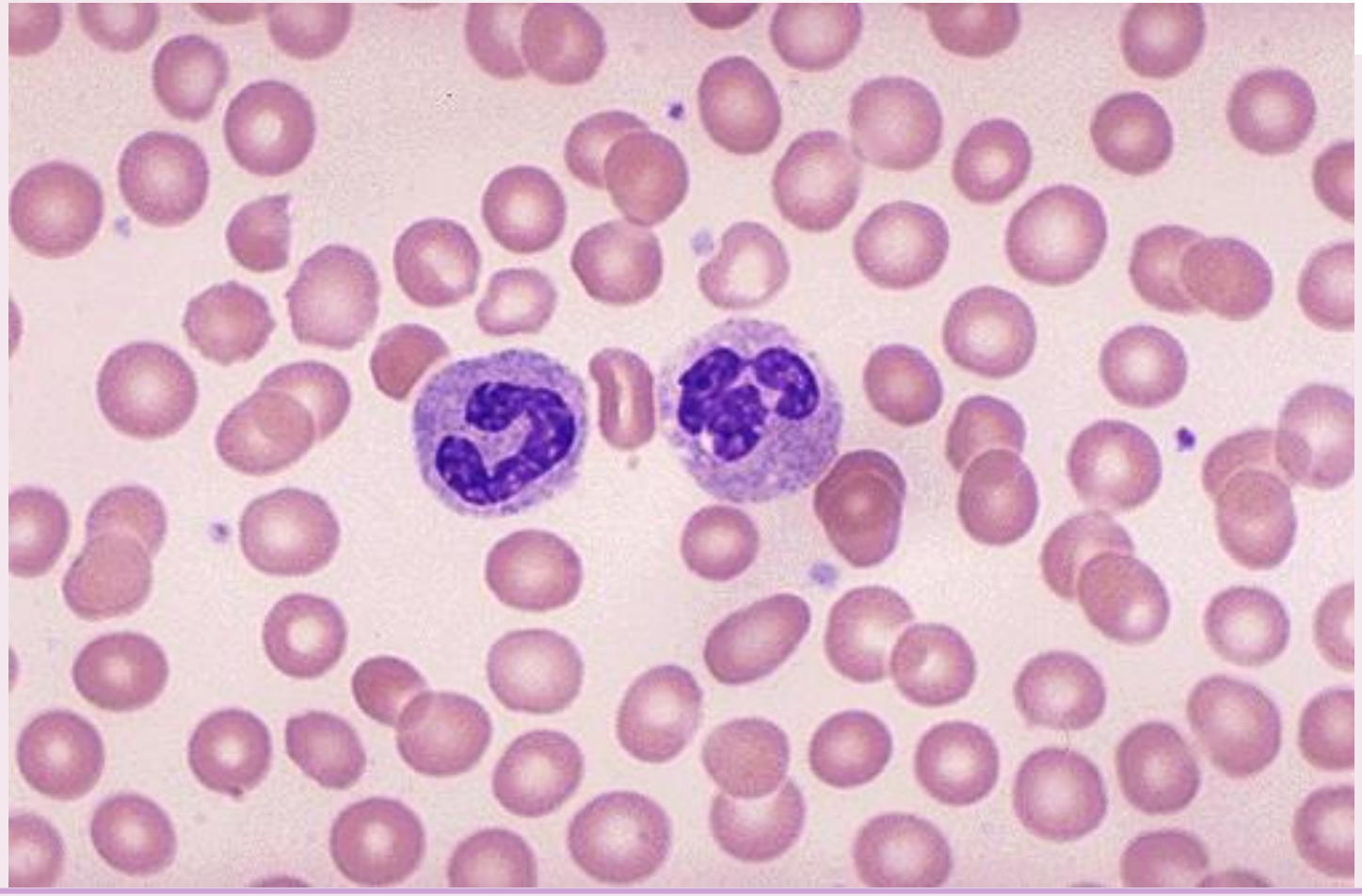


Lymphocyte



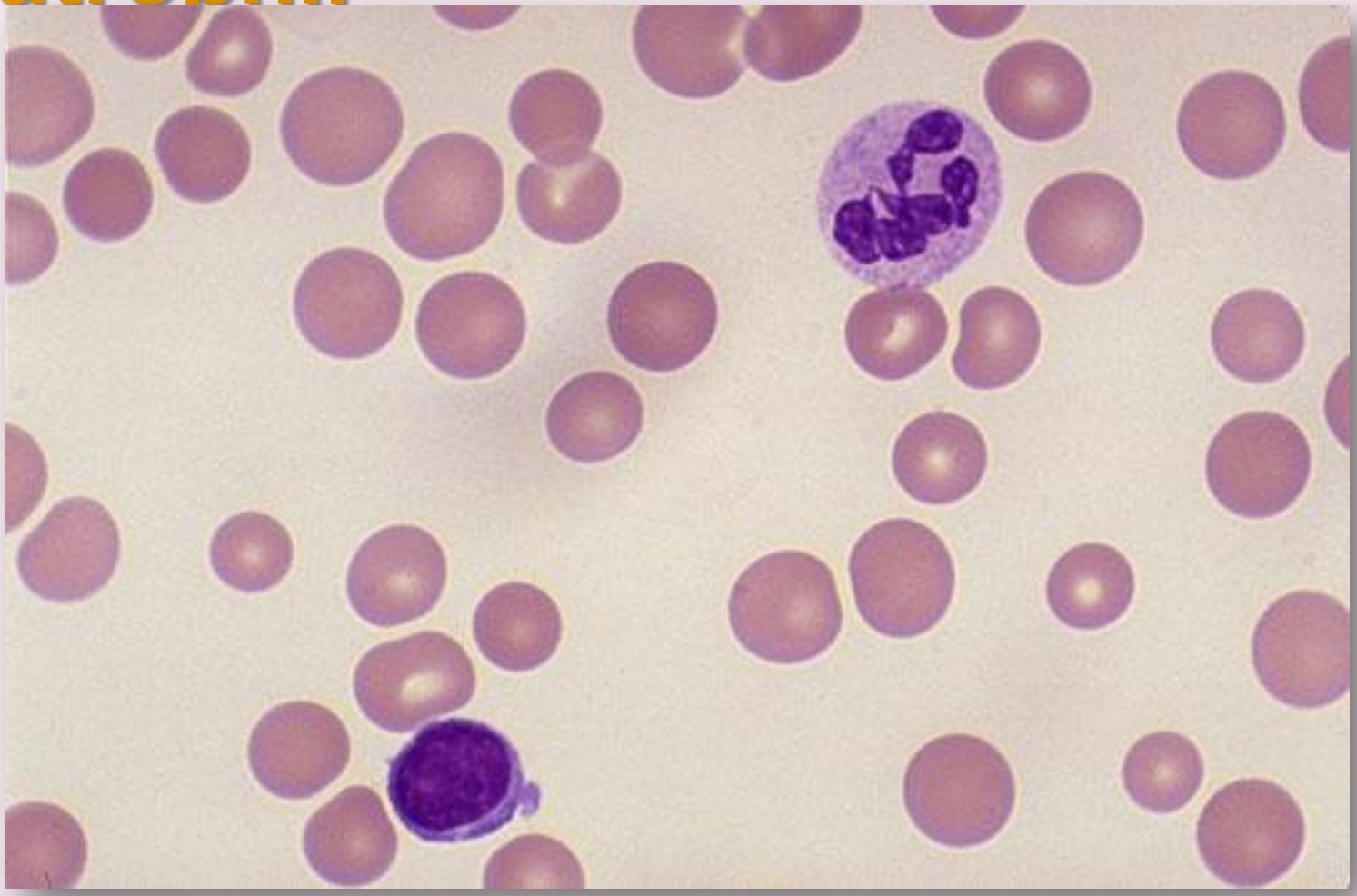


SEM of erythrocytes, leukocytes and platelets



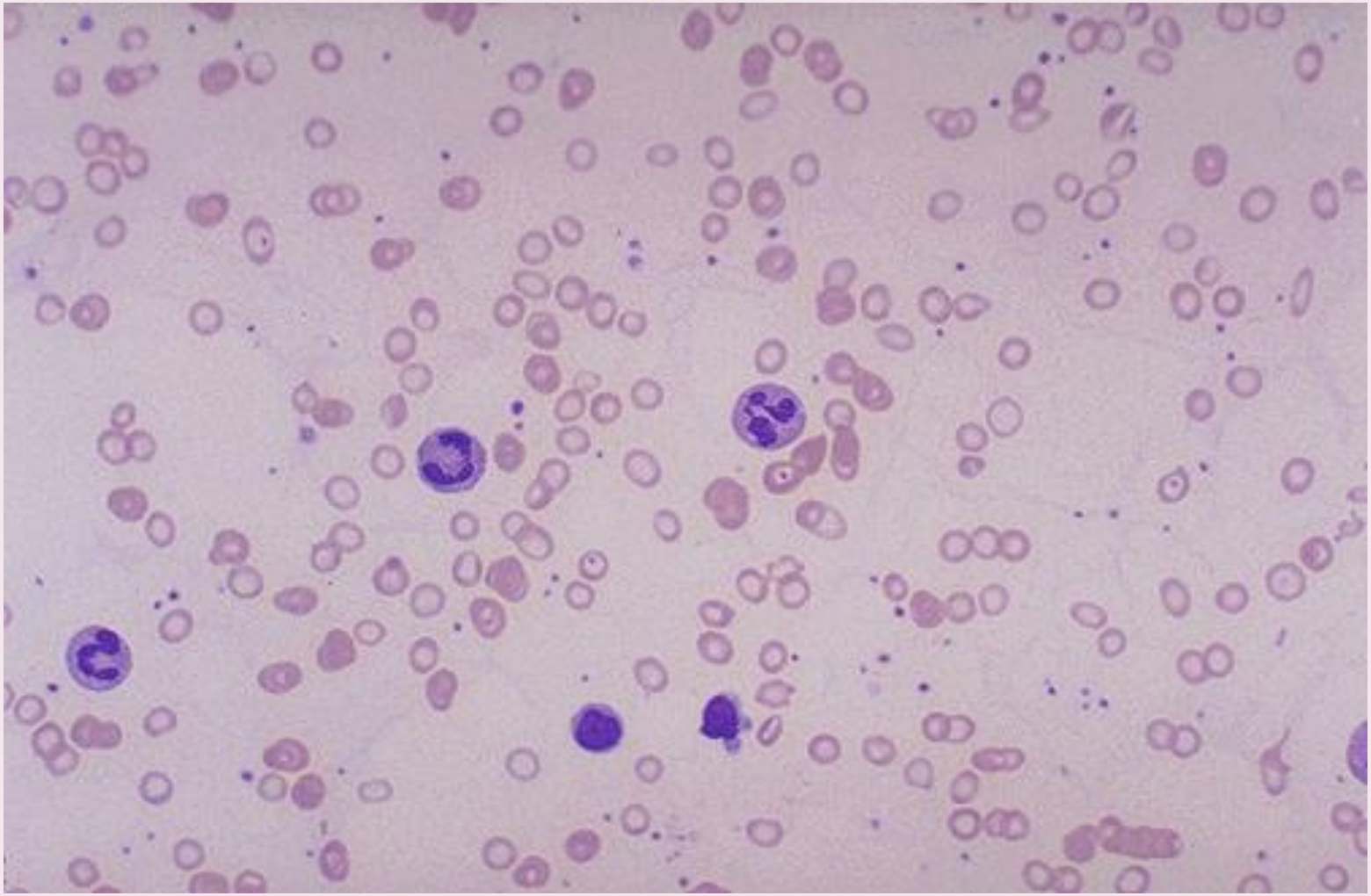
Peripheral blood smear showing **erythrocytes**, tiny **platelets**, immature ***band*** **neutrophil** (center, L), and mature, ***segmented*** neutrophil (R); note normal **central pallor** of erythrocytes

Megaloblastic anemia with ovalocytes and hypersegmented neutrophil

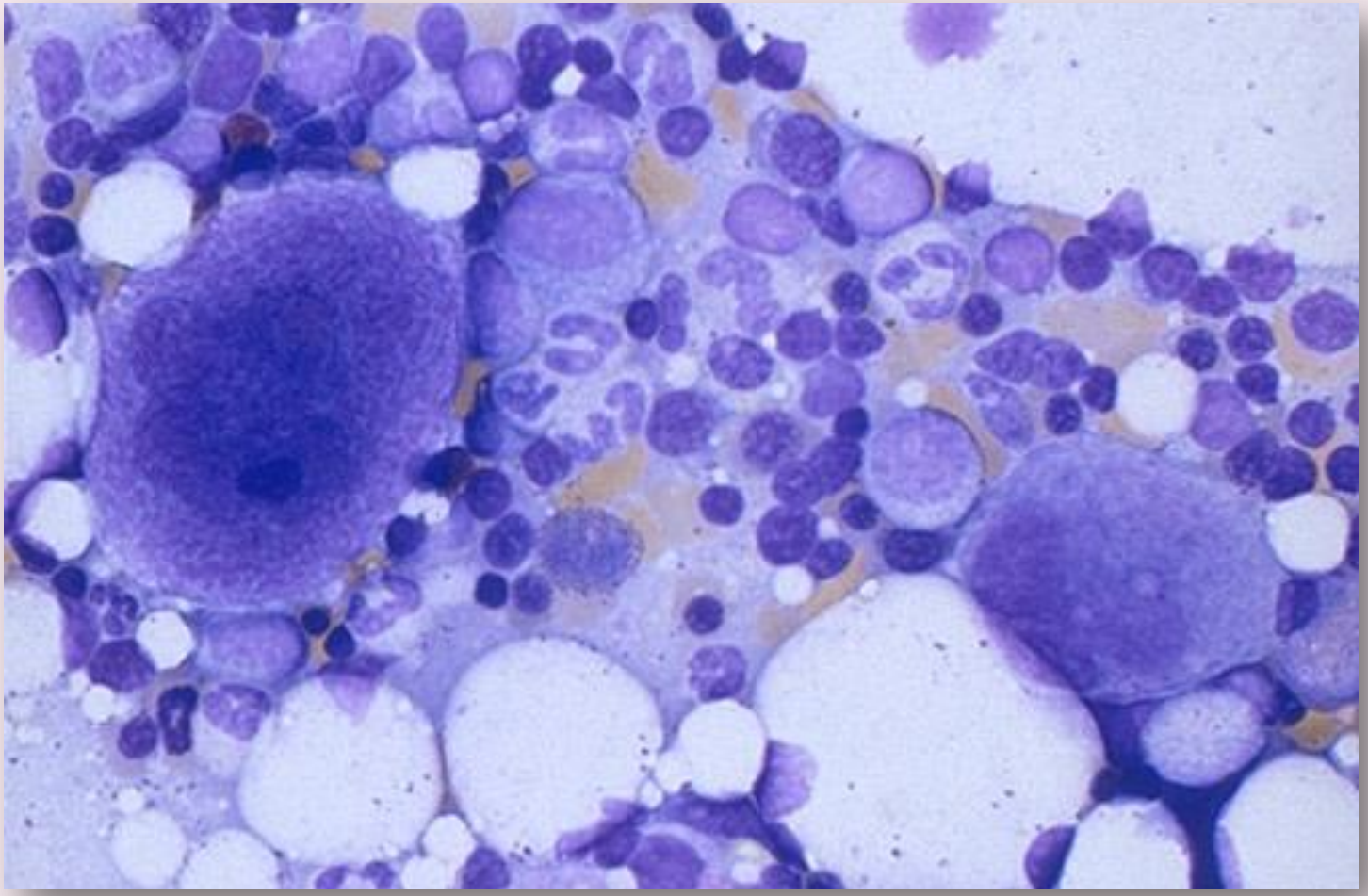


Iron deficiency anemia

blood loss or impaired iron absorption



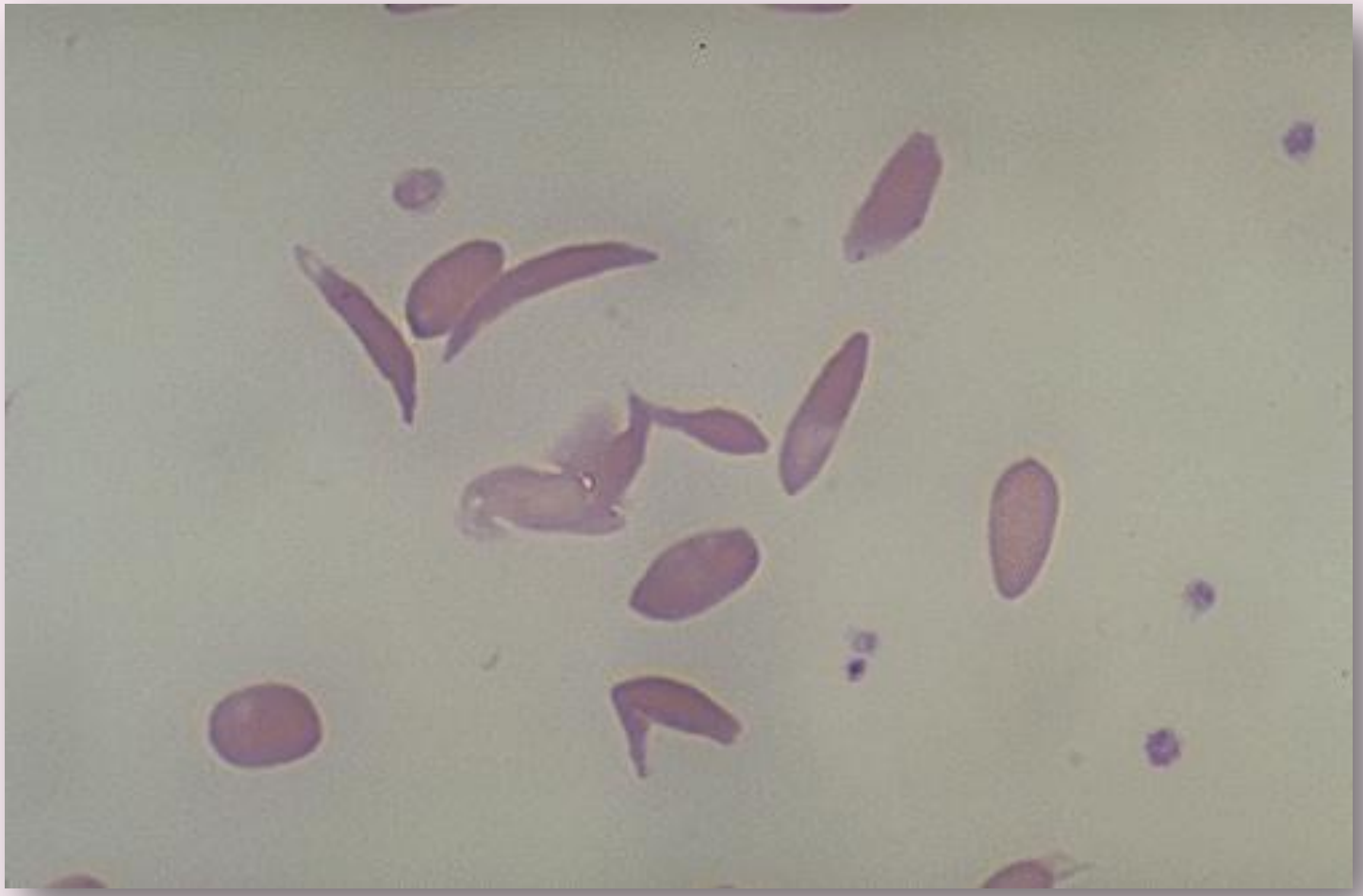
Hypochromia and microcytosis



Bone marrow smear with megakaryocytes and erythroid and granulocytic precursors

Sickle Cell Anemia

Hemoglobin SS sickles under low O_2 tension; RBCs tend to get caught on each other, especially in the microcirculation, where they may interrupt blood flow, causing *sickle crisis*



Hereditary Spherocytosis

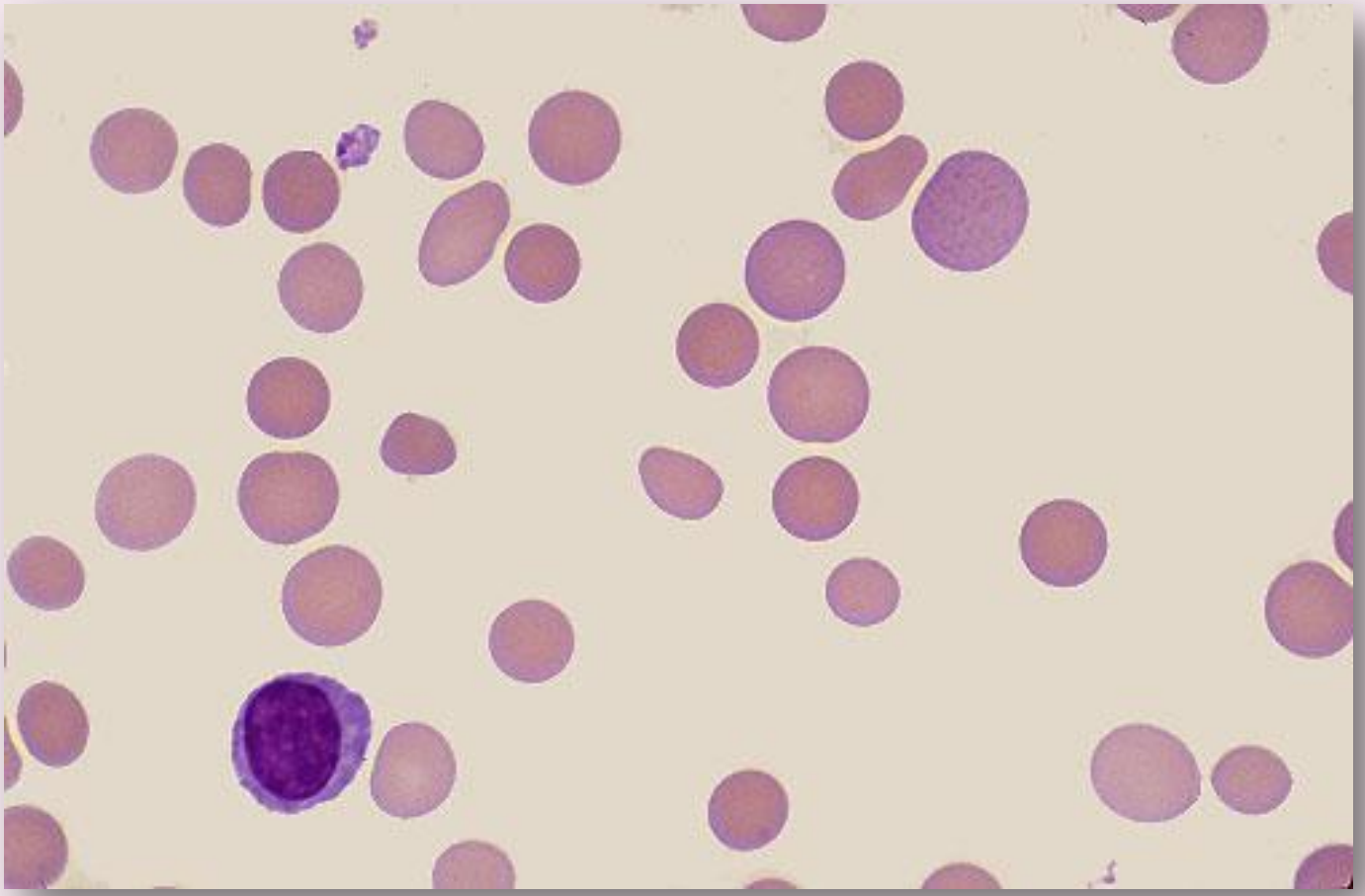
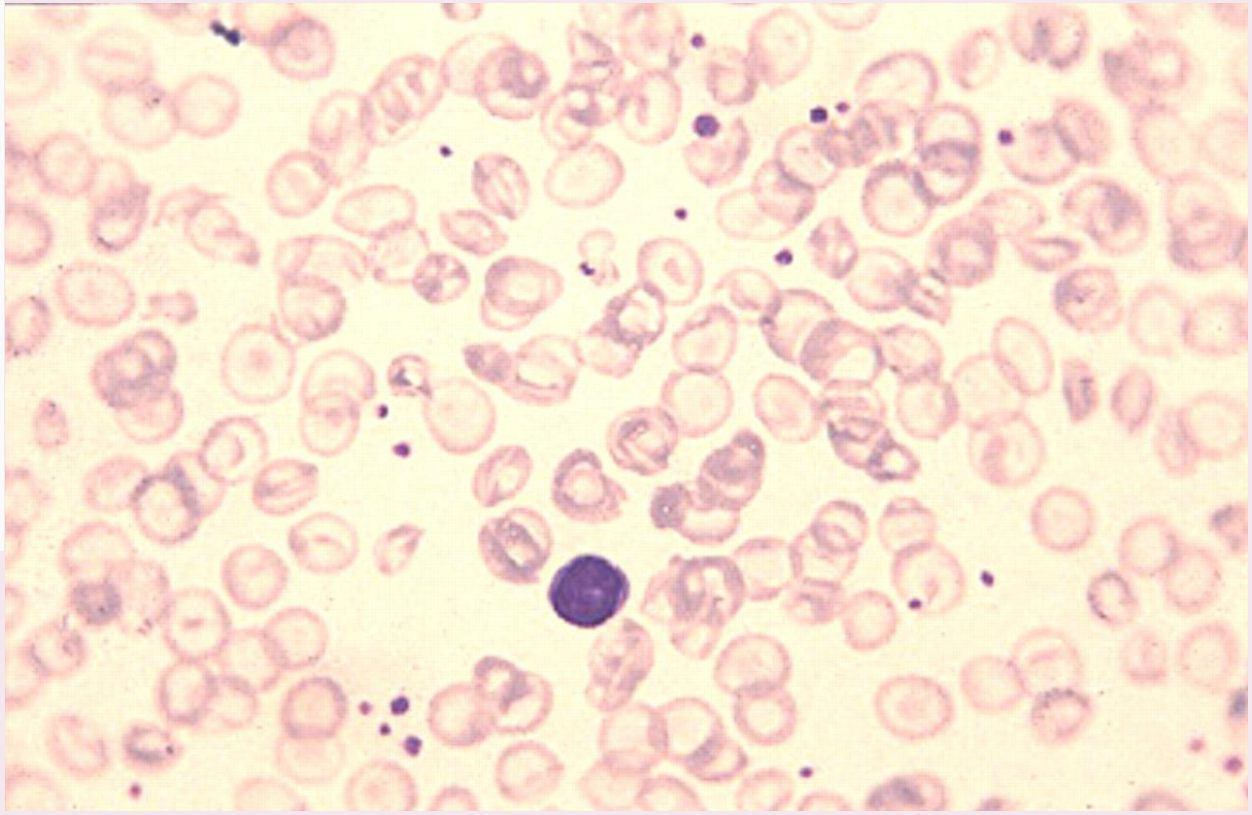


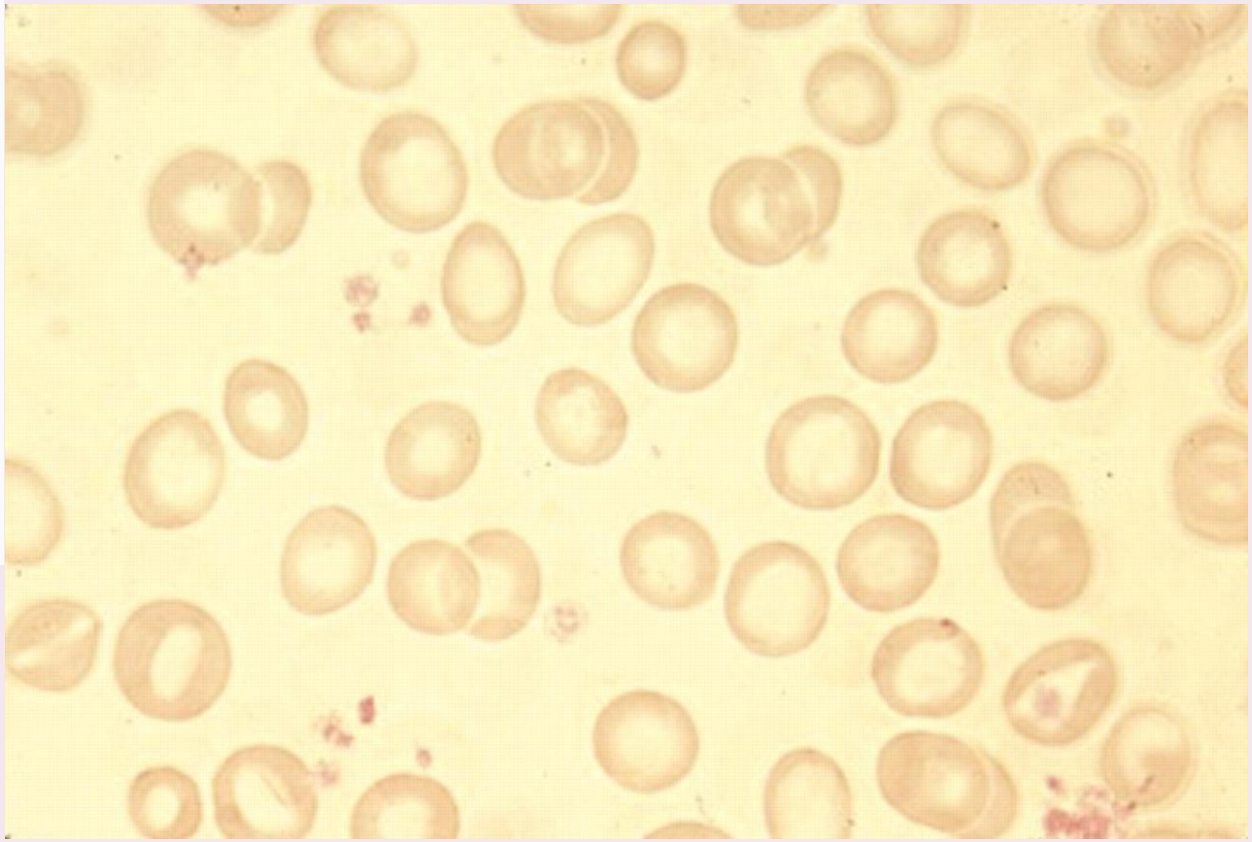
Figure 2. Peripheral smear



Schrier, S. ASH Image Bank 2001;2001:100208

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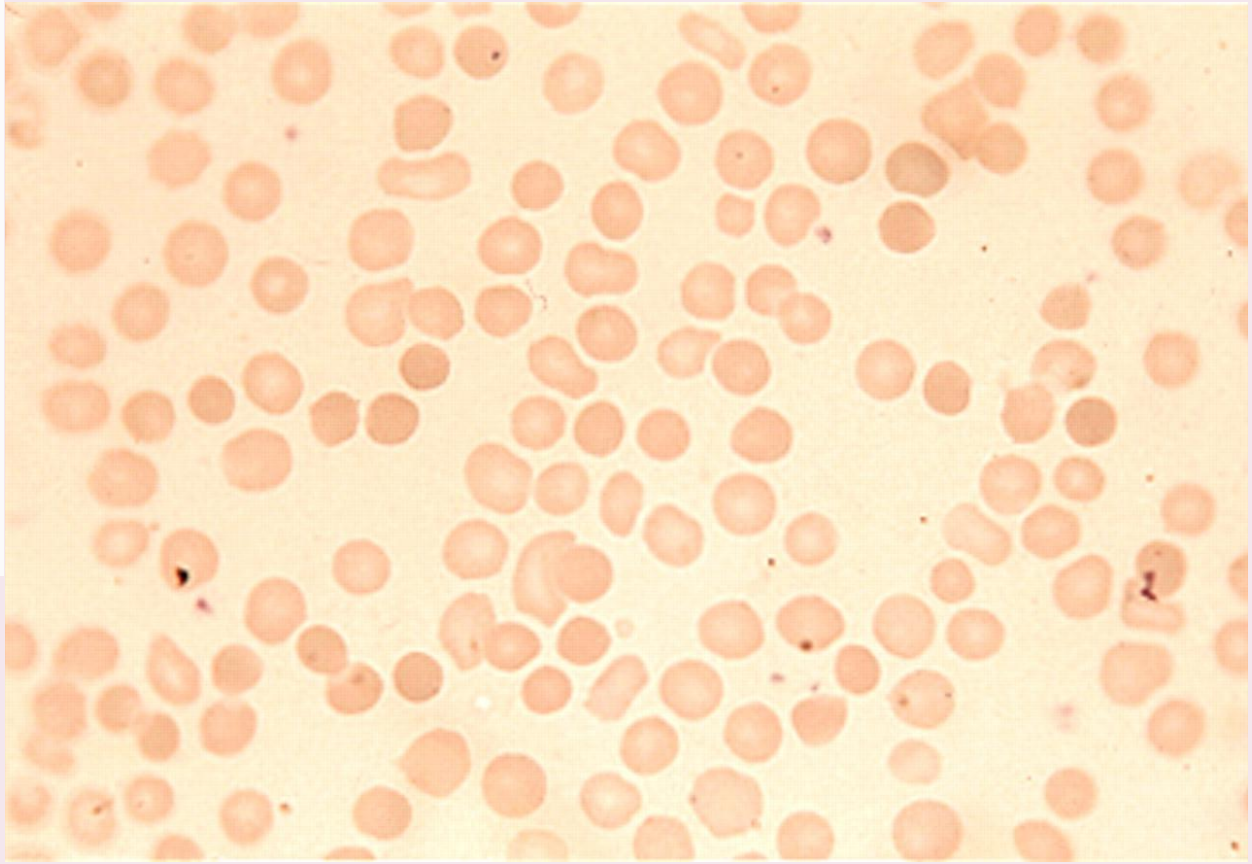
Figure 1. Note the profound central pallor of the hypochromic and microcytic RBC



Schrier, S. ASH Image Bank 2002;2002:100325

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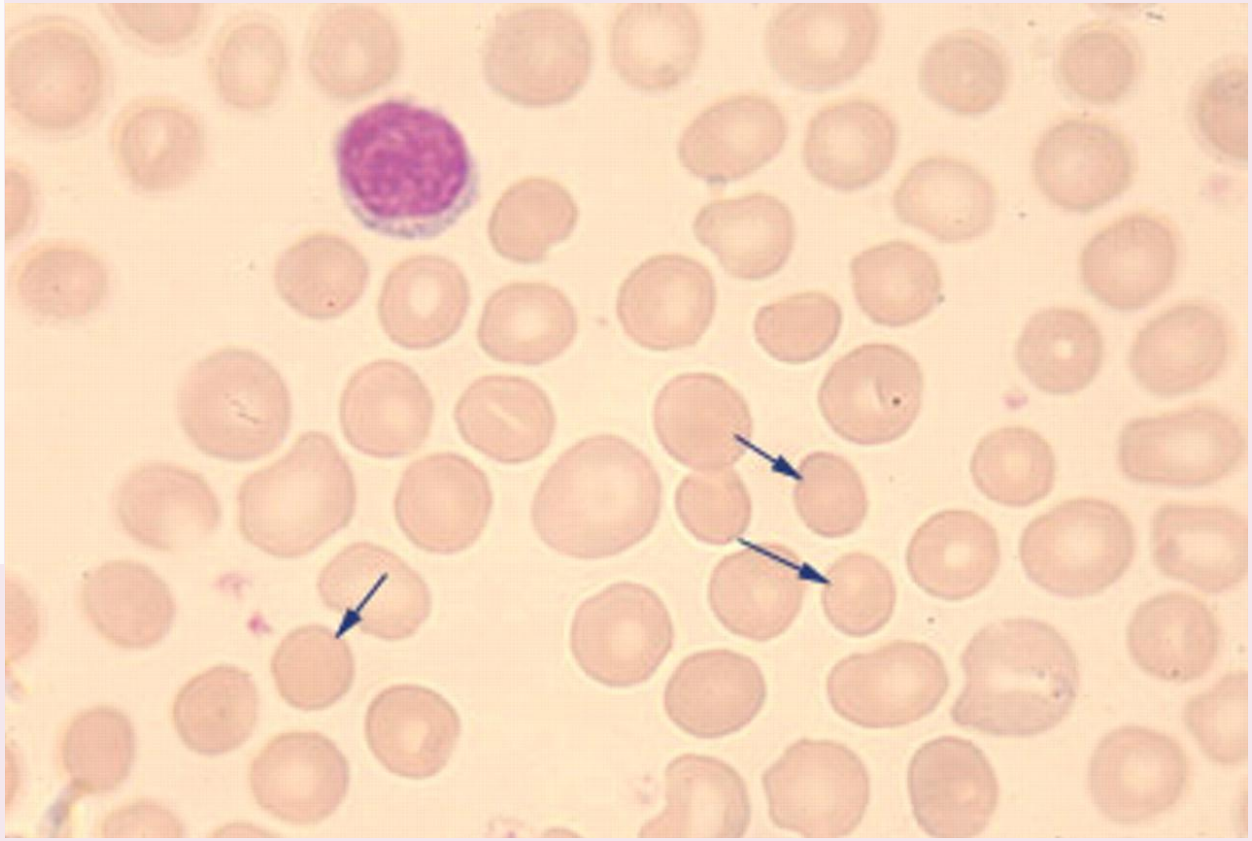
Figure 4. Low-power view showing dense micro-spherocytes without central pallor



Schrier, S. ASH Image Bank 2002;2002:100344

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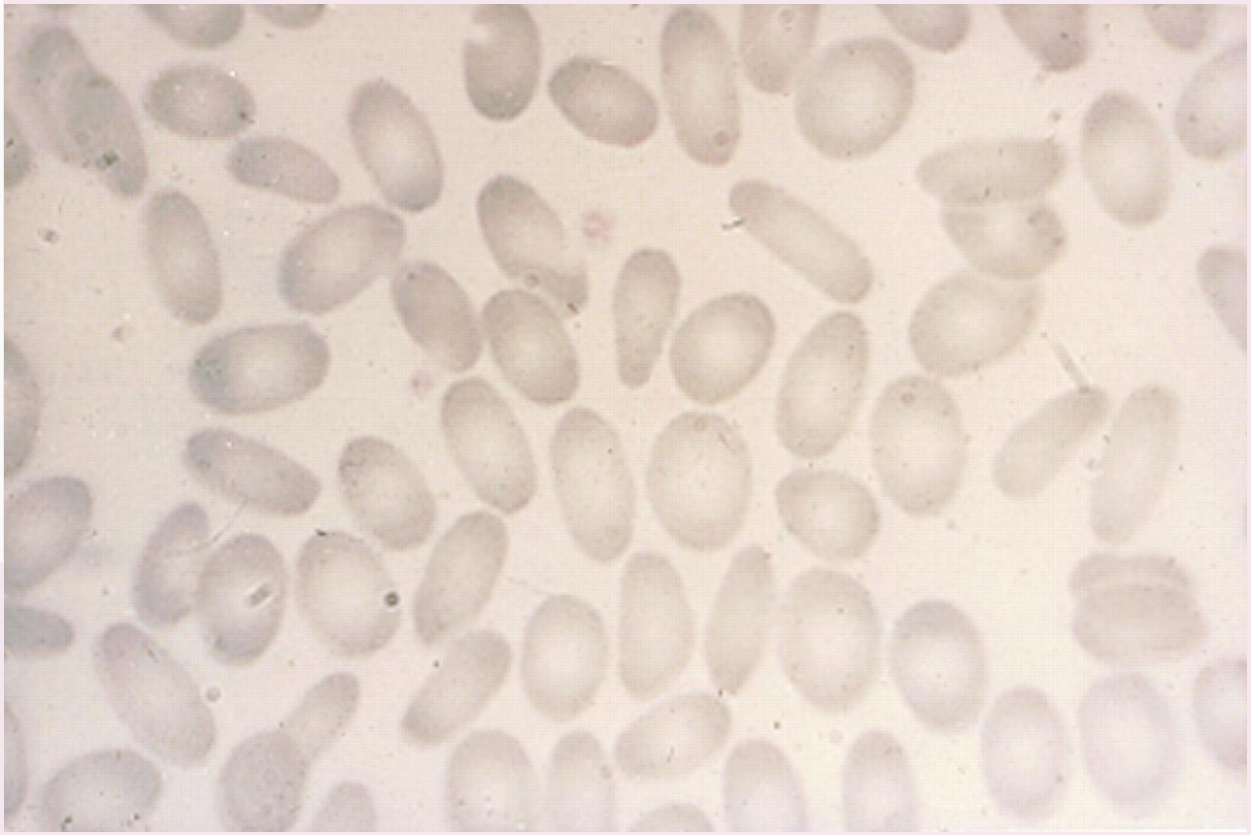
Figure 1. Note the dense microspherocytes and the macrocytes with polychromasia



Schrier, S. ASH Image Bank 2001;2001:100214

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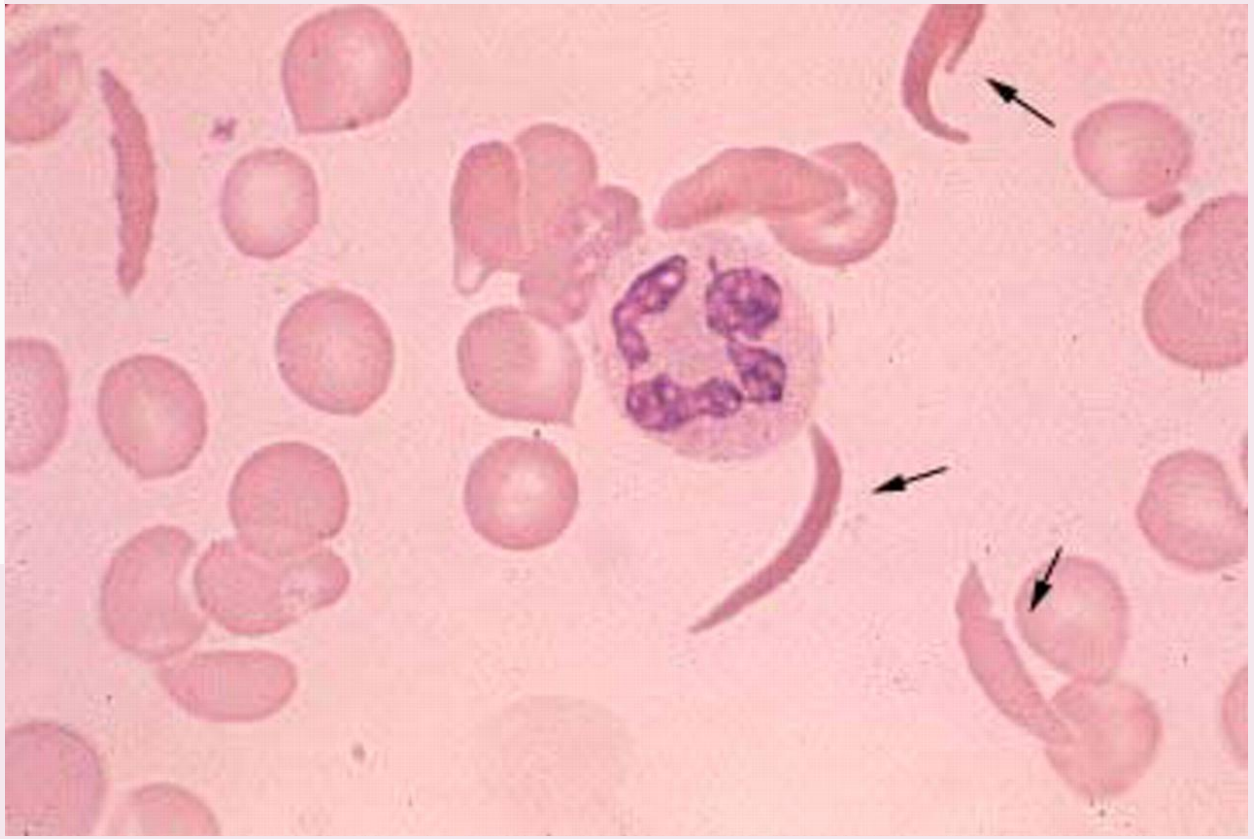
Figure 5. This patient has hereditary elliptocytosis



Schrier, S. ASH Image Bank 2002;2002:100344

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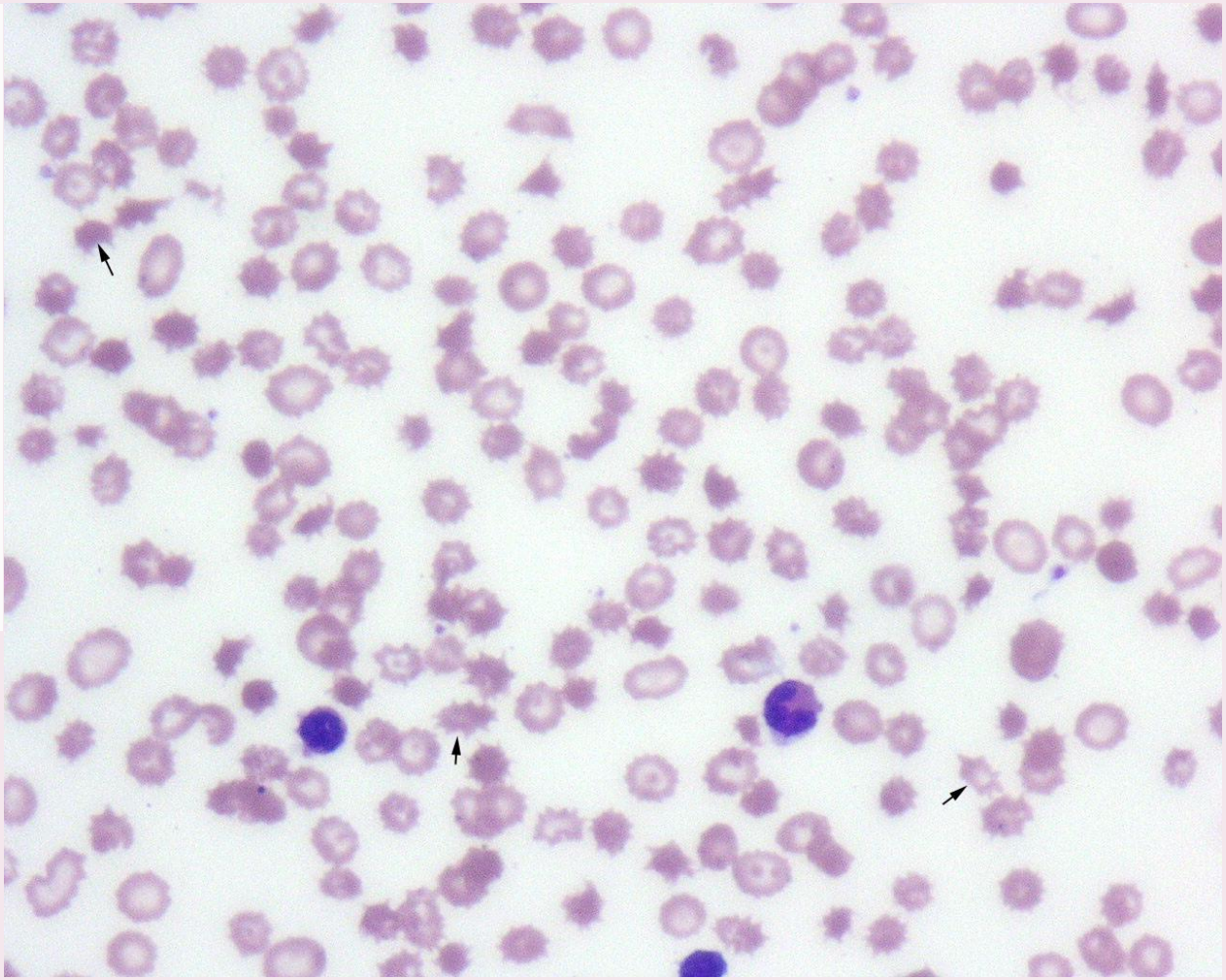
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Schrier, S. ASH Image Bank 2001;2001:100248

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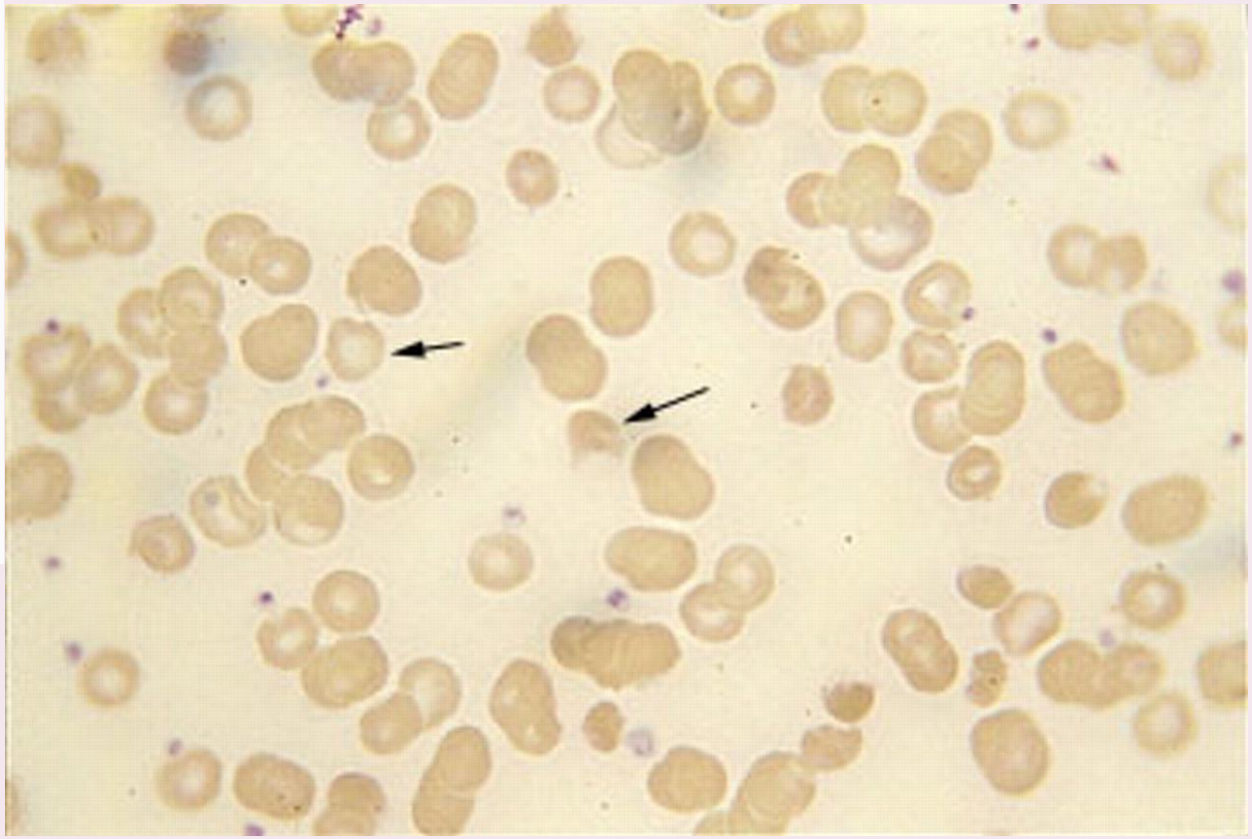
Figure 1. Peripheral smear from a patient with liver disease and hemolytic anemia



Lazarchick, J. ASH Image Bank 2002;2002:100507

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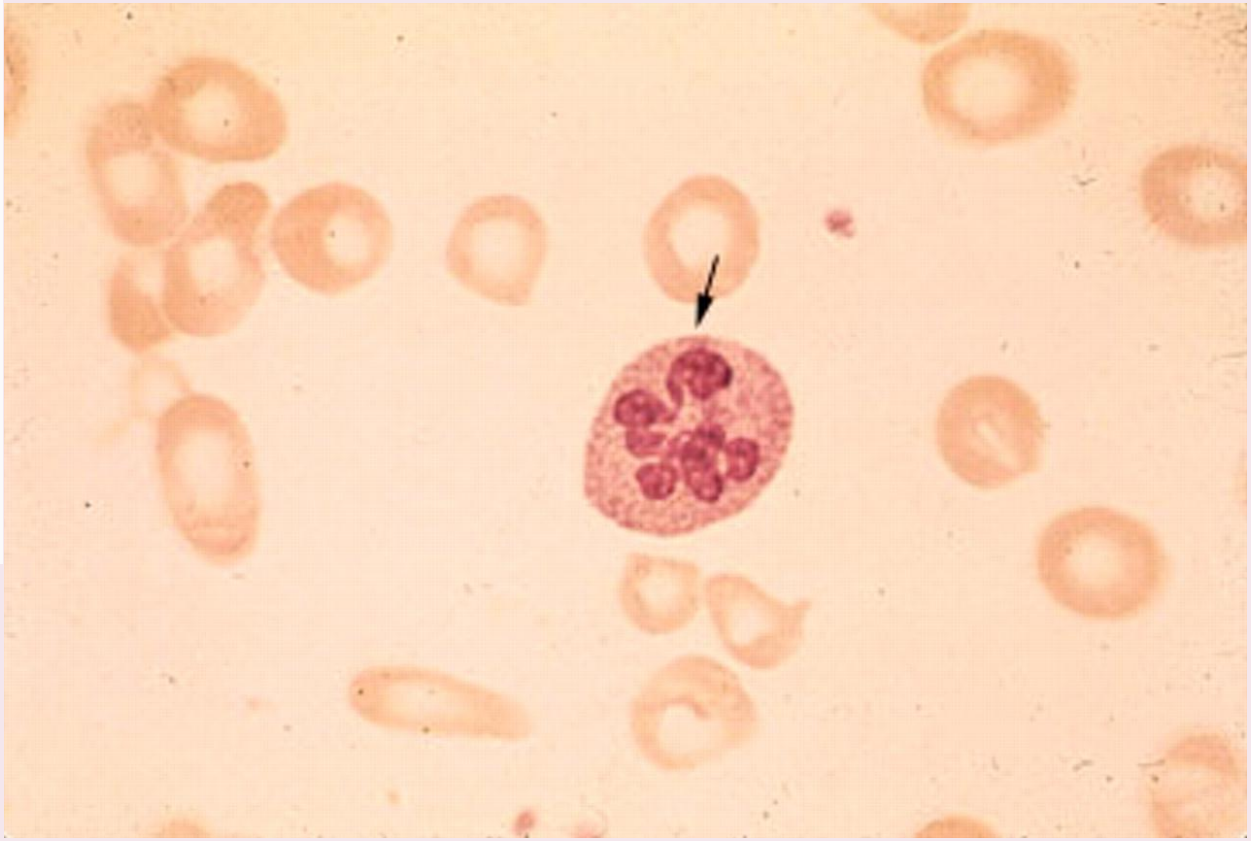
Figure 1. Note the "bite cells" and the cells with "blisters" and dense cross-bonded hemoglobin



Schrier, S. ASH Image Bank 2001;2001:100226

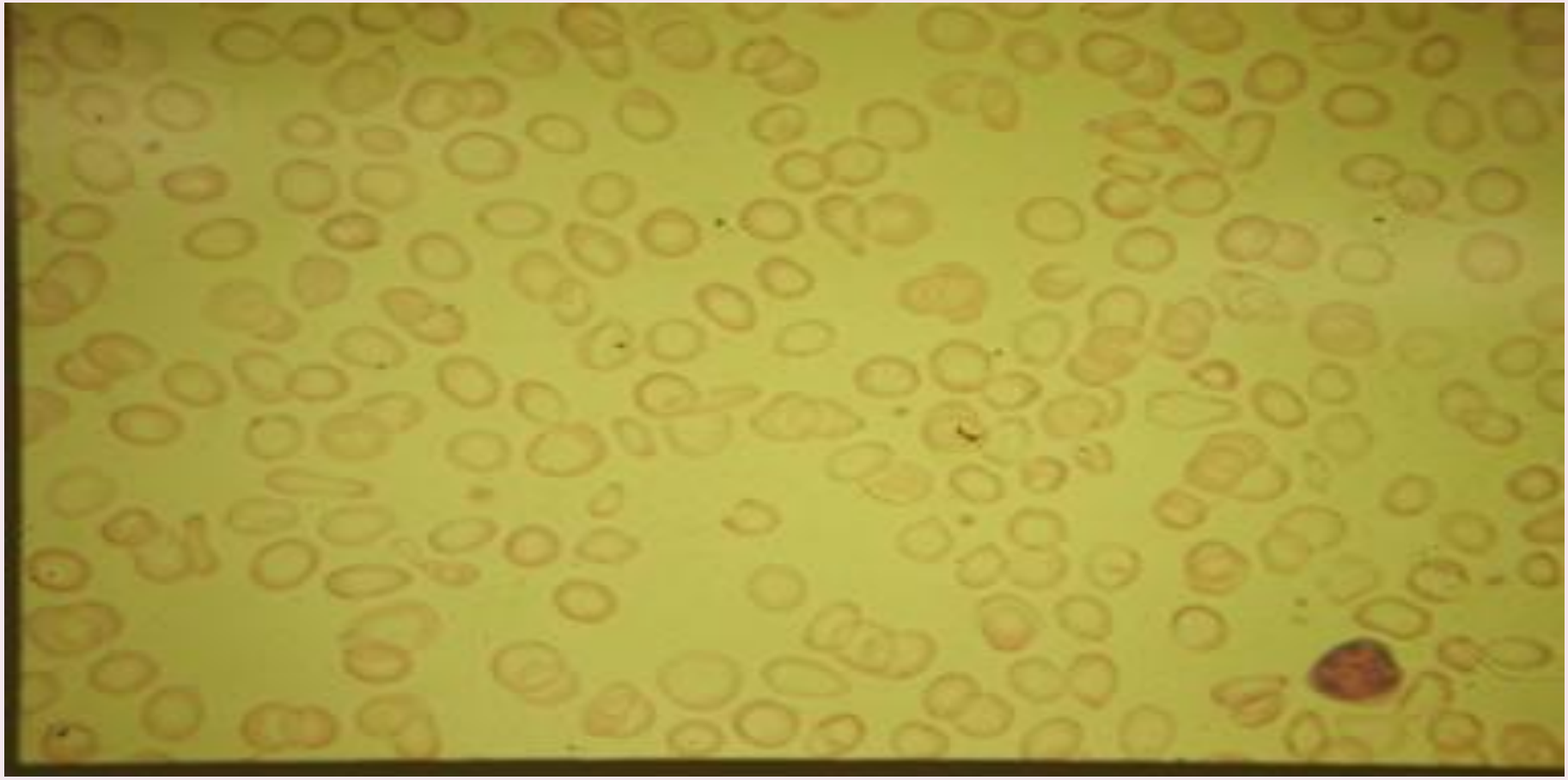
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Figure 2. Note the hypersegmented neutrophil (7-8 lobes)



Schrier, S. ASH Image Bank 2001;2001:100231

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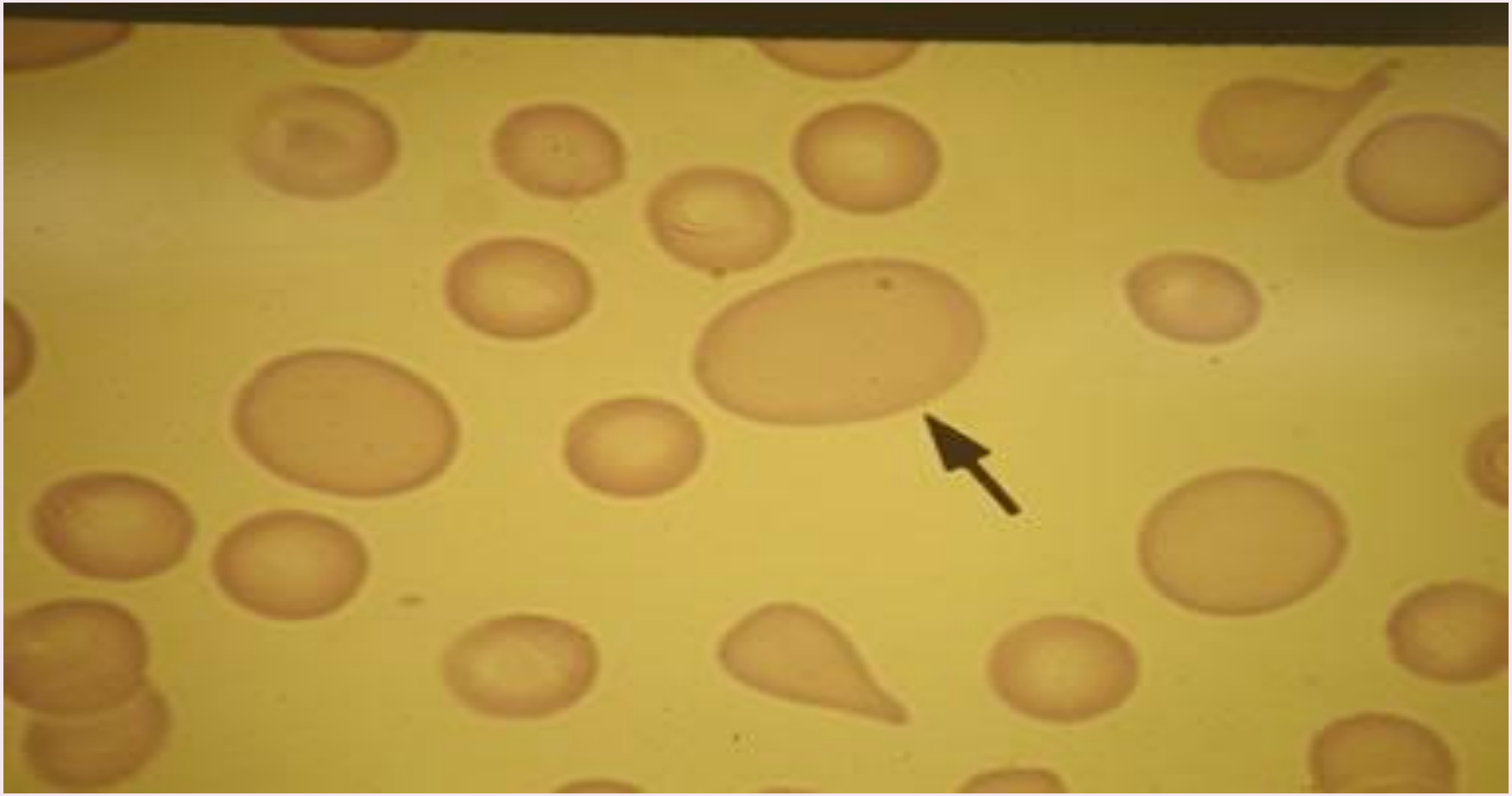
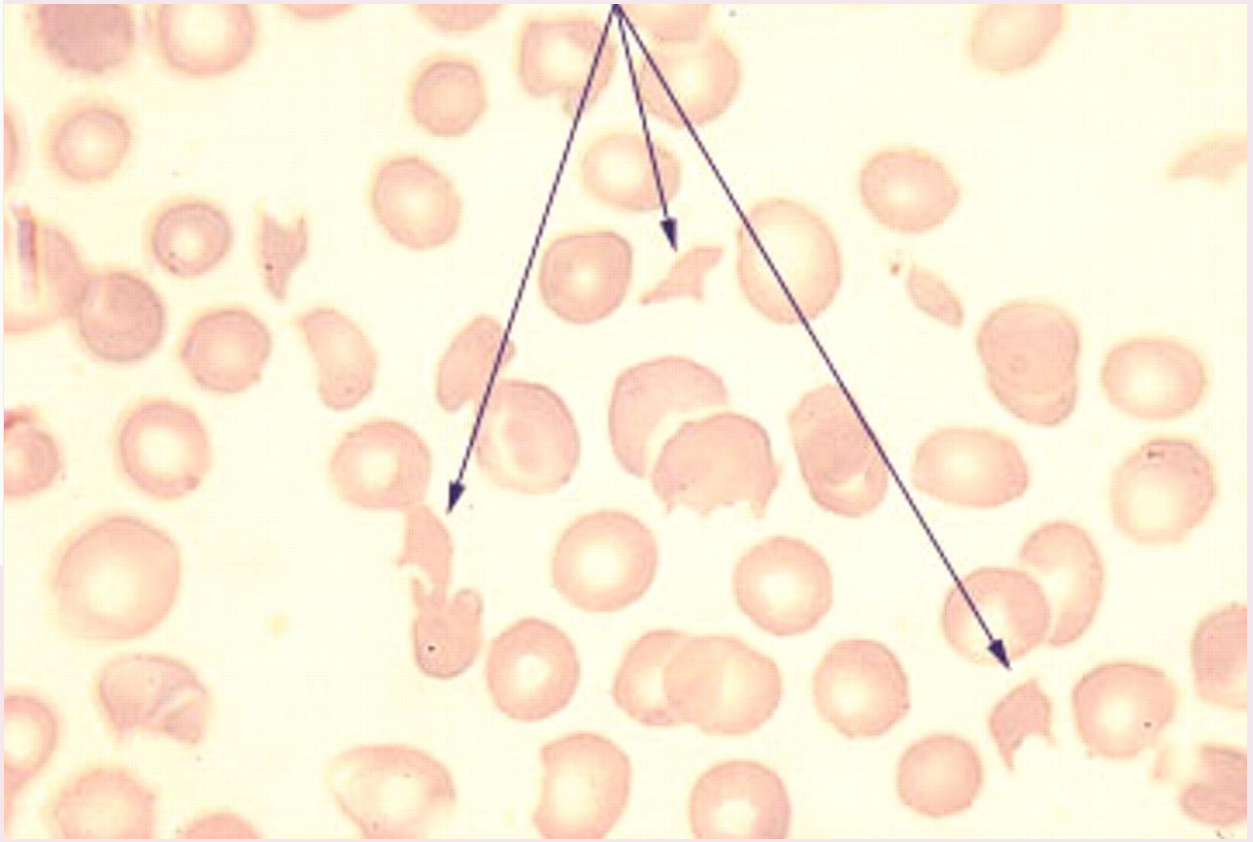
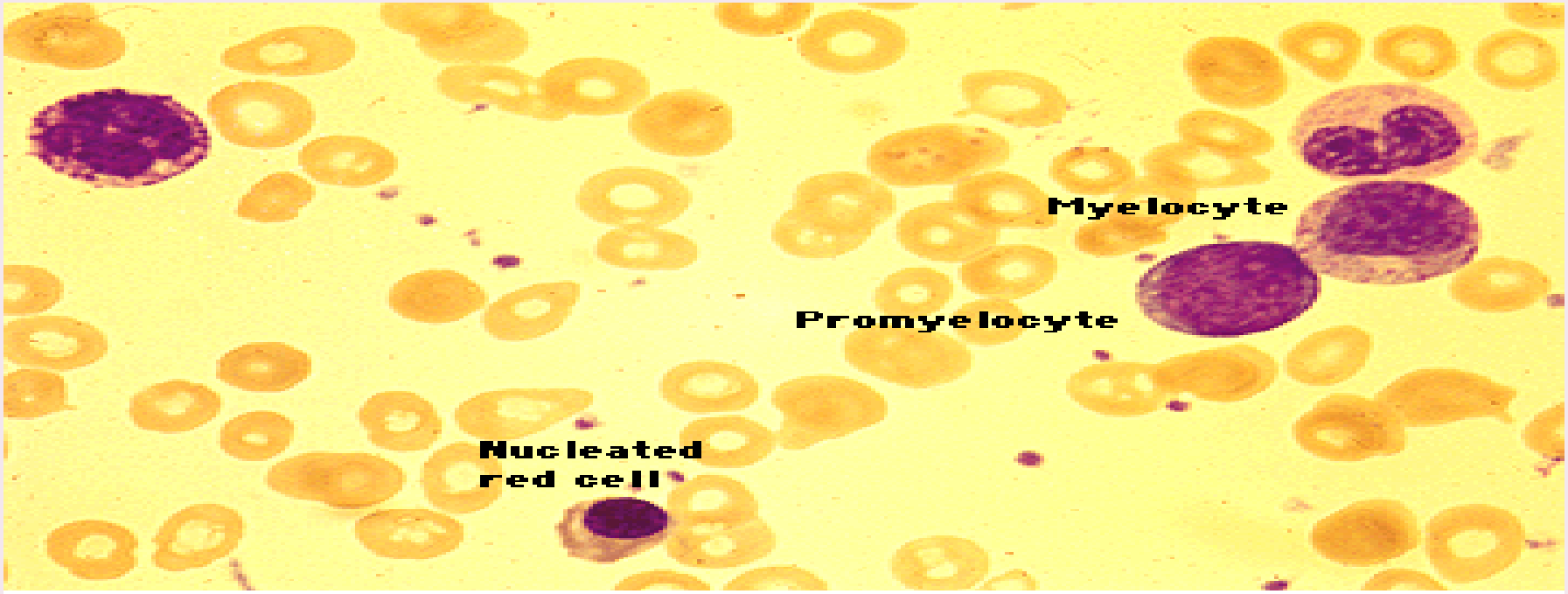


Figure 1. Note the fragmented schistocytes, burr cells, and helmet cells

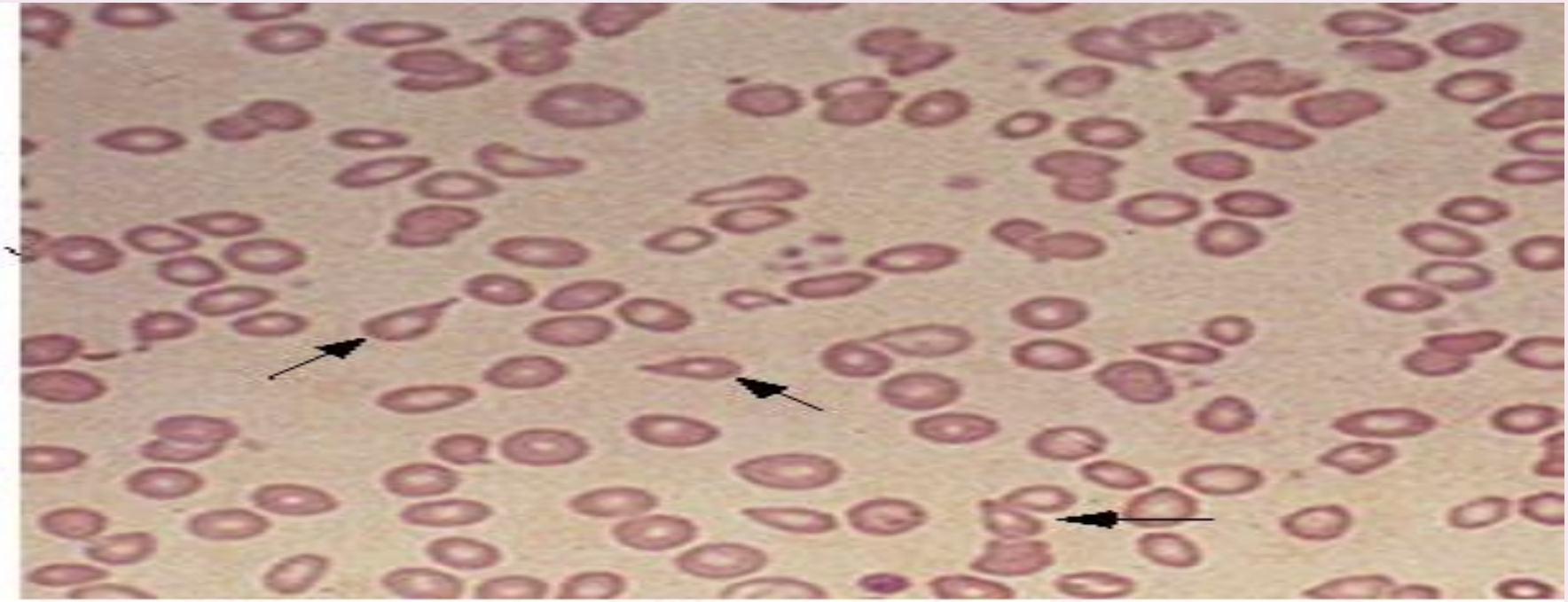


Schrier, S. ASH Image Bank 2001;2001:100249

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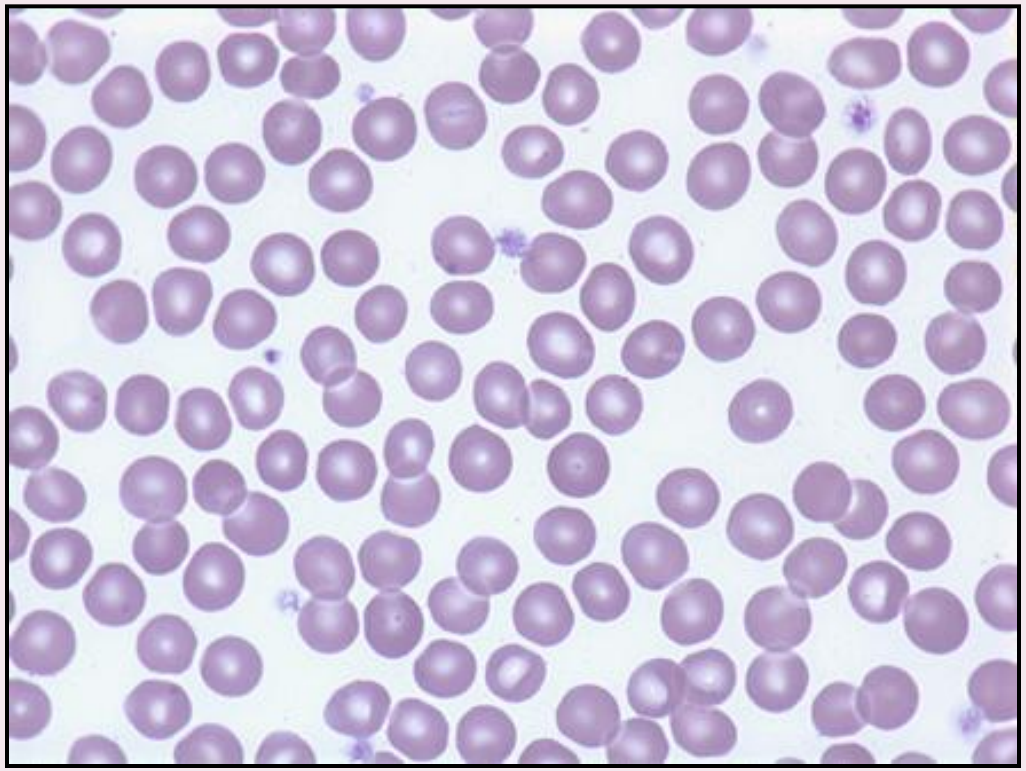


Leukoerythroblastic smear Leukoerythroblastic peripheral blood smear showing the presence of nucleated red cells and immature white cells. This pattern occurs with marrow replacement, usually due to fibrosis that may be idiopathic (eg, myelofibrosis with agnogenic myeloid metaplasia) or reactive to conditions such as metastatic cancer. Courtesy of Carola von Kapff, SH (ASCP).



Teardrop cells This peripheral smear from a patient with bone marrow fibrosis shows numerous teardrop-shaped red cells (arrows). Note that the teardrops are pointed in several different directions, ruling out an artifact due to preparation of the smear. Courtesy of Carola von Kapff, SH (ASCP).

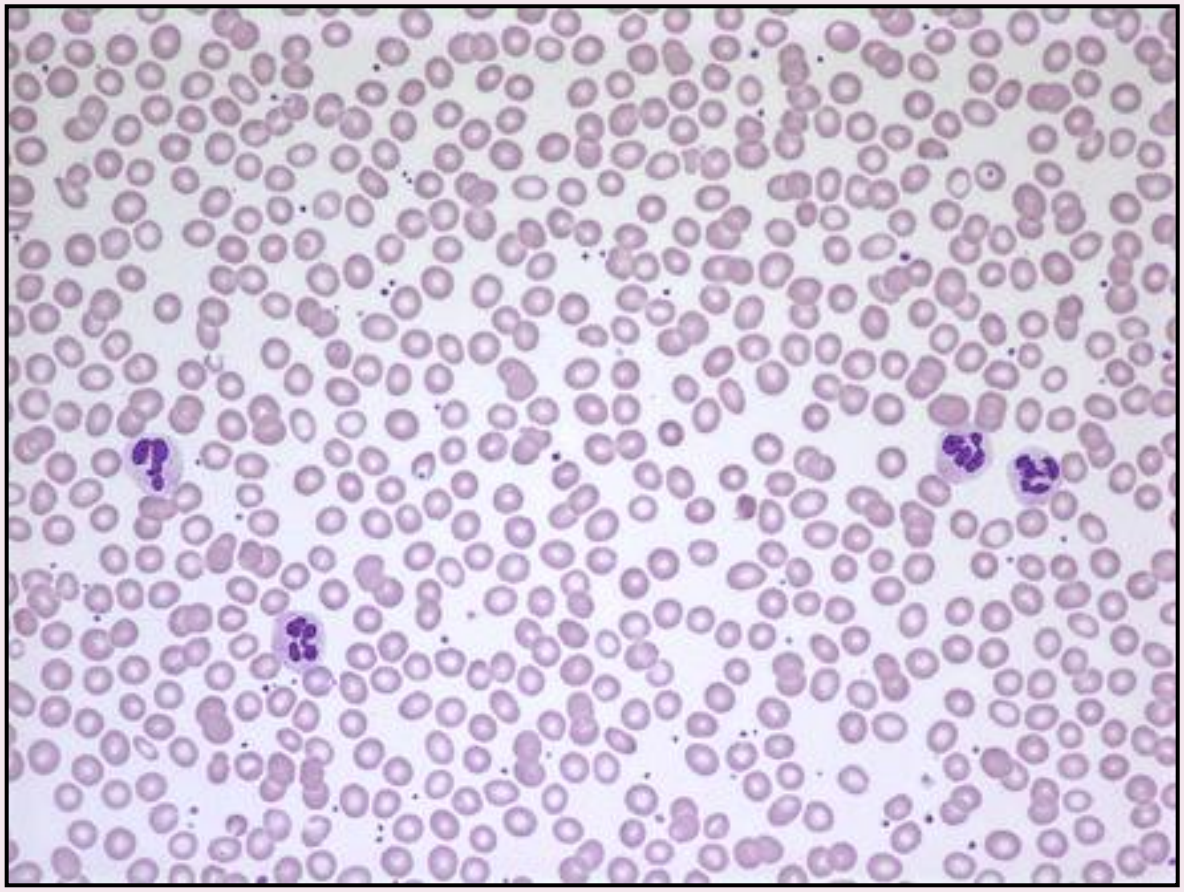
ASH Teaching Slides: Blood Cells



The appearance of normal circulating blood is relatively uniform with little variation in size and shape. Red blood cells will have an area of paleness in the center, which is approximately one-third the diameter of the cell.

Maslak, P. ASH Image Bank 2008;2008:8-00044. Copyright ©2008 American Society of Hematology.

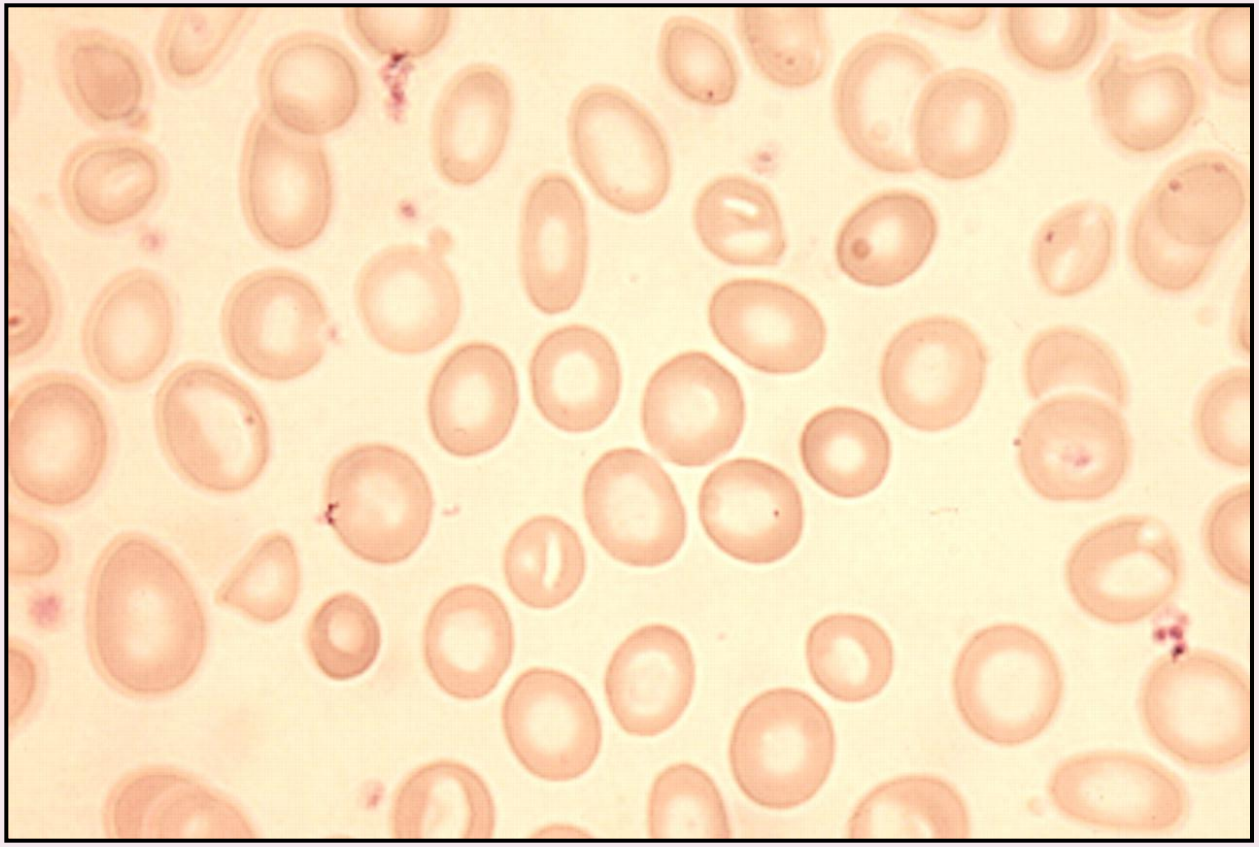
ASH Teaching Slides: Blood Cells



Normal blood smear. The four larger cells shown are called granulocytes, a type of white blood cell.

Maslak, P. ASH Image Bank 2008;2008:8-00067. Copyright ©2008 American Society of Hematology.

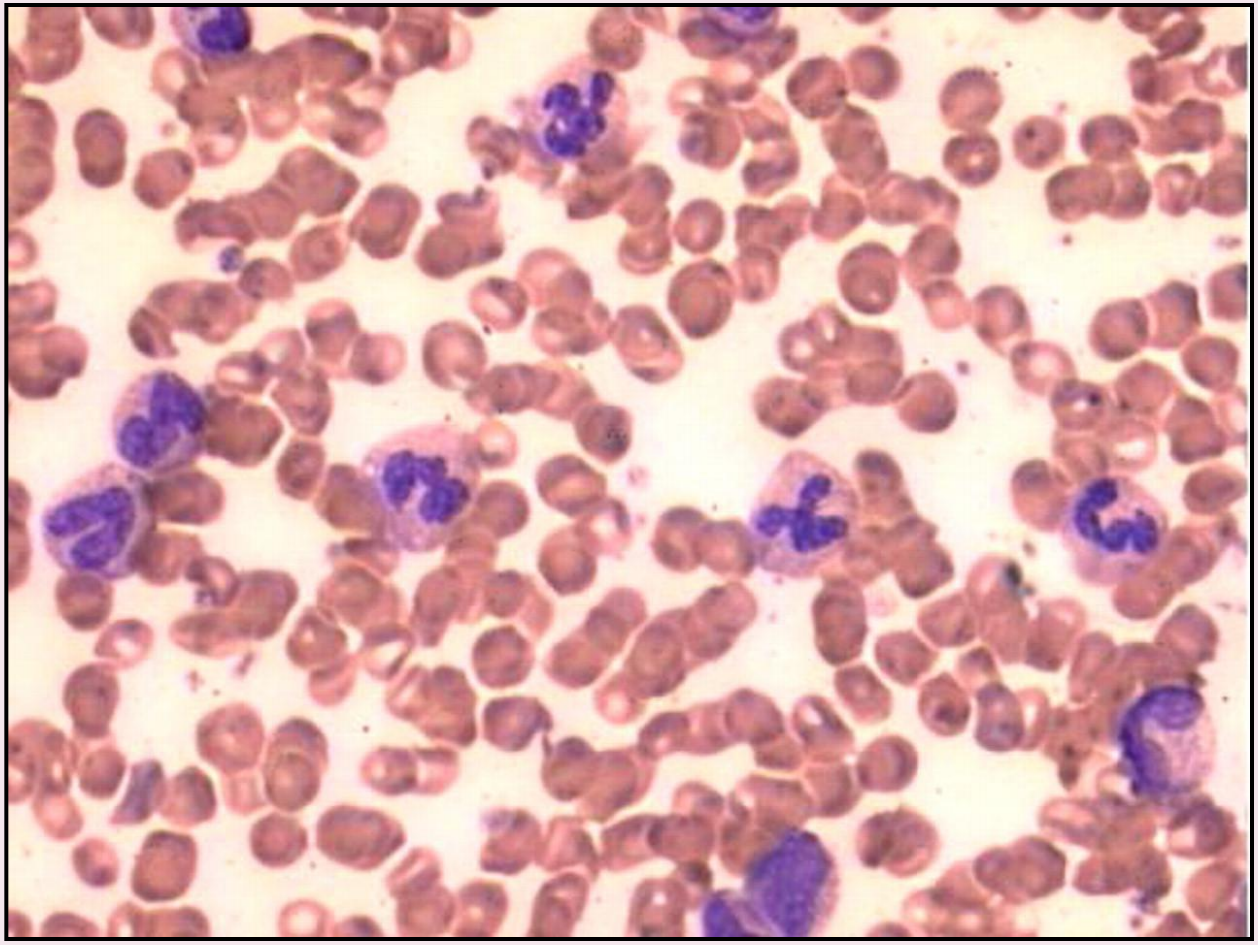
ASH Teaching Slides: Blood Cells



Iron-deficiency anemia is indicated by red blood cells that are paler and of a smaller size than normal.

Schrier, S. ASH Image Bank 202;2002:100345. Copyright ©2002 American Society of Hematology.

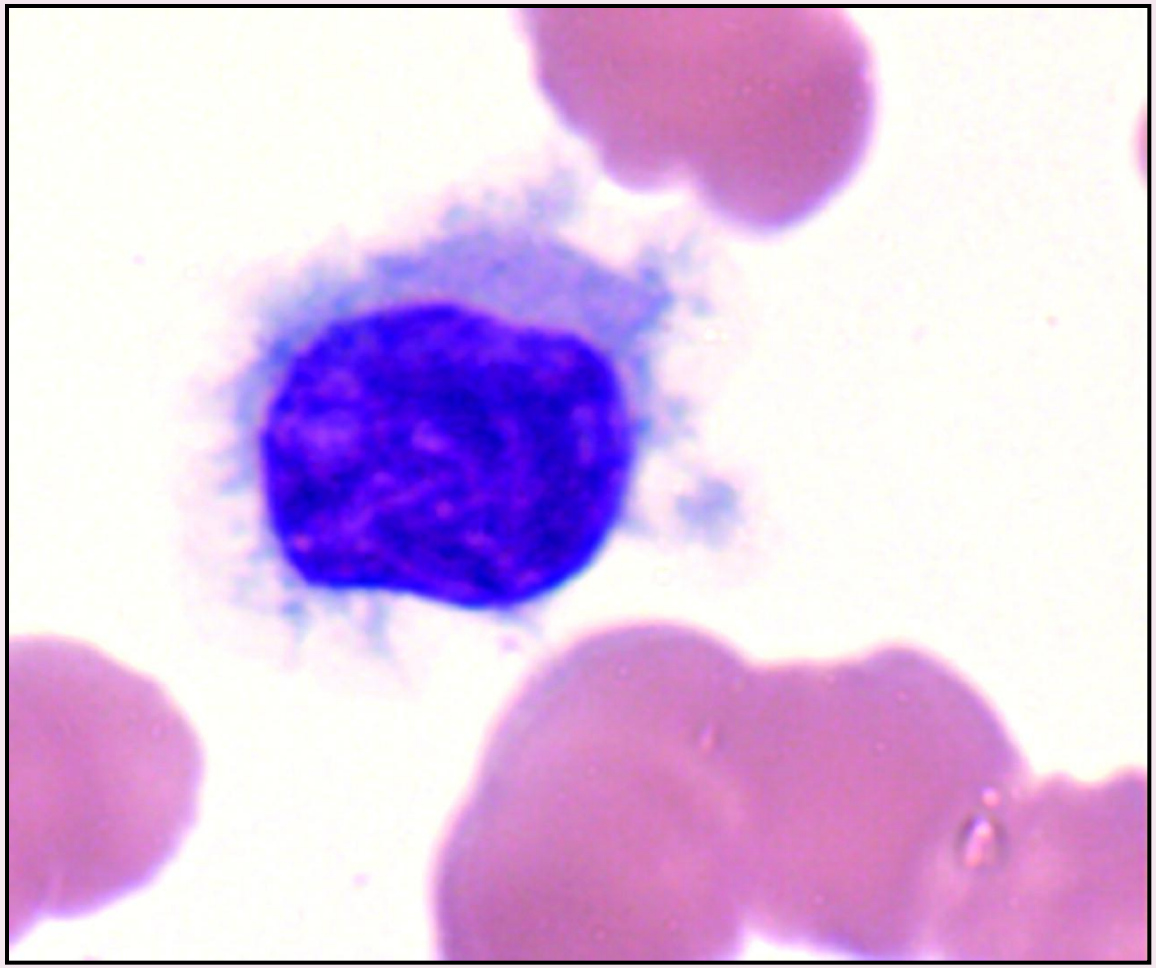
ASH Teaching Slides: Blood Cells



Chronic myelogenous leukemia. The blood smear shows an increased number of neutrophils, a type of white blood cell.

Maslak, P. ASH Image Bank 2001;2001:100202. Copyright ©2001 American Society of Hematology.

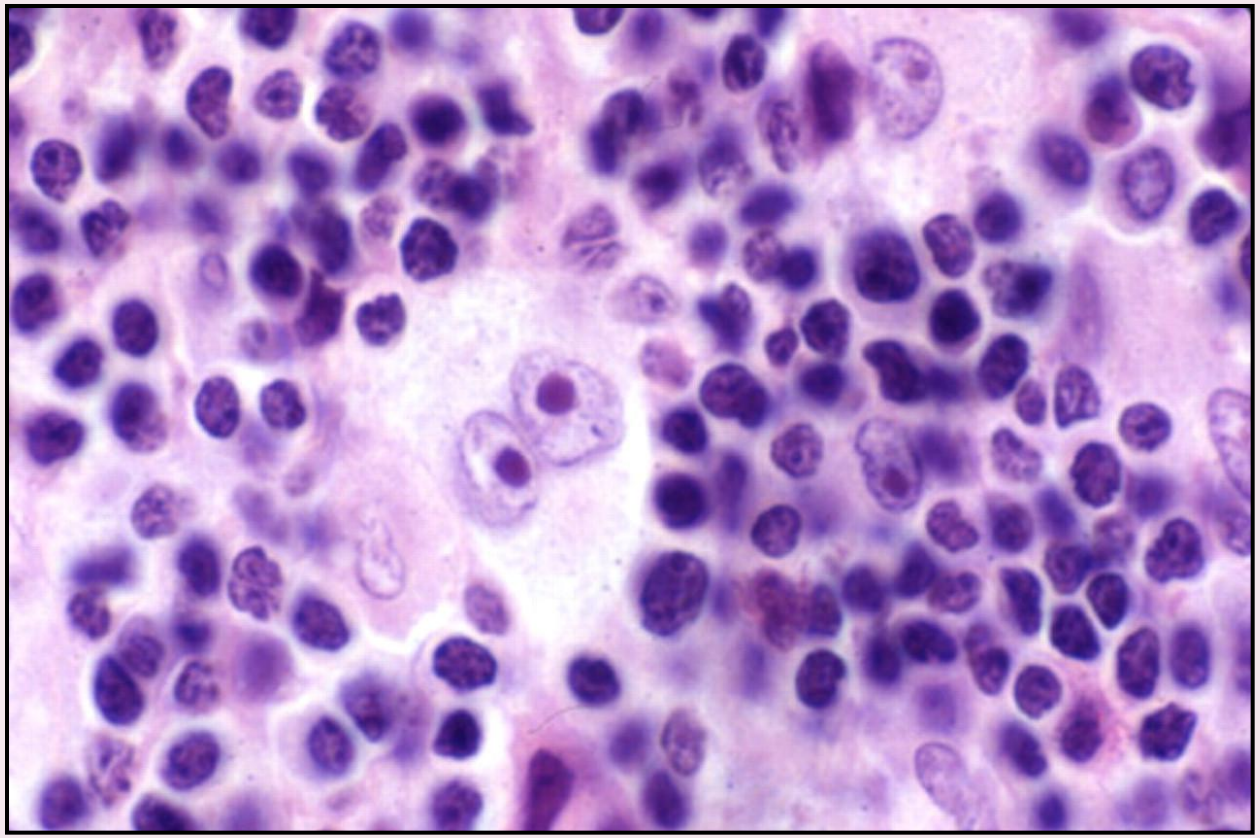
ASH Teaching Slides: Blood Cells



Hairy cell leukemia. The characteristic cell of this type of leukemia has projections uniformly distributed around its border that give it a hairy appearance.

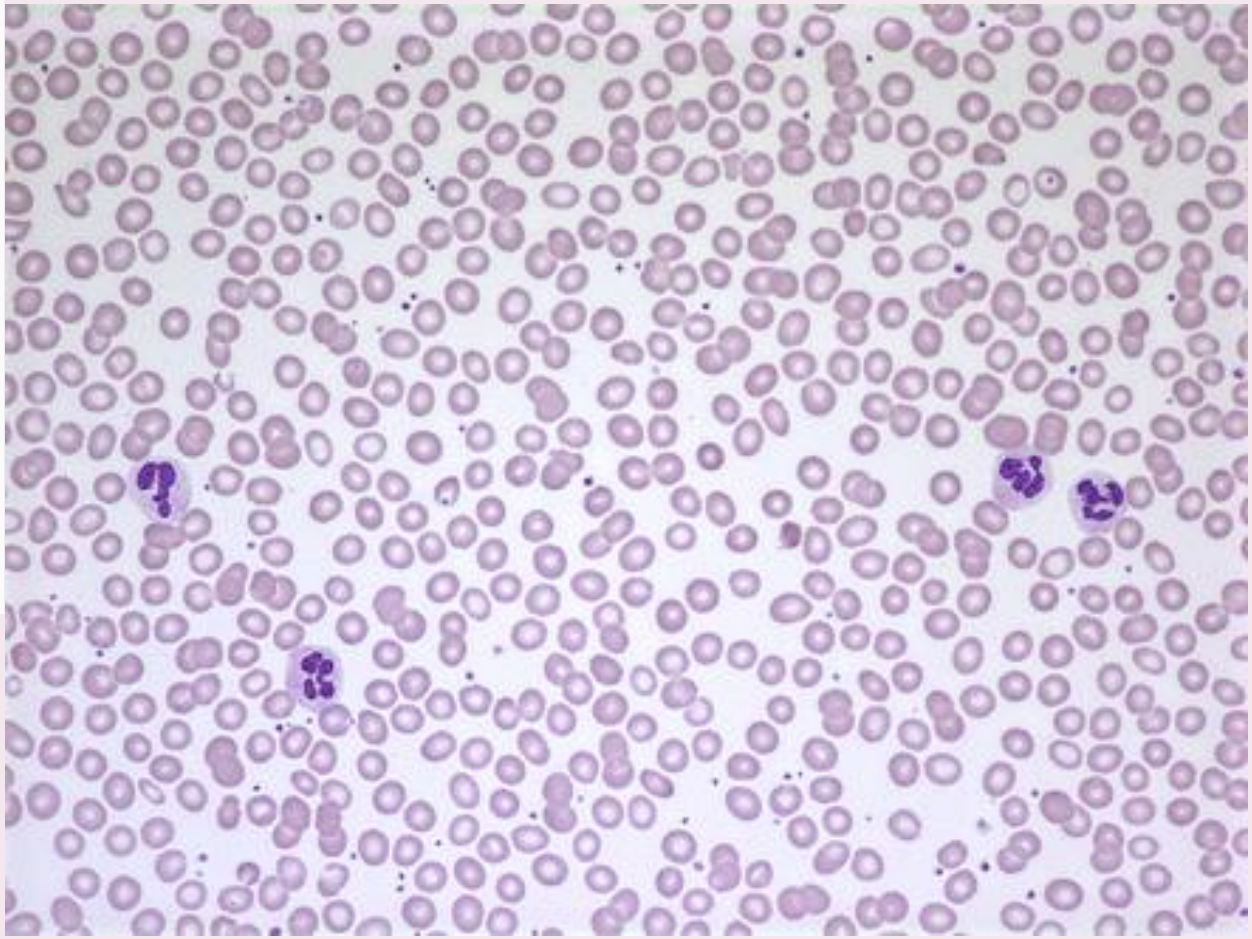
Maslak, P. ASH Image Bank 2007;2007:7-00011. Copyright ©2007 American Society of

ASH Teaching Slides: Blood Cells



Hodgkin lymphoma. The large cells with an owl-like appearance are called Reed-Sternberg cells and are a sign of Hodgkin lymphoma.

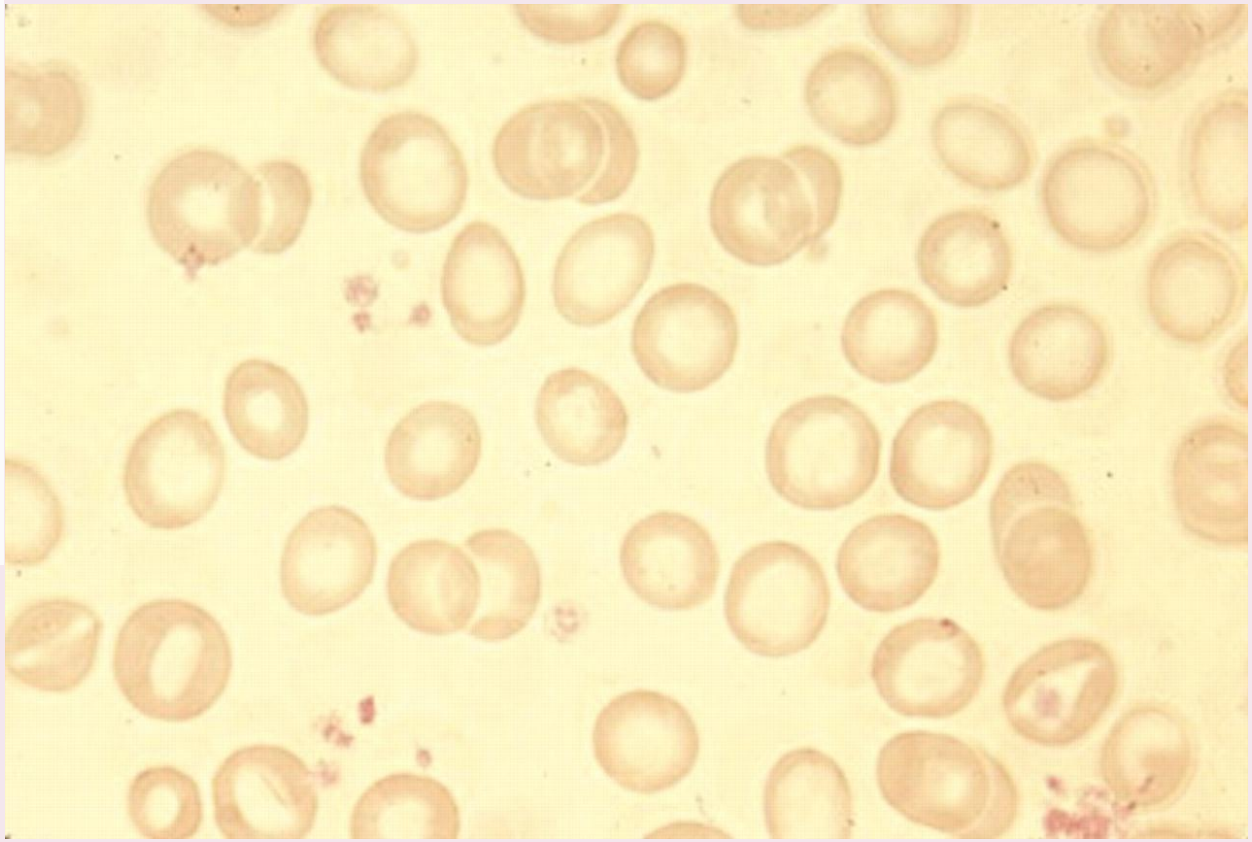
Kadin, M. ASH Image Bank 2002;2002:100484. Copyright ©2002 American Society of Hematology



Maslak, P. ASH Image Bank 2008;2008:8-00067

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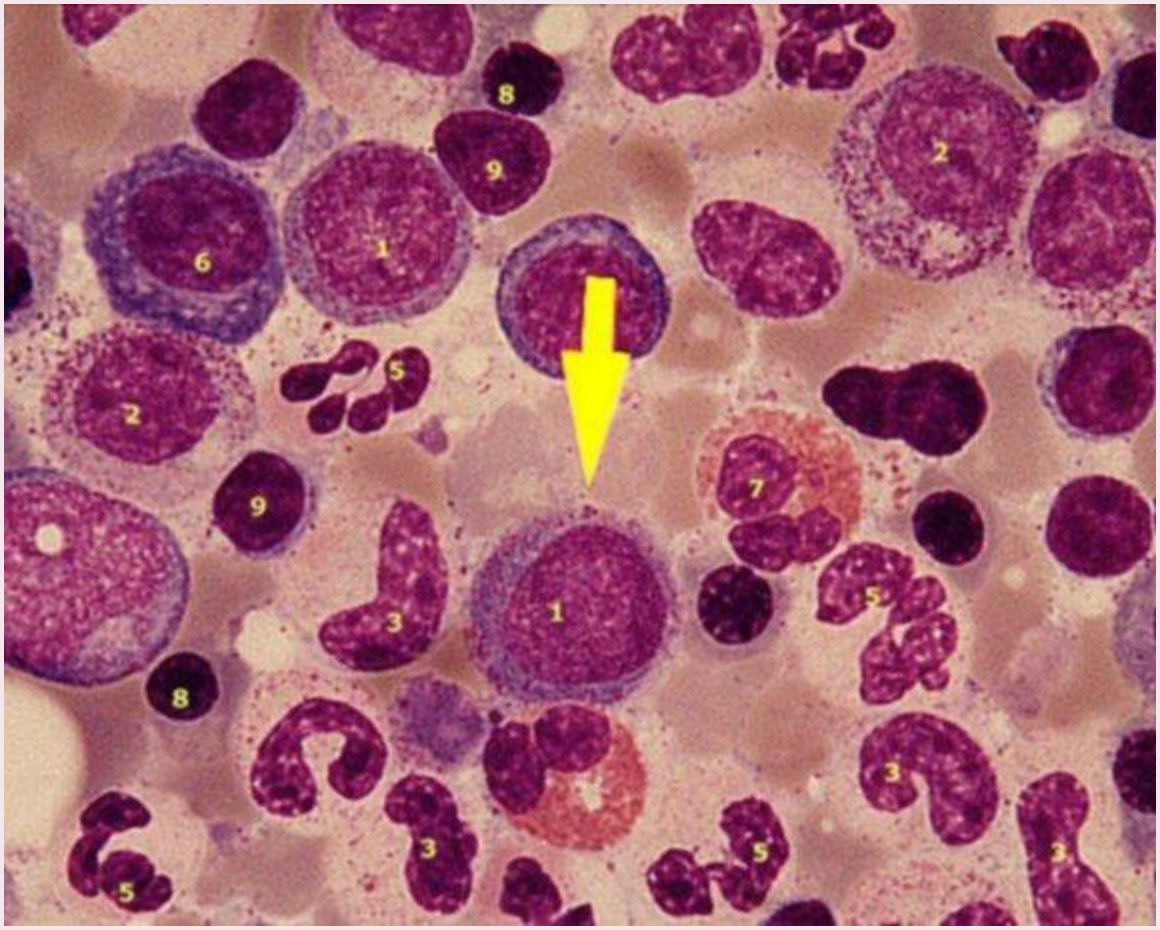
Figure 1. Note the profound central pallor of the hypochromic and microcytic RBC



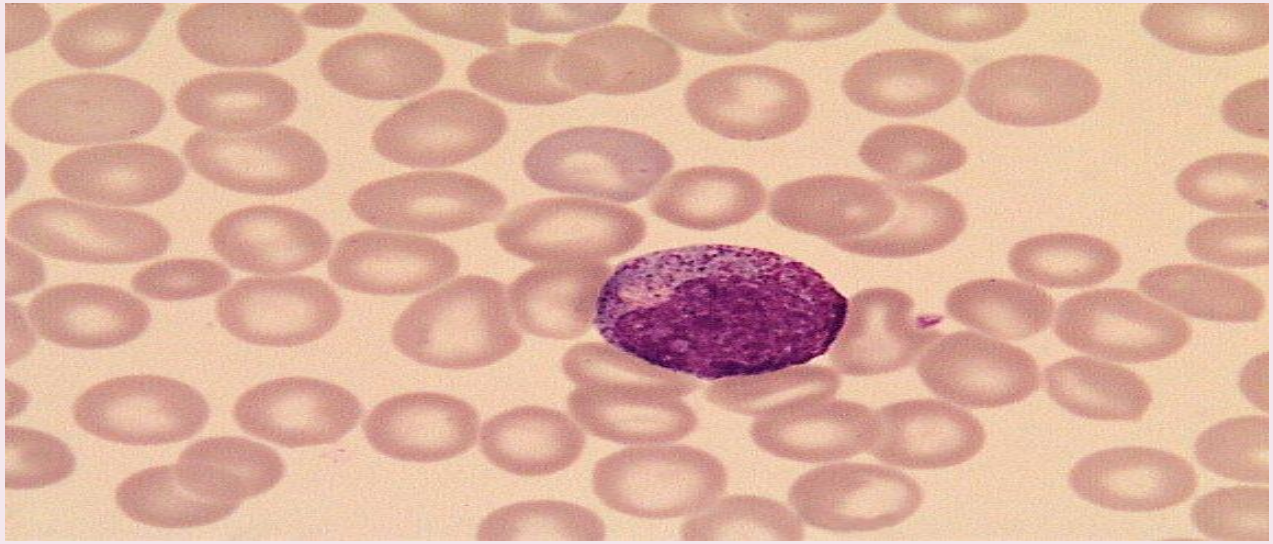
Schrier, S. ASH Image Bank 2002;2002:100325

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Myeloblast



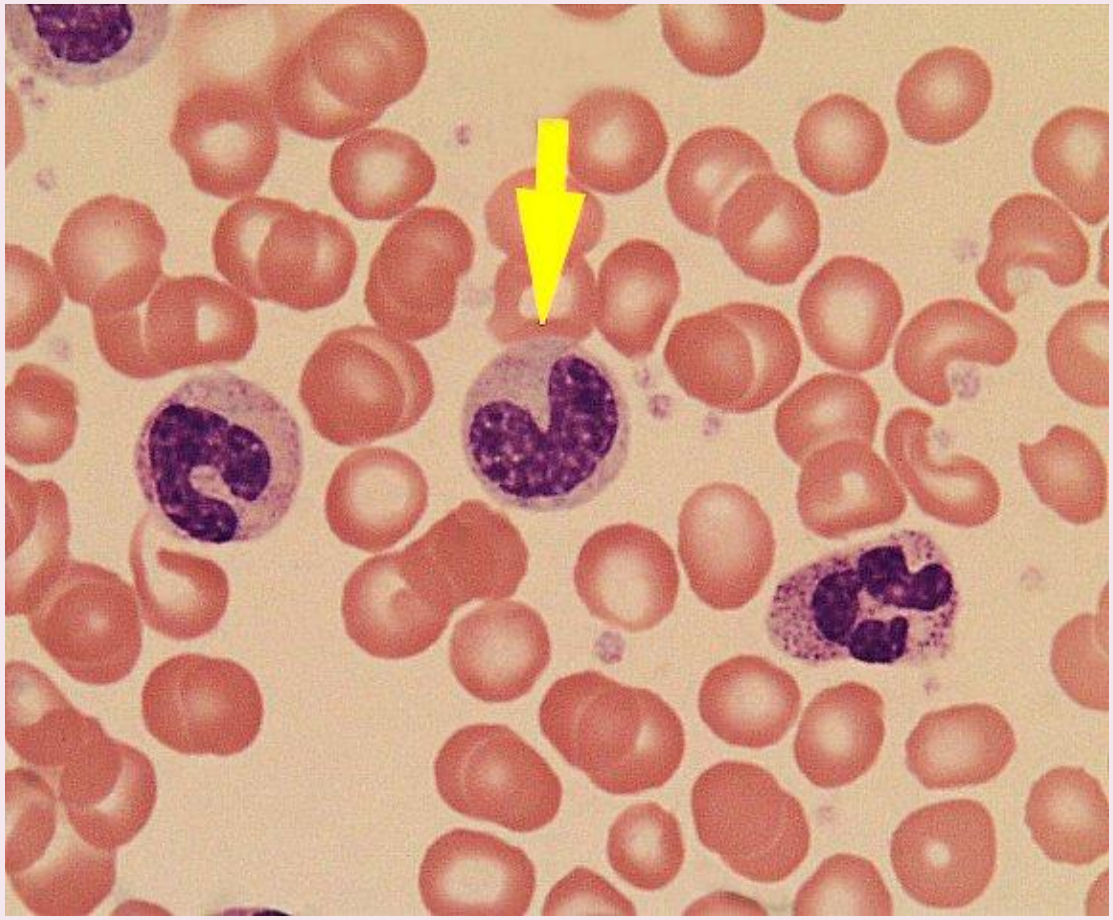
promyelocyte



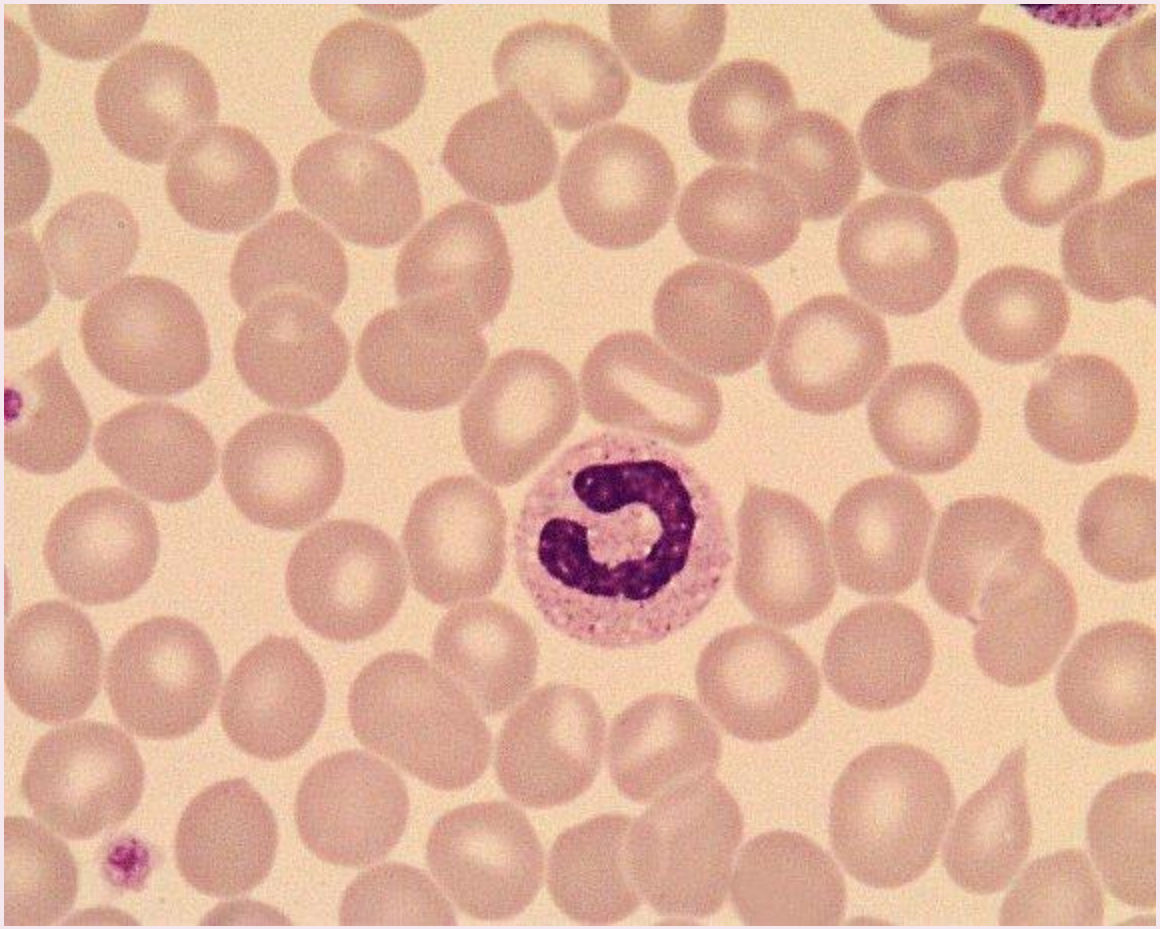
The promyelocyte .

contains abundant primary granules and a distinct zone of perinuclear halo. Also distinct anisocytosis of the erythrocytes

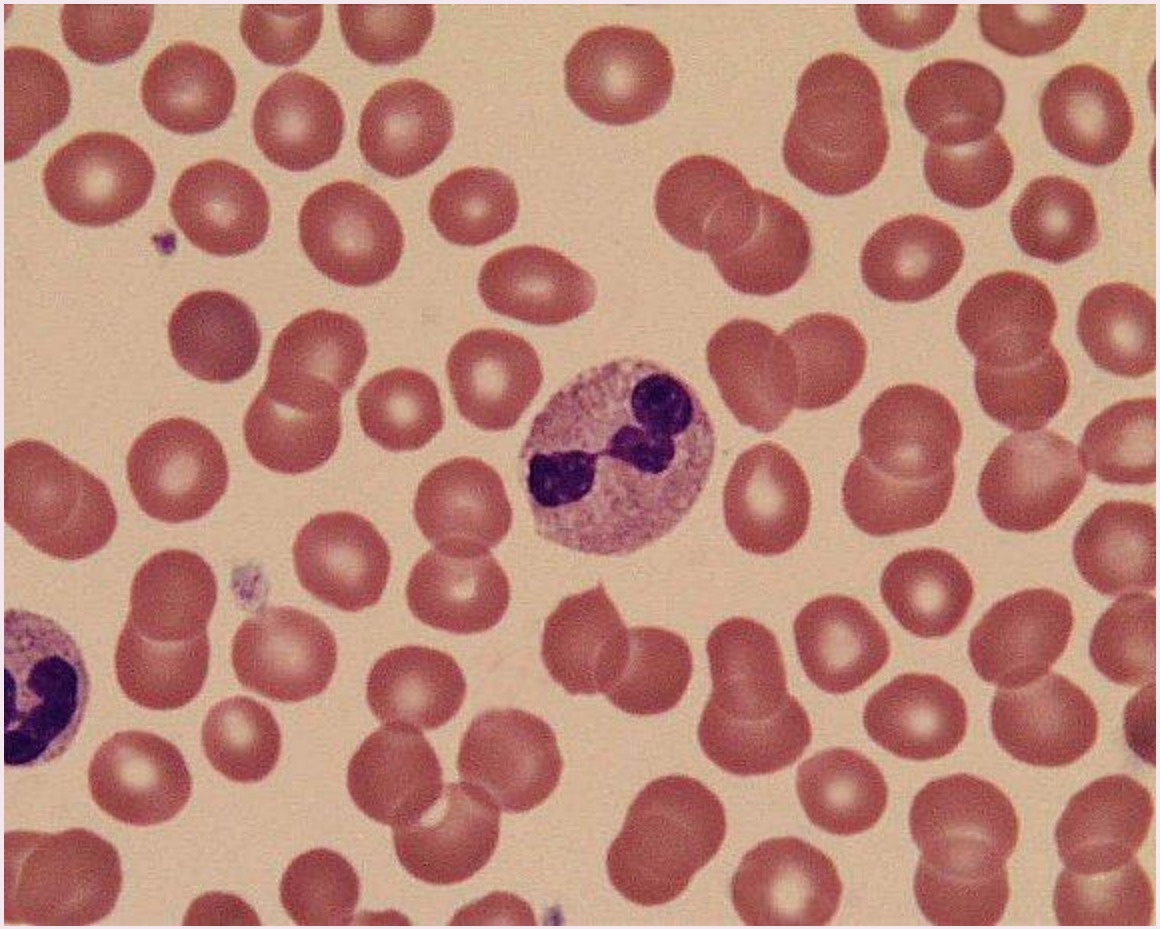
Metamyelocytes



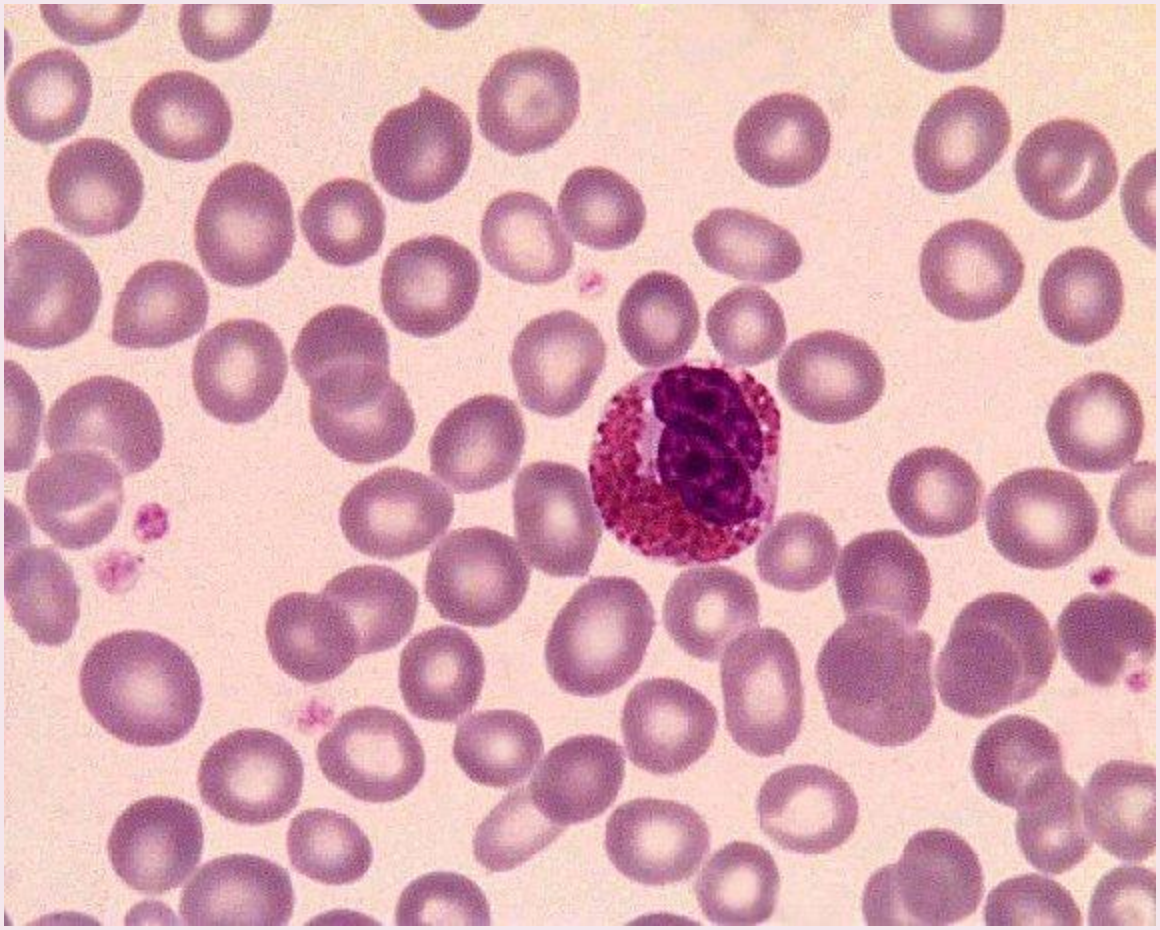
BAND NEUTROPHILS



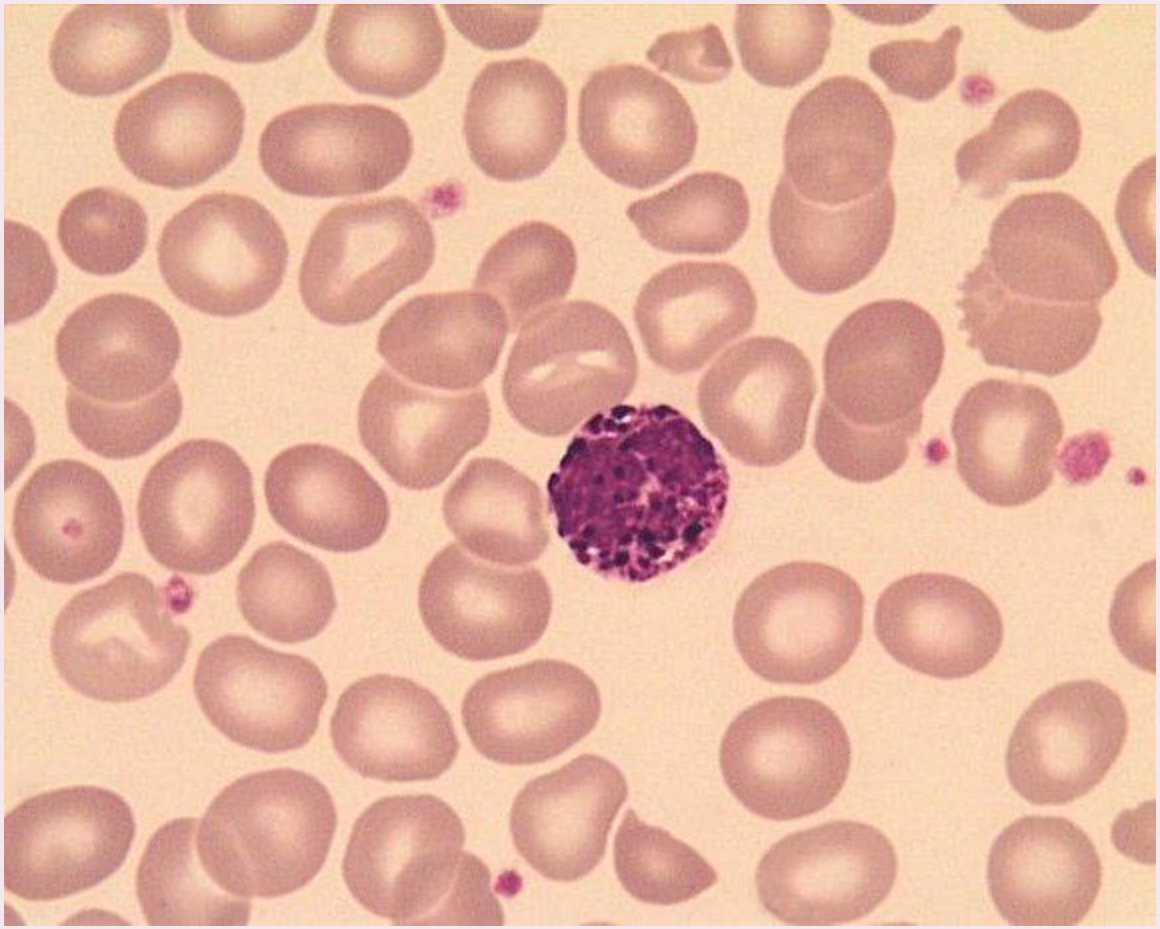
SEGMENTED NEUTROPHILS



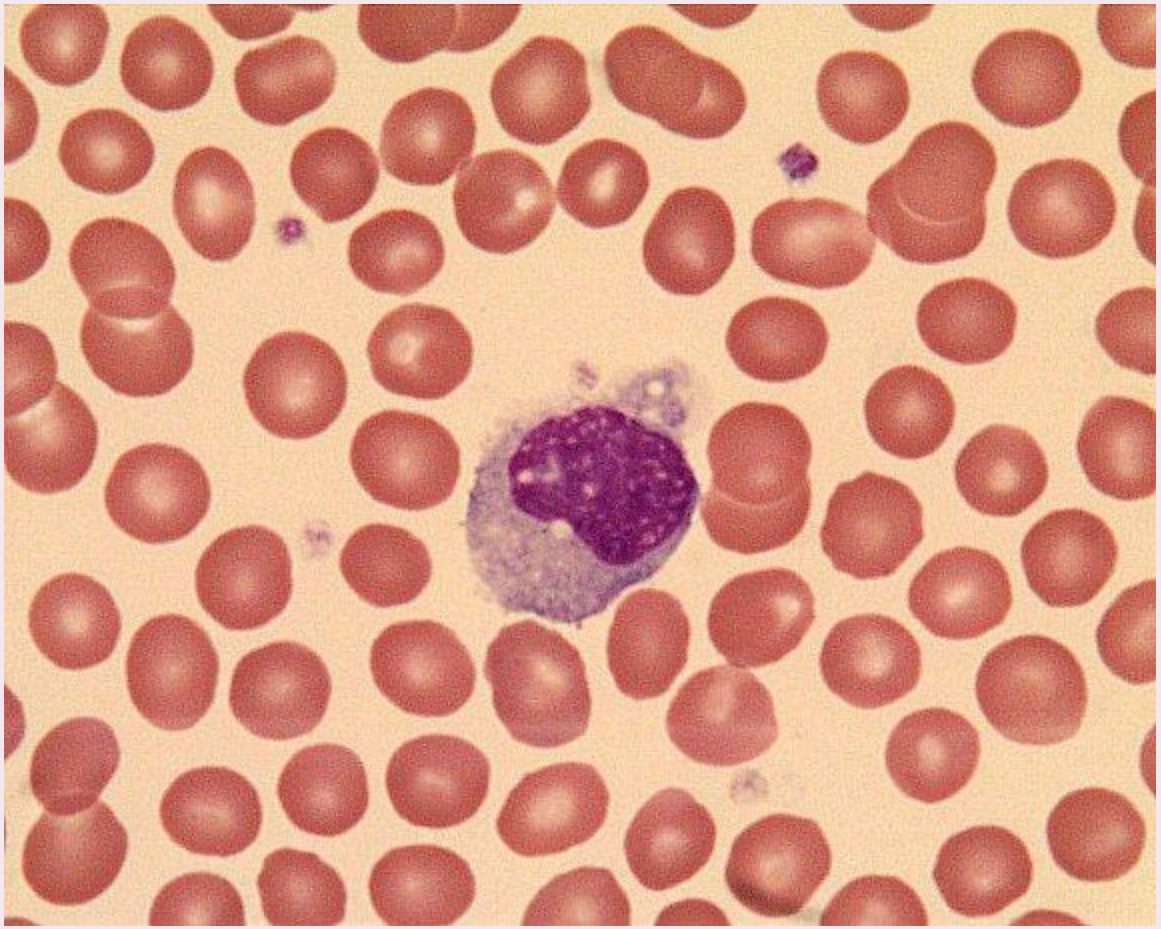
MATURE EOSINOPHILS



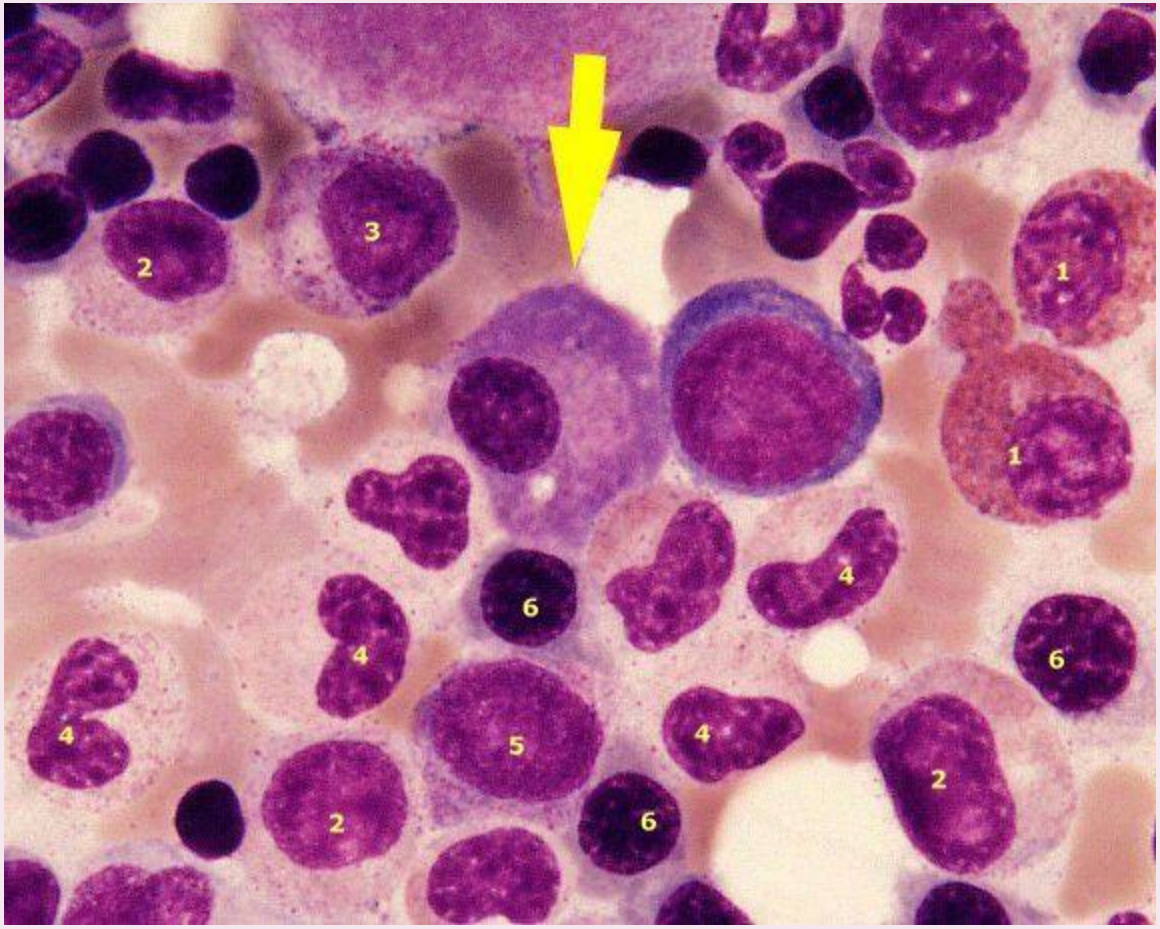
BASOPHILS



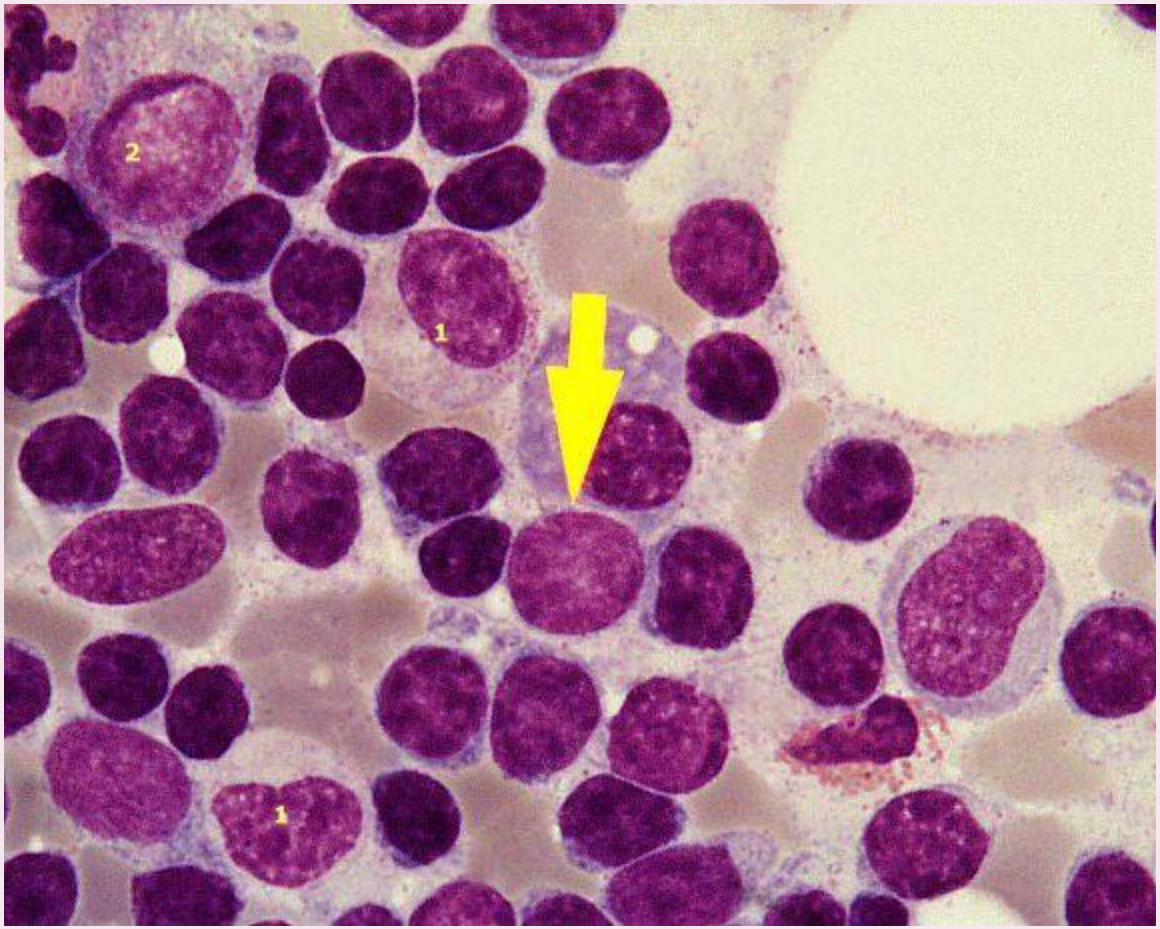
MONOCYTES



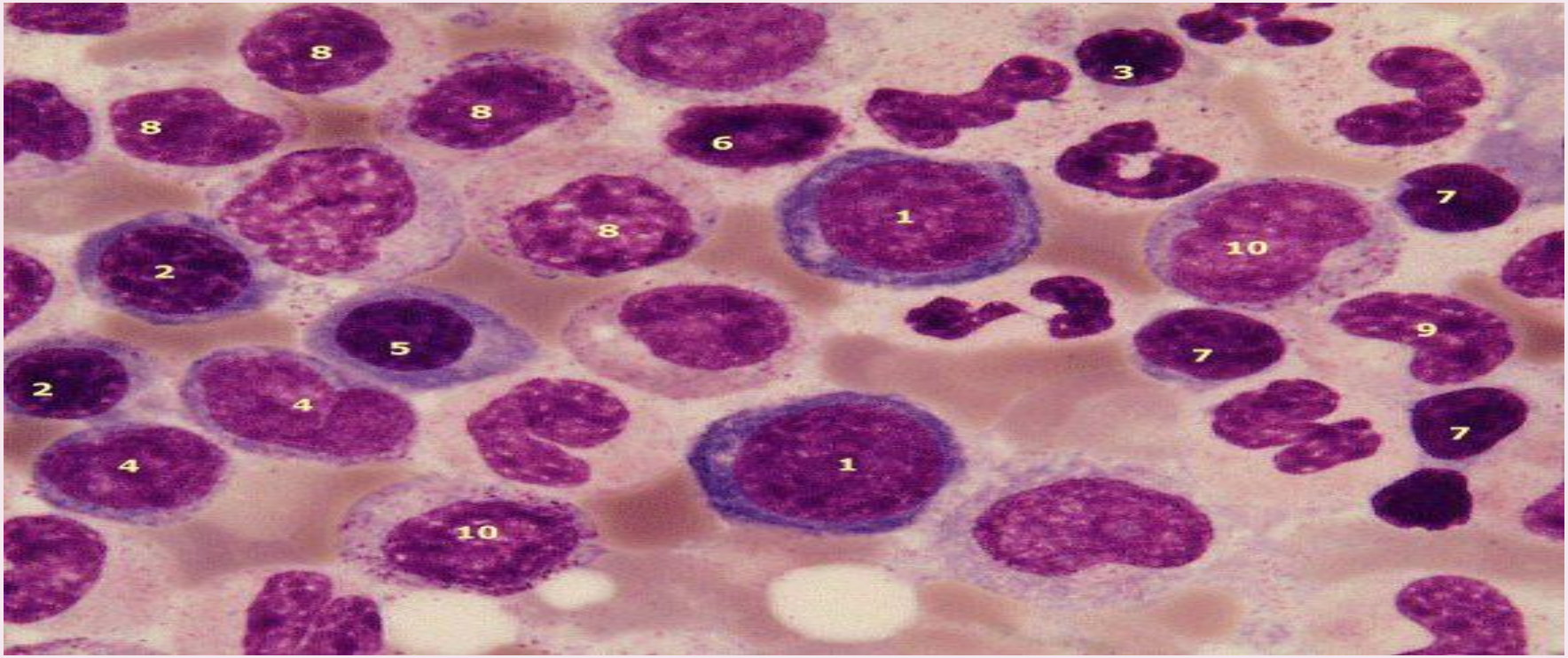
PLASMA CELLS



LYMPHOBLASTS



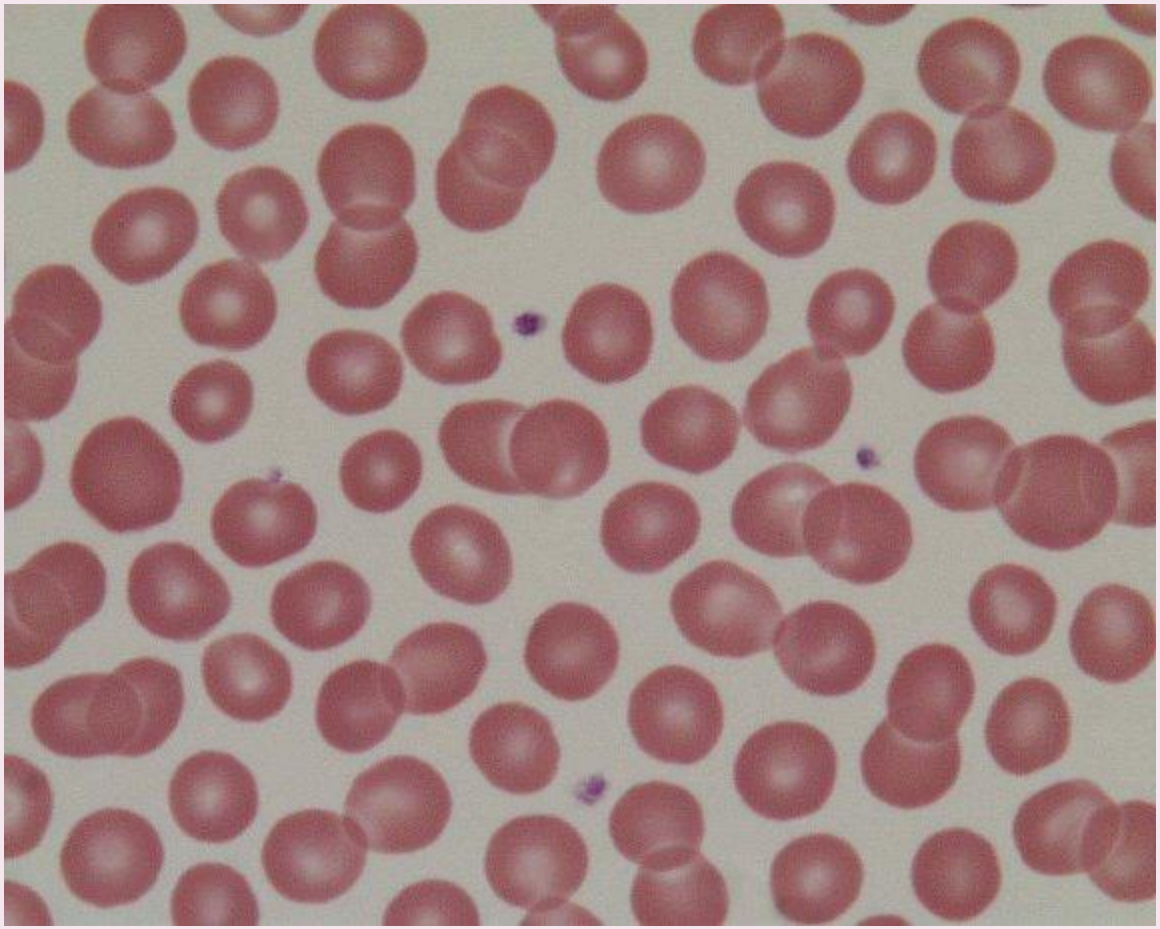
PROERYTHRPOEISIS



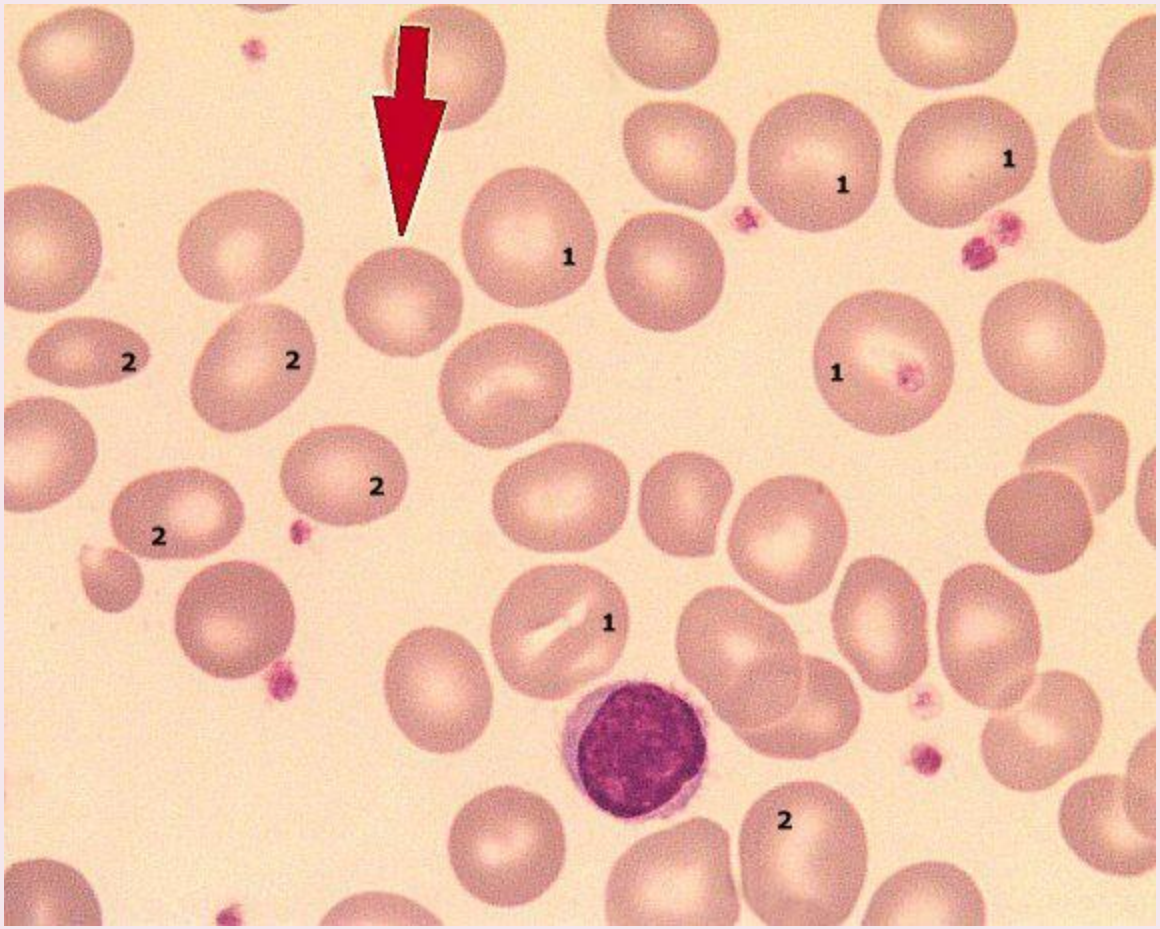
proerythroblast 2. polychromatic normoblast 3. pycnotic normoblast 4. monocyte 5. plasmocyte 6. basophil 7. lymphocyte

٨.eutrophil myelocyte 9. neutrophil metamyelocyte 10. promyelocyte

NORMOCYTES



MACROCYTES

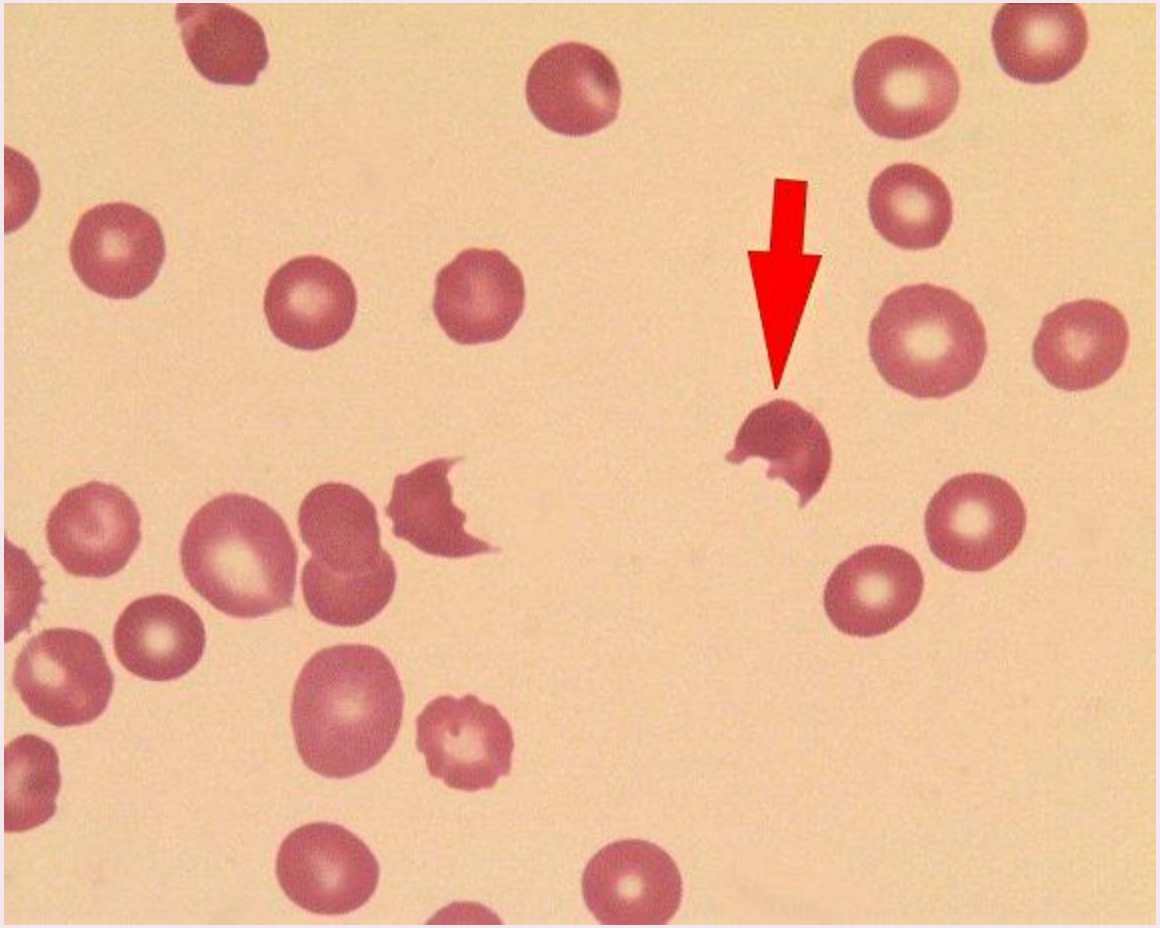


1. macrocyte 2. elliptocyte

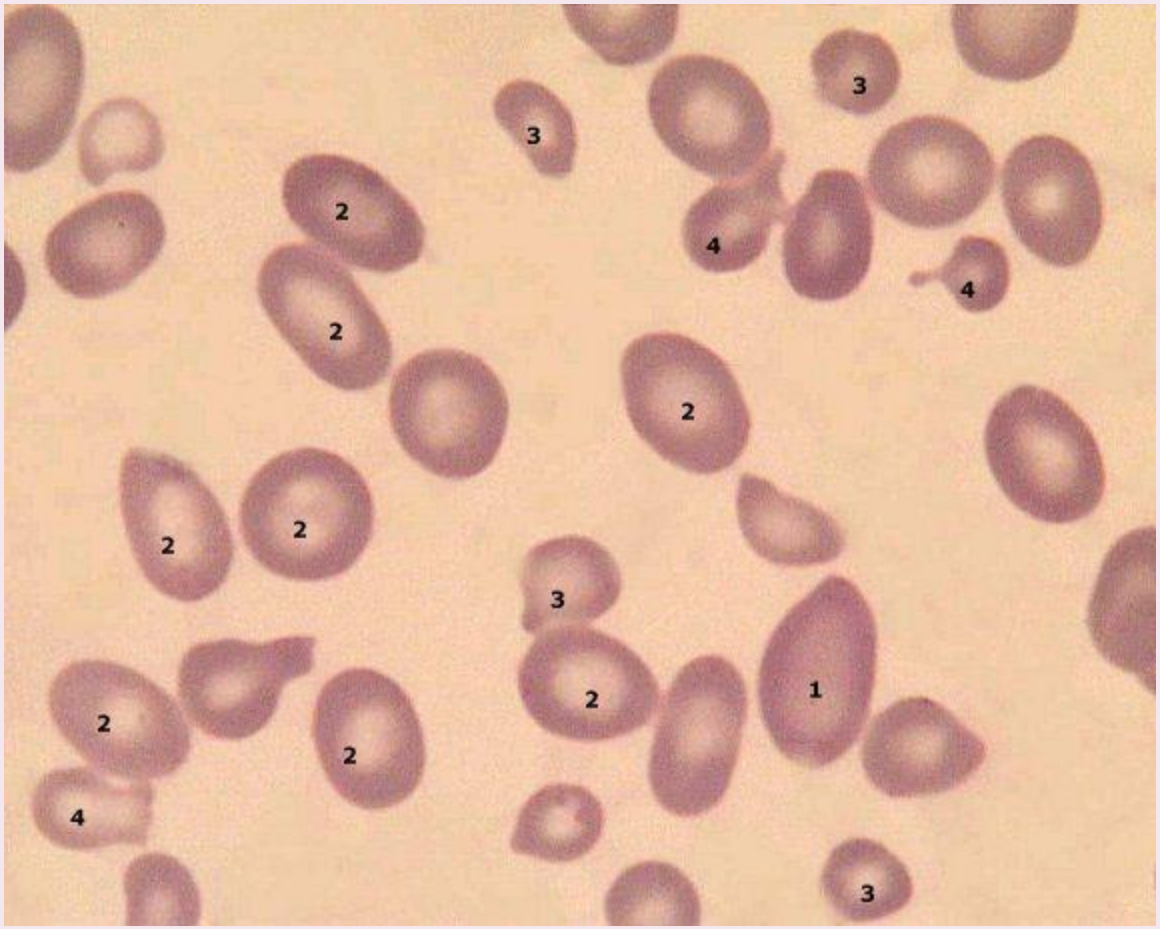
ELLIPTOCYTES (OVALOCYTES)



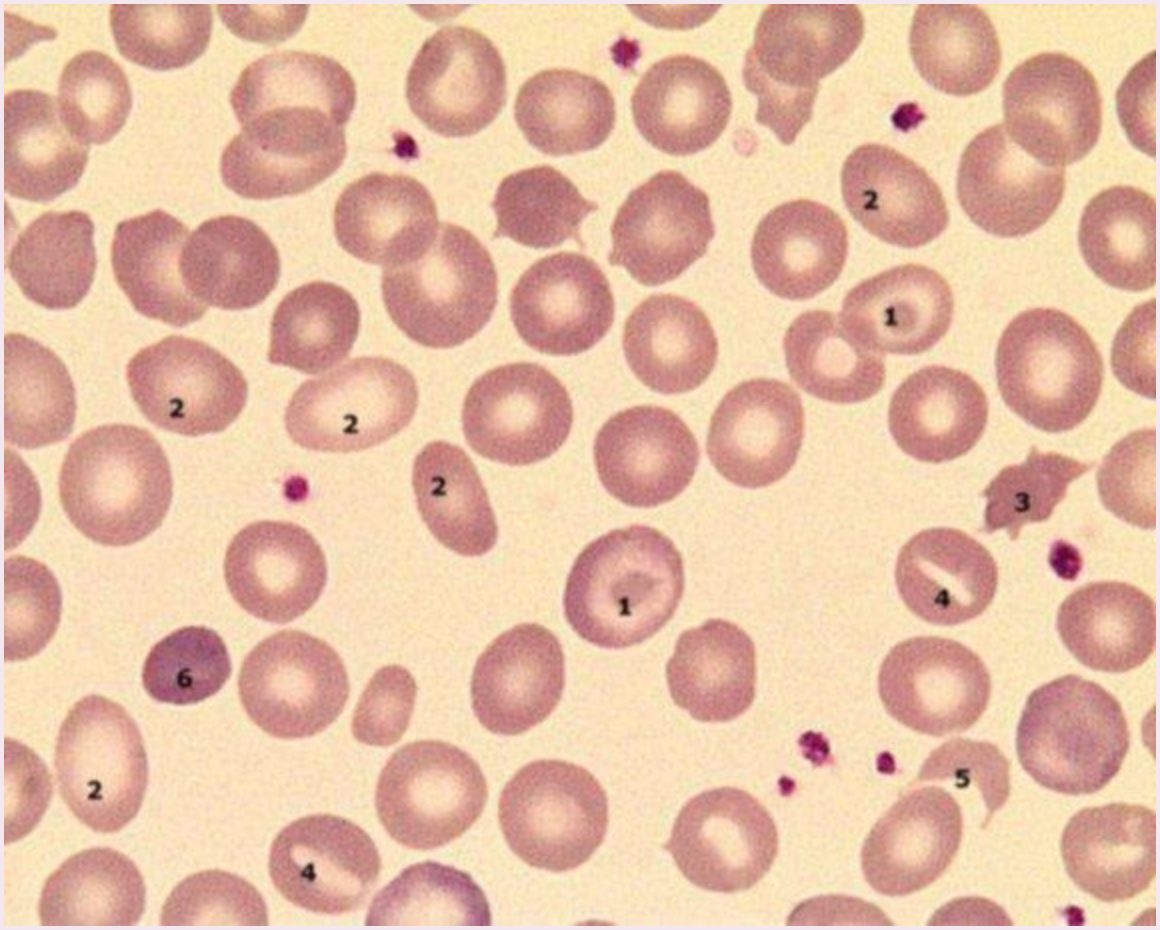
SCHISTOCYTES



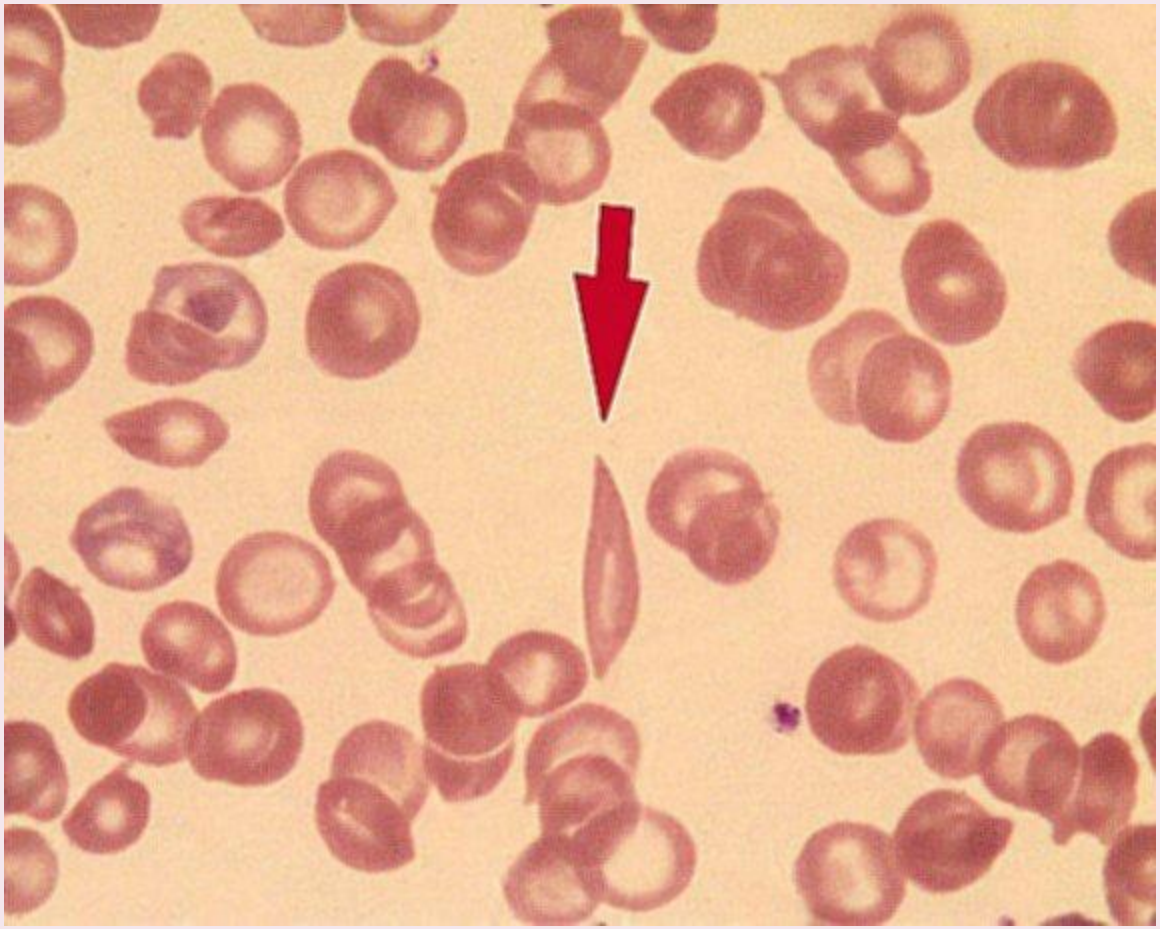
ANISOCYTOSIS



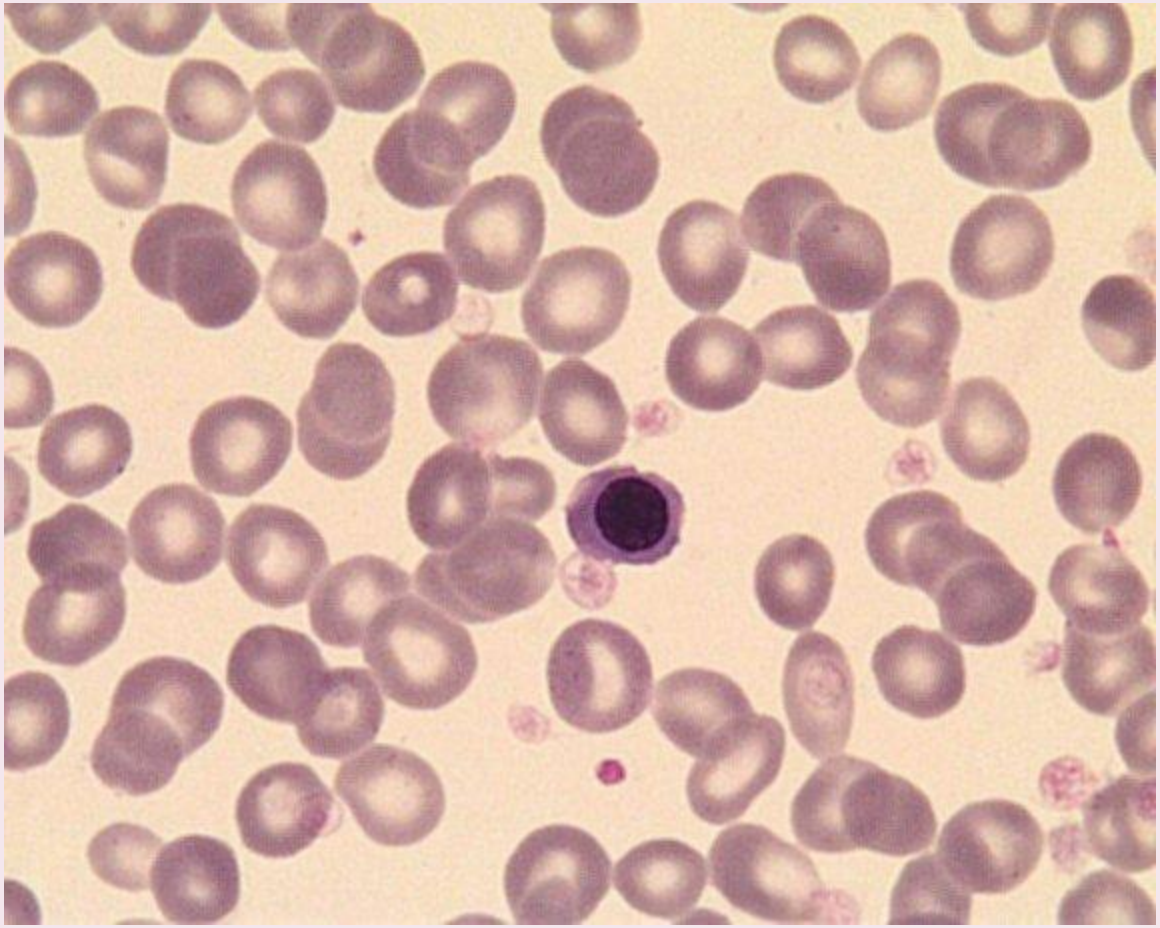
POIKILOCYTOSIS



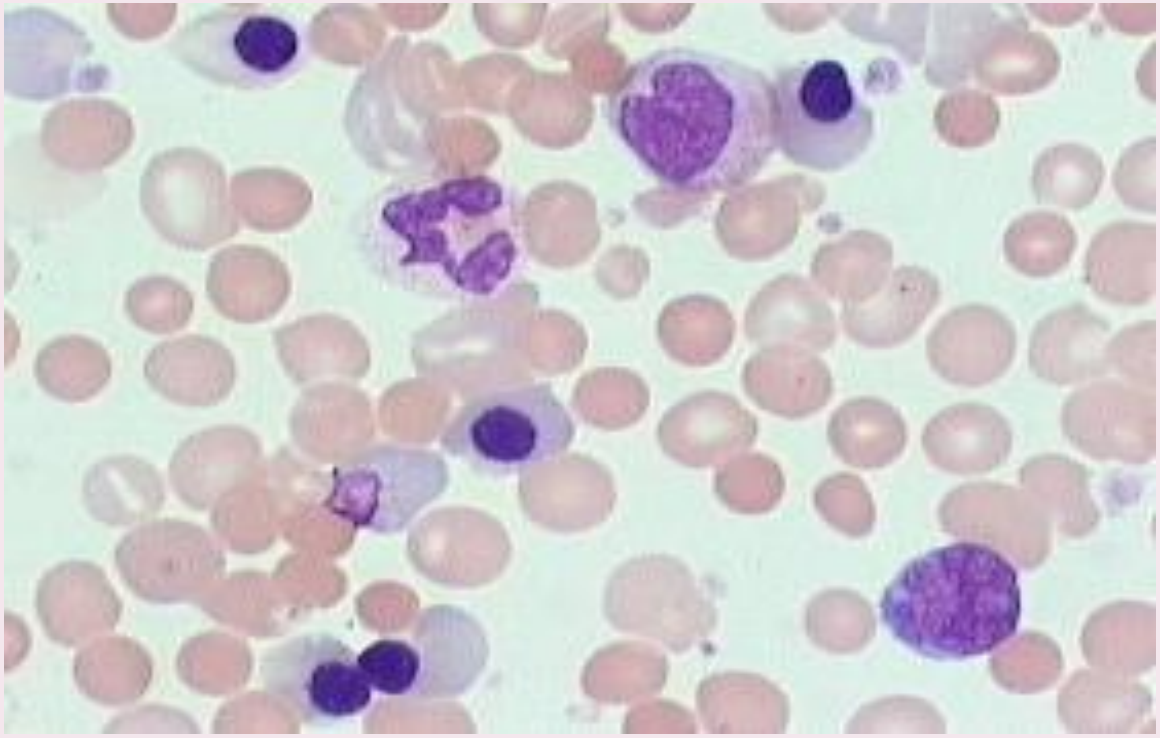
SICKLE CELLS



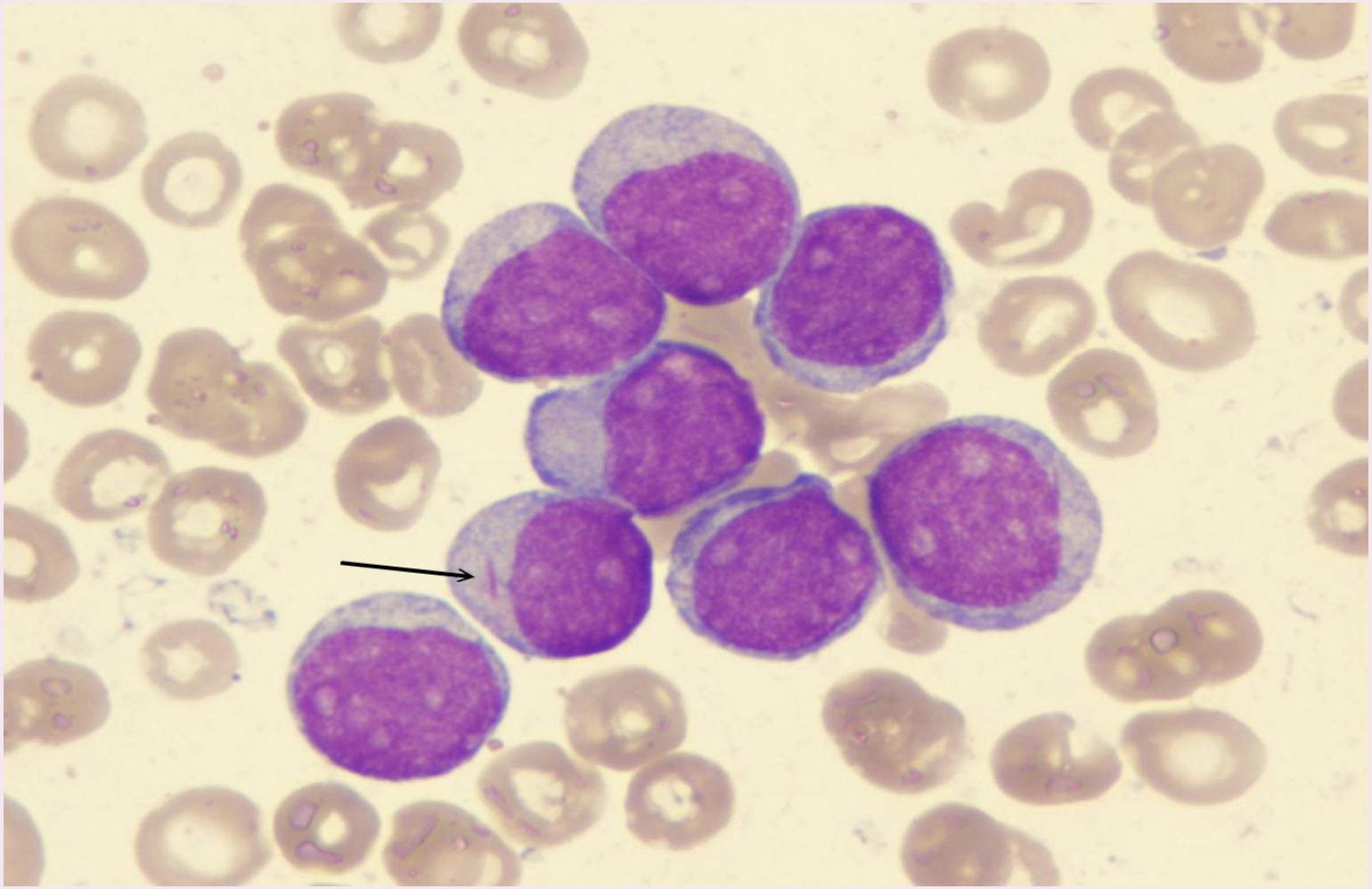
ERYTHROBLASTS IN THE BLOOD



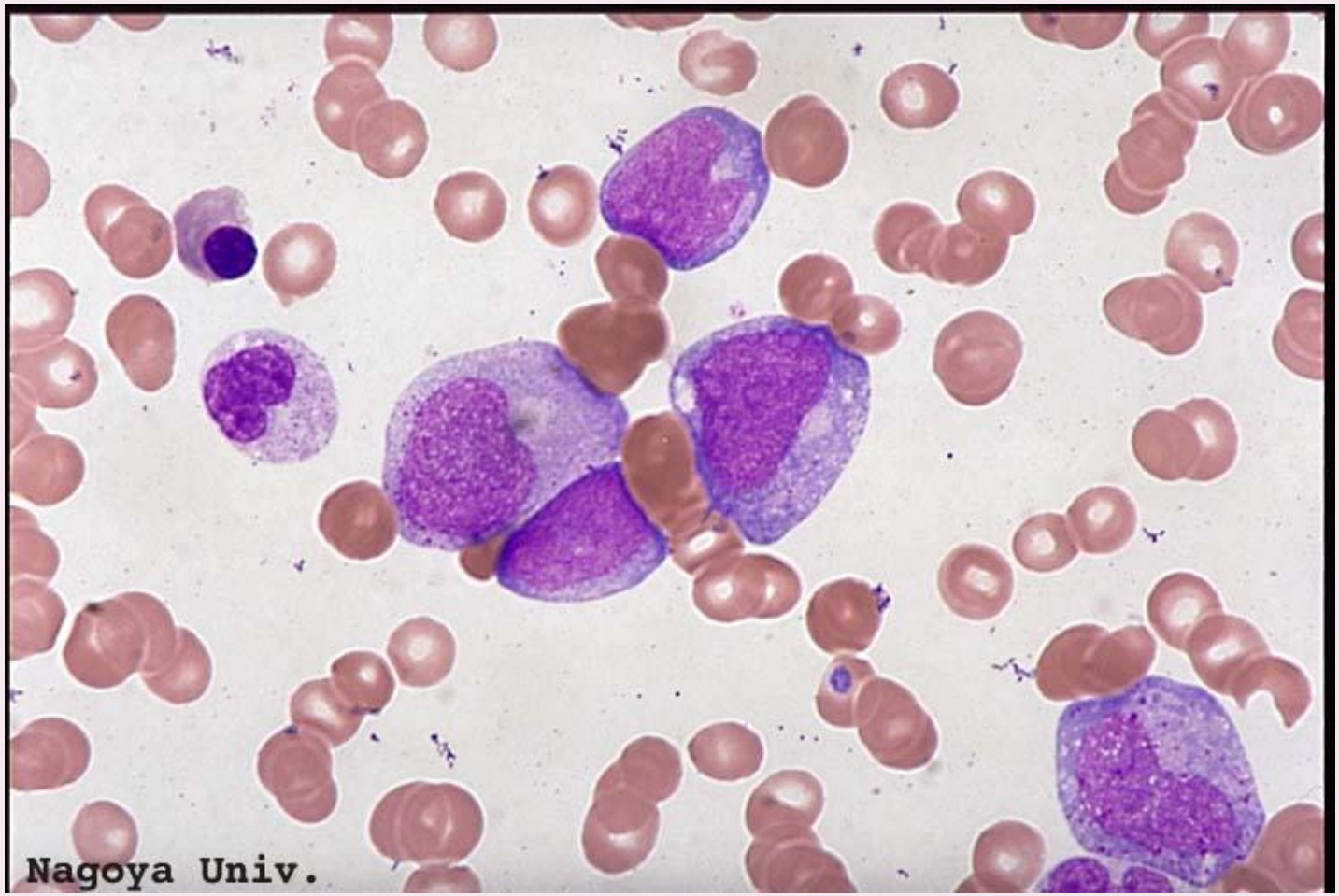
Leukoerythroblastic reaction



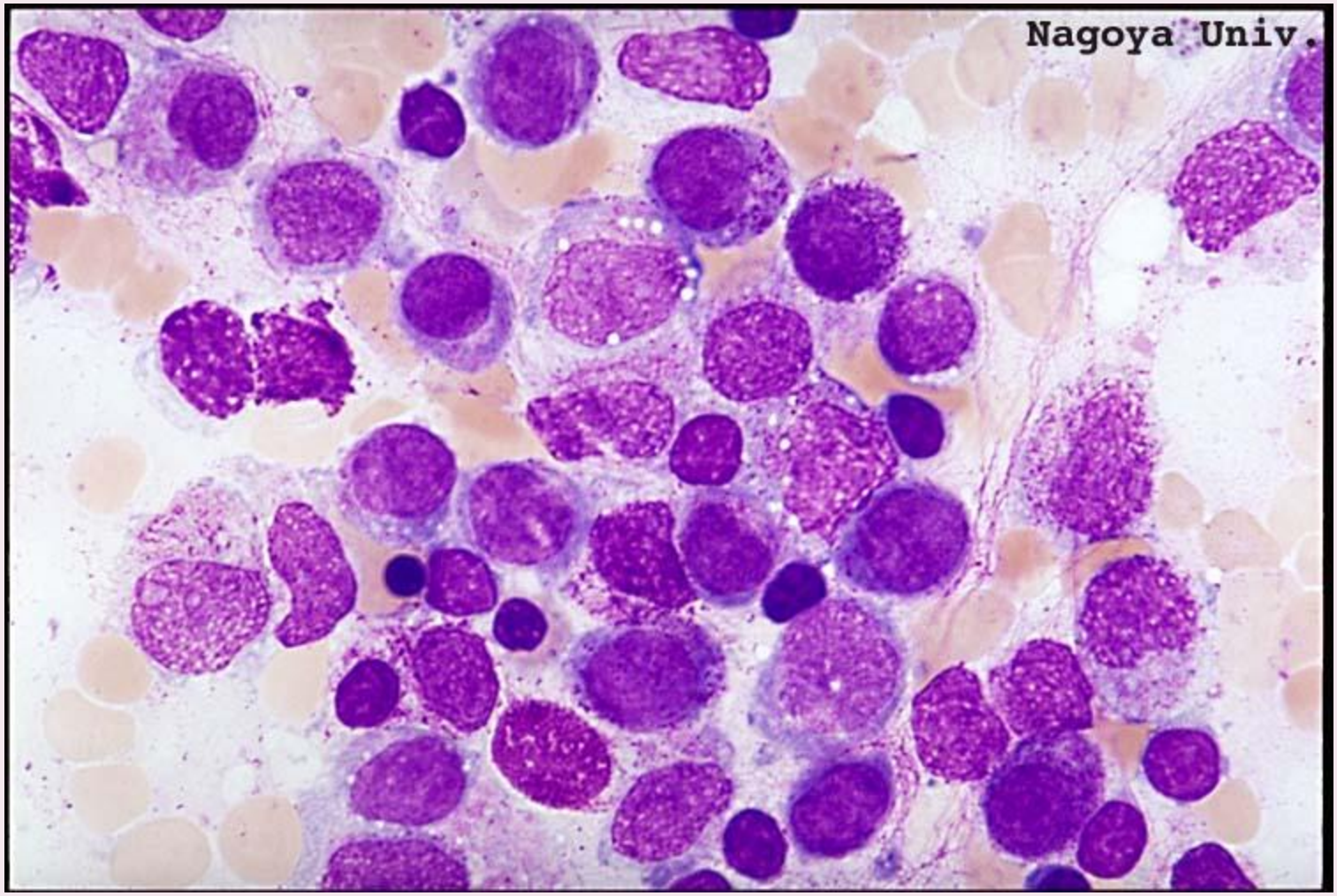
LEUKEMIAS



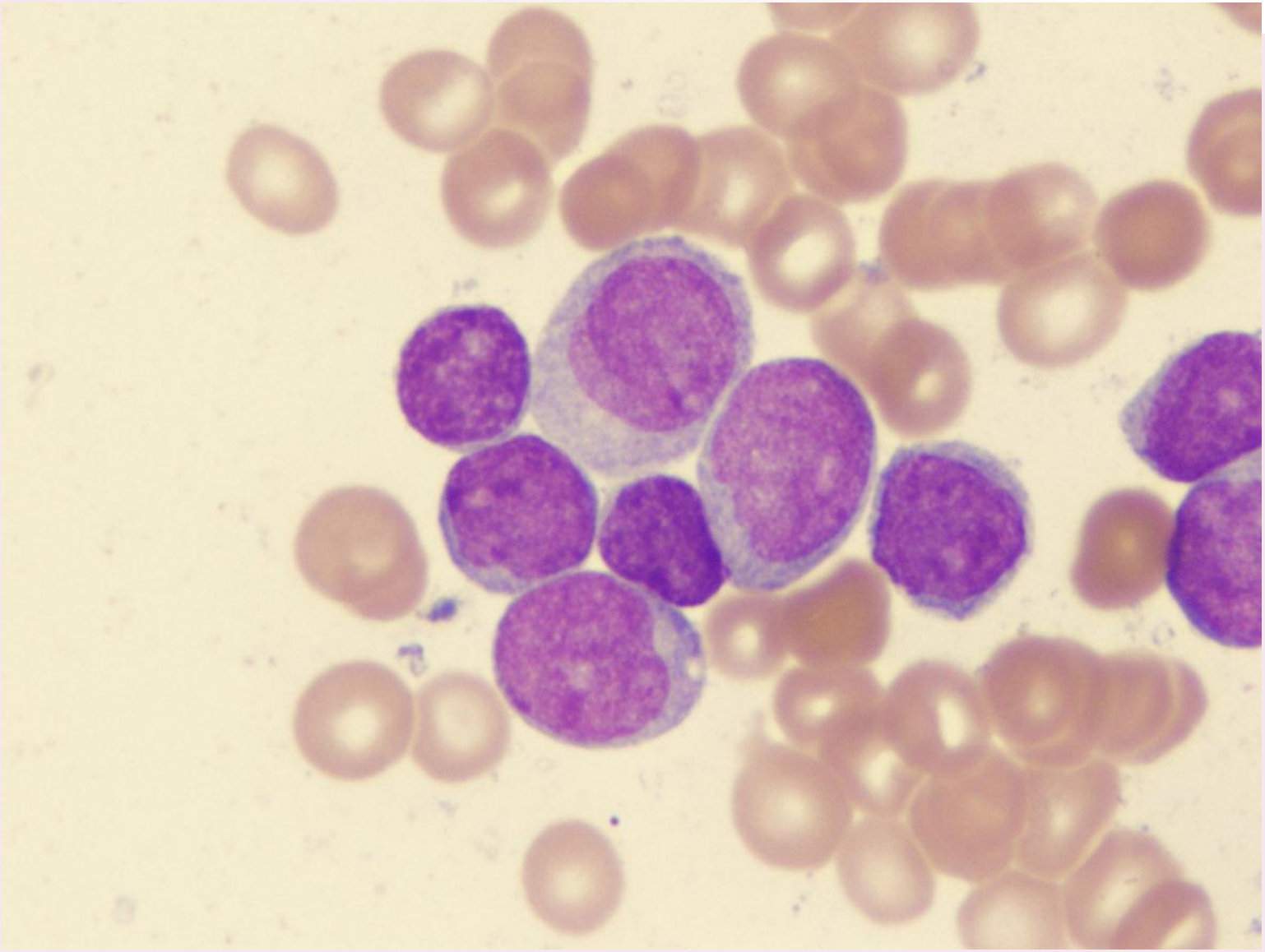
AML (M1 with Auer rods)



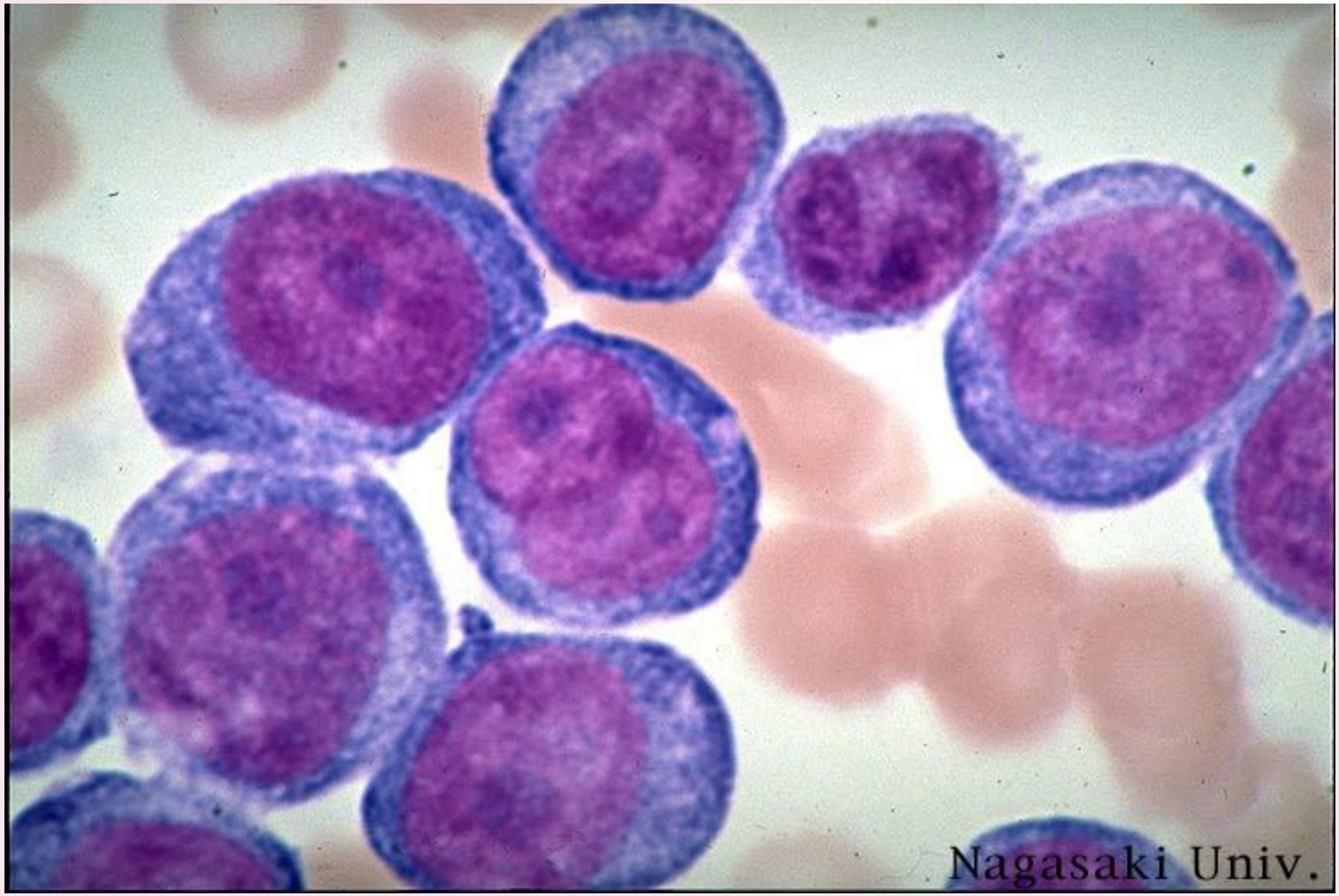
AML (M2)



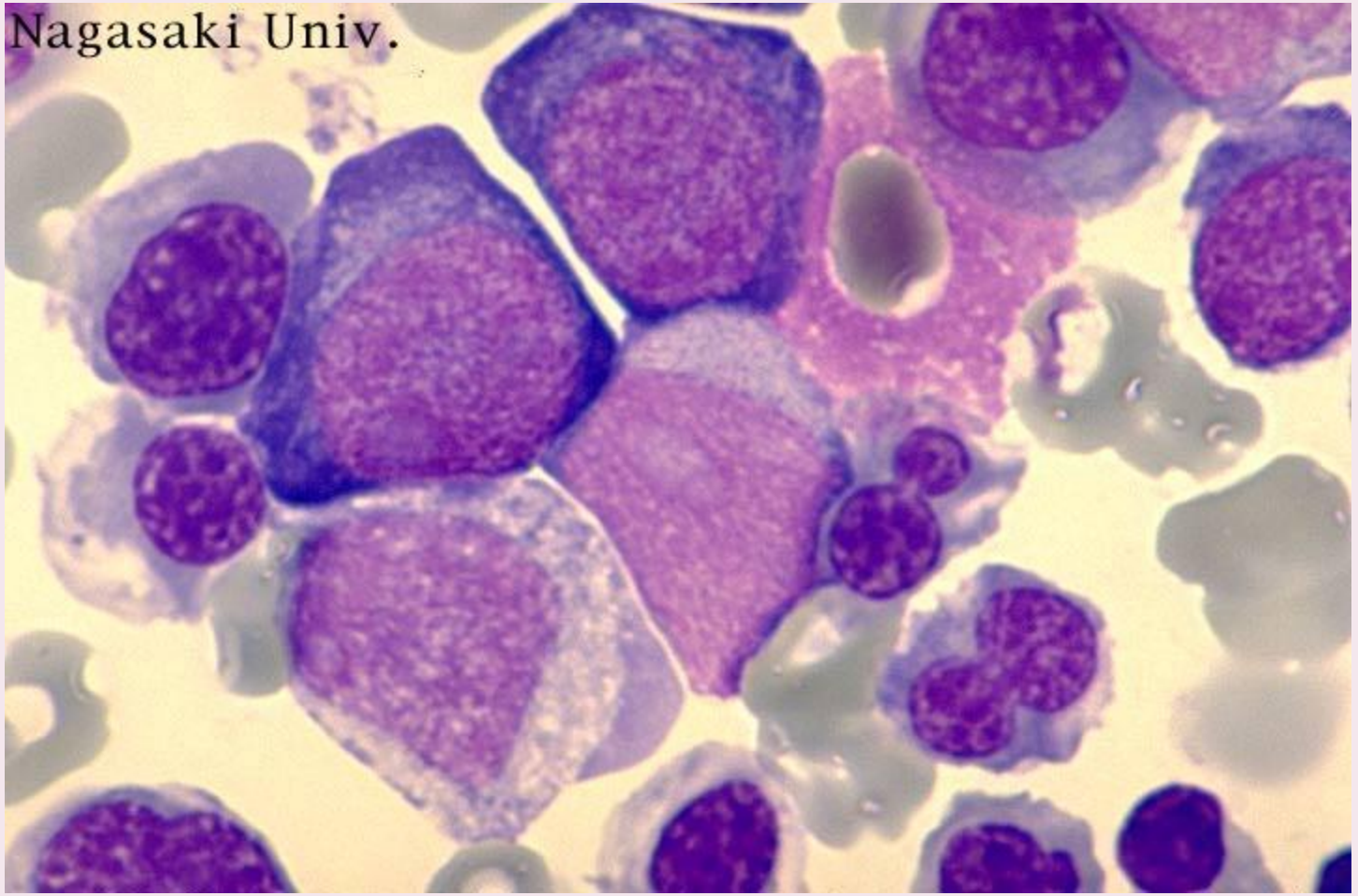
AML(M3)



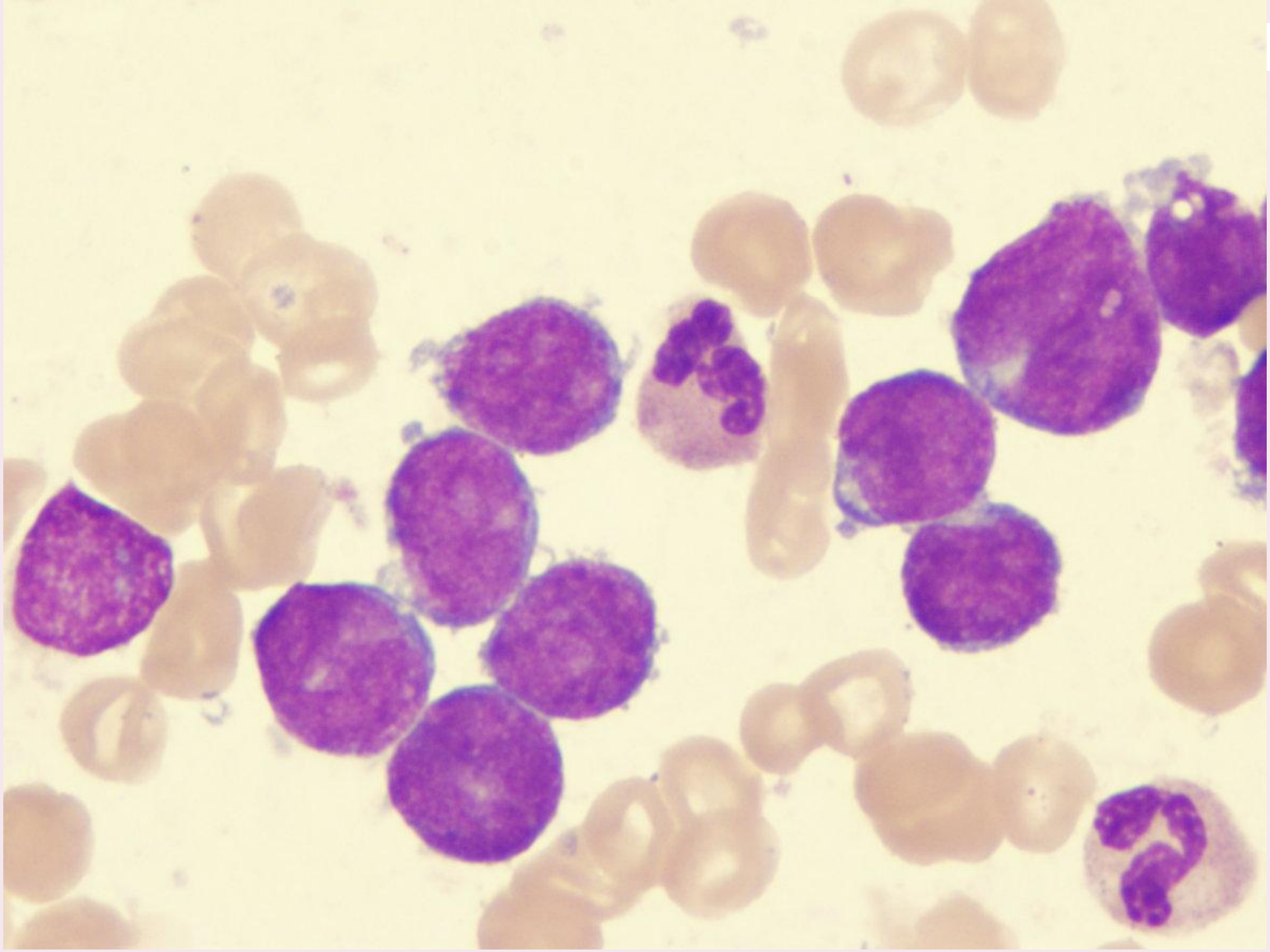
AML(M4)



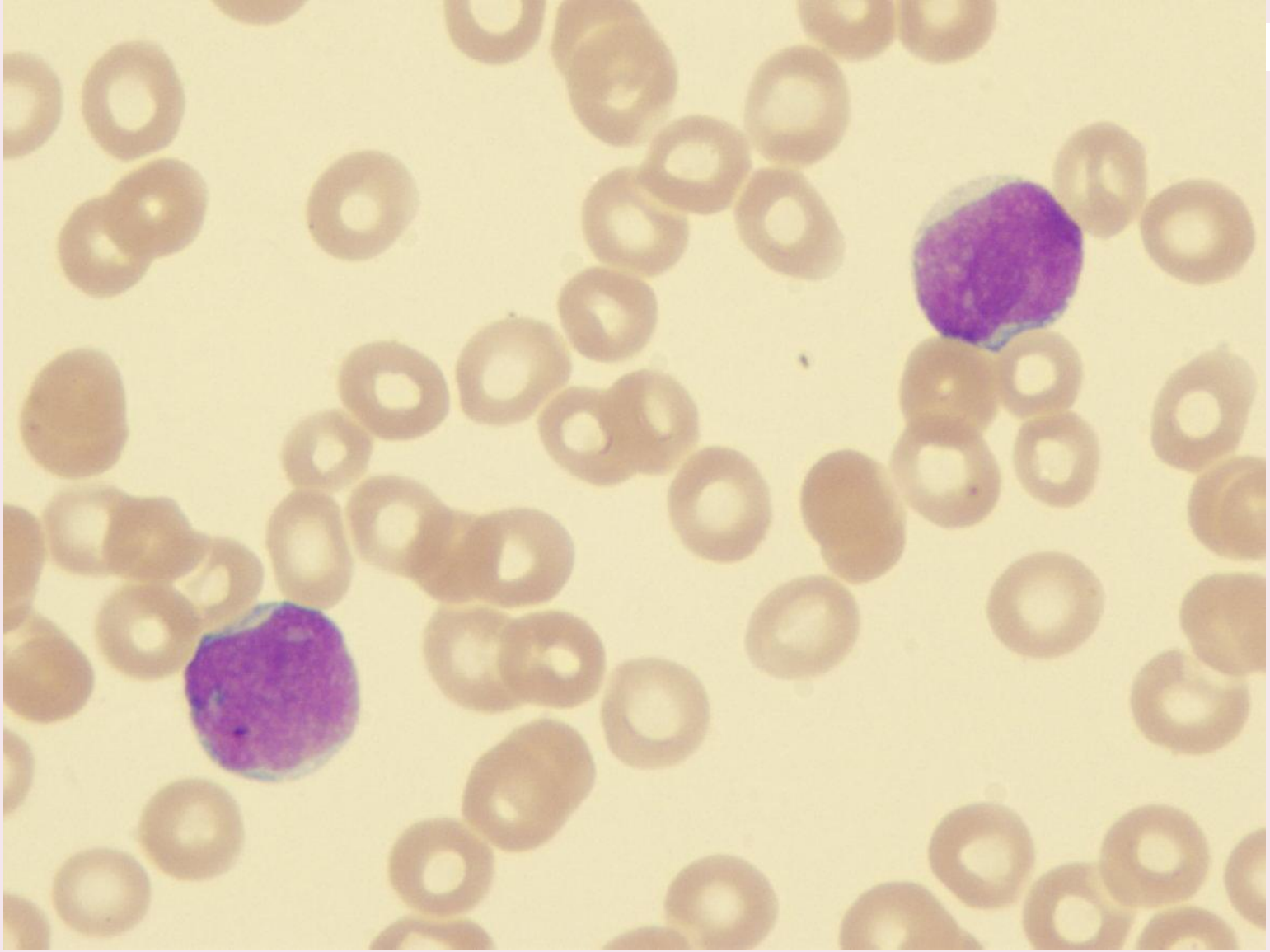
AML(M5)



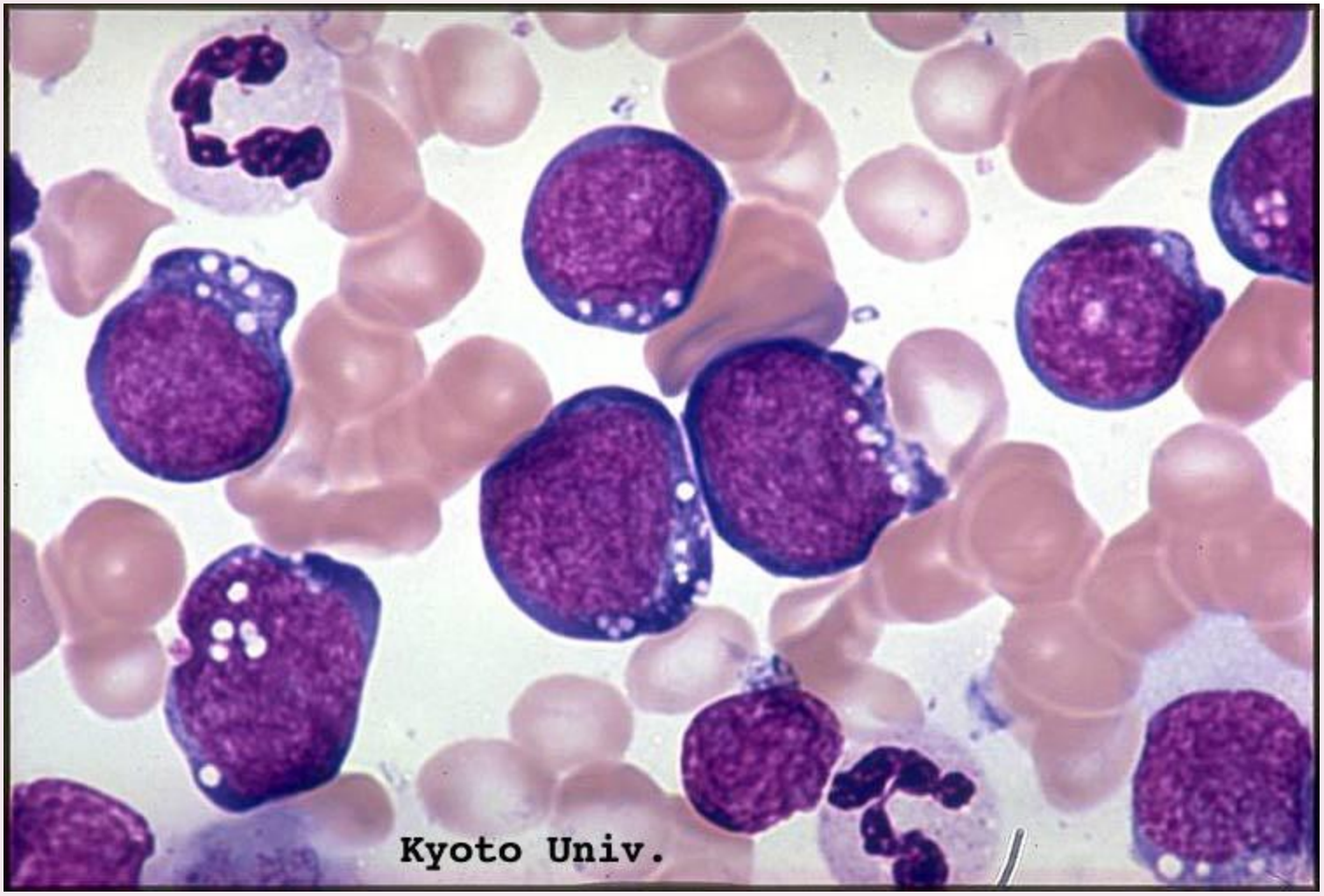
AML(M6)



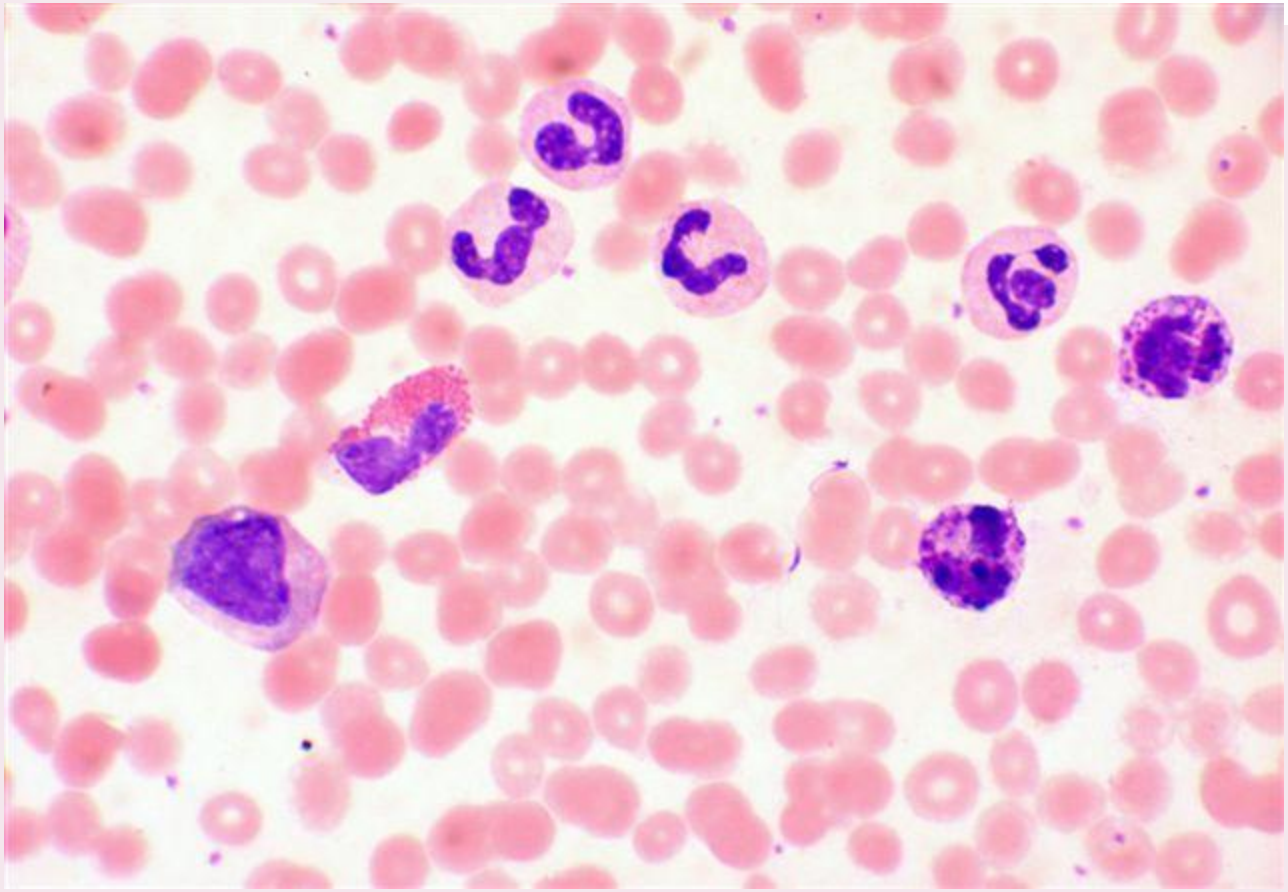
ALL(L1)



ALL(L2)

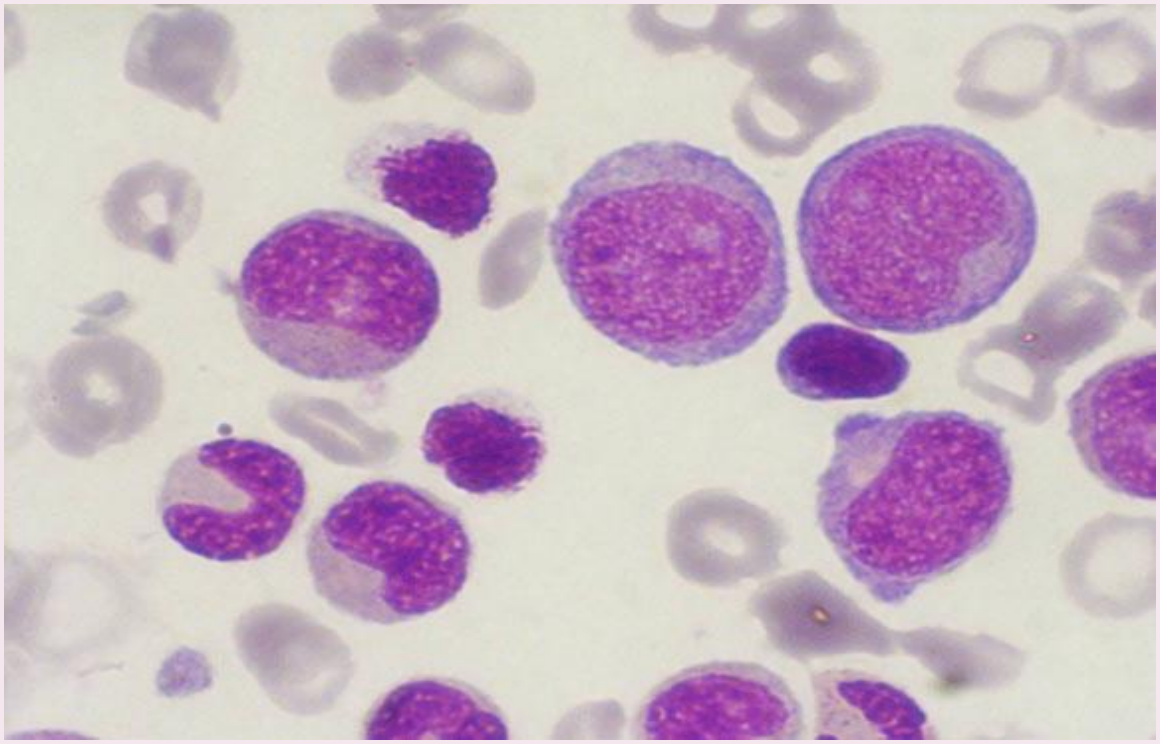


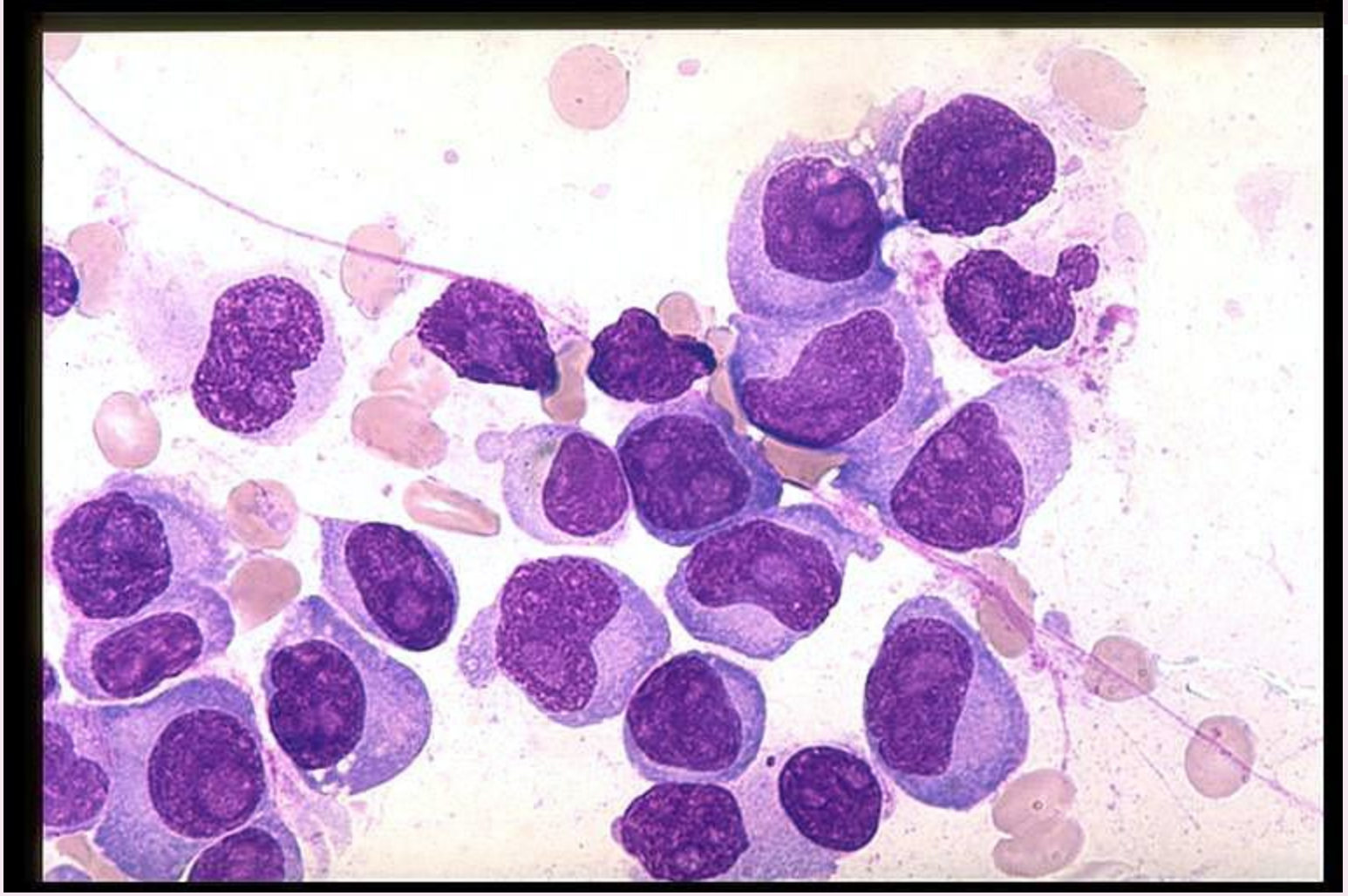
ALL(L3)



Chromic Myeloid Leukemia(chronic phase)

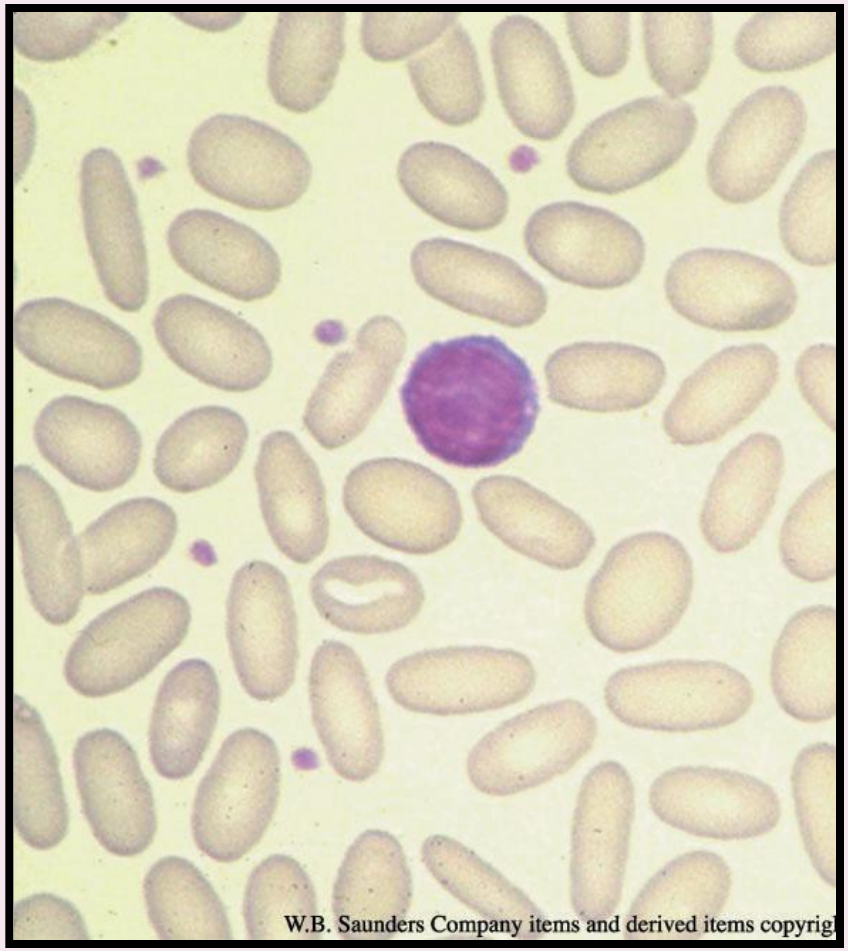
CML IN BLASTIC PHASE



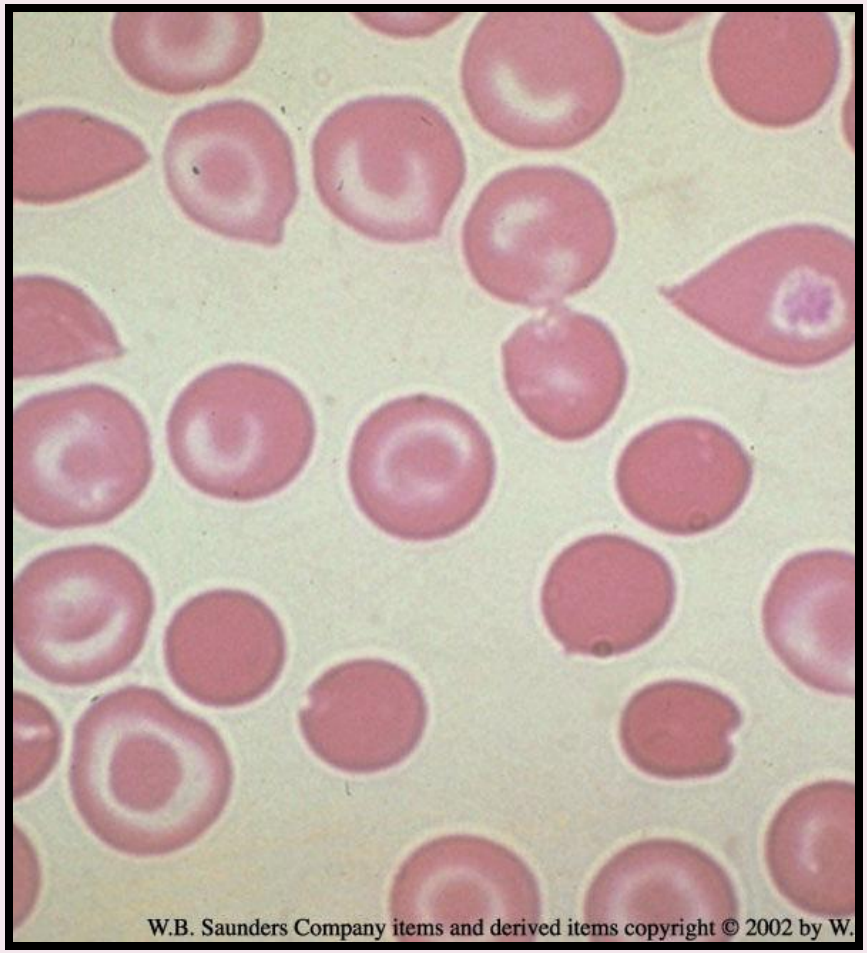


MULTIPLE MYELOMA

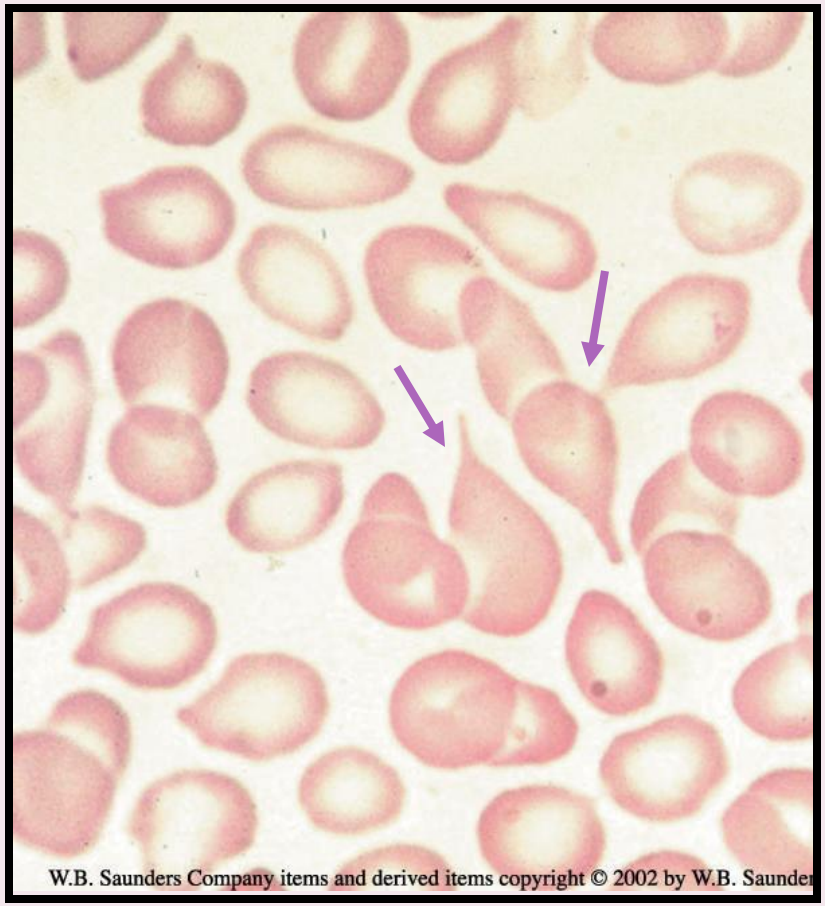
Elliptocytes



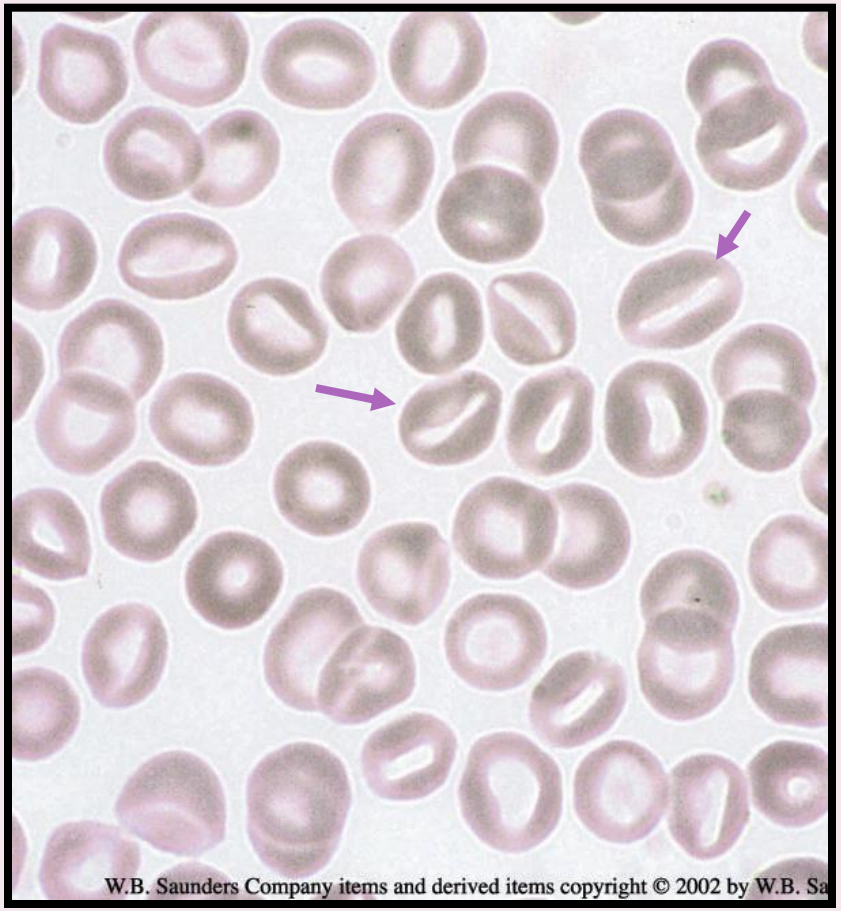
Target Cells



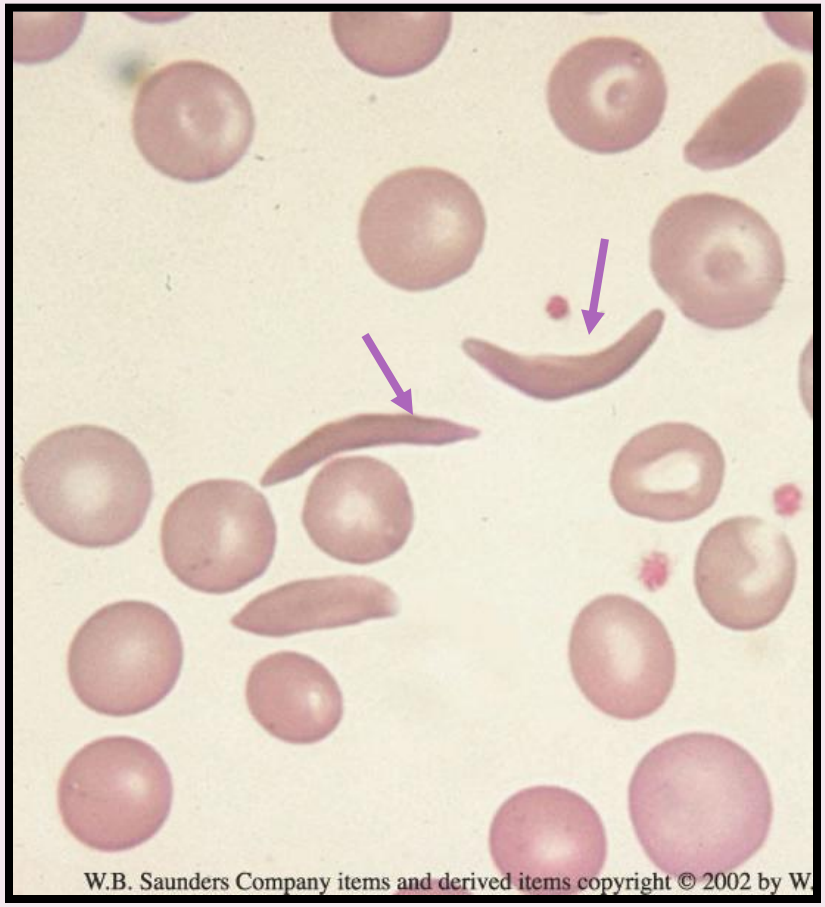
Tear Drops



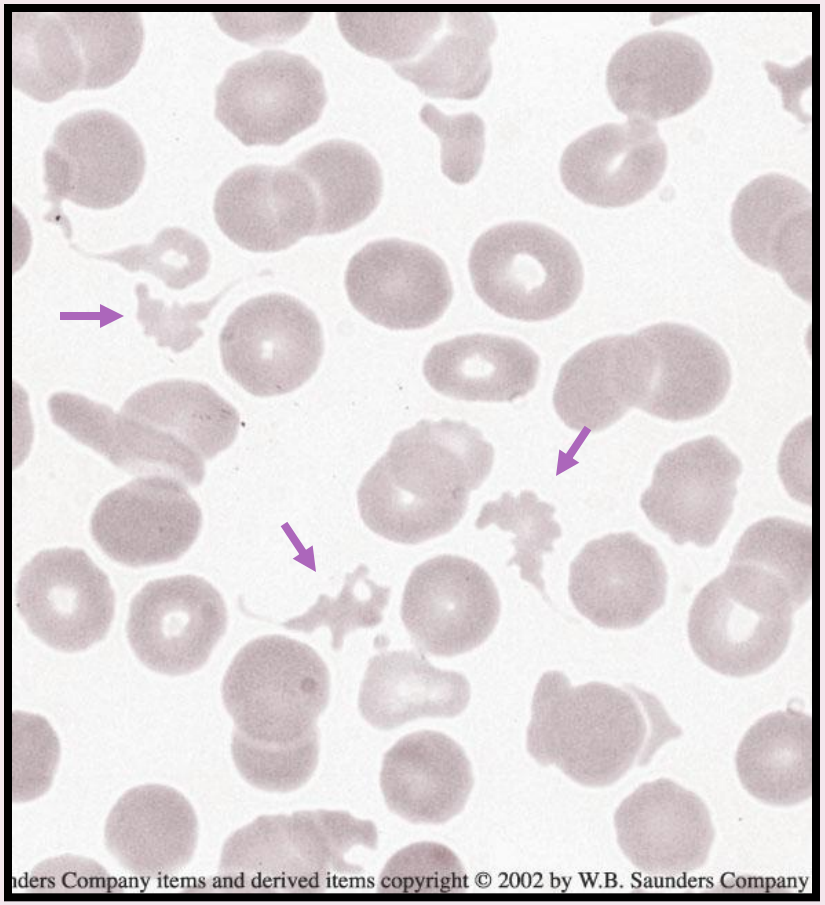
Stomatocytes



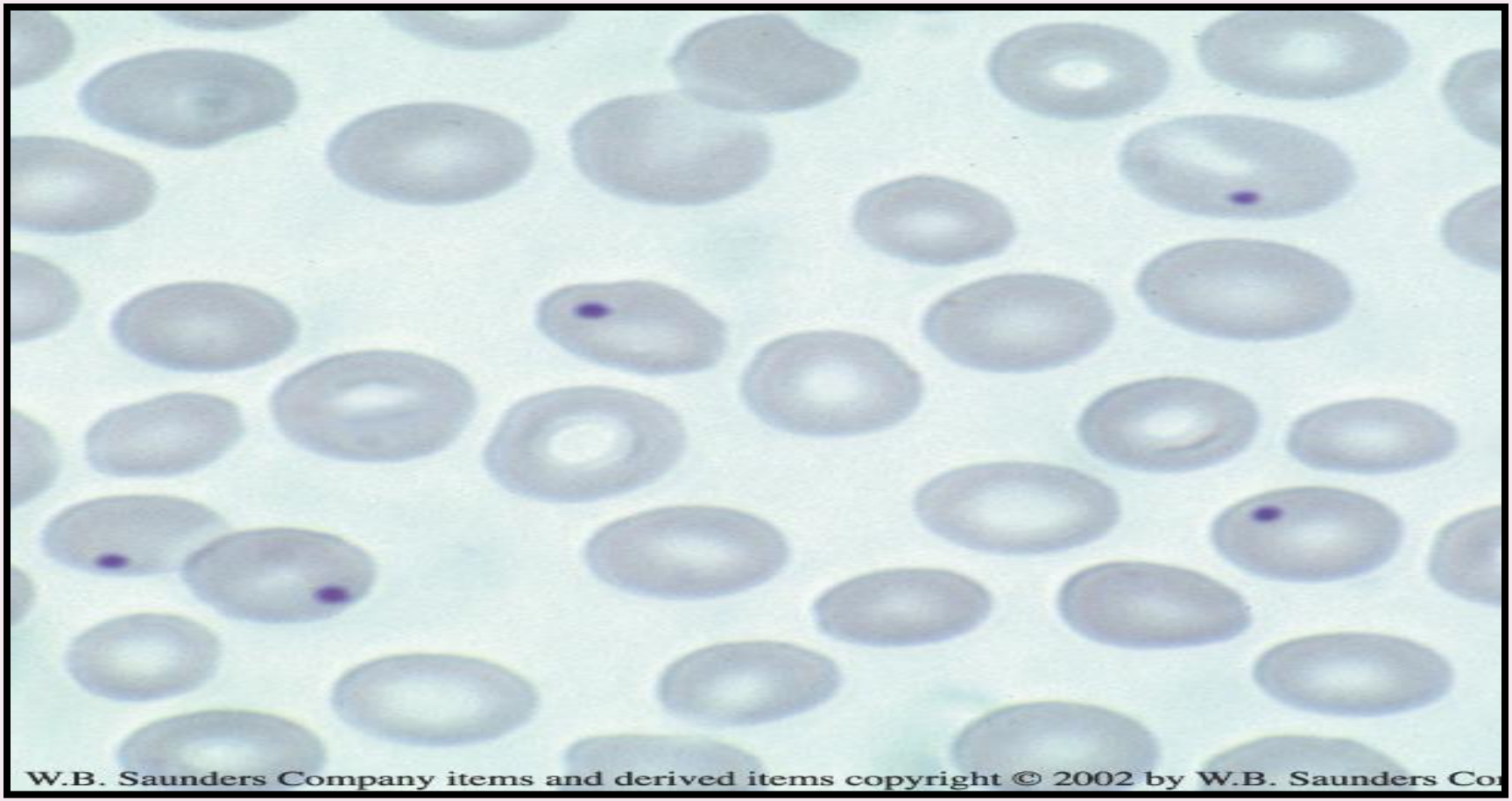
Sickle Cells



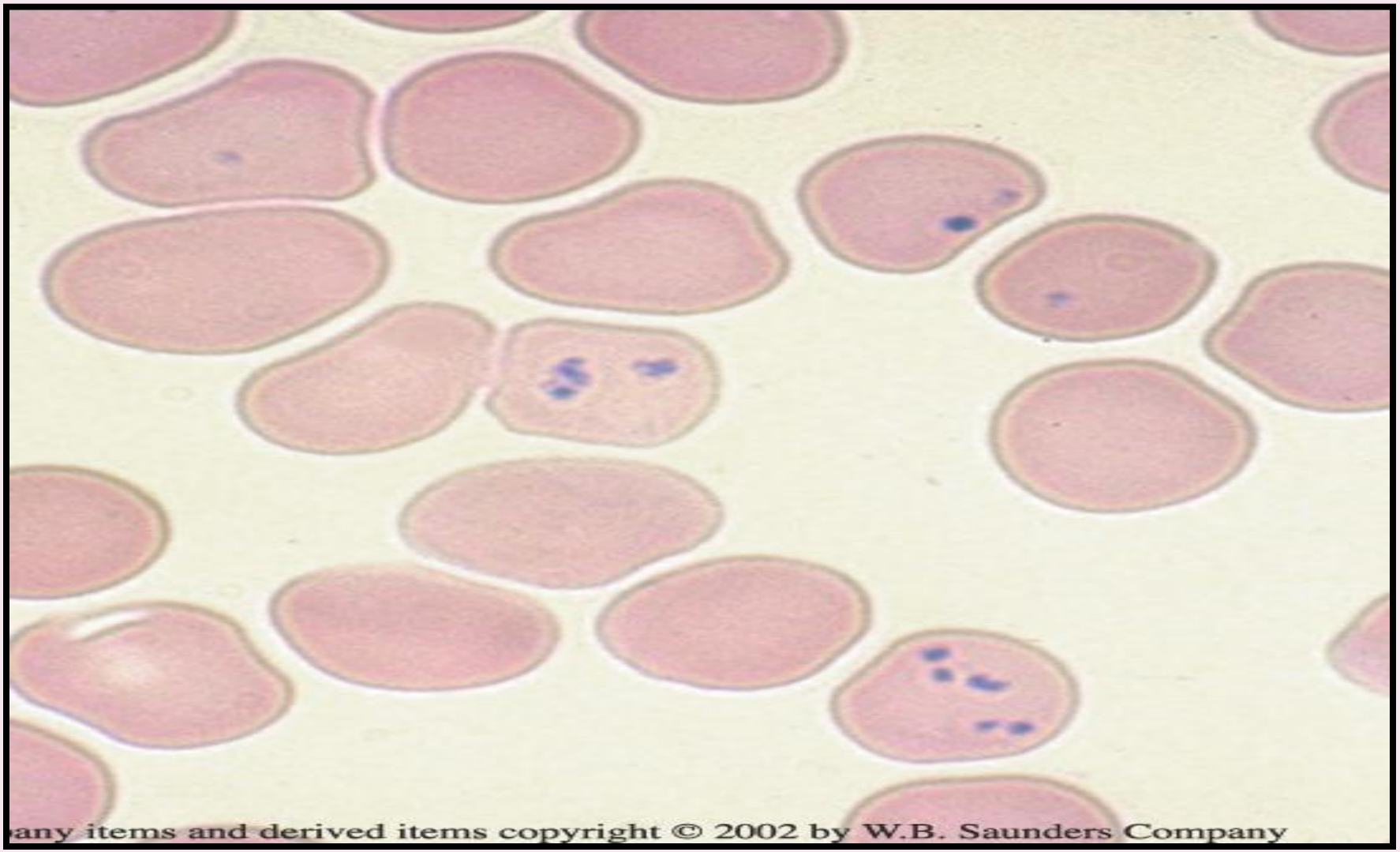
Schistocytes



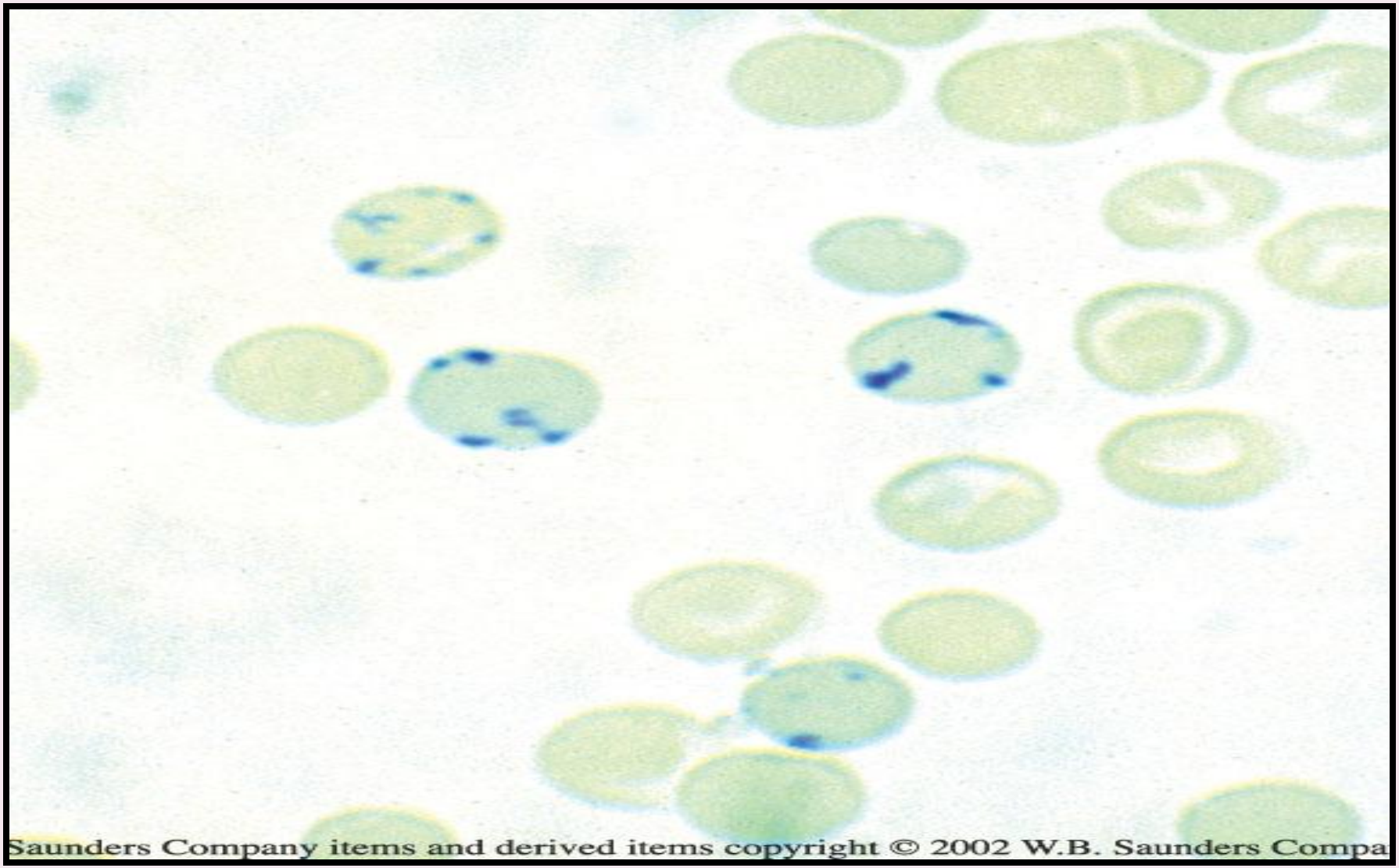
Howell-Jolly Bodies



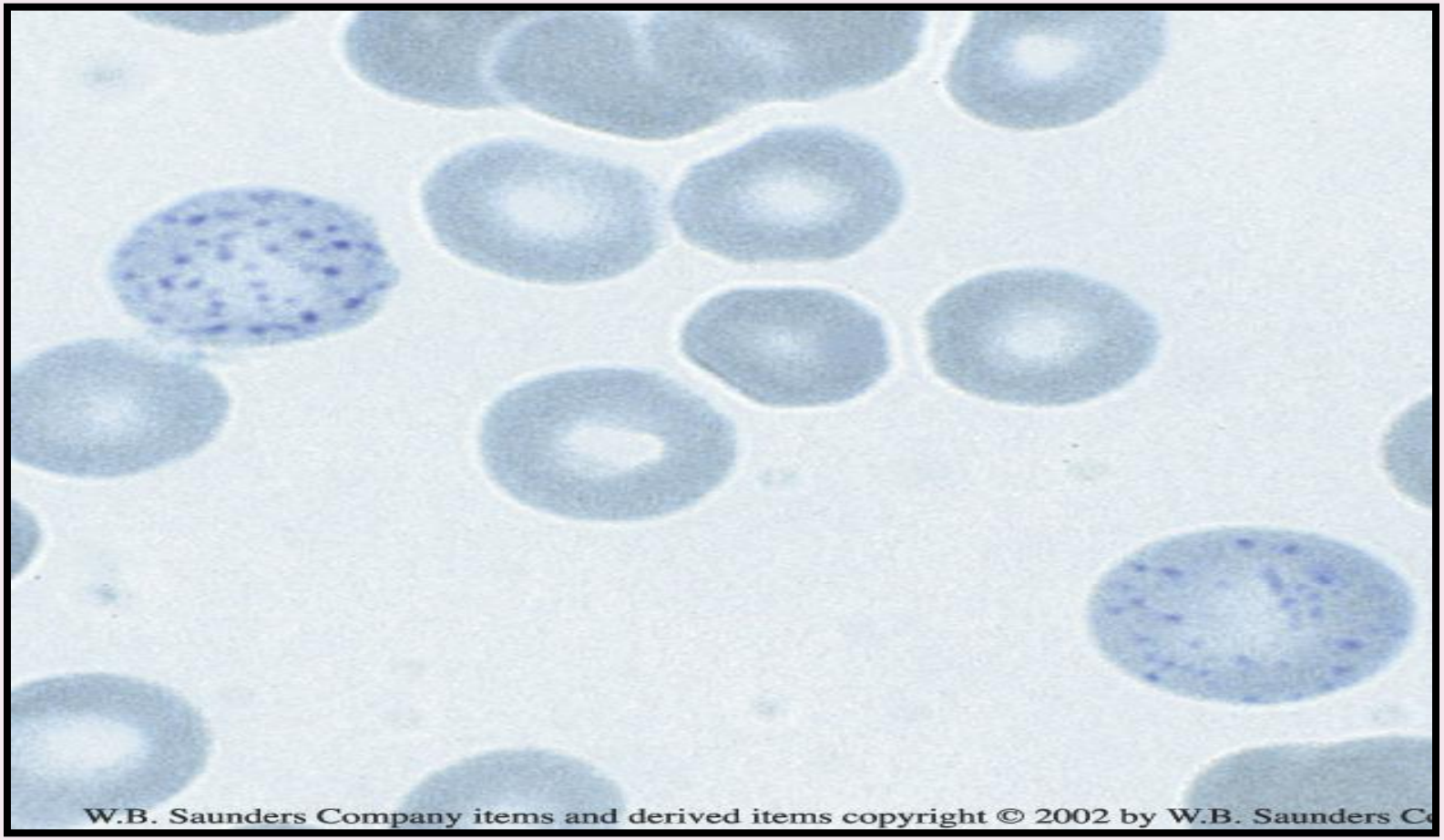
Pappenheimer Bodies



Reticulocytes



Basophilic Stippling



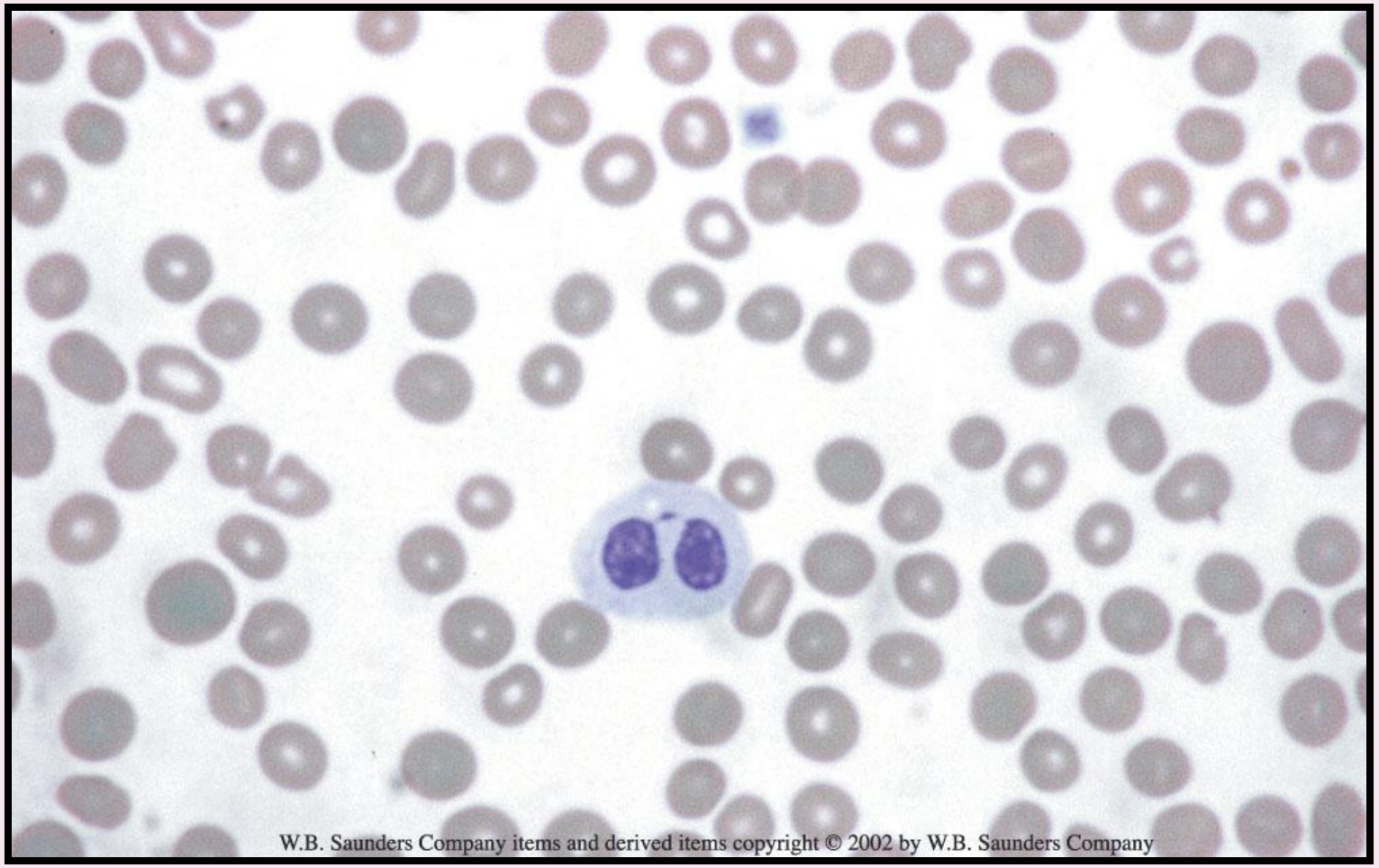
Toxic Granulation



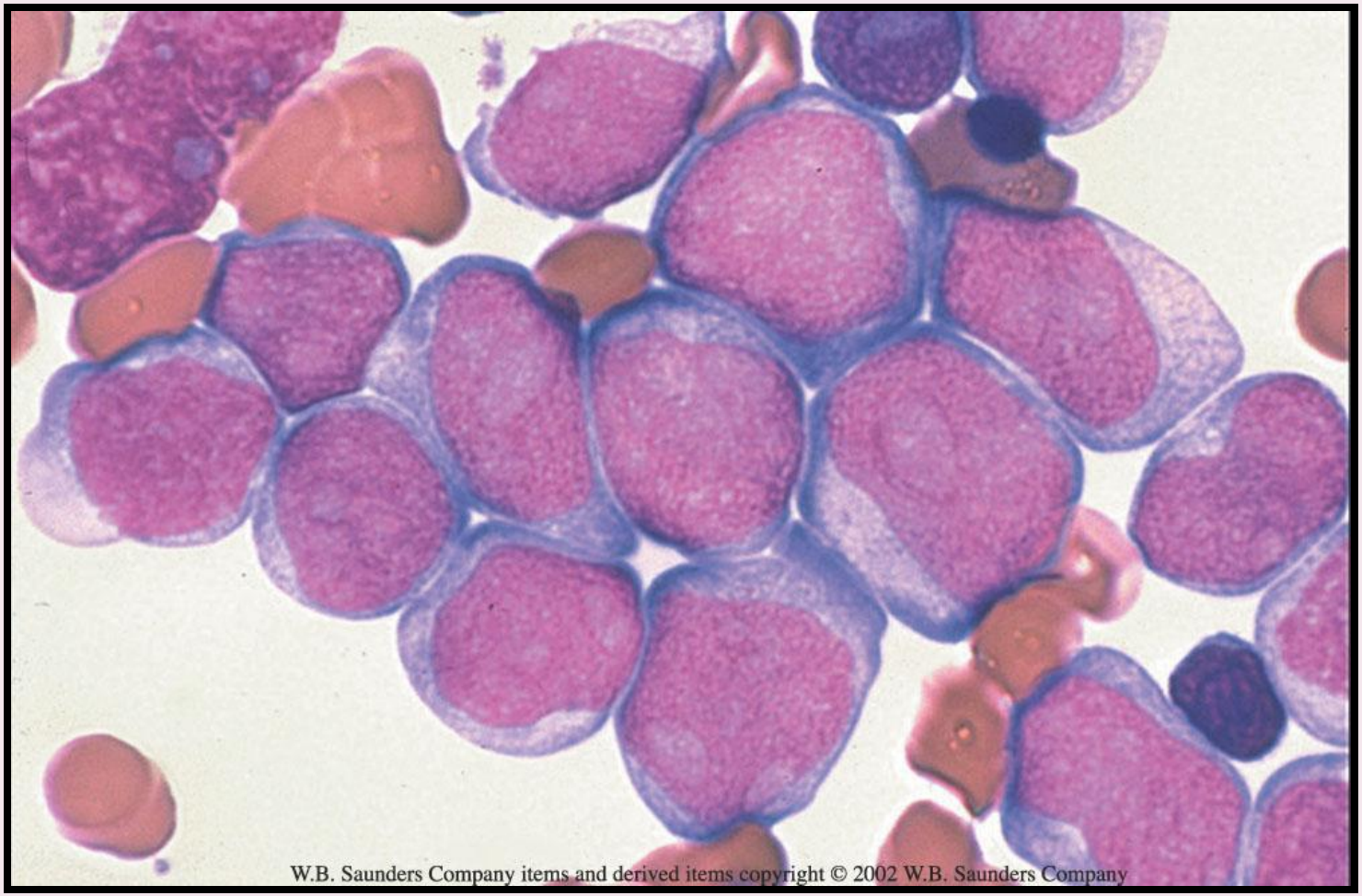
Dohle Bodies



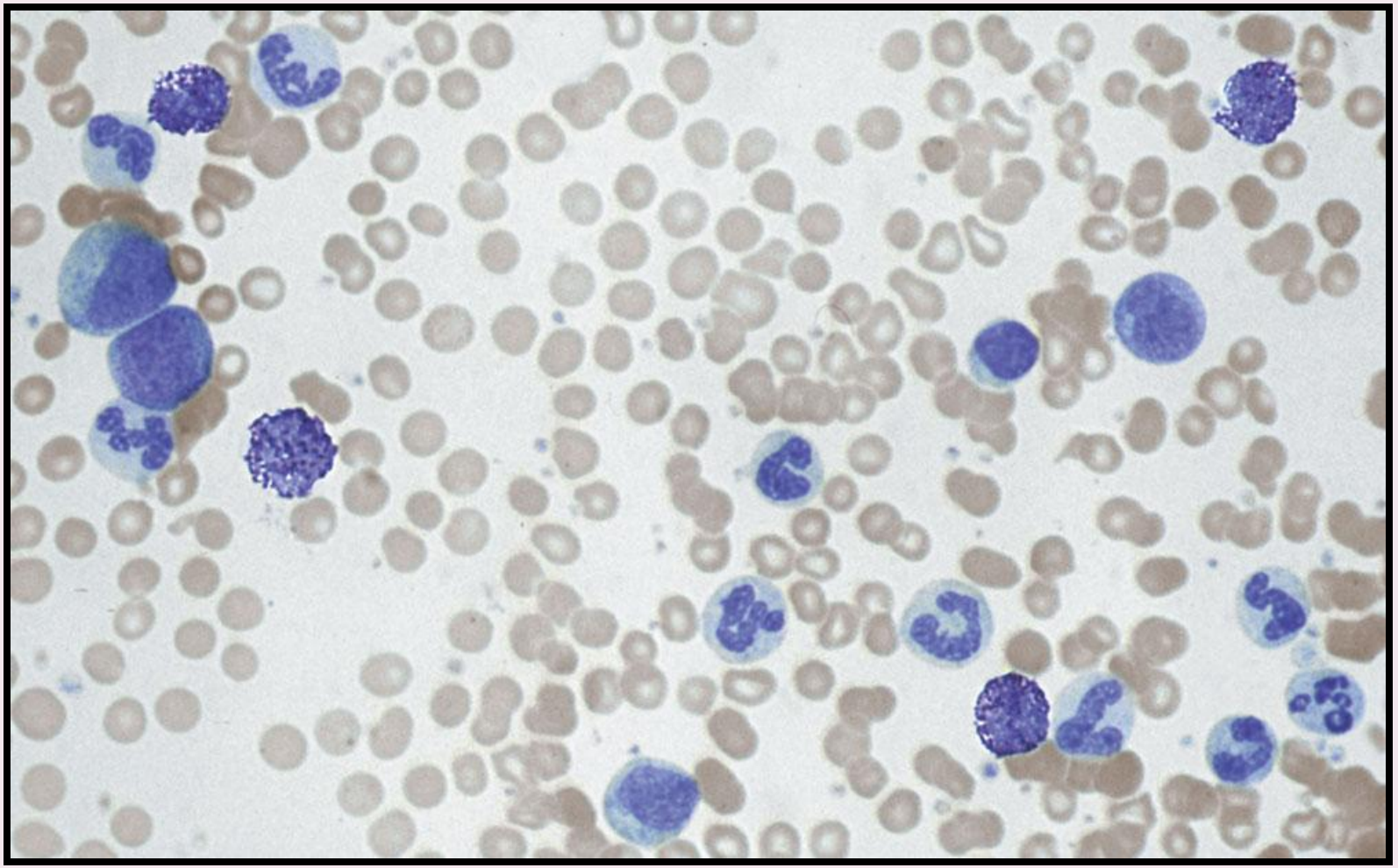
Pelger-Huet Anomaly



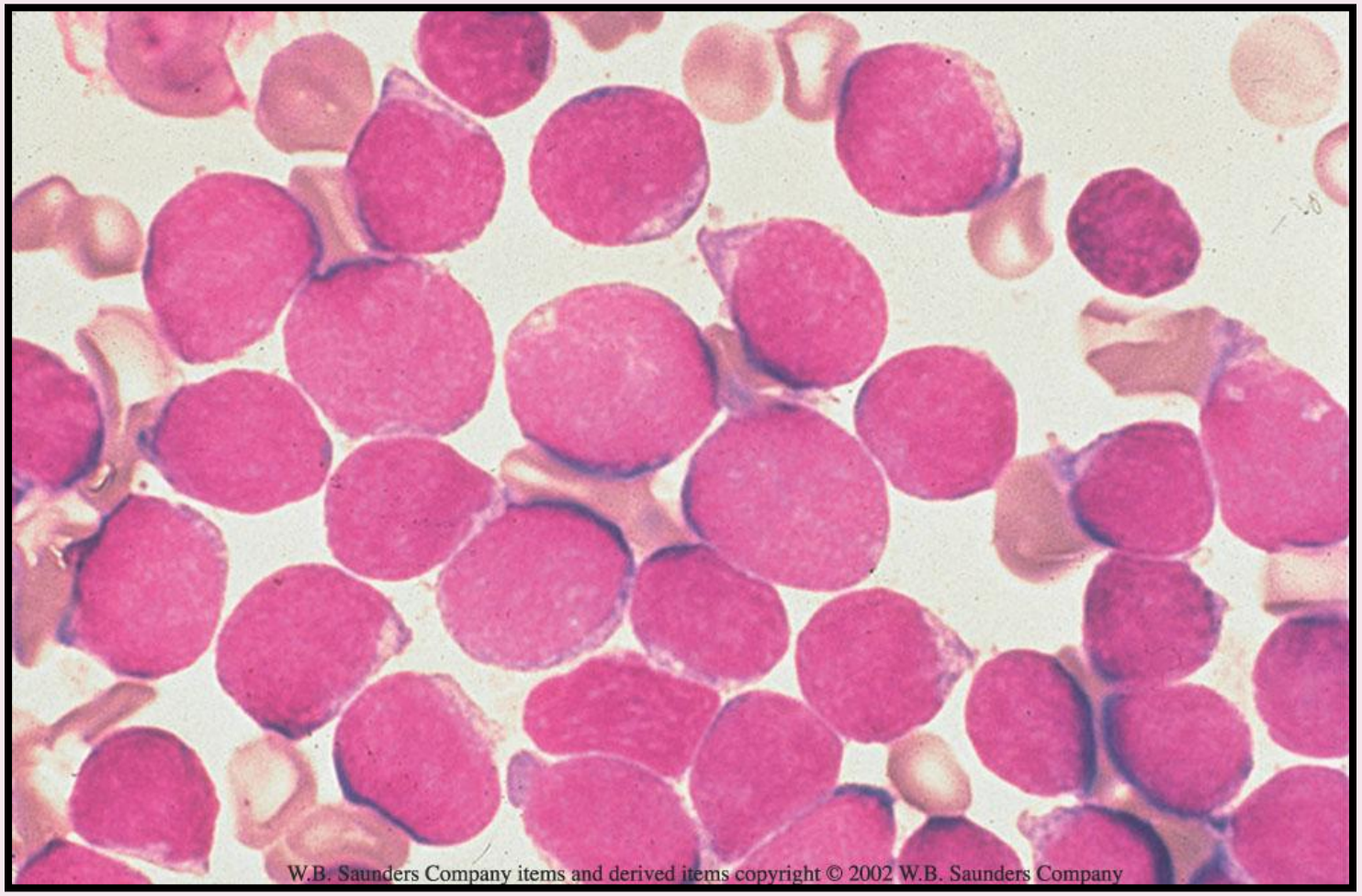
Acute Myeblastic Leukemia (M1)



Chronic Myelogenous Leukemia



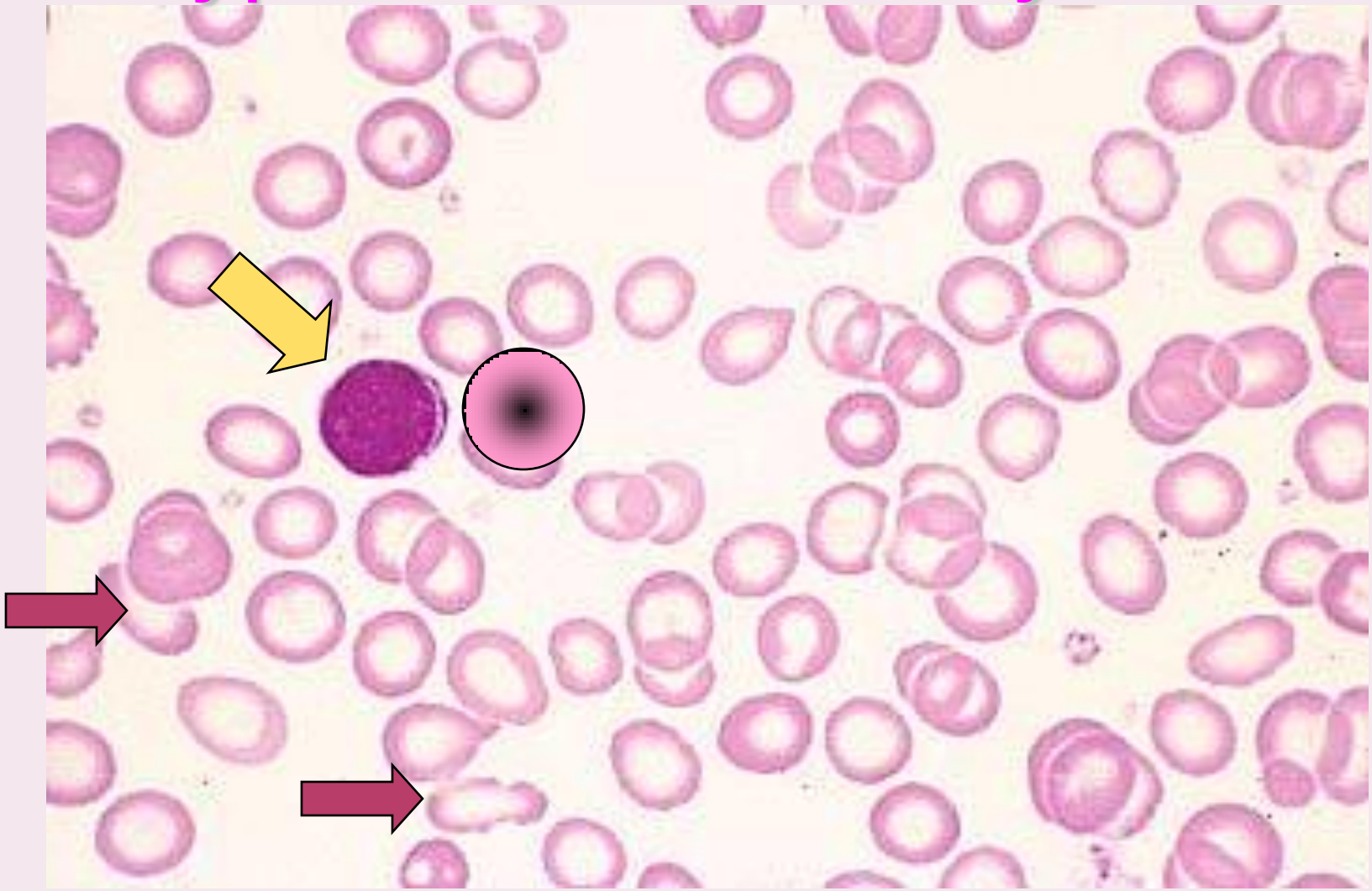
Acute Lymphoblastic Leukemia



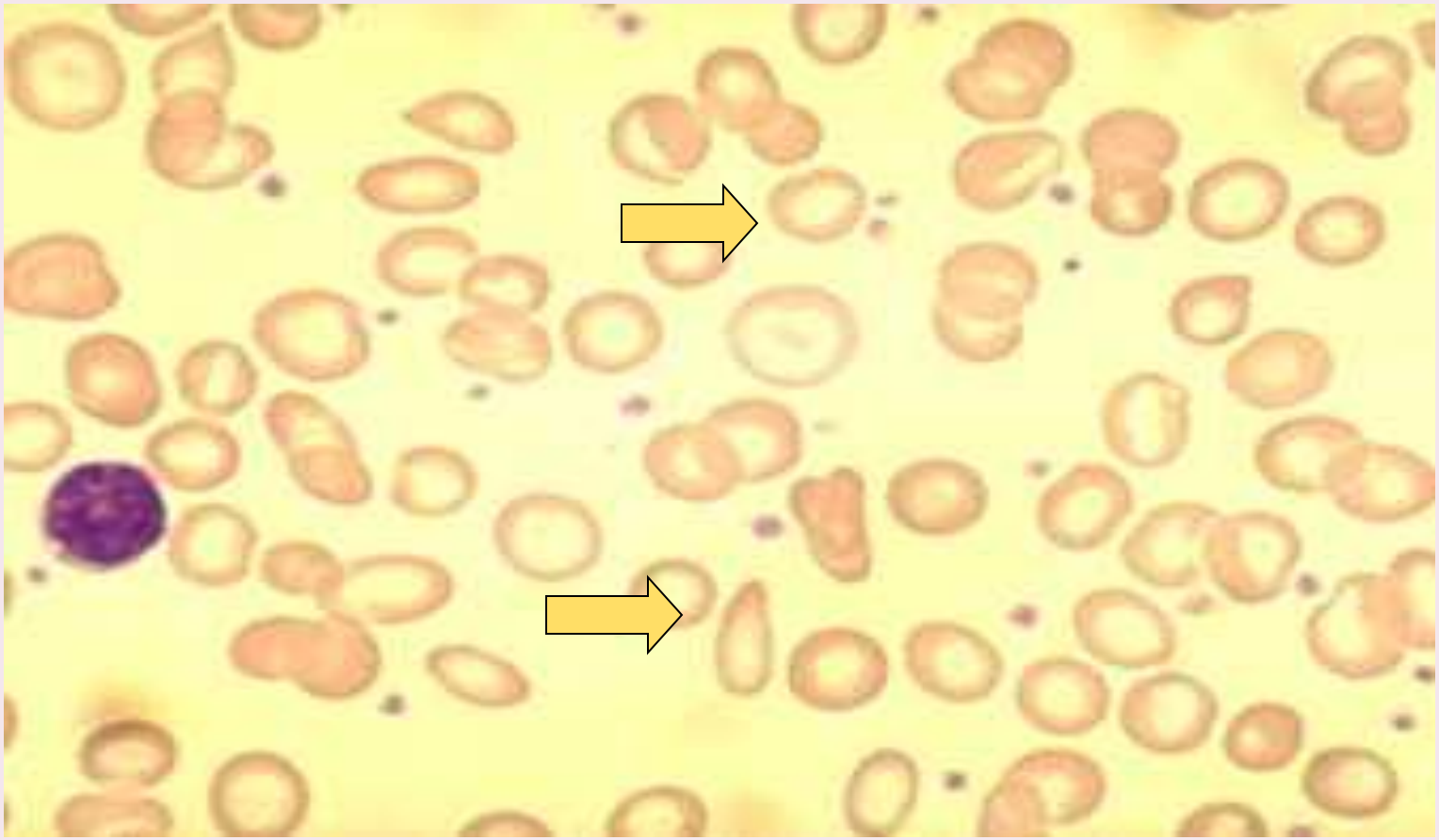
Chronic Lymphocytic Leukemia



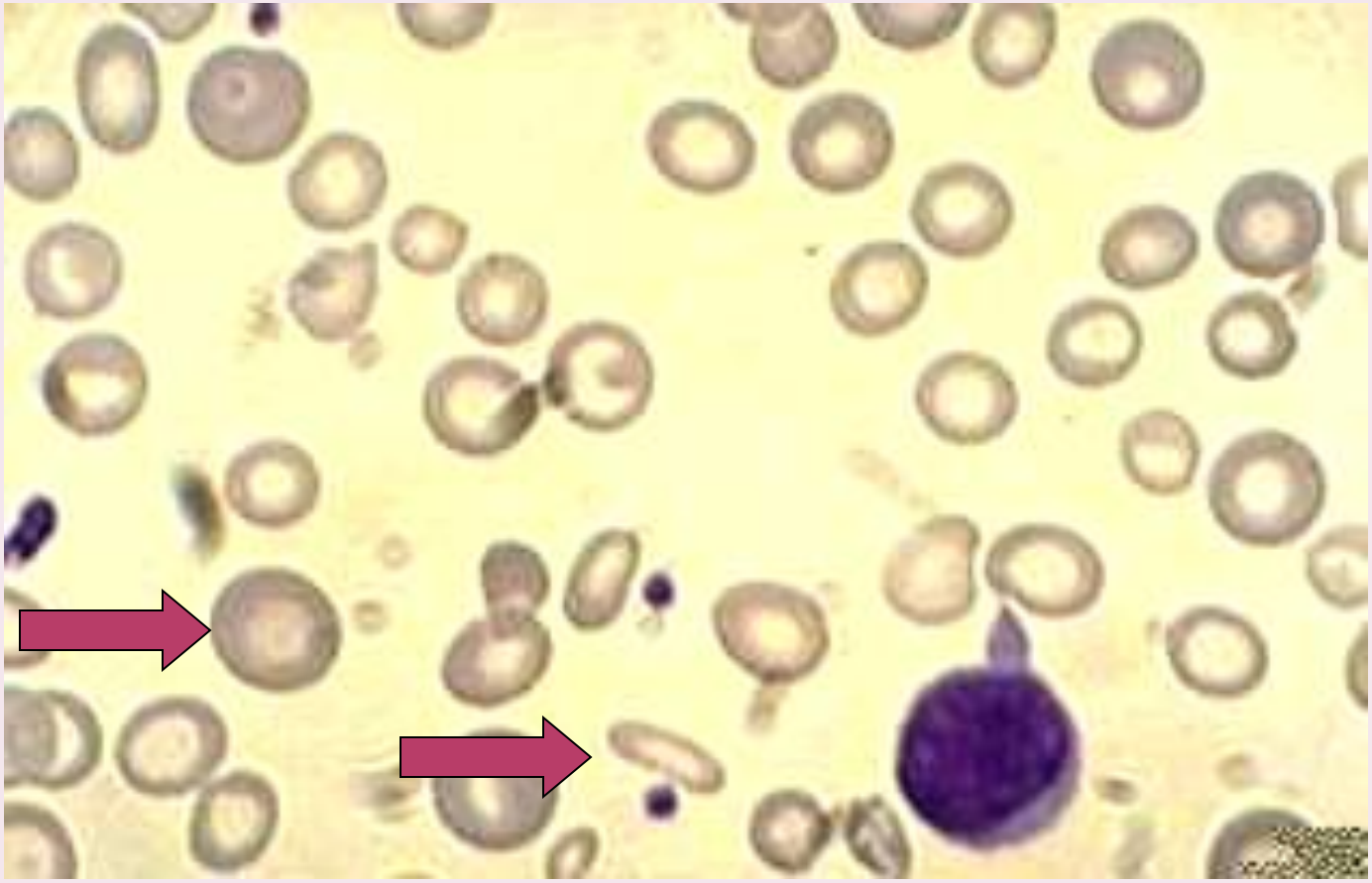
Hypochromic Microcytic RBC



Iron Deficiency Anemia:



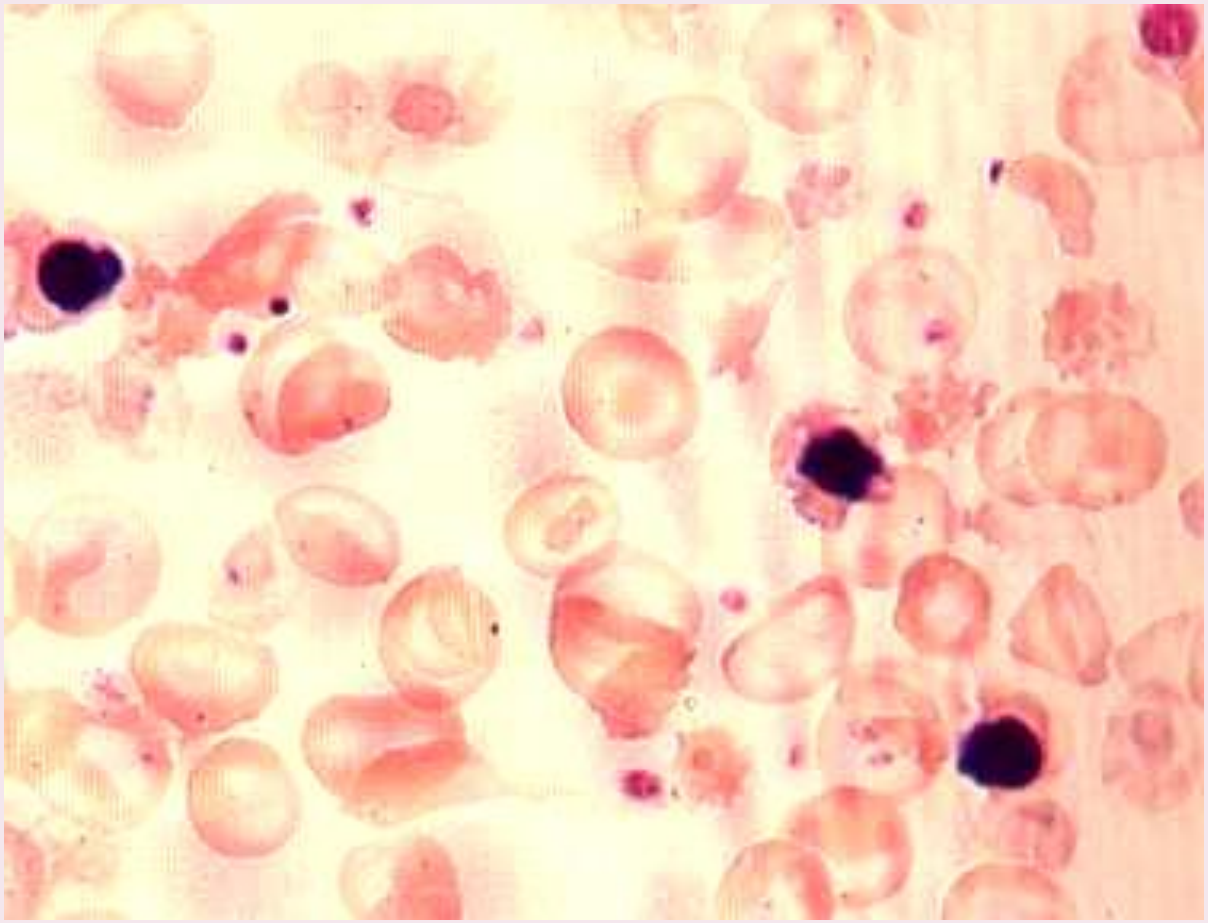
IDA on Treatment :



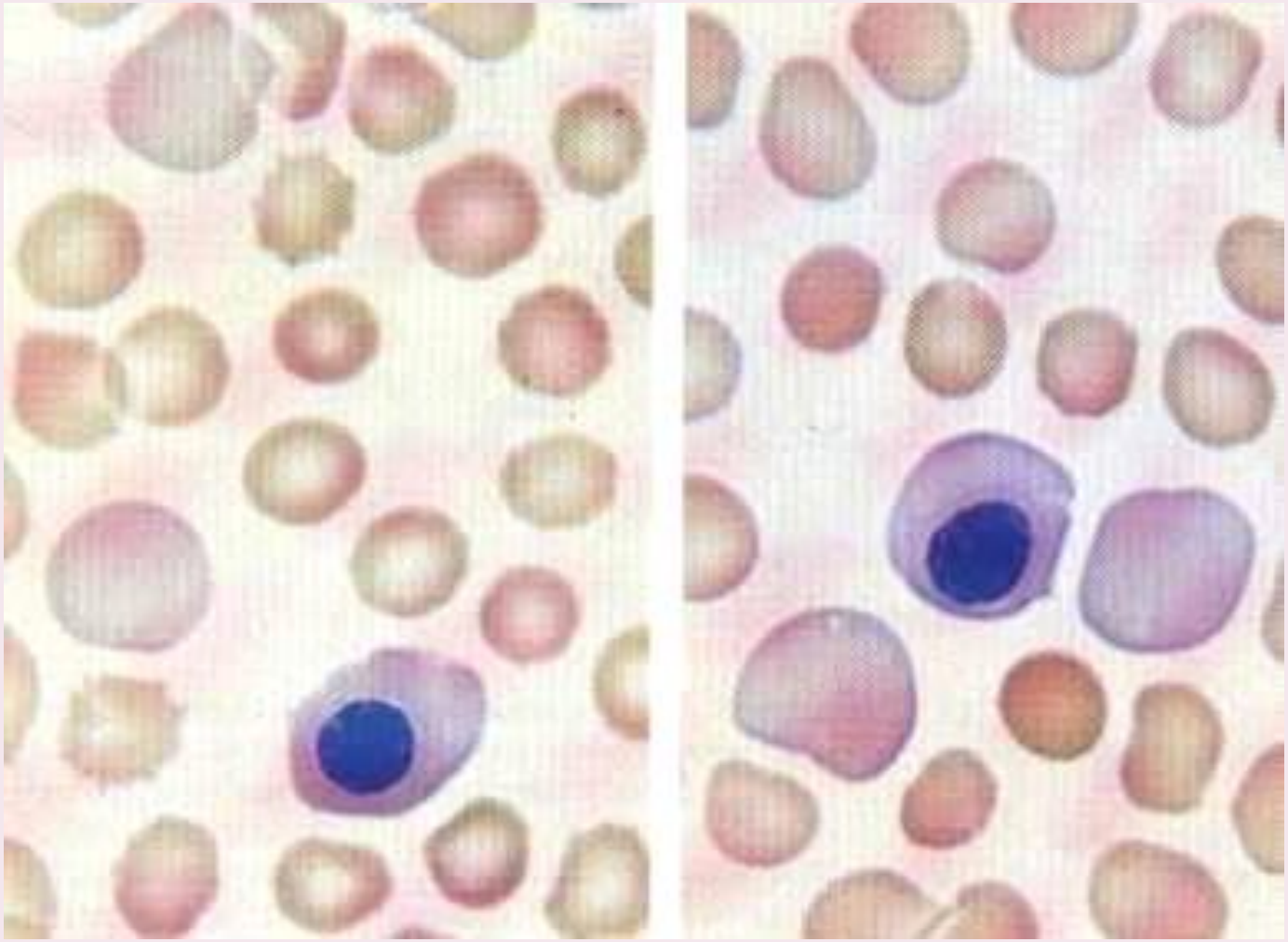
CWM-20353-Meg.An



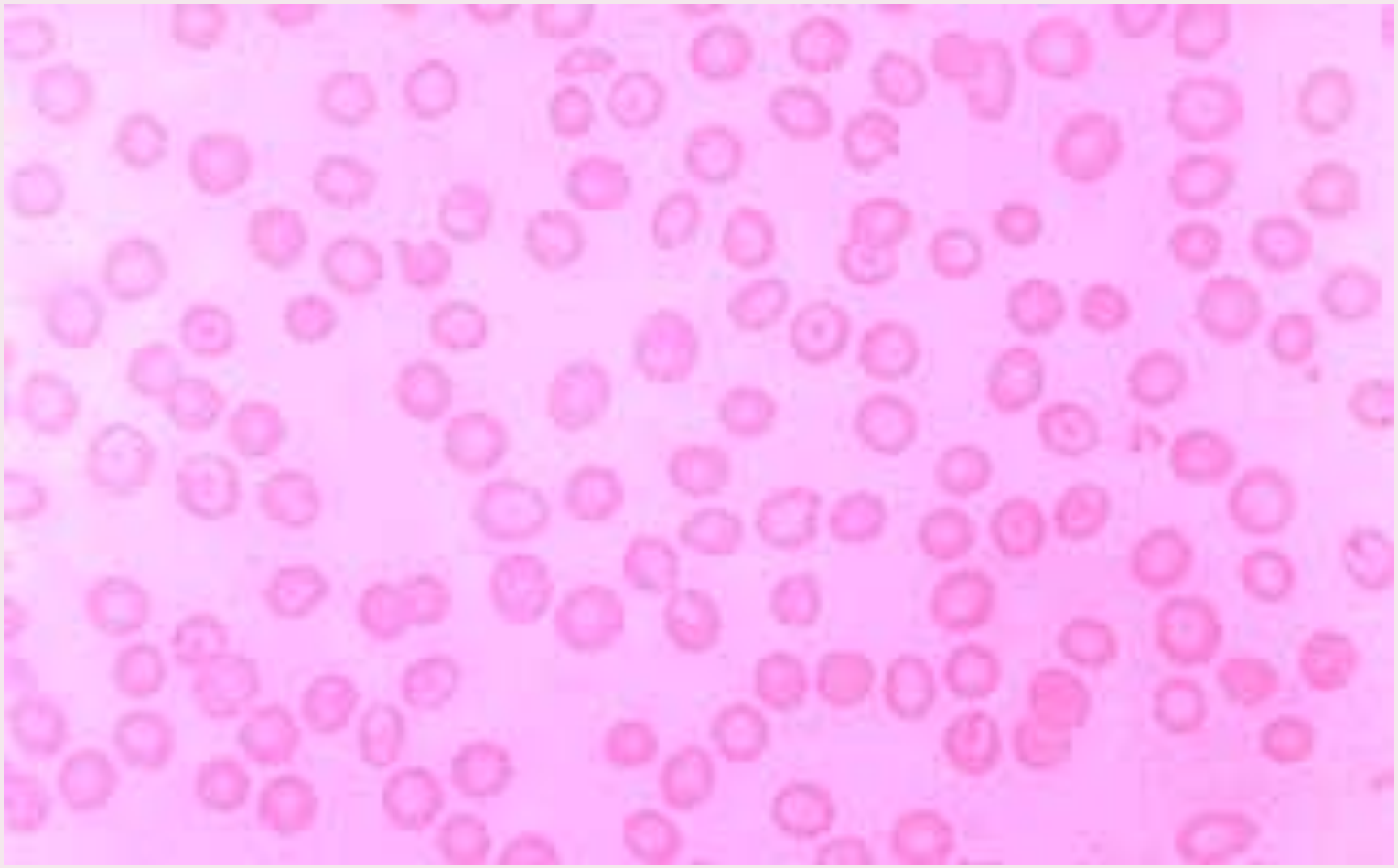
ß Thalassemia Major:



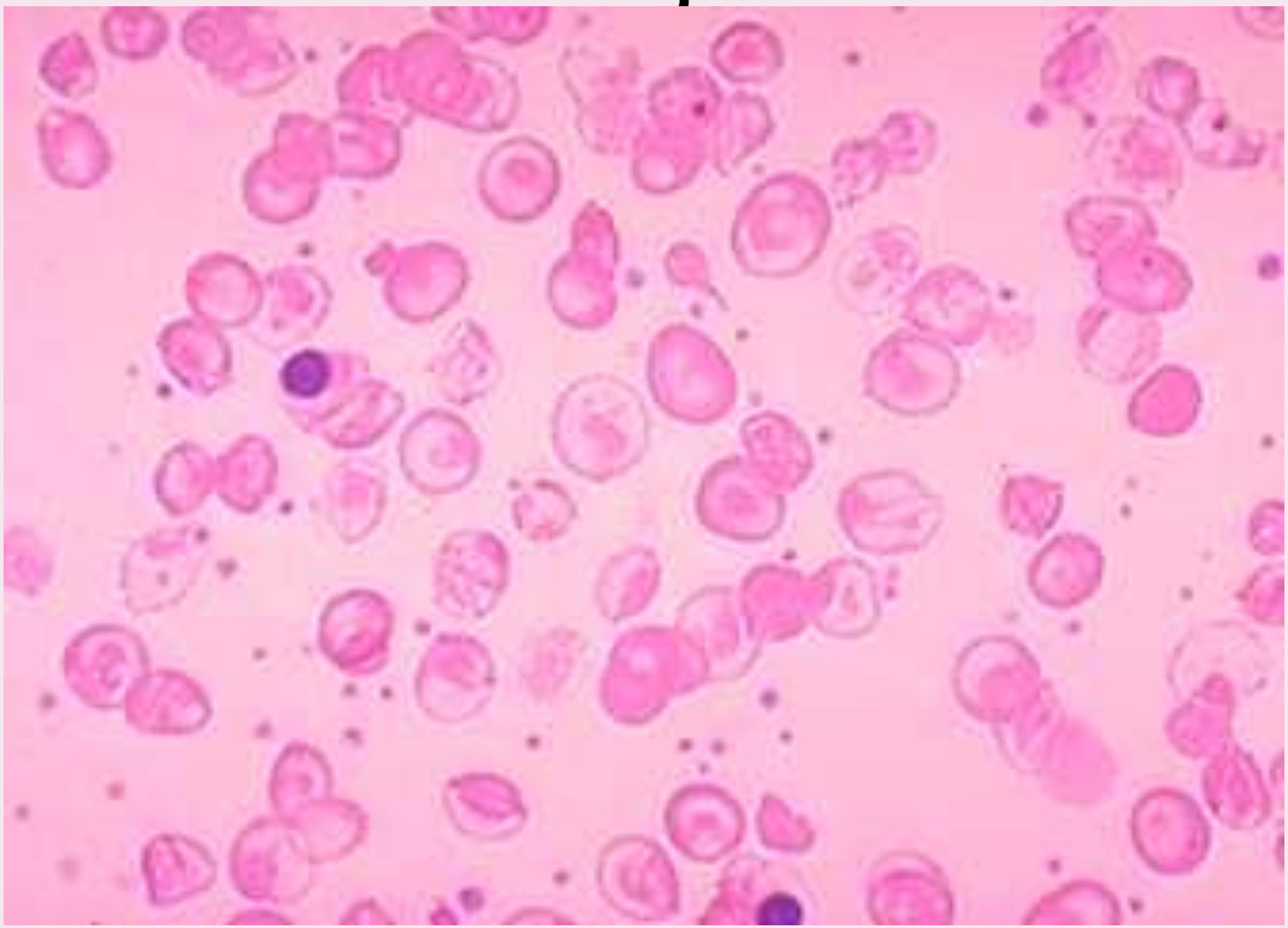
Polychromasia - Hemolytic An.



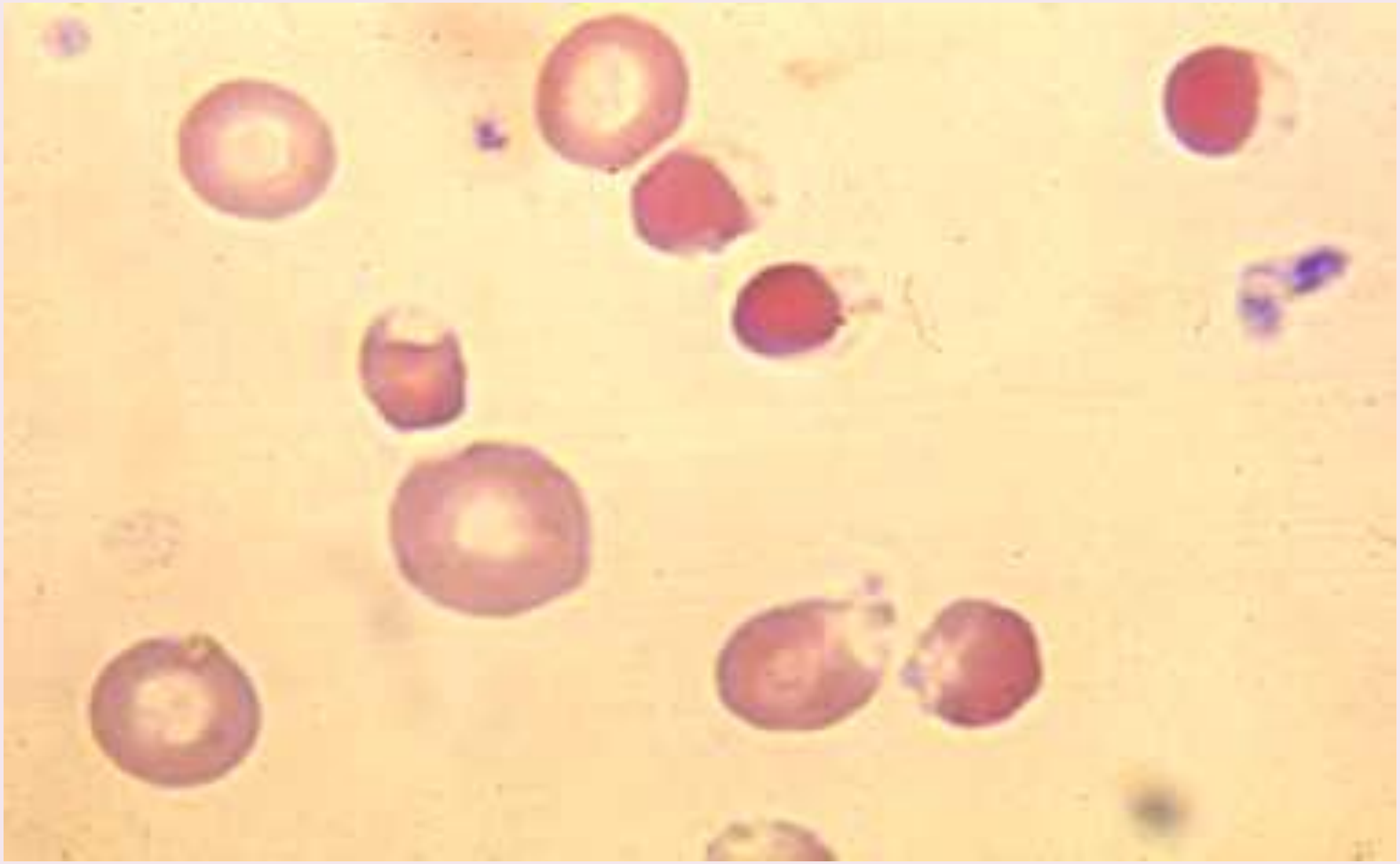
Thalassemia Trait:



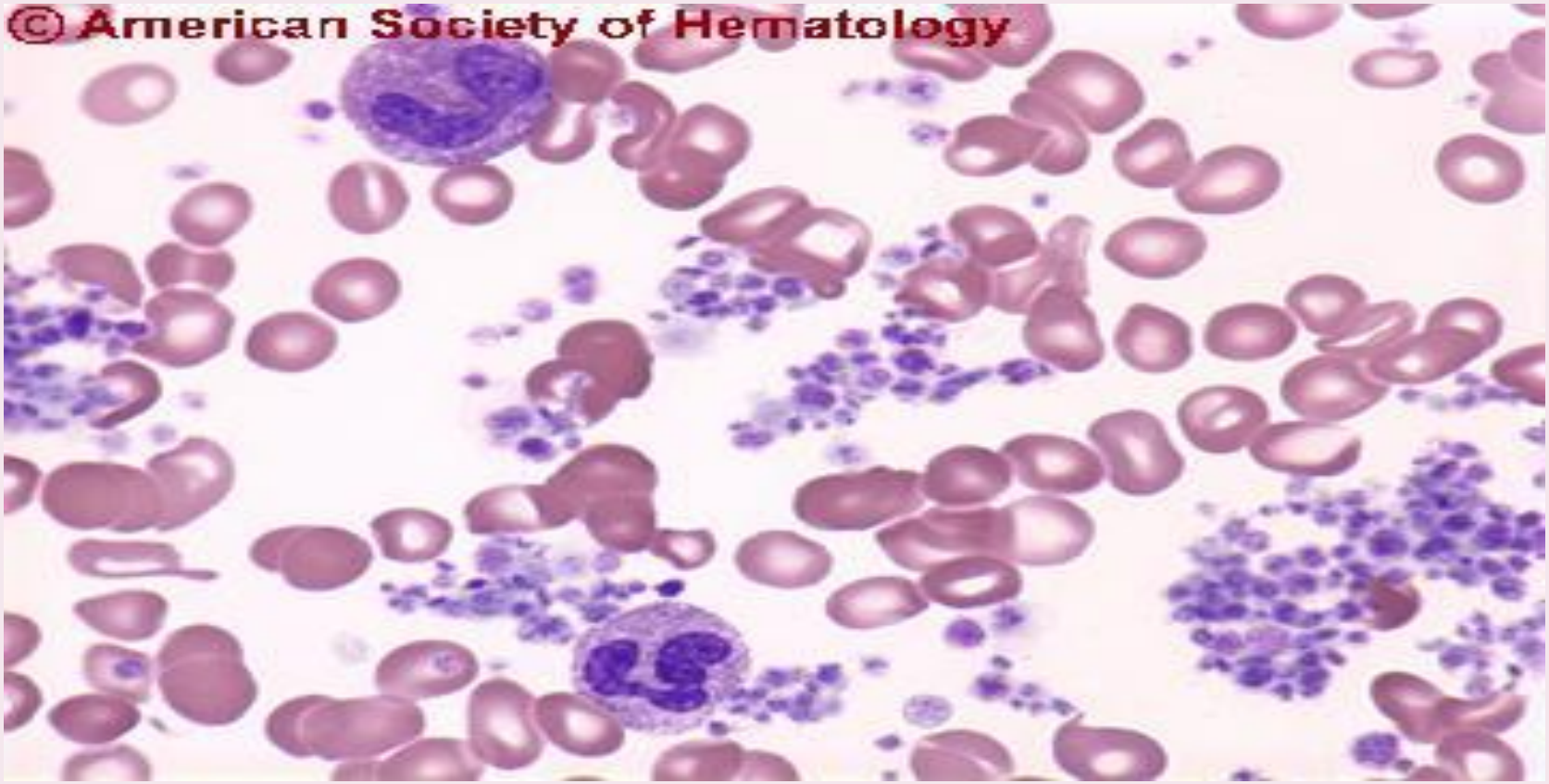
Thalassemia Major:



G6PD Deficiency Anemia:



Essential Thrombocytosis



RED BLOOD CELL MORPHOLOGY

Size variation

- Normal
- Microcyte
- Macrocyte
- Oval macrocyte
- Hypochromic macrocyte



Hemoglobin distribution

- Hypochromia
  - 1+
  - 2+
  - 3+
  - 4+
- Polychromasia

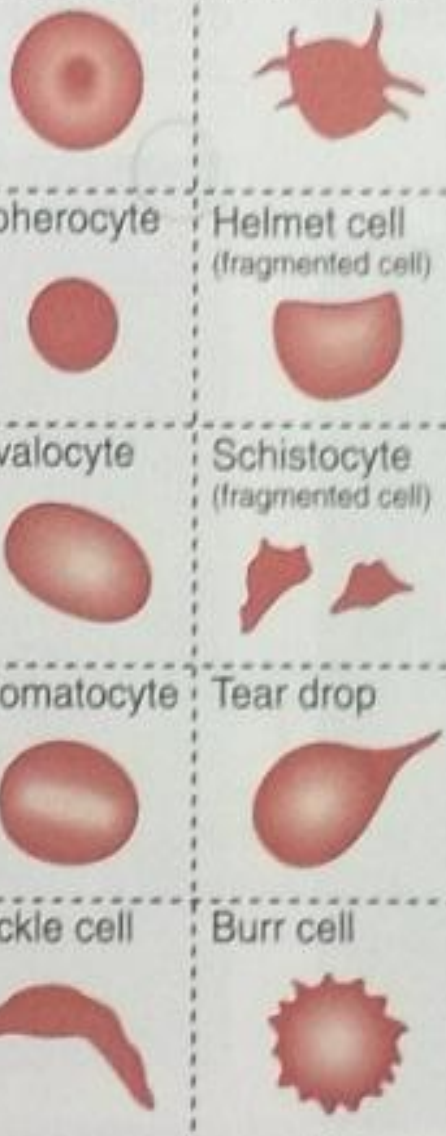




(Reticulocyte)

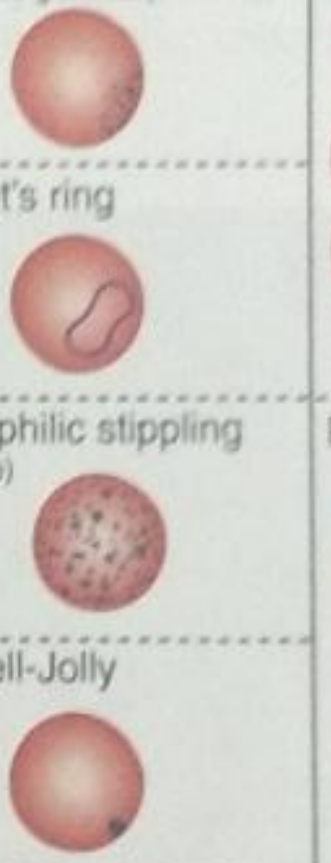
Shape variation

- Target cell
- Acanthocyte
- Spherocyte
- Helmet cell (fragmented cell)
- Ovalocyte
- Schistocyte (fragmented cell)
- Stomatocyte
- Tear drop
- Sickle cell
- Burr cell



Inclusions

- Pappenheimer bodies (siderotic granules)
- Cabot's ring
- Basophilic stippling (coarse)
- Howell-Jolly



Red cell distribution

- Agglutination
- Rouleaux



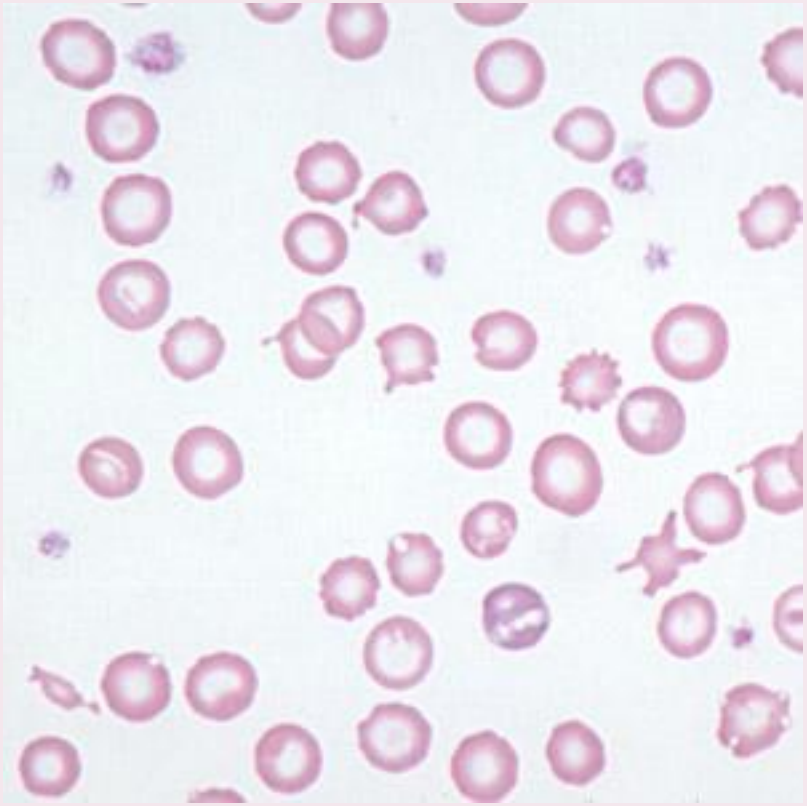
Crystal formation

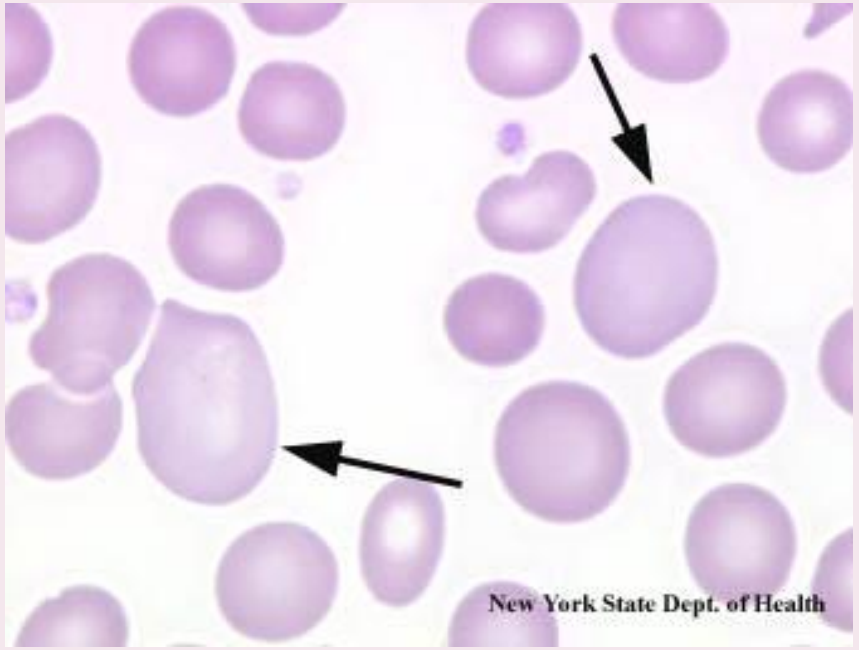
HbSC

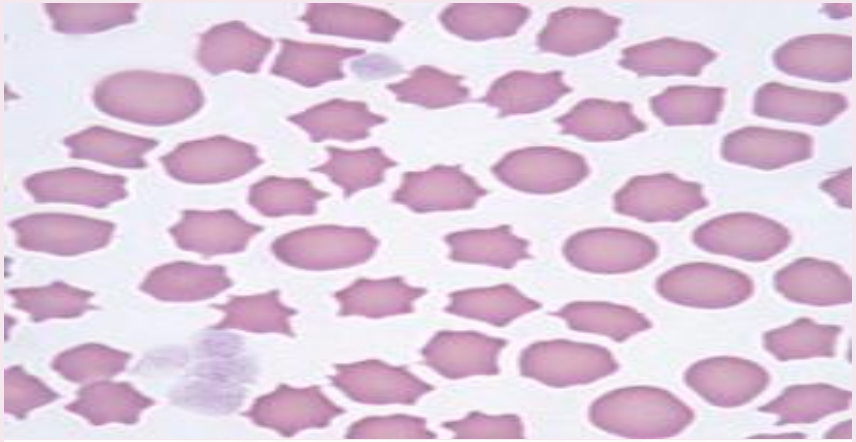


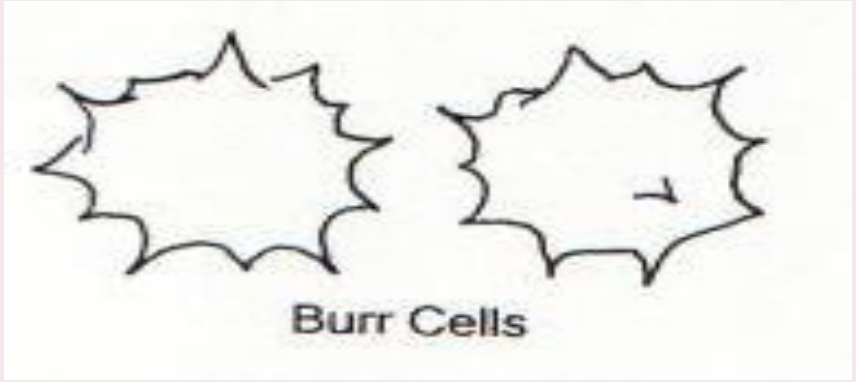
HbC

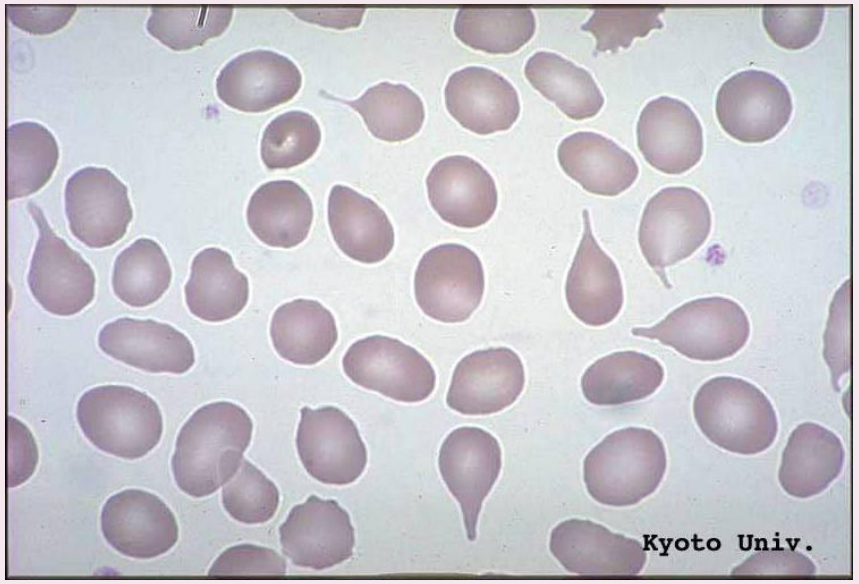


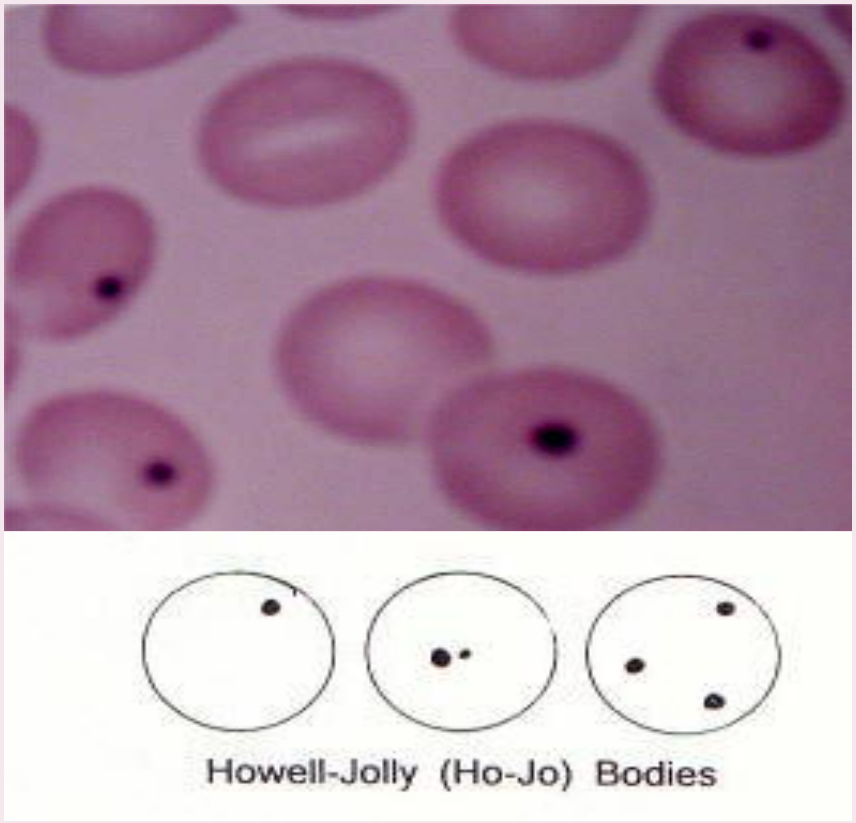


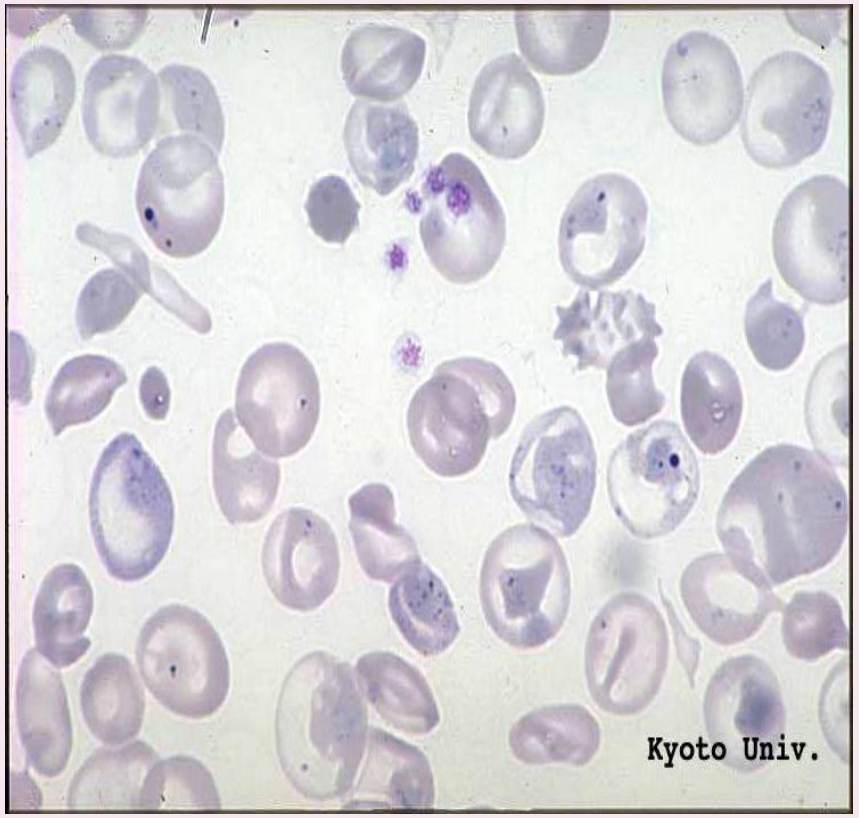

New York State Dept. of Health

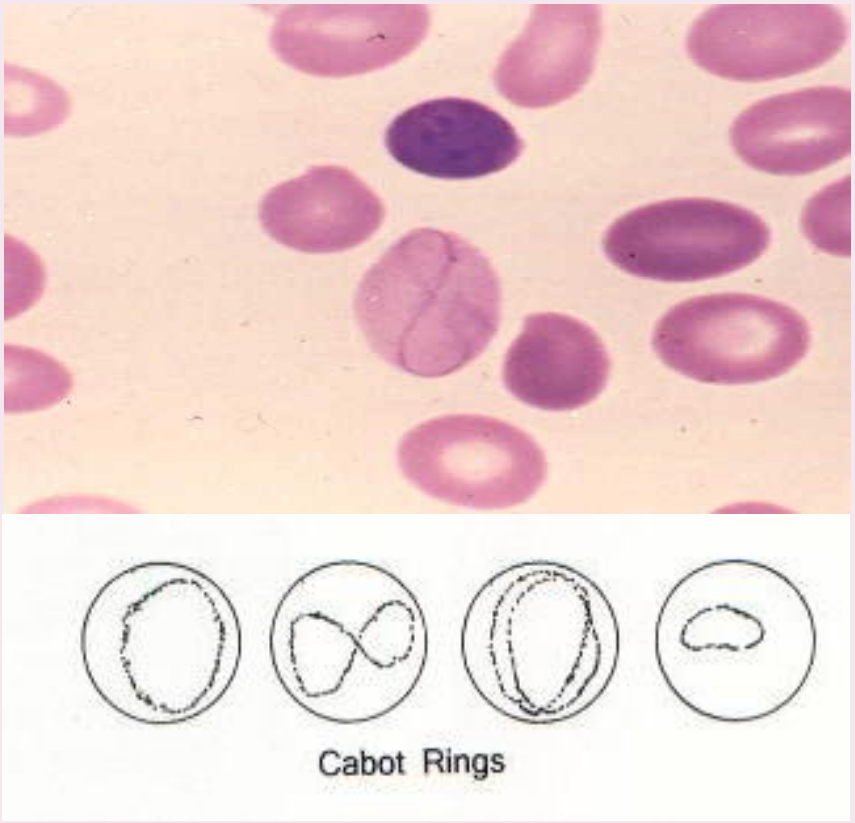


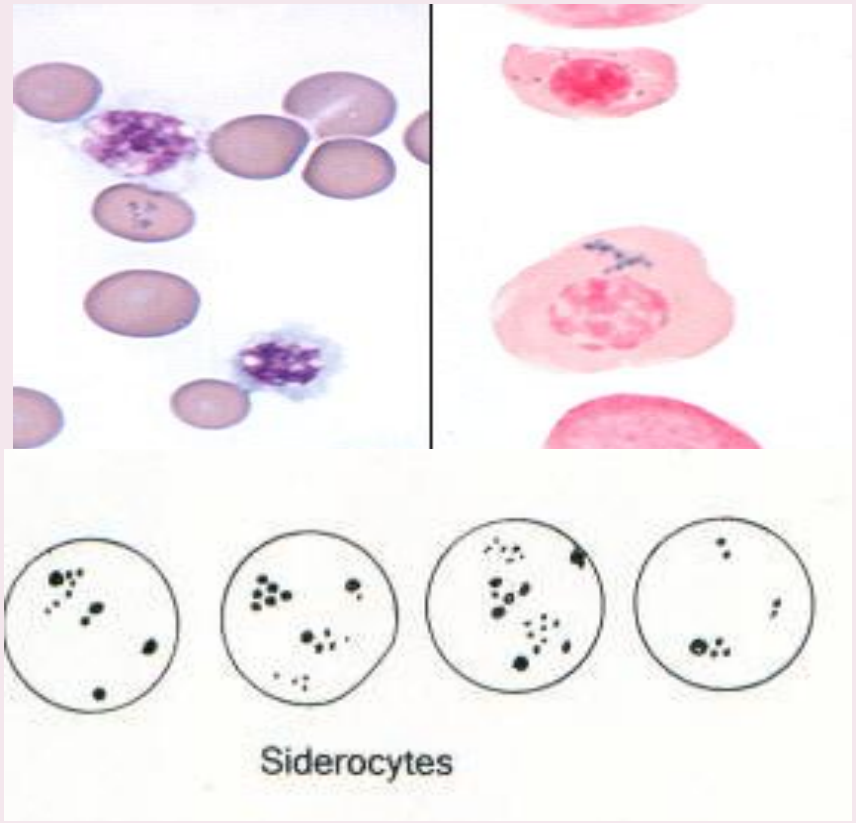

Burr Cells

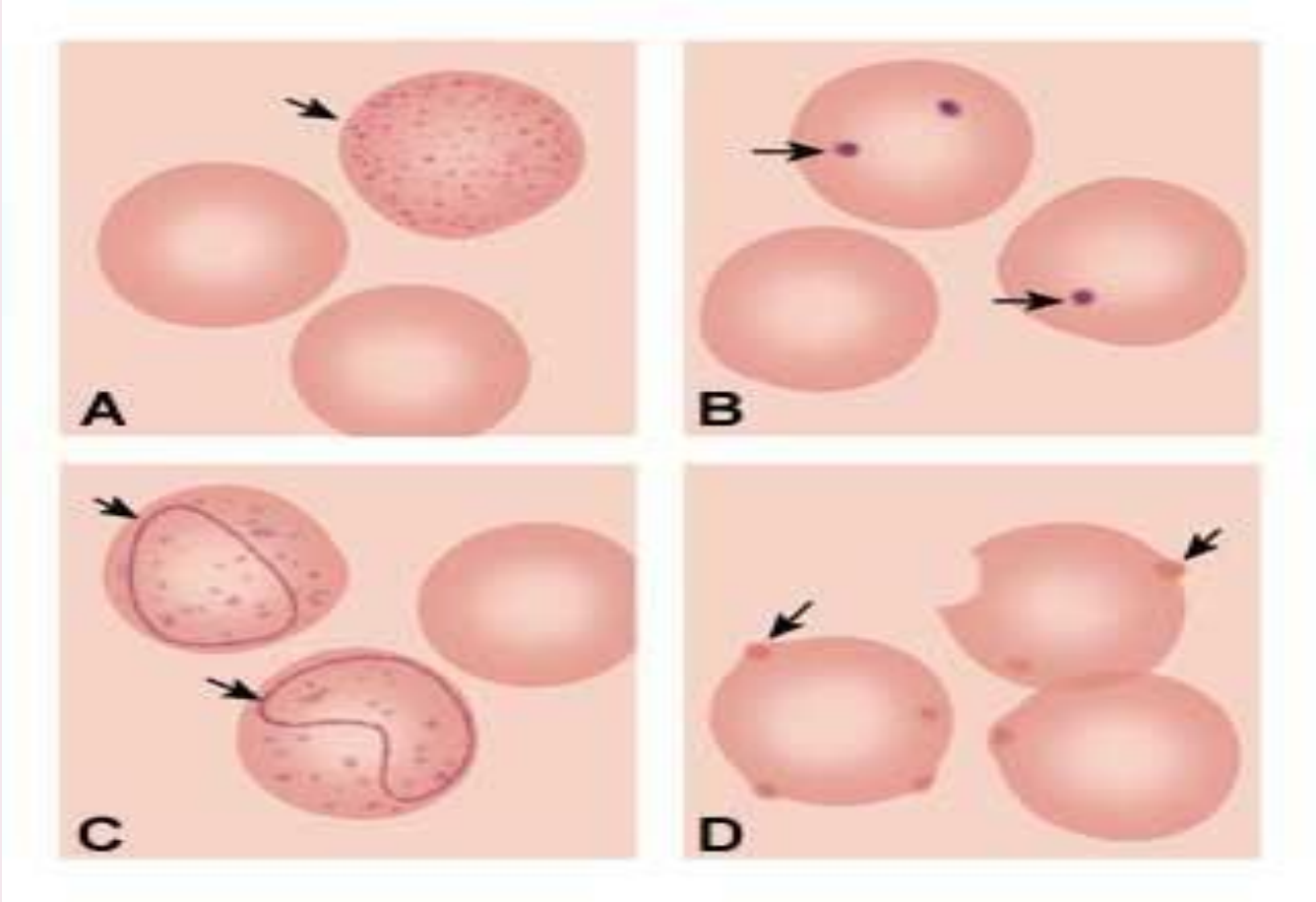

Kyoto Univ.

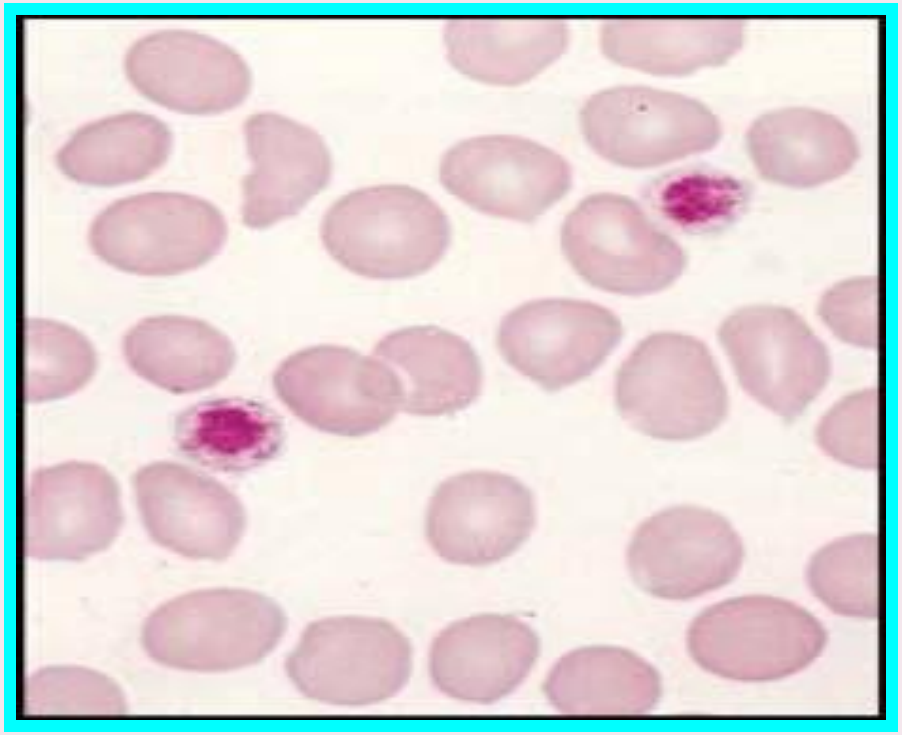

Howell-Jolly (Ho-Jo) Bodies

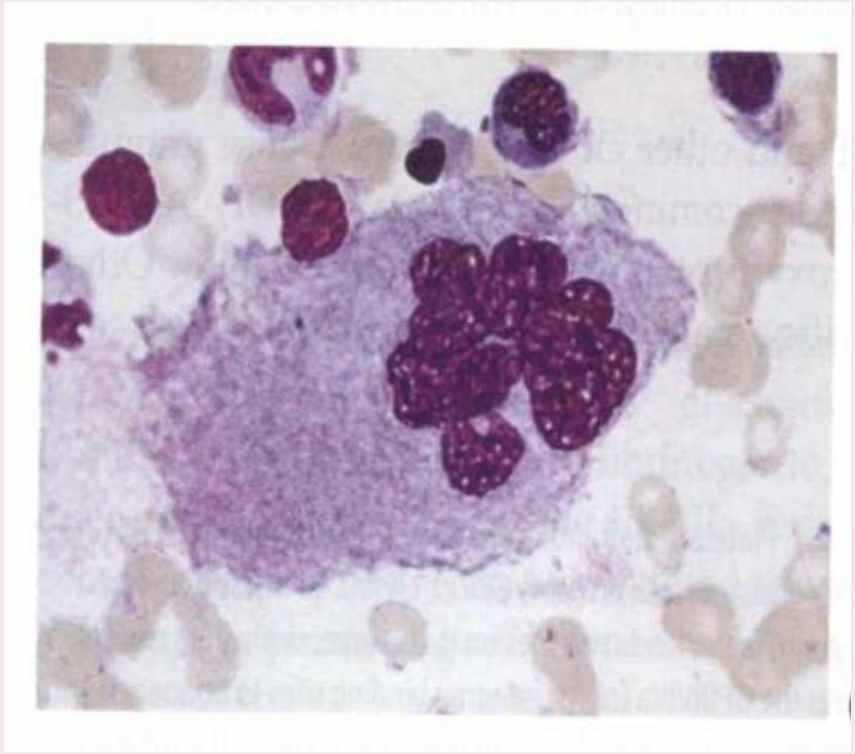

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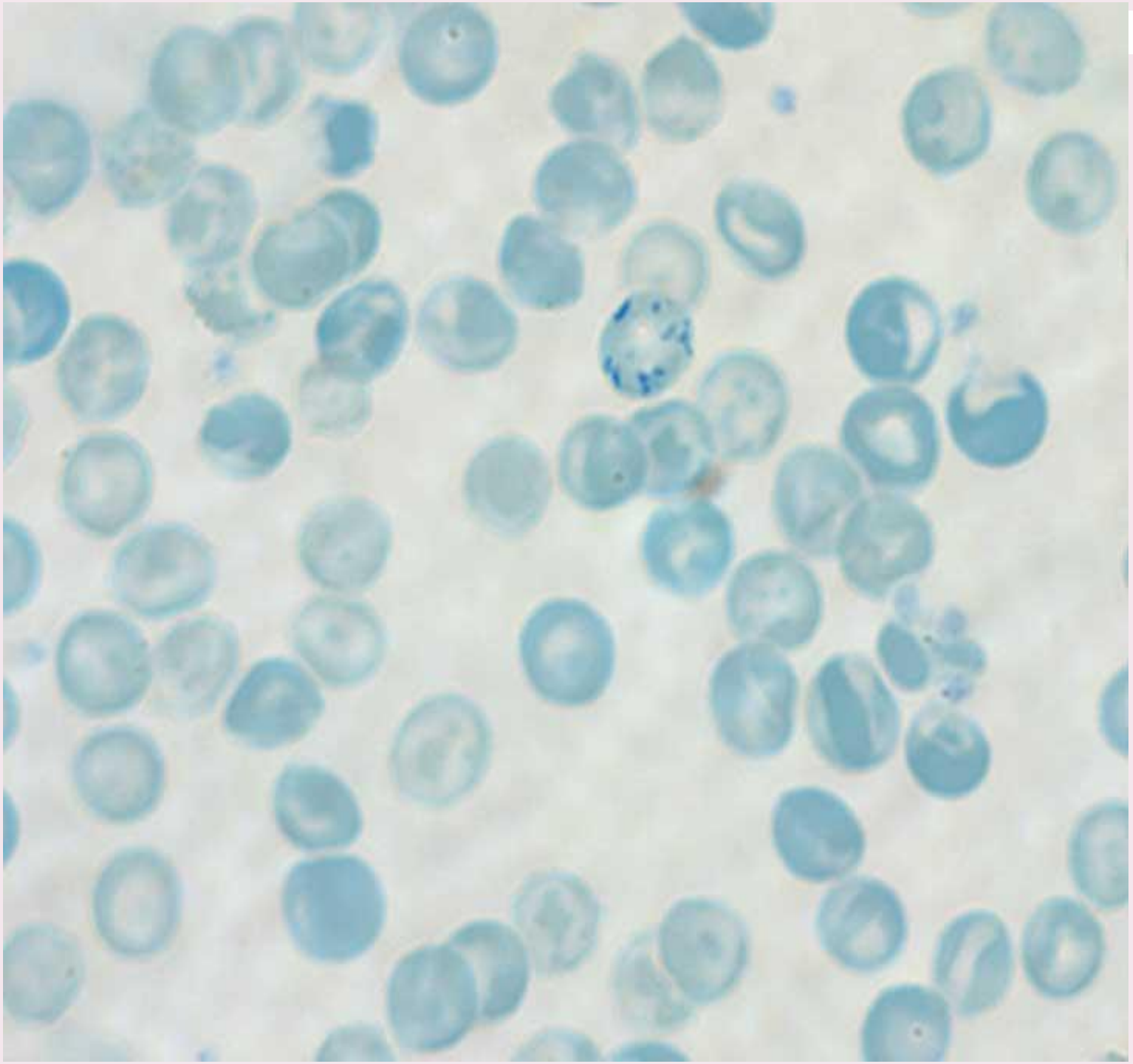

Cabot Rings

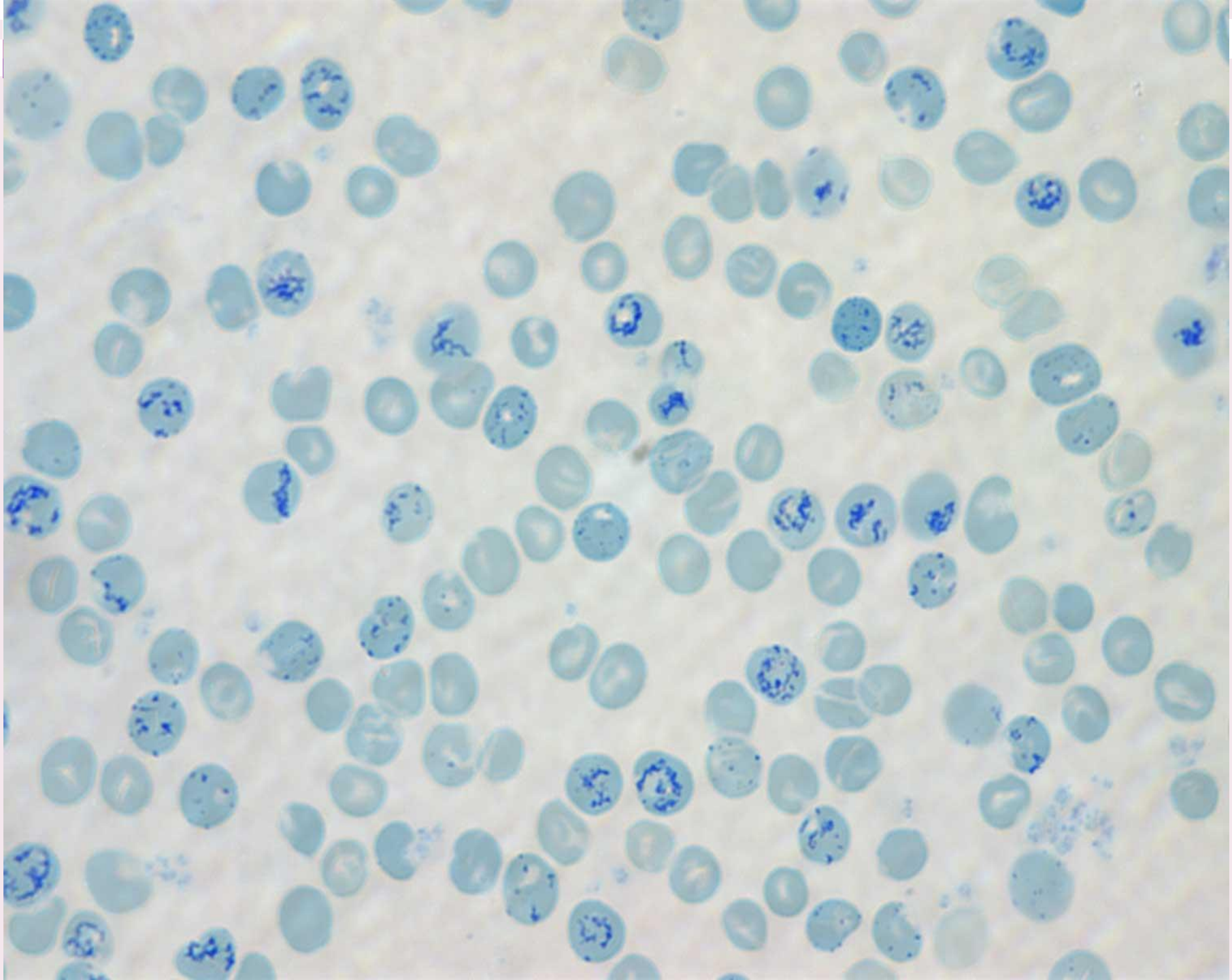

Siderocytes

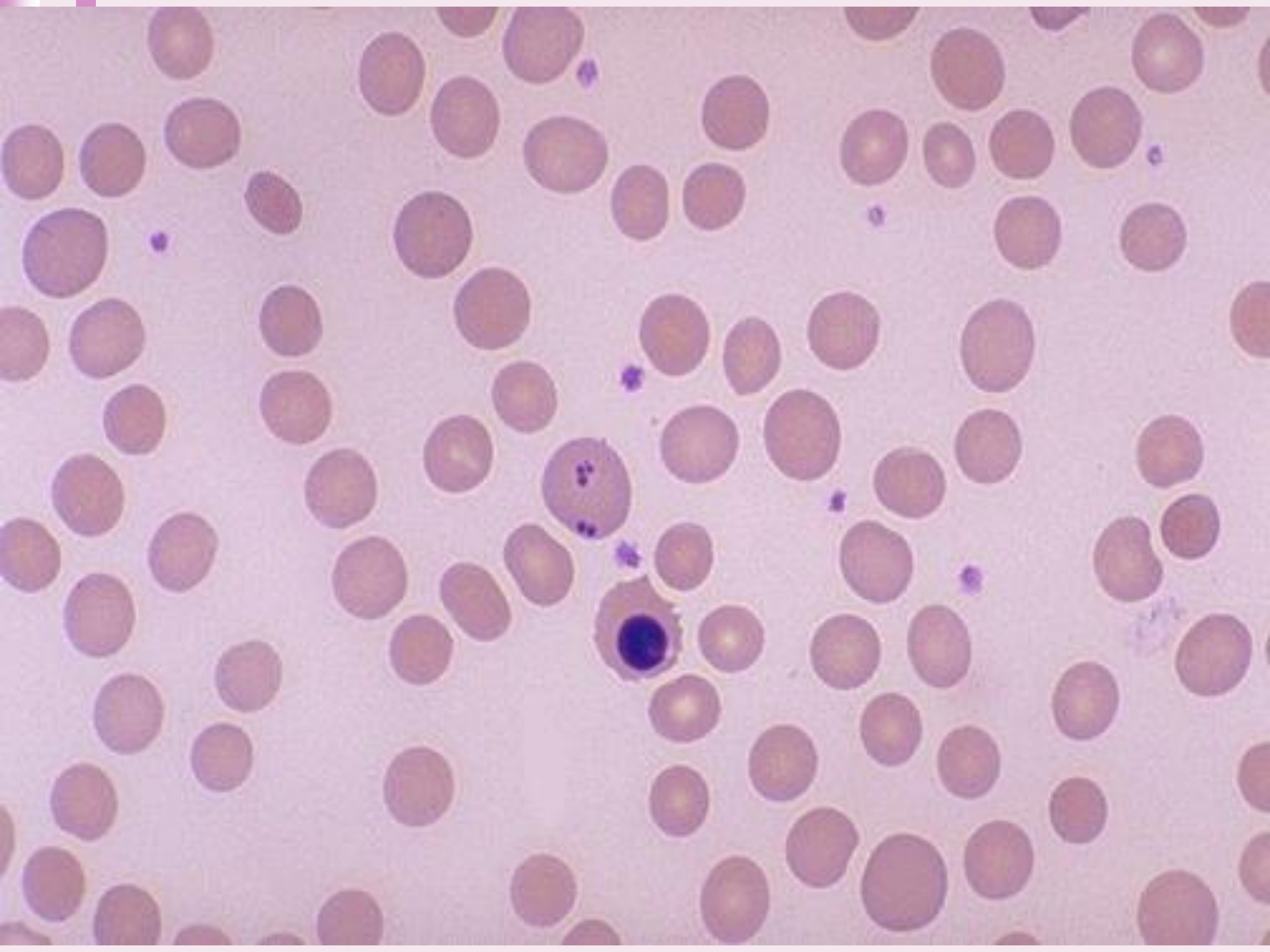

A
B
C
D

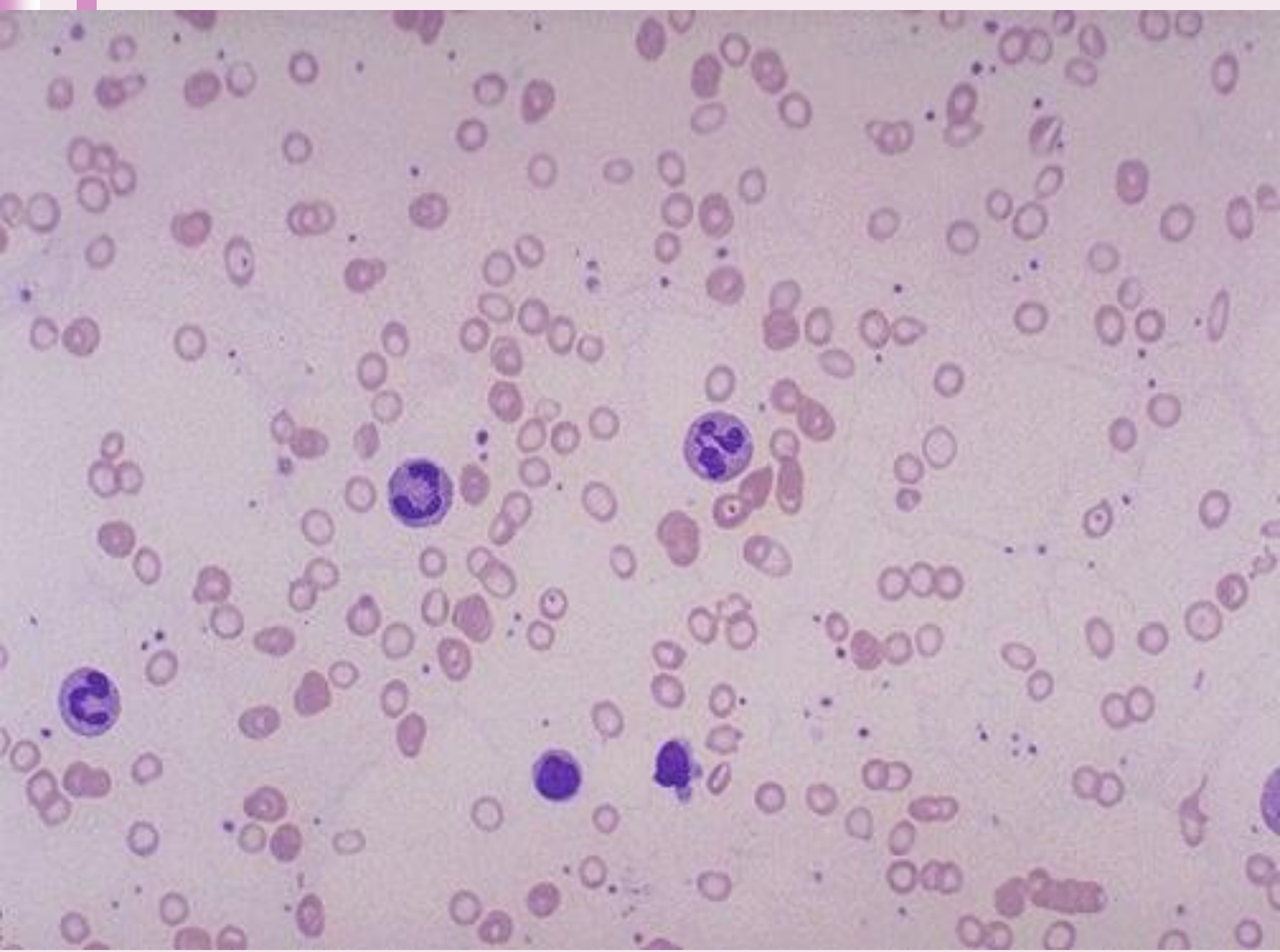


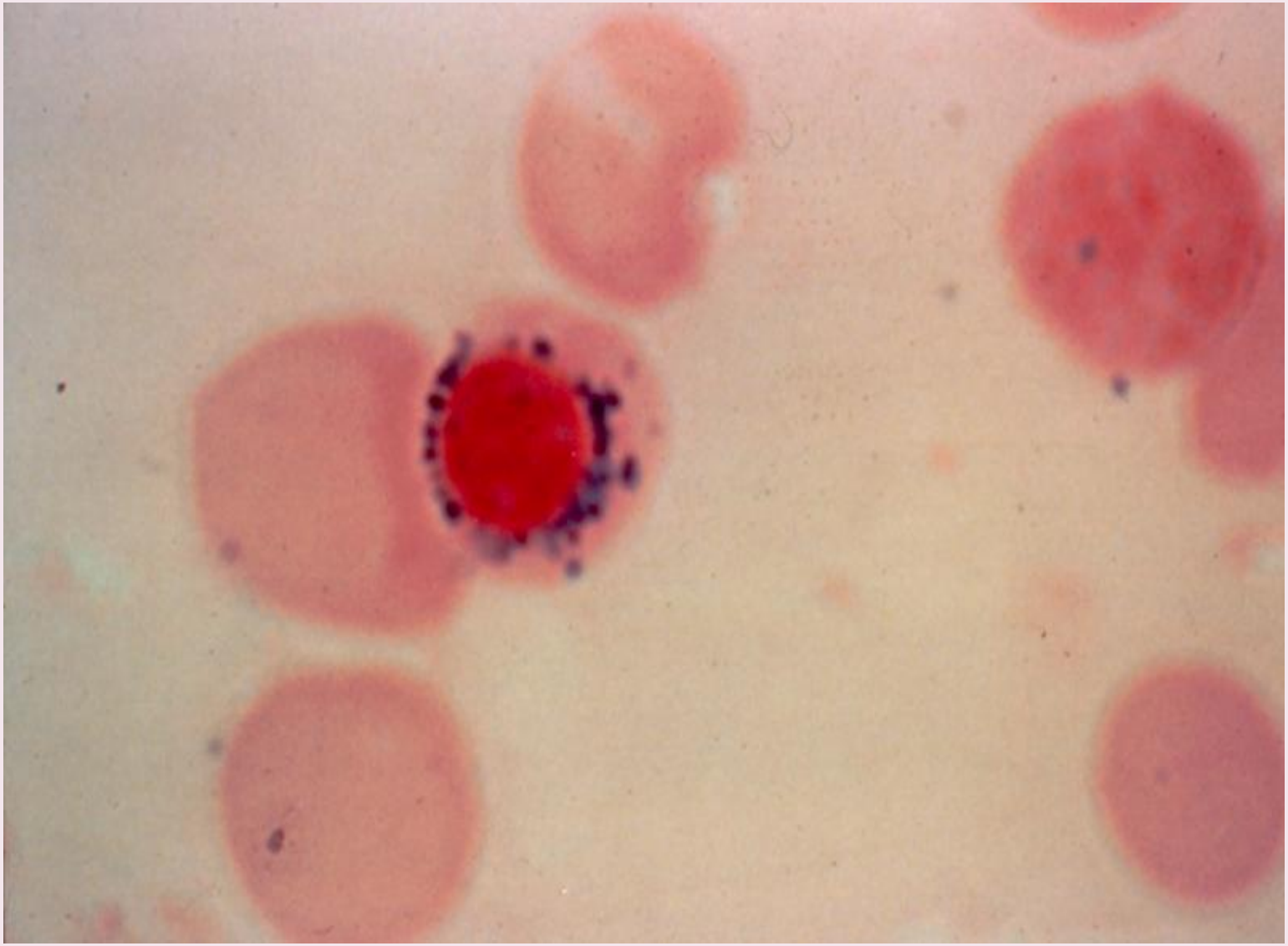


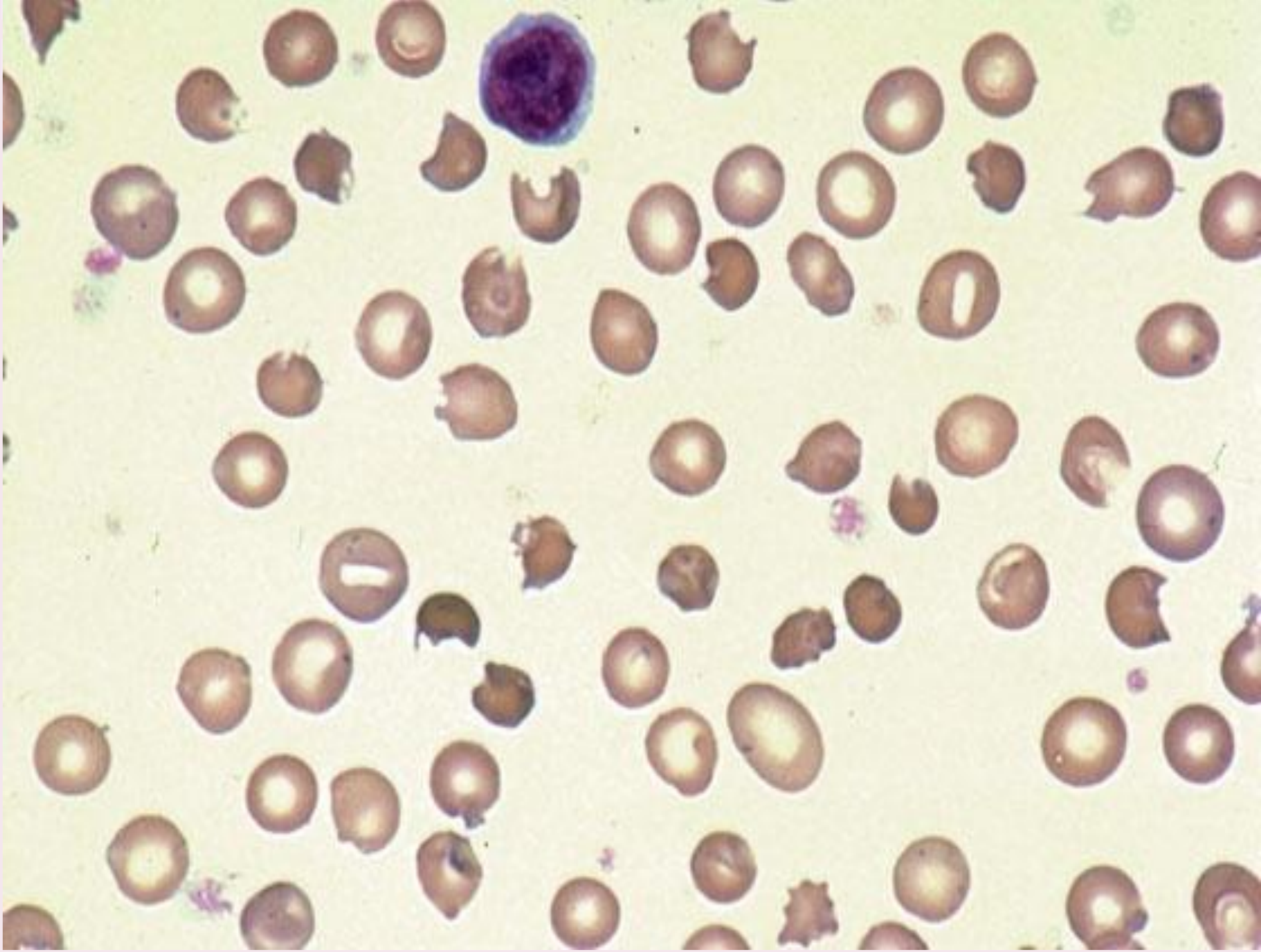


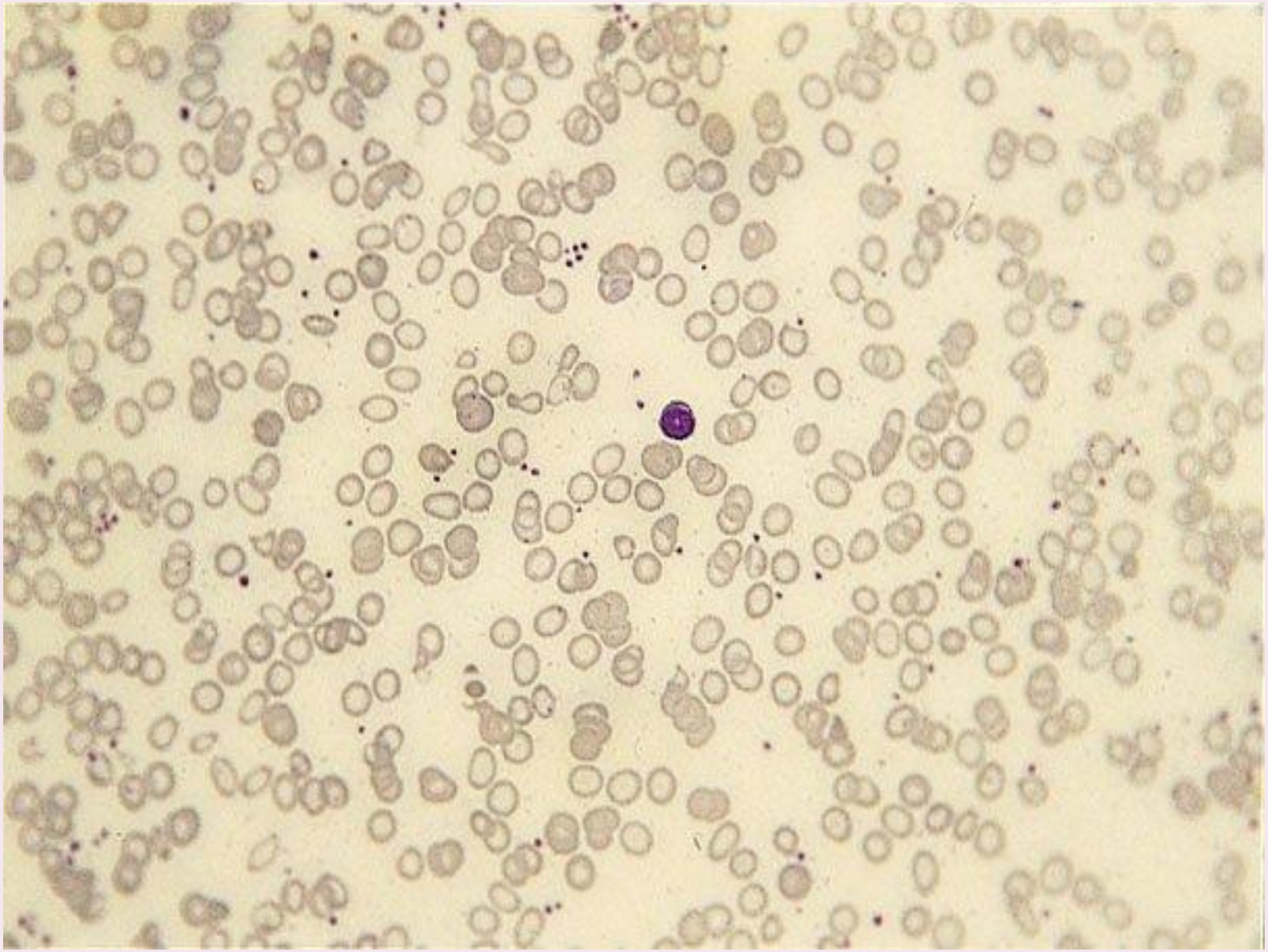




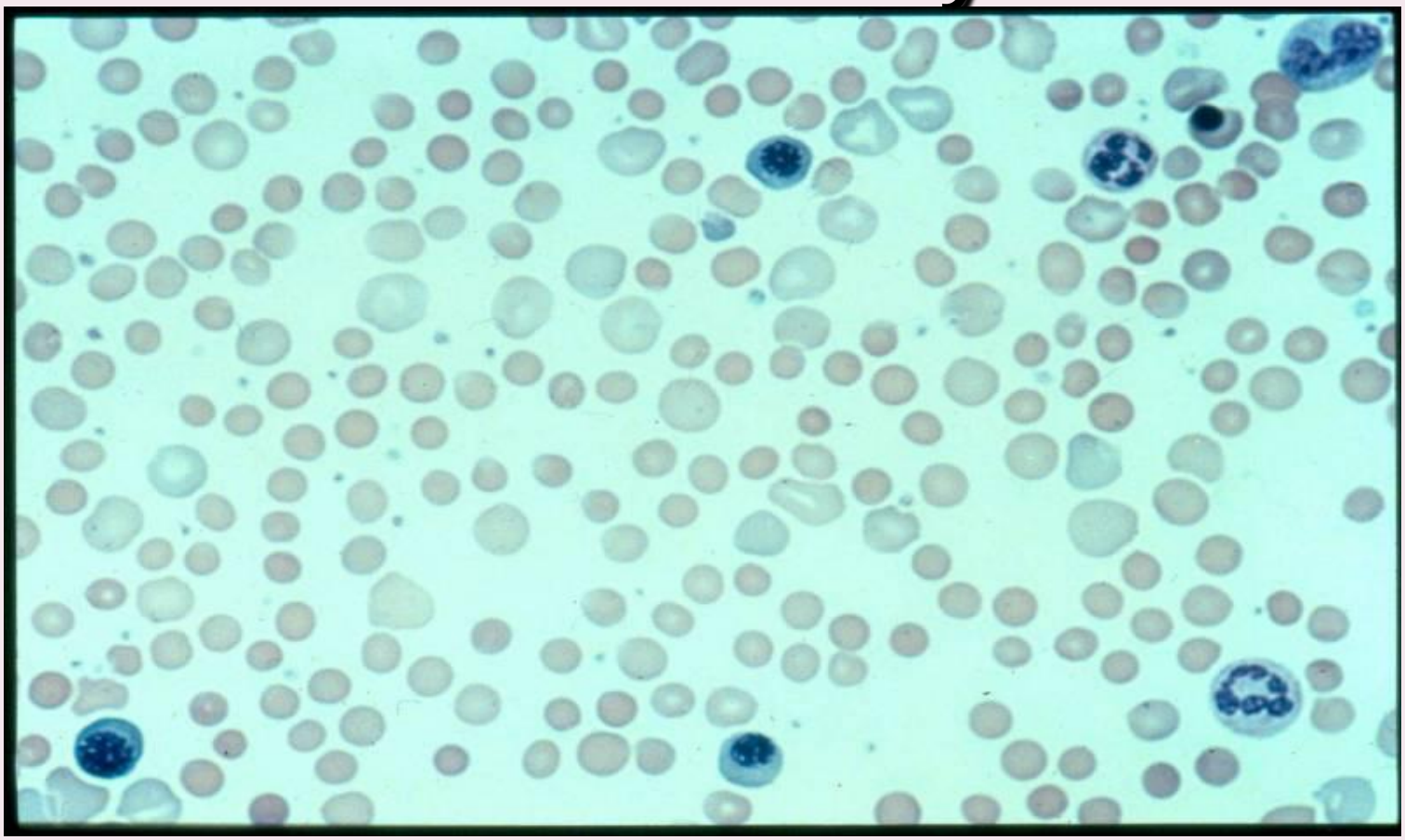




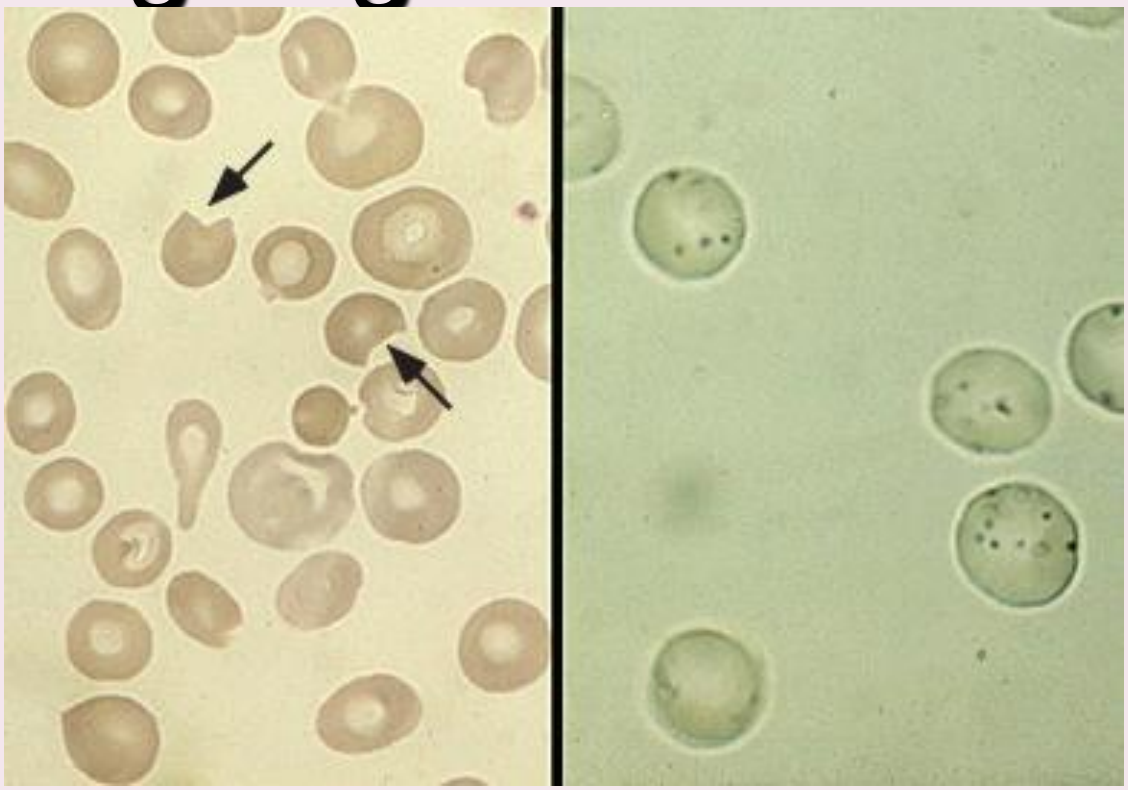




Extravascular Hemolysis

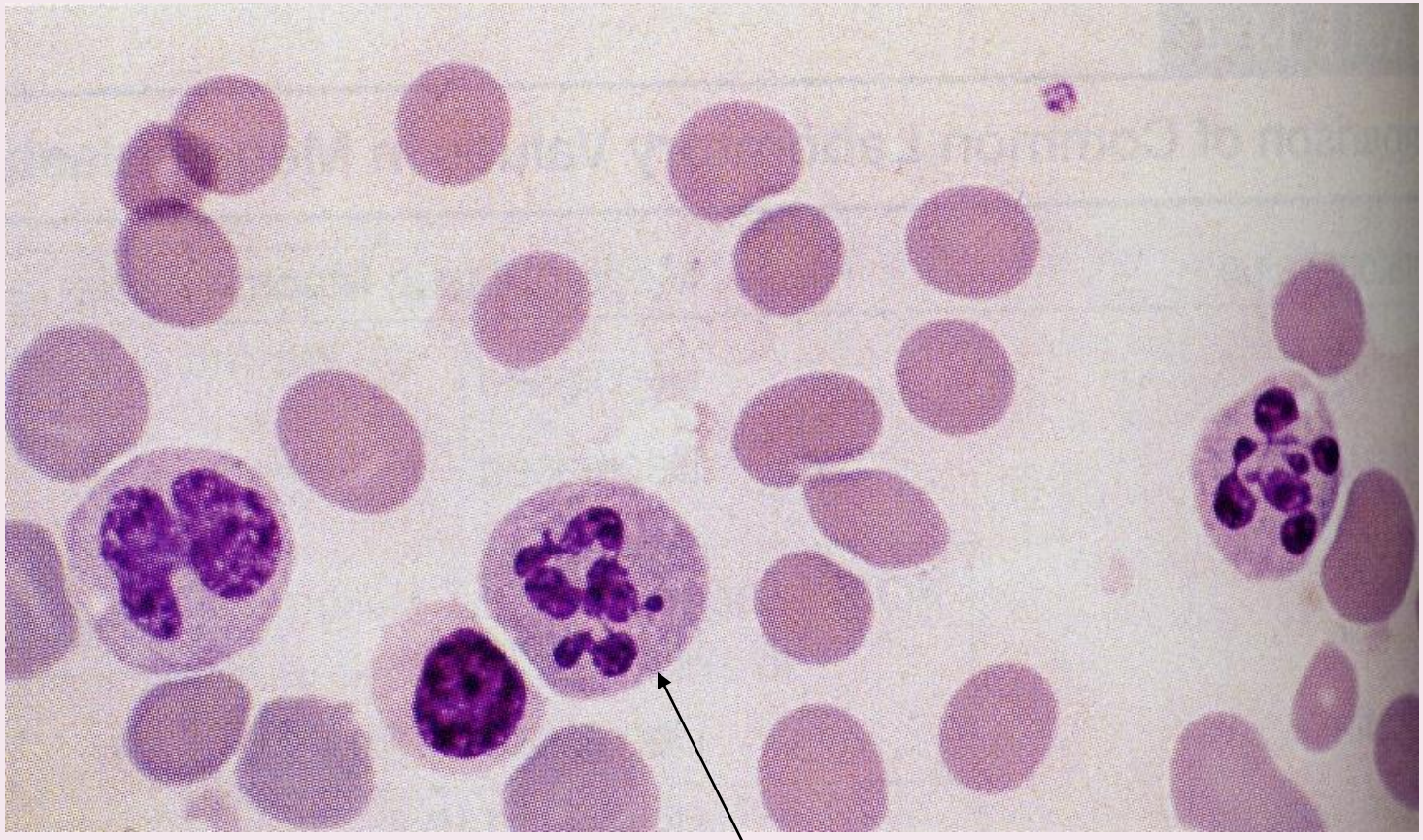


What's going on here?



http://www.uptodate.com/online/content/image.do;jsessionid=49B7B6DD5EECE1FD7800FAECB4D78805.1102?imageKey=HEME%2F8853

PERIPHERAL SMEAR OF MEGALOBLASTIC ANEMIA



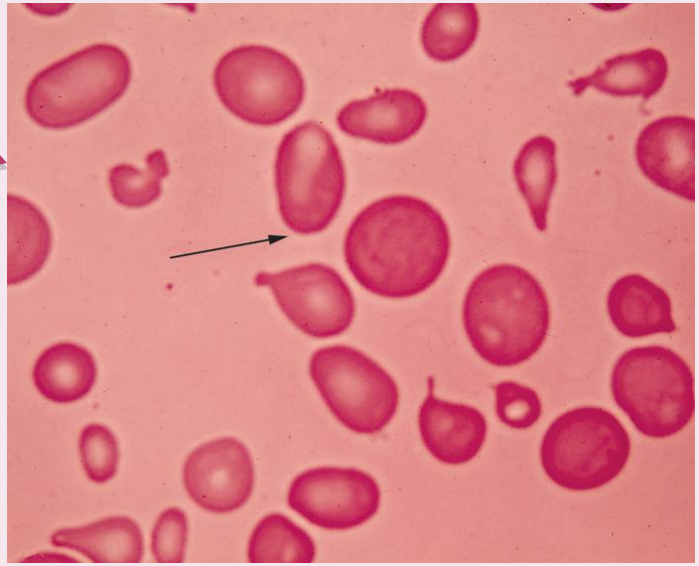
Hypersegmented neutrophil

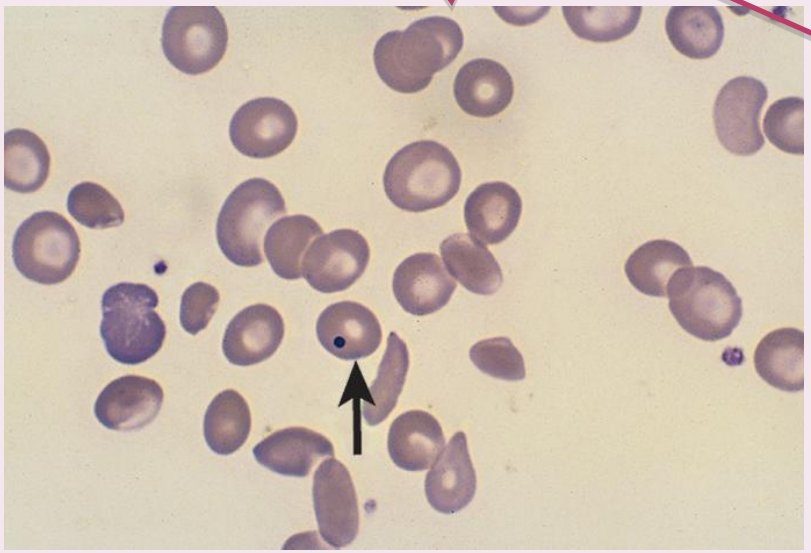
PERIPHERAL SMEAR OF MEGALOBLASTIC ANEMIA

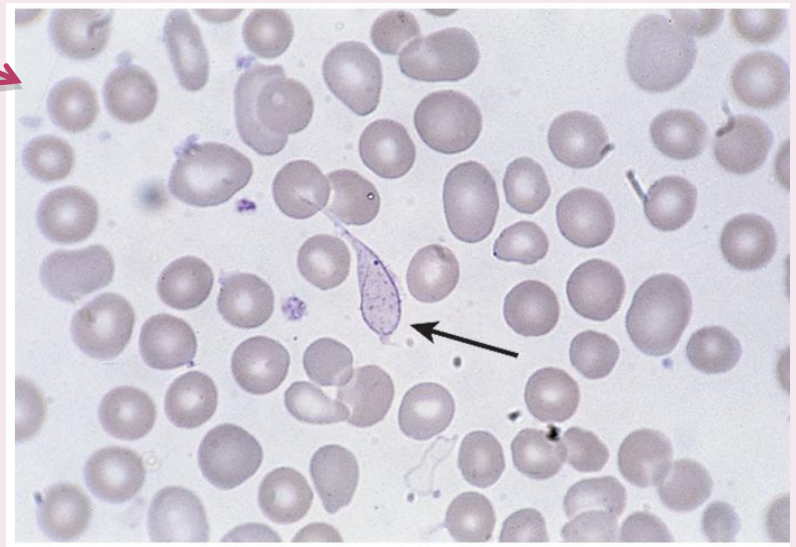
Oval Macrocyte

Howell Jolly Body

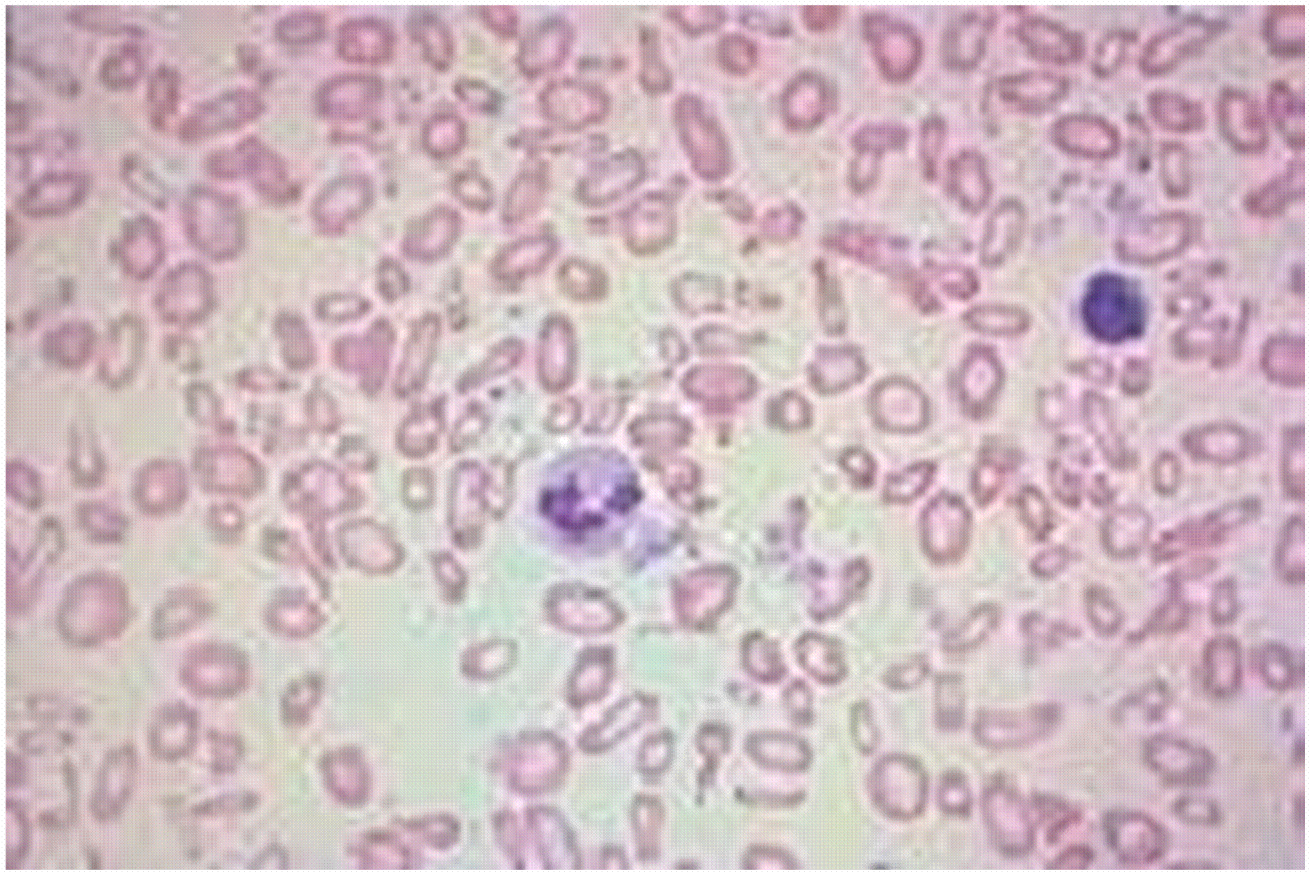
Cabot ring







Microcytic hypochromic RBCs



Macrocytic/megaloblastic RBCs

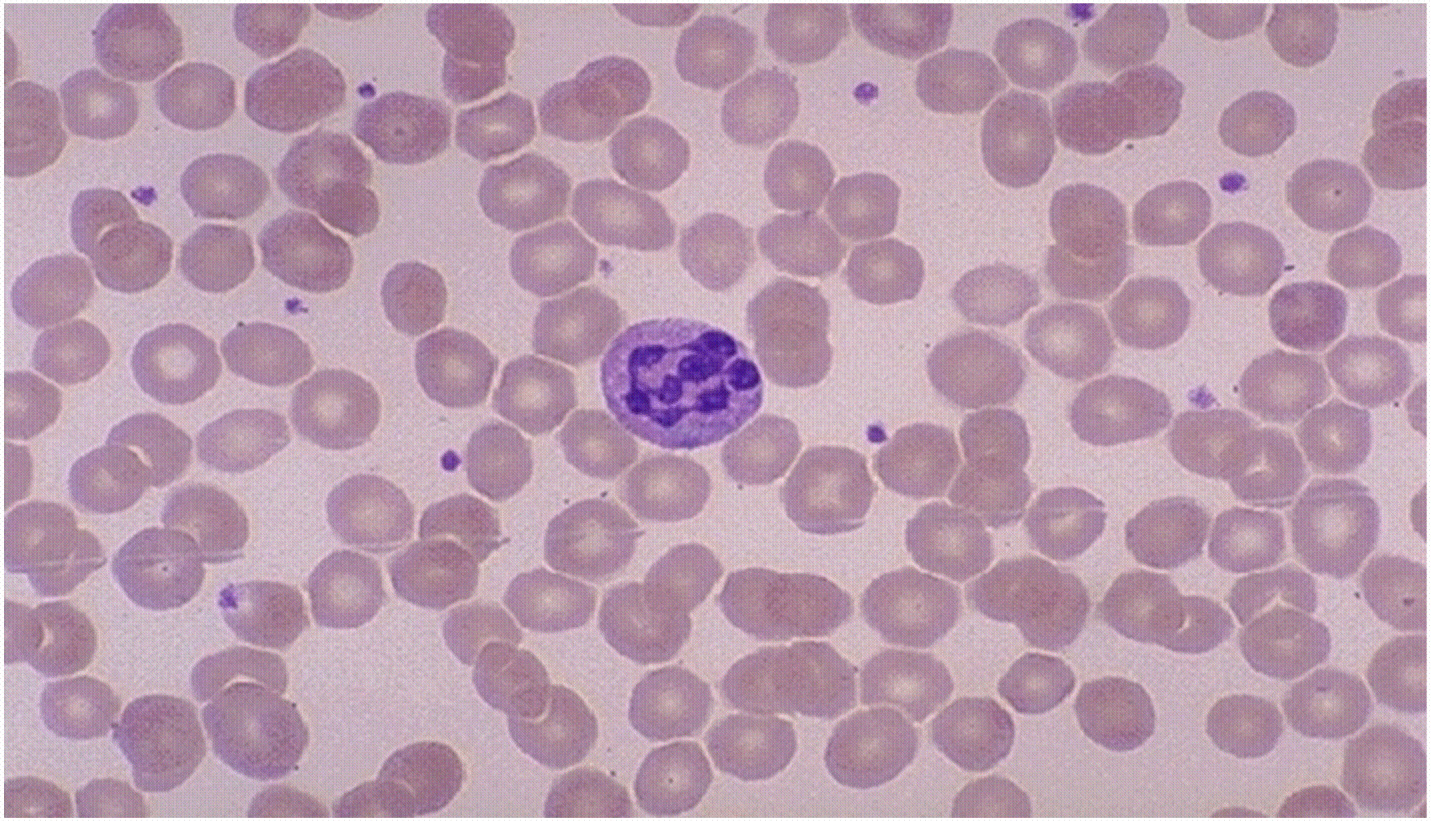
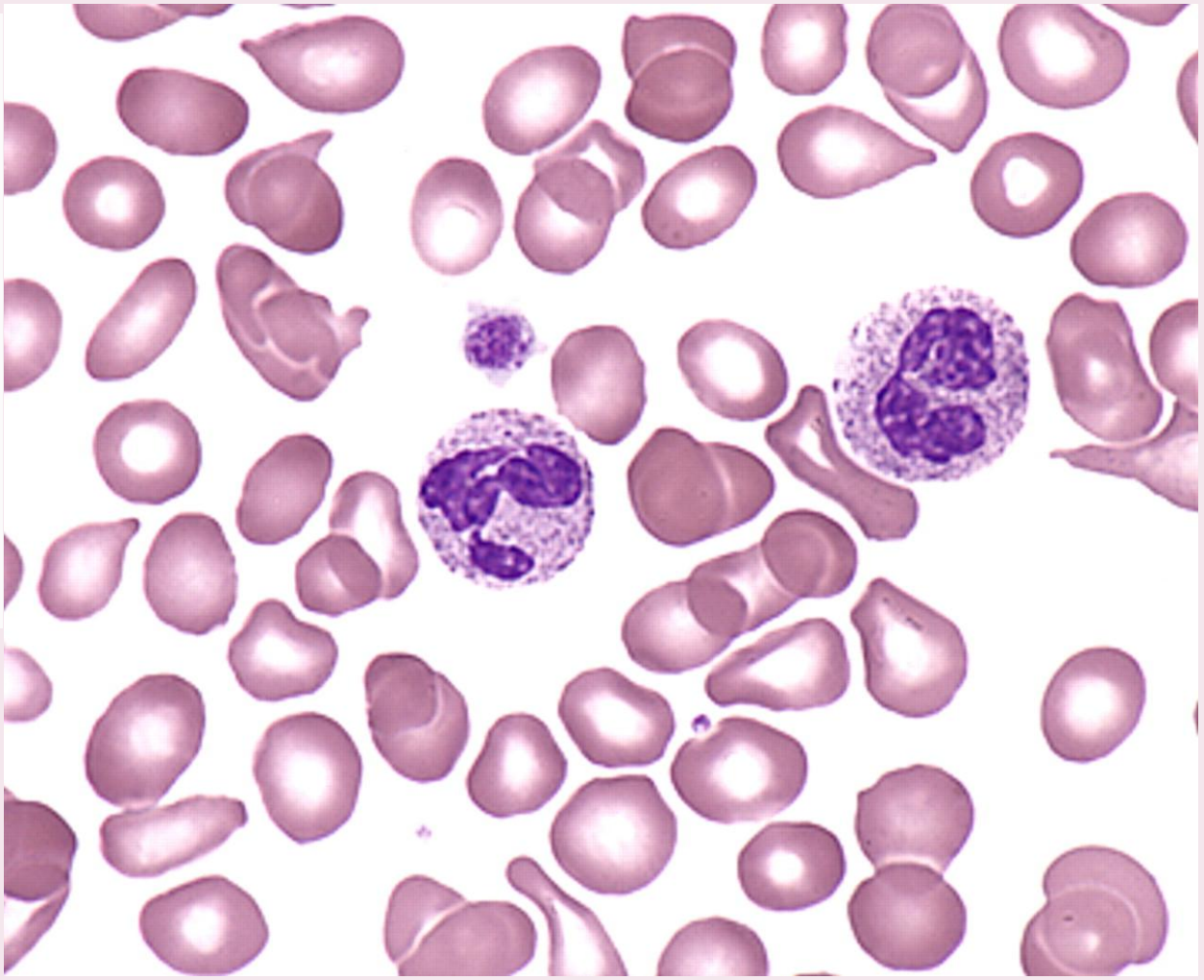
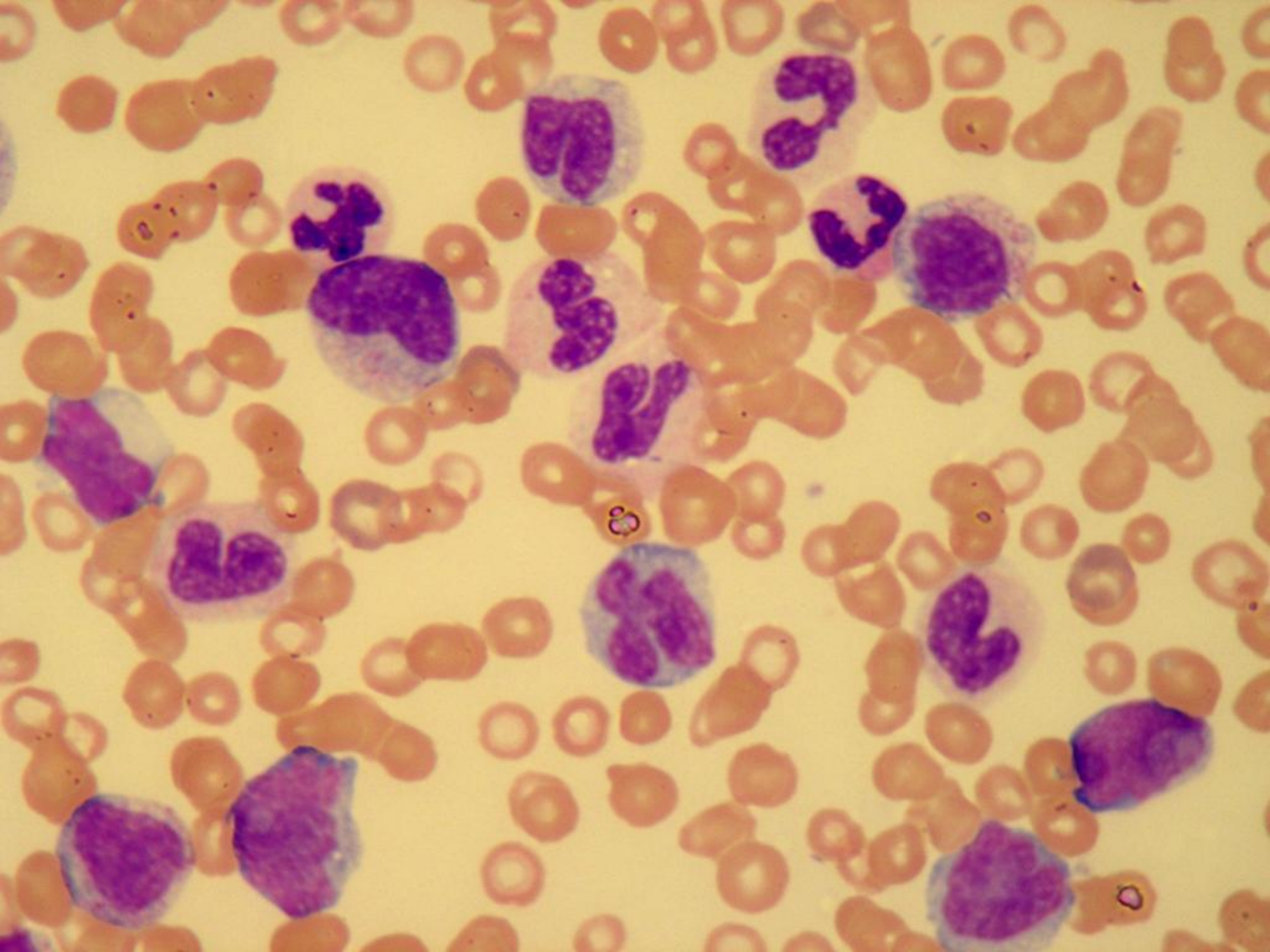


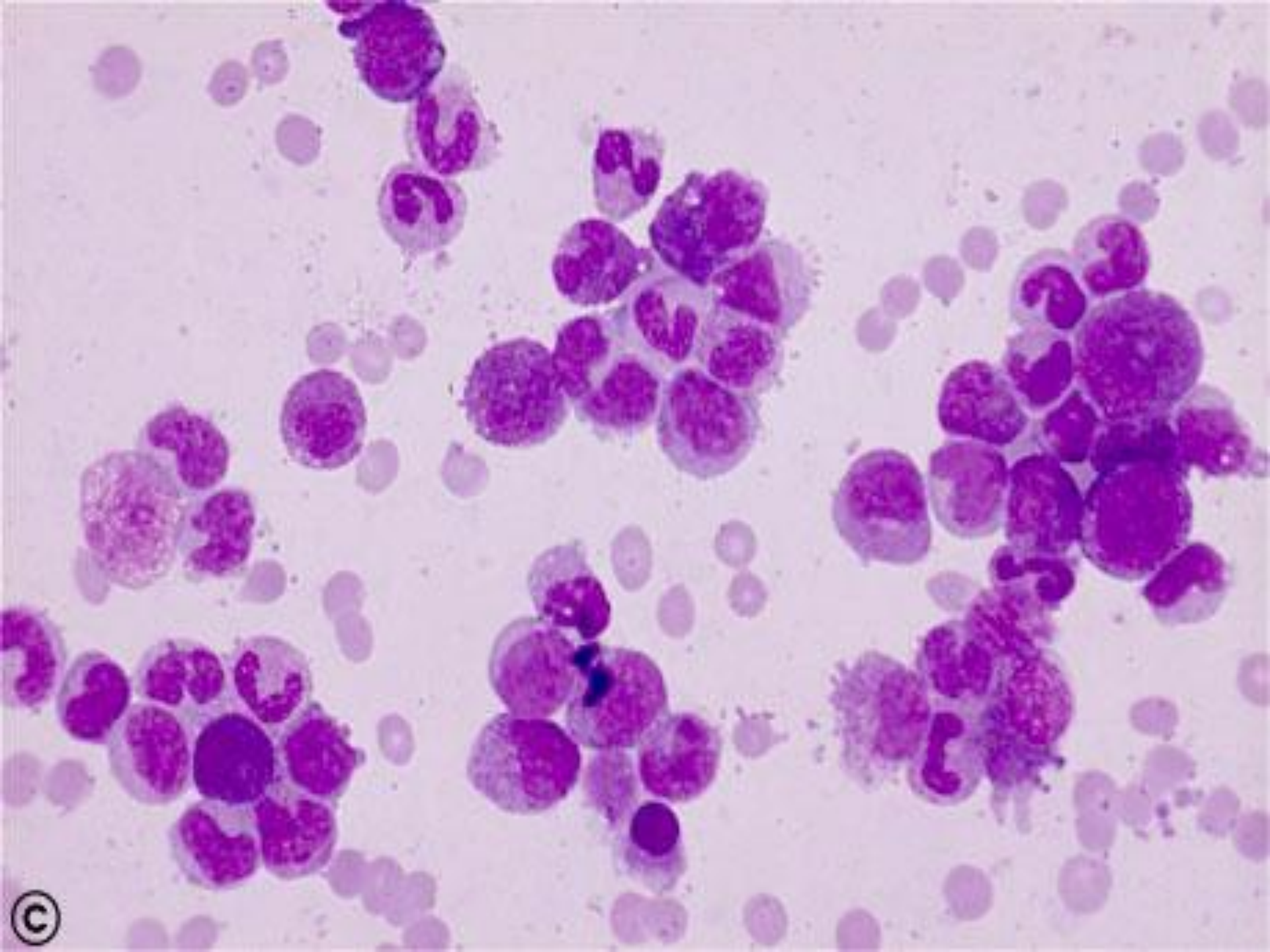
Figure 5. A typical picture in the peripheral blood may include dacrocytes, dysplastic granulocytes and large platelets



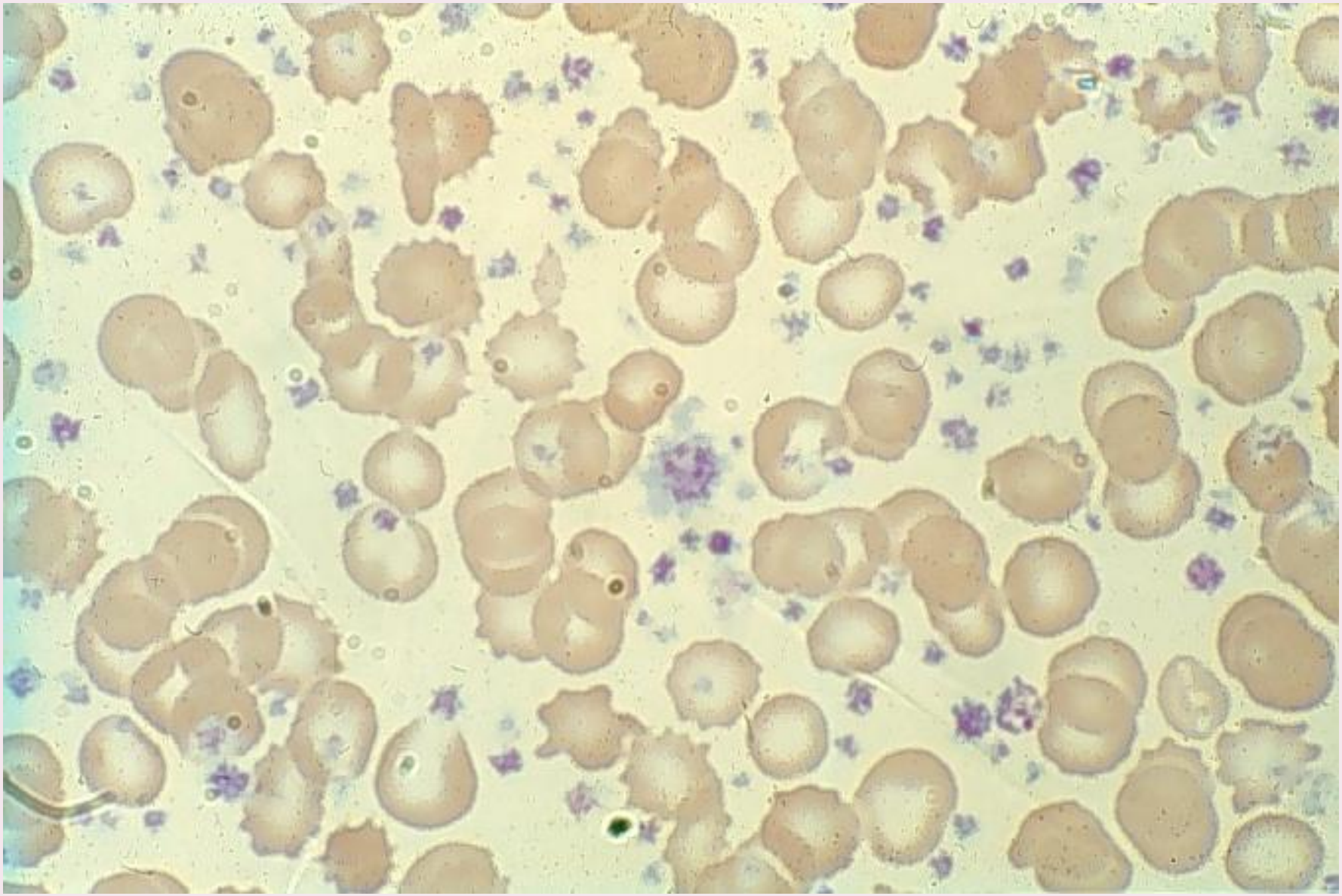
Maslak, P. ASH Image Bank 2004;2004:101216

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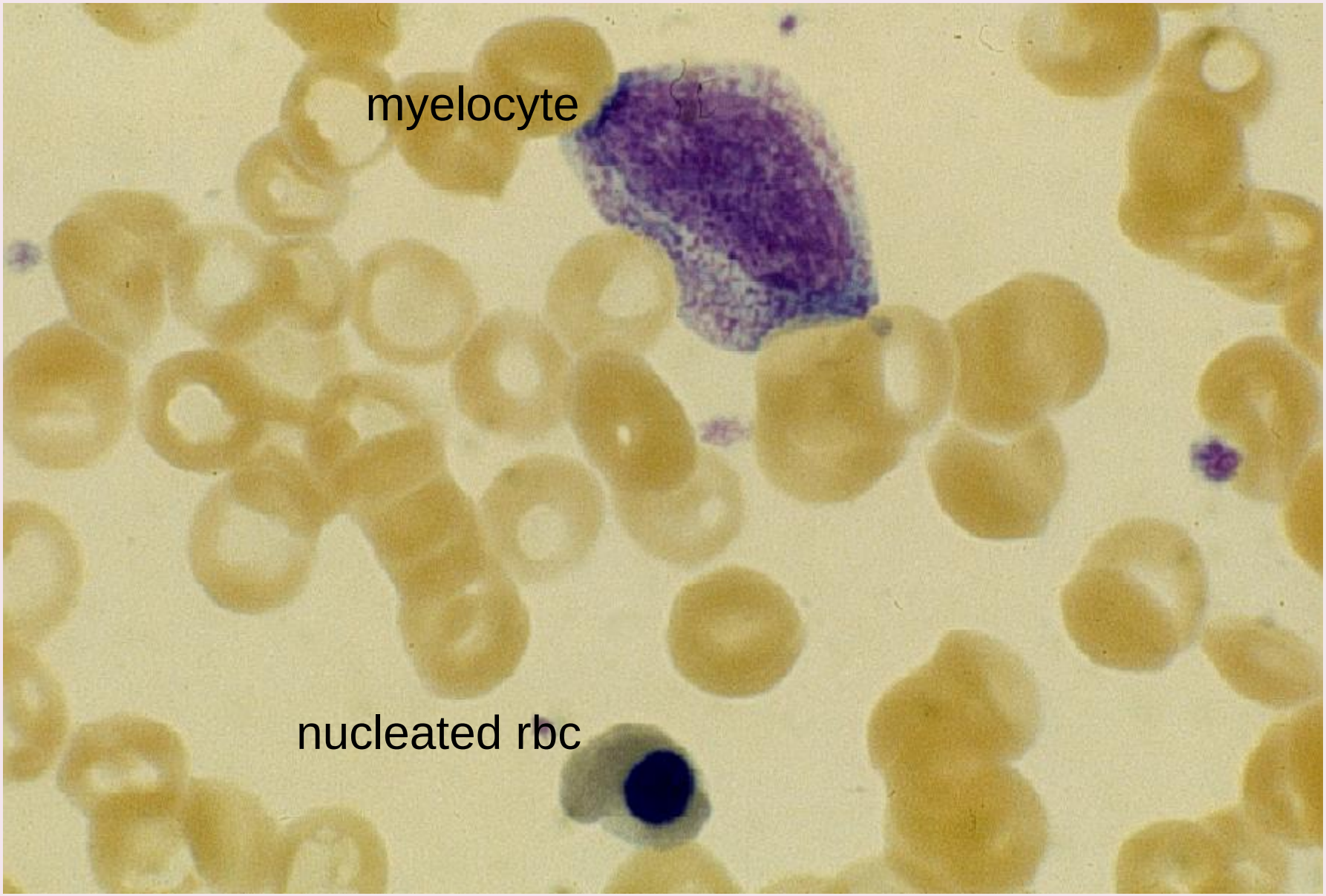


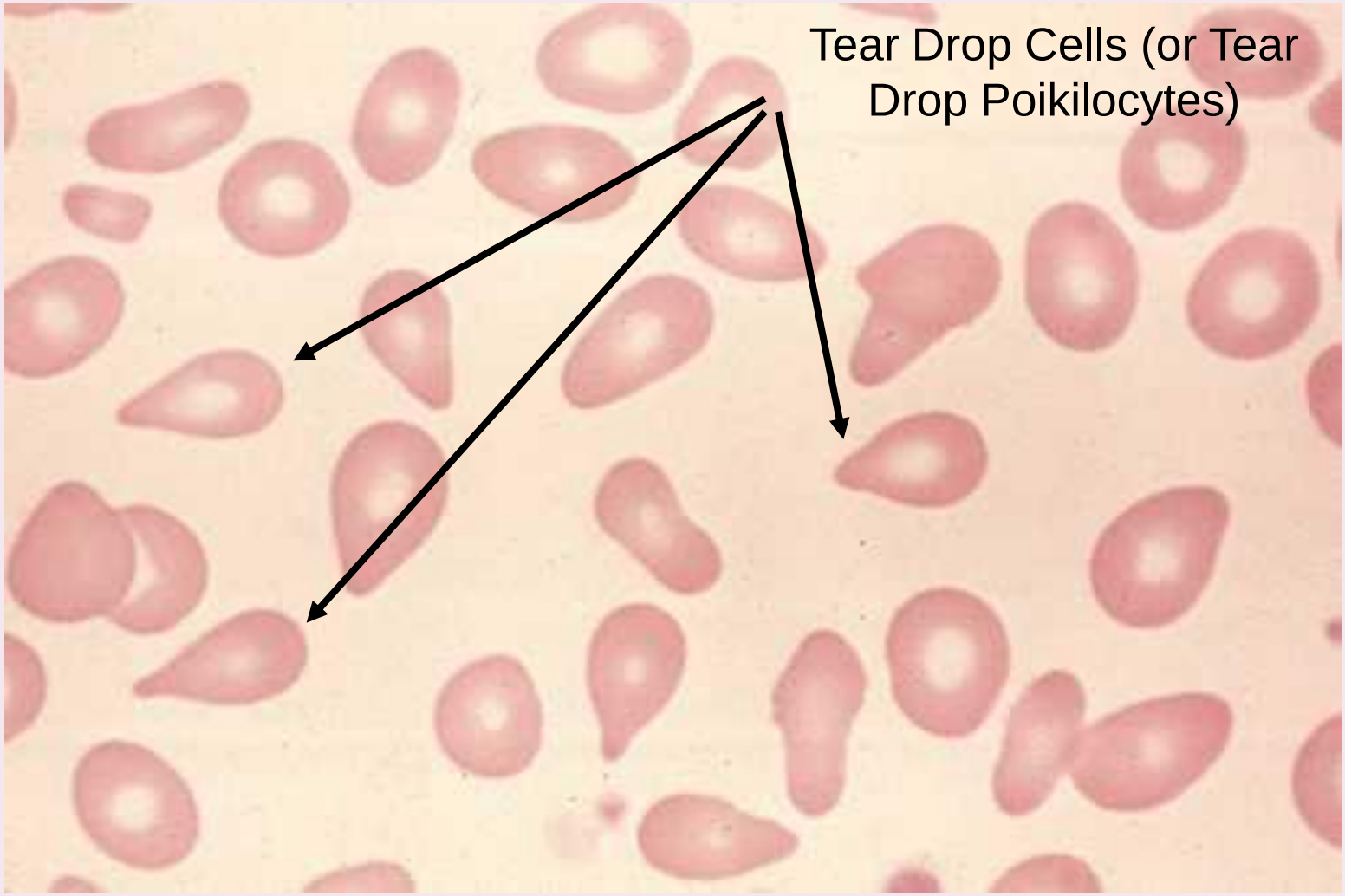


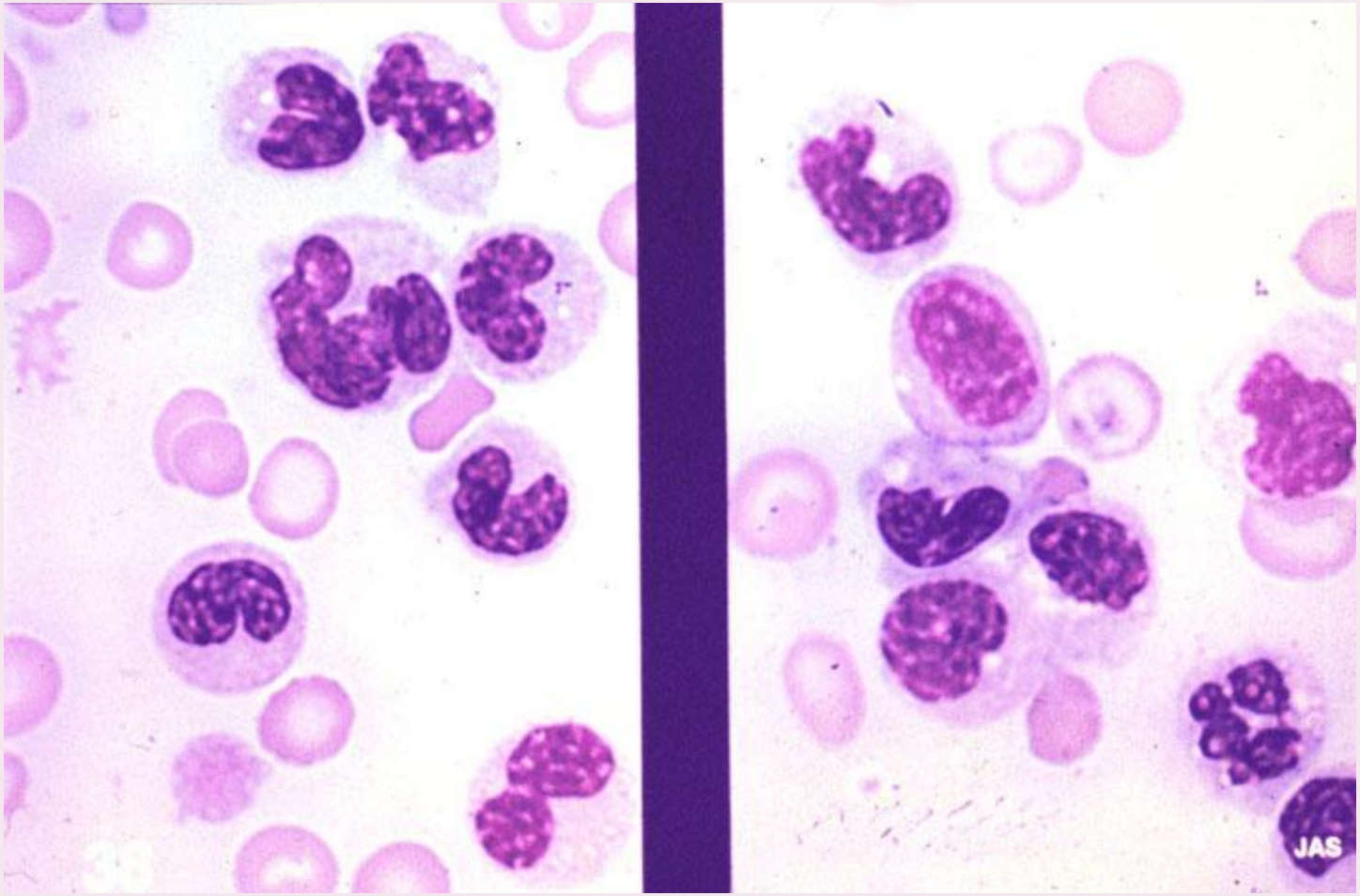
Essential Thrombocythemia

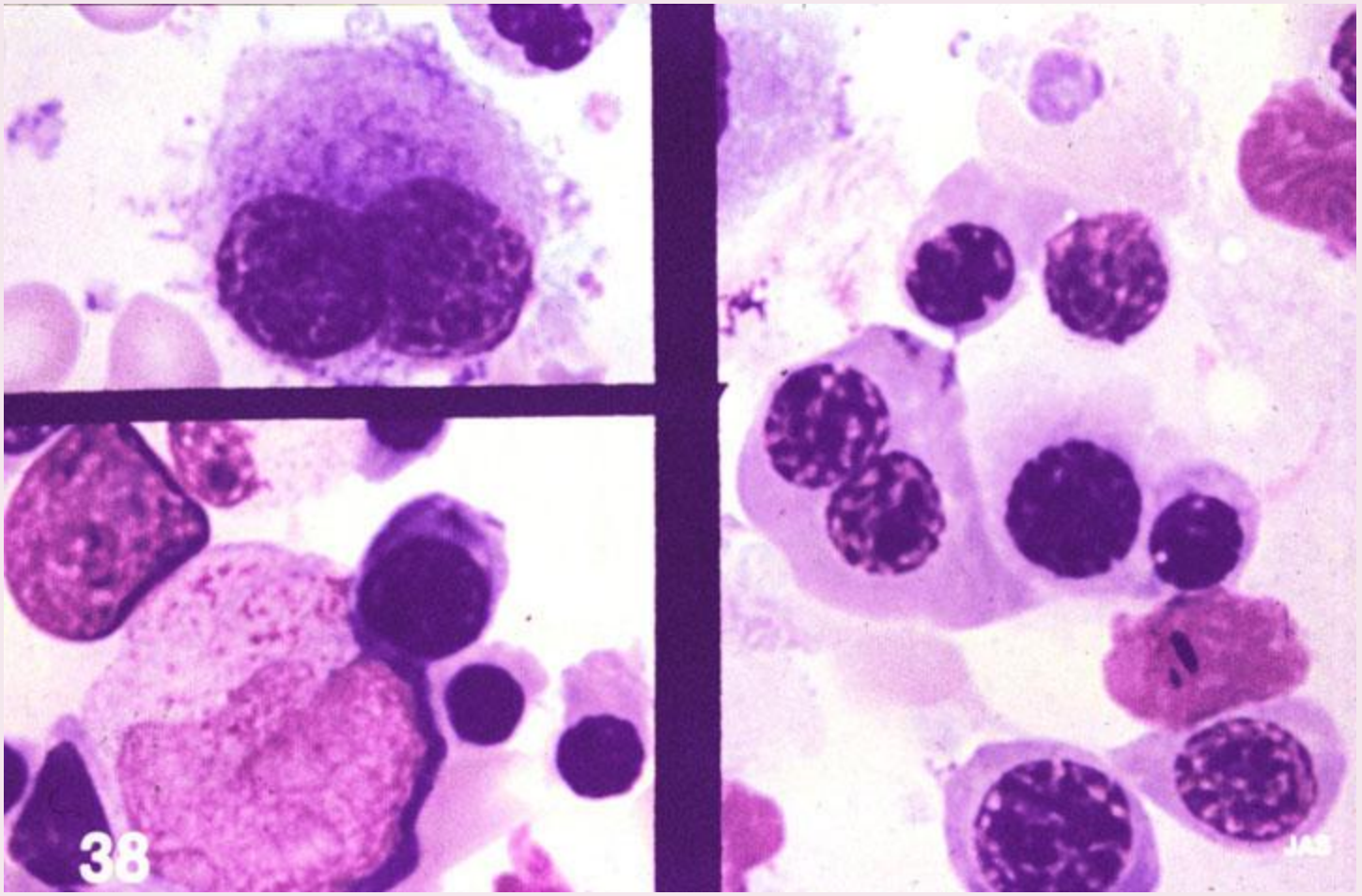


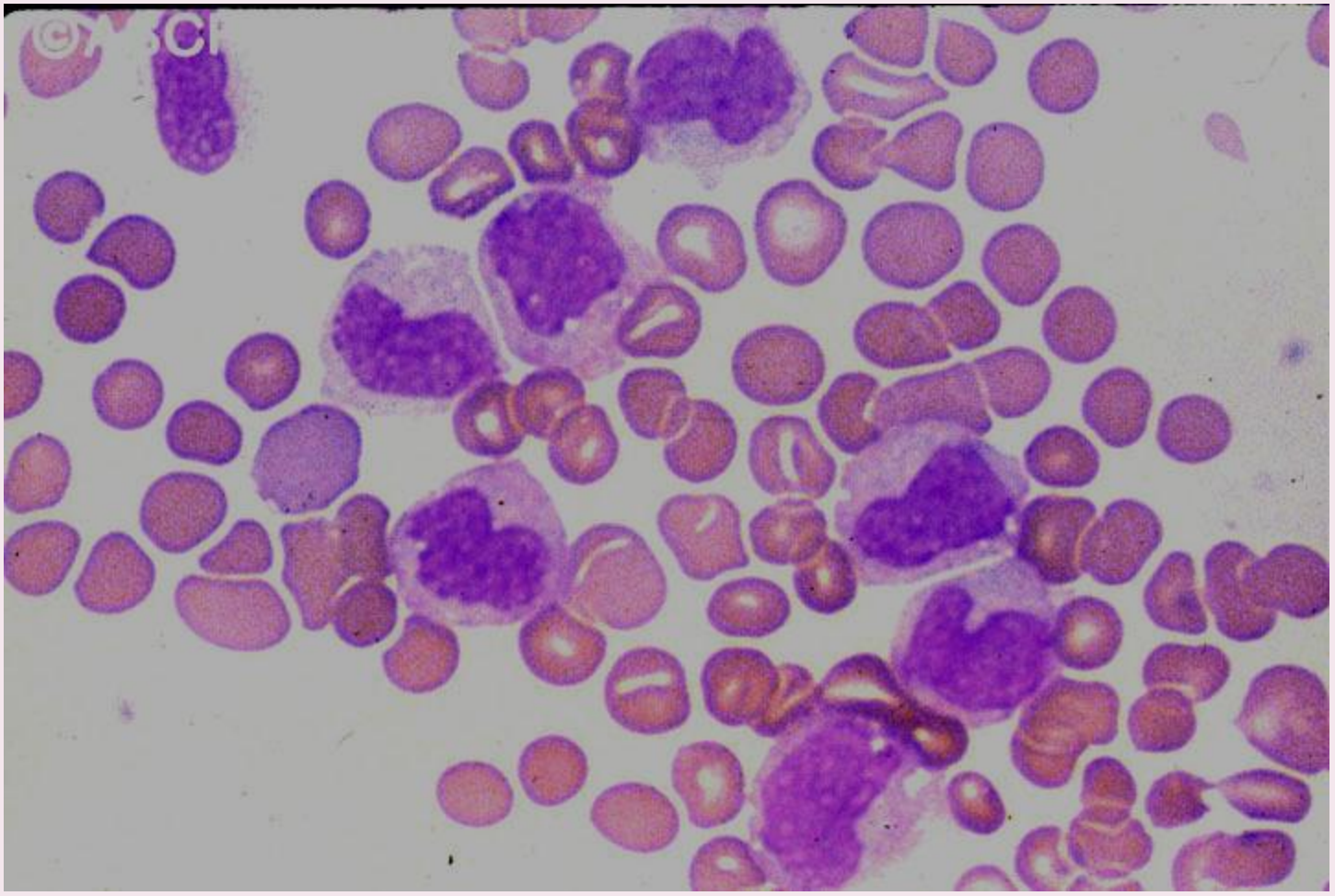
note giant platelets


myelocyte
nucleated rbc

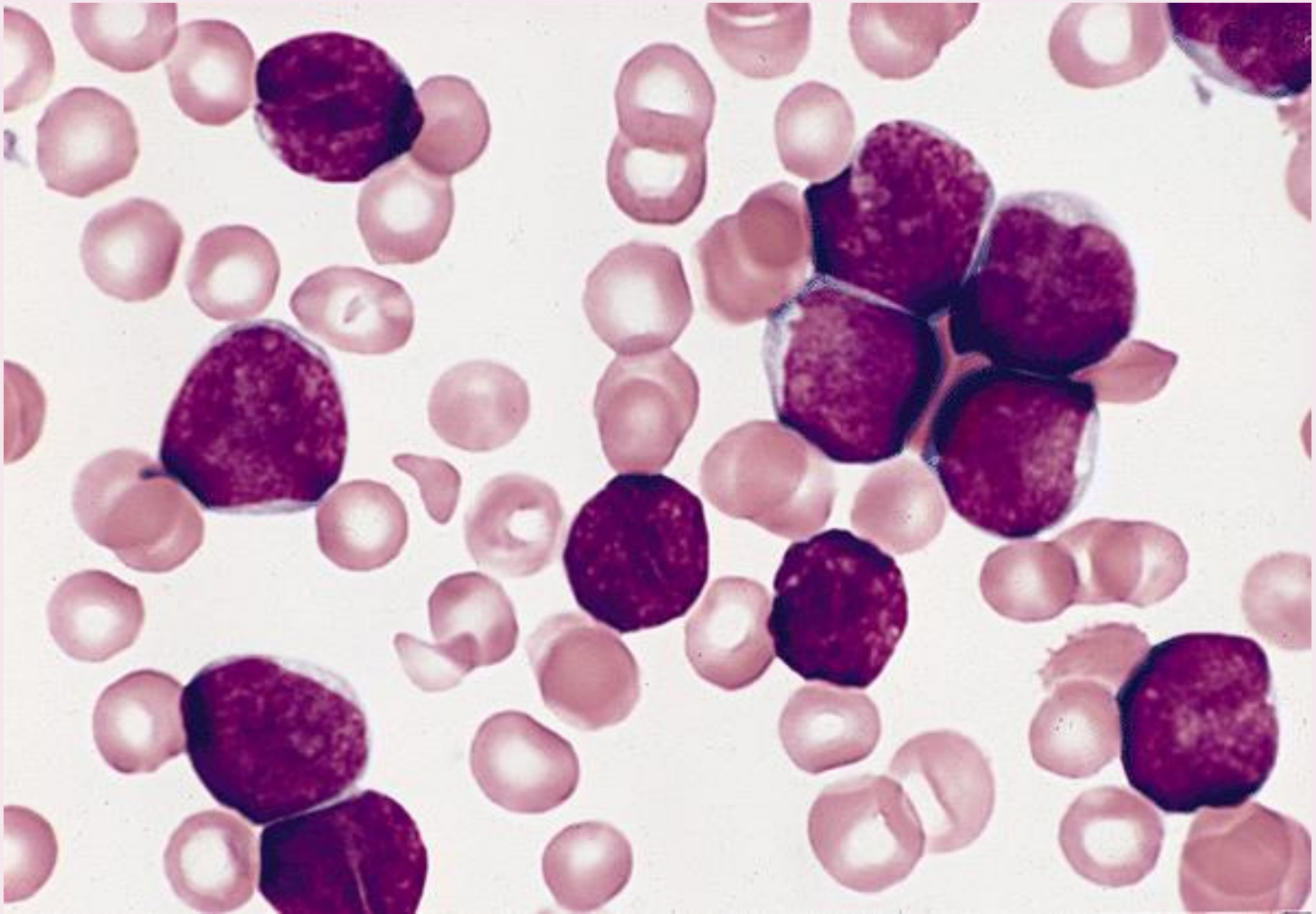

Tear Drop Cells (or Tear Drop Poikilocytes)


JAS

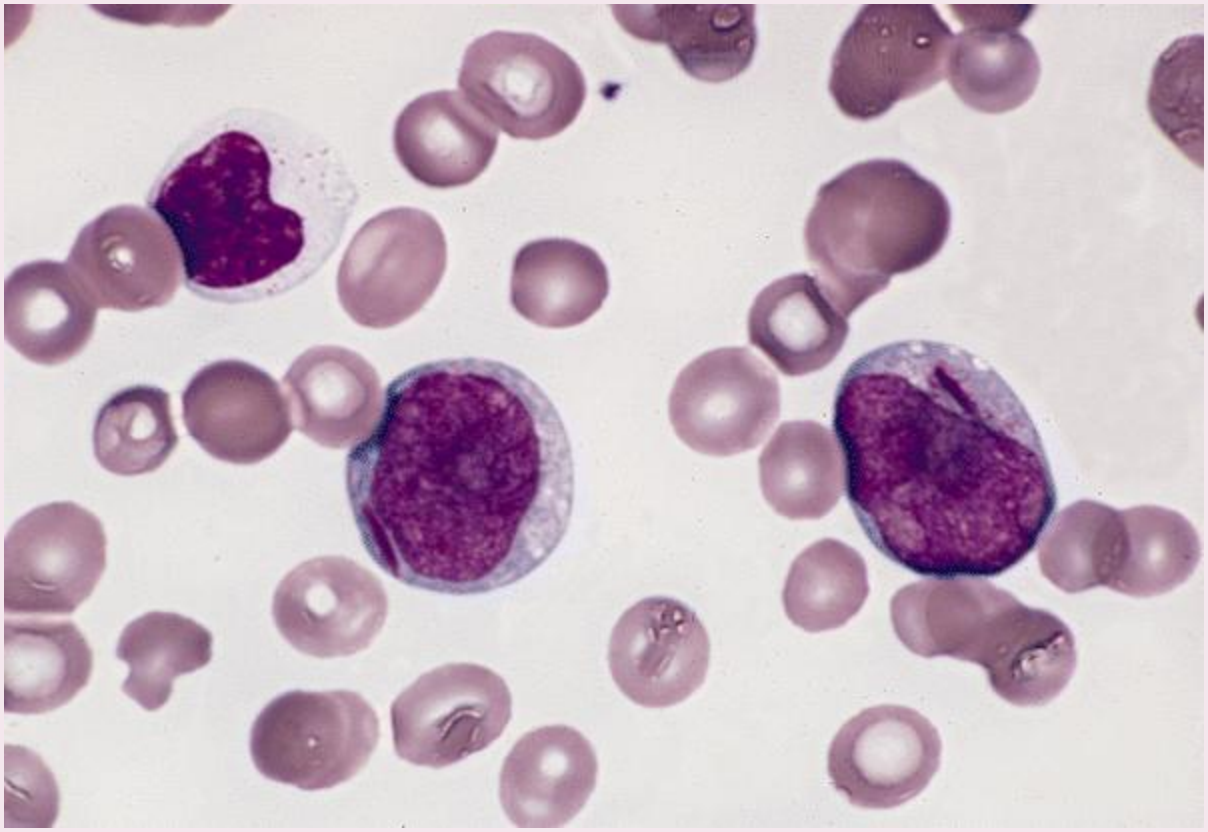

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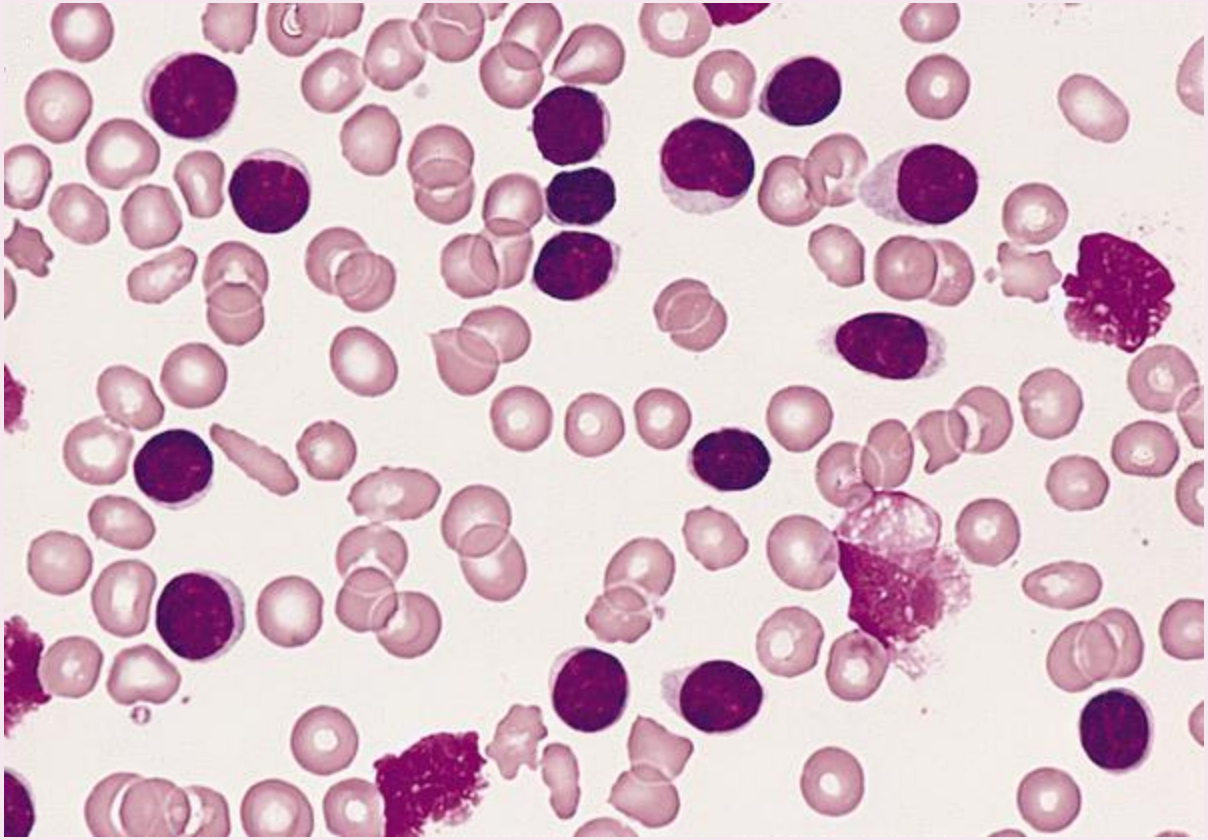
Acute Lymphoblastic Leukemia



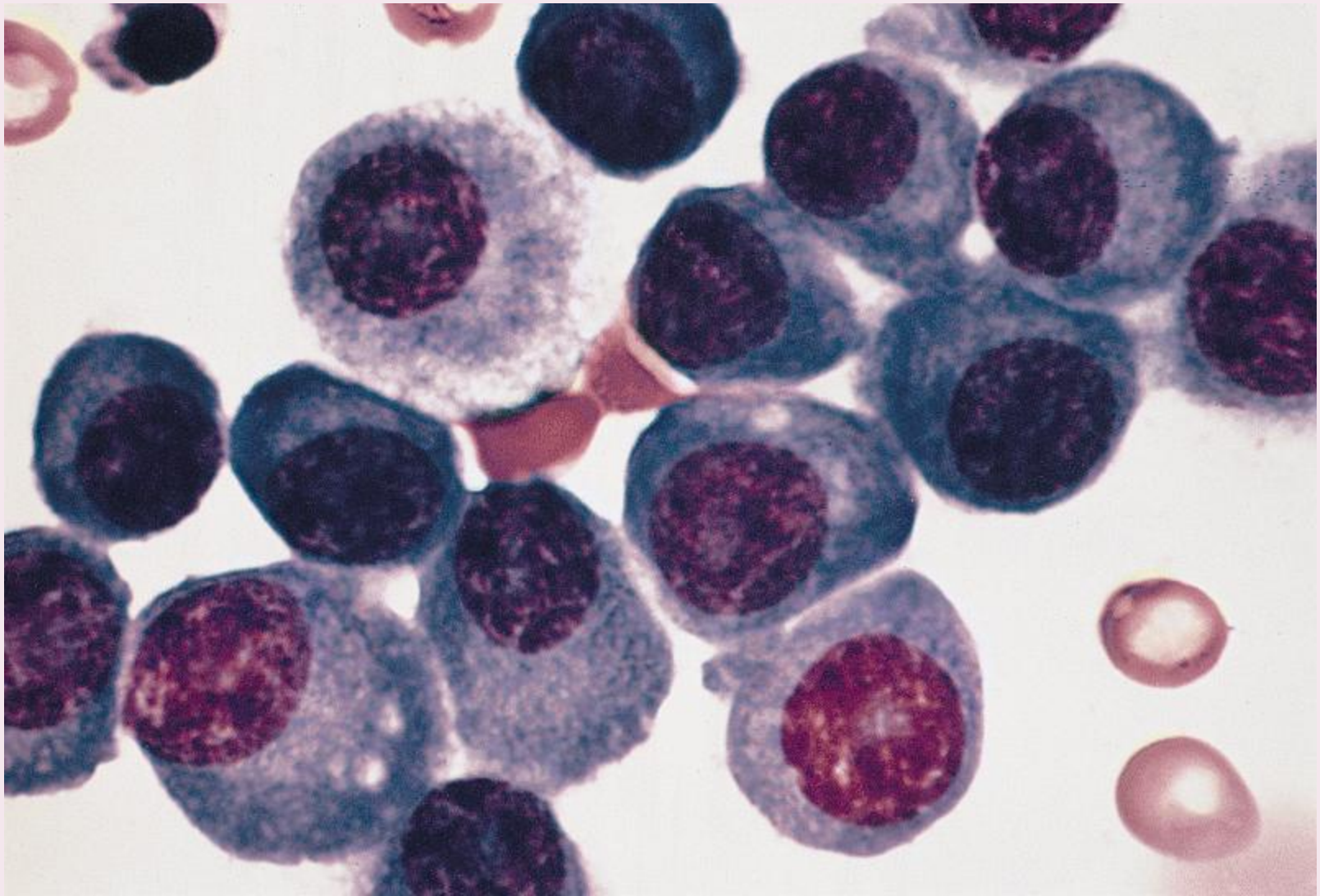
Acute Myelogenous Leukemia



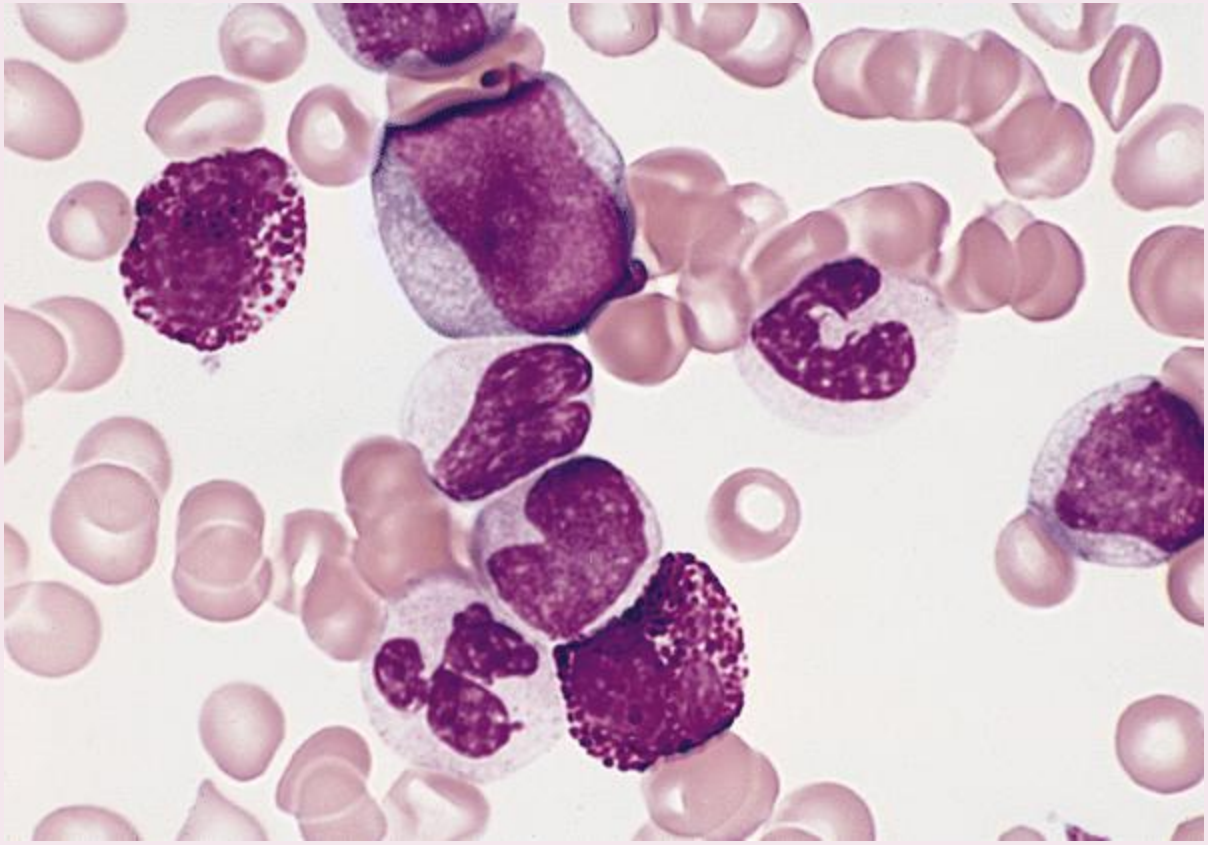
Chronic Lymphocytic Leukemia



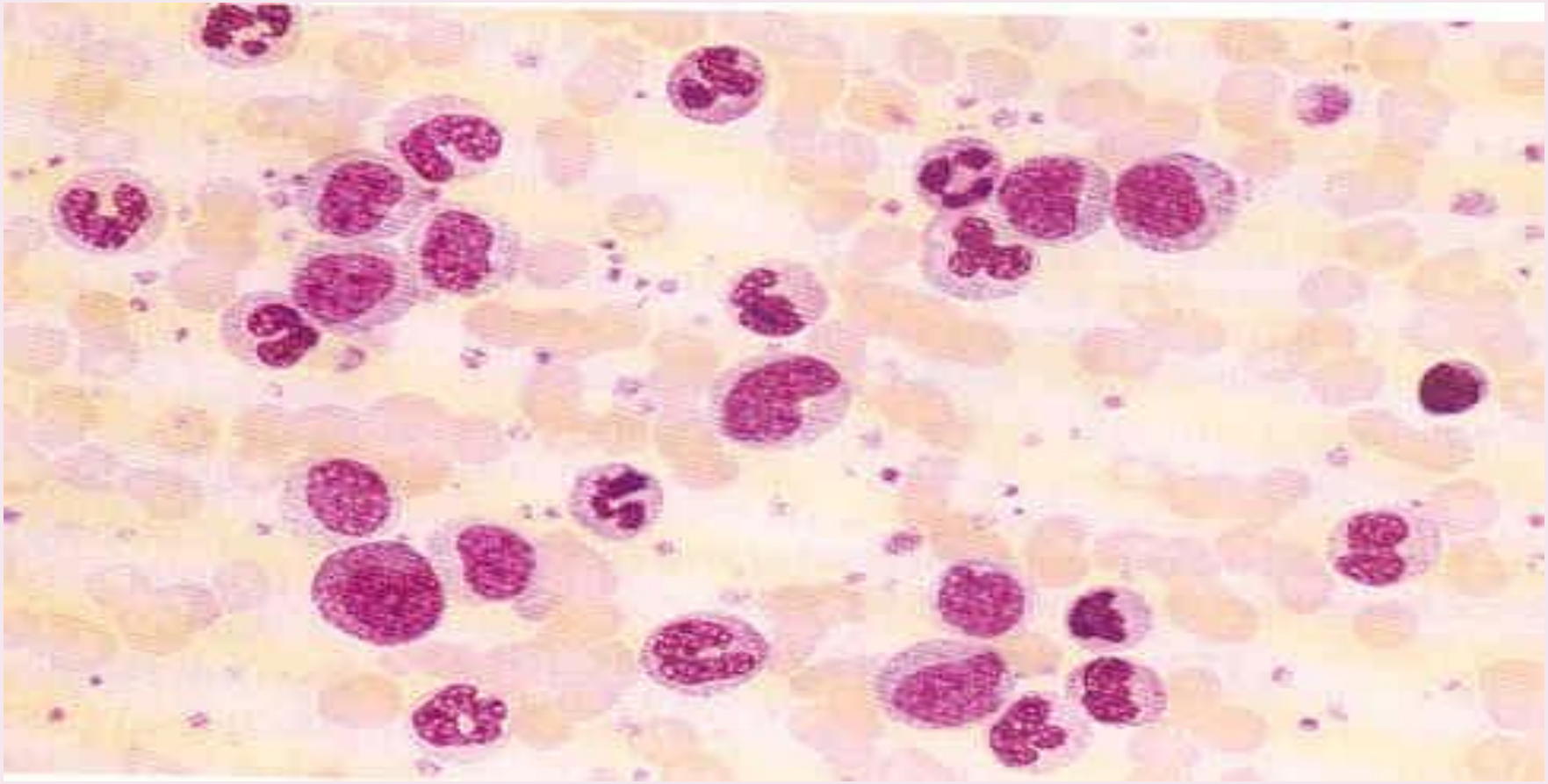
Multiple Myeloma



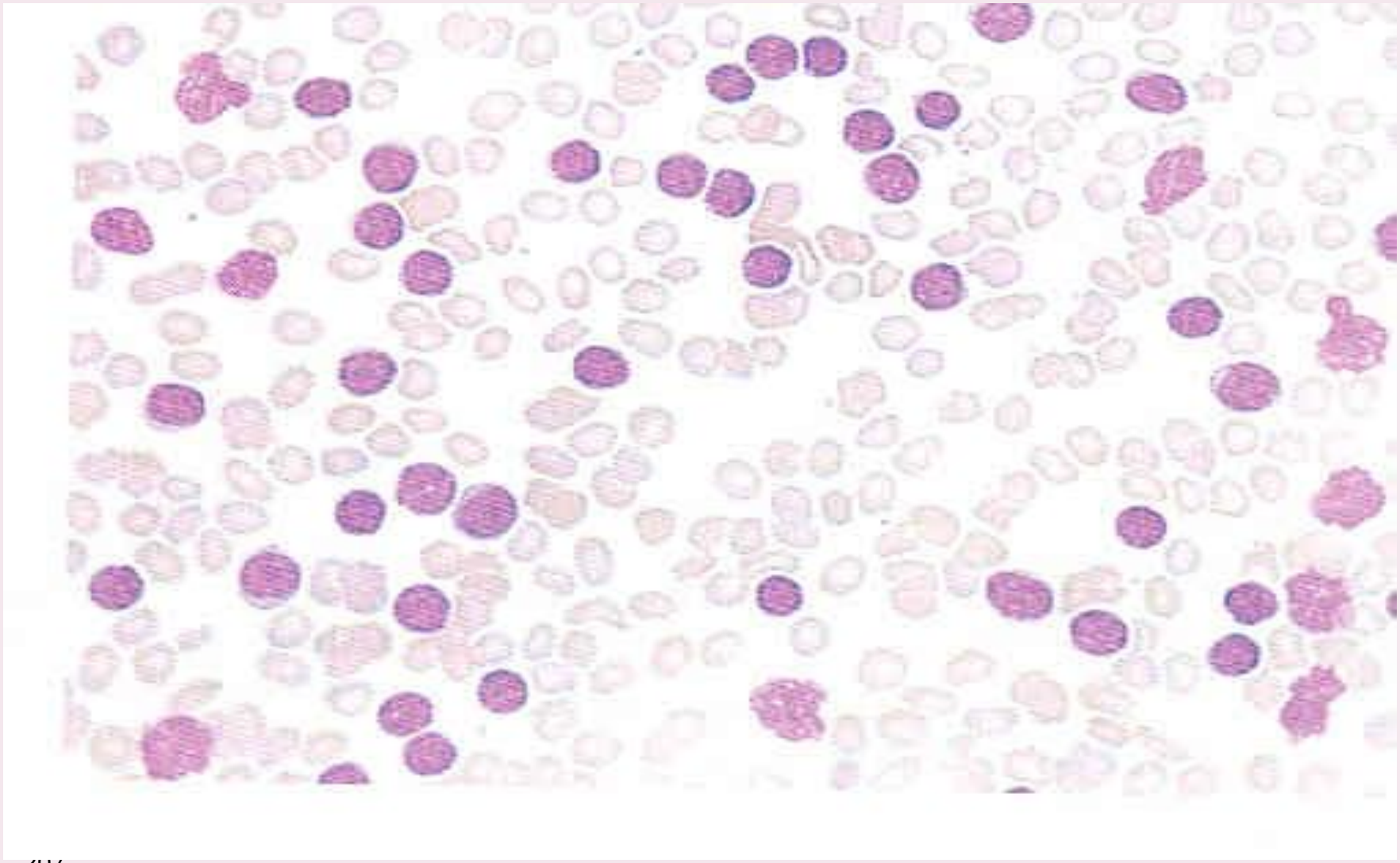
Chronic Myelogenous Leukemia

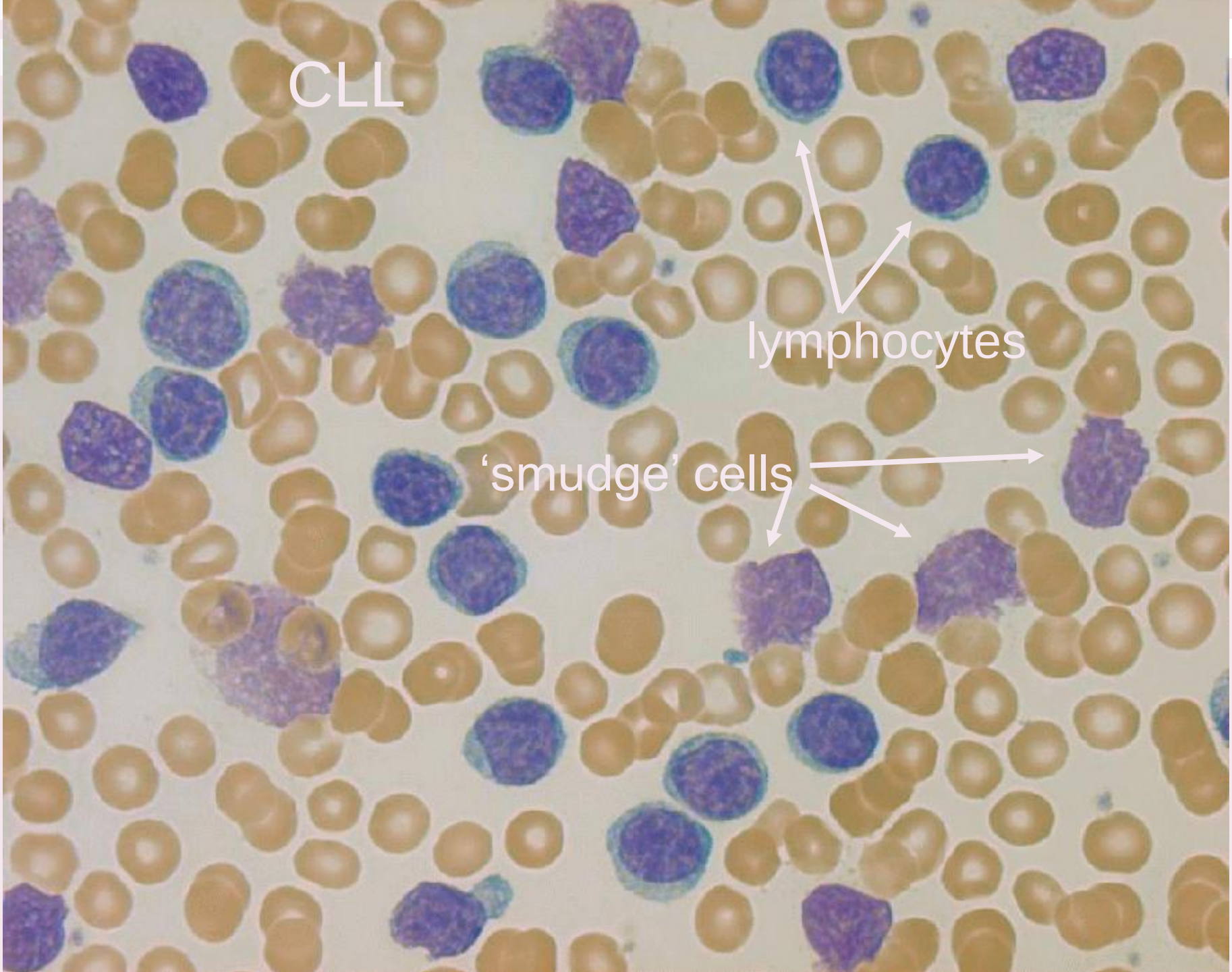


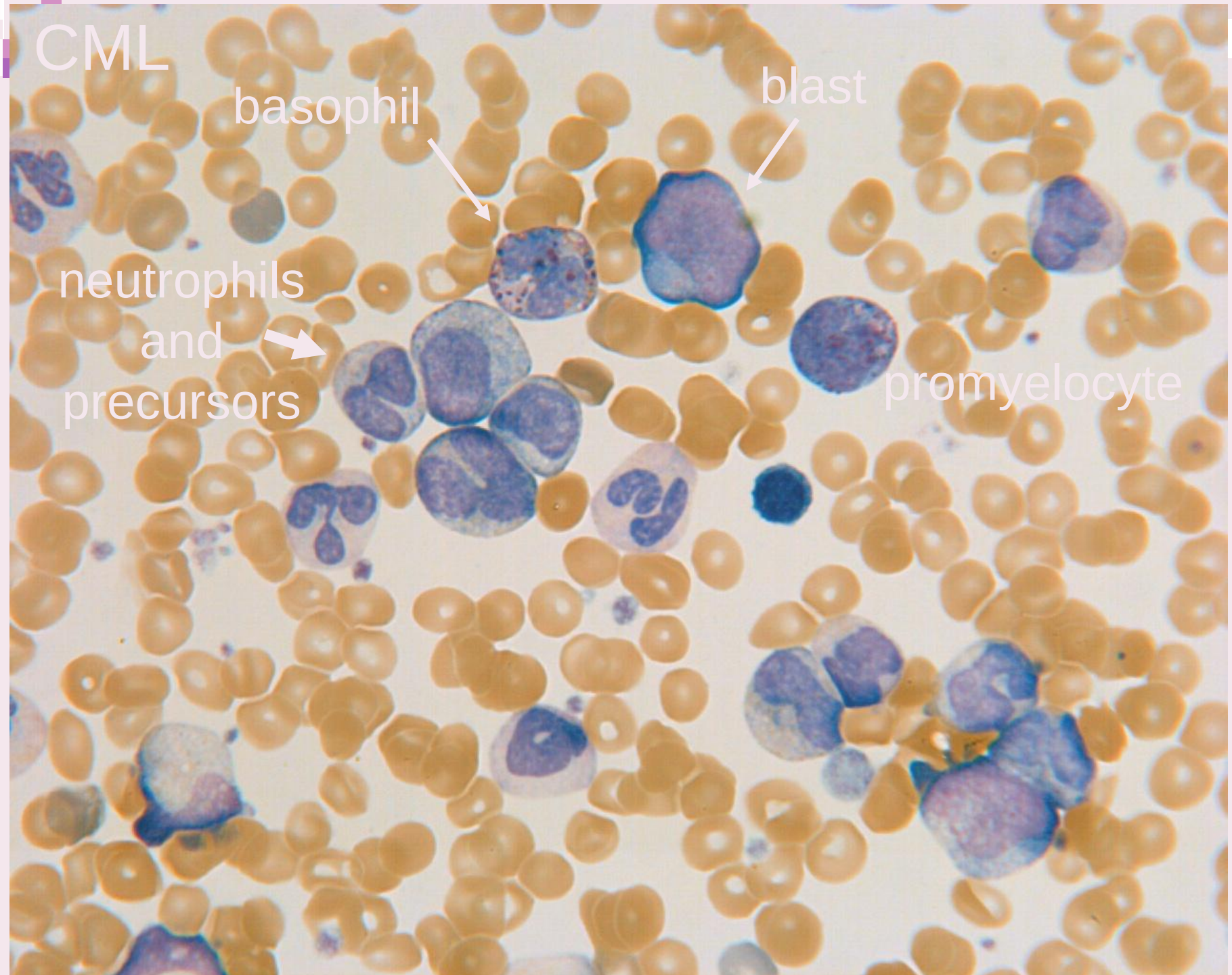
fig

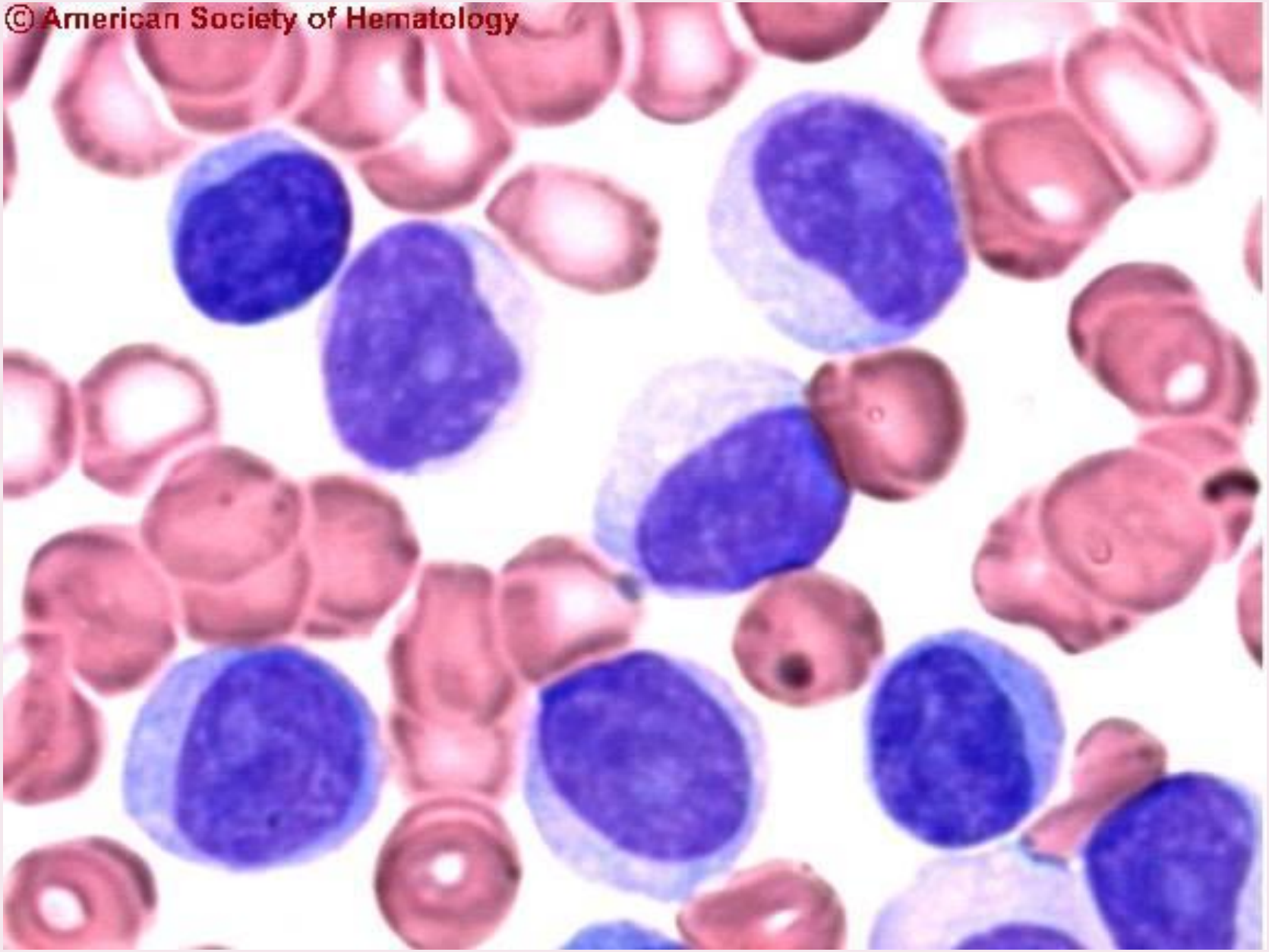


Fig(3)

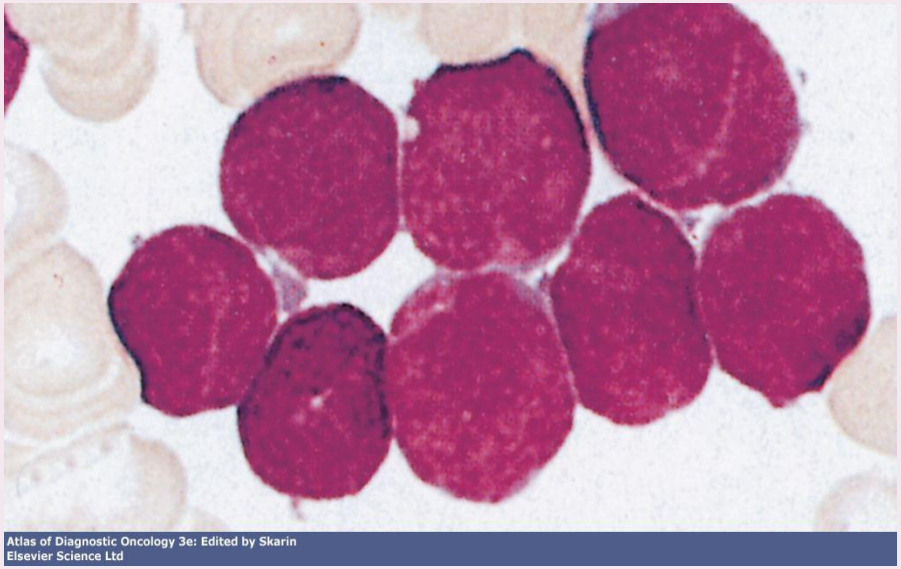


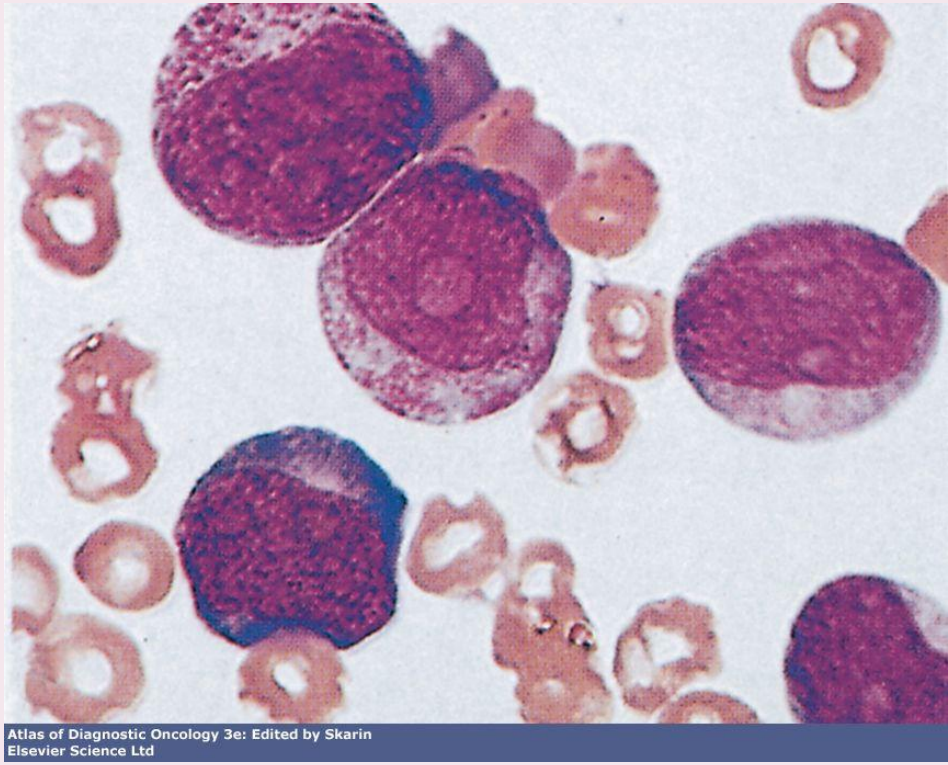

CLL
lymphocytes
‘smudge’ cells

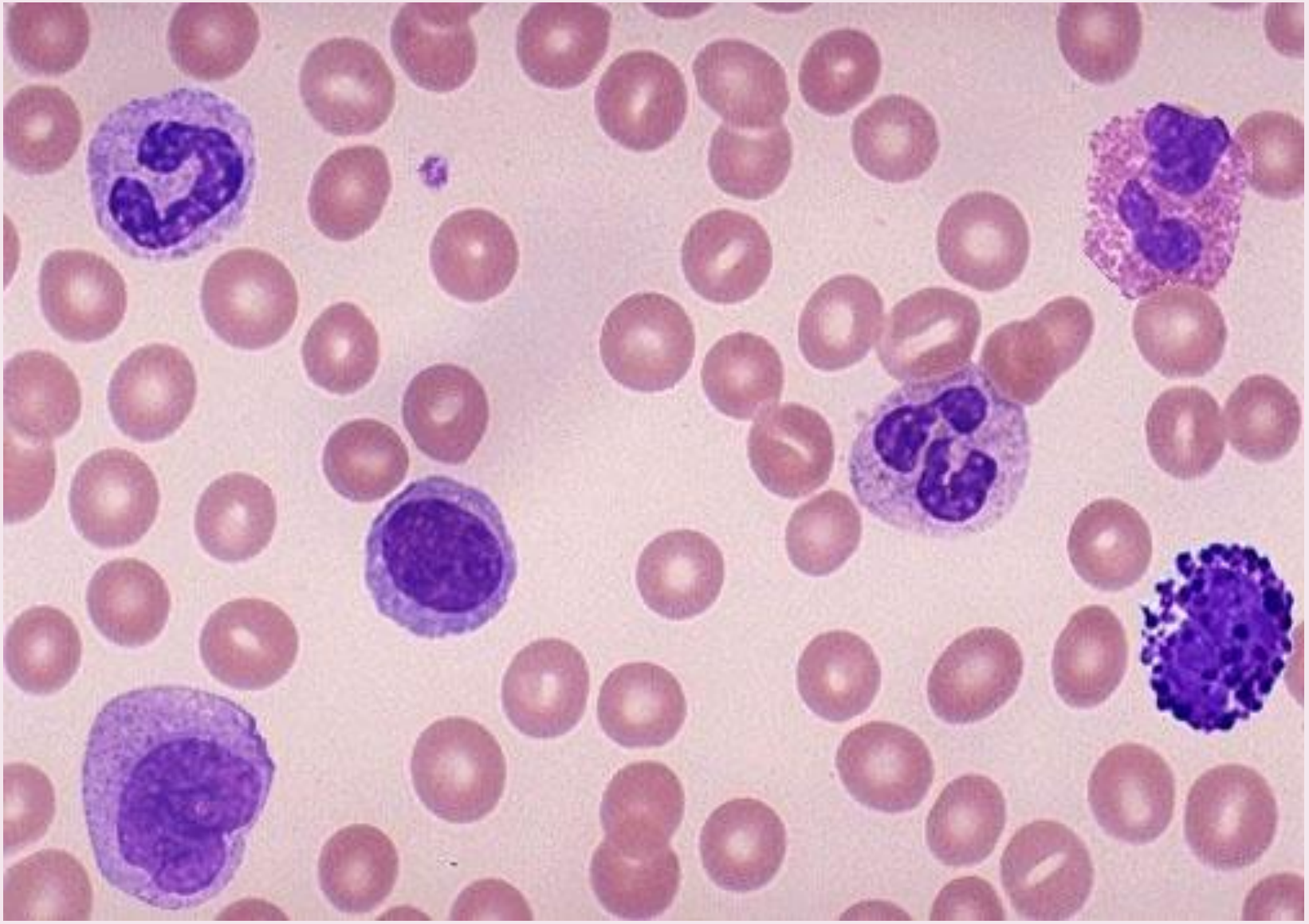

CML
basophil
blast
neutrophils
and
precursors
promyelocyte

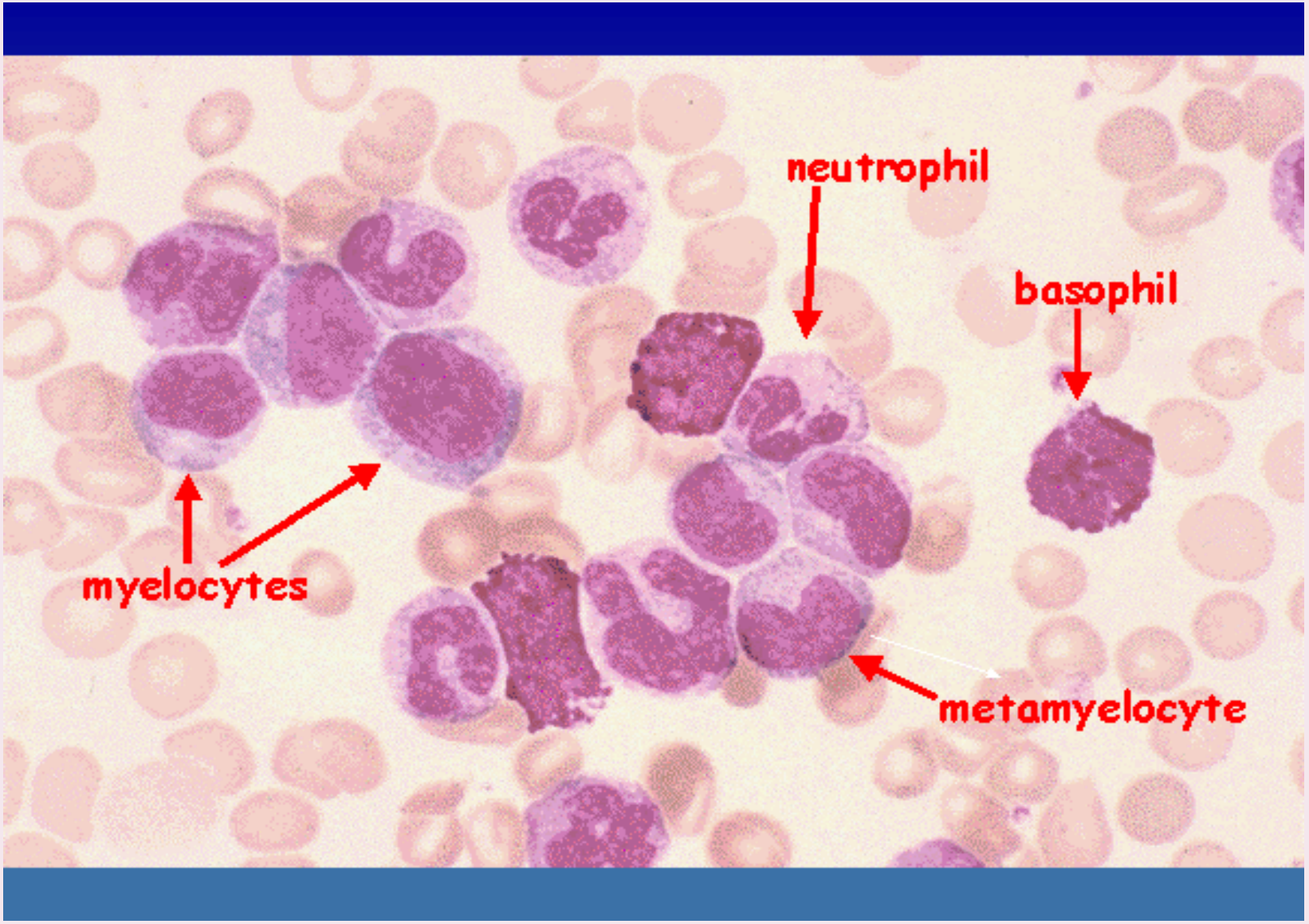

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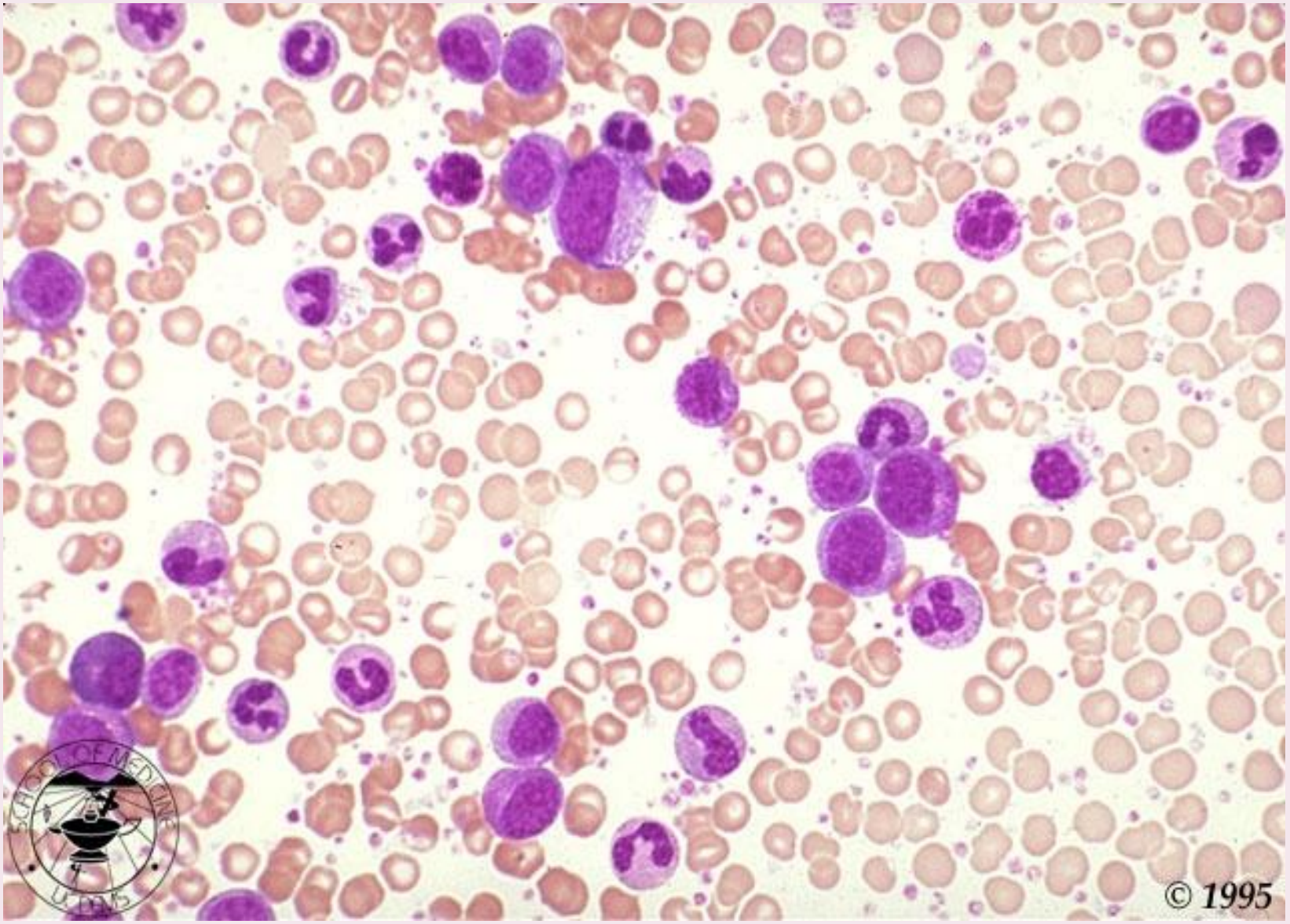
Lymphoblast/myeloblast

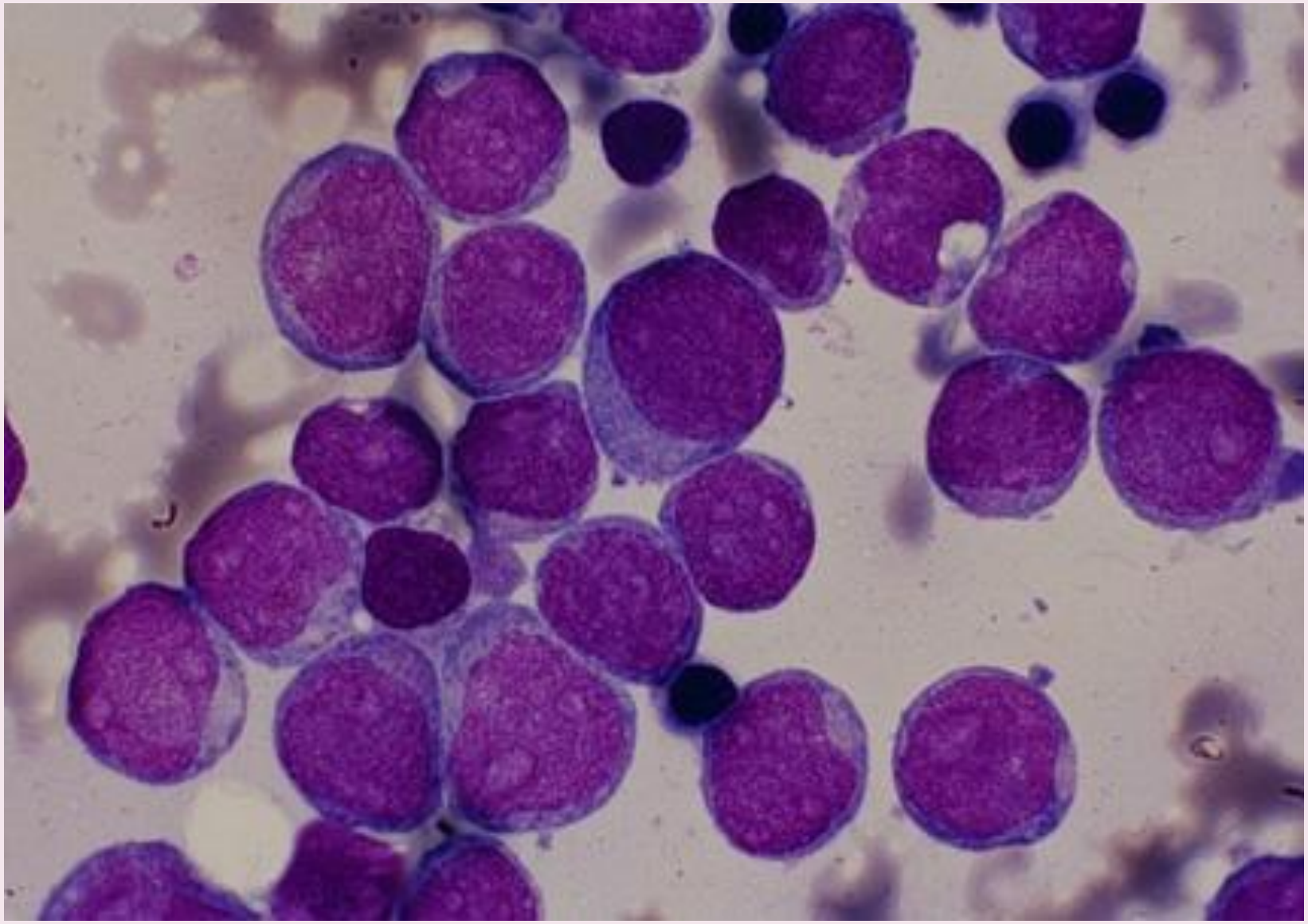




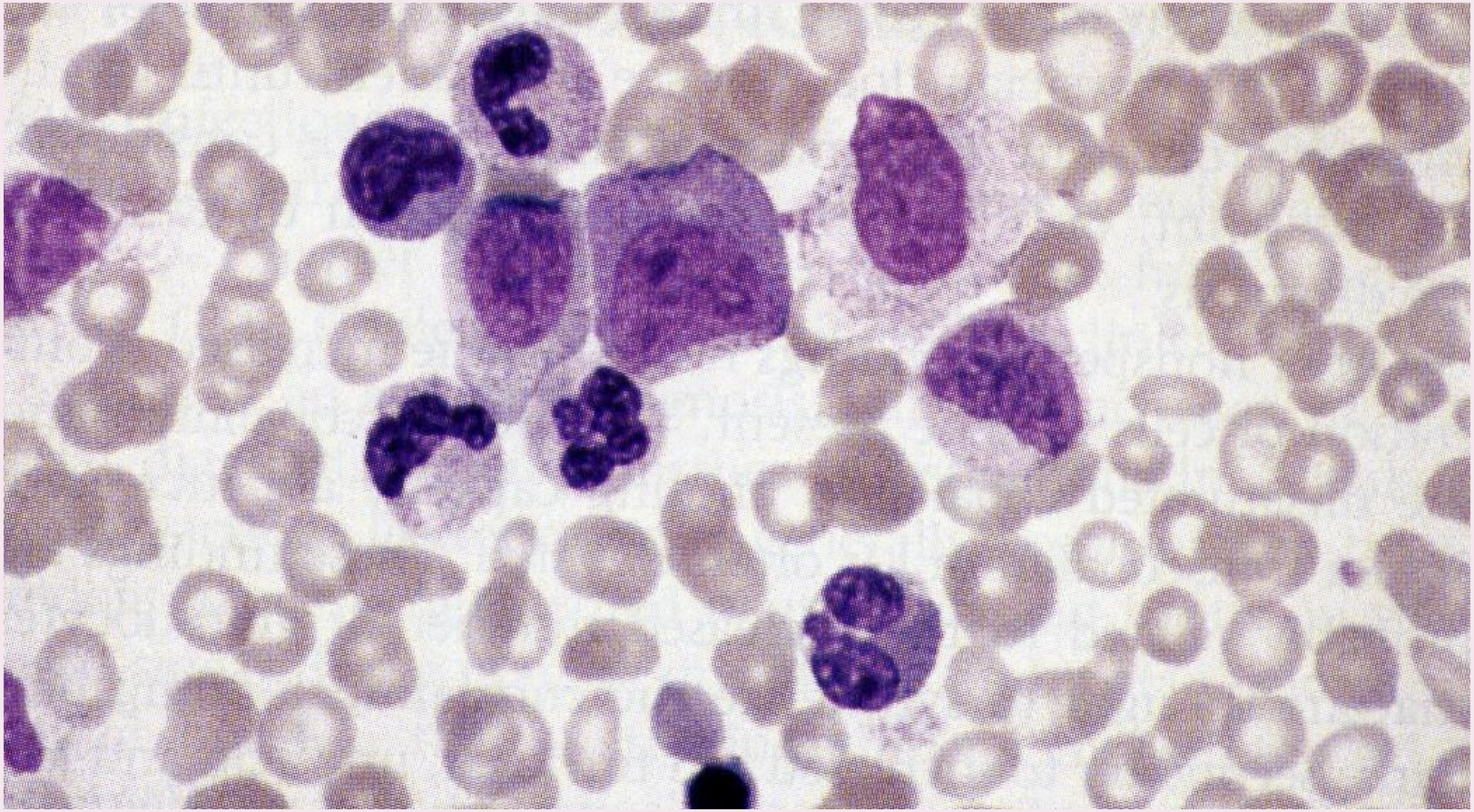



neutrophil
basophil
myelocytes
metamyelocyte

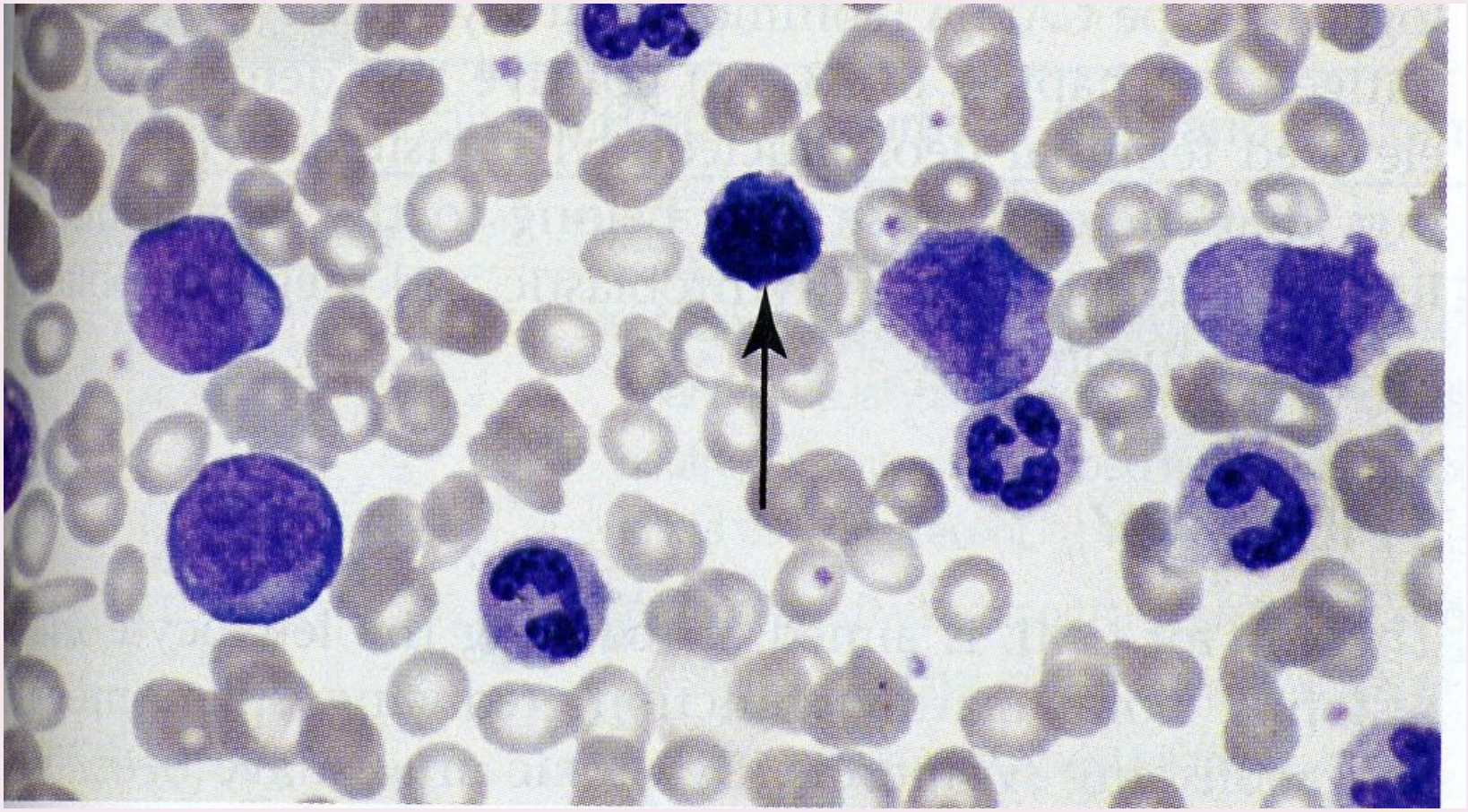

SCHOOL OF MEDICINE
UCLA
© 1995



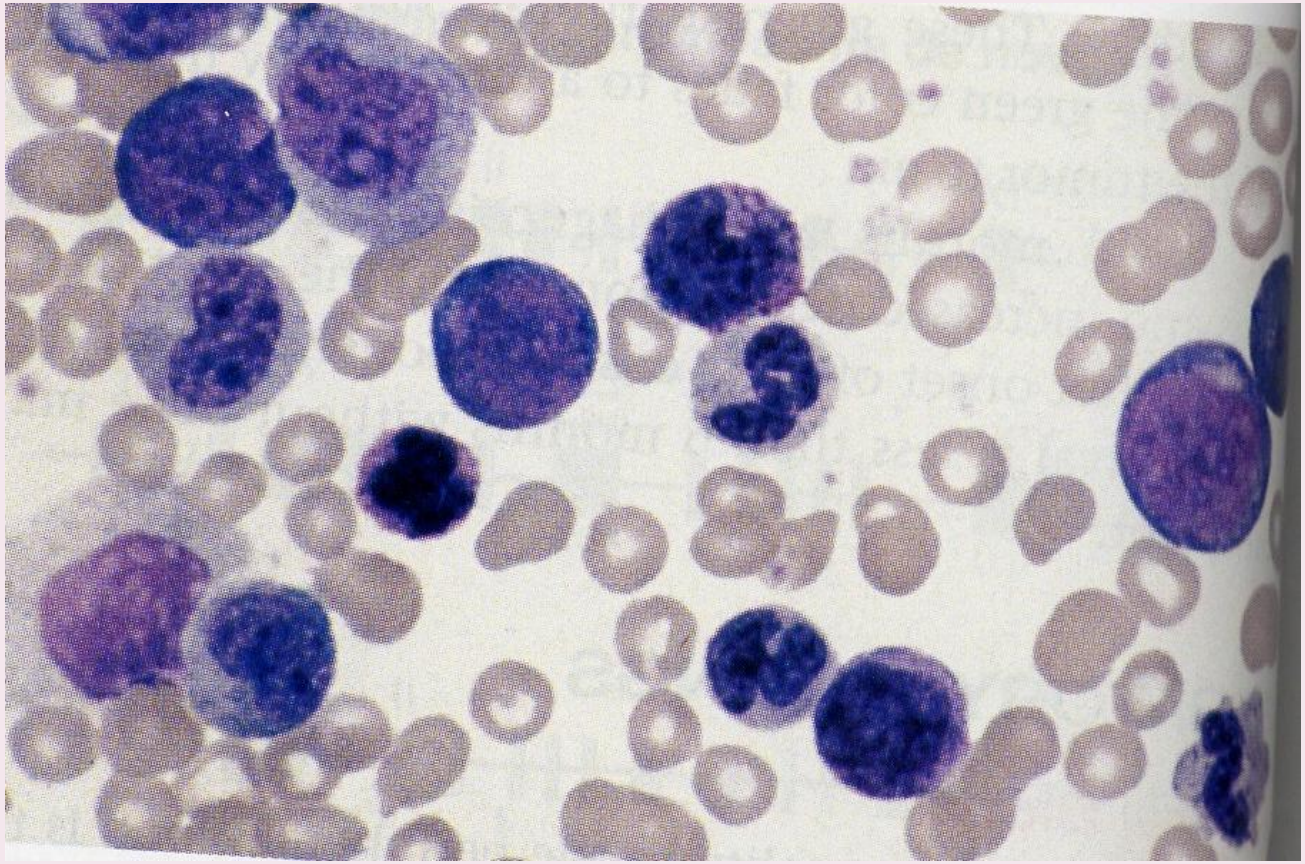
CML



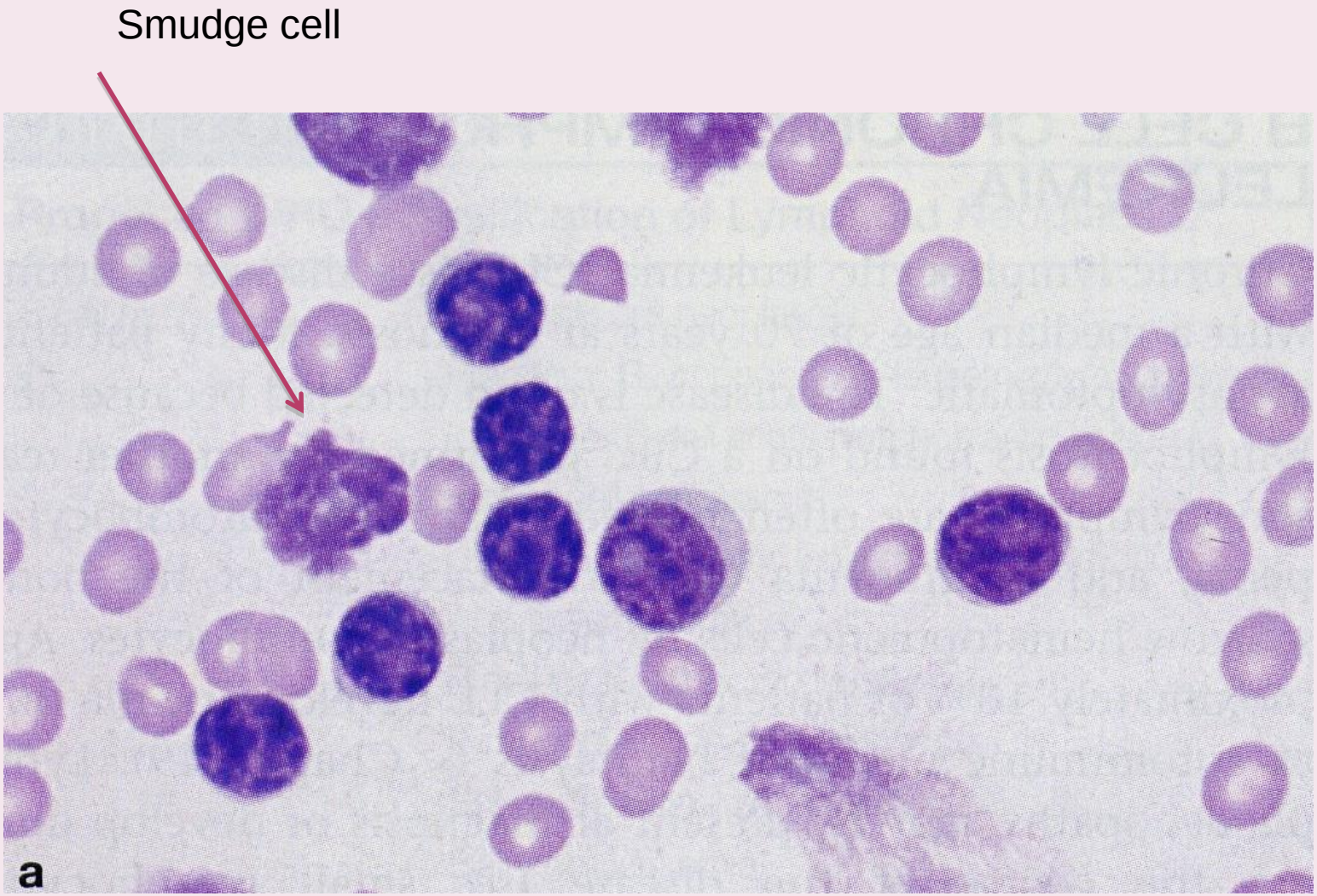
CML – ABNORMAL PLATLET



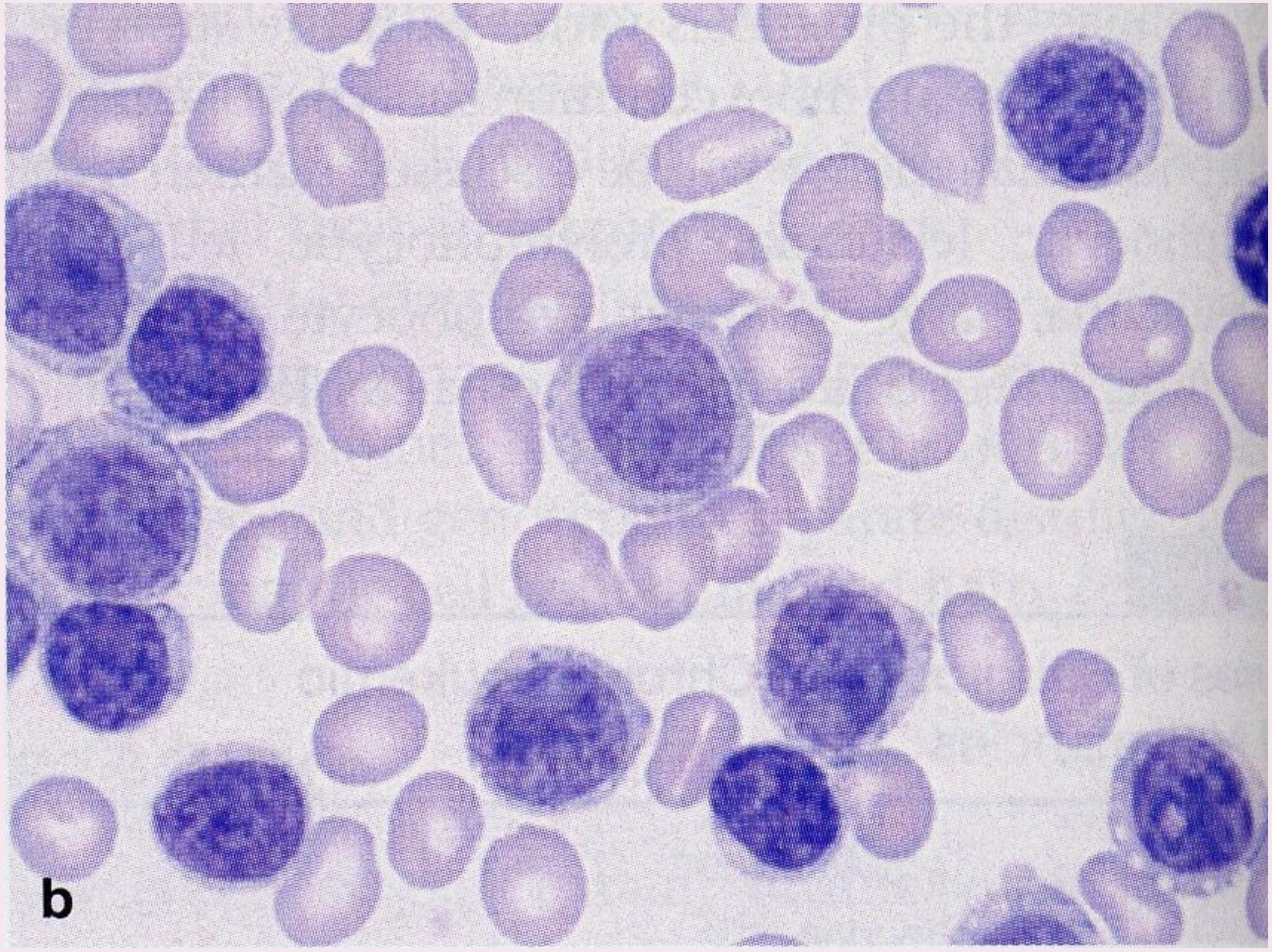
CML – BLAST TRANSFORMATION



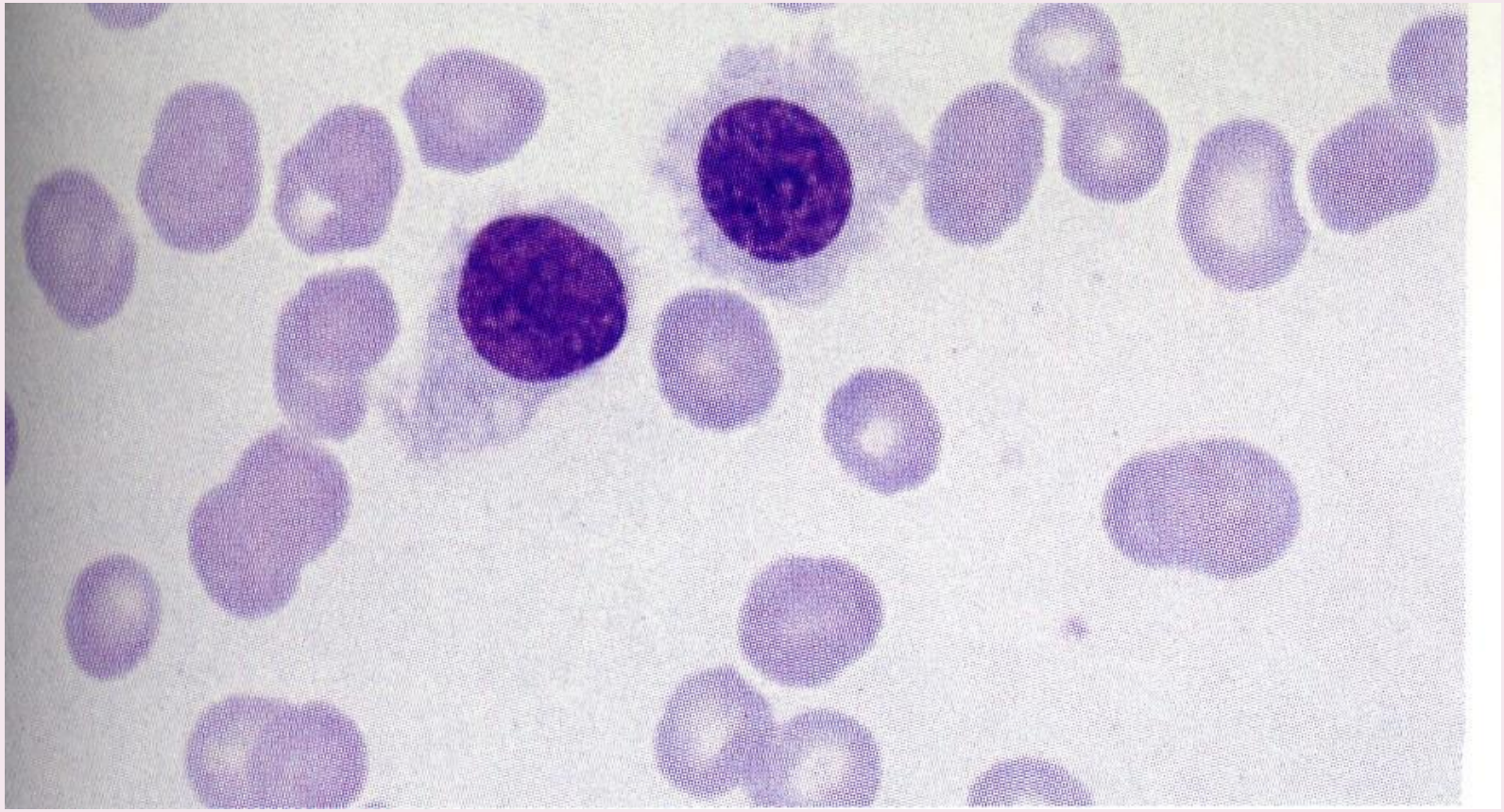
CLL with smudge cells



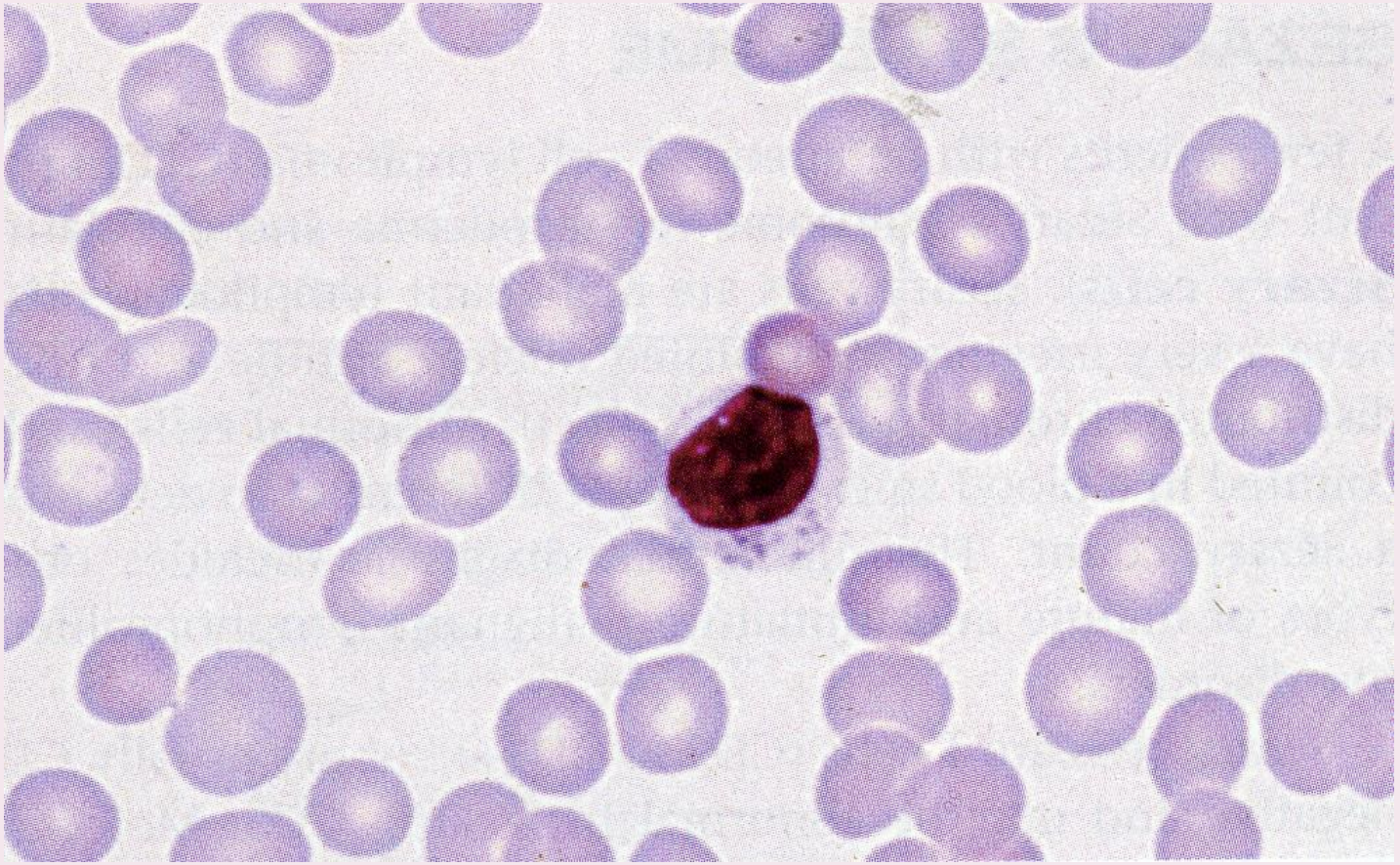
Prolymphocytic leukemia



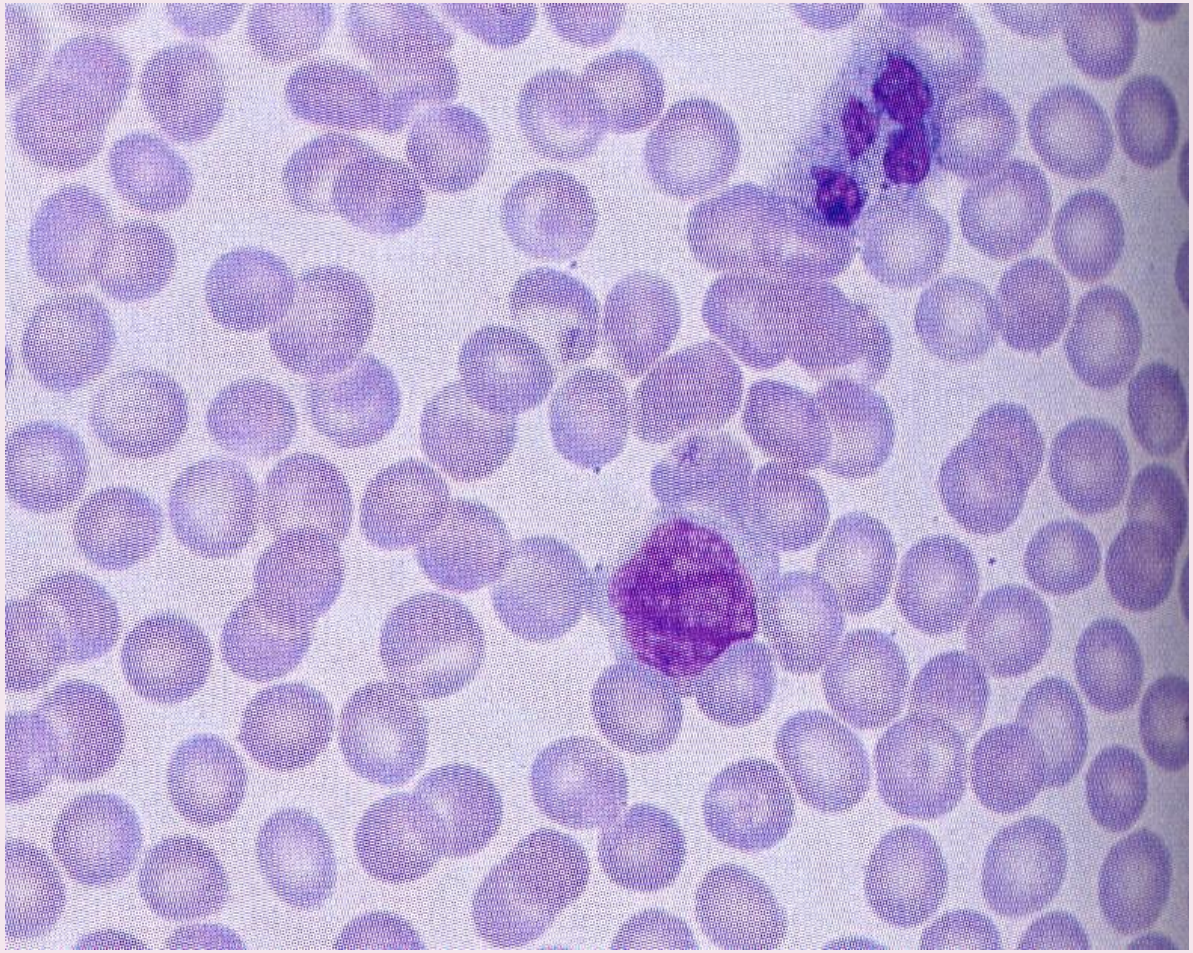
Hairy cell leukemia



Large, granular lymphocyte leukemia

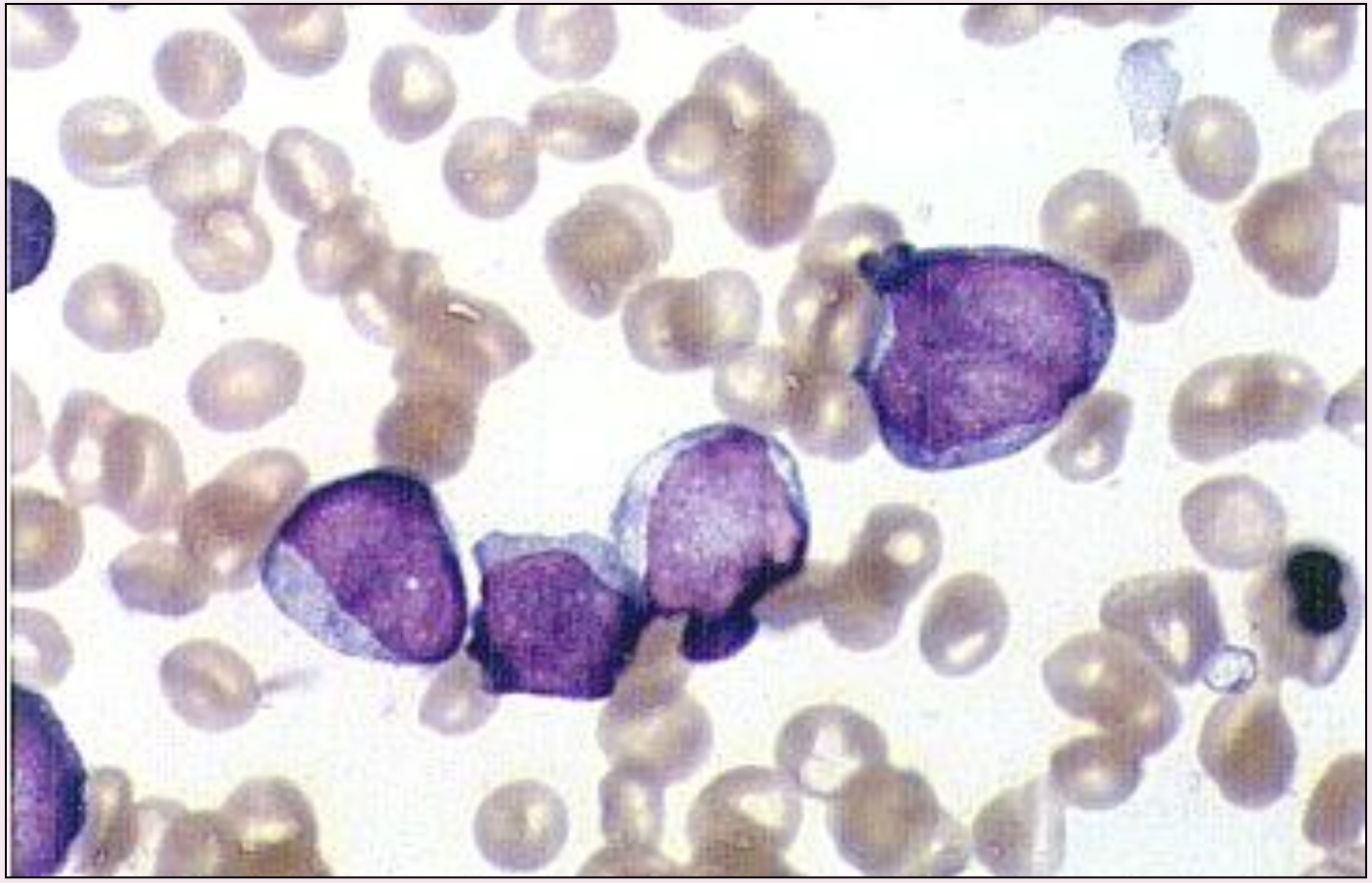


SEZARY'S SYNDROME

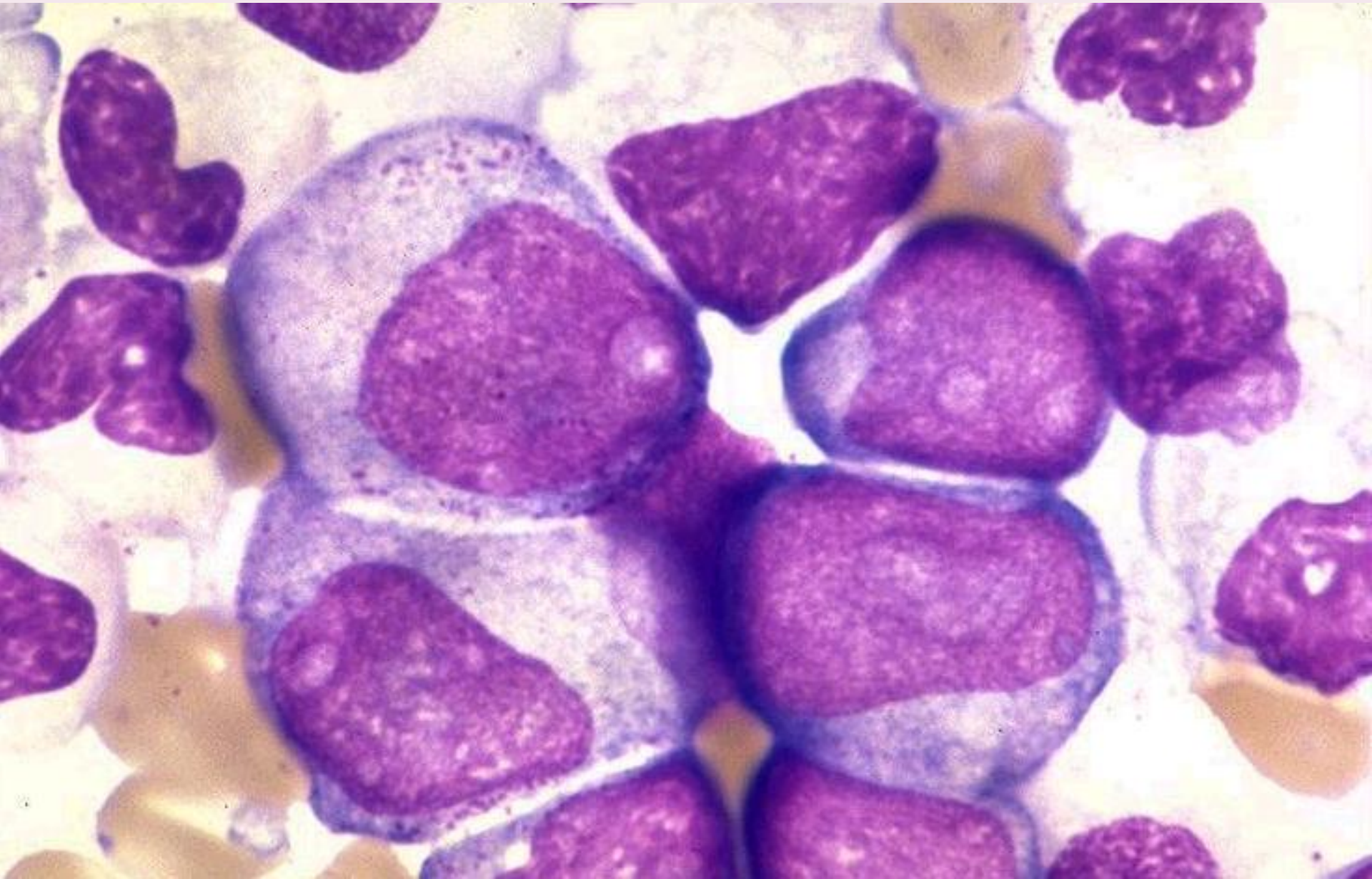


Acute Leukemia

accumulation of blasts in the marrow



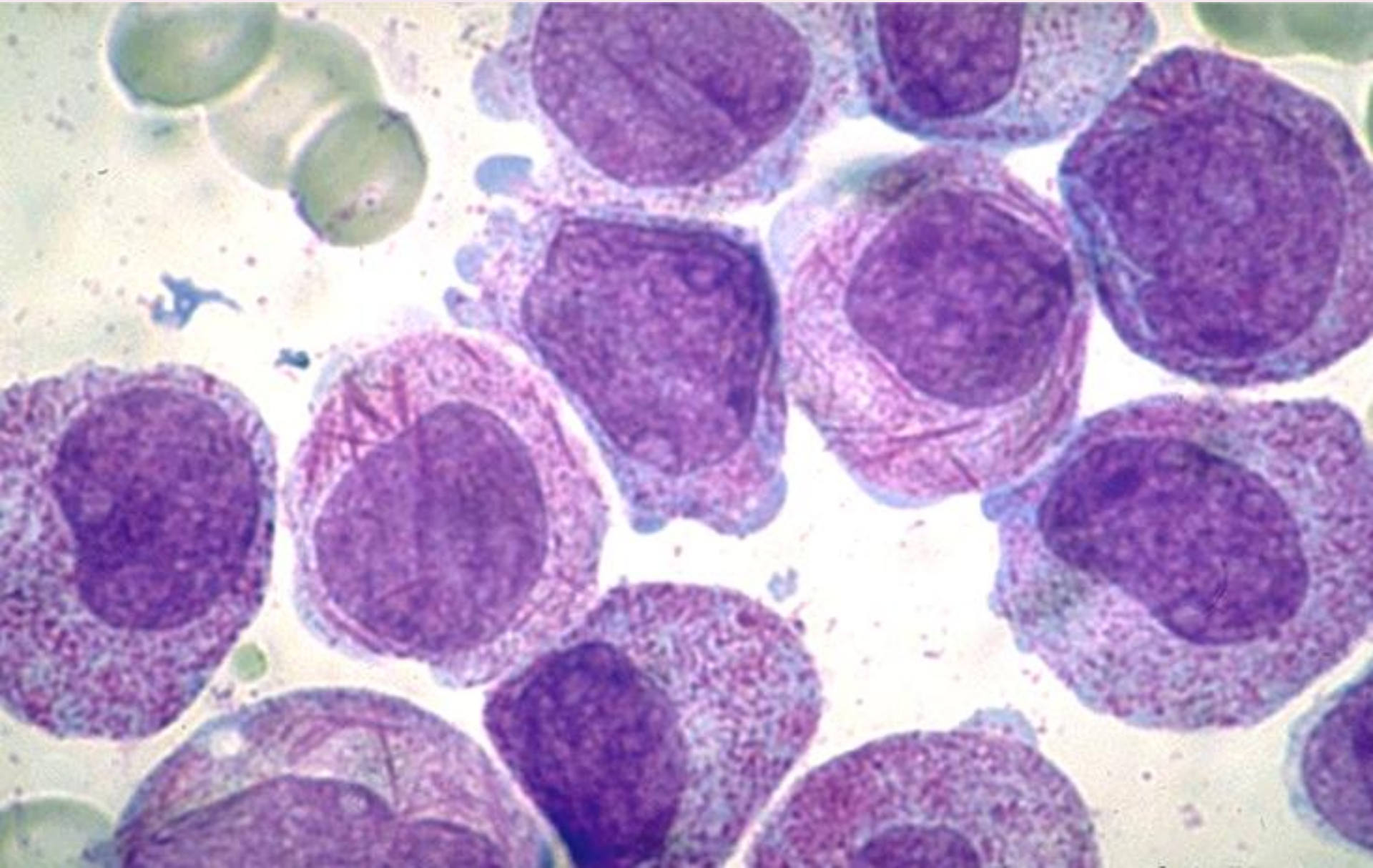
AML



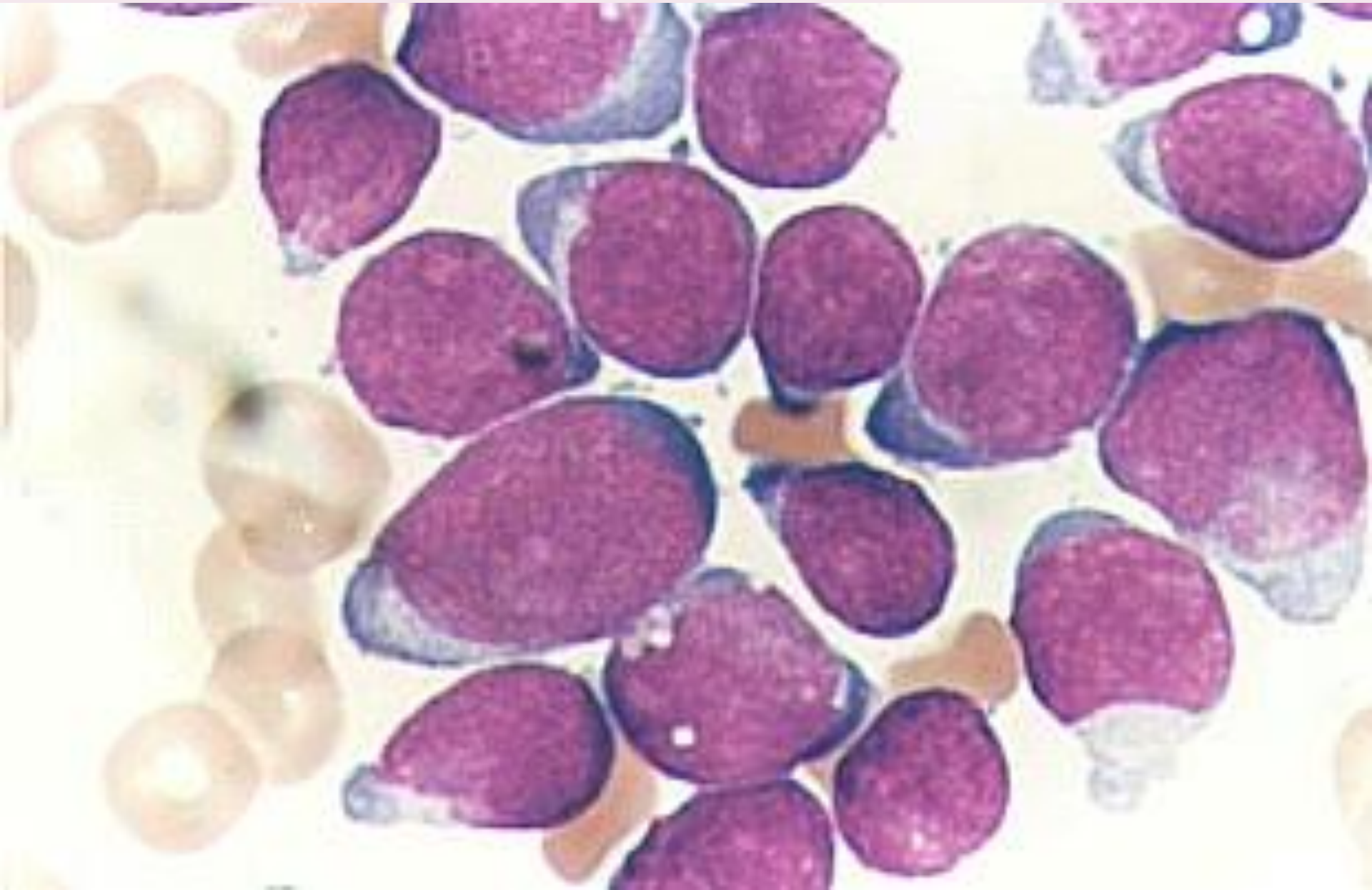
AML



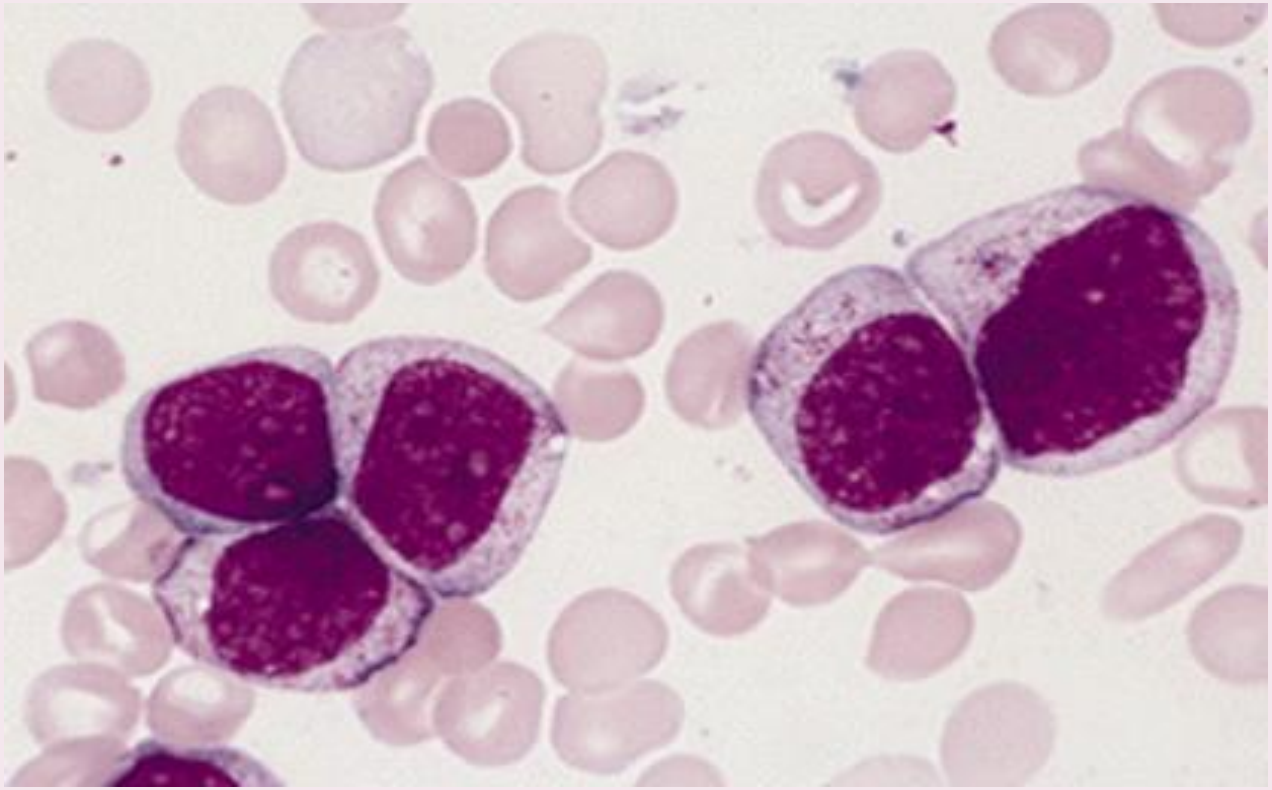
Auer rods in AML



ALL

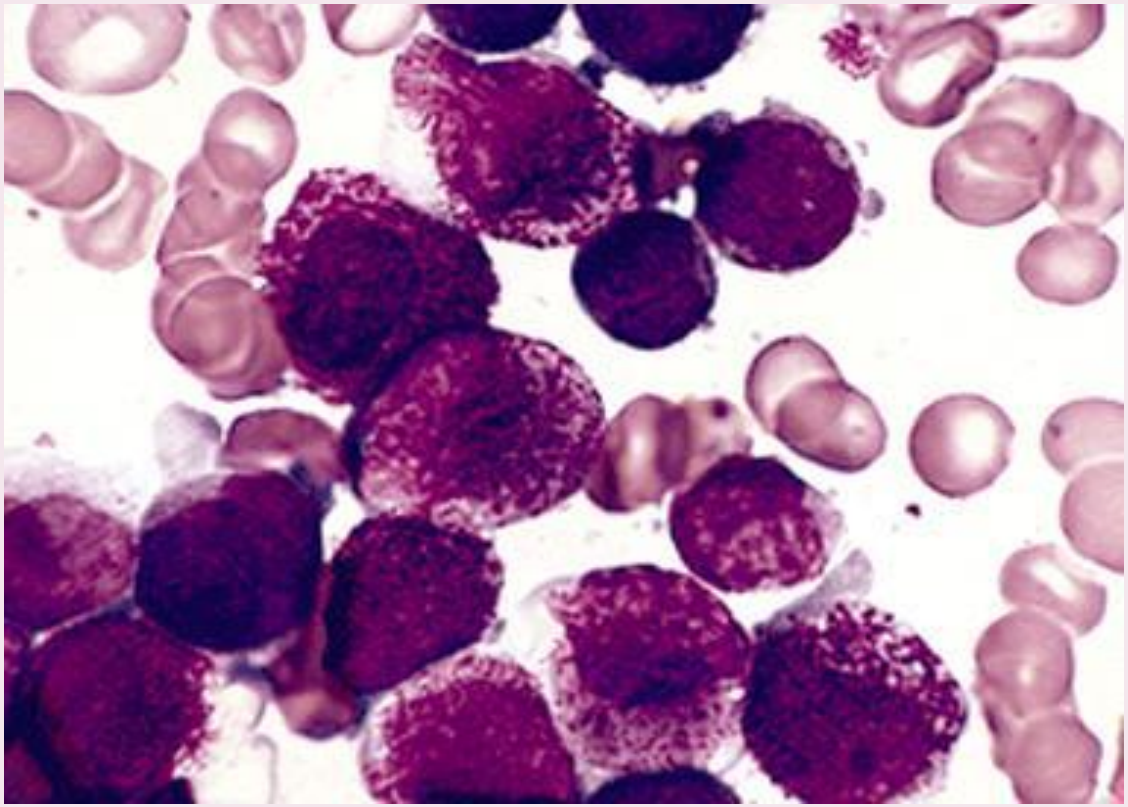


AML M2



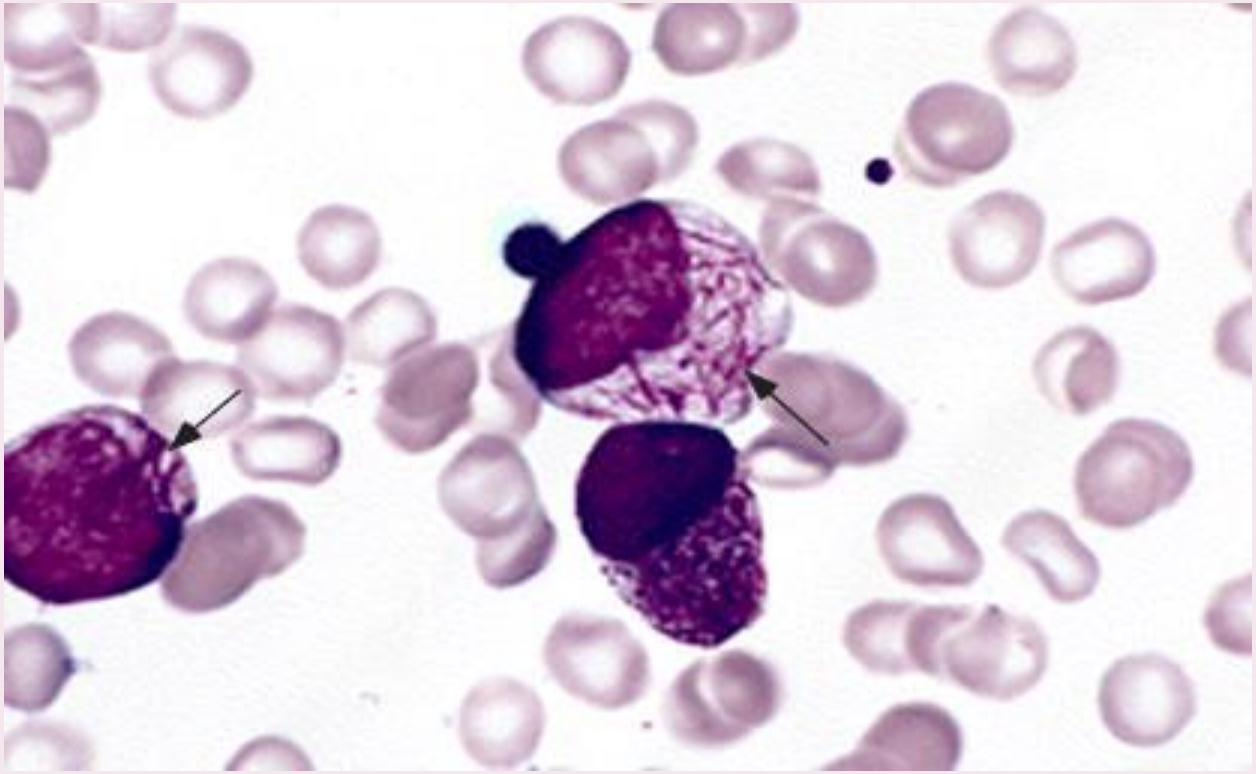
Brunning, RD, McKenna, RW. Tumors of the bone marrow. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 9, 1994, Washington, DC. Armed Forces Institute of Pathology.

AML M3 (Promyelocytic)



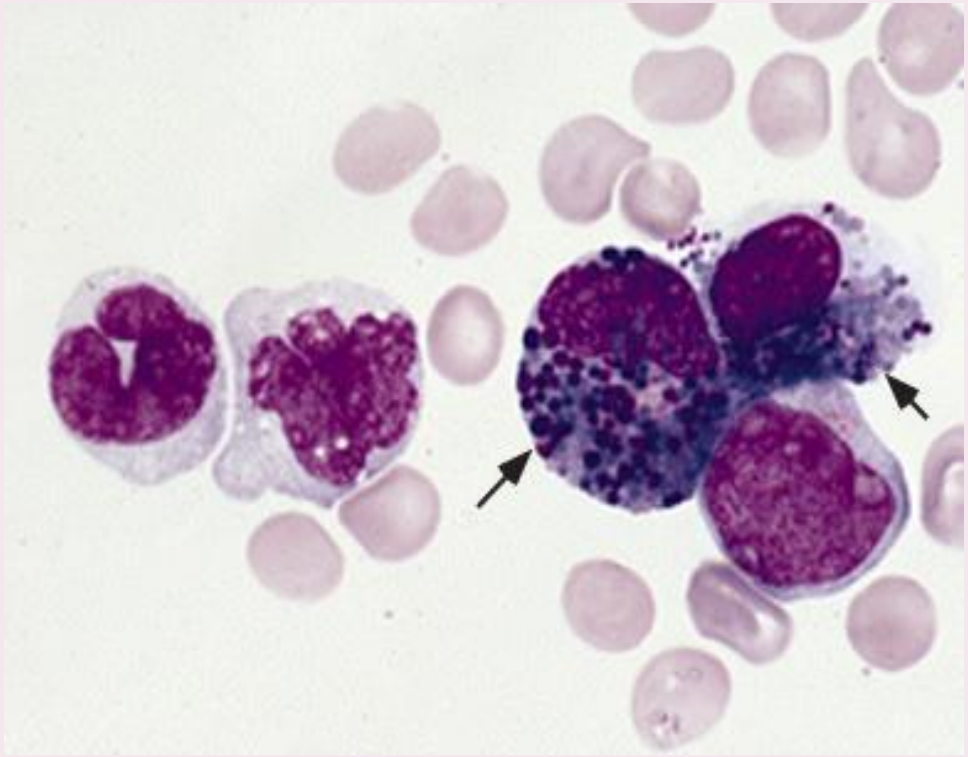
Brunning, RD, McKenna, RW. Tumors of the bone marrow. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 9, 1994, Washington, DC. Armed Forces Institute of Pathology.

AML M3 (Promyelocytic)



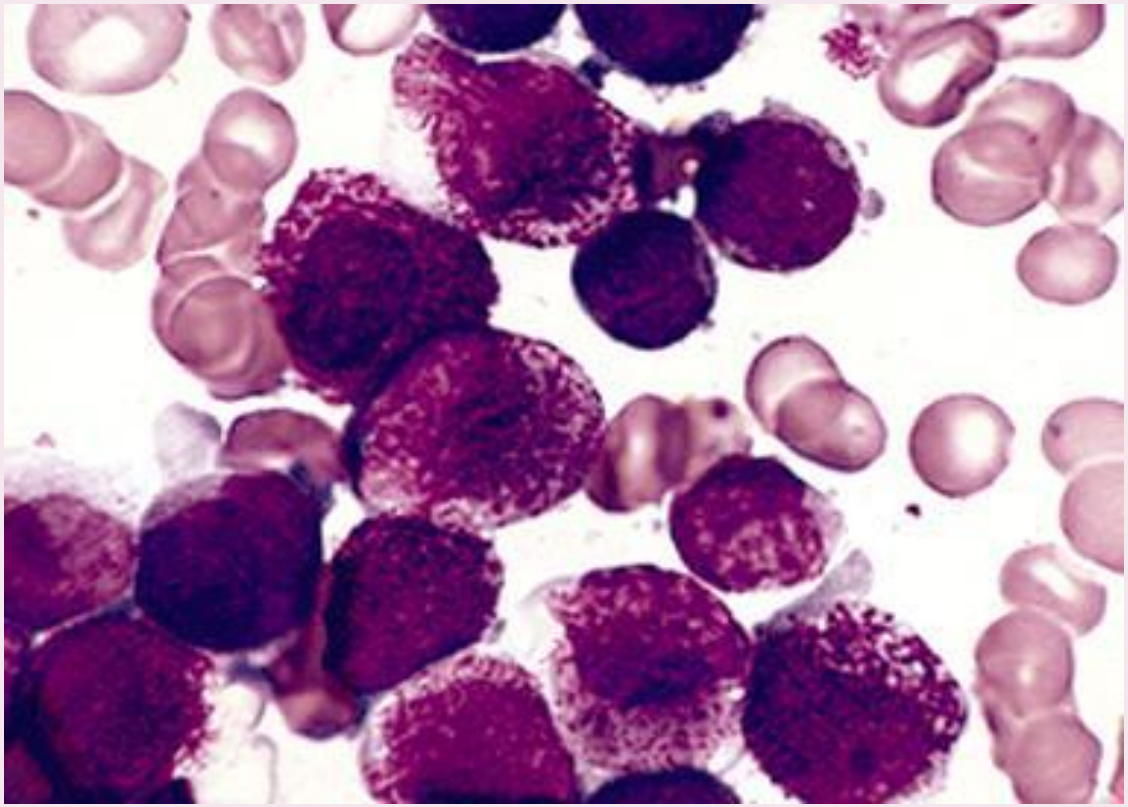
Brunning, RD, McKenna, RW. Tumors of the bone marrow. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 9, 1994, Washington, DC. Armed Forces Institute of Pathology.

AML M4 eos



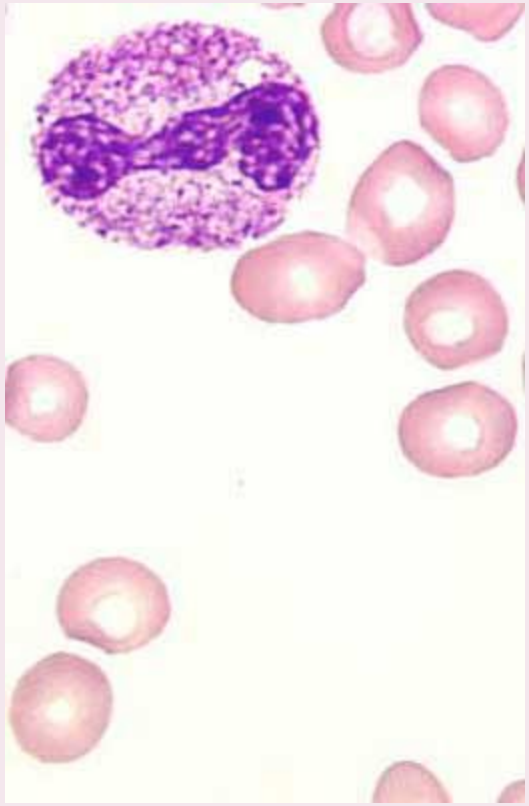
From Brunning, RD, McKenna, RW. Tumors of the bone marrow. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 9, 1994, Washington, DC. Armed Forces Institute of Pathology.

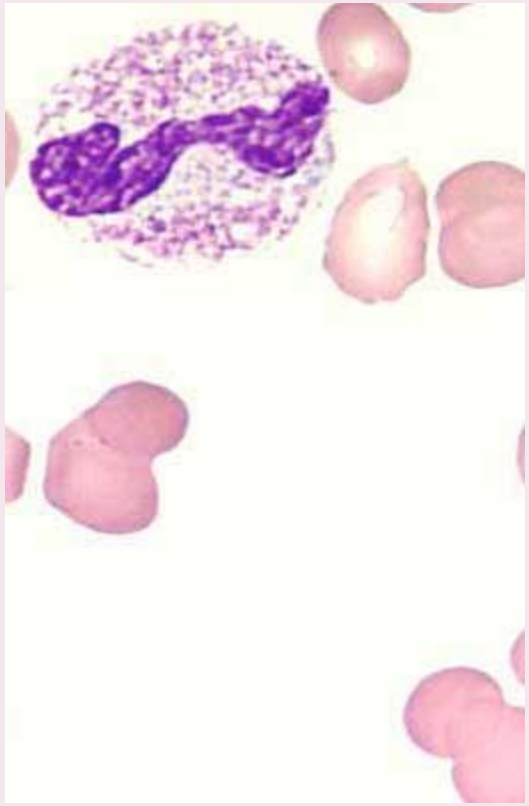
AML M3 (Promyelocytic)

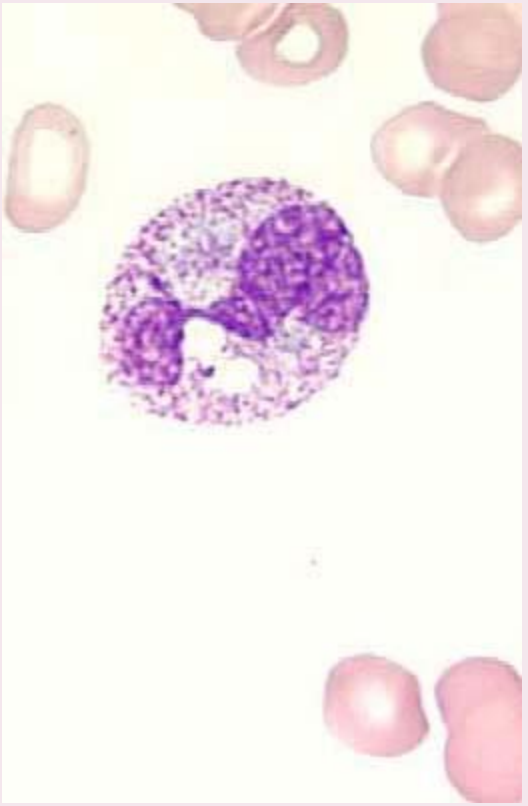


Brunning, RD, McKenna, RW. Tumors of the bone marrow. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 9, 1994, Washington, DC. Armed Forces Institute of Pathology.

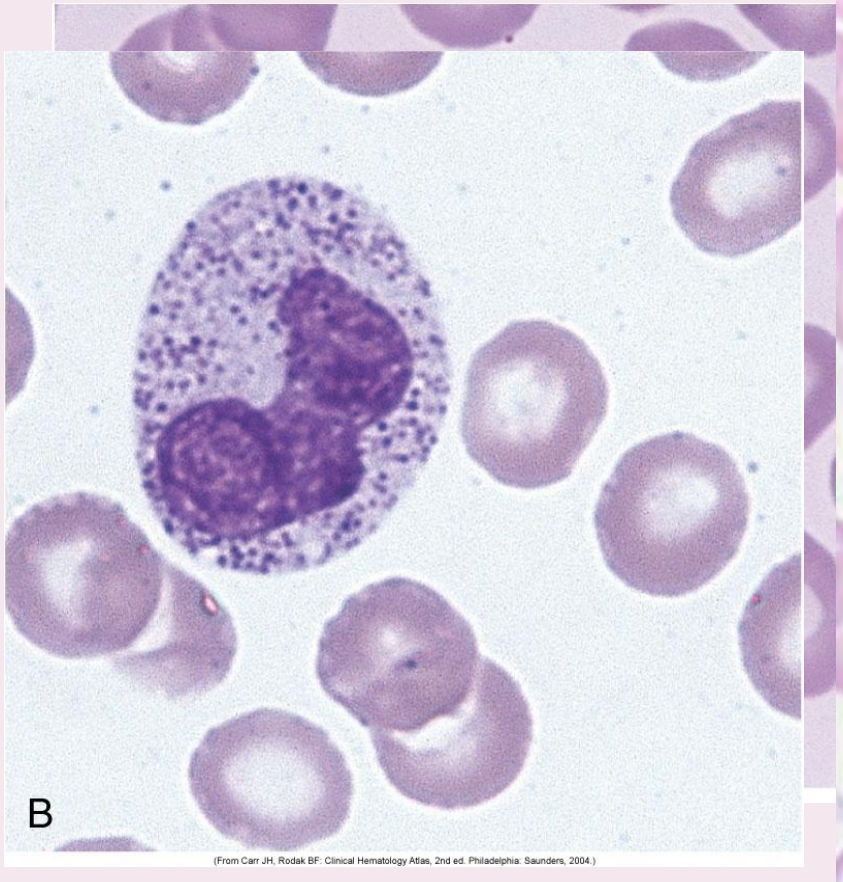
Toxic Granulation

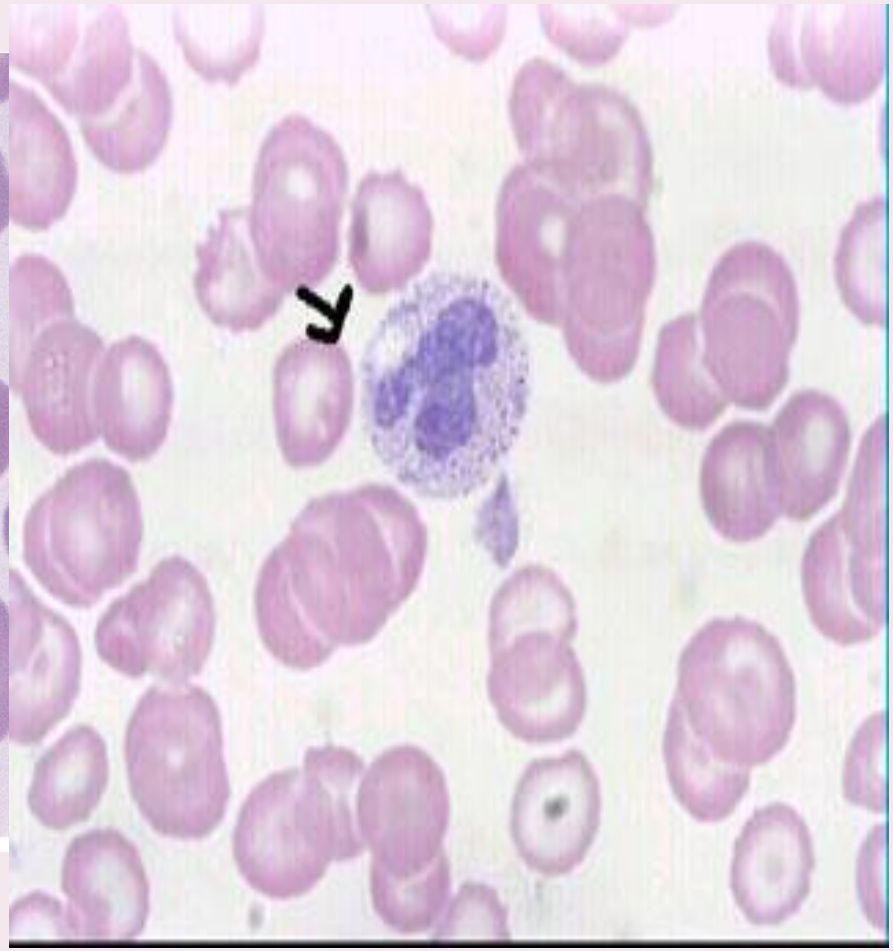






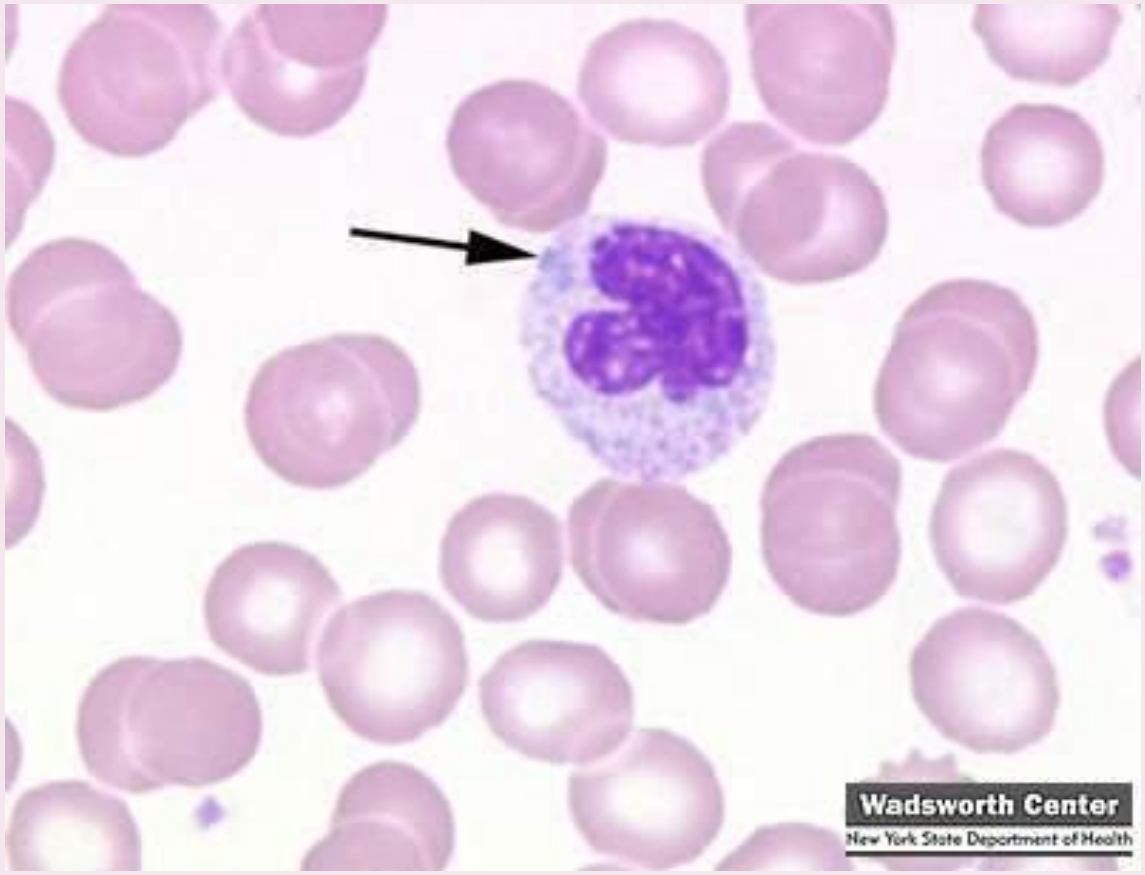
Toxic Granulation & Vacuolization



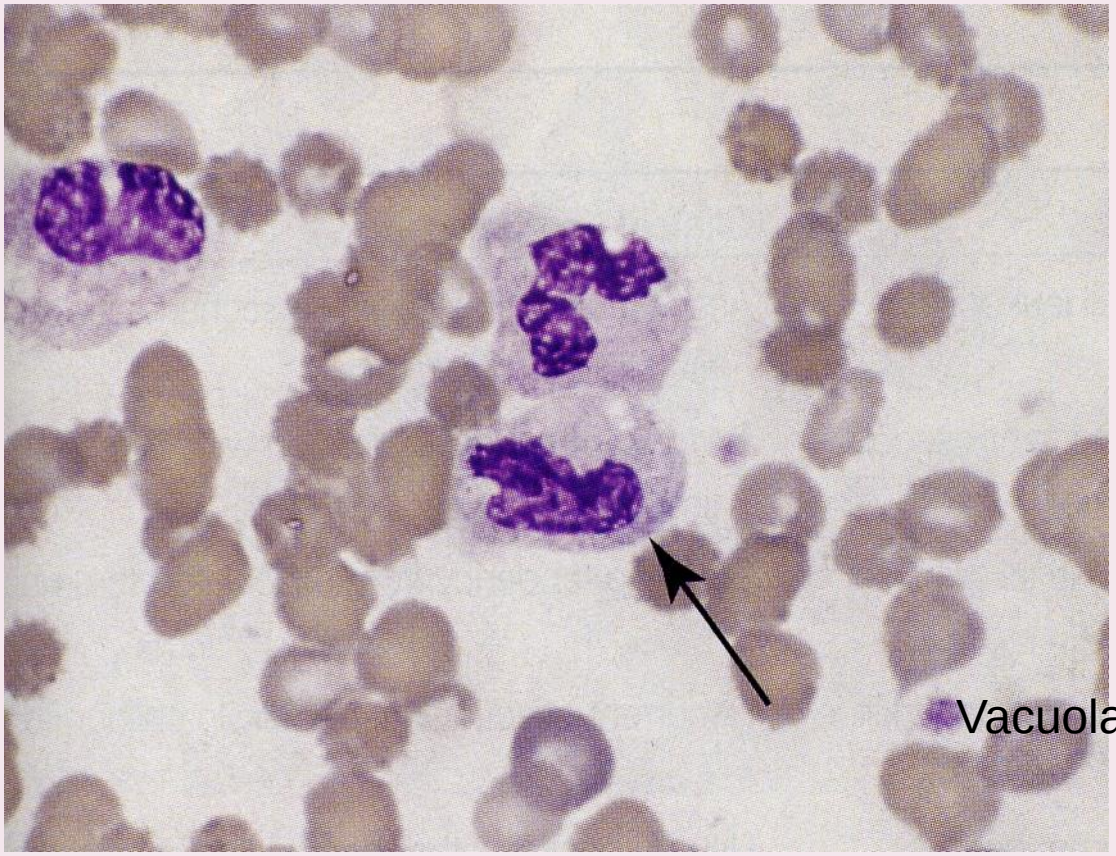


Graphics accessed http://evolvels.elsevier.com/section/default.asp?id=1138_ccalvo7_0001, http://www.mclno.org/webresources/kbase/cellatlas/images/Vacuolated%20Segmented%20Neutrophil.jpg, http://path.upmc.edu/cases/case53/images/micro2.jpg , 2008.

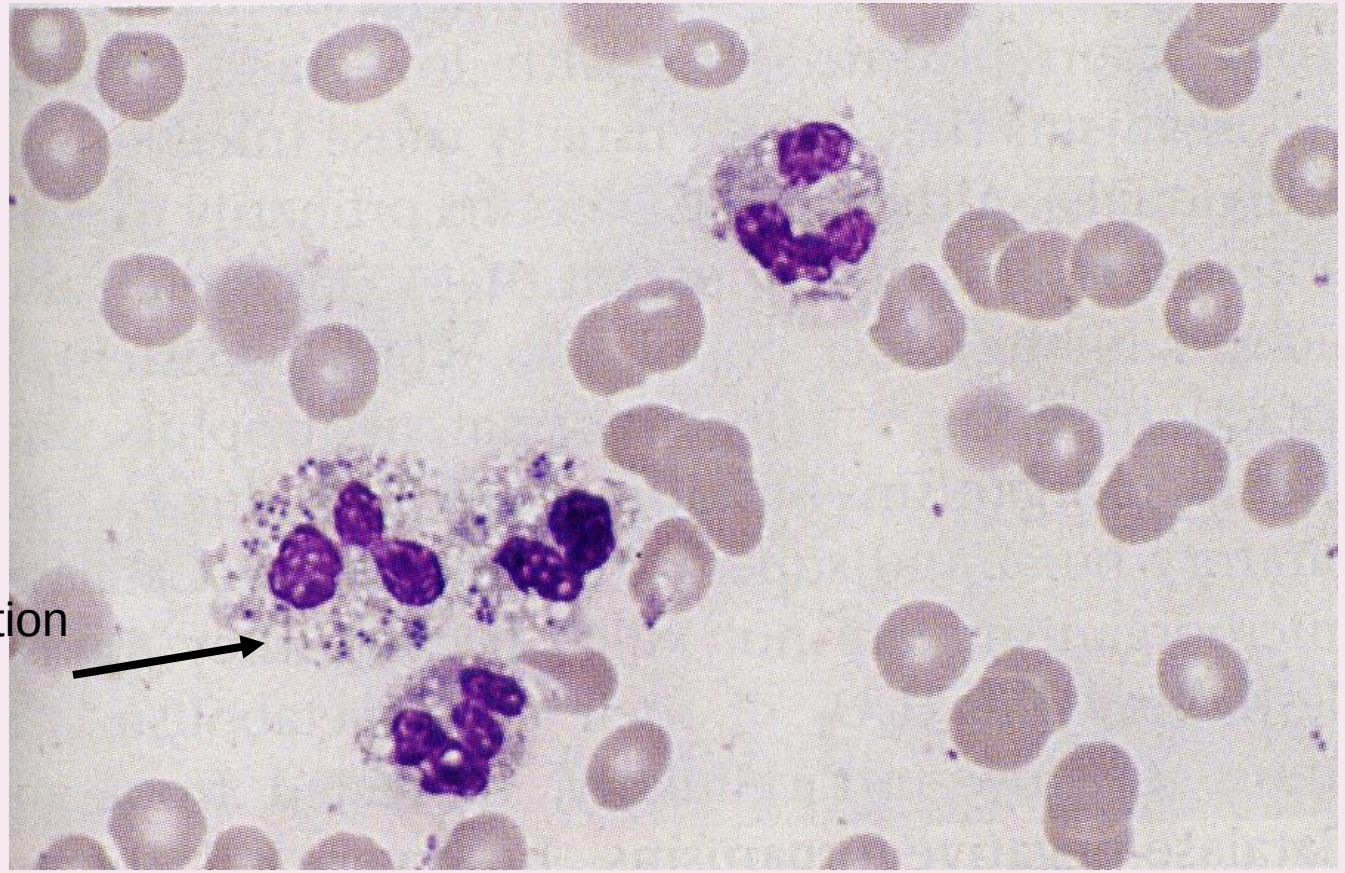
DÖHLE Bodies



MORPHOLOGIC NEUTROPHIL CHANGES

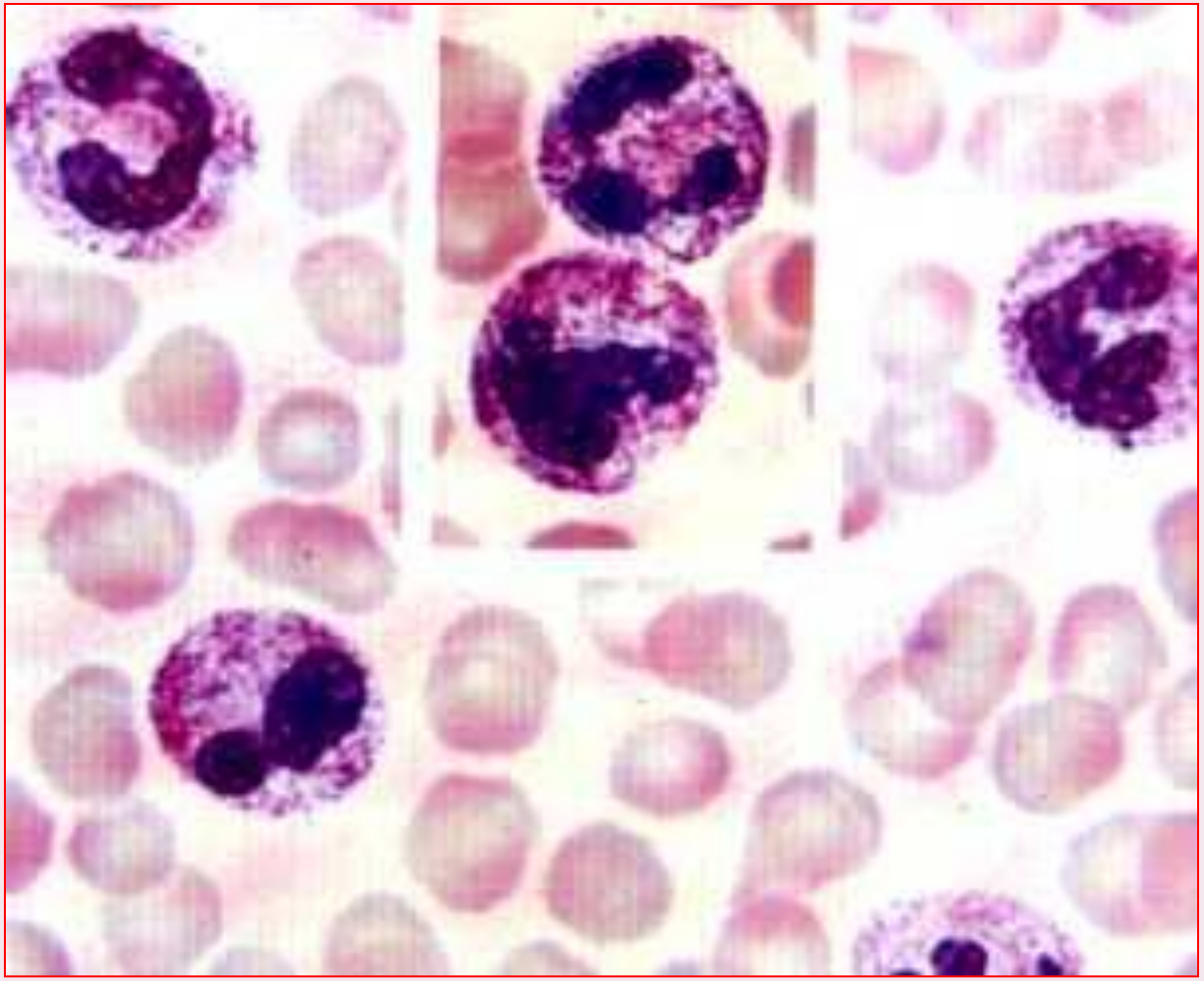


MORPHOLOGIC NEUTROPHIL CHANGES



Toxic granulation

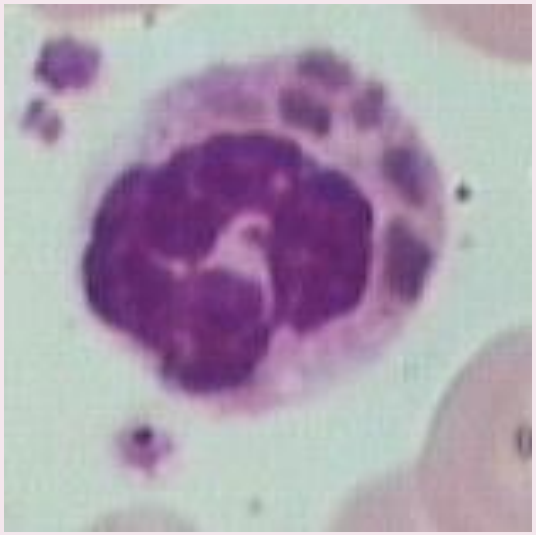
WBC :Non – neoplastic Abnormalities
Leukocytosis -Toxic Granulation:

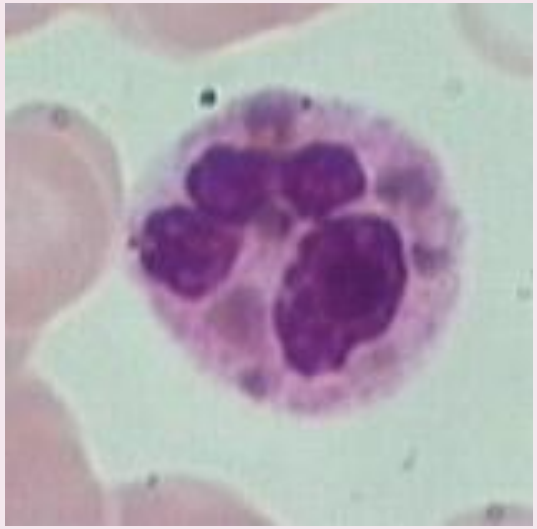


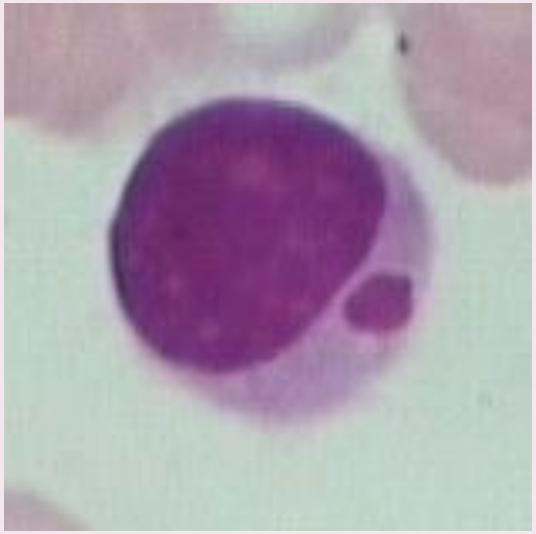
Pelger Huet Anomaly



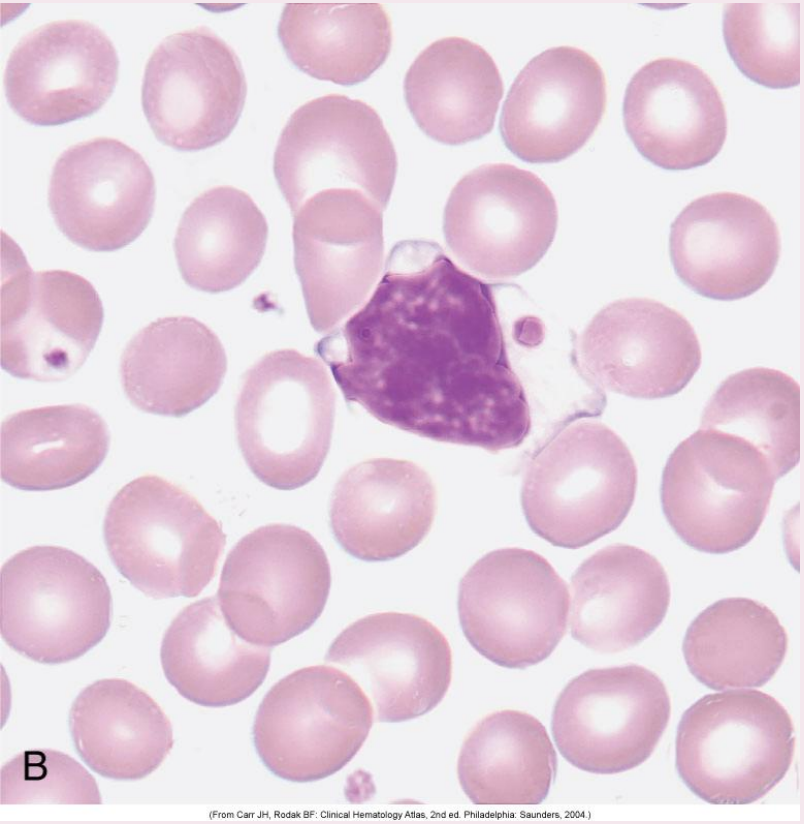
The Chediak-Higashi syndrome is a rare autosomal recessive condition associated with abnormally large leukocyte granules resulting from fusion of lysozymes. This disorder may affect granulocytes, leukocytes, and monocytes. Chemotaxis and phagocytosis is defective. Platelets lack dense granules and platelet function is abnormal. Giant melanosomes in occular and skin tissues result in hypopigmentation.



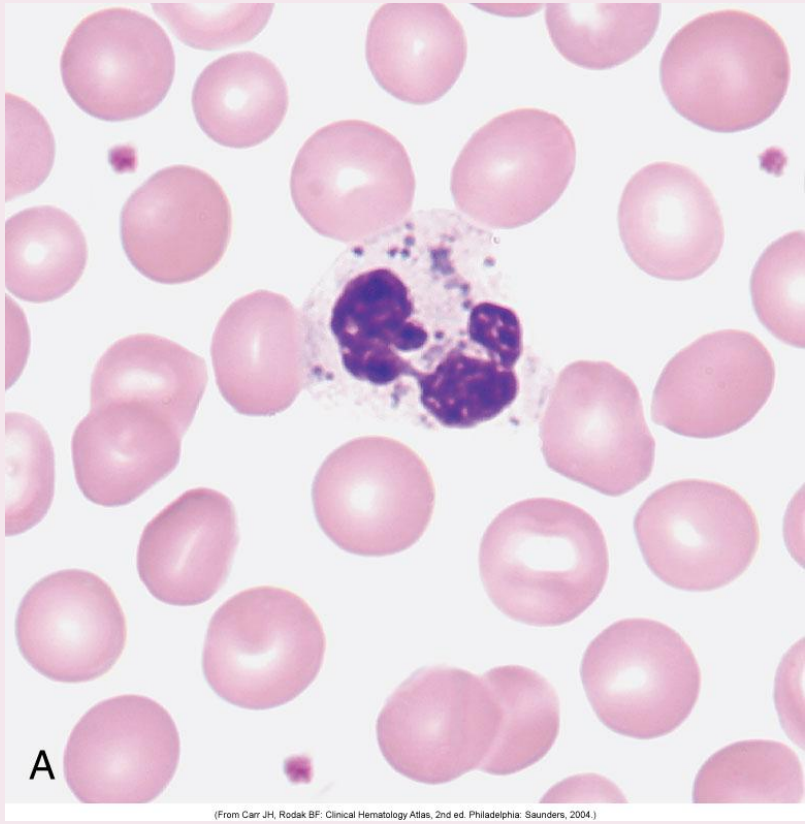




Chediak Higashi



(From Carr JH, Rodak BF: Clinical Hematology Atlas, 2nd ed. Philadelphia: Saunders, 2004.)

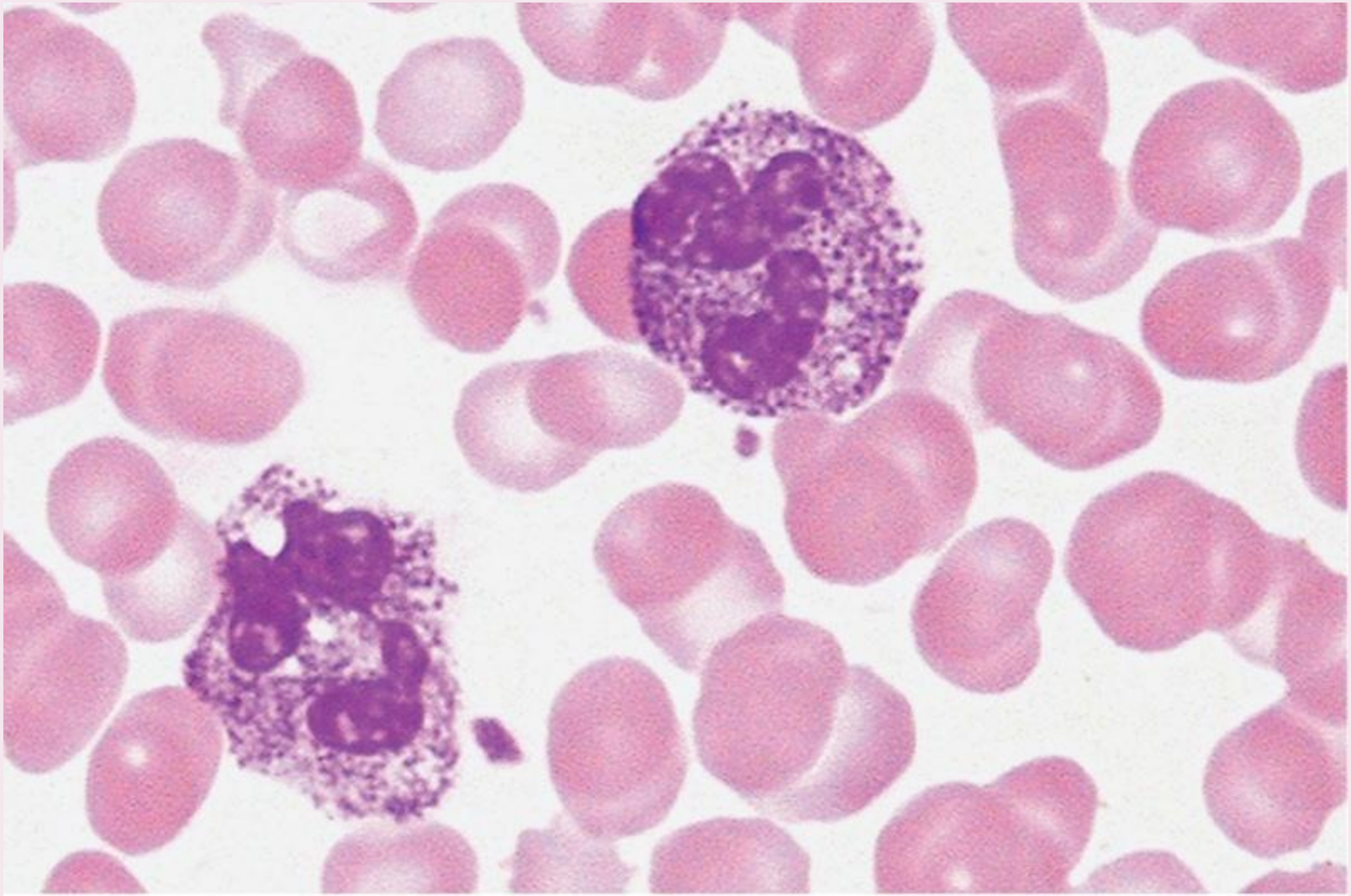


(From Carr JH, Rodak BF: Clinical Hematology Atlas, 2nd ed. Philadelphia: Saunders, 2004.)

Graphic accessed http://evolvels.elsevier.com/section/default.asp?id=1138_ccalvo7_0001, 2008.

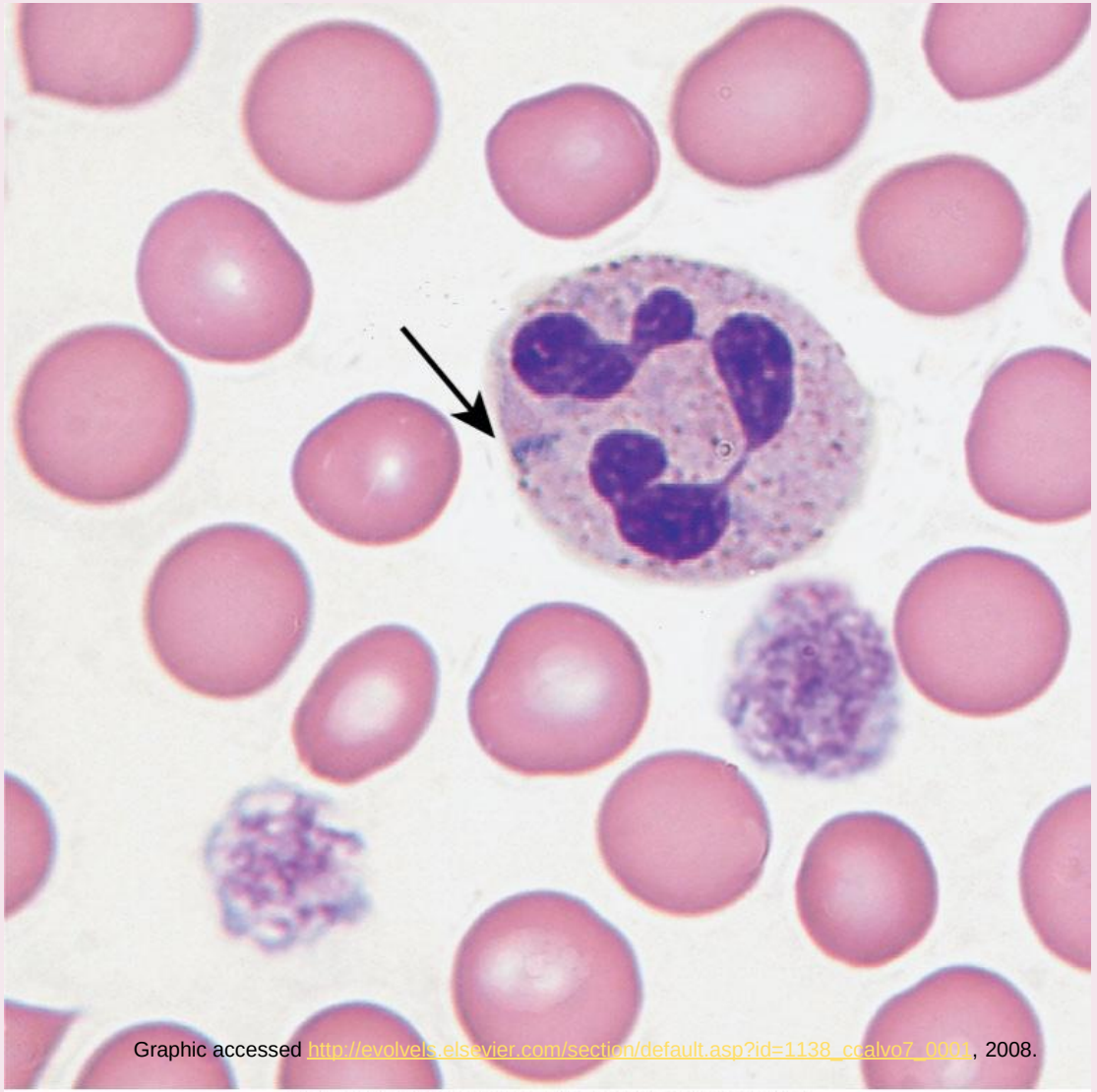
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Alder Reilly



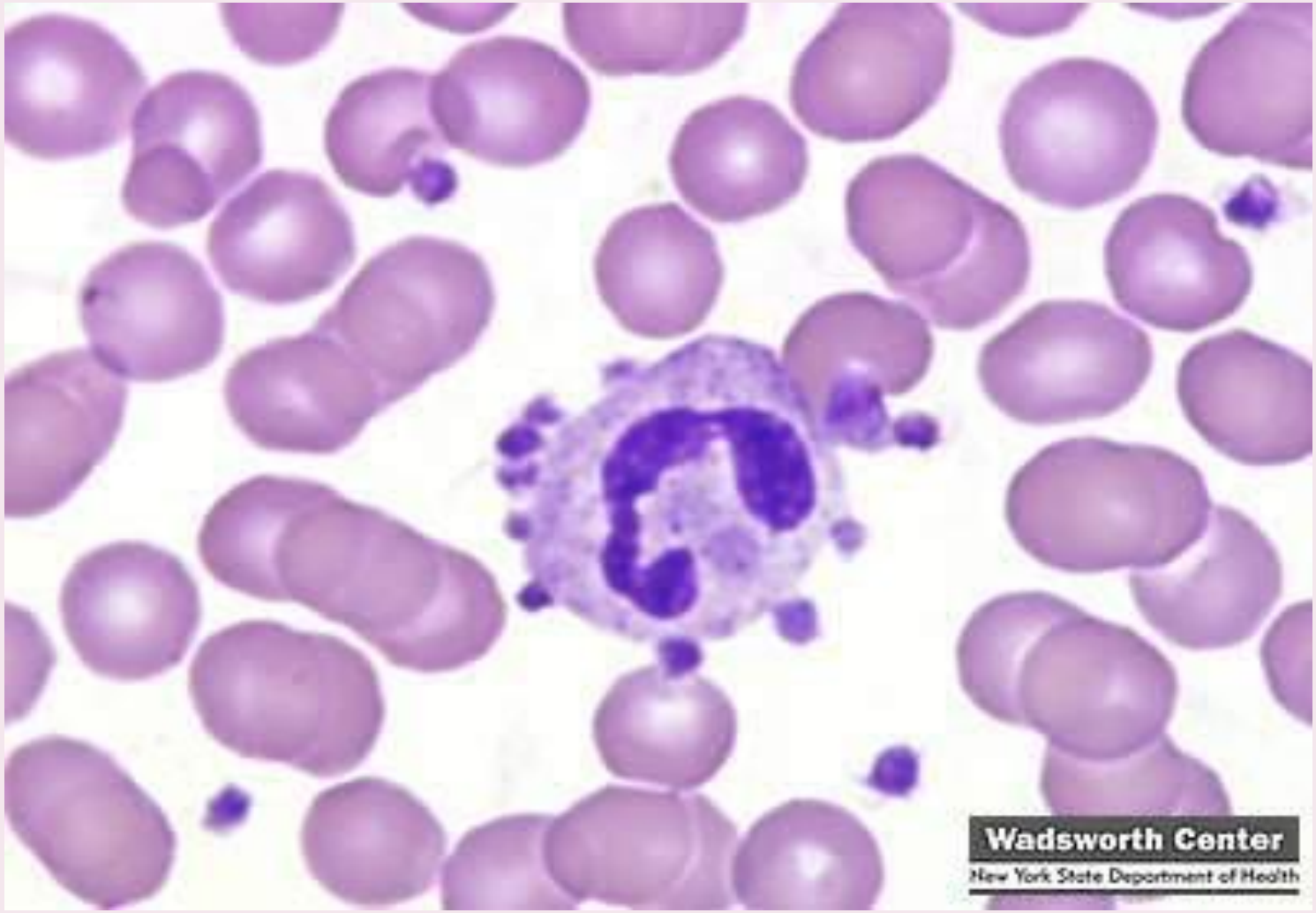
(Courtesy of Dennis P. O'Malley, M.D., US Labs; Irvine, Calif.)

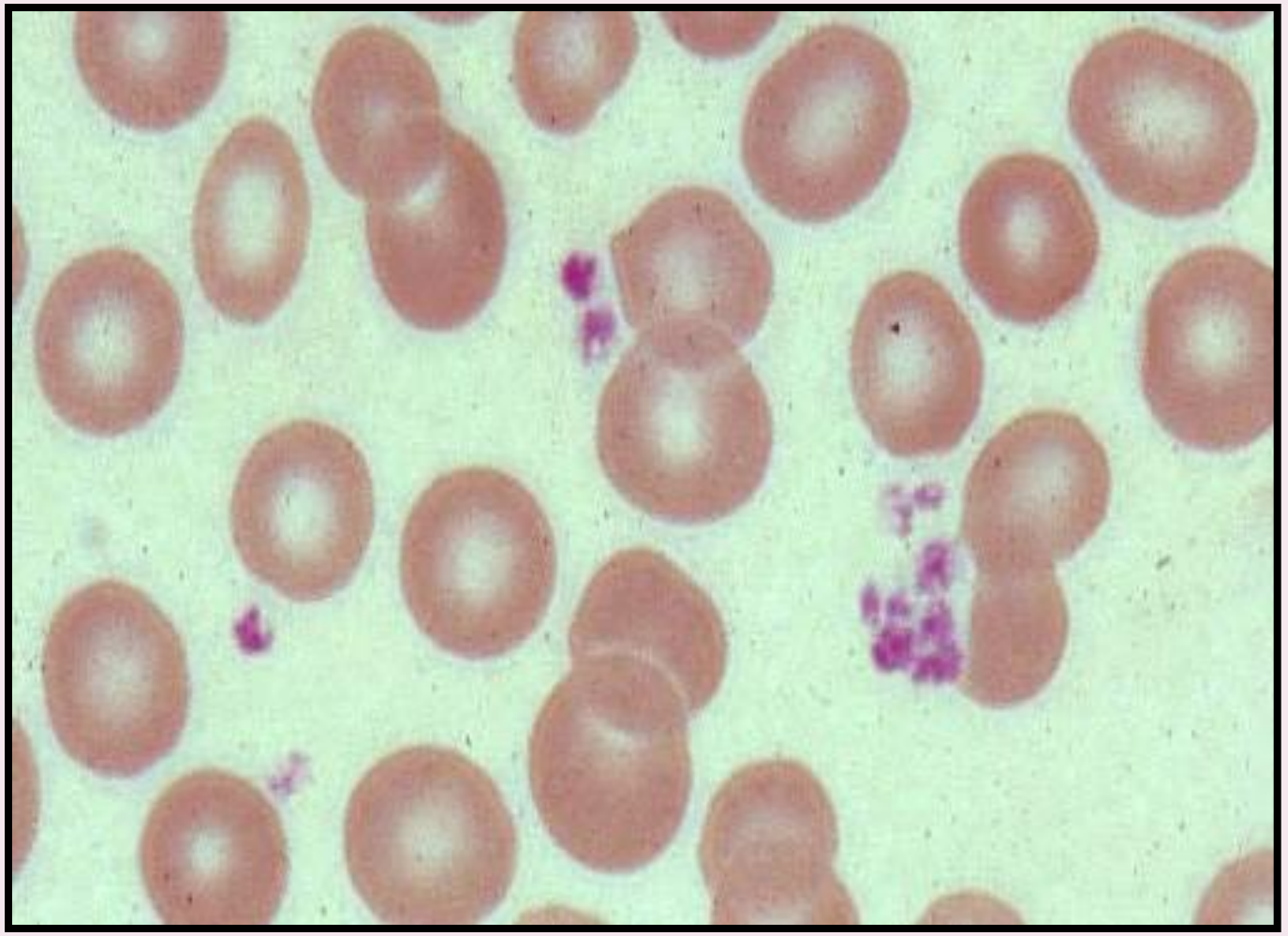
May Hegglin



Graphic accessed http://evolvels.elsevier.com/section/default.asp?id=1138_ccalvo7_0001, 2008.

(From Carr JH, Rodak BF: Clinical Hematology Atlas, 2nd ed. Philadelphia: Saunders, 2004.)


Wadsworth Center
New York State Department of Health



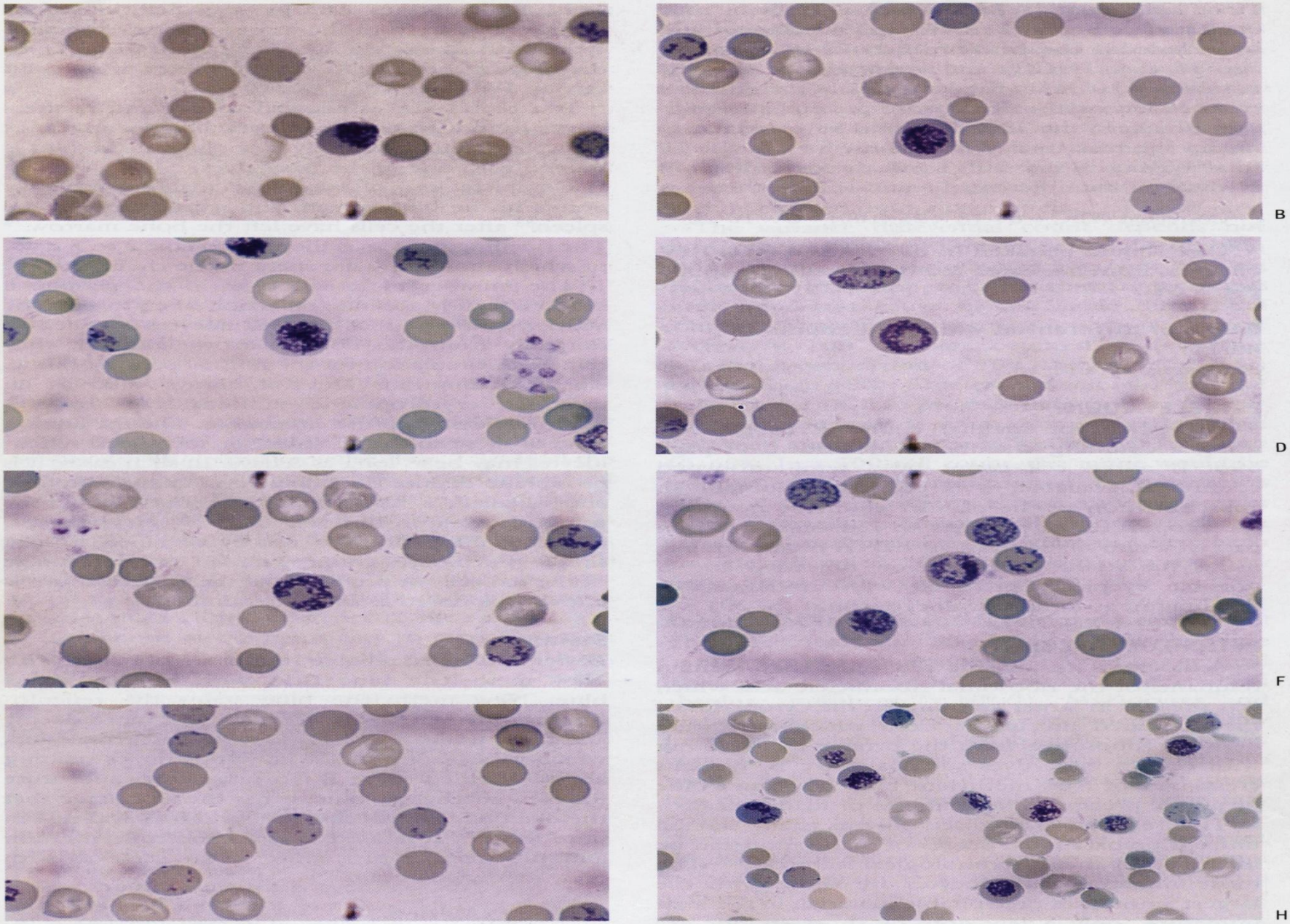
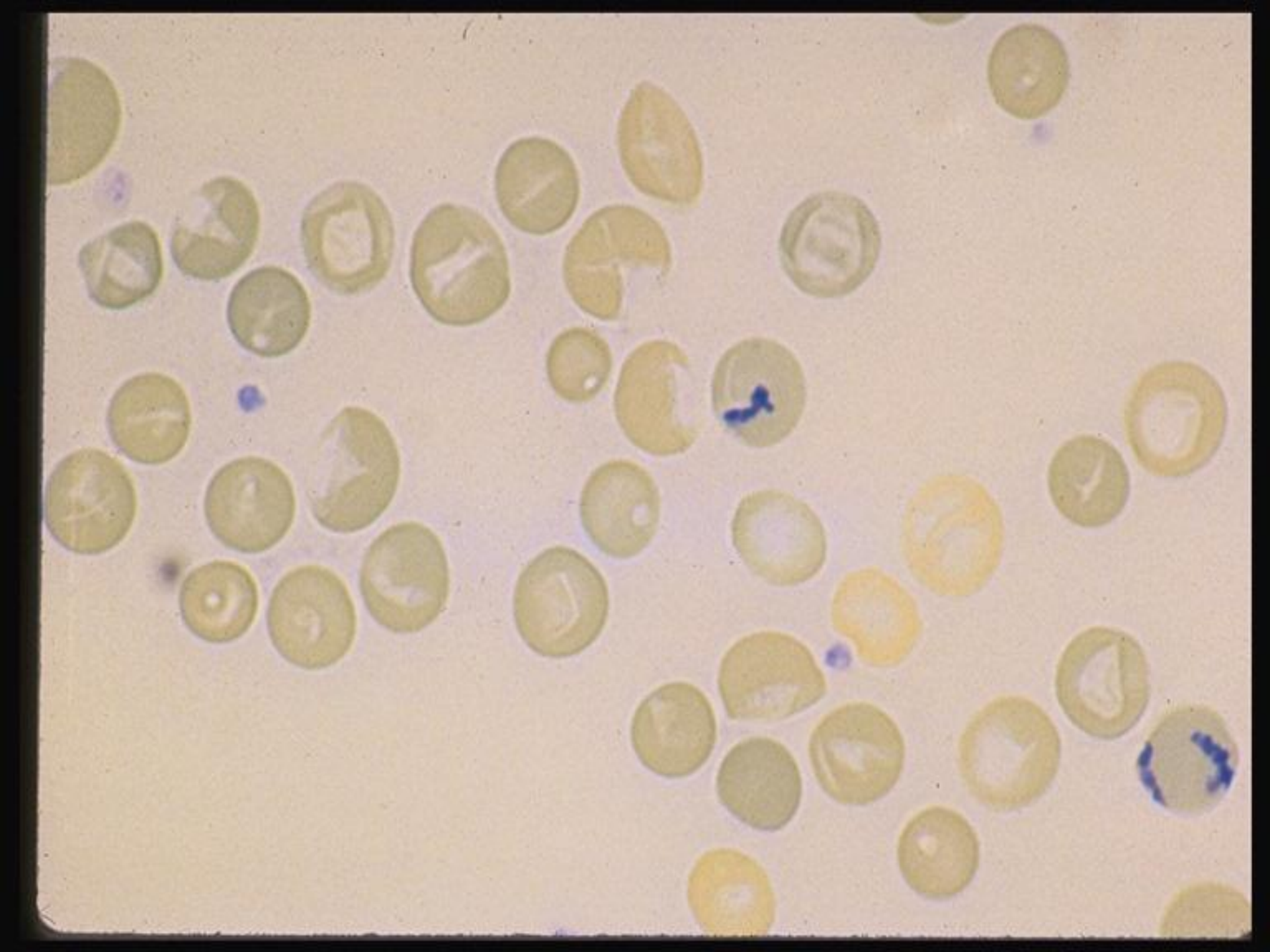


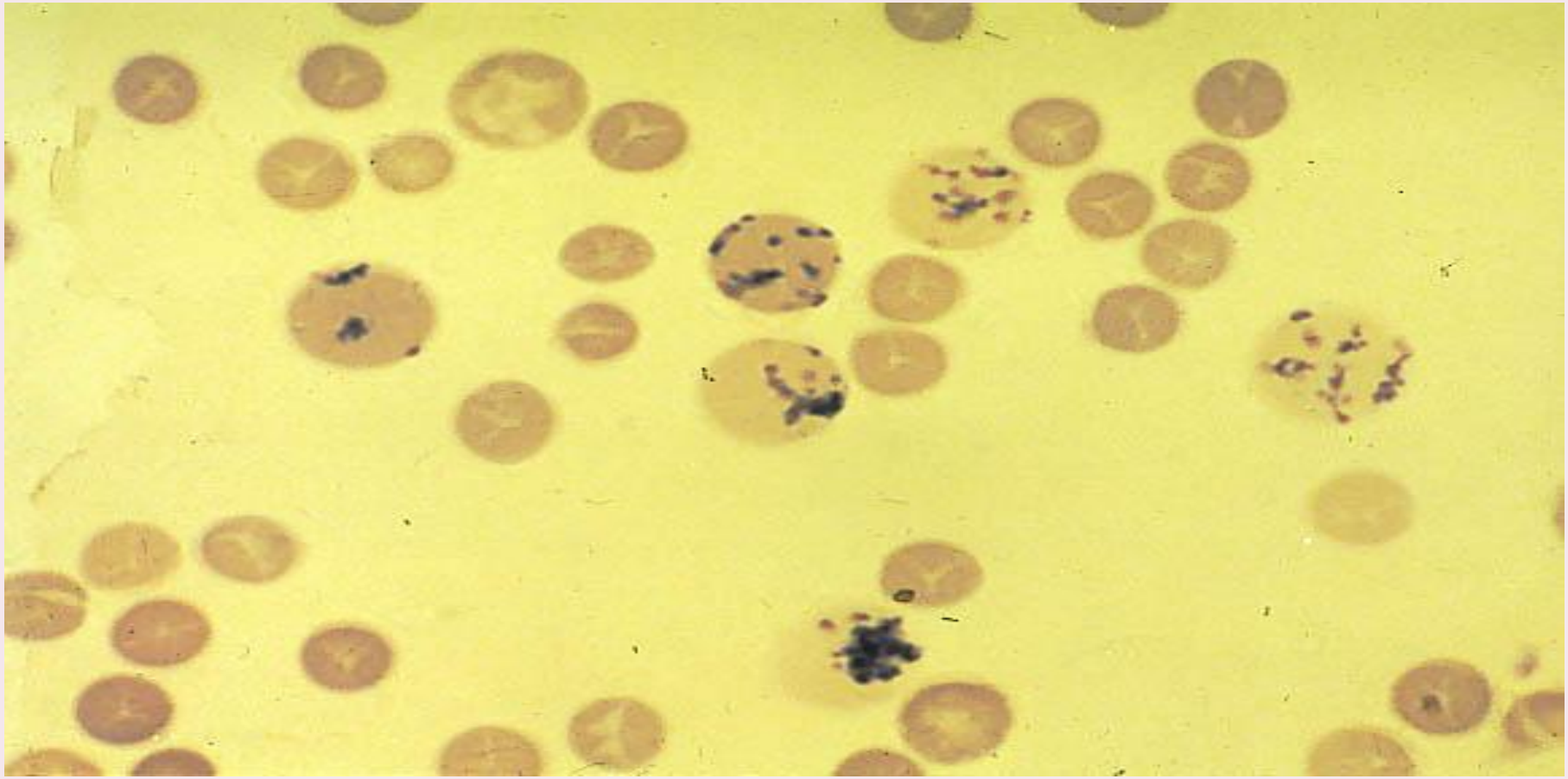
Fig. 3.4 Photomicrographs of reticulocytes showing stages of maturation. A and B, most immature (group I); C and D, intermediate (group II); E and F, later stage itermediate (group III); G, most mature (group IV); H, haemolytic anaemia, stained supravitally by new methylene blue.



Reticulocyte Manual Count by Supravital Stain: Normal Count

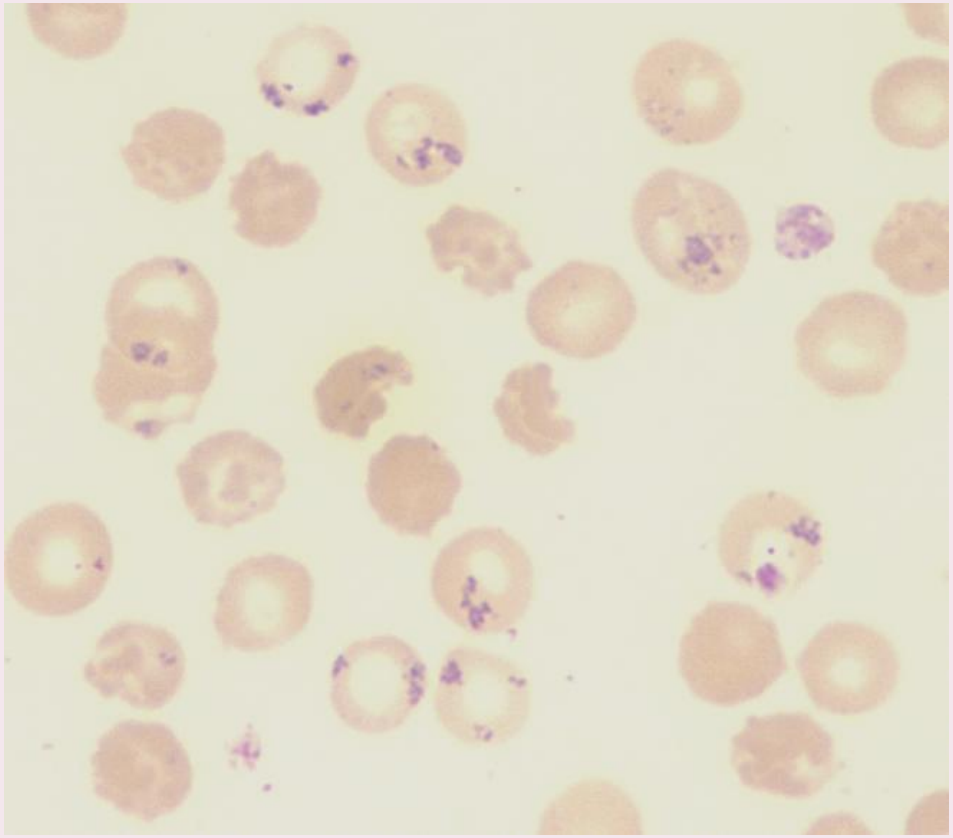


Reticulocytes: Elevated Count



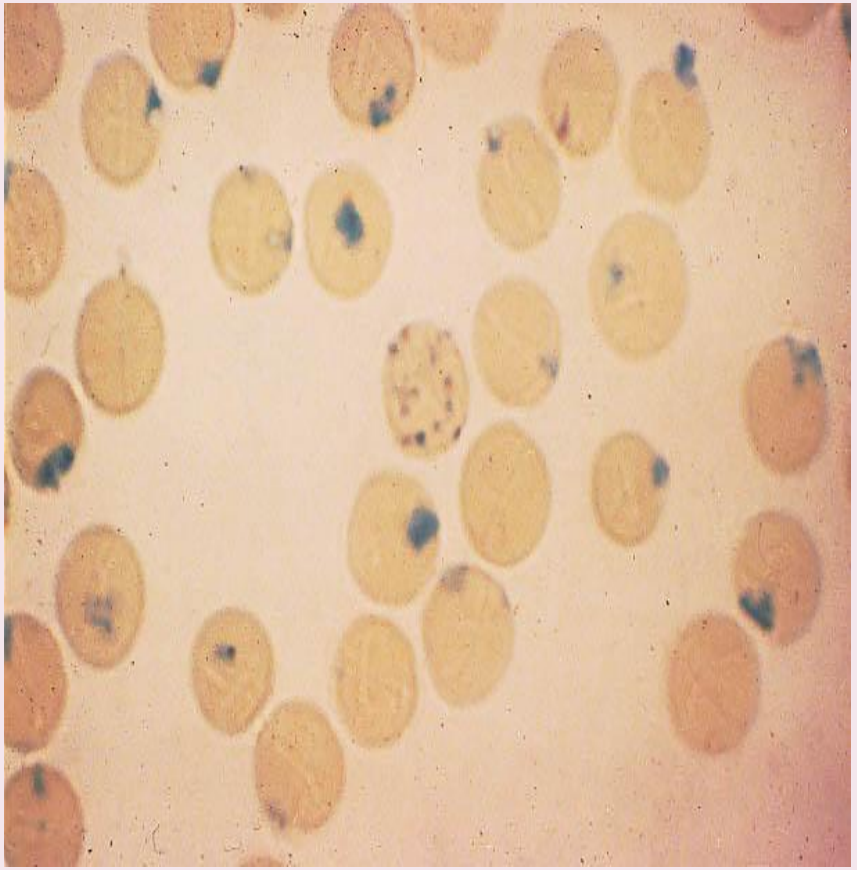
Pappenheimer bodies

- Iron-containing inclusions
- One or more granules towards the periphery of the cell
- May stain a deeper blue than reticulum
- It can be identified by over staining for iron by Perls reaction
- Hyposplenism & Fe overload



Heinz Bodies

- Denatured Hb
- Larger than Pappenheimer bodies
- Irregular in shape
- Usually attached to the cell membrane and may protrude through it
- They can be stained by a number of vital dyes
- Pale blue
- Splenectomized subjects& G6PD deficient
- Unstable Hb



Howell Jolly body

Nuclear remnant – DNA

Larger than Pappenheimer bodies

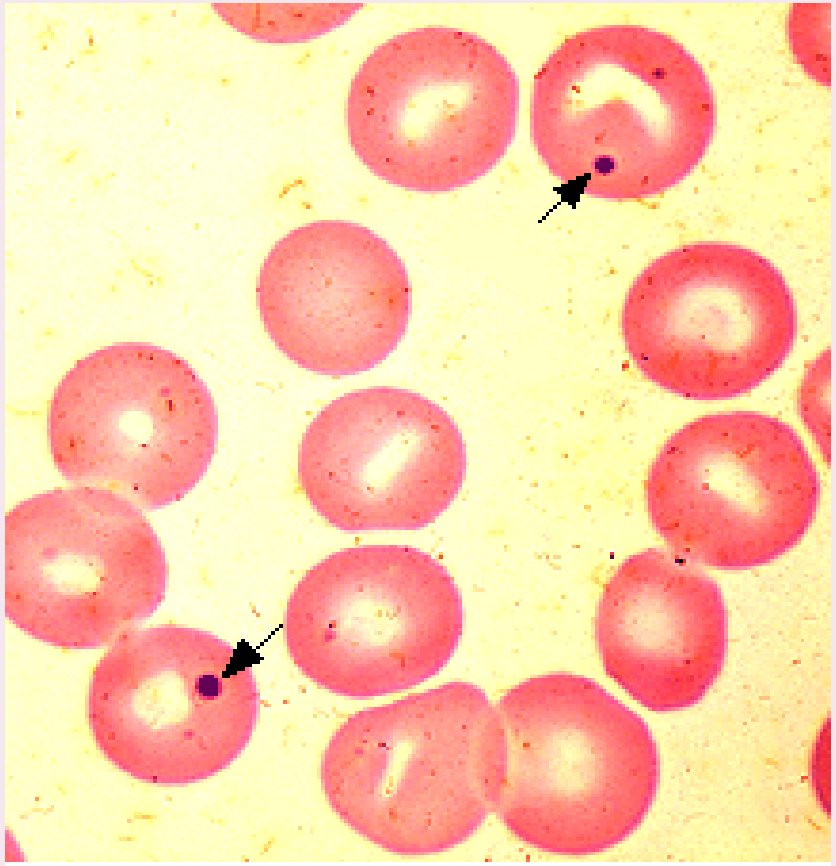
regular in shape

Distant from the cell membrane

Pale blue

hemolytic anemia

absent or hypo function spleen



Hemoglobin H inclusion

Denatured Hemoglobin H (ß4)

in • thalassemia

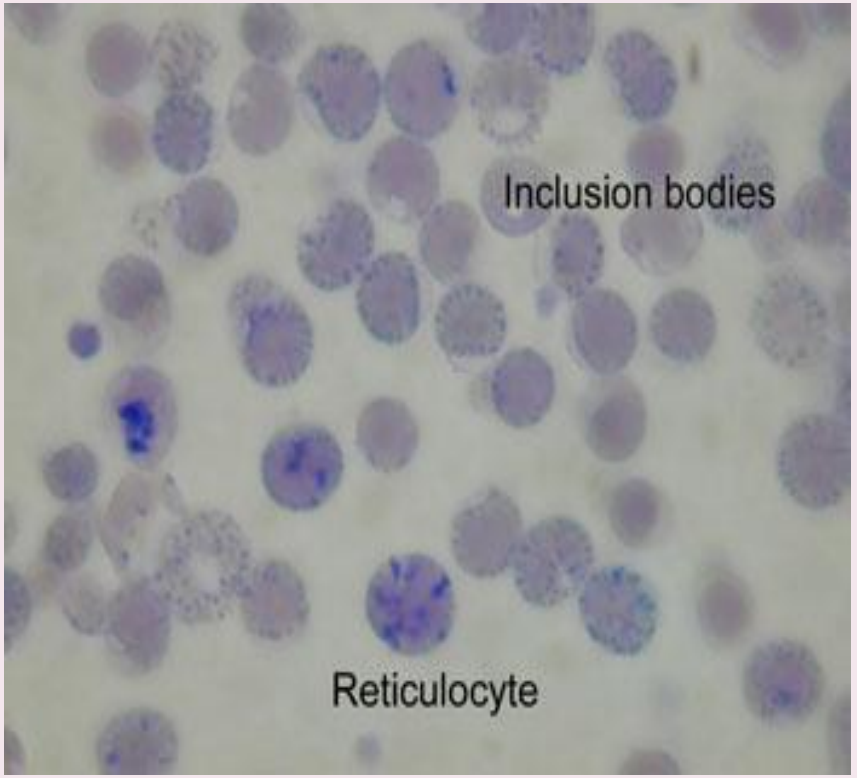
Usually do not form with short incubation periods(2 hours)

If present they are multiple and spherical, giving a "golf-ball" appearance

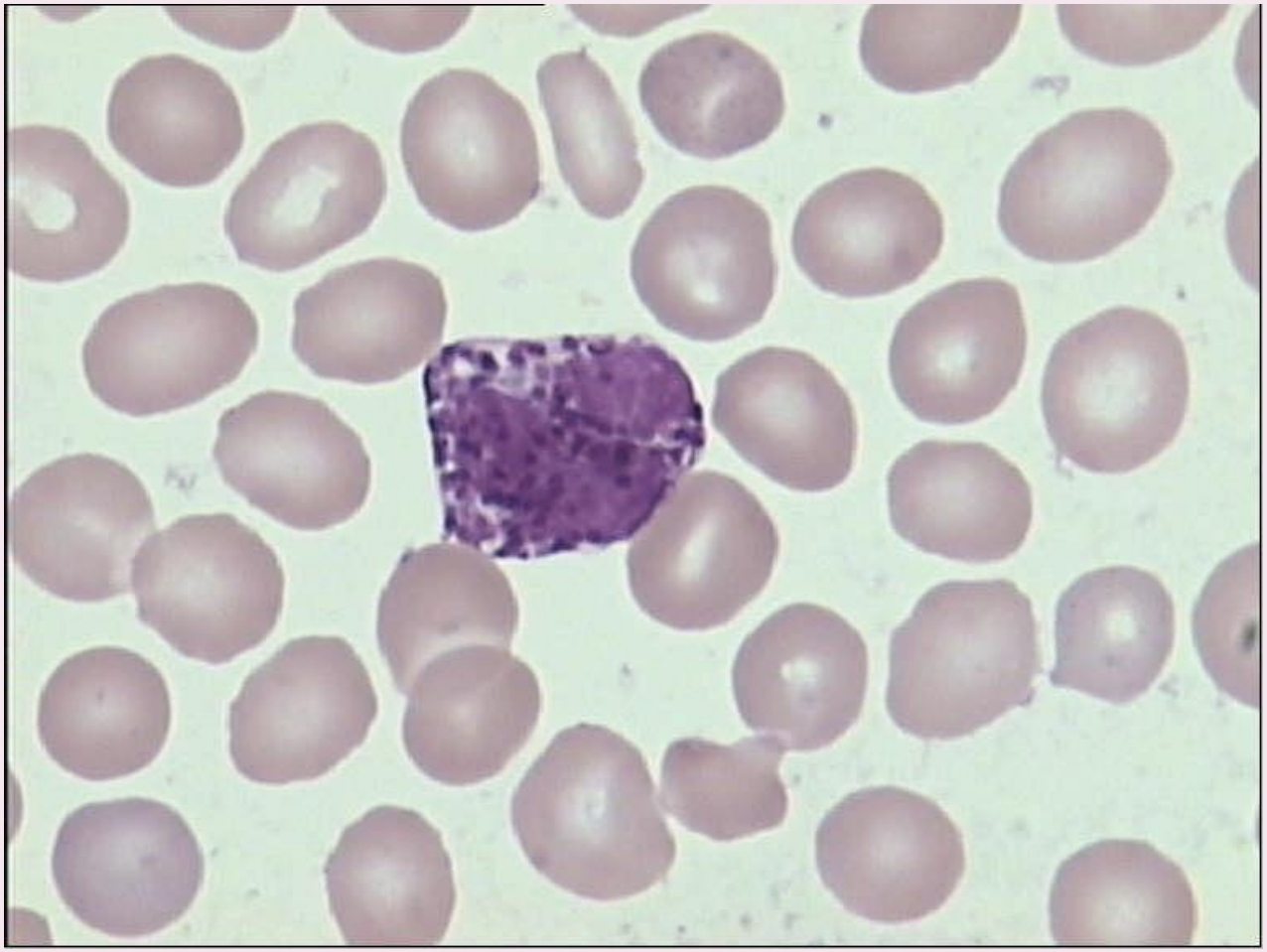
Pale greenish-blue

in • thalassemia trait 0.01-1%

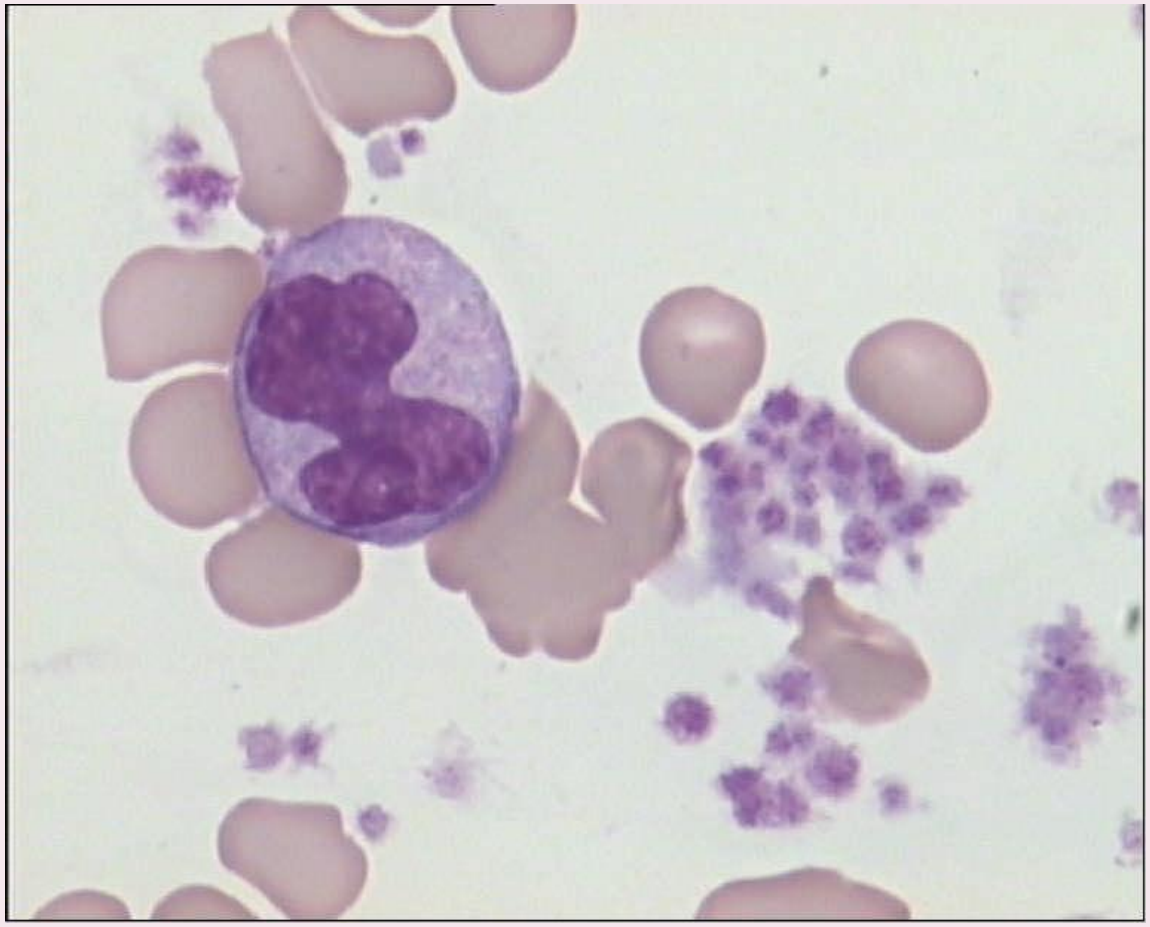
Enrichment



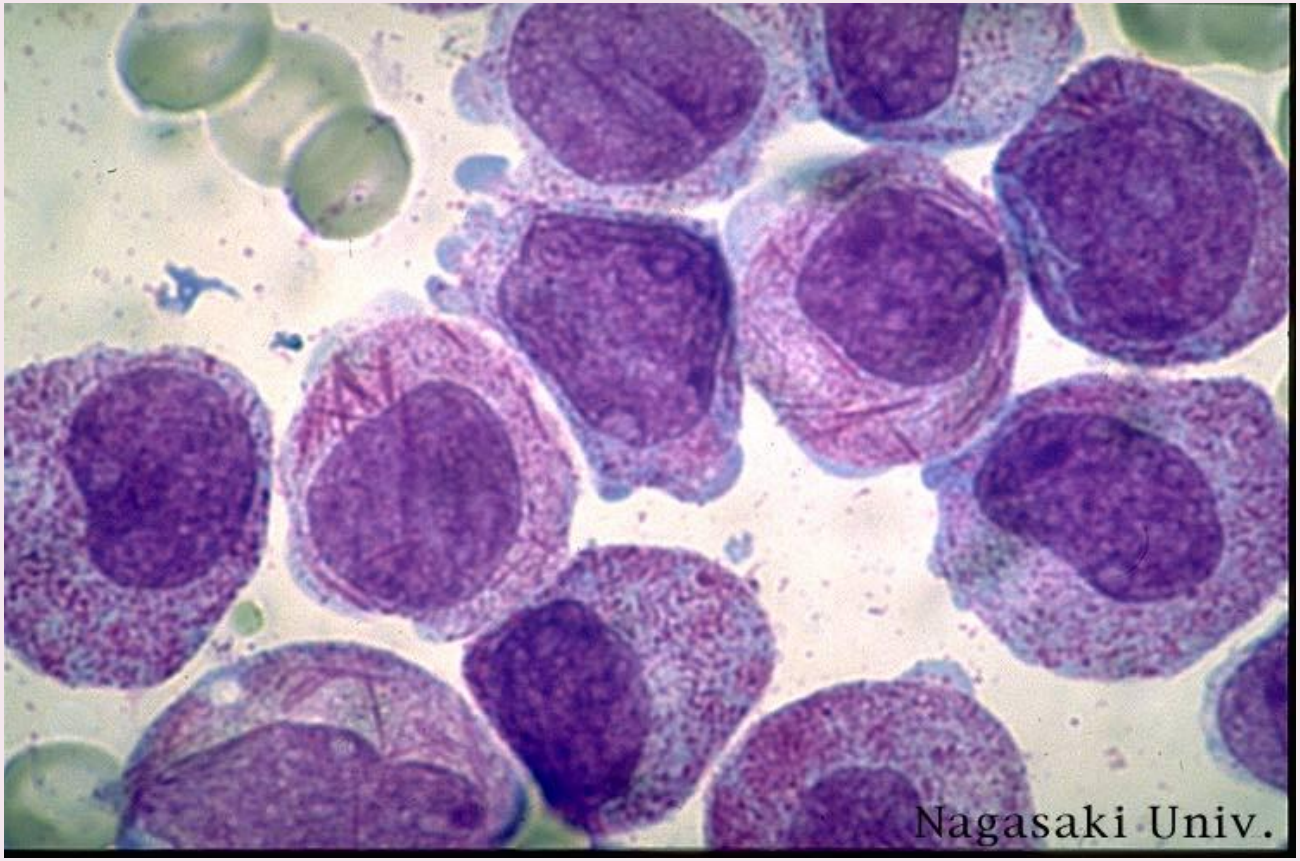
Basophil



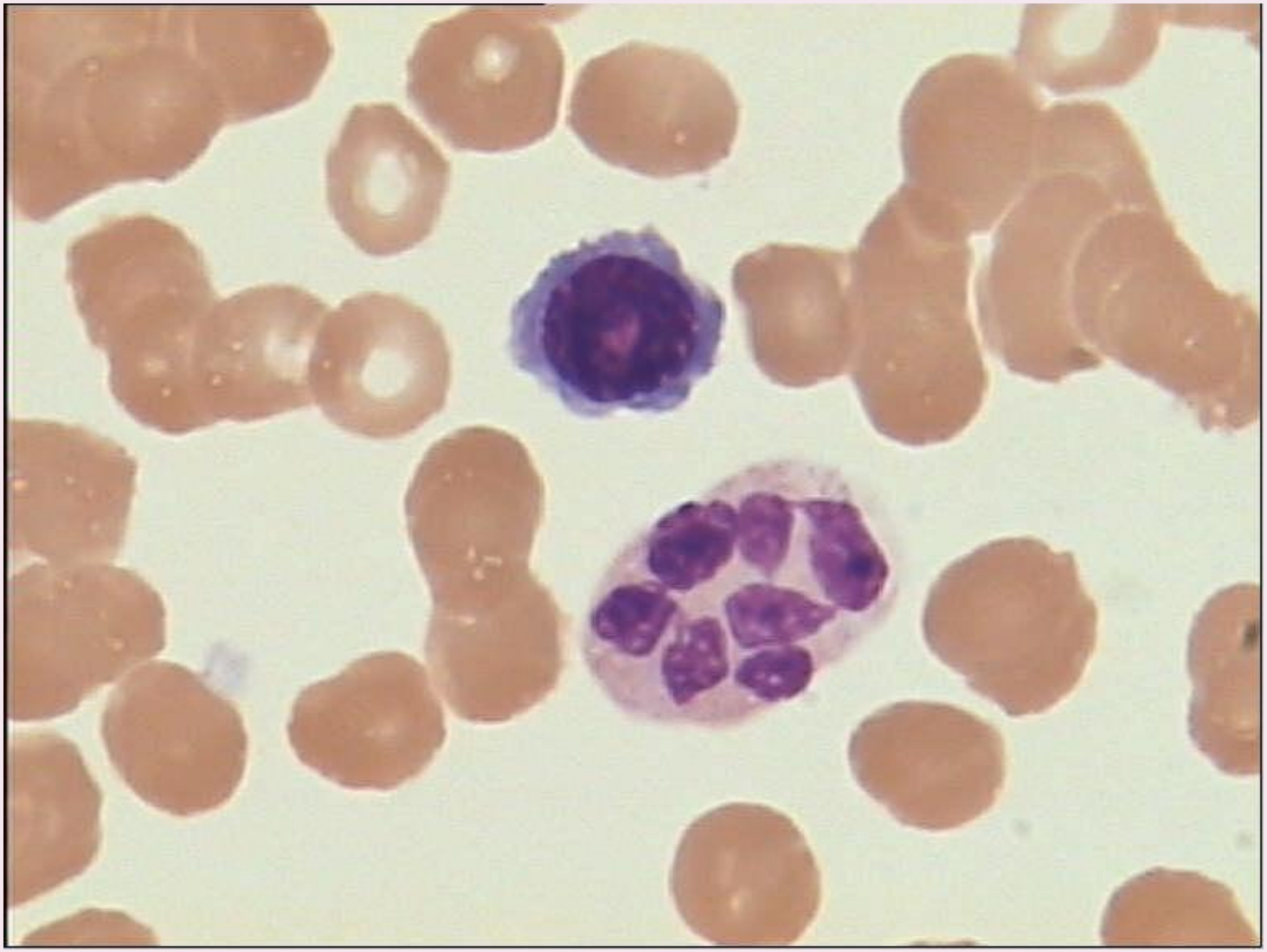
monocyte



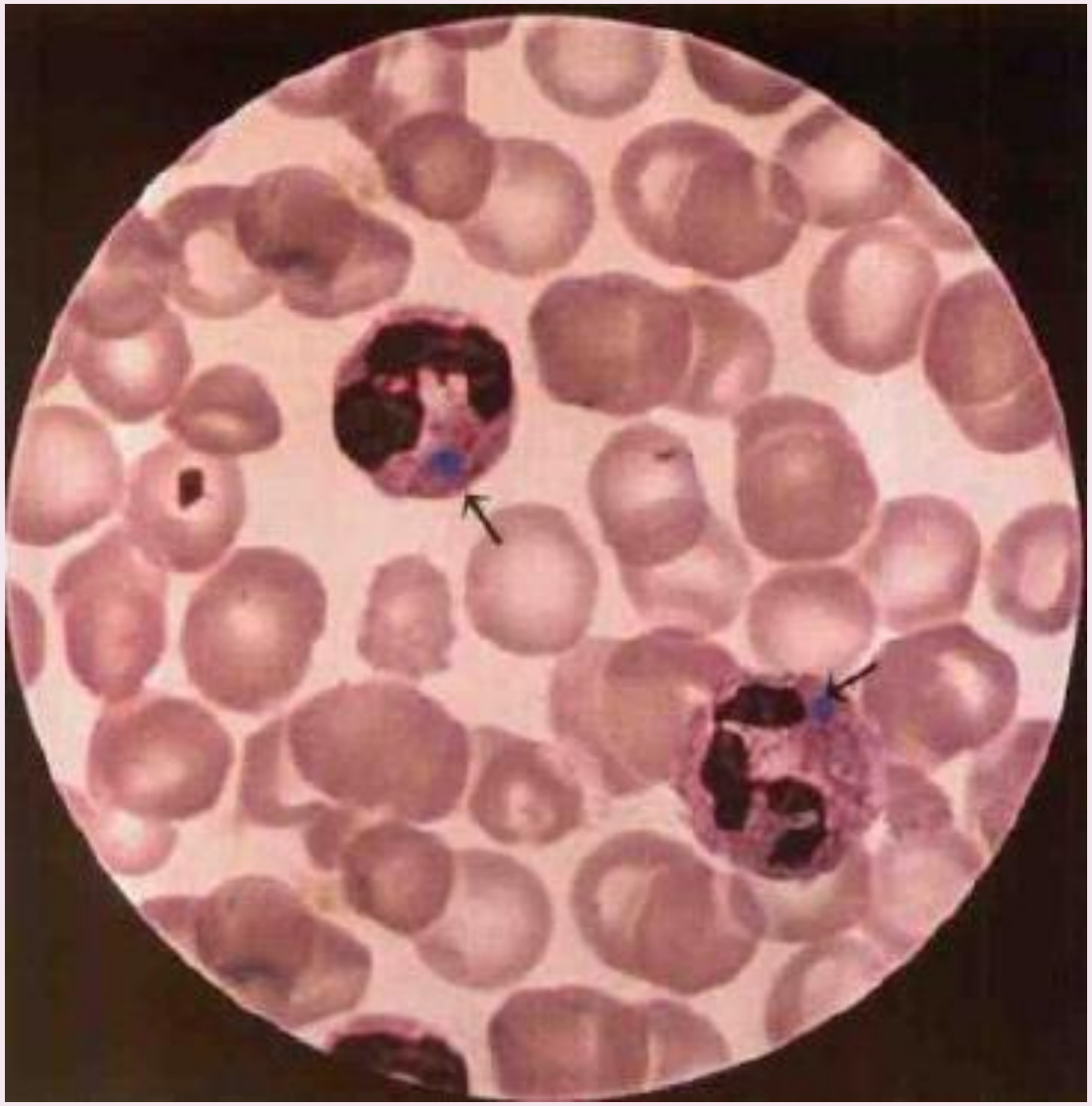
Auer Bodies(Auer Rod)

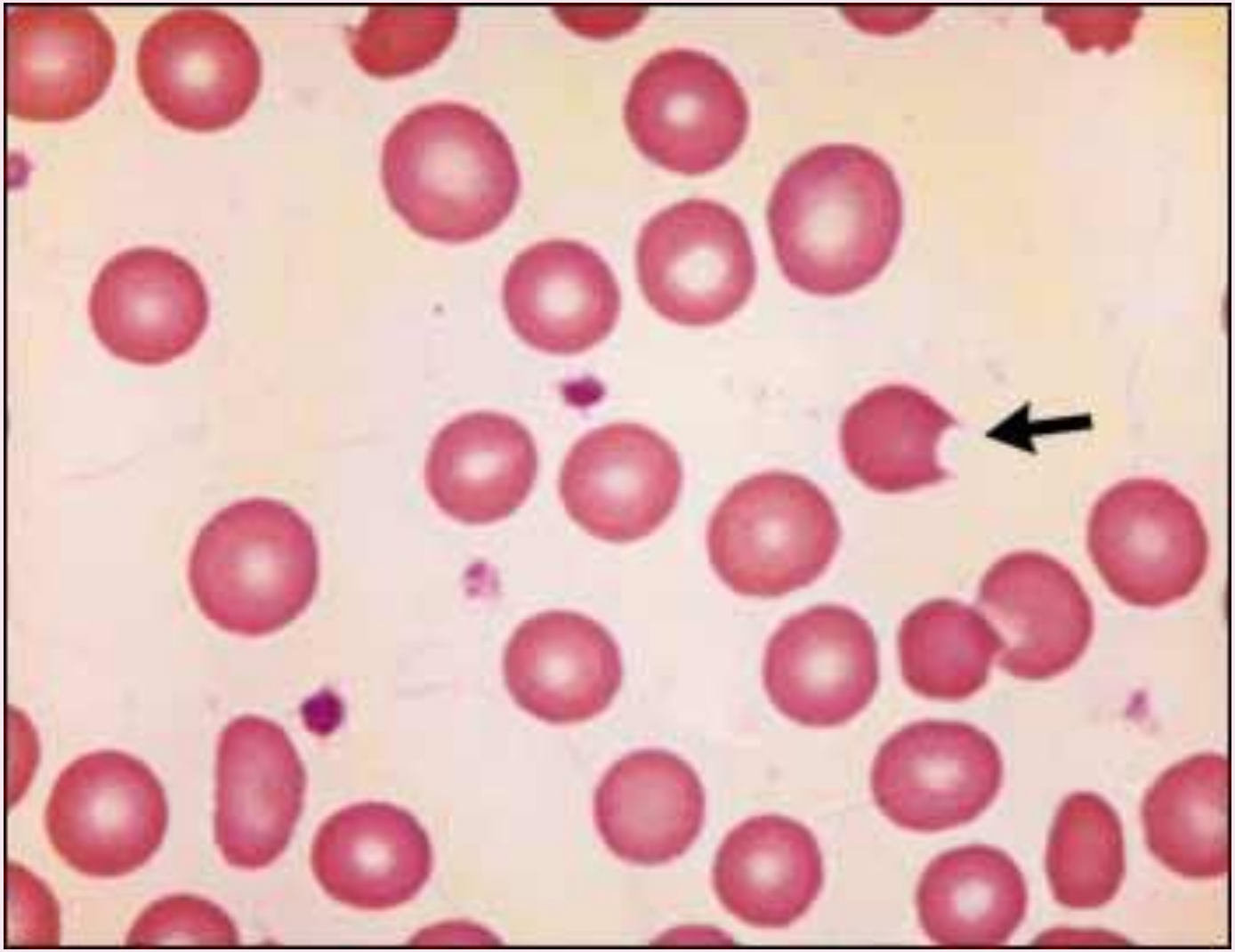


Hypersegmentation



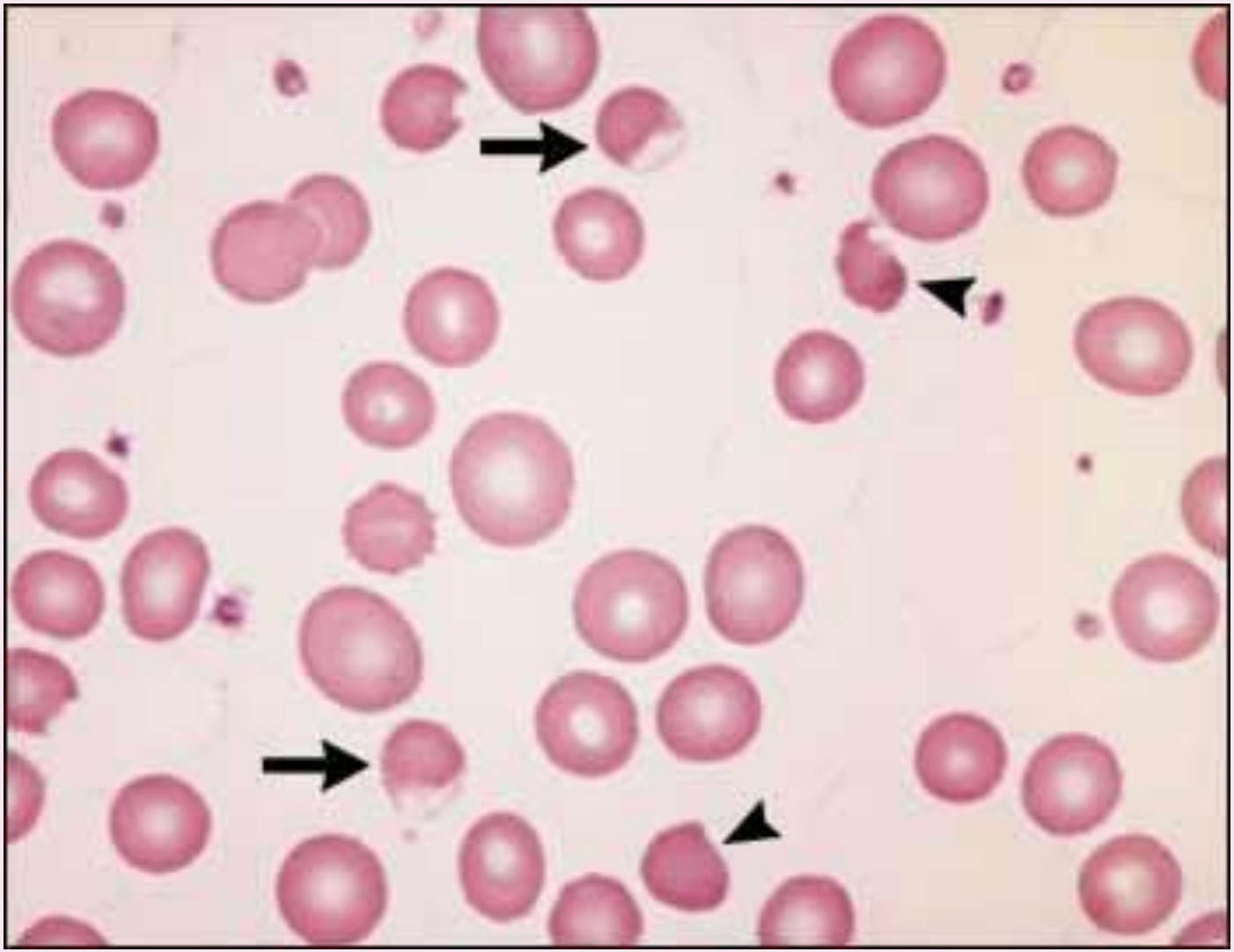
Dohle body





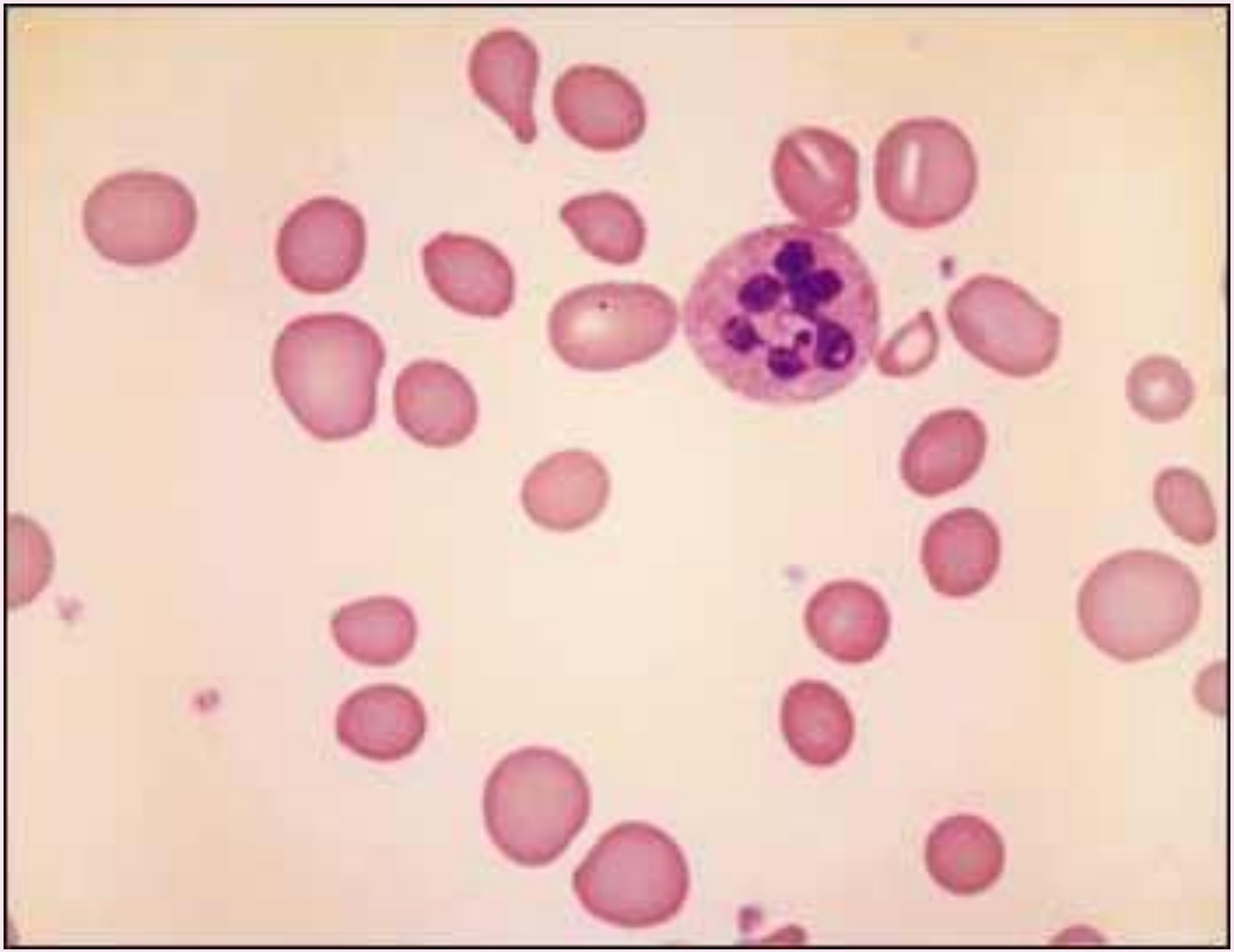
Diagnosis of the Blood Smear, N Engl J Med 2005;353:498-507

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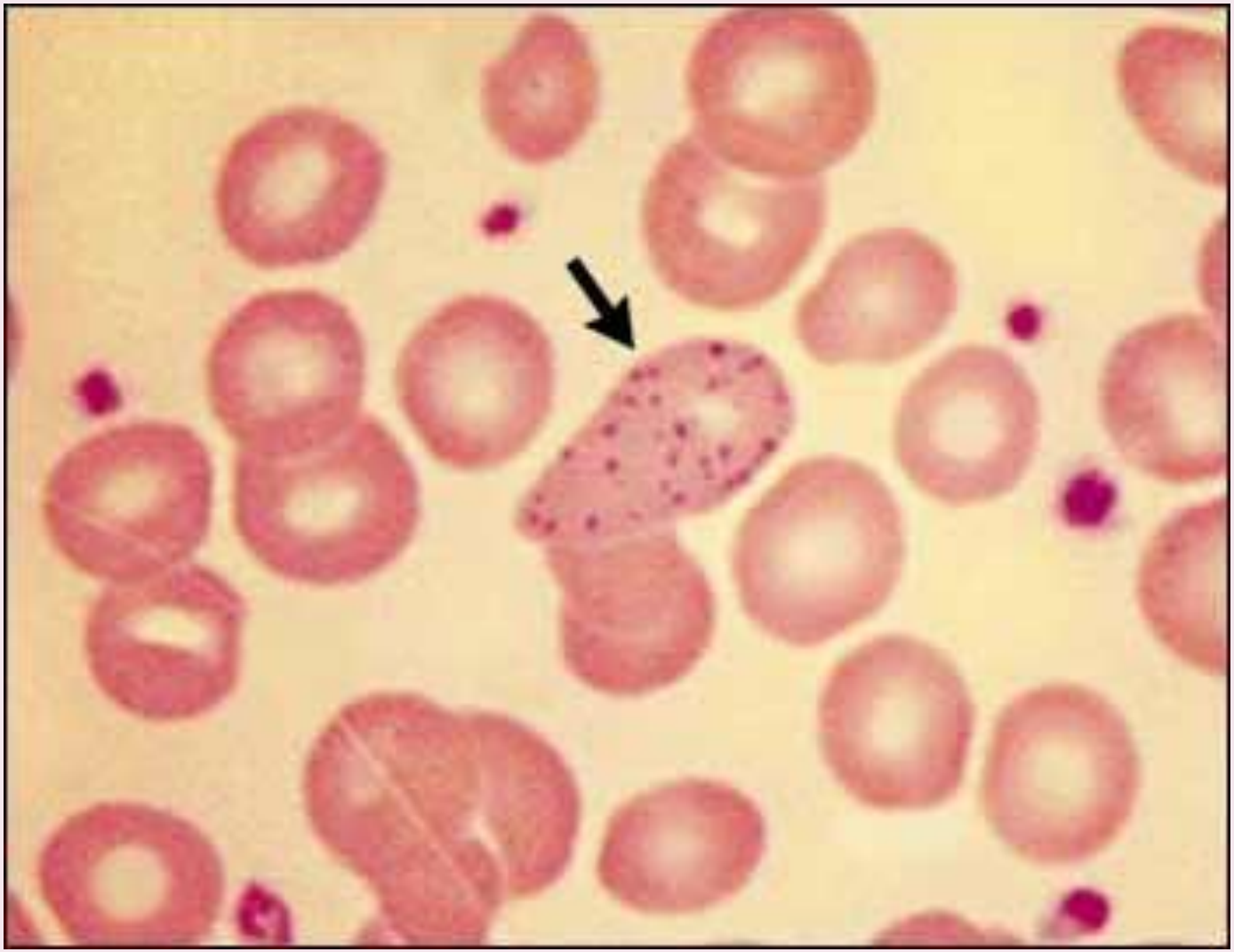
Diagnosis of the Blood Smear, N Engl J Med 2005;353:498-507

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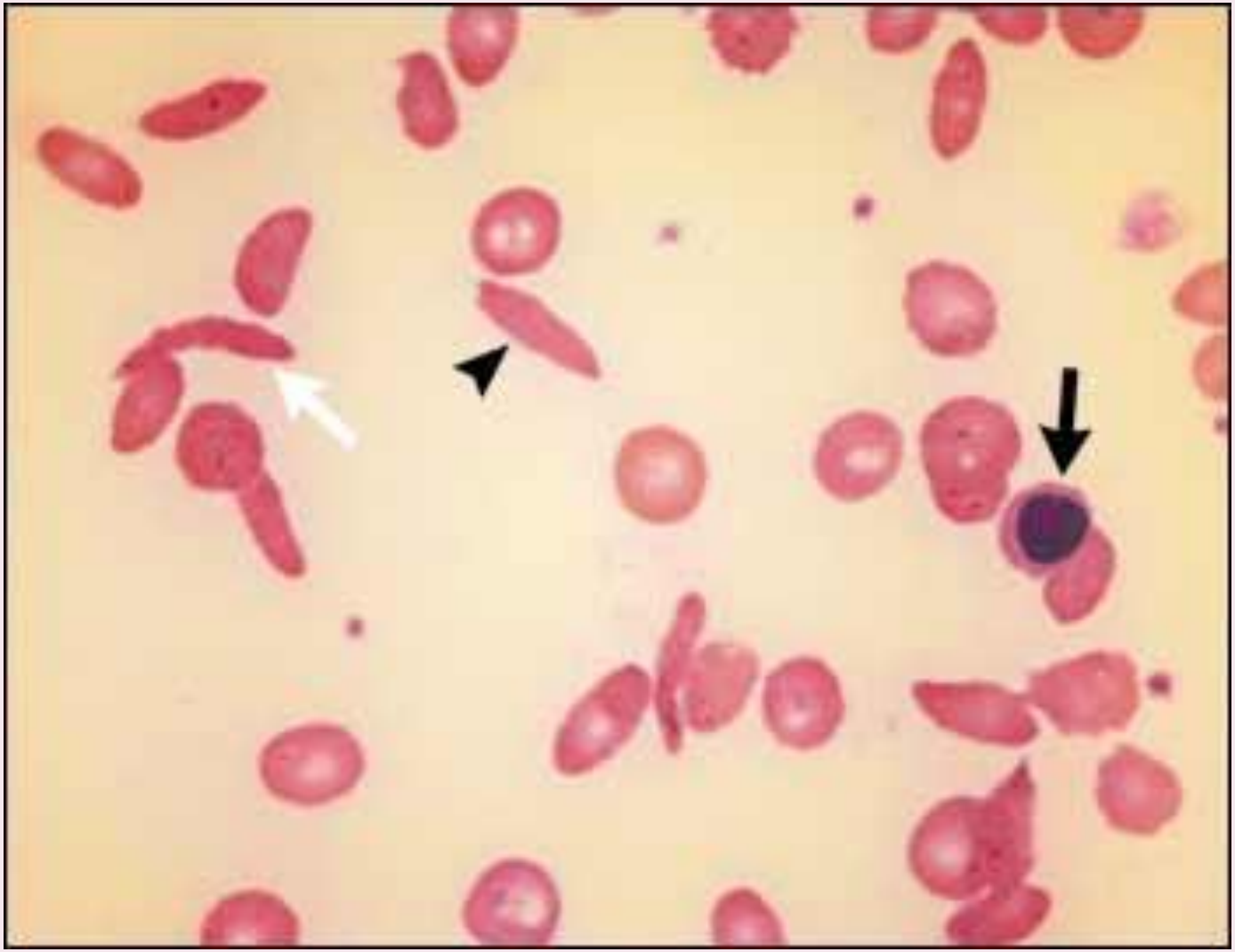
Diagnosis of the Blood Smear, N Engl J Med 2005;353:498-507

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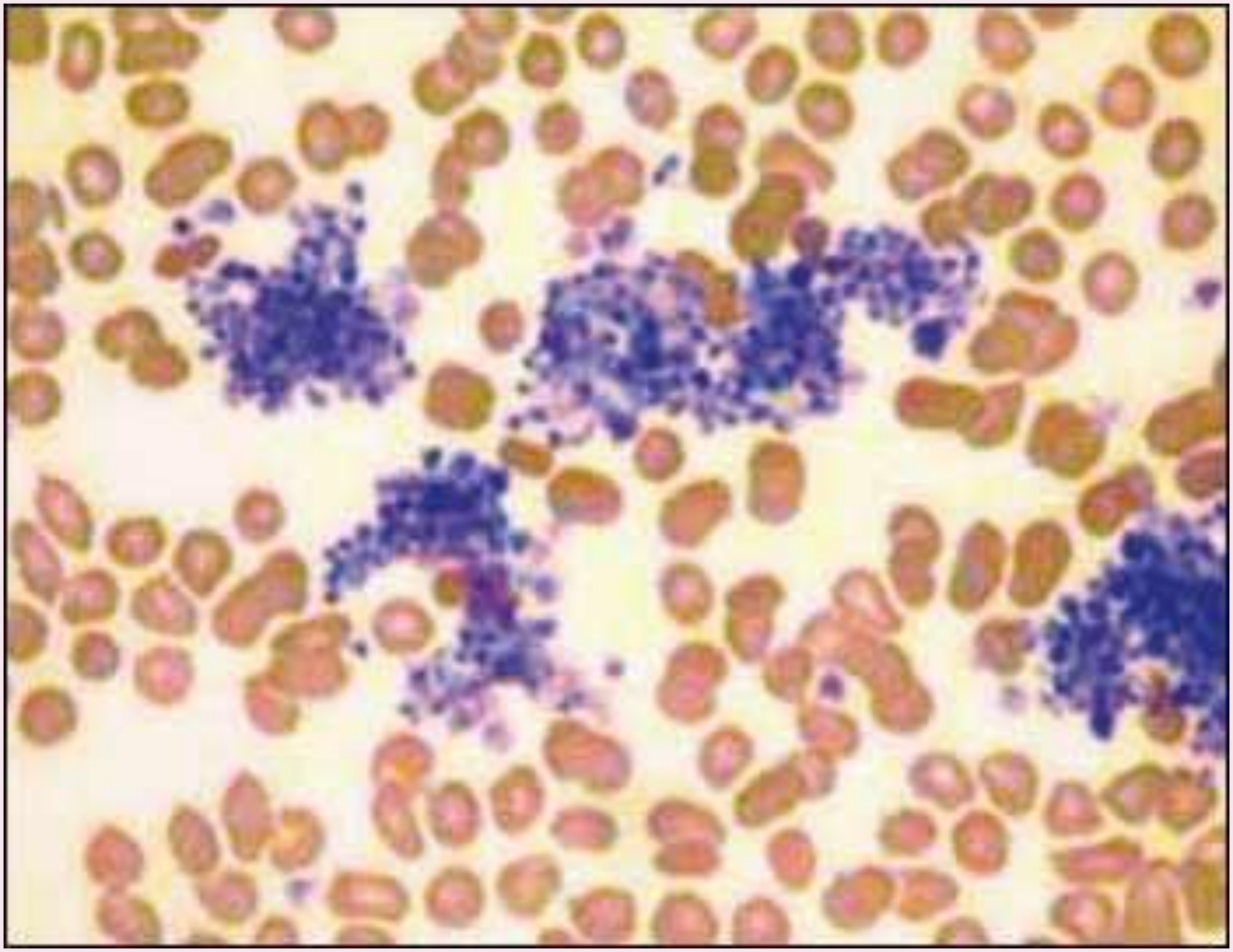
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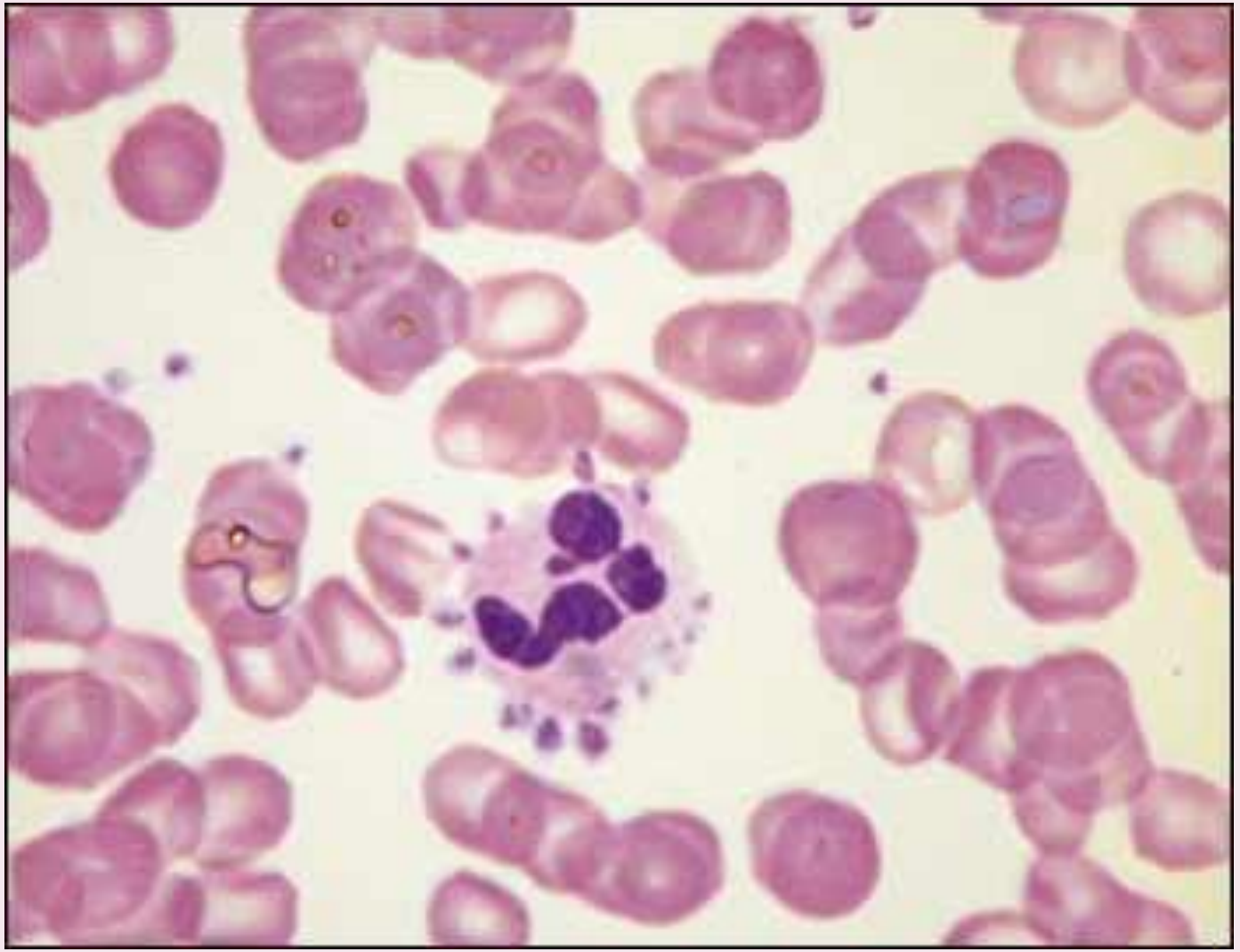
Diagnosis of the Blood Smear, N Engl J Med 2005;353:498-507

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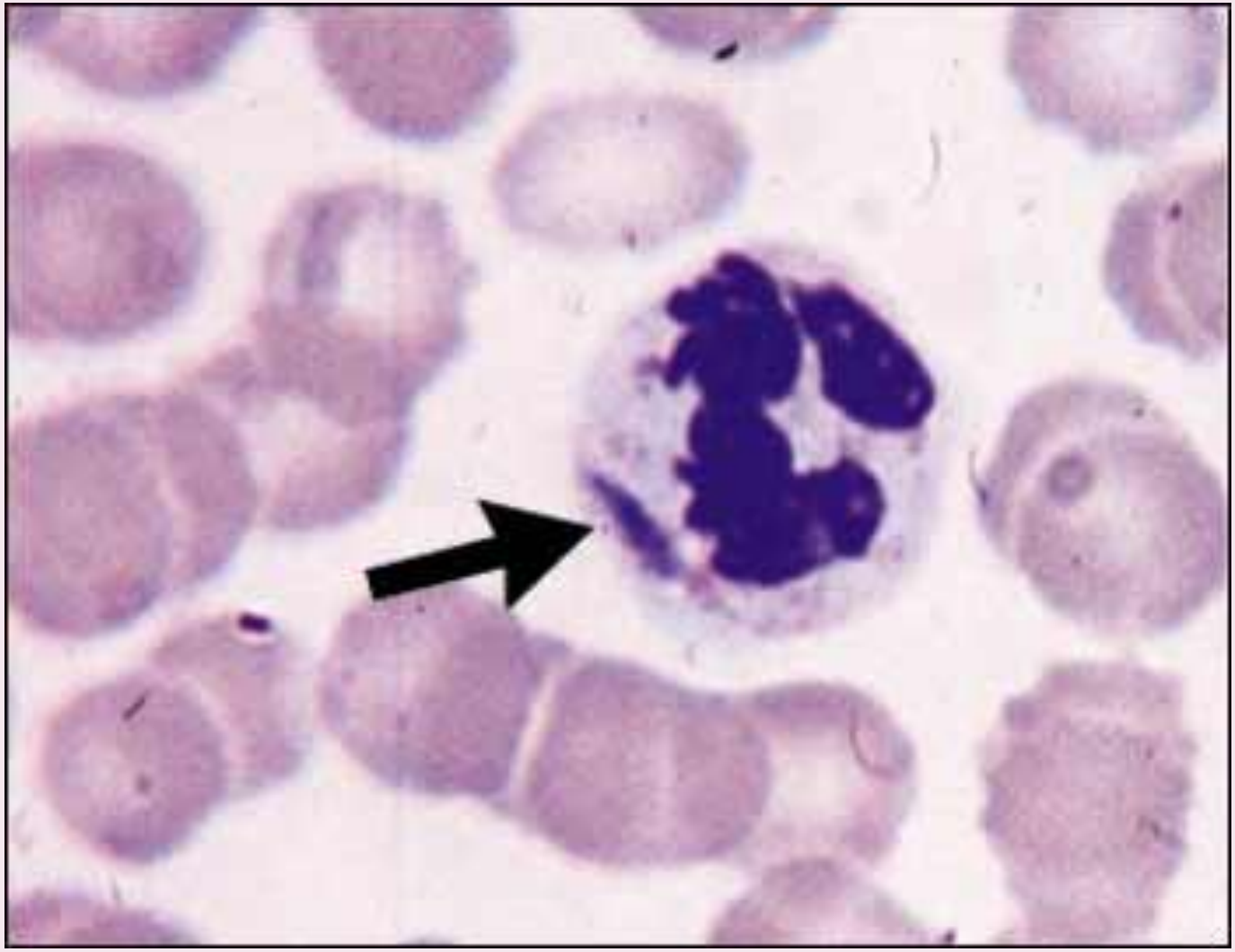
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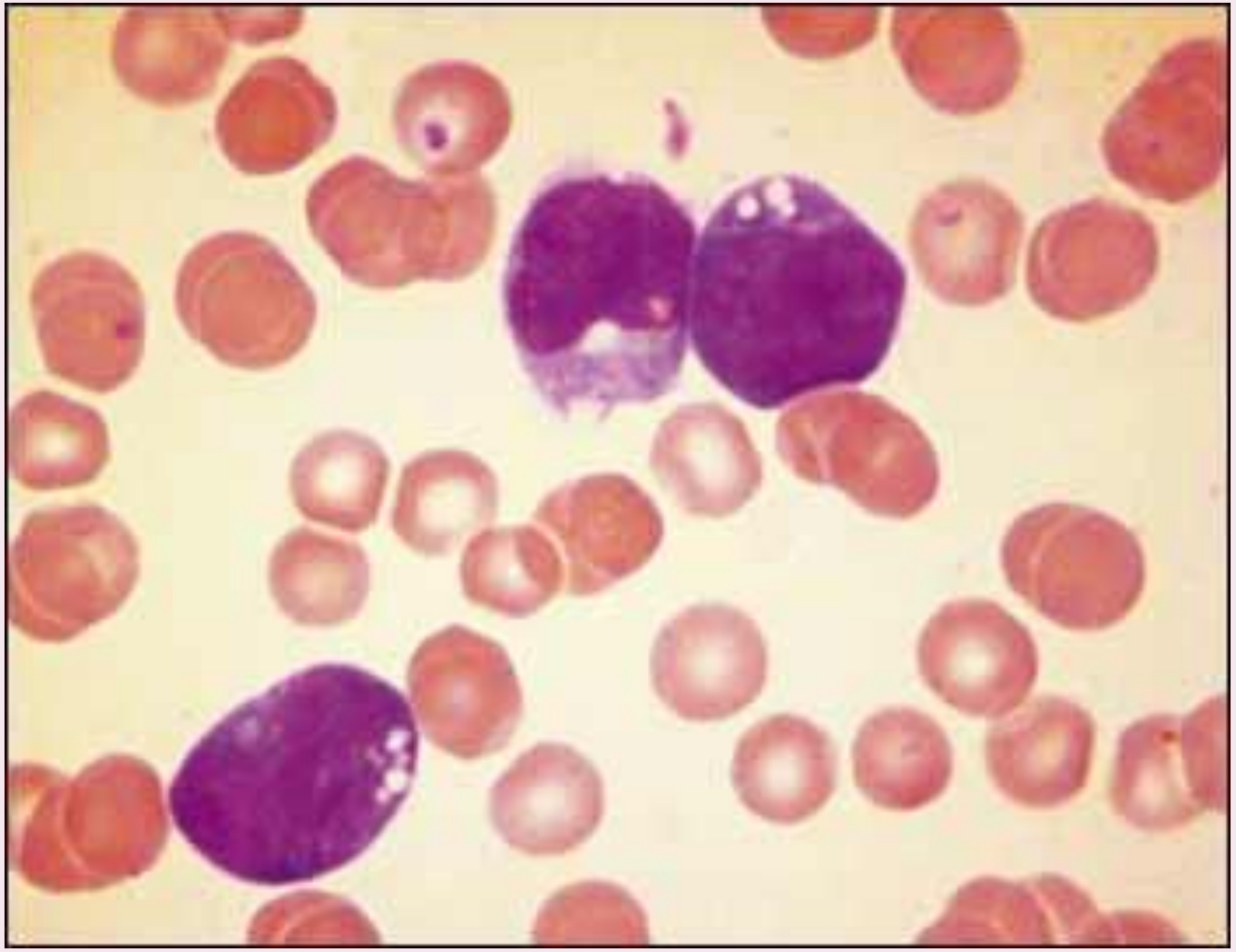
Diagnosis of the Blood Smear, N Engl J Med 2005;353:498-507

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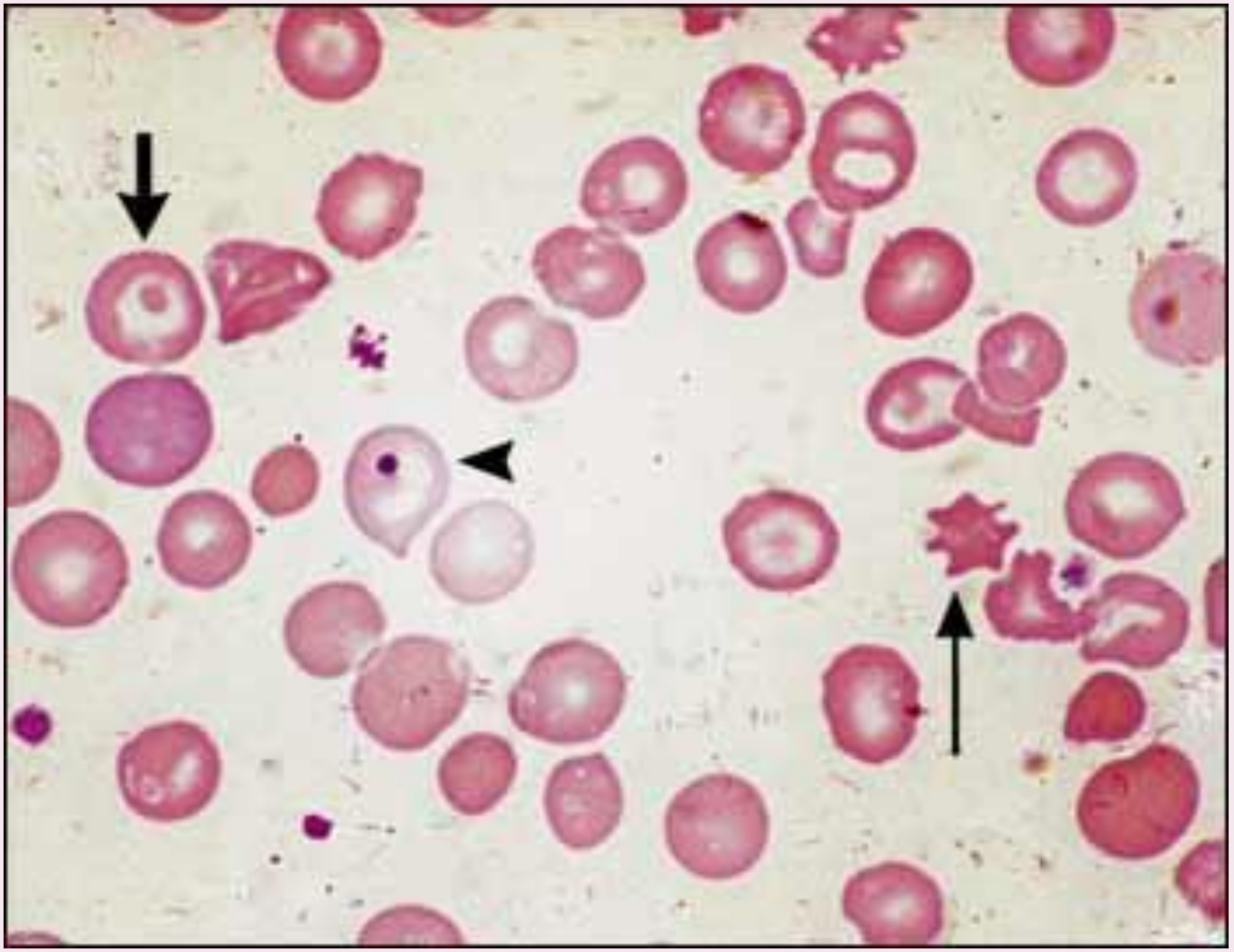
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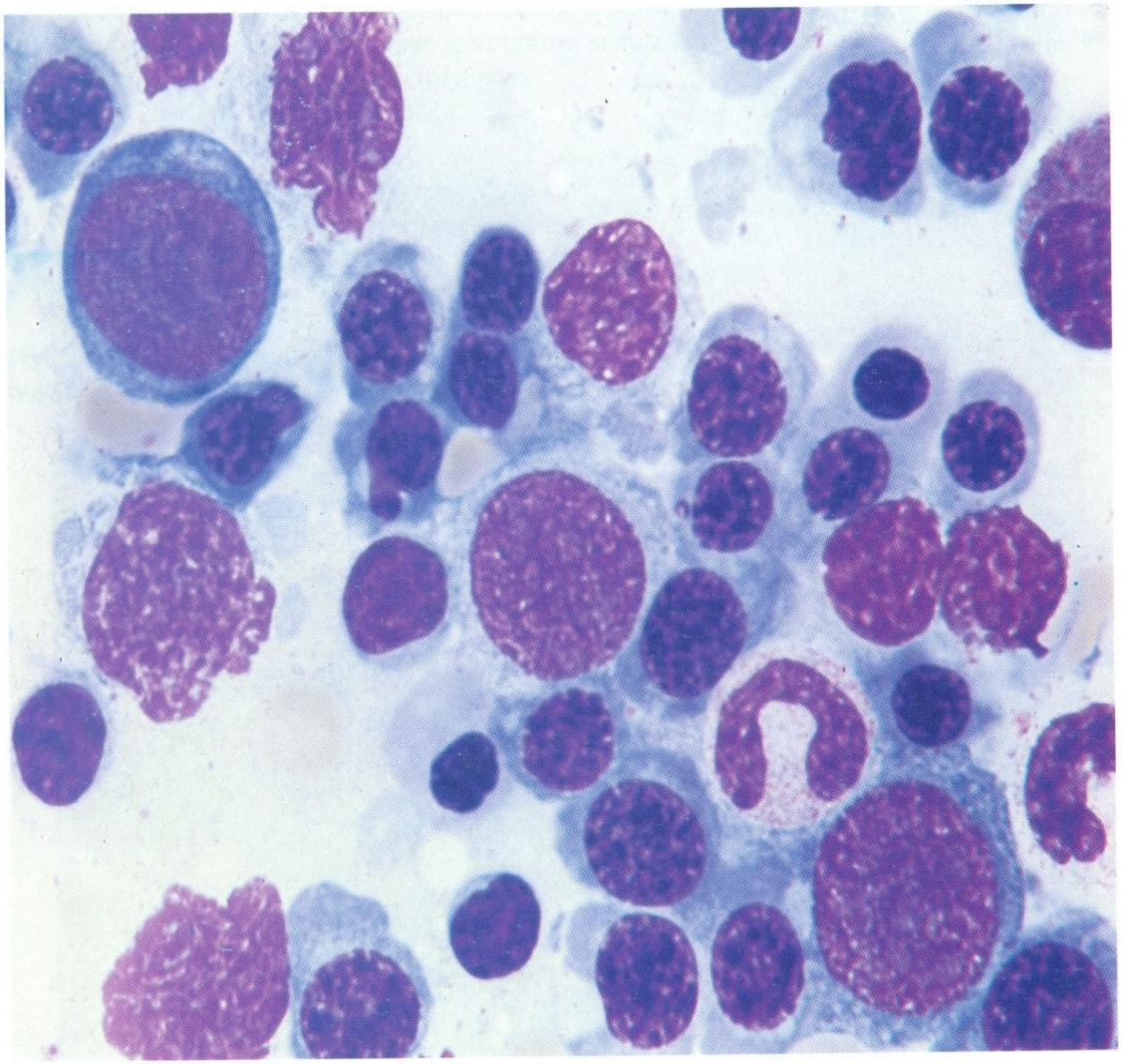
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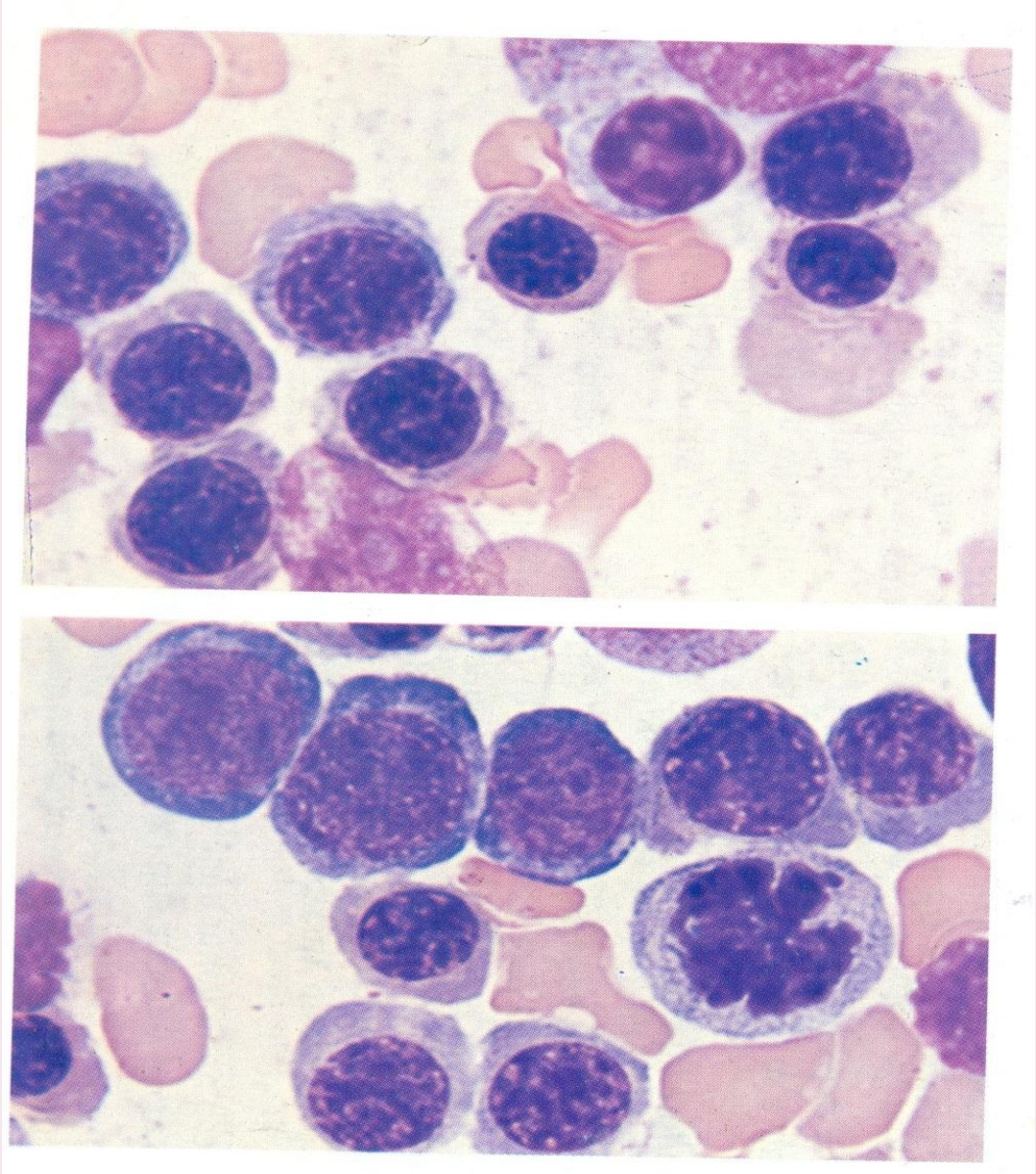
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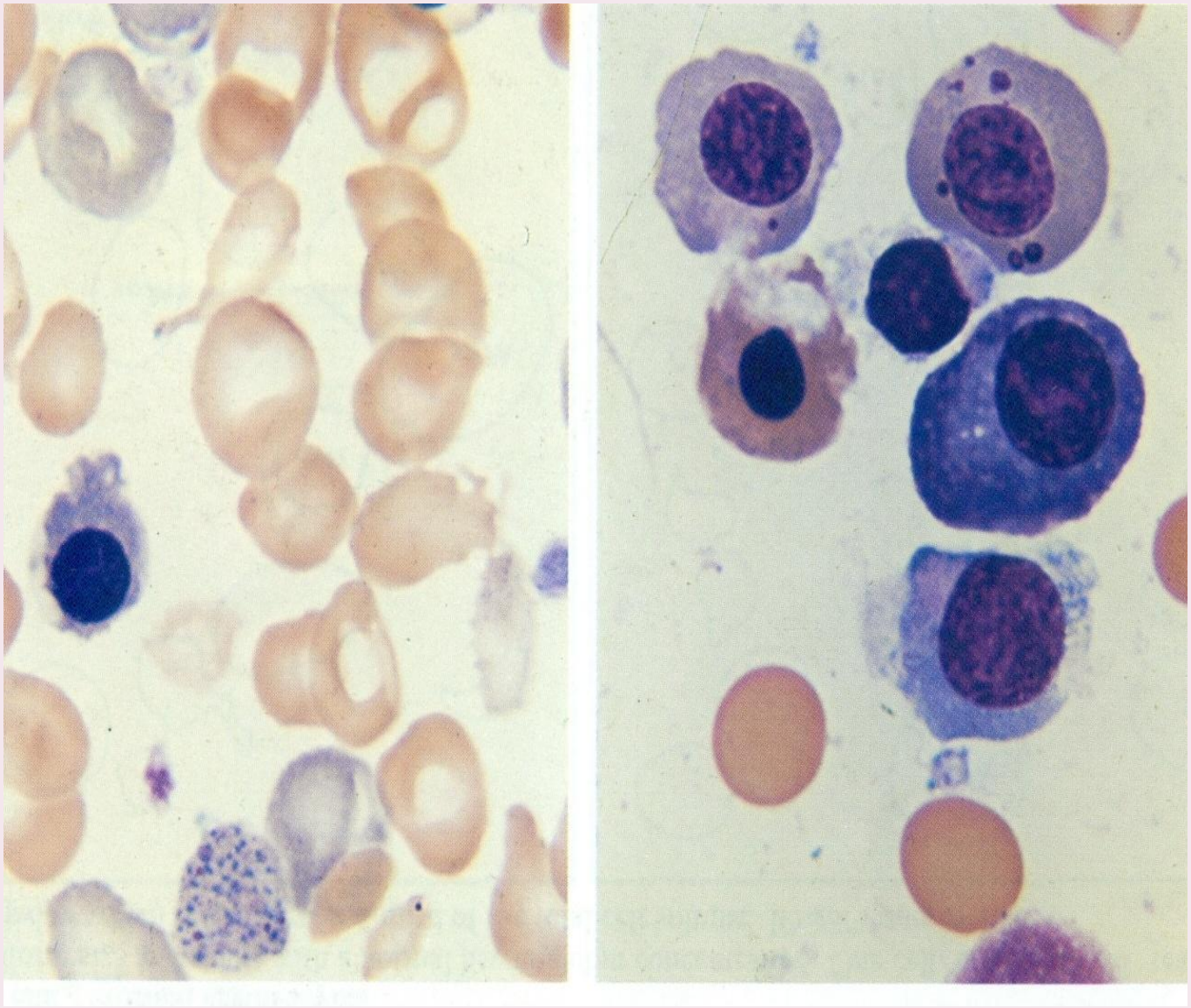


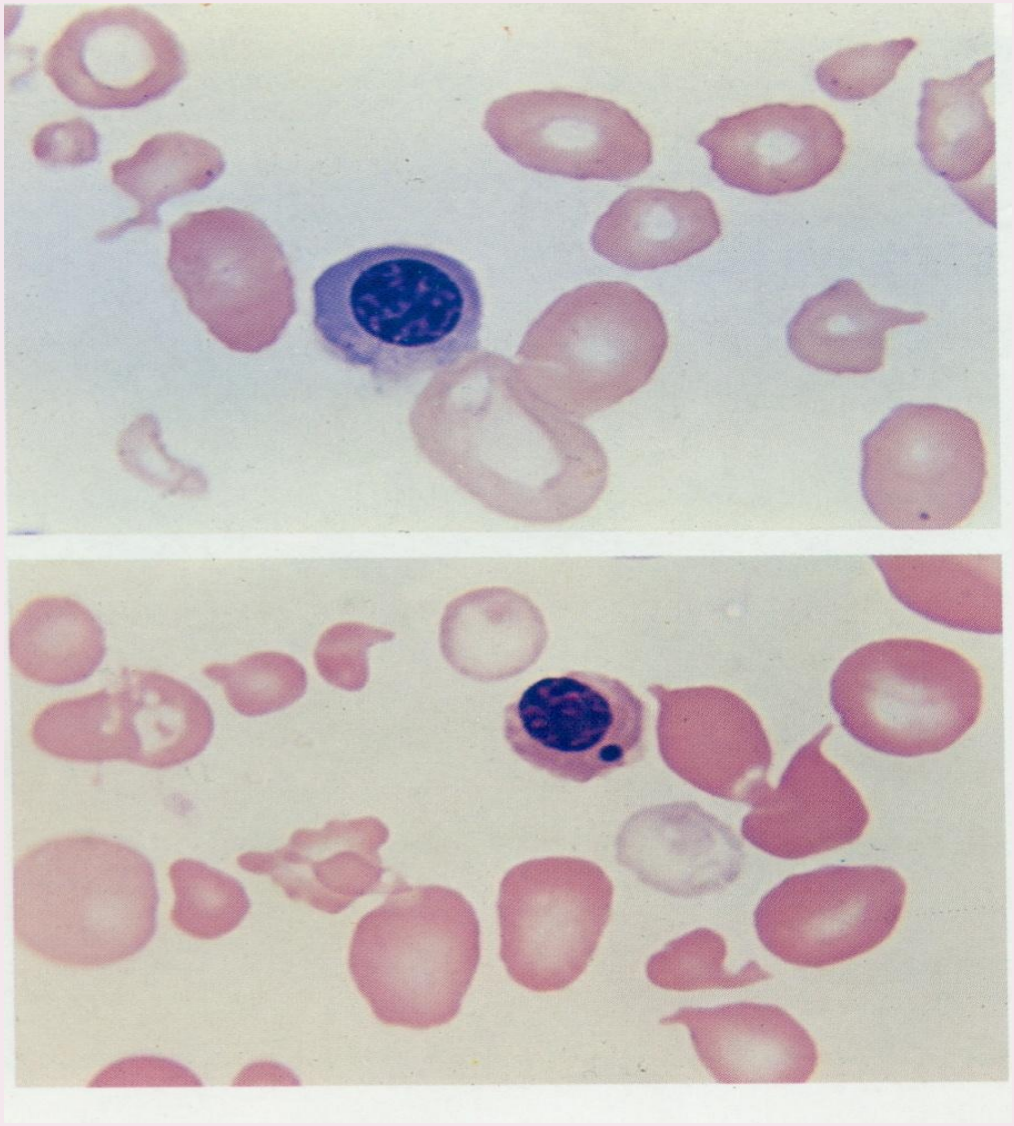
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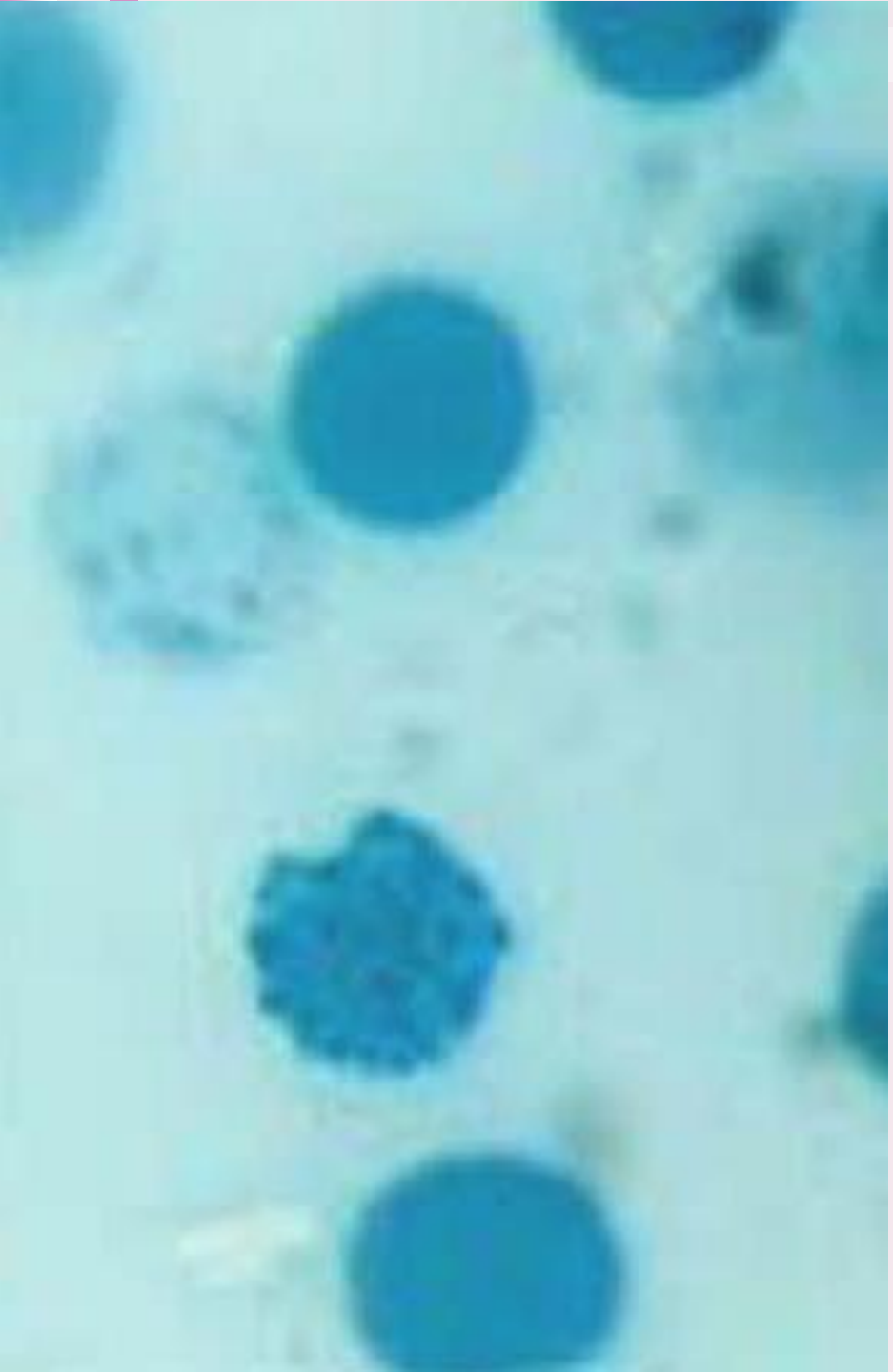
The NEW ENGLAND JOURNAL of MEDICINE

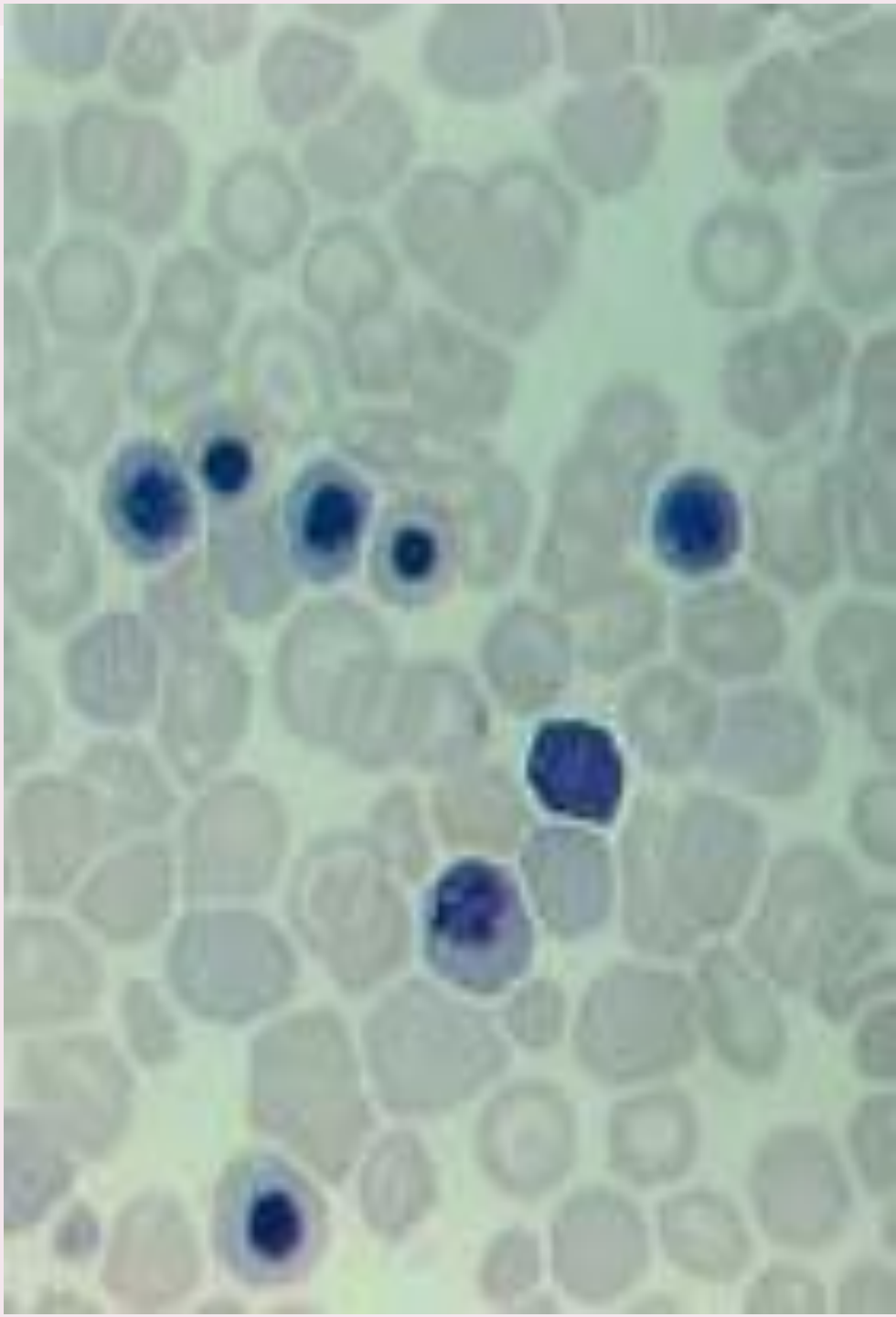








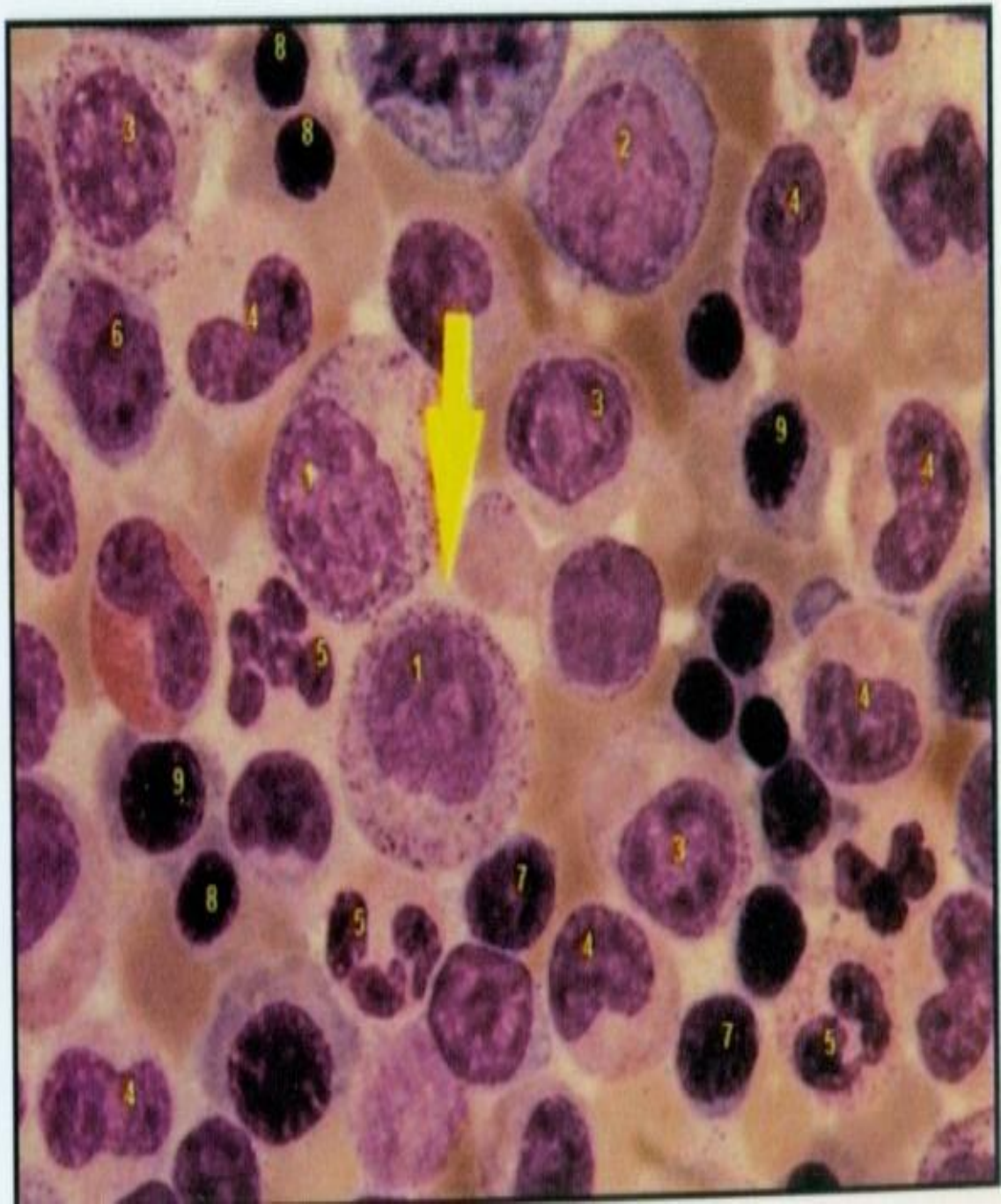




میلوبلاست در مغز استخوان.

۱-میلوبلاست myeloblast ۲-
پرومیلوسیت promyelocyte
۳- نوتروفیلیک متامیلوسیتneutrophil
۴- نوتروفیل باند metamyelocyte
۵- نوتروفیل band neutrophil
۶- سگمنتهsegmented neutrophil
۷- ائوزینوفیل پلاسموسیتplasmocyte
۸- پیکنوتیک نورموبلاست eosinophil
۹- لنفوسیت pycnotic normoblast
lymphocyte



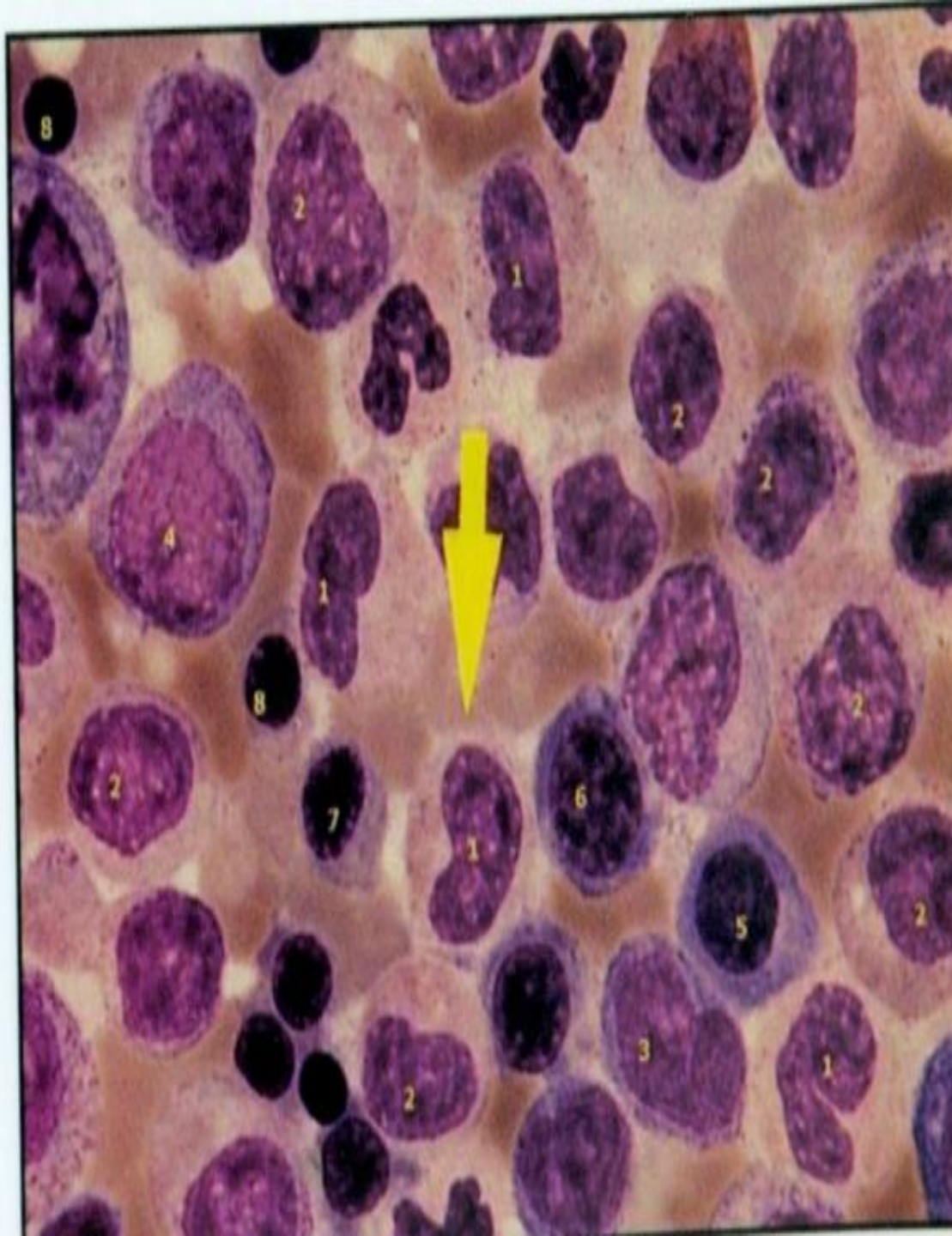


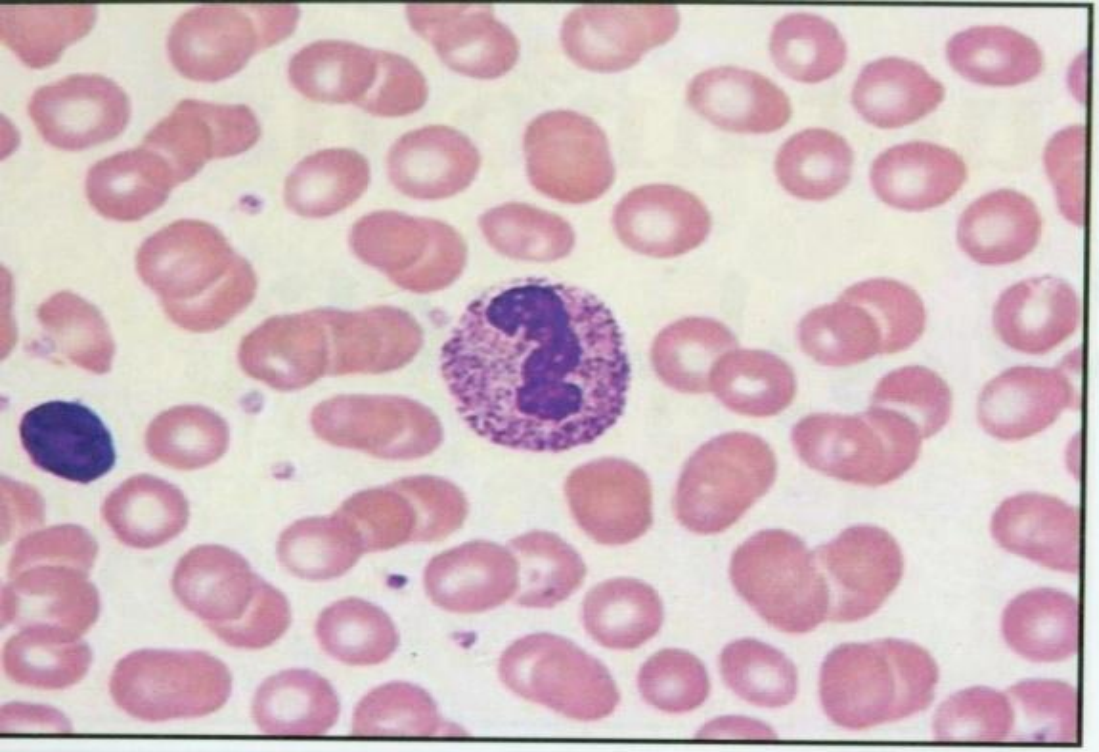
دو پرومیلوسیت در کنار هم با ناحیه اطراف هسته آشکار و گرانولهای آزوروفیلیک فراوان(مغز استخوان).این سلولها از سایر سلولهای تصویر بدلیل قطرشان متمایزترند.

۱-پرومیلوست ۲-میلوبلاست ۳-نوتروفیل میلوسیت ۴- نوتروفیل متامیلوسیت ۵- نوتروفیل سگمنته ۶-منوسیت ۷-لنفوسیت ۸- پیکنوتیک نورموبلاست ۹- پلی کروماتوفیلیک نورموبلاست

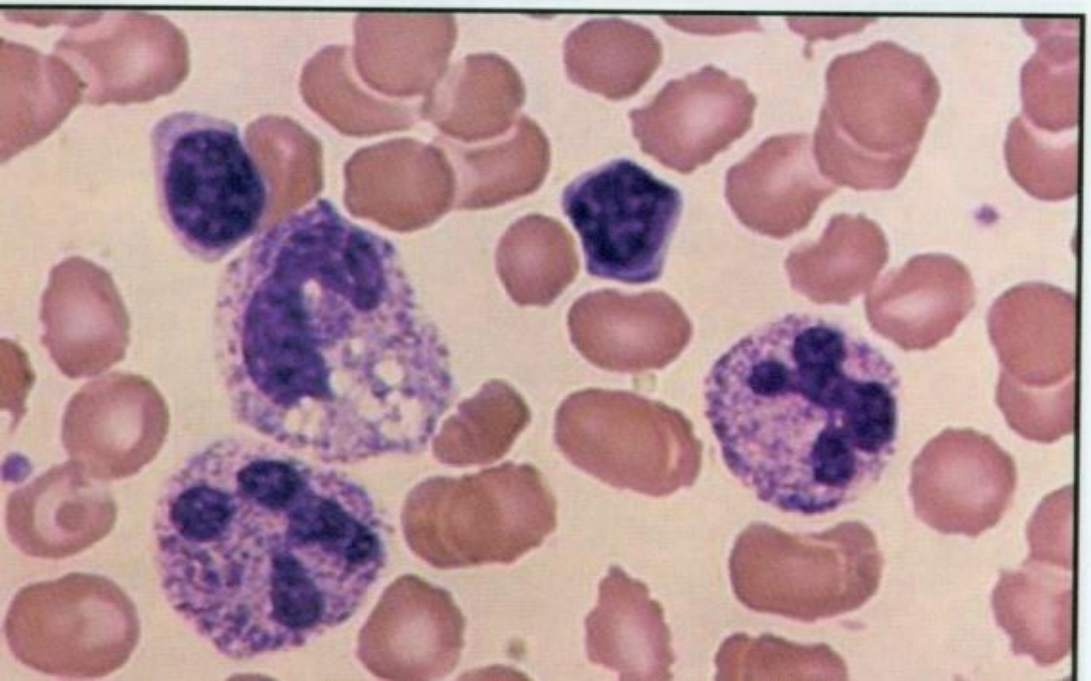
فلش یکی از ۶ عدد متامیلوسیت نوتروفیل موجود را نشان می دهد(مغز استخوان).

۱- نوتروفیل متامیلوسیت ۲- نوتروفیل میلوسیت ۳- پرومنوسیت ۴-پرومیلوسیت ۵-پلاسموسیت ۶-بازوفیلیک نورموبلاست ۷- پلی کروماتوفیلیک نورموبلاست ۸- پیکنوتیک نورموبلاست



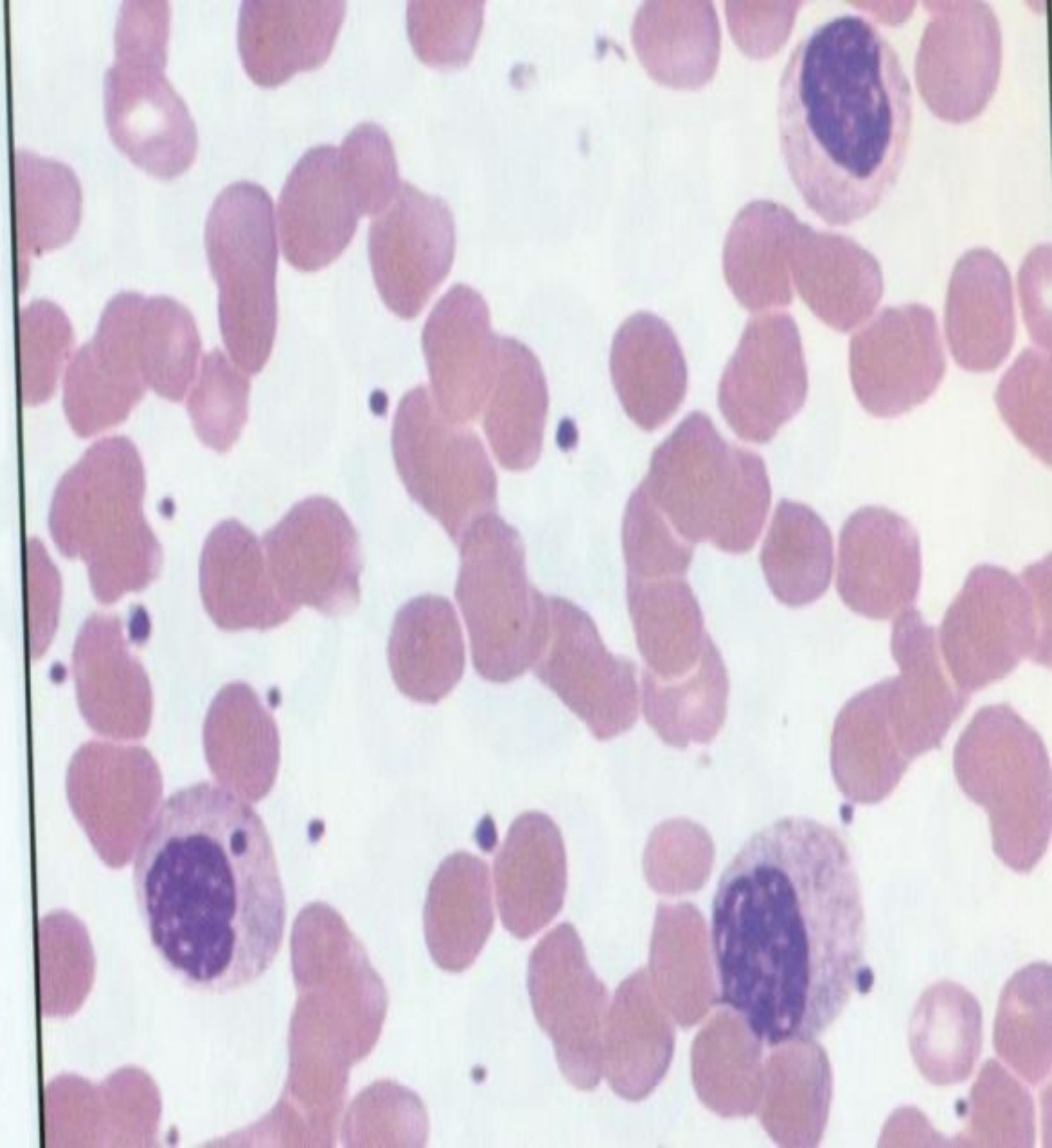


گرانولاسیون سمی در نوتروفیل باند.یک لنفوسیت طبیعی در تصویر حضور دارد.

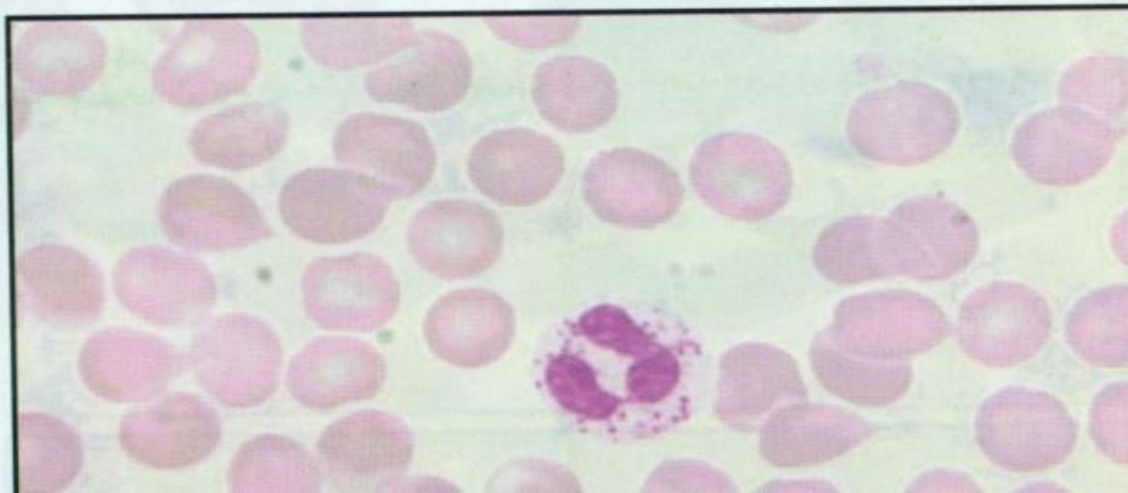


گرانولاسیون سمی و واکئولاسیون در نوتروفیل ها.

ناهنجـــاری پلـــگر هوت



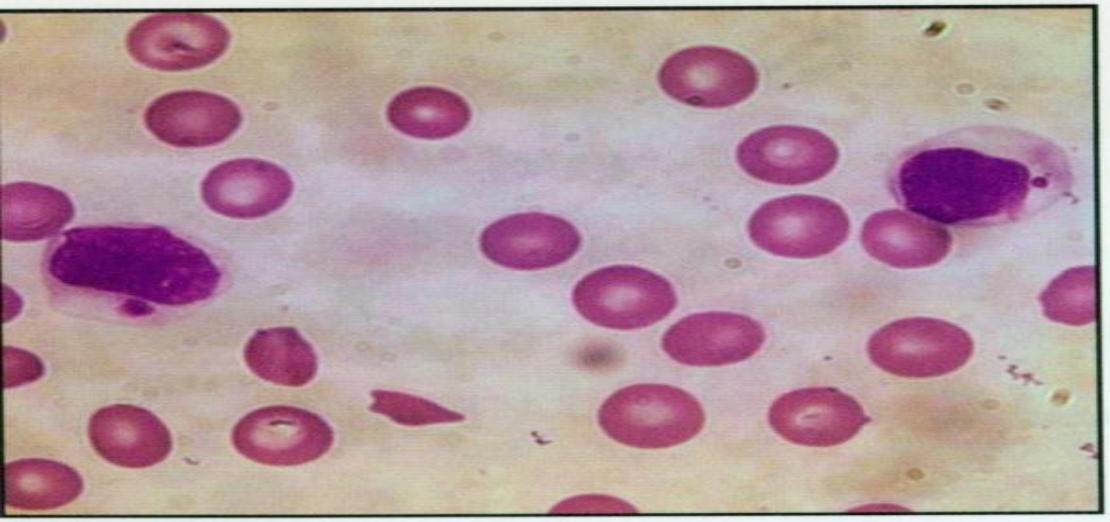
ناهنجاری آلدر ریلی در نوتروفیل ها.



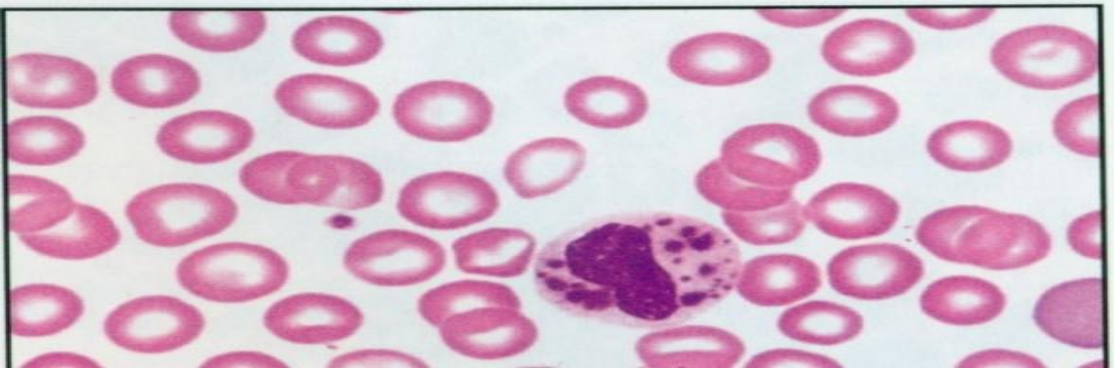
گرانولهای آلدر ریلی شبیه گرانولهای بزرگ اولیه در پرومیلوسیت ها می باشند. گرانولهایی آزوروفیلیک خشن ، بزرگ ، ارغوانی در نوتروفیل مشاهده می شوند.

Chediak–Higashi syndrome

سندرم چدیاک هیگاشی

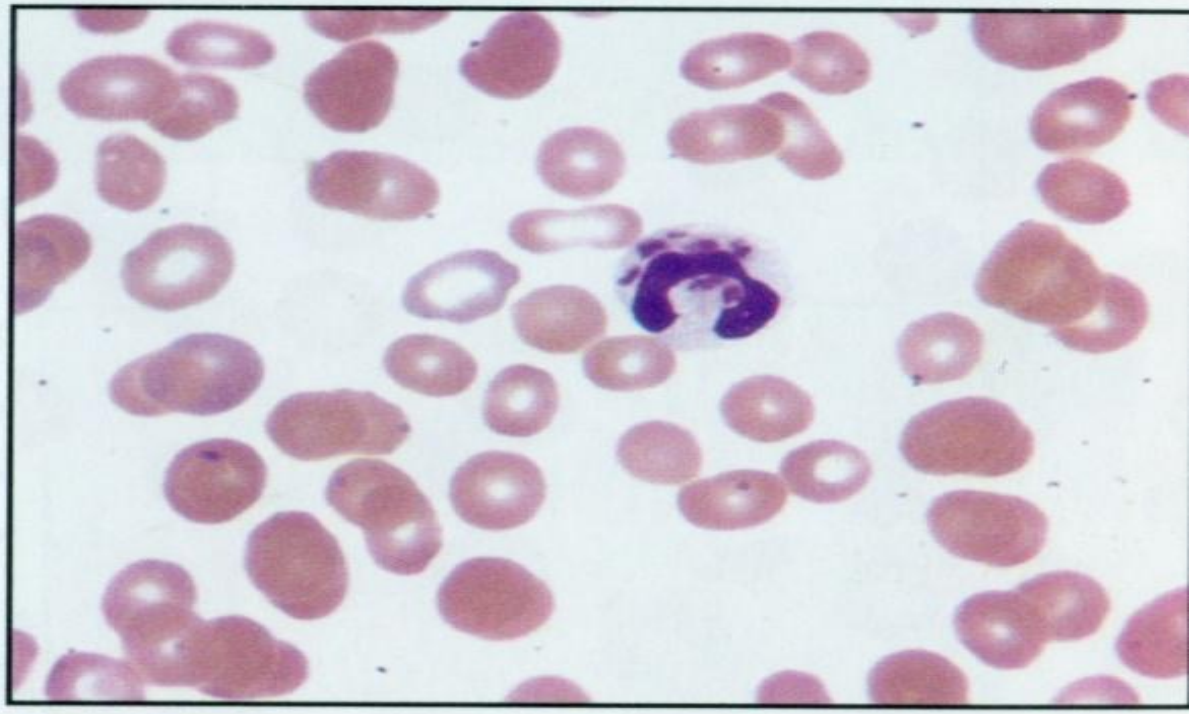


گرانولهای چدیاک هیگاشی، گرانولهایی بزرگ اغلب گرد ، آبی قرمز یا سبز خاکستری هستند که اندازه متغیری دارند و در سیتوپلاسم لوکوسیت ها و گاهی نورموبلاست ها در بیماران مبتلا به این سندرم مشاهده می شوند.

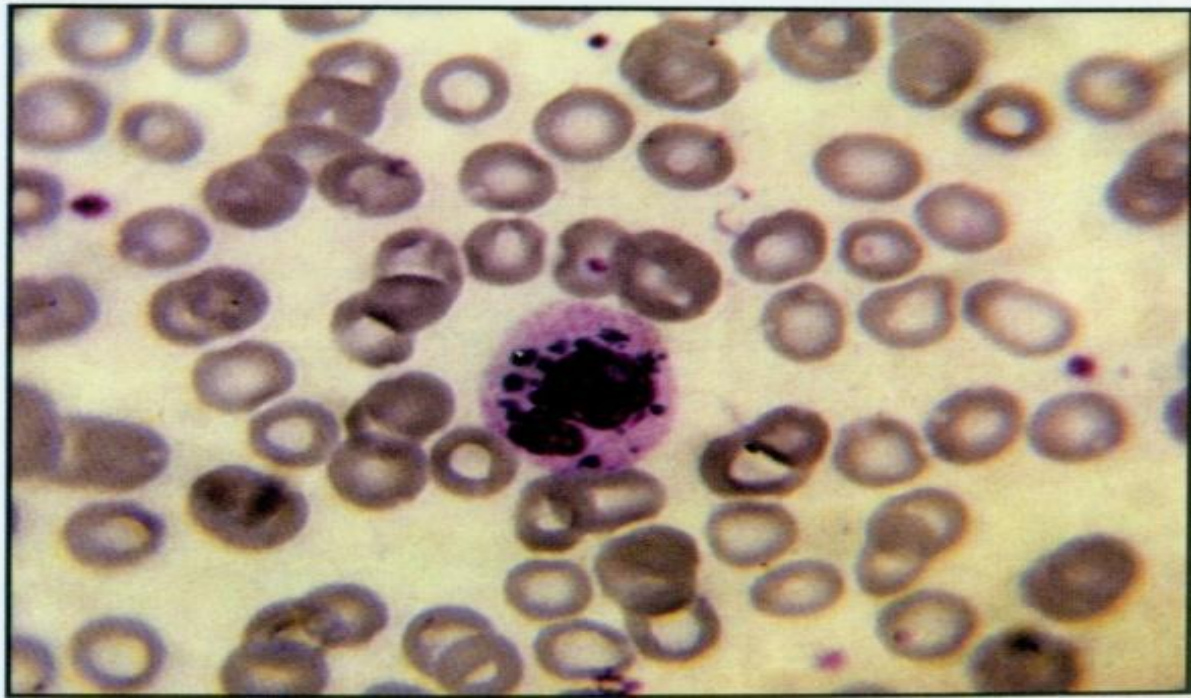


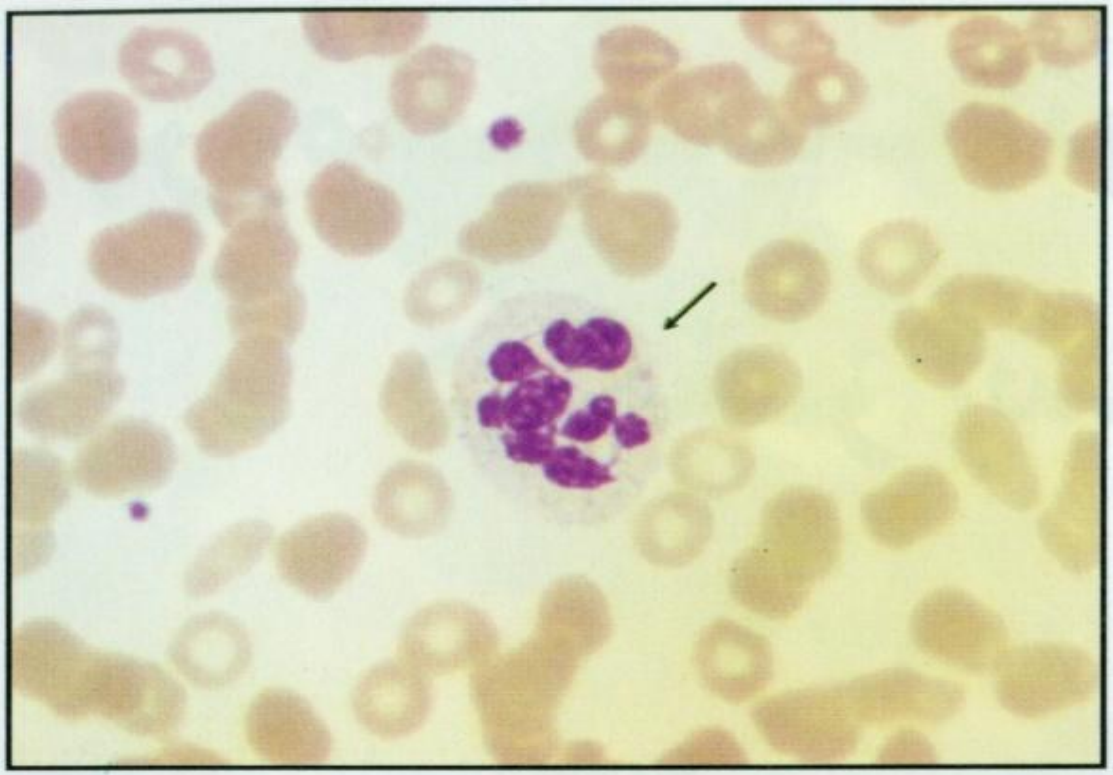
گرانولهای چدیاک هیگاشی

گرانـــولهای چدیـــاک هیـــگاشی

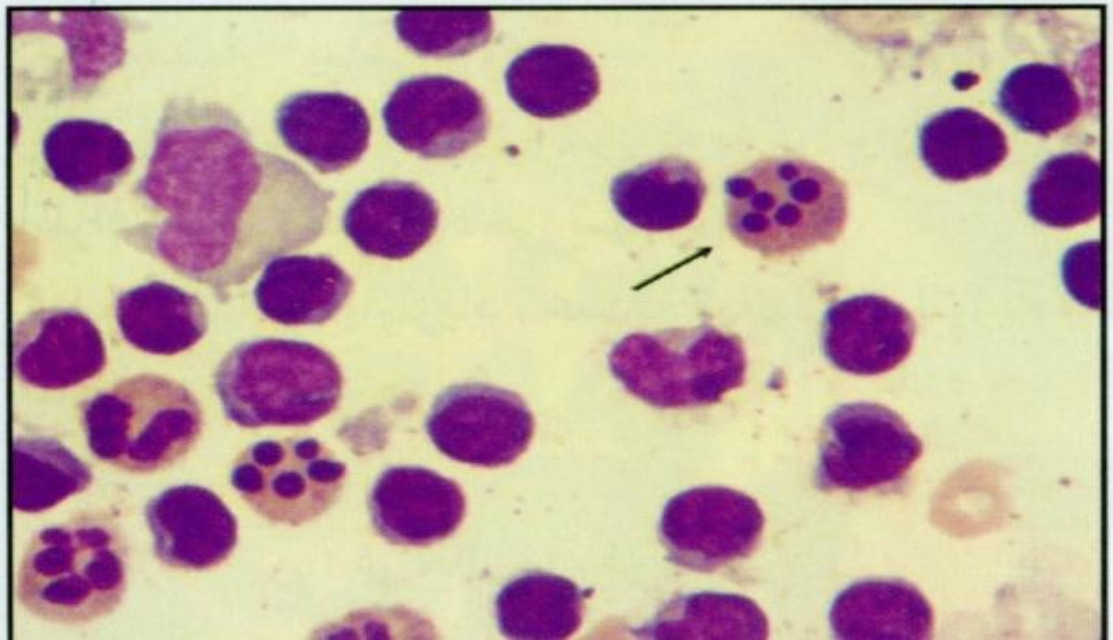


گرانـــولهای چدیـــاک هیـــگاشی





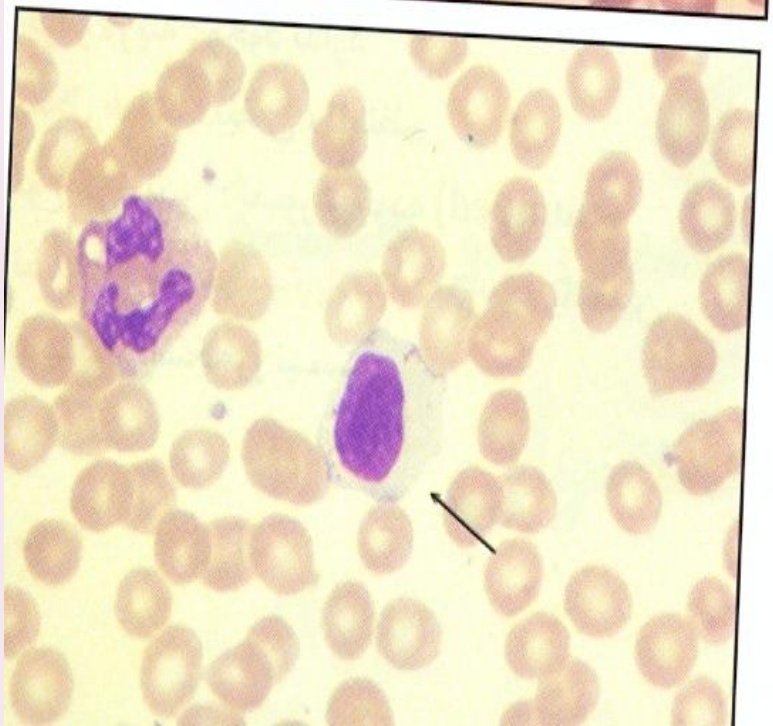
میلودیس پلازیا با افزایش لوب های نوتروفیل



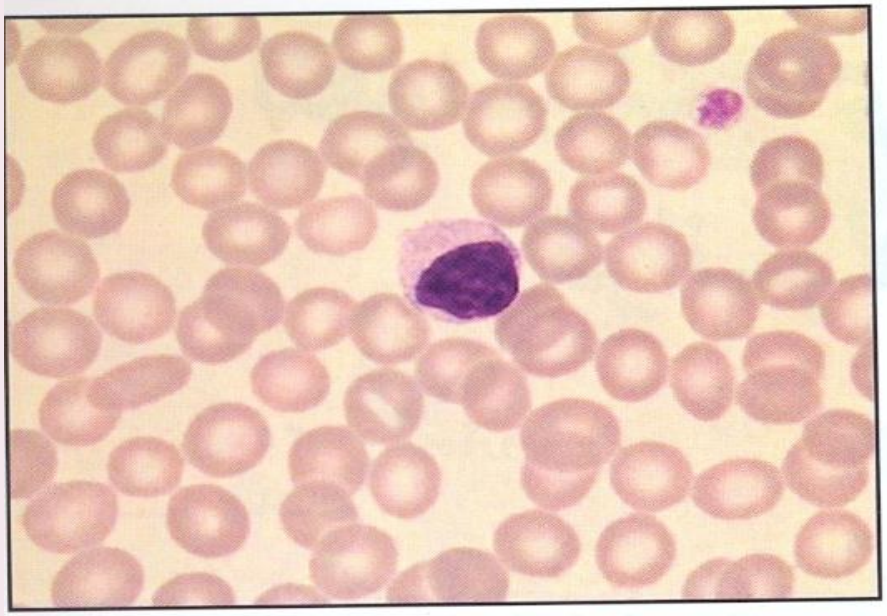
آپوپتوز در نوتروفیل با هایپر سگمنتاسیون اشتباه نشود.



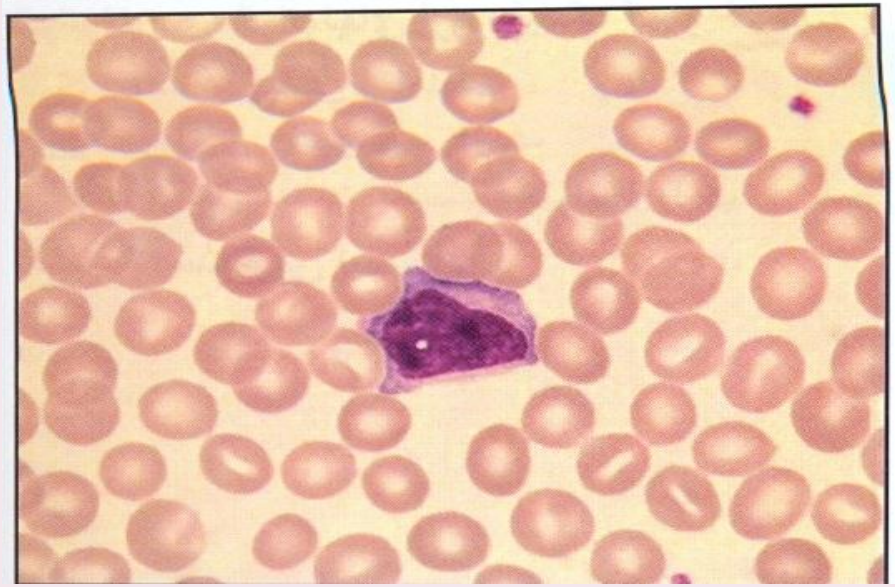
یک لنفوسیت گرانولار با گرانولهای آزوروفیلیک خشن. به آنیزوپوئیکیلوسیتوزیس (anisopoikilocytosis) اریتروسیت ها به همراه چند آکانتوسیت و شیستوسیت توجه کنید . پلاکت ها طبیعی هستند .



یک لـنفوسیت بـــزرگ

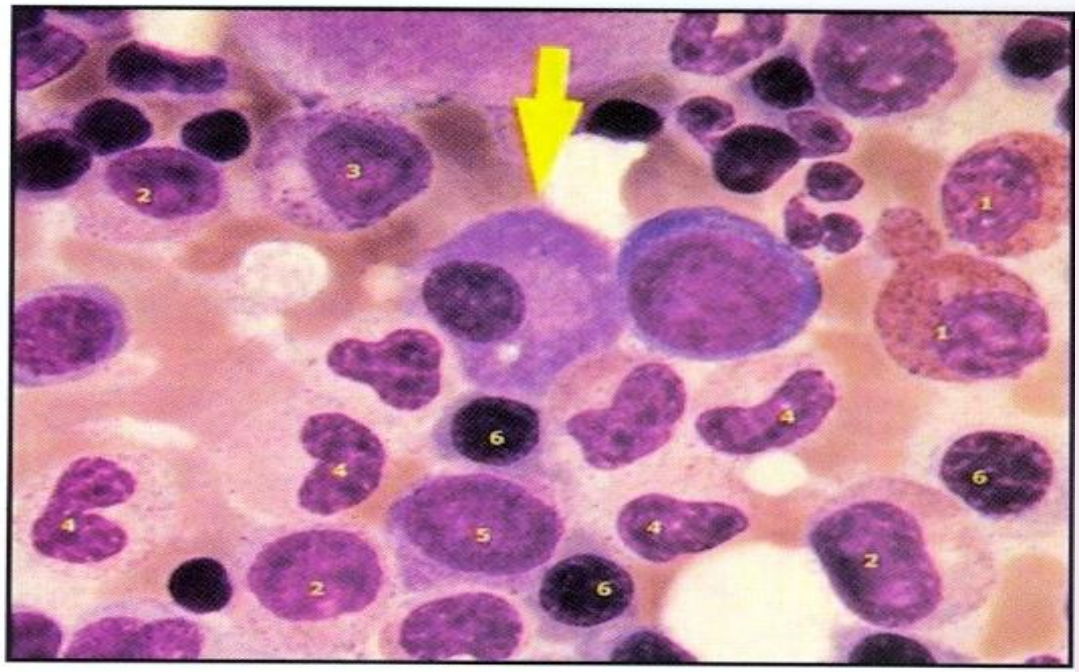


یک لنفوسیت بزرگ طبیعی با سیتوپلام فاقد گرانول .

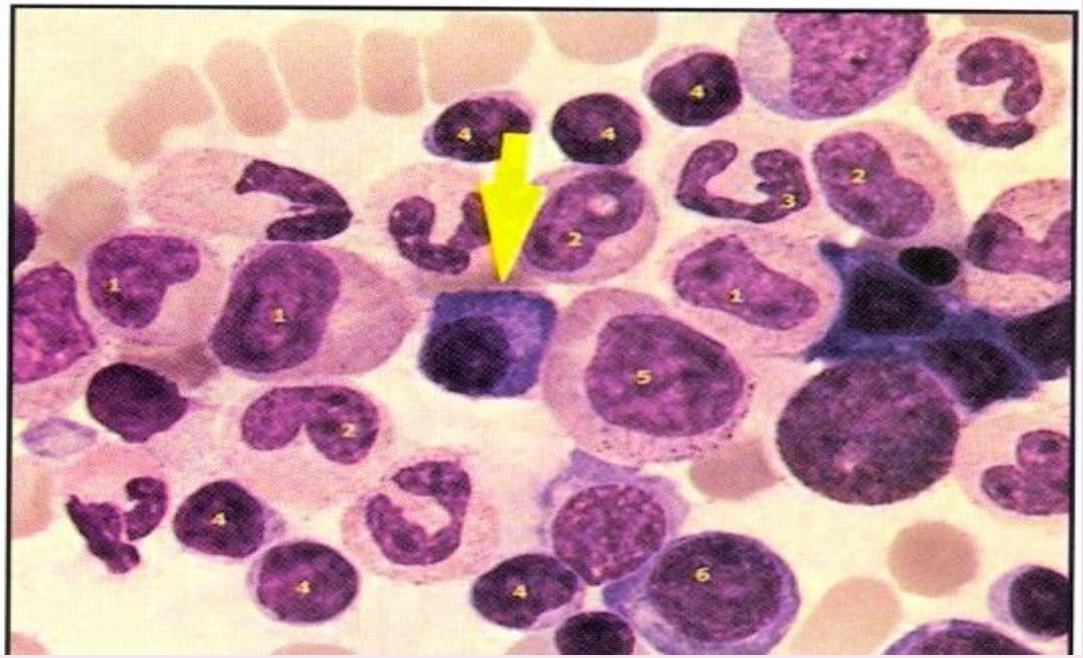


یک لنفوسیت ری اکتیو(Reactive) که طی عفونت (بخصوص عفنت ویروسی) بسیار مشاهده می شود . البته در خون طبیعی نیز گاهی دیده می شود. تعدادی استوماتوسیت در تصویر حضور دارند .

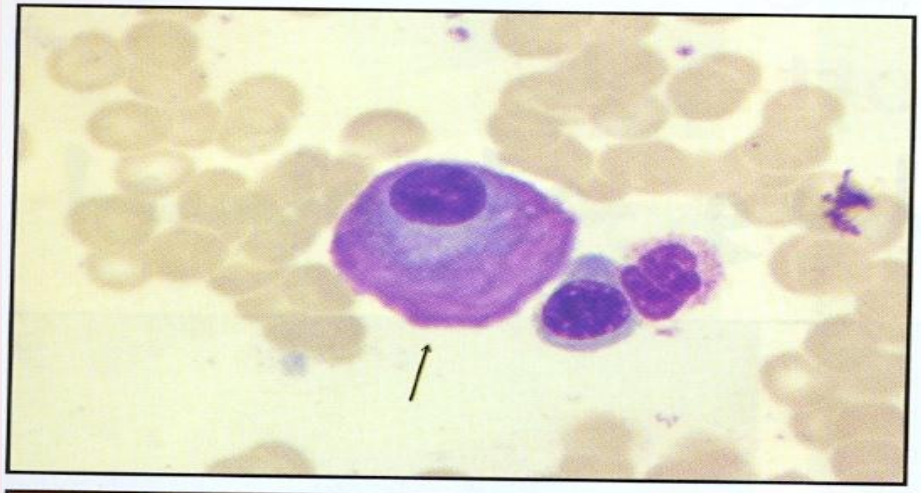
فلش یک پلاسما سل را نشان می دهد.
۱-ائوزینوفیل ۲-میلوسیت نوتروفیل ۳- پرومیلوسیت ۴- متامیلوسیت نوتروفیل ۵- میلوبلاست ۶- پلی کروماتیک نورموبلاست



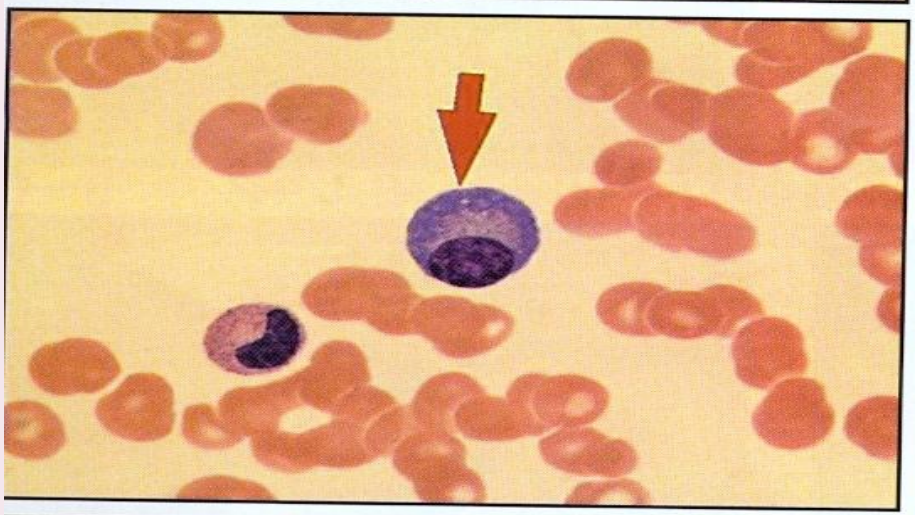
فلش یک پلاسما سل را نشان می دهد. بیشتر سلولهای اطراف آن متعلق به رده گرانولوسیتی هستند.
۱- میلوسیت نوتروفیل ۲- متامیلوسیت نوتروفیل ۳- نوتروفیل باند ۴- لنفوسیت ۵- پرومیلوسیت ۶- پرواریتروبلاست ۷- ائوزینوفیل



پلاسما سل در خون محیطی



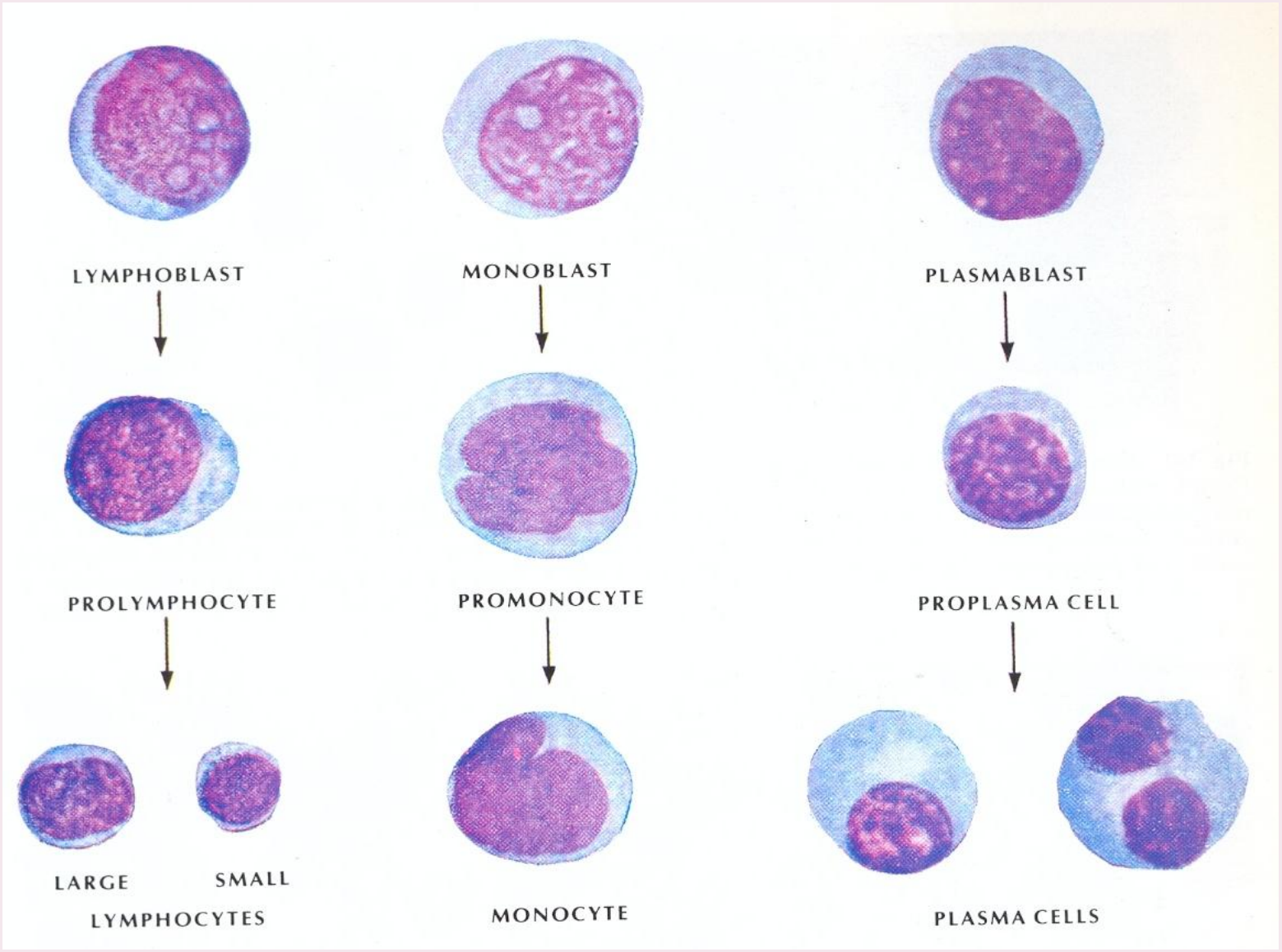
پلاسما سل یه شکل شعله (lame shaped plasma cell) در بیماری ماتیپل مایلوما .



یک پلاسما سل تیپیک در خون محیطی با هاله اطراف هسته مشخص که نشانه بلوغ سلول است . یک متامیلوسیت نوتروفیل نیز در کنار آن حضور دارد . این مکان از اسلاید منطقه مناسبی جهت ارزیابی اریتروسیت ها نیست .



یک پلاسما سل در خون محیطی بدون هاله اطاف هسته . به رولو (Rouleaux) موجود در اریتروسیت ها توجه کنید.


LYMPHOBLAST
PROLYMPHOCYTE
LARGE
SMALL
LYMPHOCYTES
MONOBLAST
PROMONOCYTE
MONOCYTE
PLASMABLAST
PROPLASMA CELL
PLASMA CELLS

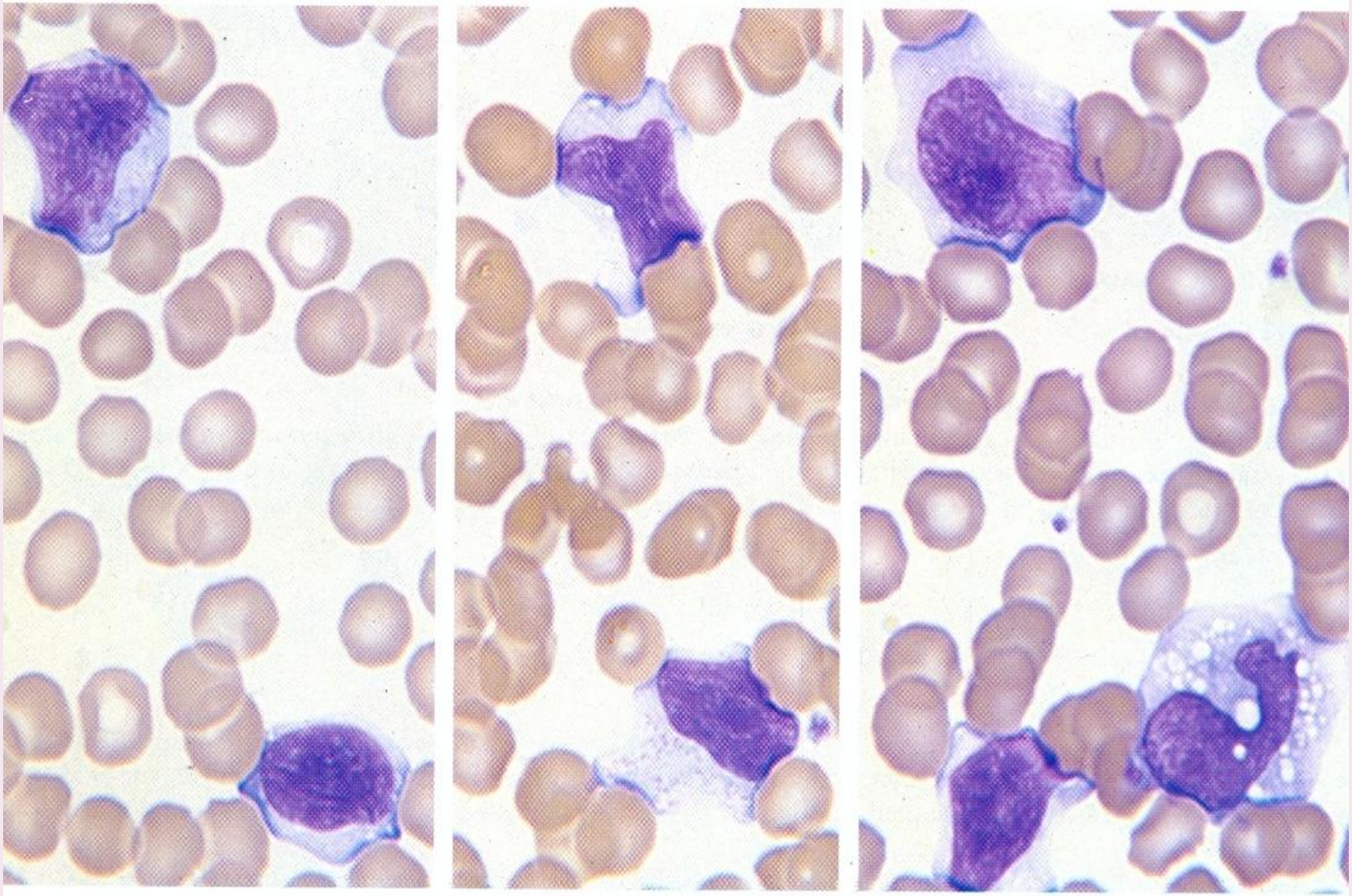
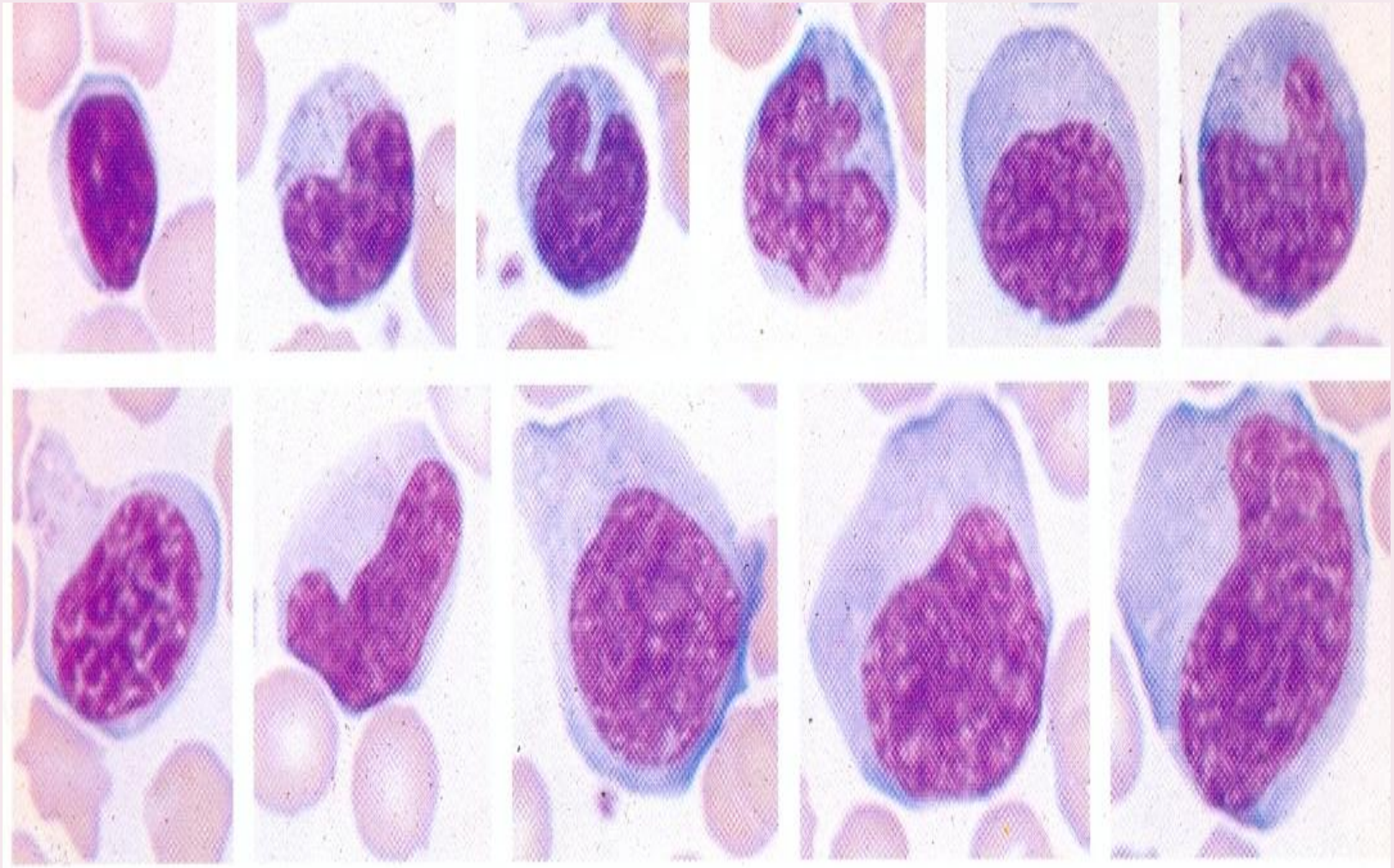
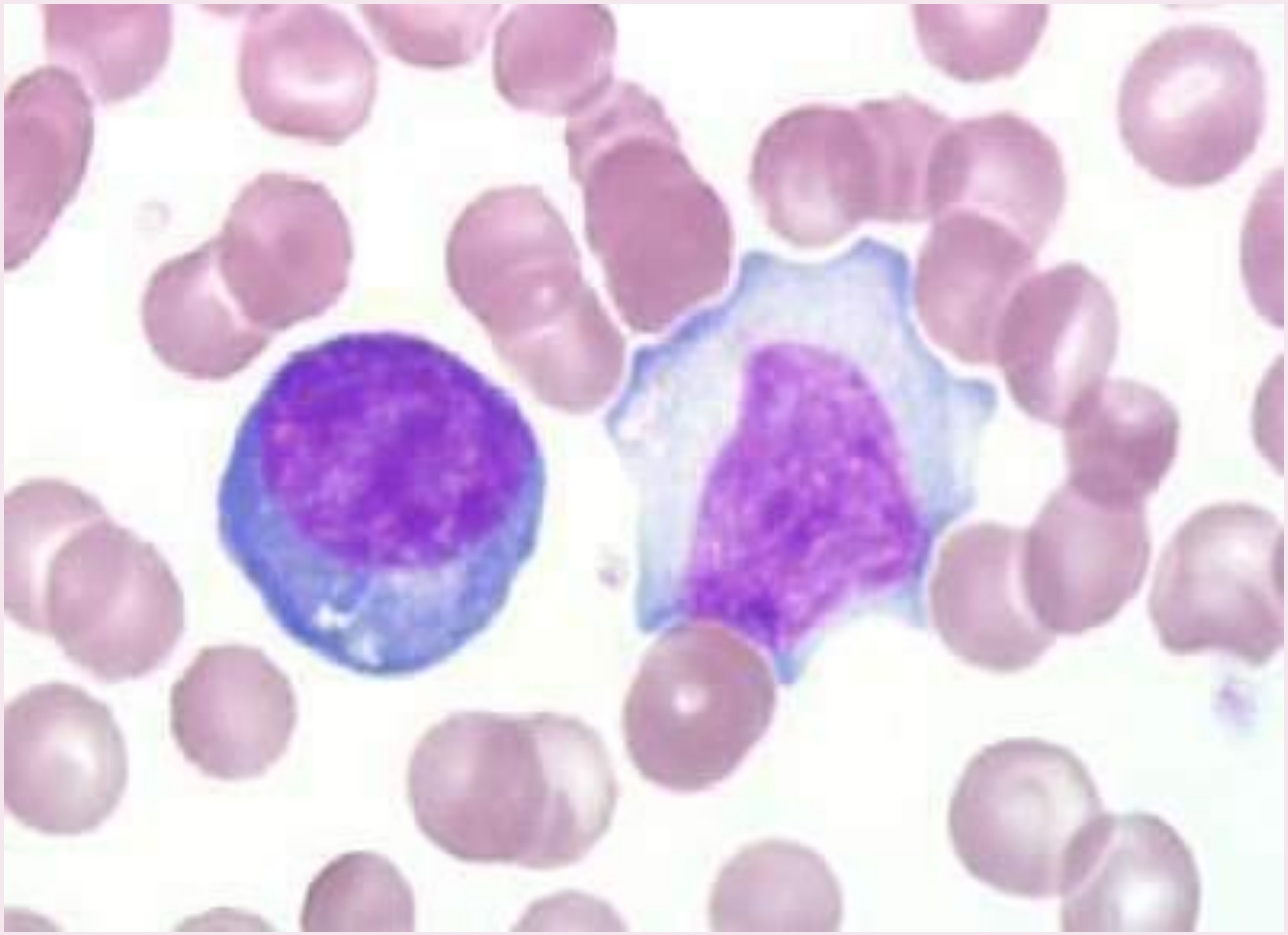


Fig. 142 Blood film Infectious mononucleosis



ig. 143 Blood film Infectious mononucleosis

Infectious Mononucleosis



Lymphoblastic leukaemia

Classification	Cell type(s)
L1	Microlymphoblasts
L2	Large undifferentiated lymphoblasts
L3	Burkitt Type

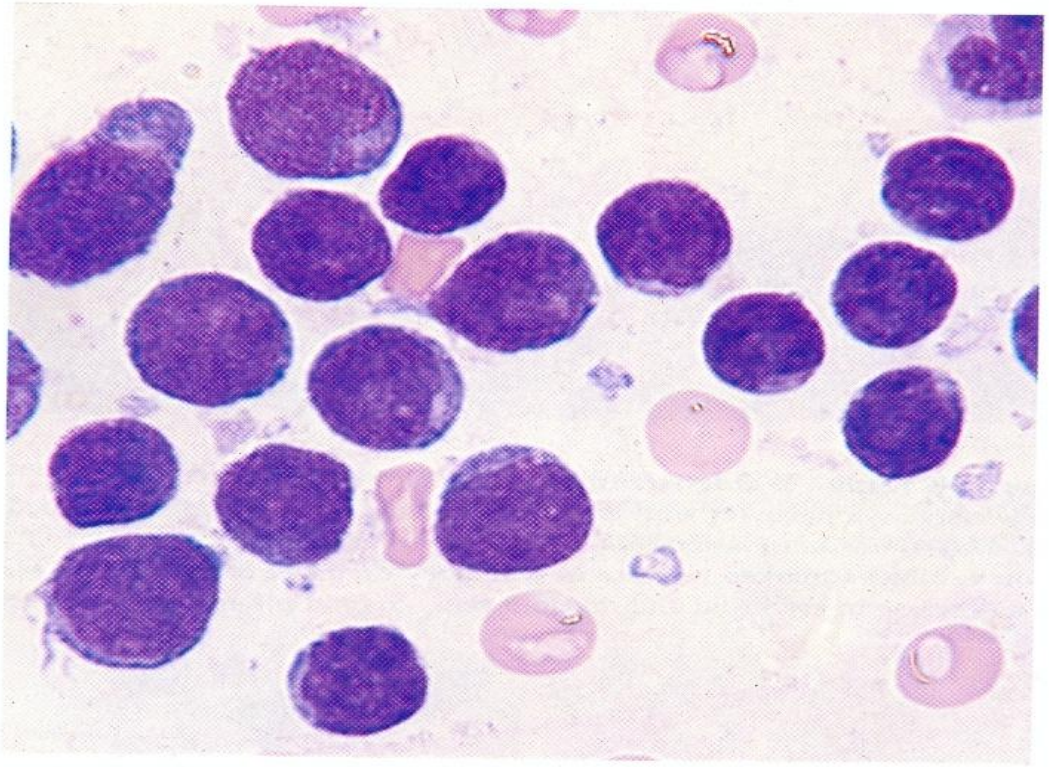


Fig. 148 Marrow film Acute lymphoblastic leukaemia – L1
The cells in this illustration are small lymphoblasts with a high nuclear-cytoplasmic ratio and indistinct nucleoli These are often described as microlymphoblasts. *May-Grünwald-Giemsa stain × 1200*

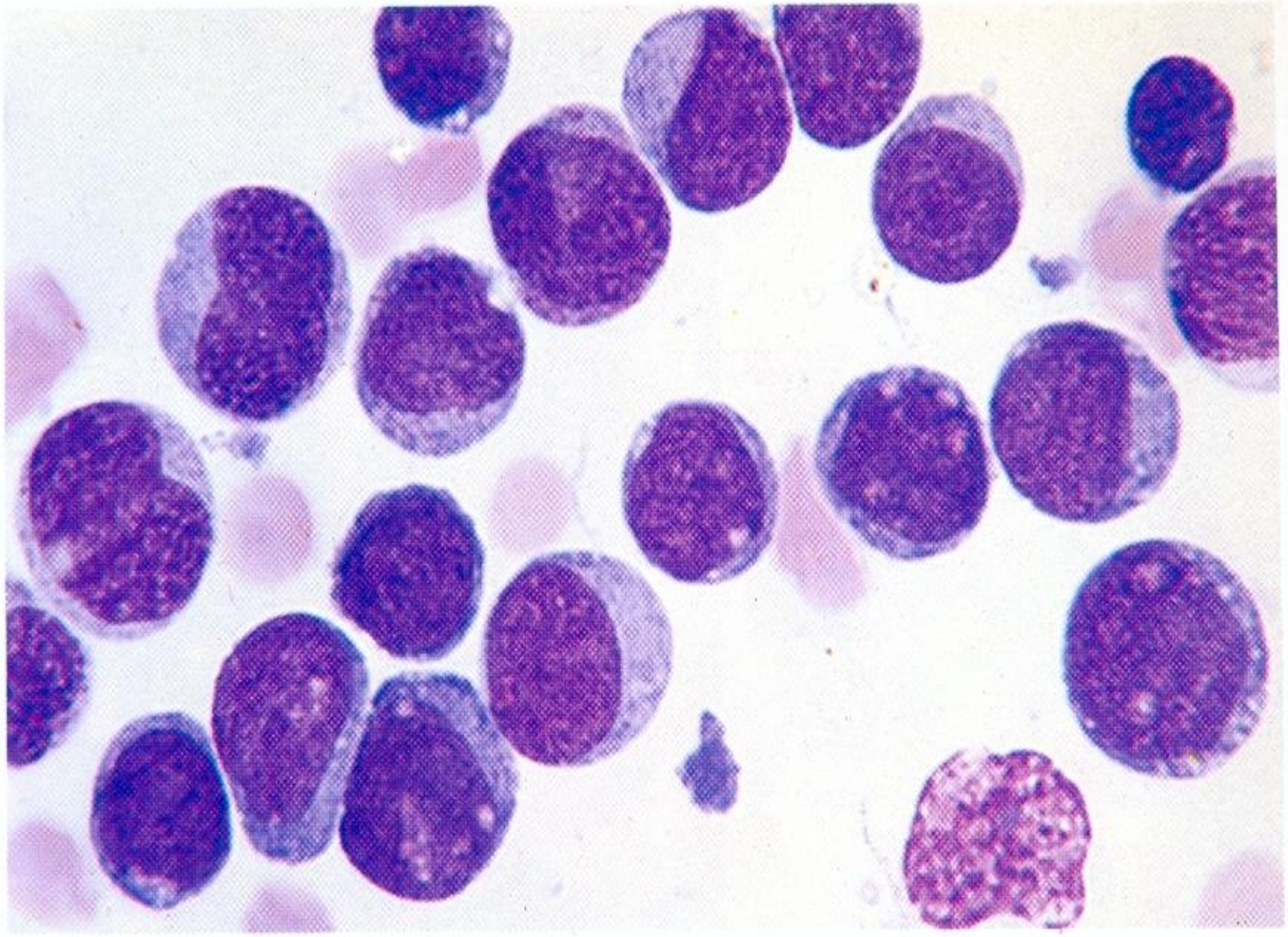


Fig. 149 Marrow film Acute lymphoblastic leukaemia – L2
The lymphoblasts are large with more cytoplasm compared to the cells illustrated in Figure 148. Prominent nucleoli varying in size and number are also present in these cells. *May-Grünwald-Giemsa stain × 1200*

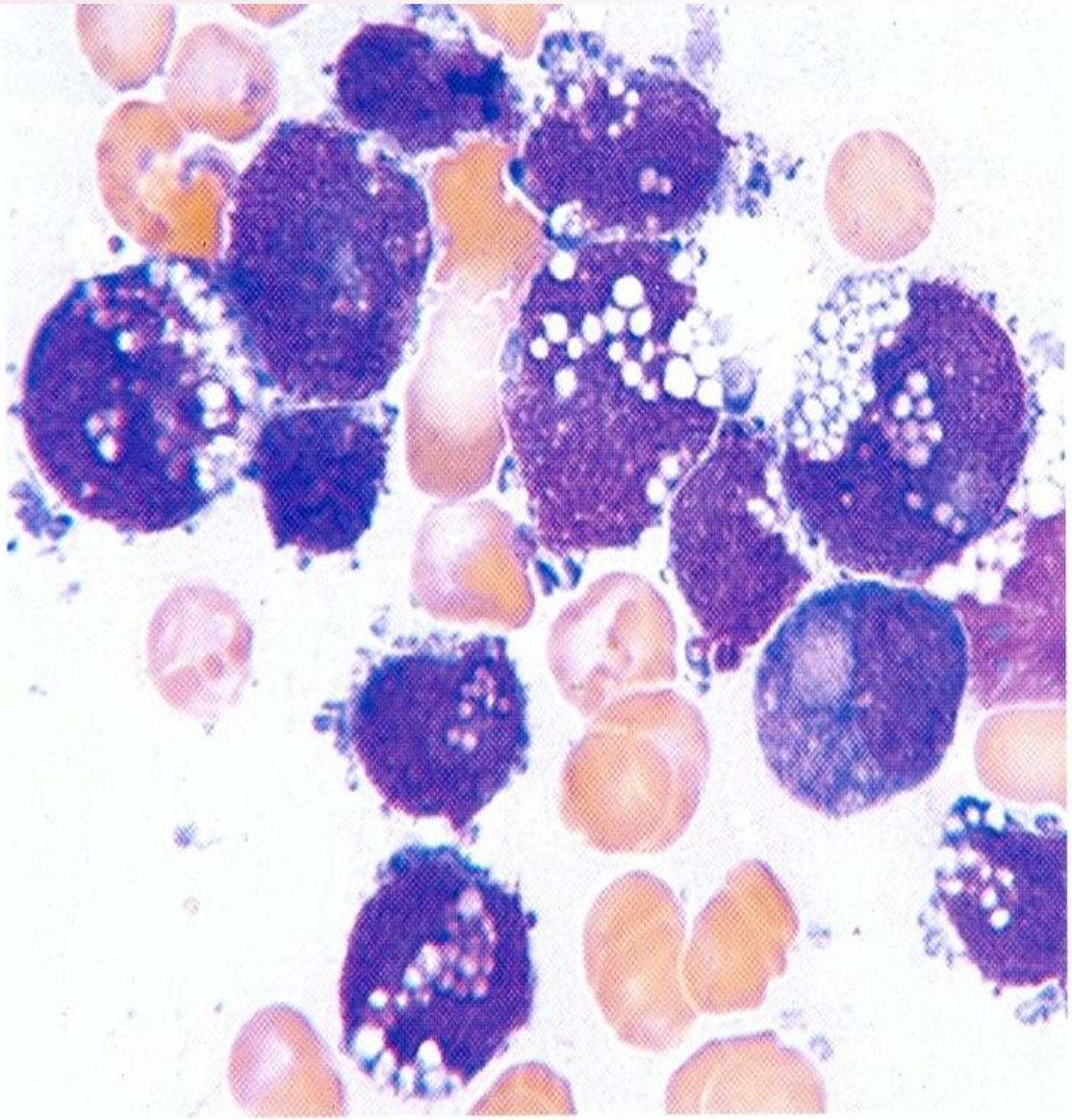


Fig. 150 Marrow film Acute lymphoblastic leukaemia – L3
The prominent features in this illustration are the heavily vacuolated large lymphoblasts. These cells are morphologically similar to those found in Burkitt's lymphoma. *May-Grünwald-Giemsa stain × 1200*

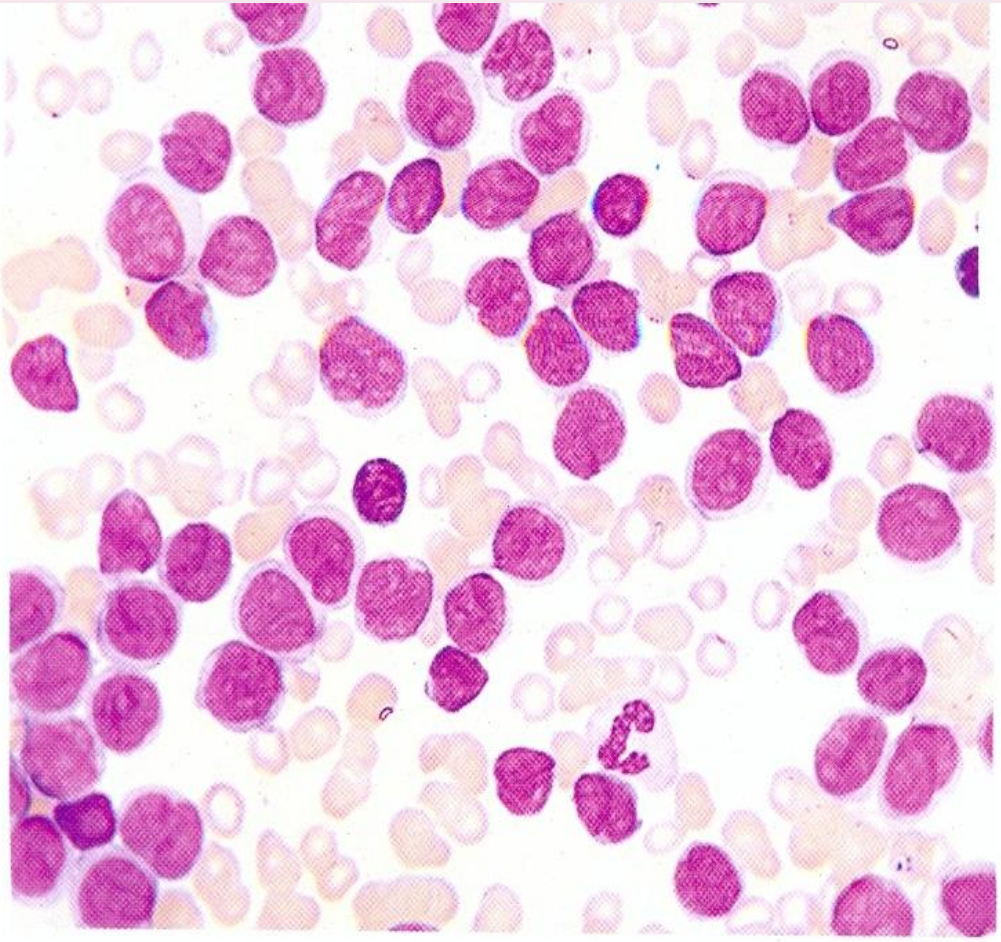


Fig. 158 Blood film Prolymphocytic leukaemia
A well marked increase in the total white cell count is obvious, the cells being mainly prolymphocytes and a small percentage of lymphoblasts. *May-Grünwald-Giemsa stain × 500*

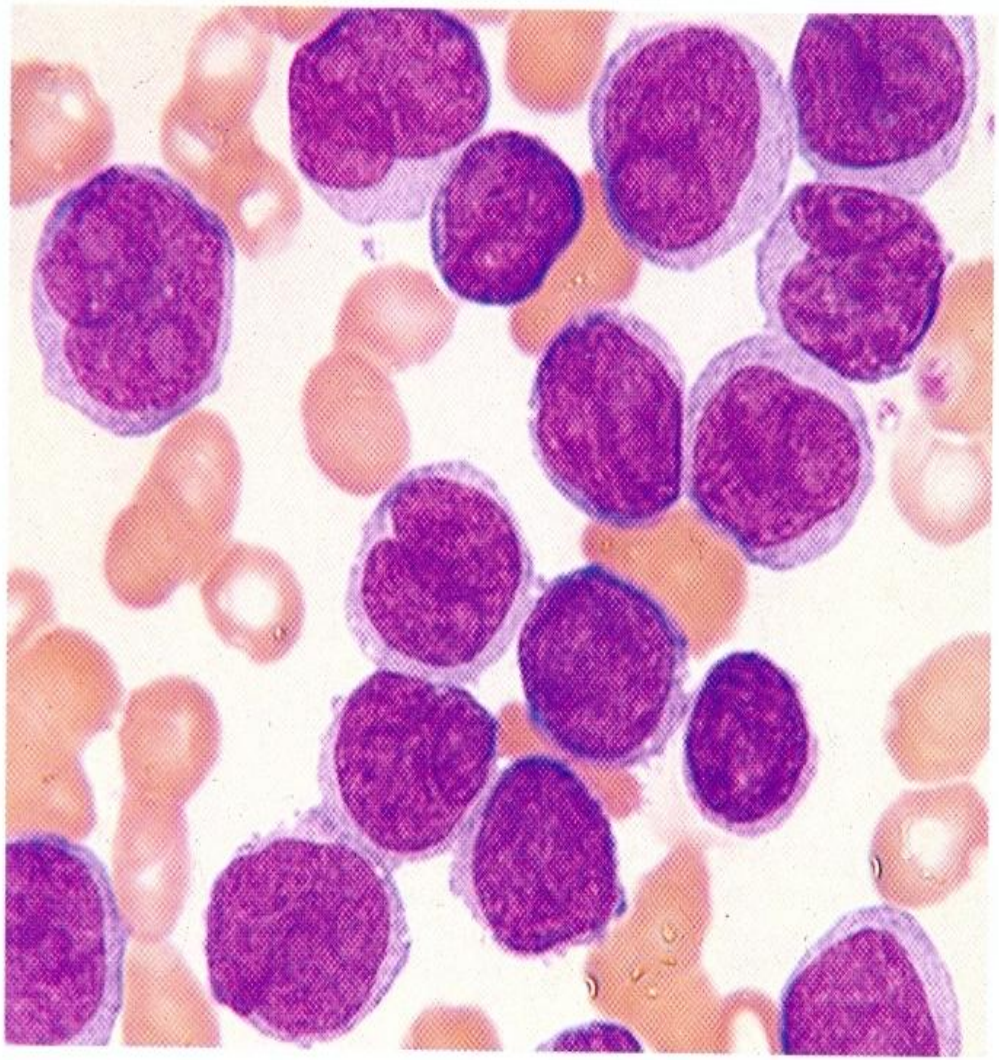


Fig. 159 Blood film Prolymphocytic leukaemia
This higher magnification of a field taken from Fig. 158 illustrates the prolymphocytes with indented nuclei and shadow nucleoli; lymphoblasts with large distinct nucleoli. *May-Grünwald-Giemsa stain × 1200*

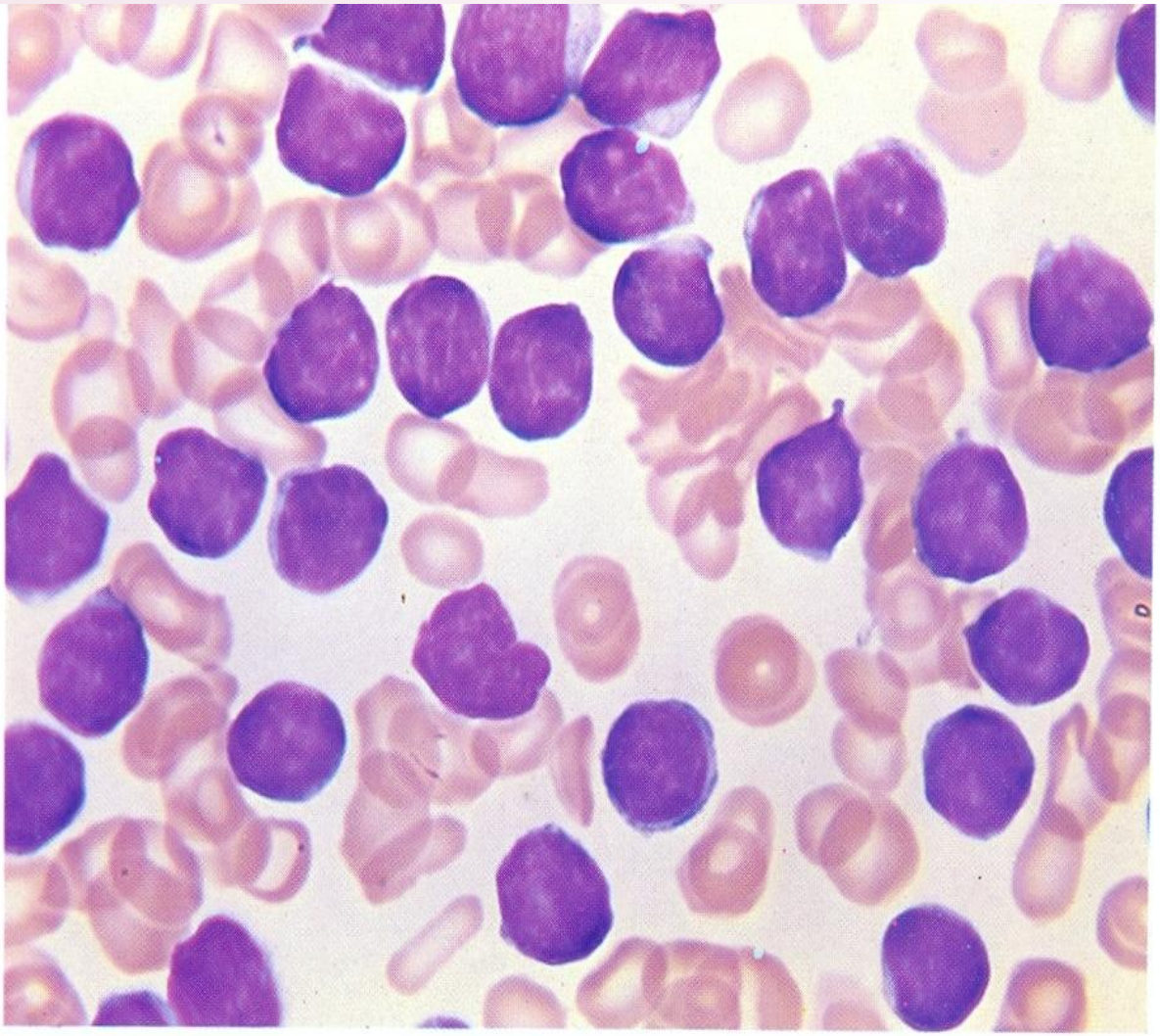


Fig. 163 Blood film Chronic lymphocytic leukaemia
Note the marked uniformity of the cell type. Medium-sized lymphocytes with light-blue cytoplasm and smaller lymphocytes with a very narrow rim of dark-blue cytoplasm are seen. Several of the larger cells show indentation of the nucleus, which is a common finding in this condition. *May-Grünwald-Giemsa stain × 1200*

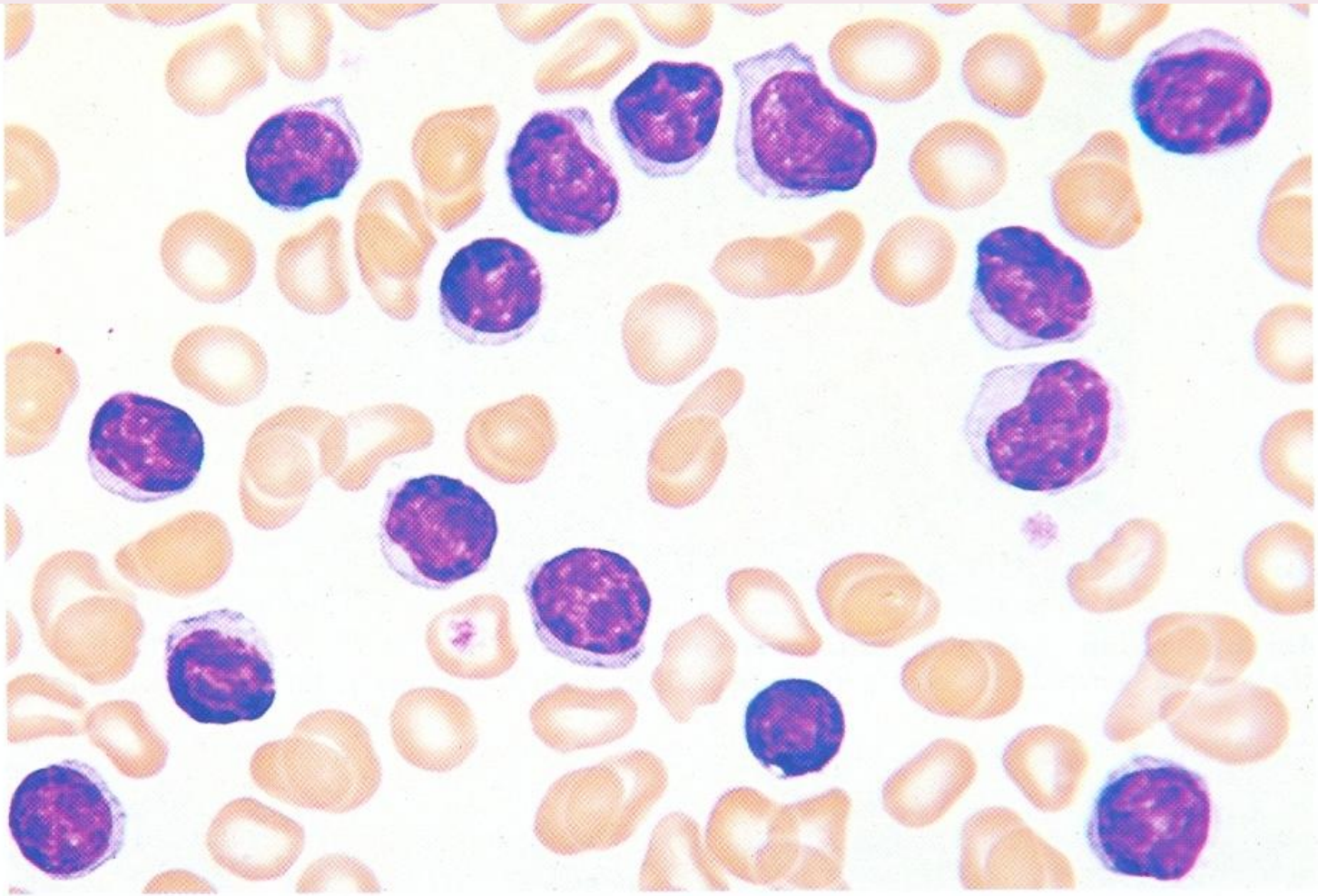


Fig. 164 Blood film Chronic lymphocytic leukaemia
The majority of the cells are medium sized lymphocytes with indentation of the nucleus and light blue cytoplasm.
May-Grünwald-Giemsa stain × 1200

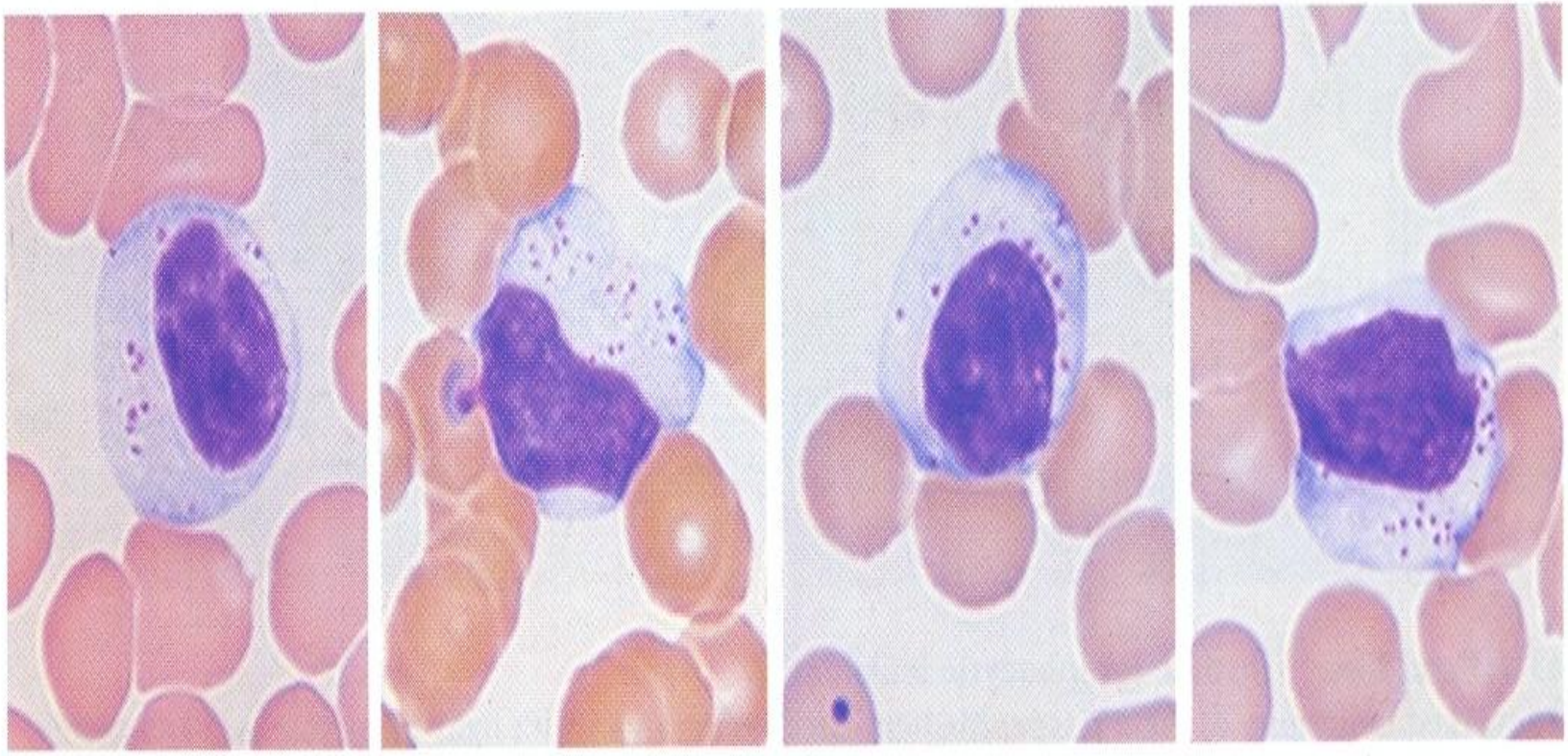
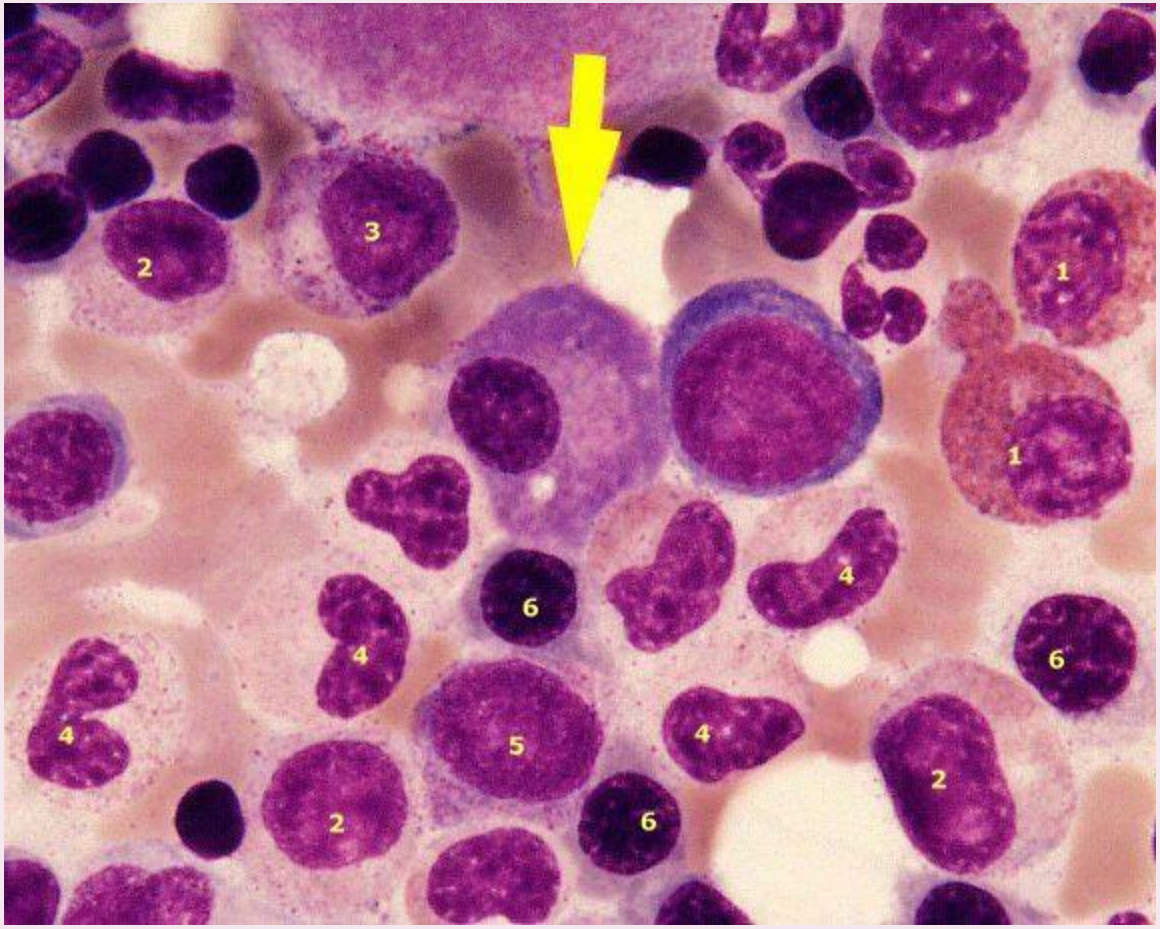


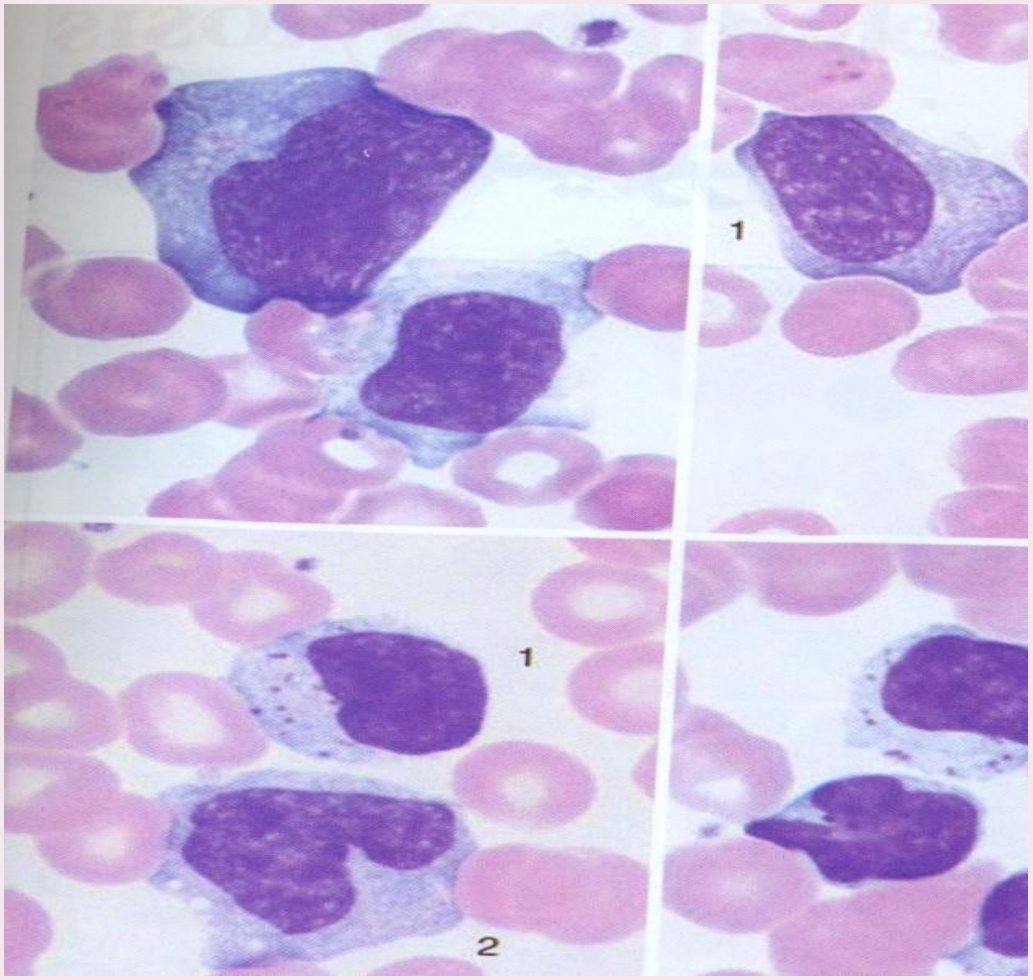
Fig. 165 Blood film Large granular lymphocytic leukaemia

The lymphocytes are much larger in size than the lymphocytes illustrated in Figs. 163 and 164. The striking features are the large red cytoplasmic granules, abundant, cytoplasm and variation in size and shape of the nucleus. *May-Grünwald-Giemsa stain × 1200*

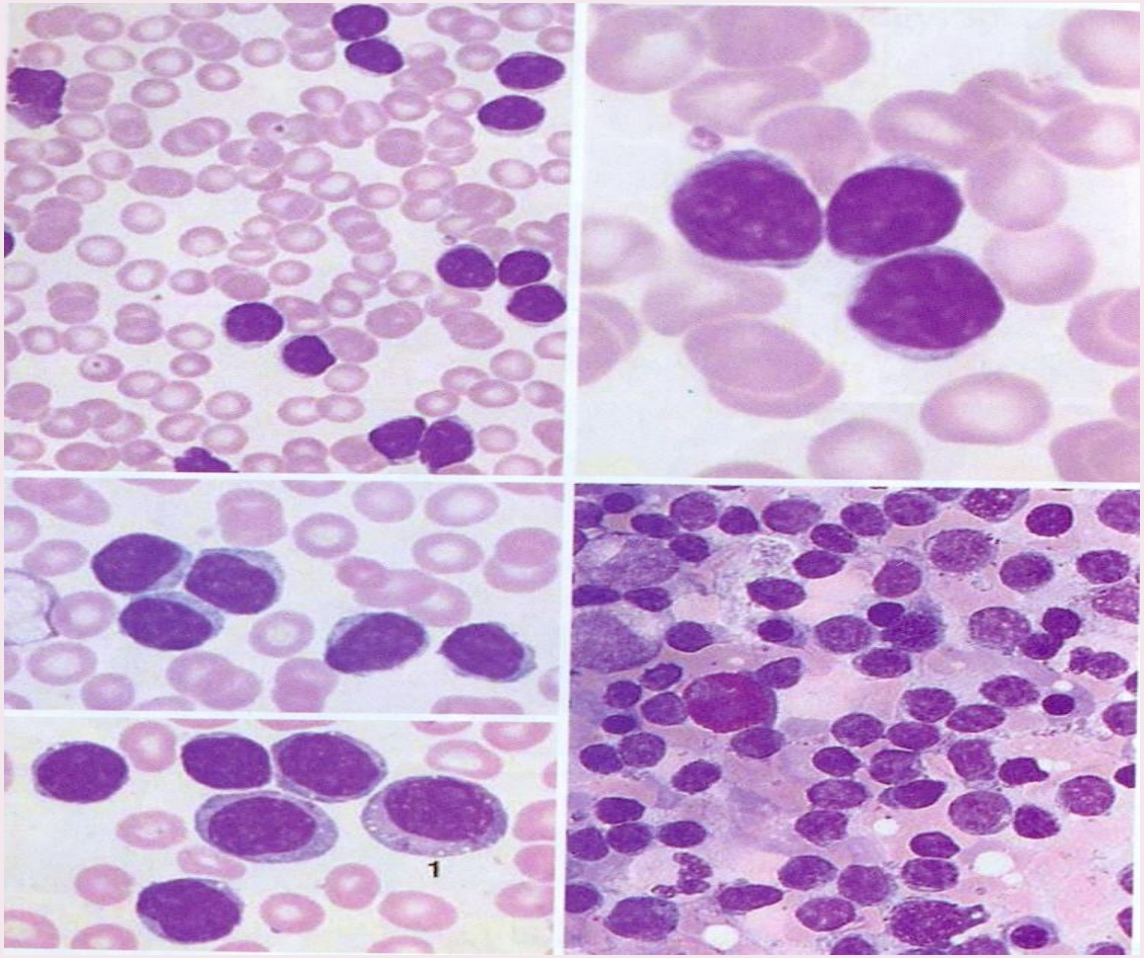
PLASMA CELLS



Lym in IM

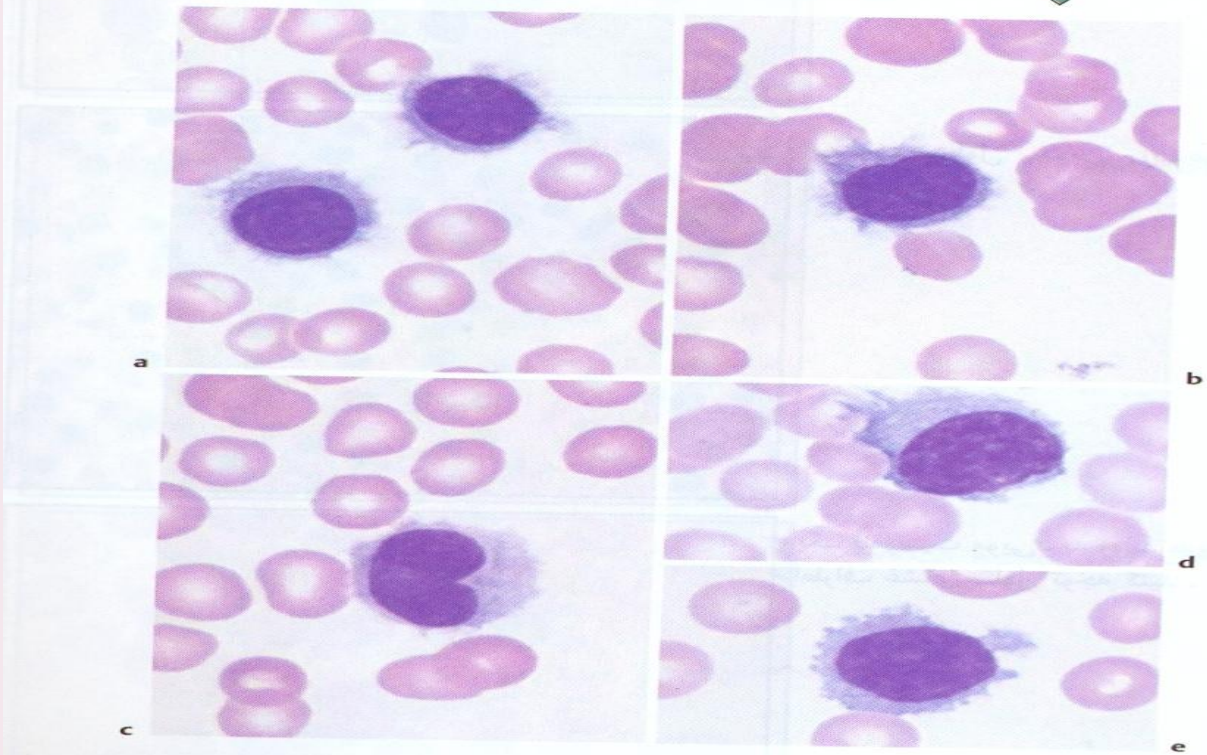


CLL



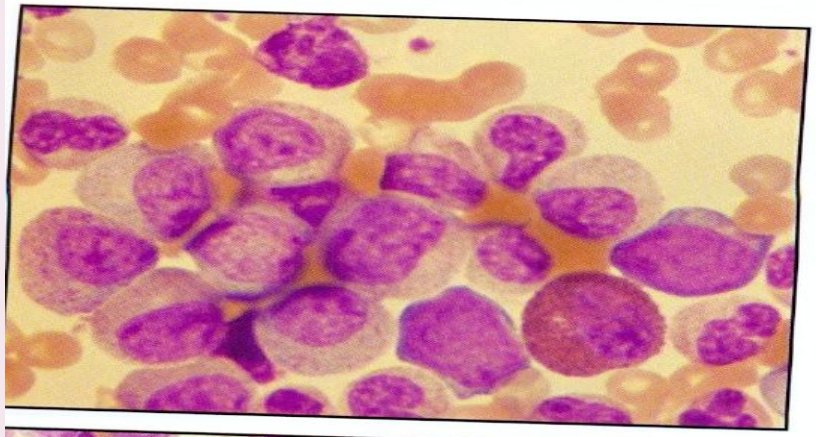
HCL & SLVL

لوسمی سلول مویی و لنفوم طحالی با لنفوسیت های مویی

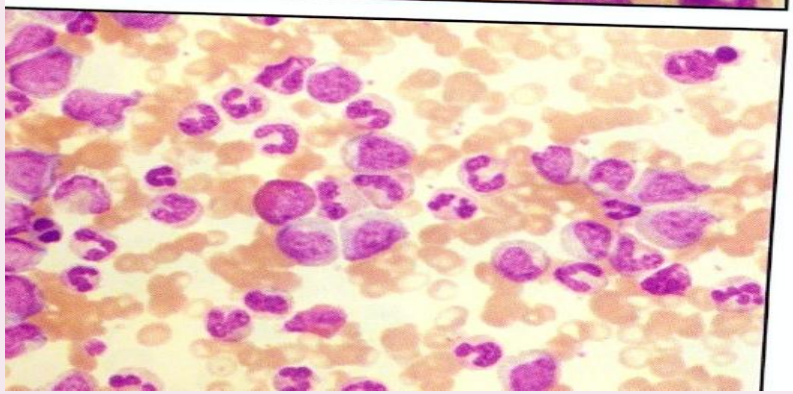


لوسمی سلول مویی (HCL) و لنفوم طحالی. A و b هسته بیضی و سیتوپلاسم کم و دارای زوائد مشخصه لوسمی سلول مویی می باشد.c)معمولاً این سلولها کرک دار به نظر می رسند.d و e وقتی زوائد سیتوپلاسمی ضخیم تر و کمتر شبیه کرک باشند تشخیص لنفوم طحالی با لنفوسیت های مویی(SLVL) نادر ، باید مورد ملاحظه قرار گیرد.

لوسمی میلوژن مزمن

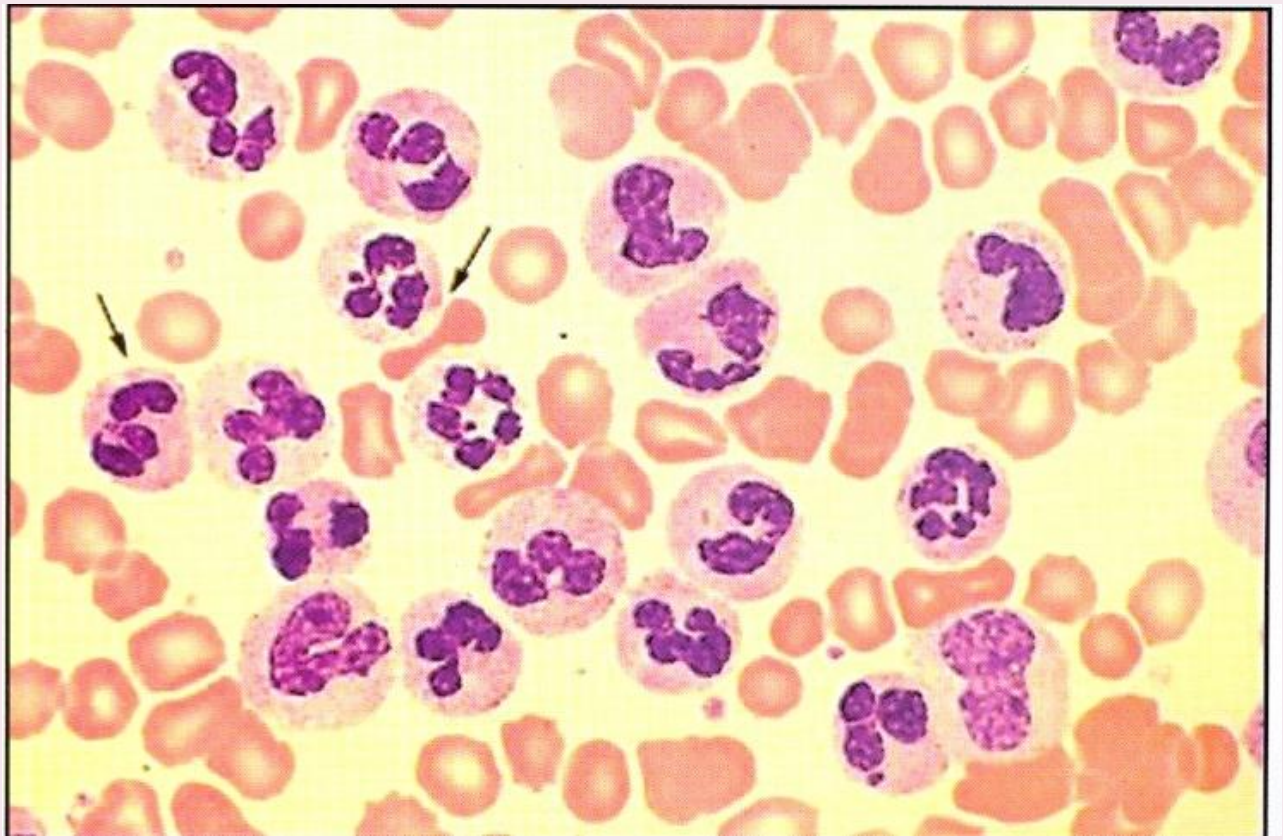


لوسمی میلوژن مزمن. مغز استخوان به طور مشخص هایپر سلولار است (در ابتدا در نتیجه تکثیر گرانولوسیتی ،همراه با حضور تمام مراحل سلولی).معمولاً تعداد پیشسازهای بازوفیل و ائوزینوفیل افزایش می یابد.

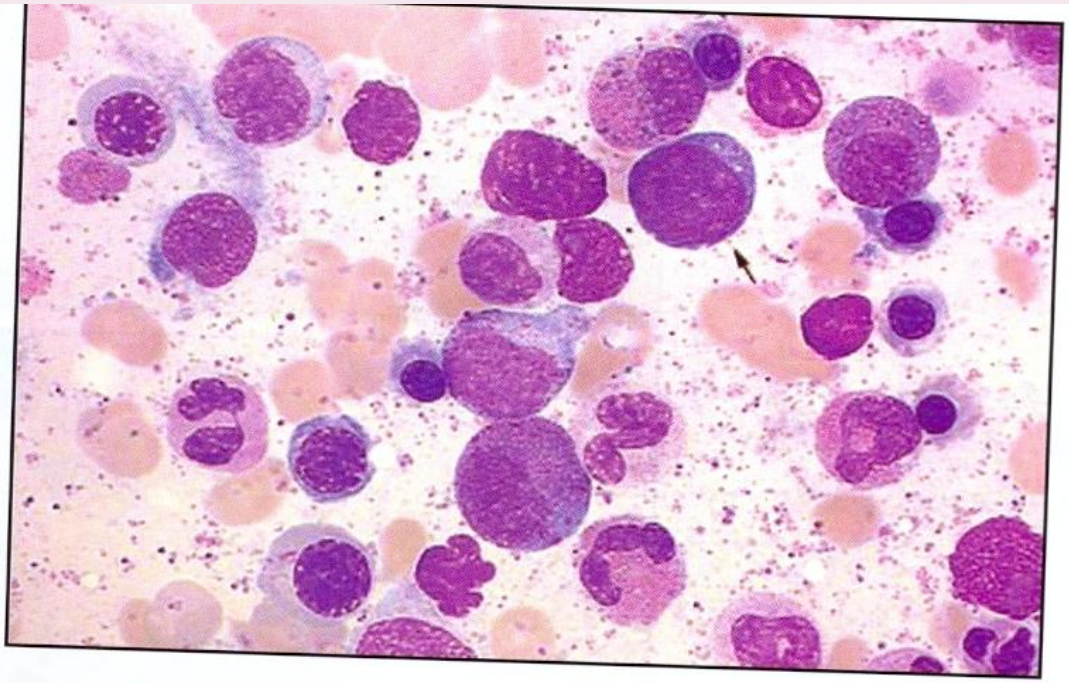


لوسمی میلوژن مزمن.

CNL

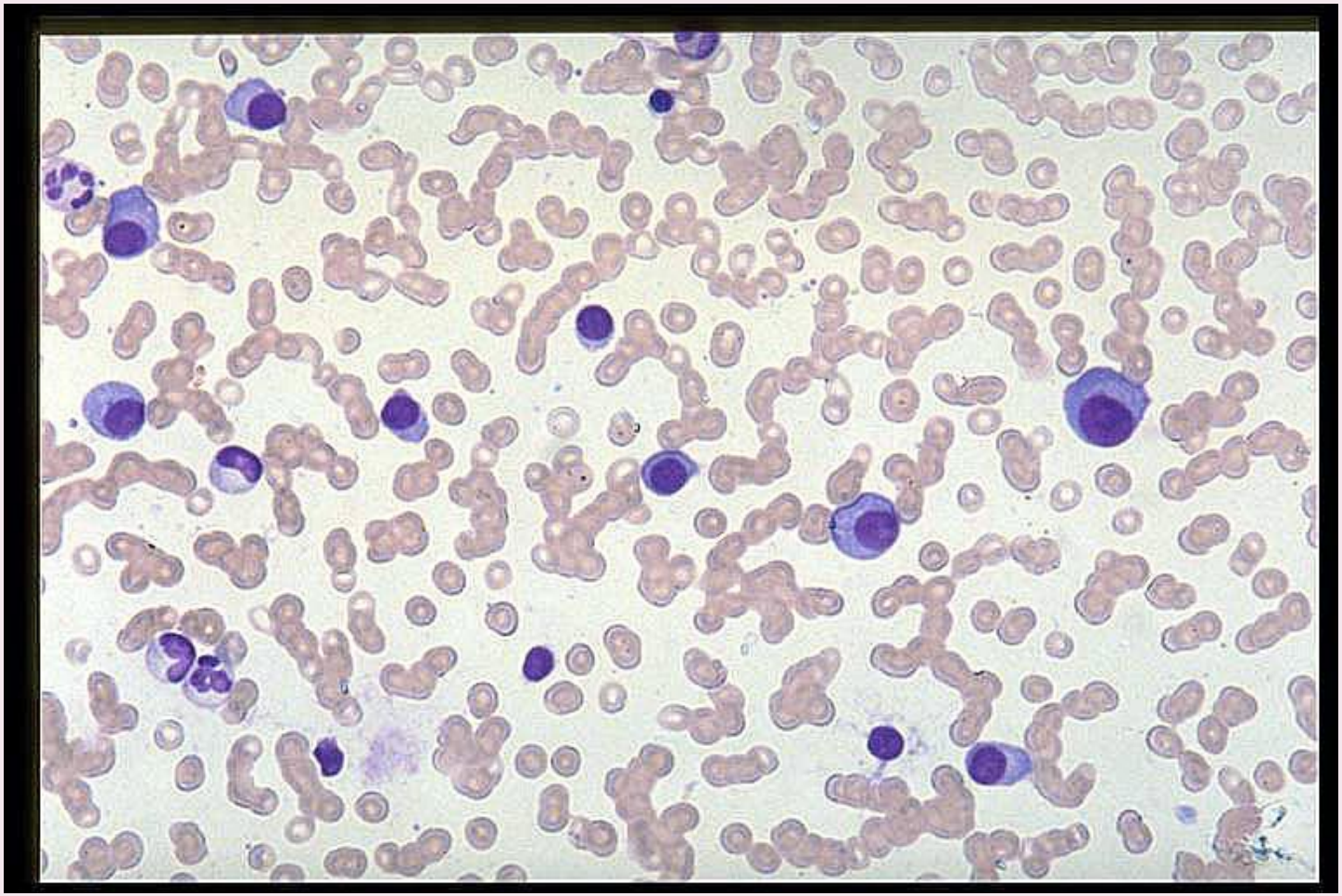


CEL

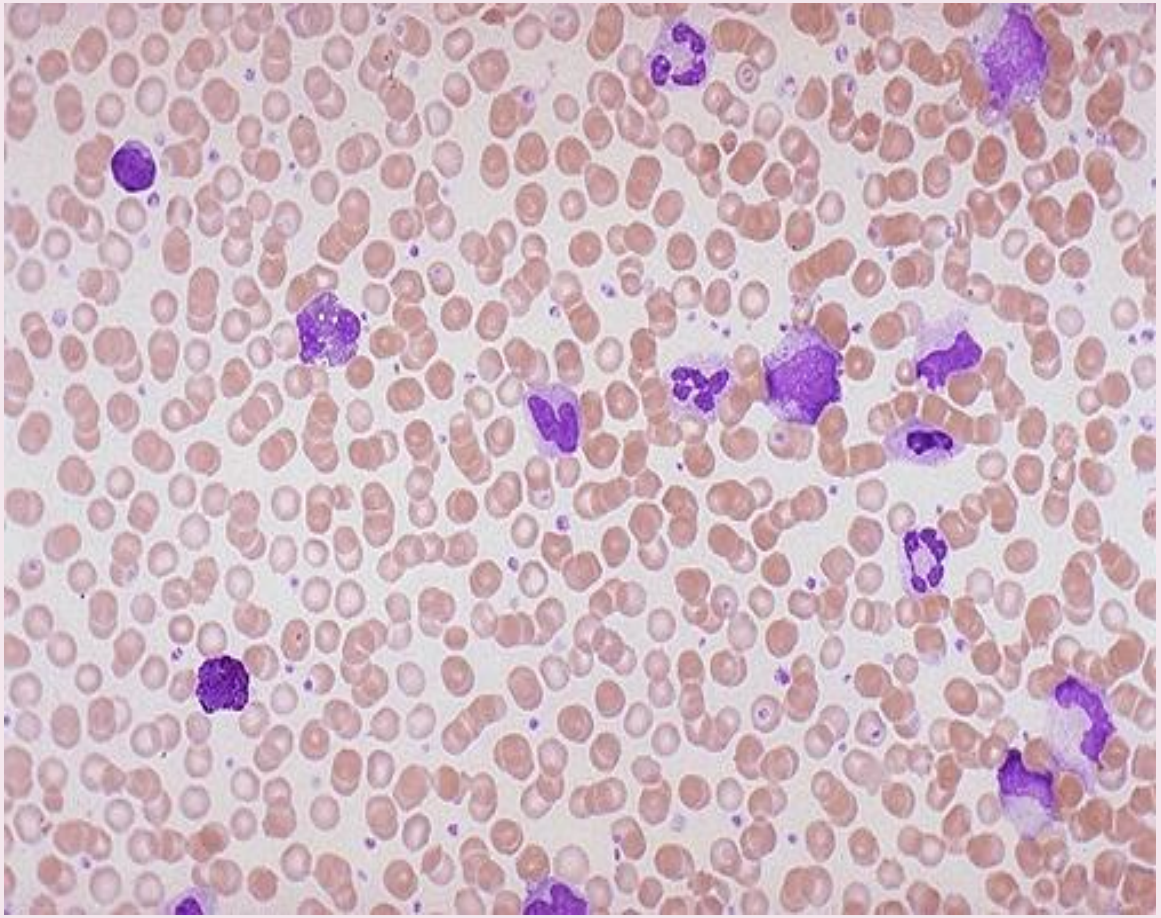


لوسمی ائوزینوفیلیک مزمن و سندرم هایپرائوزینوفیلیک .این آسپیره مغز استخوان از یک بیمار سندرم هایپرائوزینوفیلیک گرفته شده و ائوزینوفیلی قابل ملاحظه به همراه اشکال بالغ مشاهده می شوند.افزایش در بلاست ها (فلش) باید یک فرآیند نئوپلاستیک را مد نظر داشته باشیم. گرانولهای ائوزینوفیل متعدد رها شده از سلولهای دگرانوله منجر به ایجاد این زمینه کثیف در تصویر شده اند(رنگ آمیزی رایت گیمسا).

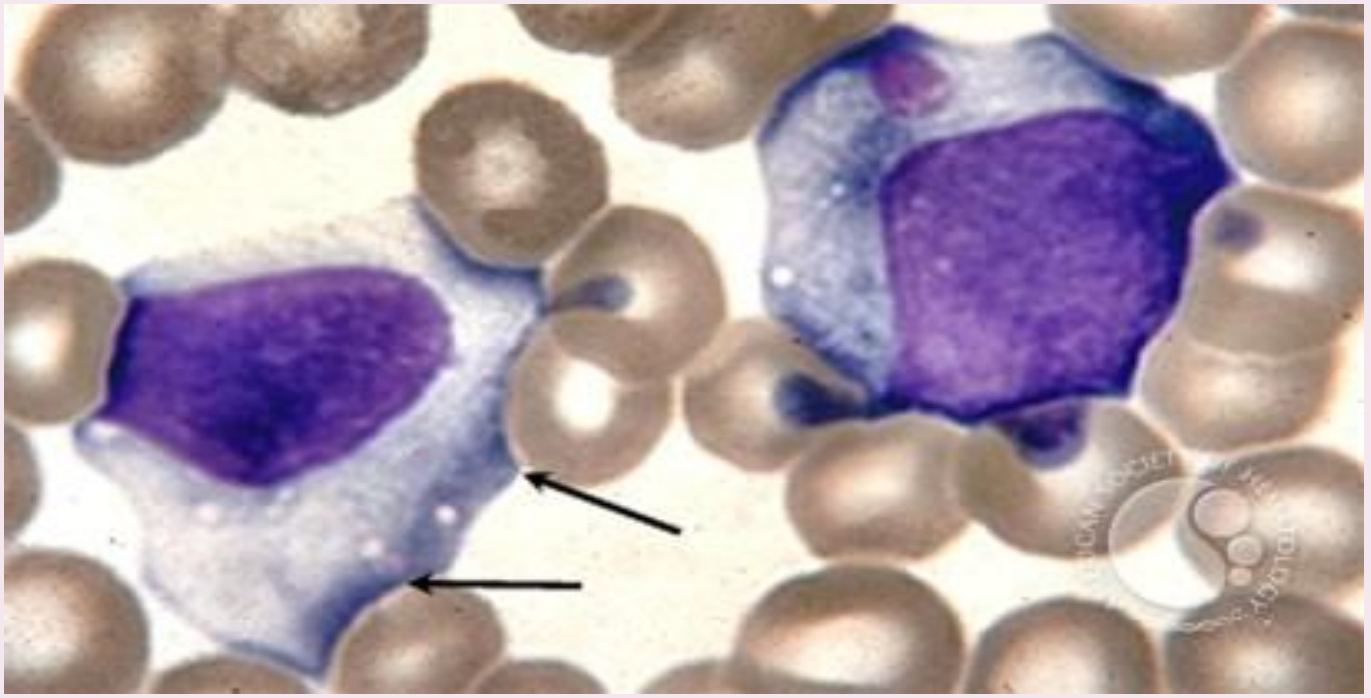
Plasma cell



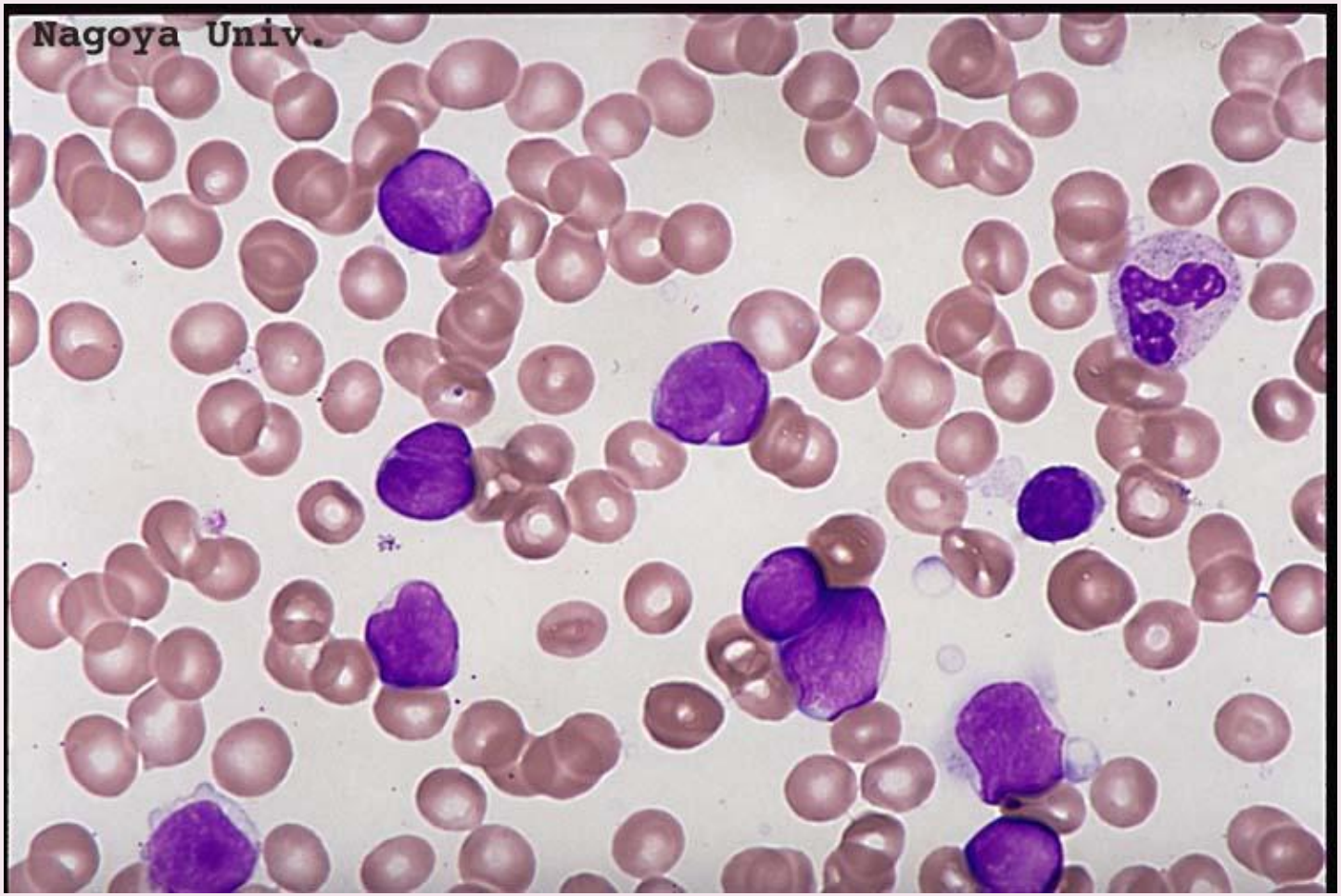
CML



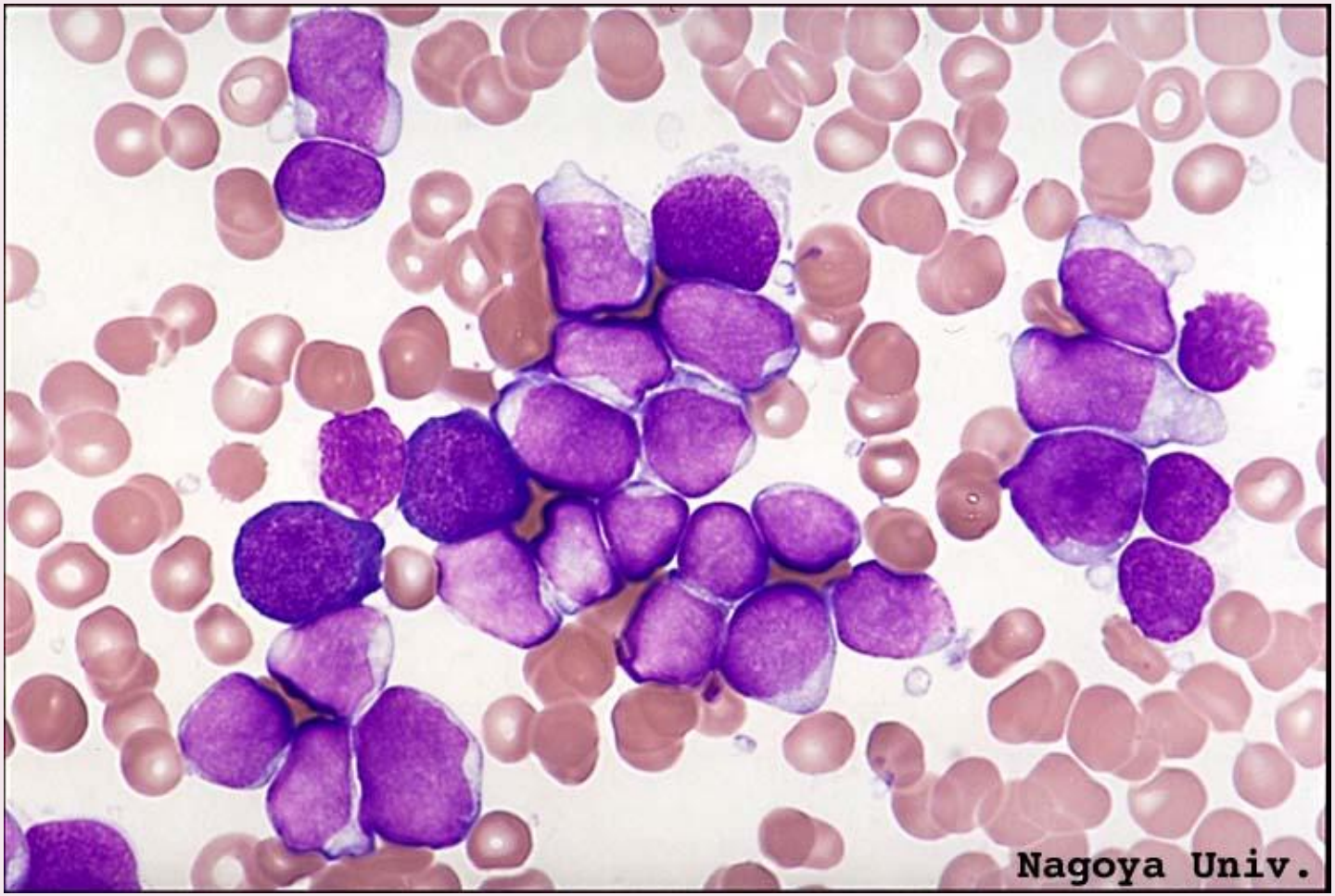
IM-LYM VARIANT



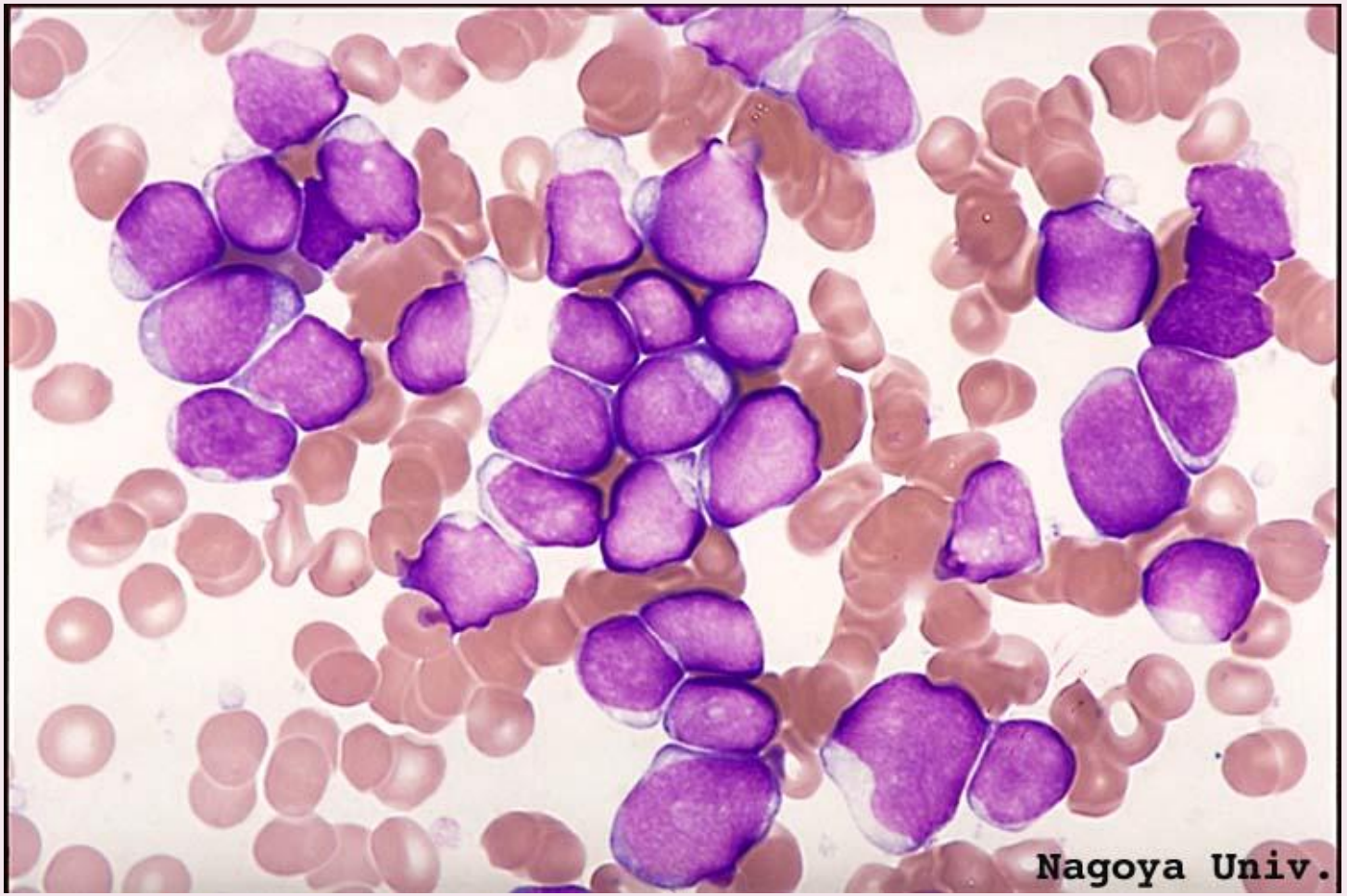
ALL1

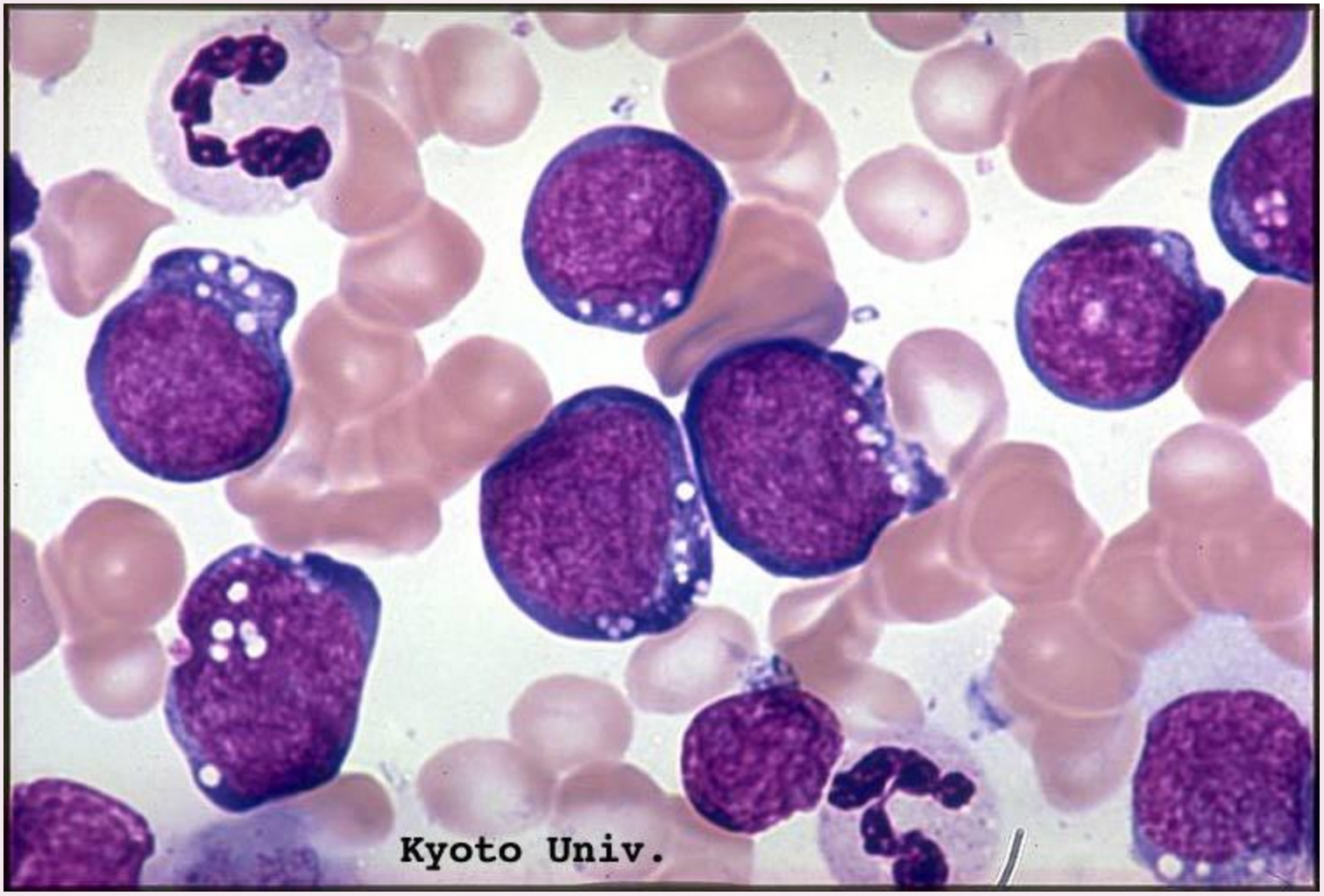


ALL2



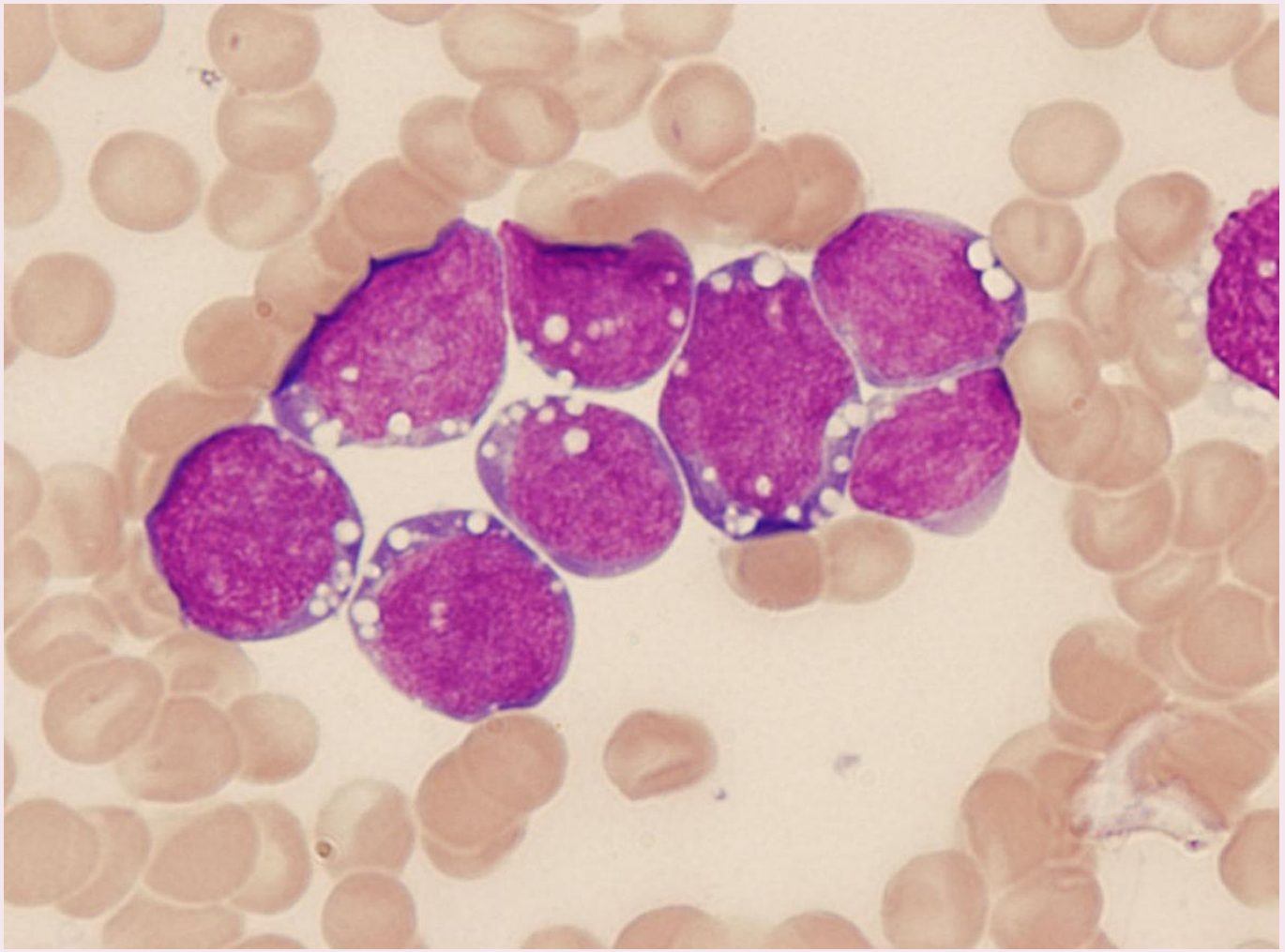
ALL2





ALL(L
3)

L3 vacuolated blasts



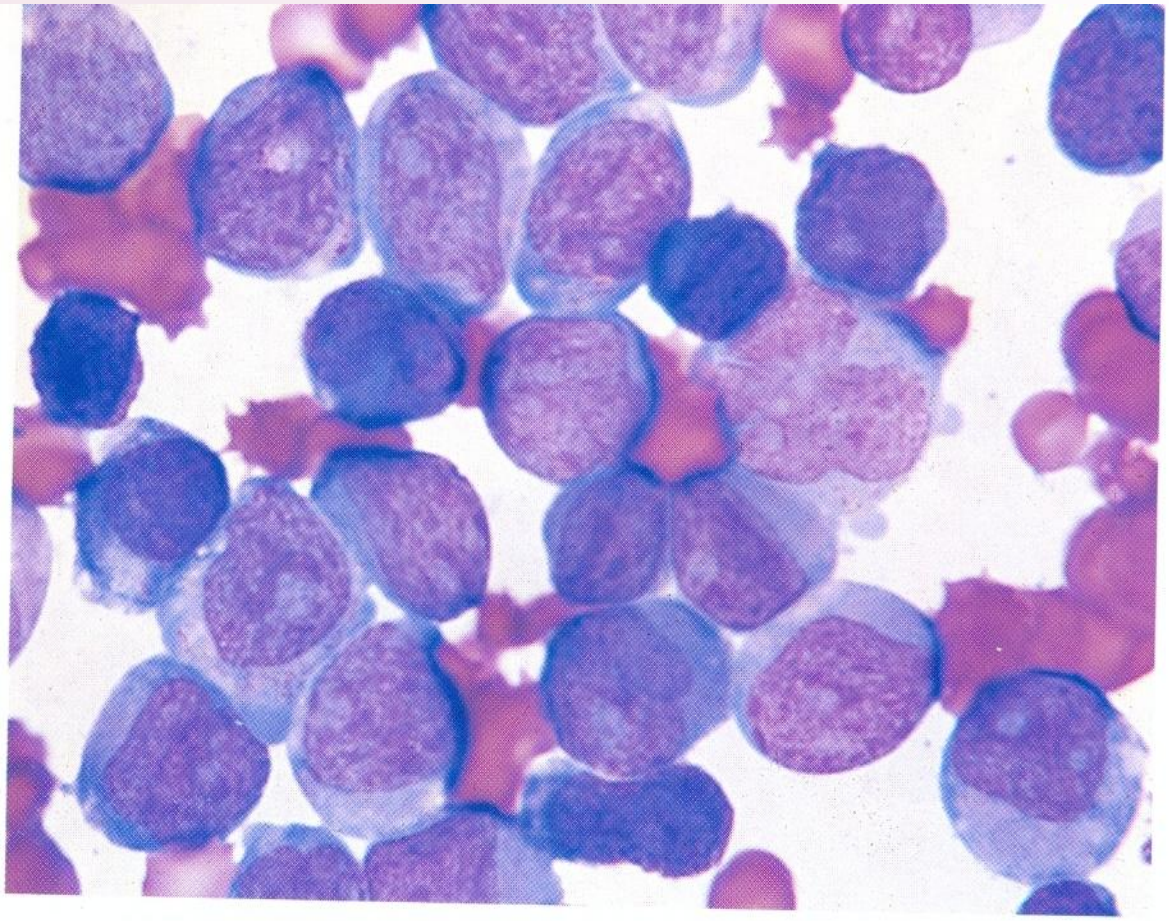


Fig. 91 Blood film Acute undifferentiated leukaemia – M0
In this preparation practically all of the cells present are atypical 'blast' cells, the nuclei of which have a fine structure, their nucleoli being pale with no thickening of the chromatin at the circumference. The majority of the cells have a narrow border of basophilic cytoplasm. From this preparation it is not possible to state whether these very primitive cells are of lymphoblastic, myeloblastic or monoblastic origin. *Leishman stain* × *1200*

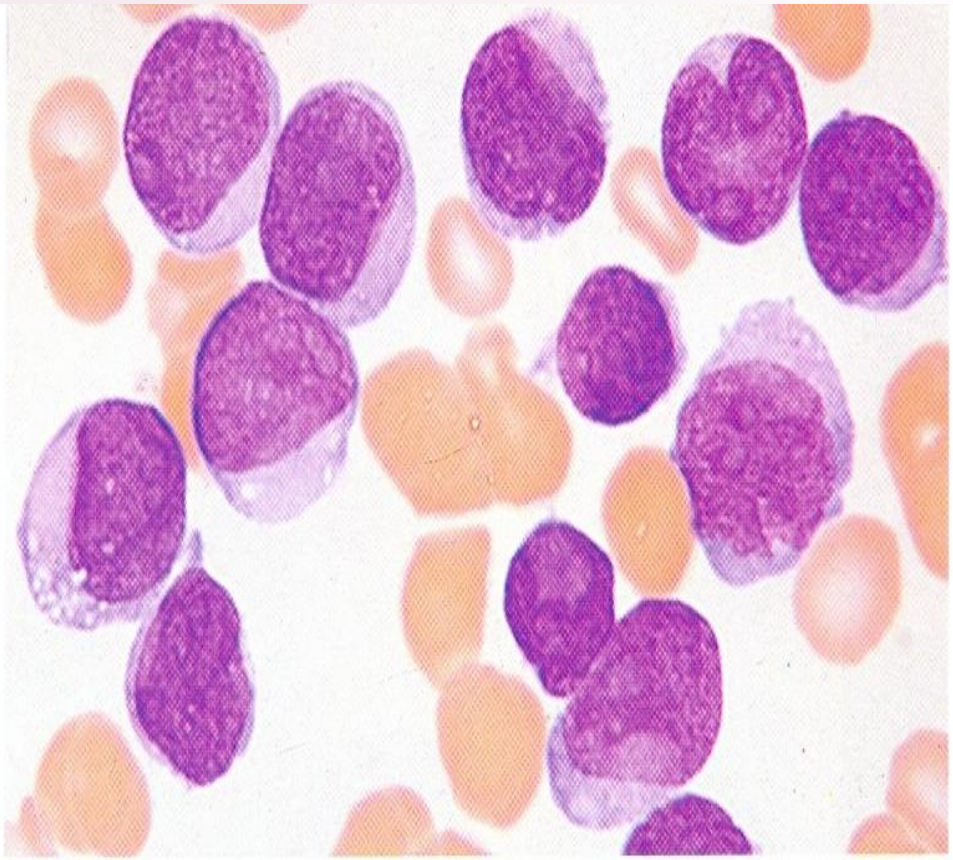


Fig. 107 Blood film Acute myeloid leukaemia – M1
The cells in this illustration are of the same type, myeloblasts of varying size with basophilic cytoplasm; irregular shaped nucleus with nucleoli. *May-Grünwald-Giemsa stain × 1200*

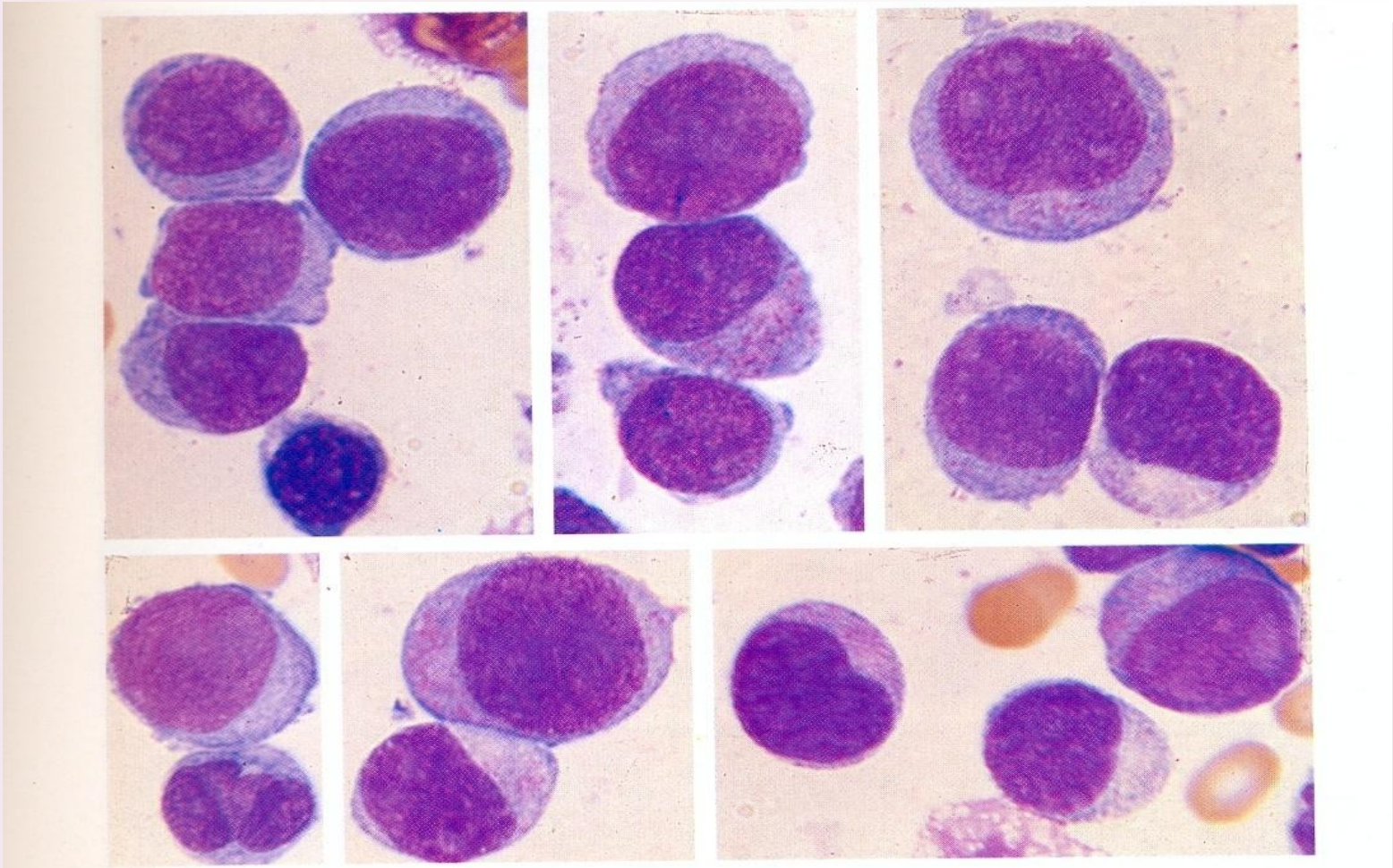


Fig. 101 Marrow film Acute myeloid leukaemia – M2
In this illustration the chief cells are myeloblasts with variable nucleo-cytoplasmic ratios. Their nuclei are large, with smooth finely stranded chromatin, and contain nucleoli. Promyelocytes, some of which possess azurophil granules, but with otherwise similar characteristics to the myeloblasts are also present. *May-Grünwald-Giemsa*

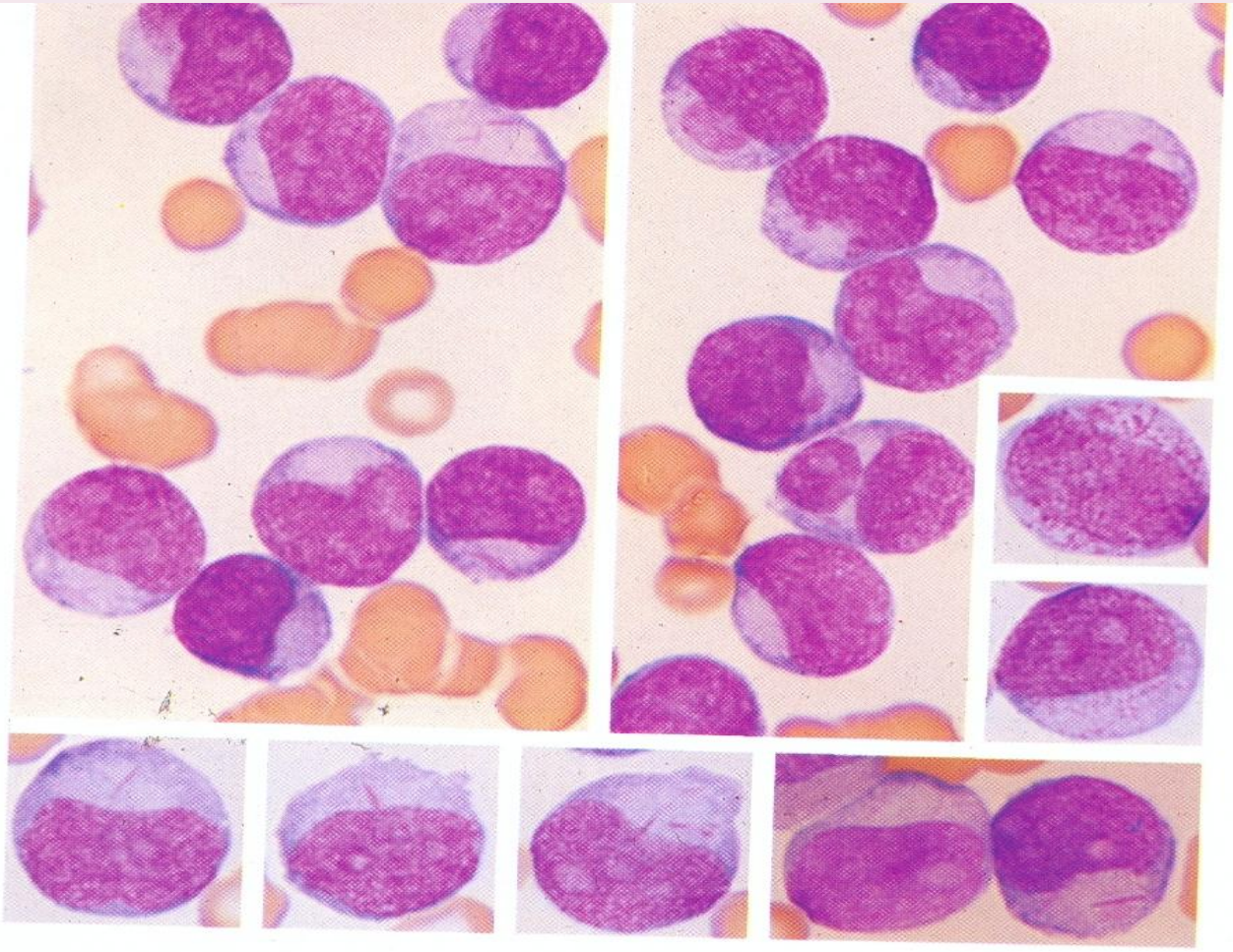


Fig. 104 Blood film Acute myeloid leukaemia Auer rods – M2
Several of the myeloblasts, in this composite illustration, contain single or multiple rod-shaped structures in their cytoplasm; these are known as *Auer bodies*. These bodies are probably formed by the coalescence of cytoplasmic granules in leukaemic myeloblasts. *May-Grünwald-Giemsa stain × 1200*

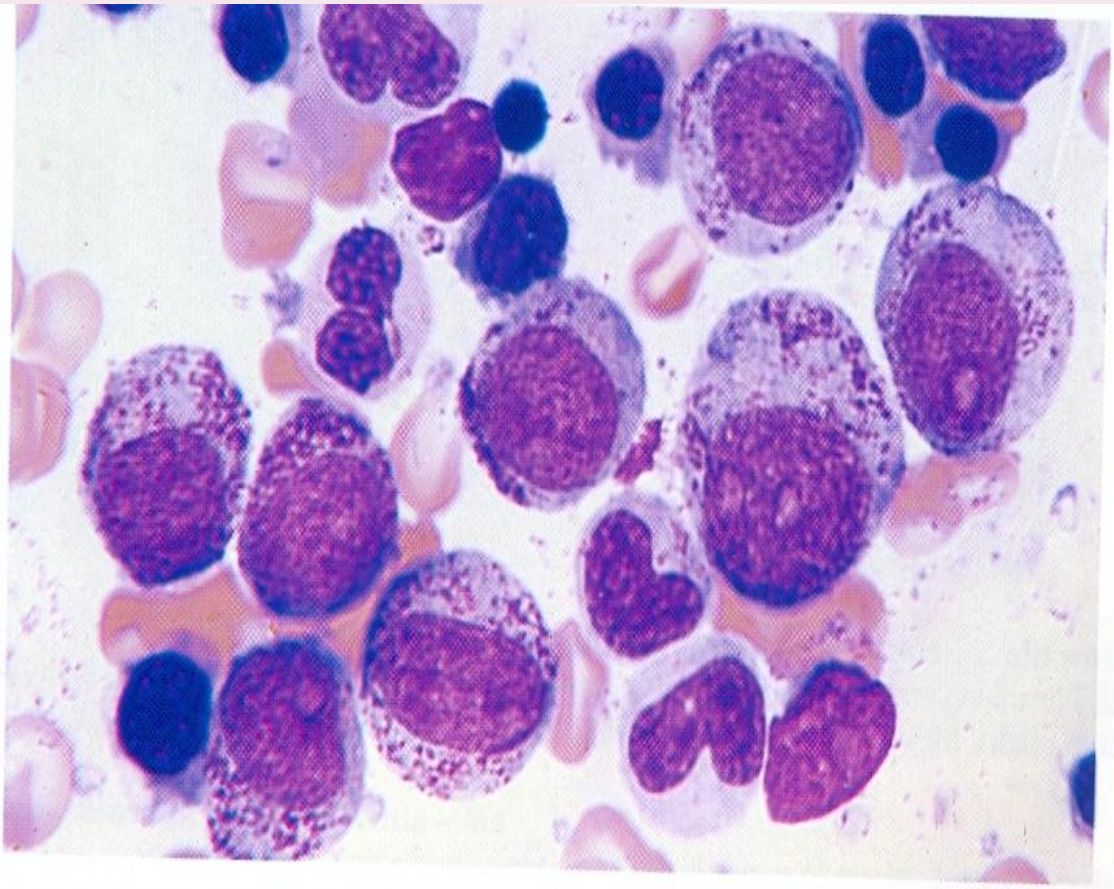


Fig. 94 Marrow film Acute myeloid leukaemia – M3
The cells are predominantly promyelocytes with prominent coarse granulations. *May-Grünwald-Giemsa stain*
1200

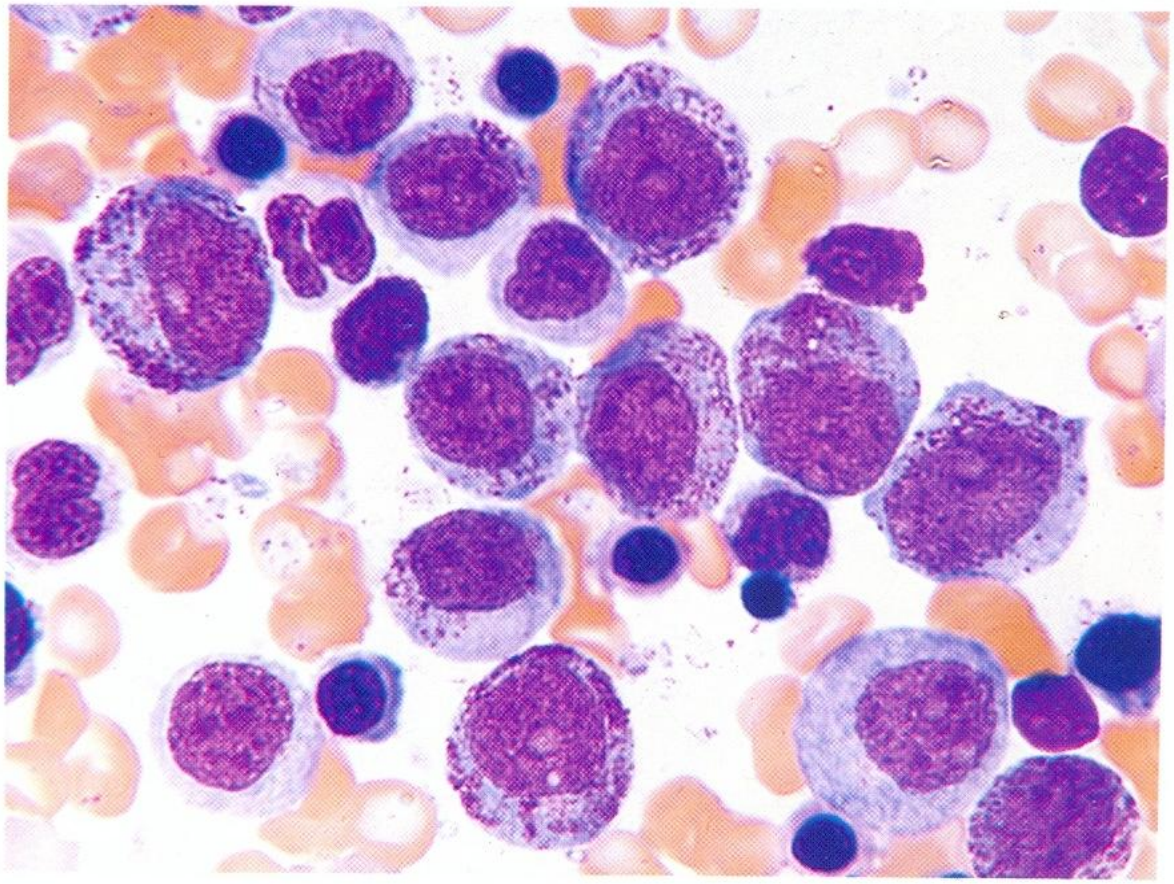


Fig. 110 Marrow film Promyelocytic leukaemia – M3
In this illustration the majority of the immature cells exhibit cytoplasmic granulation ranging from fine to coarse. The nucleus of the promyelocytes appear more immature than in the normal promyelocyte. *May-Grünwald-Giemsa stain × 1200*

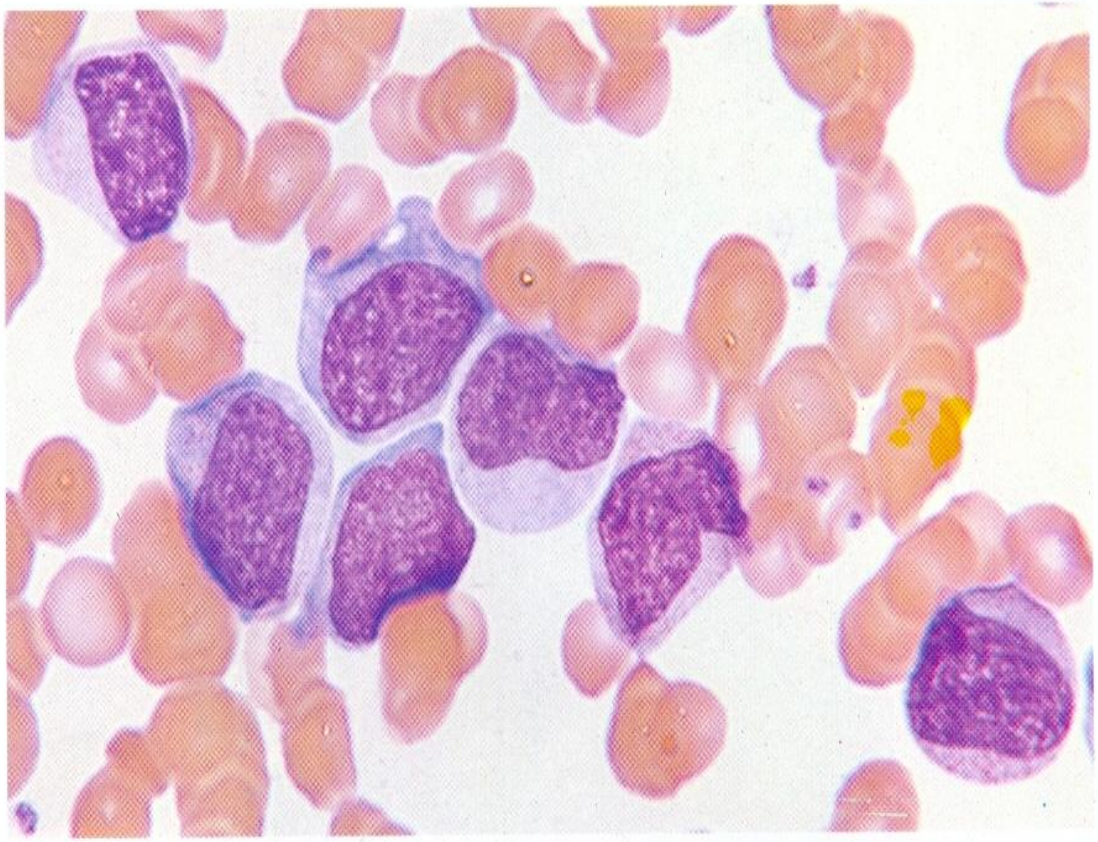


Fig. 95 Blood film Acute myelomonocytic leukaemia – M4
The cells in this illustration are primitive cells of the monocyte series, monoblast and promonocyte (left centre), and primitive cells of the myeloid series promyelocyte and myeloblasts (lower right). *May-Grünwald-Giemsa stain*

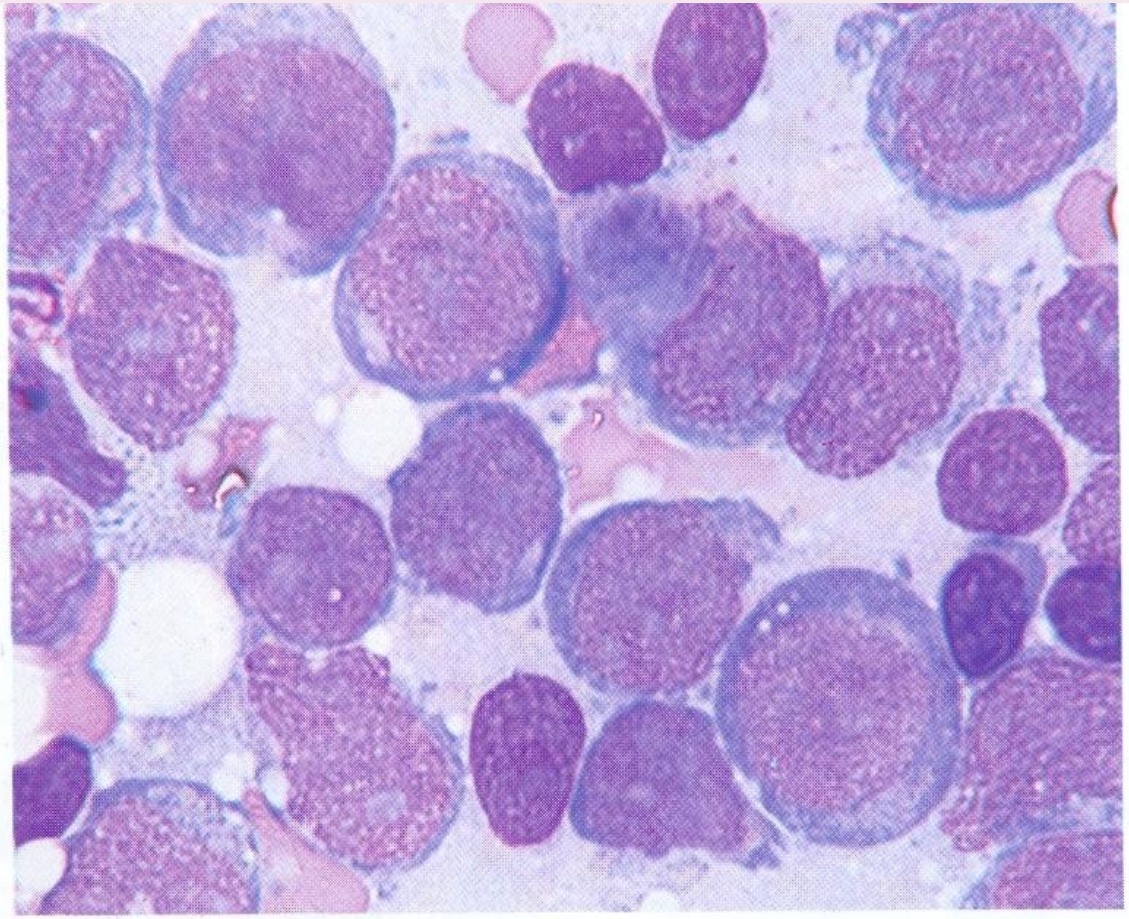


Fig. 96 Marrow film Acute myelomonocytic leukaemia – M4
The cells in this illustration are primitive cells of the myeloid and monocyte series. Monoblasts top left and myeloblasts bottom right. *May-Grünwald-Giemsa stain × 1200*

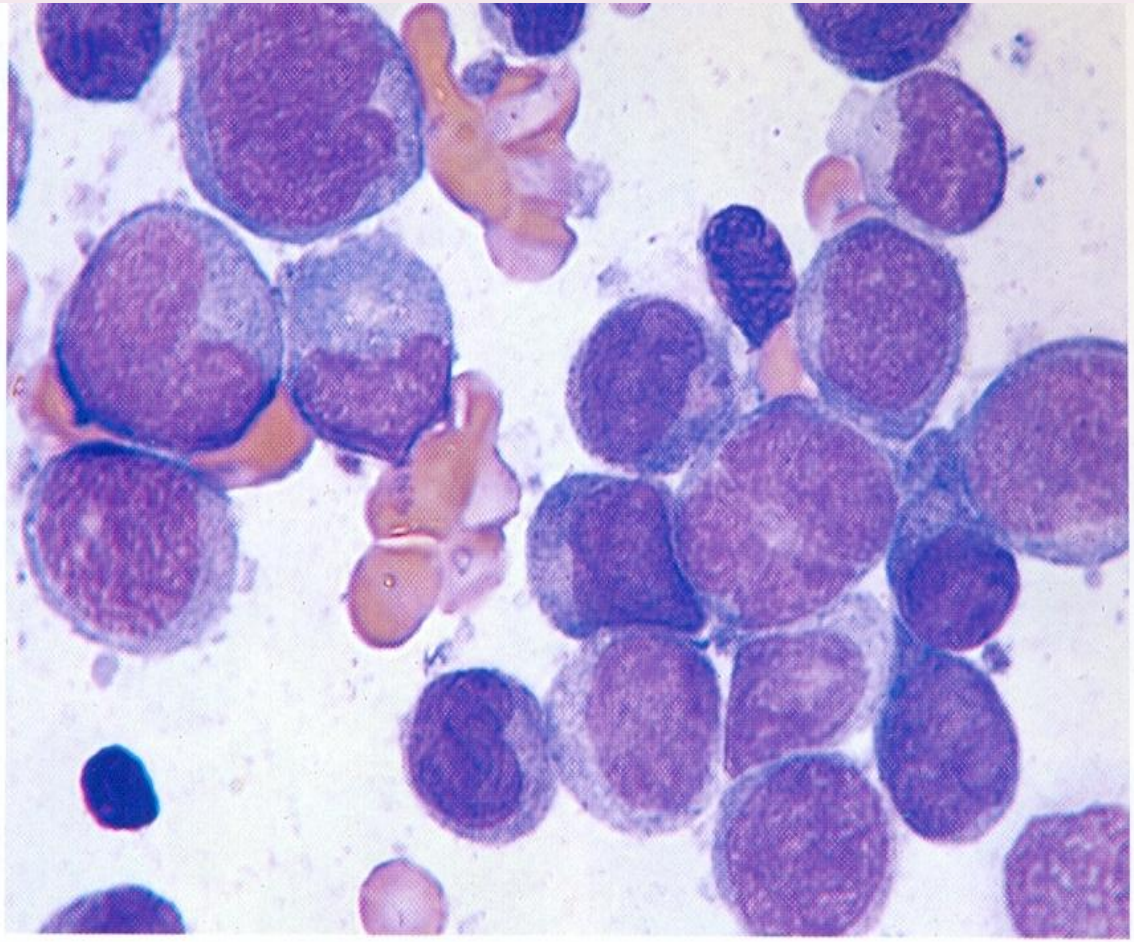
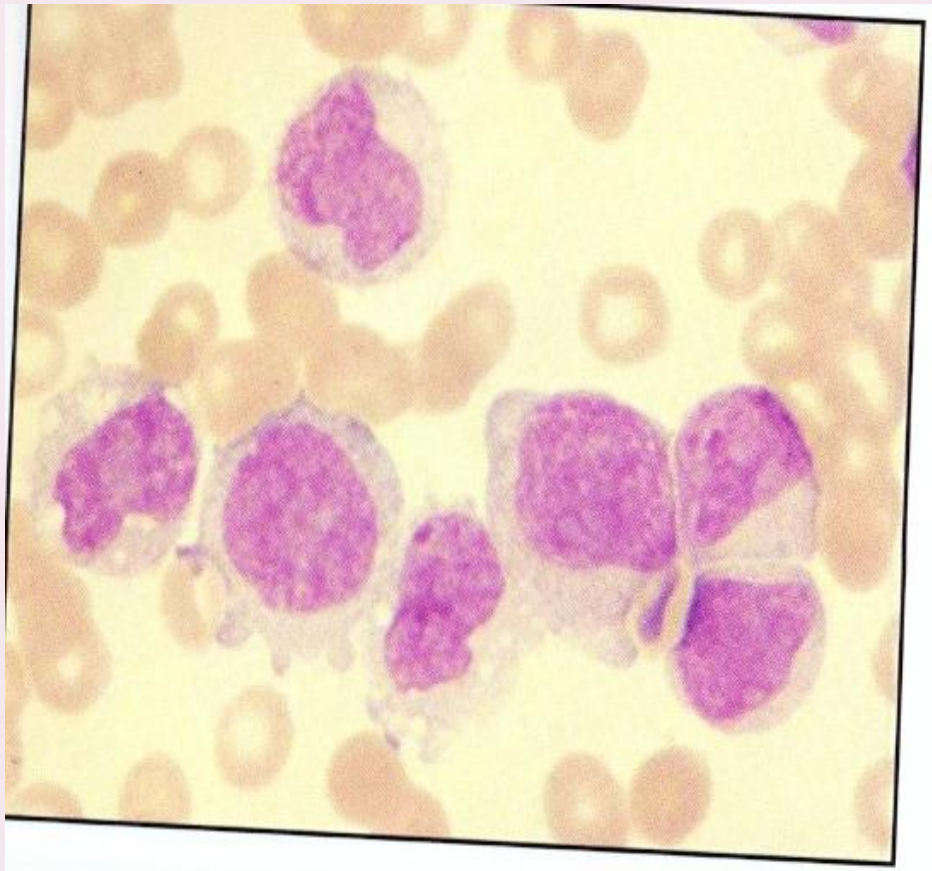


Fig. 97 Marrow film Acute monoblastic leukaemia – M5 (b)
This illustrates proliferation of cells of the monocytic series at various stages of development, monoblasts and promonocytes with variation in size and nuclear configuration. *May-Grünwald-Giemsa stain × 1200*



لوسمی میلوژن حاد (M5b).

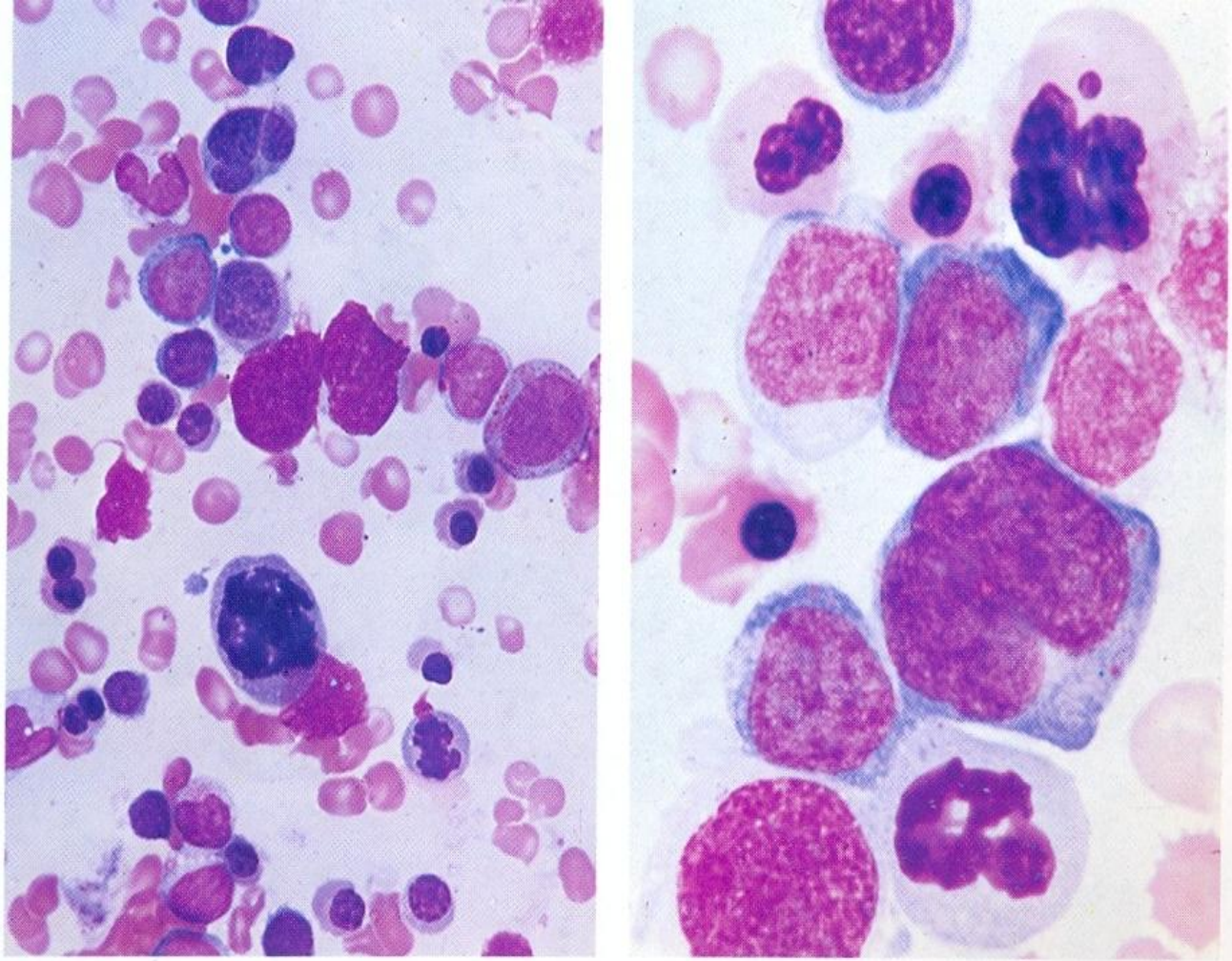
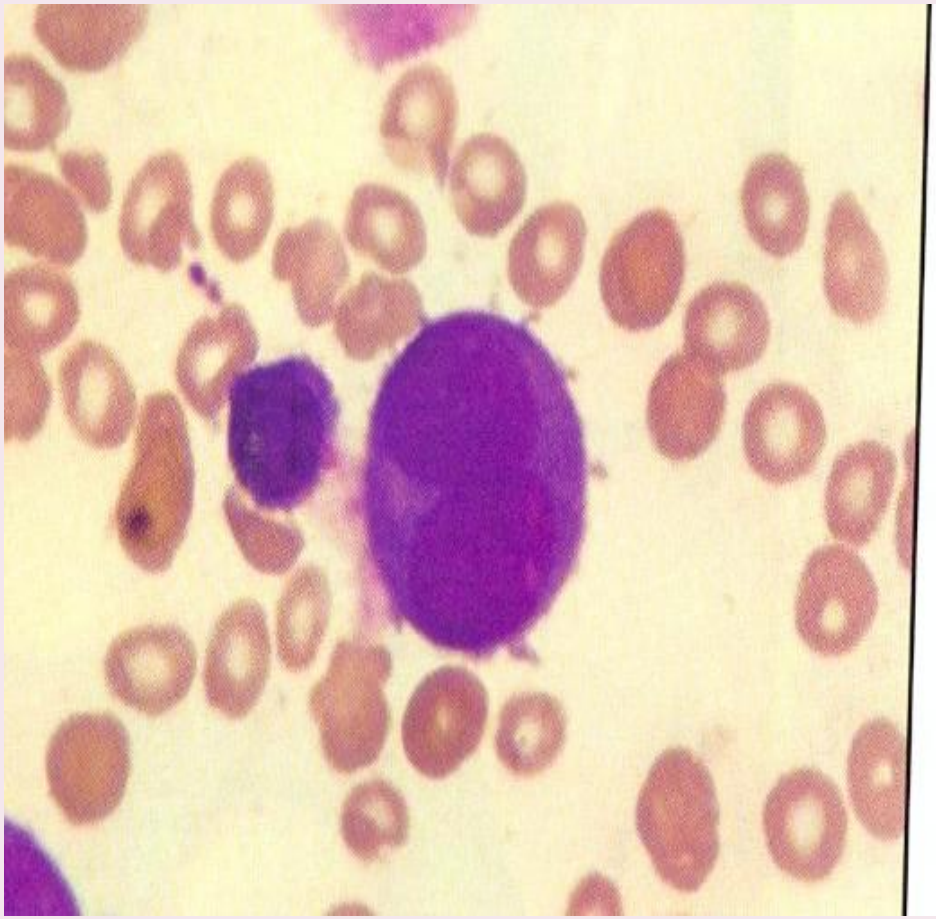
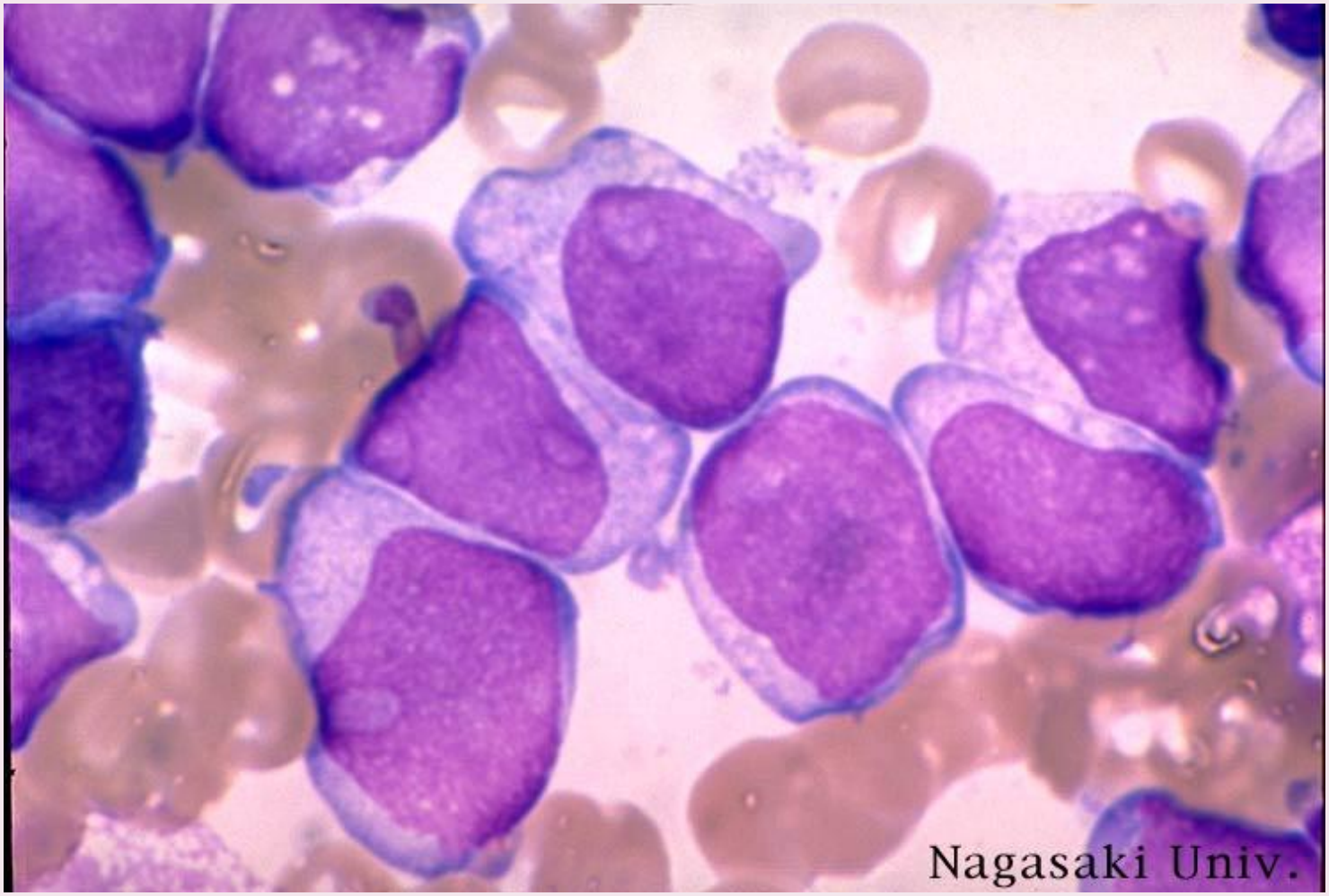


Fig. 98 Marrow film Erythroleukaemia – M6
At low magnification (left) and high magnification (right) the bizarre nature of erythropoiesis is evident. There is complete absence of cells of the myeloid series. Erythroblasts with multiple lobation of the nucleus and multiple nuclei are present. *May-Grünwald-Giemsa stain × 1200*



یک. لوسمی میلوژن حاد (M7)
مگاکاریوسیت نابالغ دو لوبه.

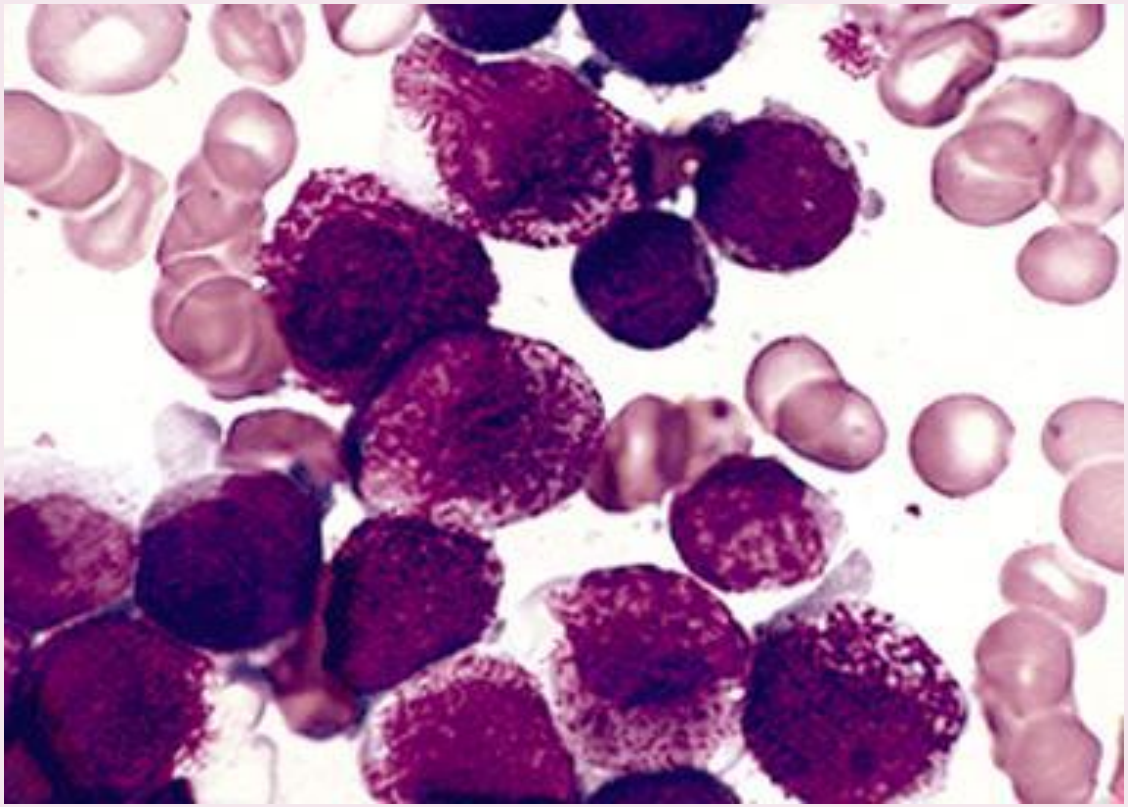
AML-M1



AML-M2

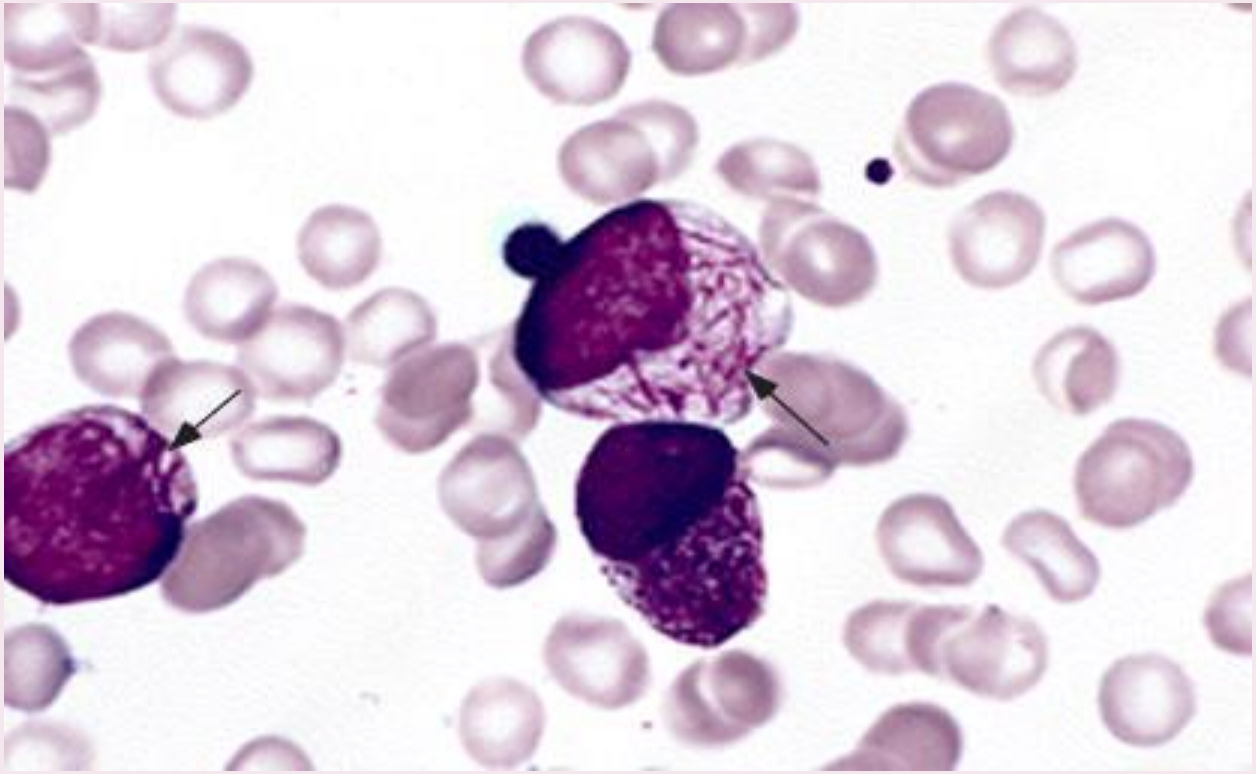


AML M3 (Promyelocytic)



Brunning, RD, McKenna, RW. Tumors of the bone marrow. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 9, 1994, Washington, DC. Armed Forces Institute of Pathology.

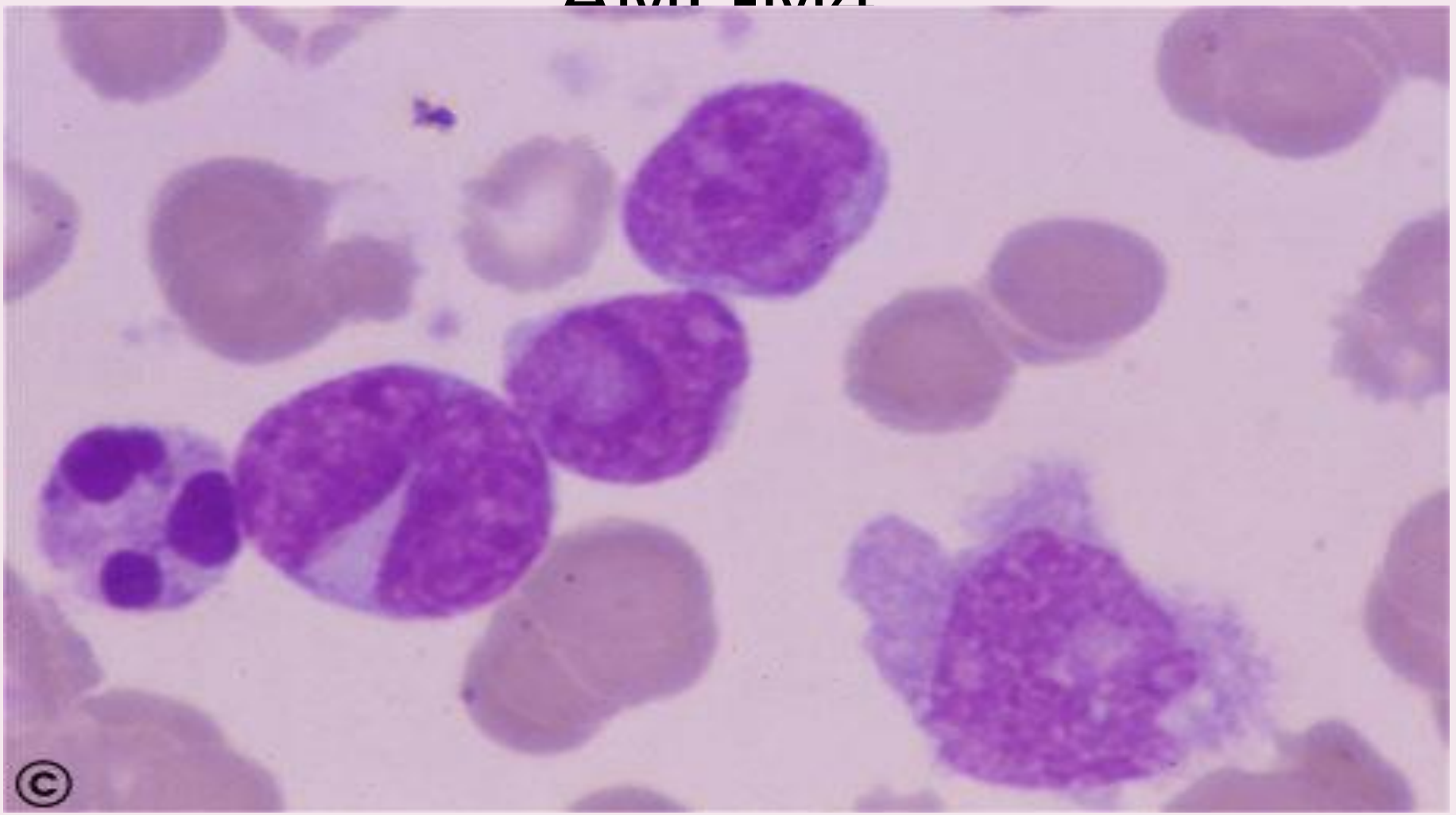
AML M3 (Promyelocytic)



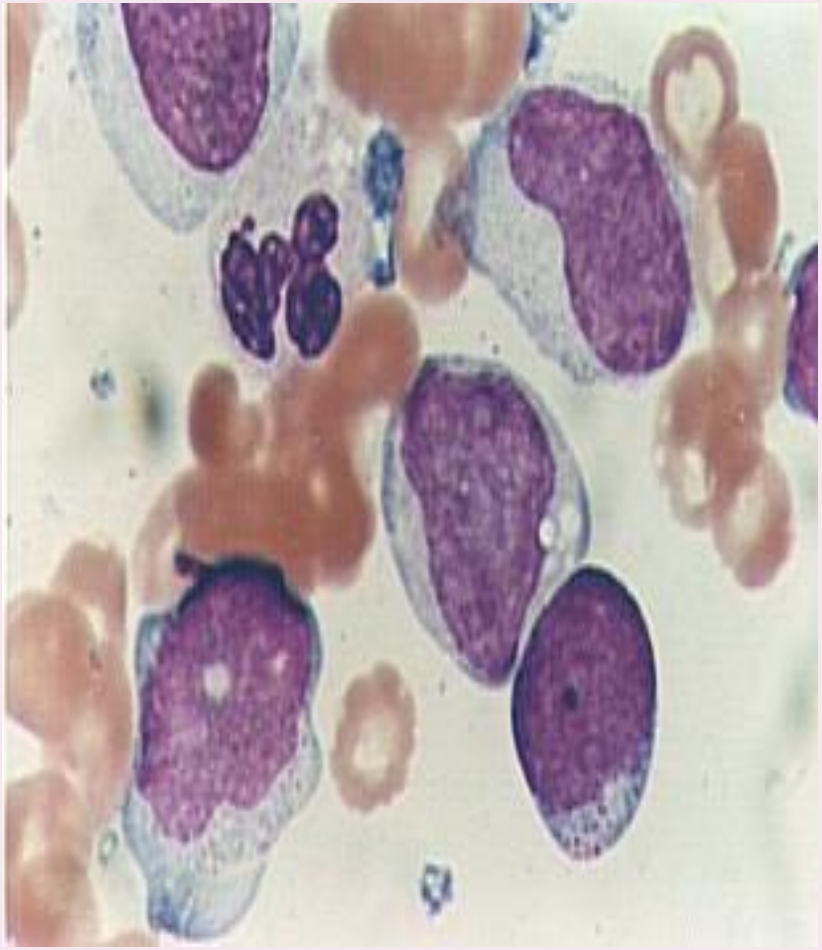
Brunning, RD, McKenna, RW. Tumors of the bone marrow. Atlas of tumor pathology (electronic fascicle), Third series, fascicle 9, 1994, Washington, DC. Armed Forces Institute of Pathology.

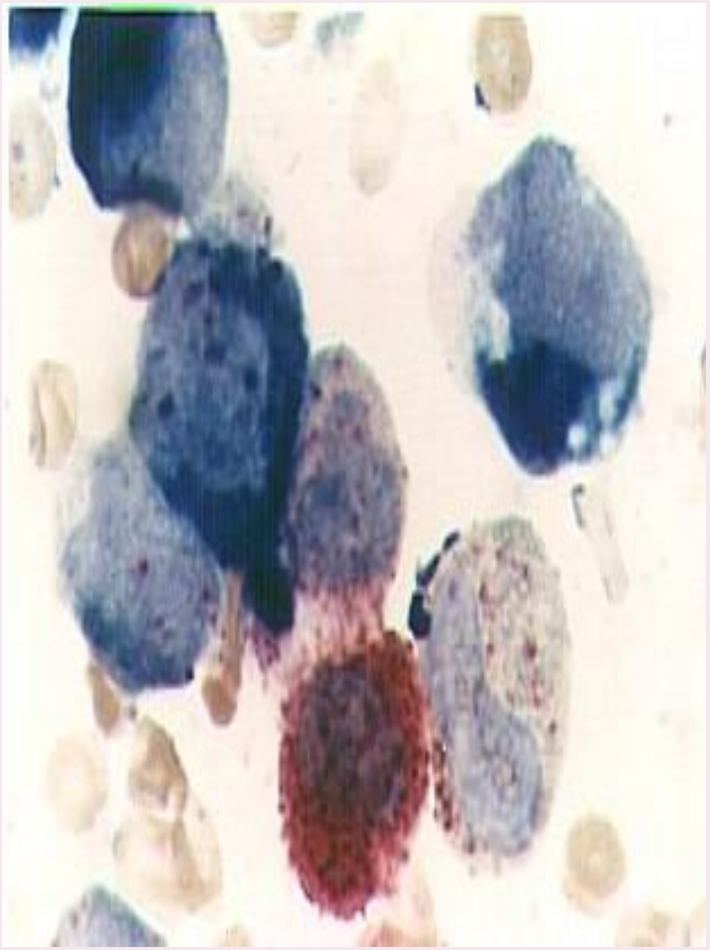
ACUTE MYELOID LEUKEMIA

AML-M4

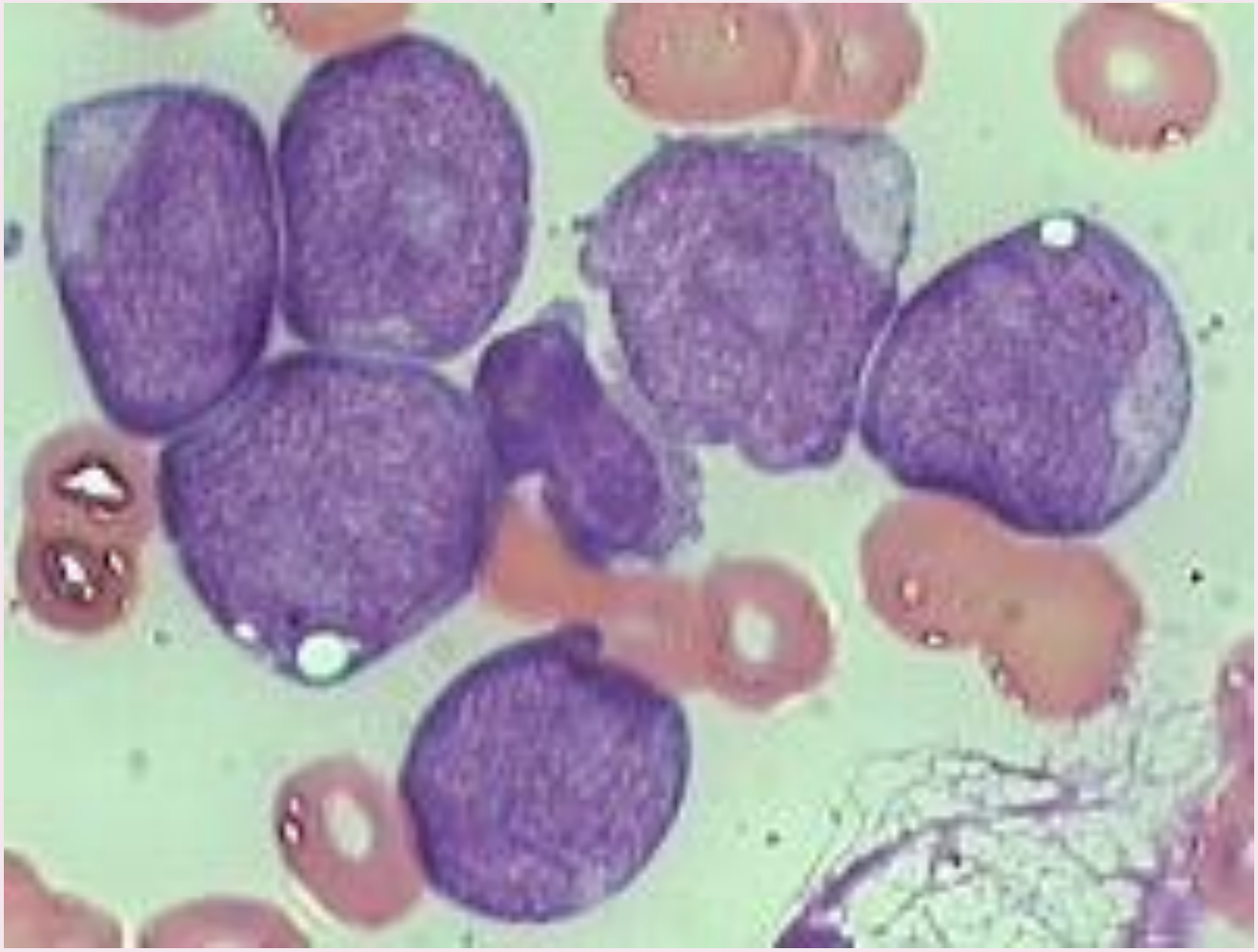


AML-M4

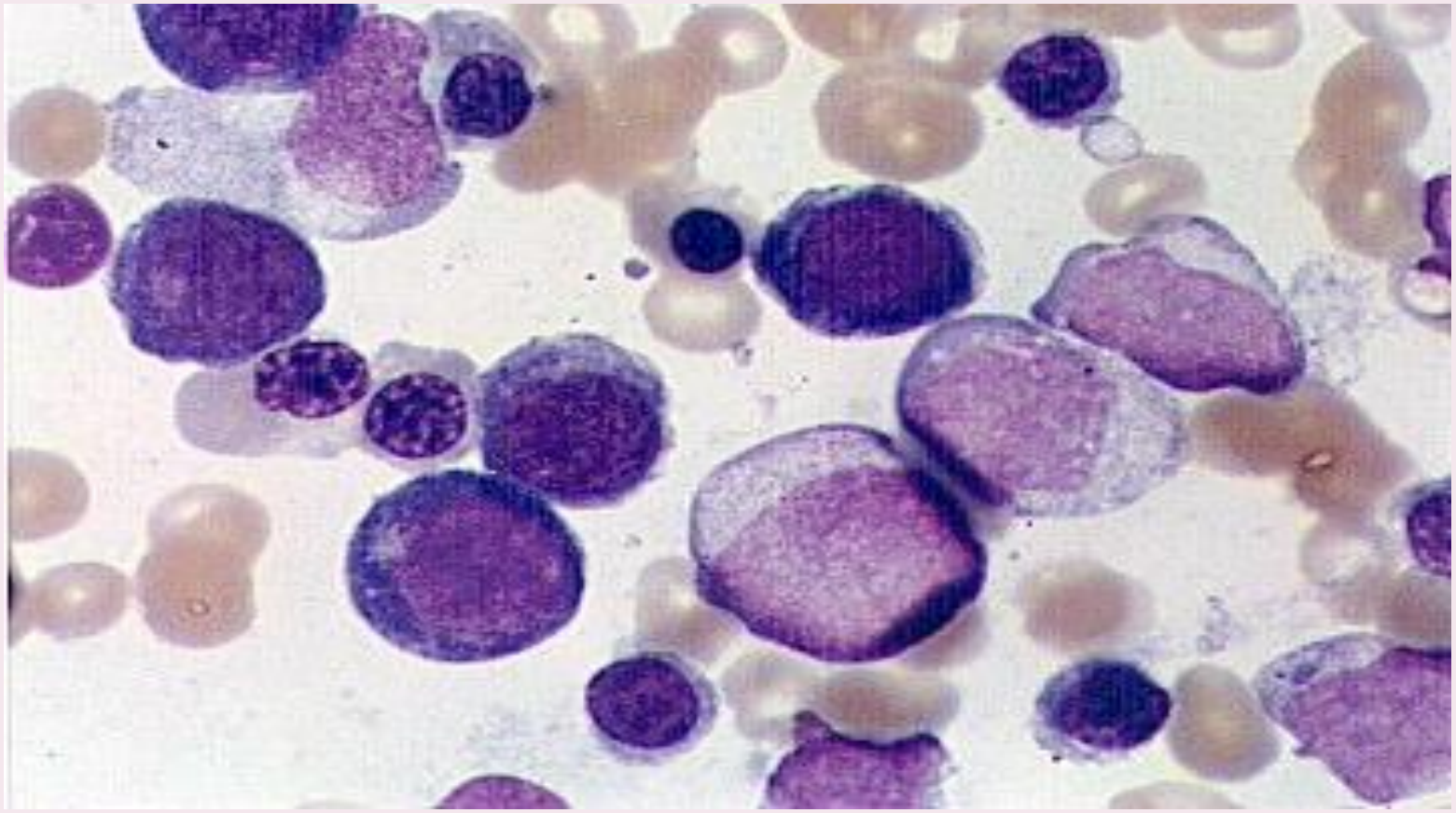




AML-M5a



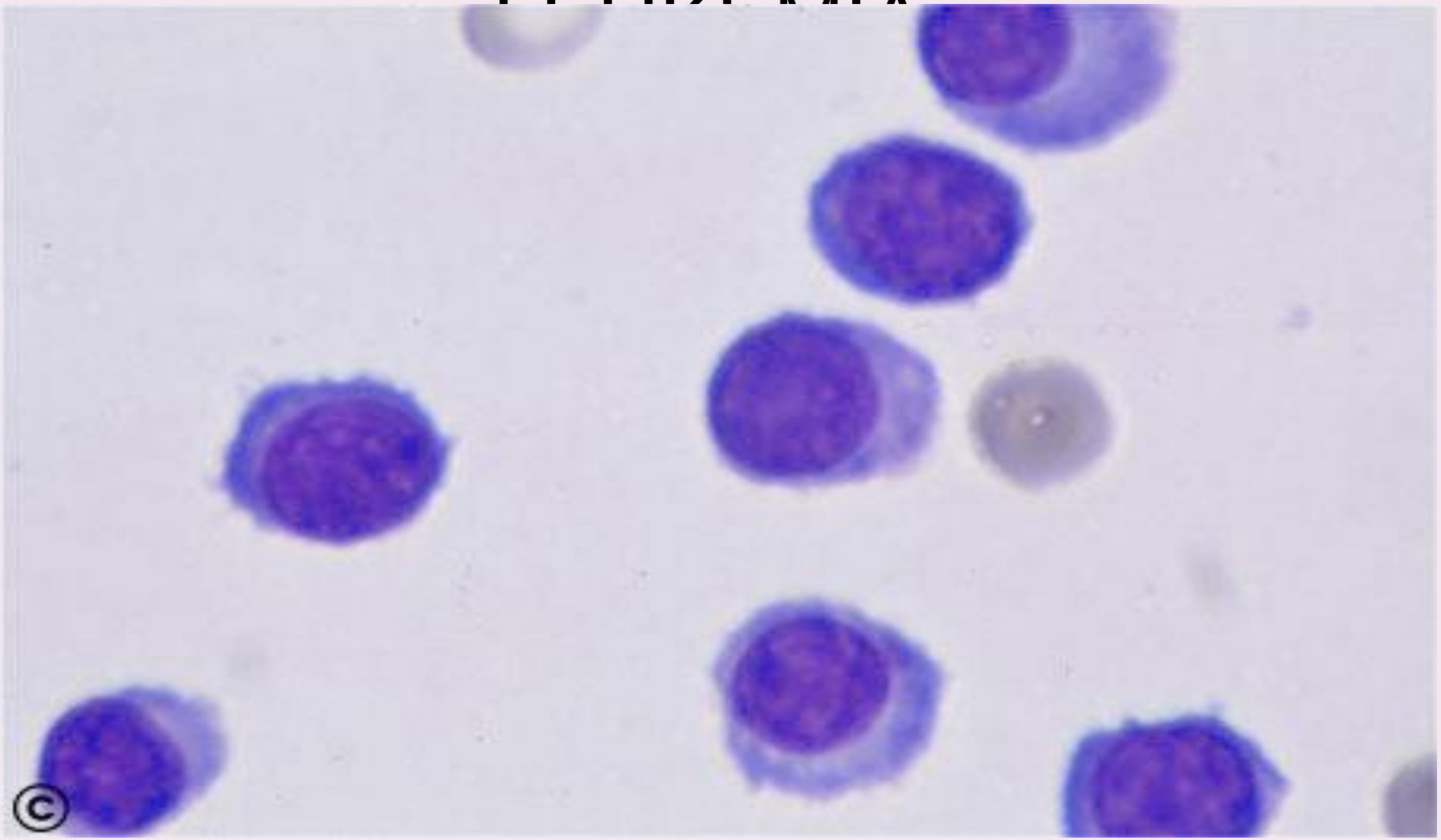
AML-M6

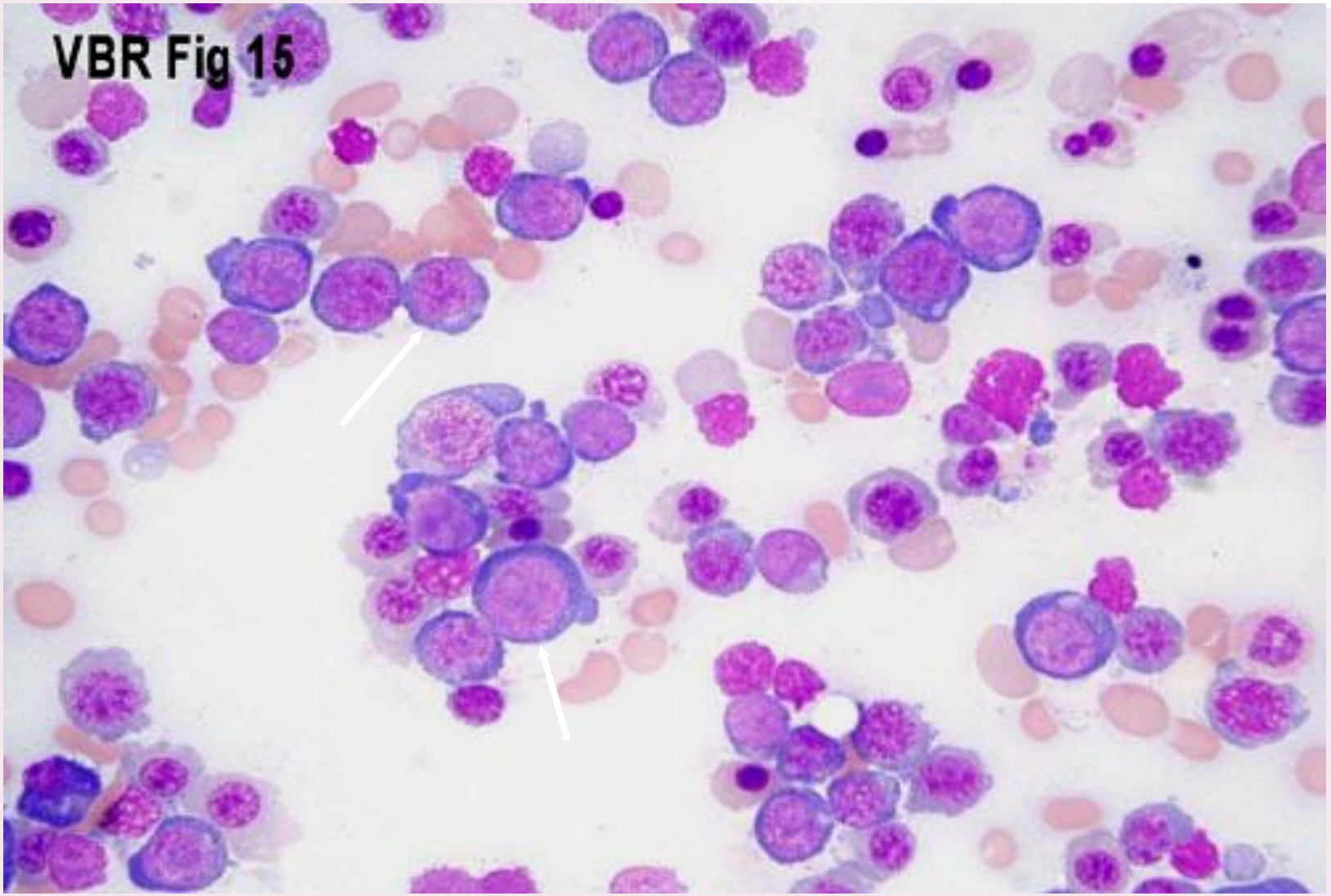


AML-M7



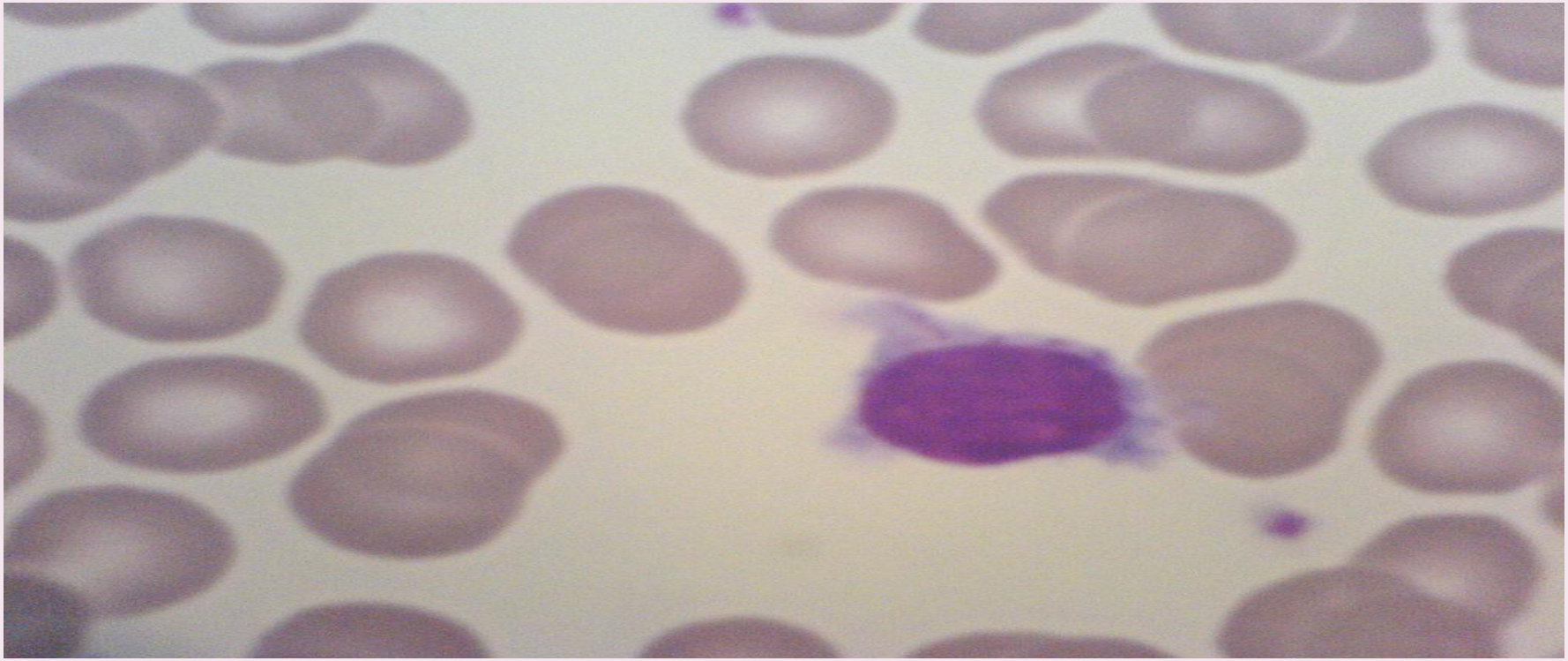
ACUTE PLASMOCUTIC LEUKEMIA





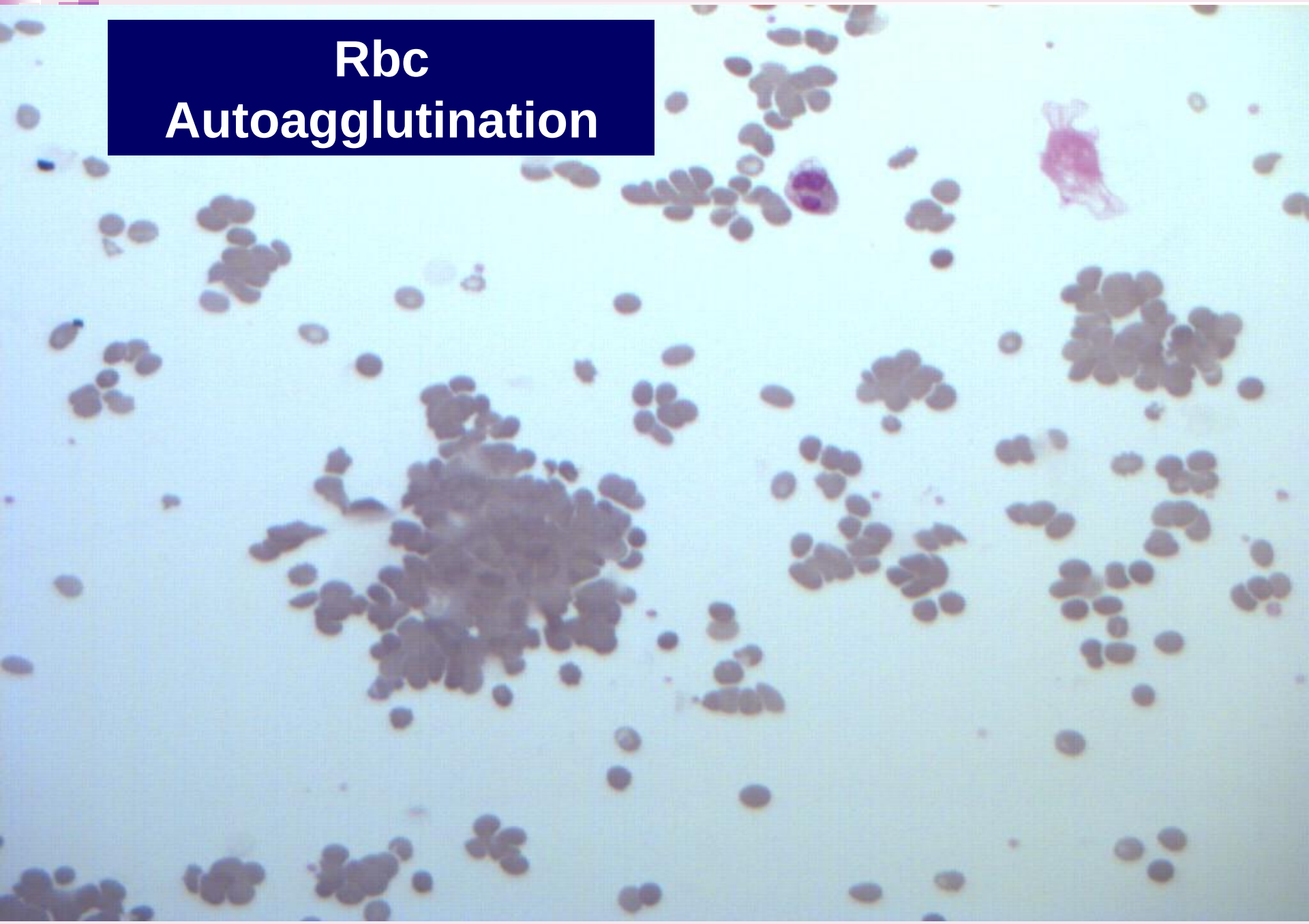
P. Smear AML

What is the name of this leukocyte?

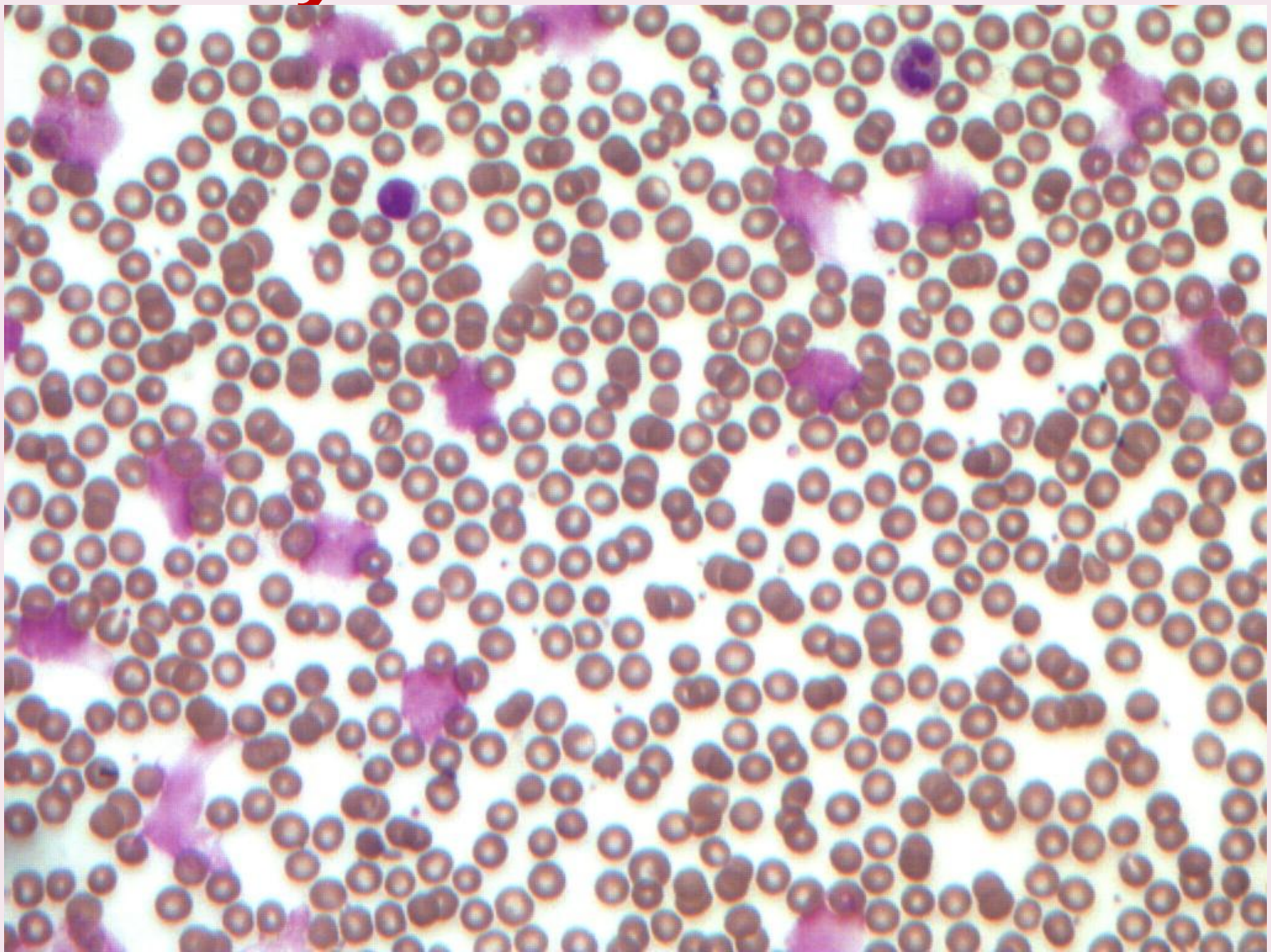


The hairy lymph. comes from a person suffering from active infection (without any malignant disease).
The granules identify it as a T or NK cell

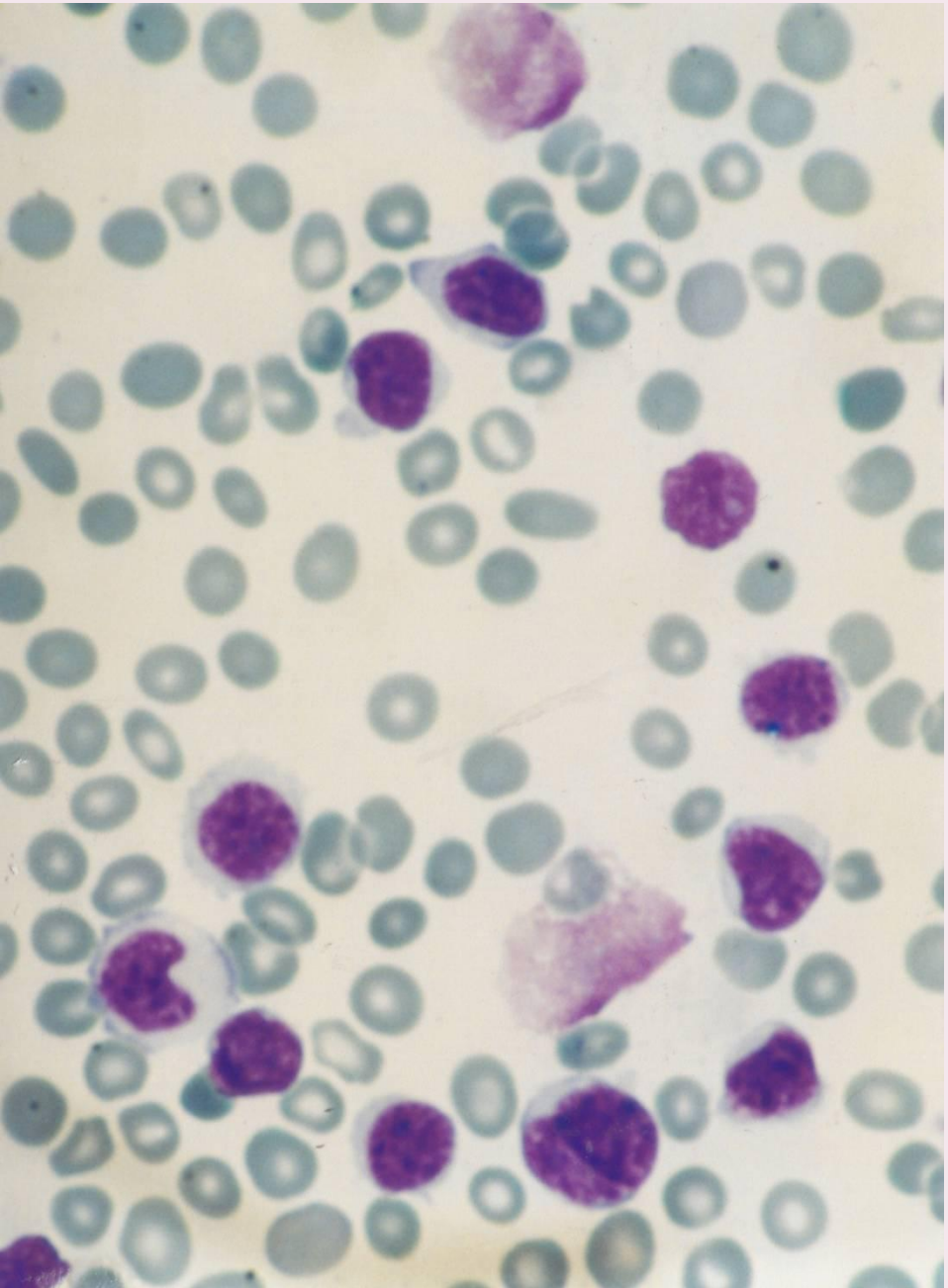
Rbc Autoagglutination

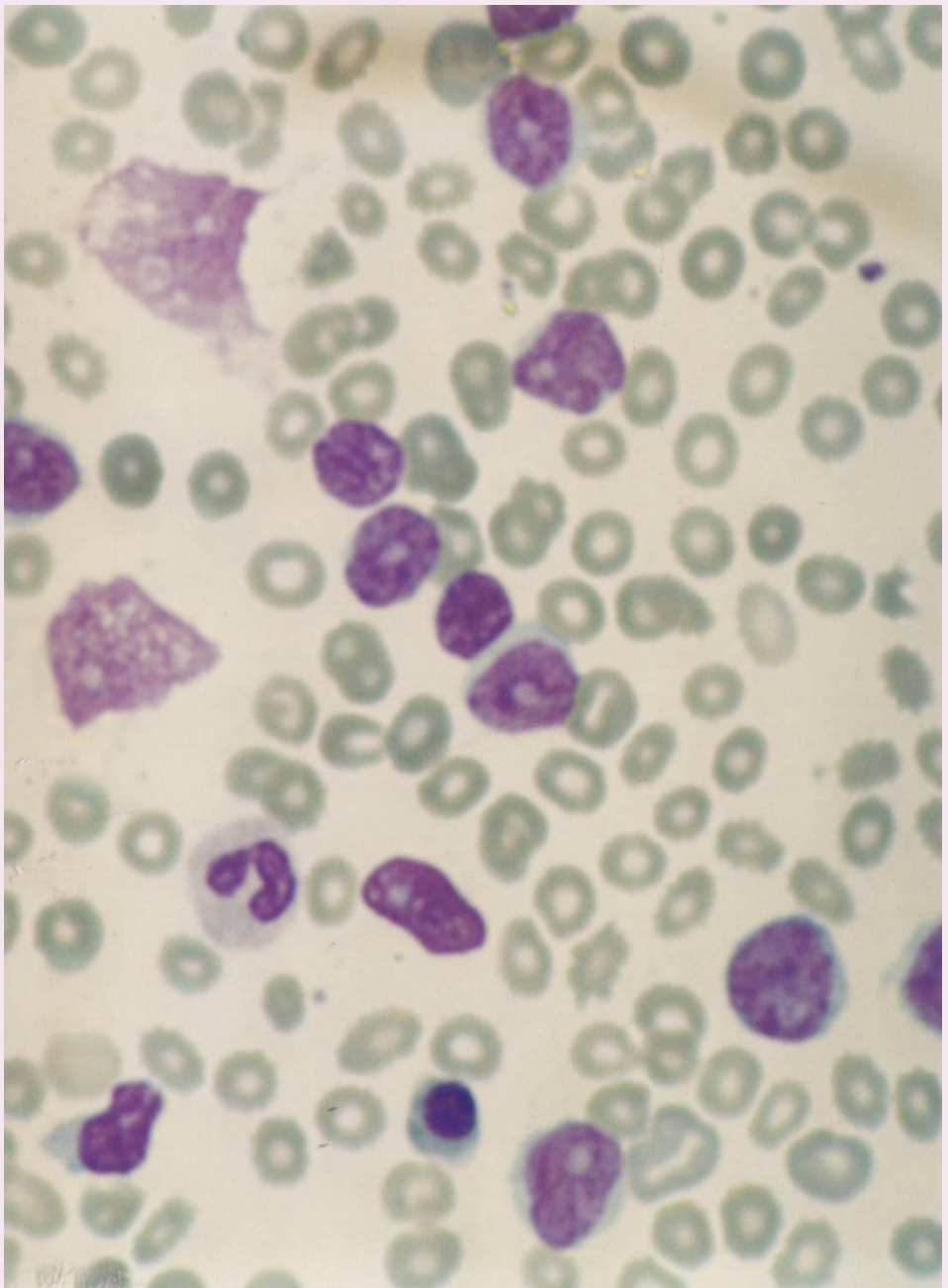


PBS of a patient with Dx of CLL, What do you do for diff. count?

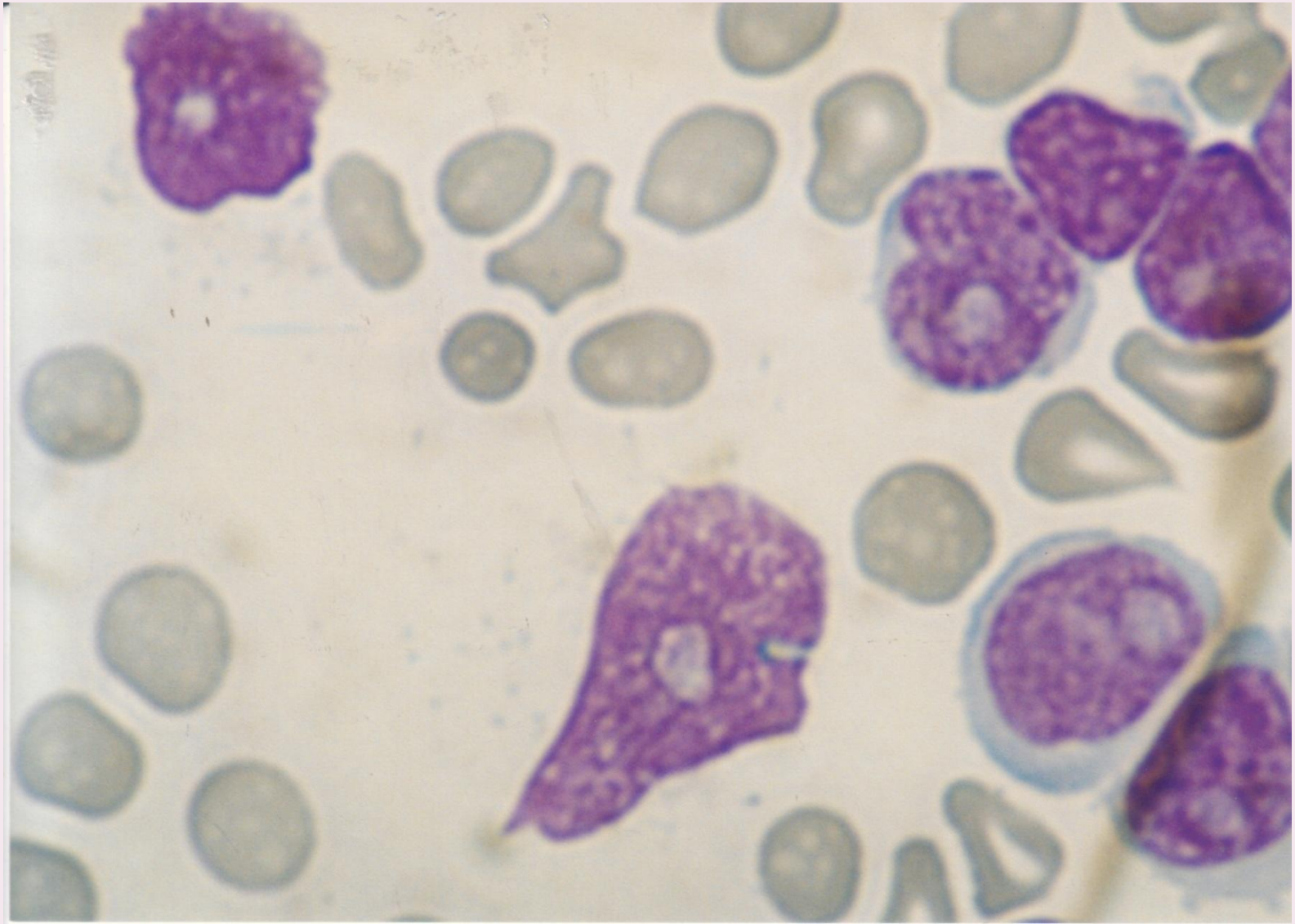


What are your diagnosis for these two films?





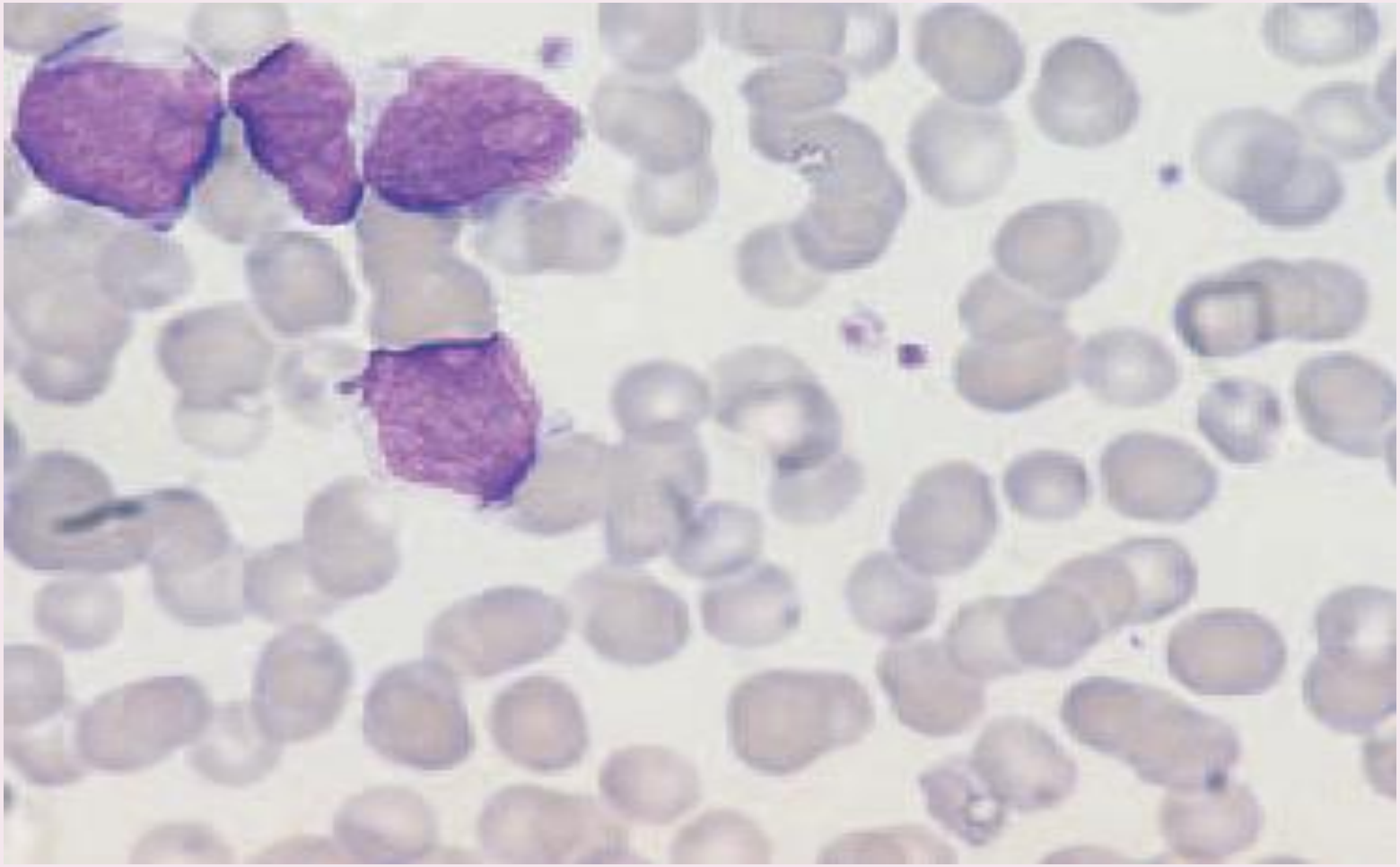
Higher magnification of previous film



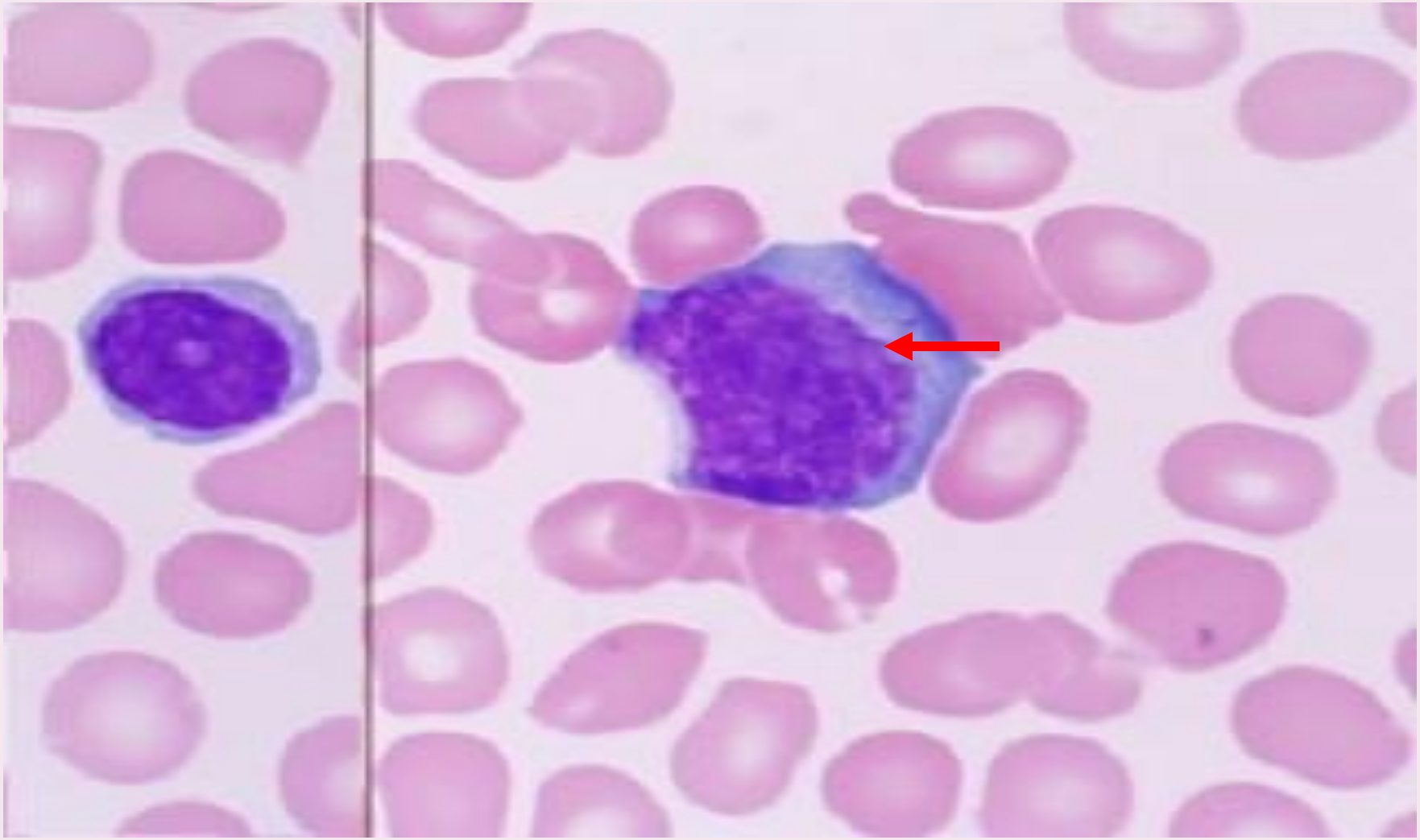
Proplatelets



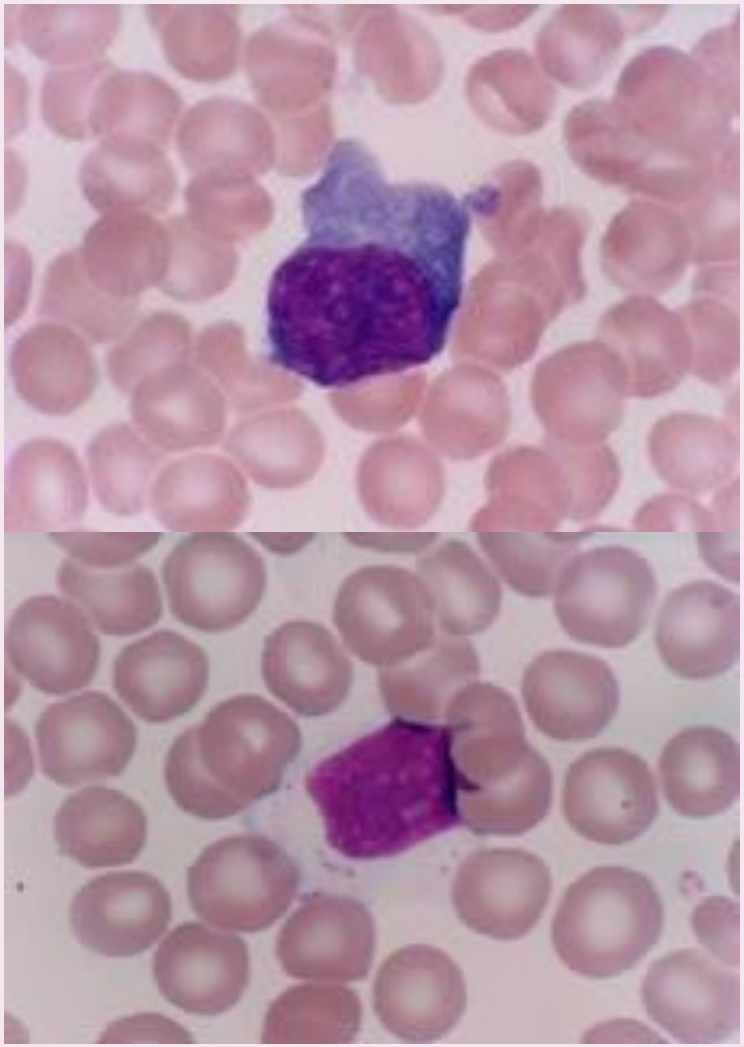
What do you see in PBS?

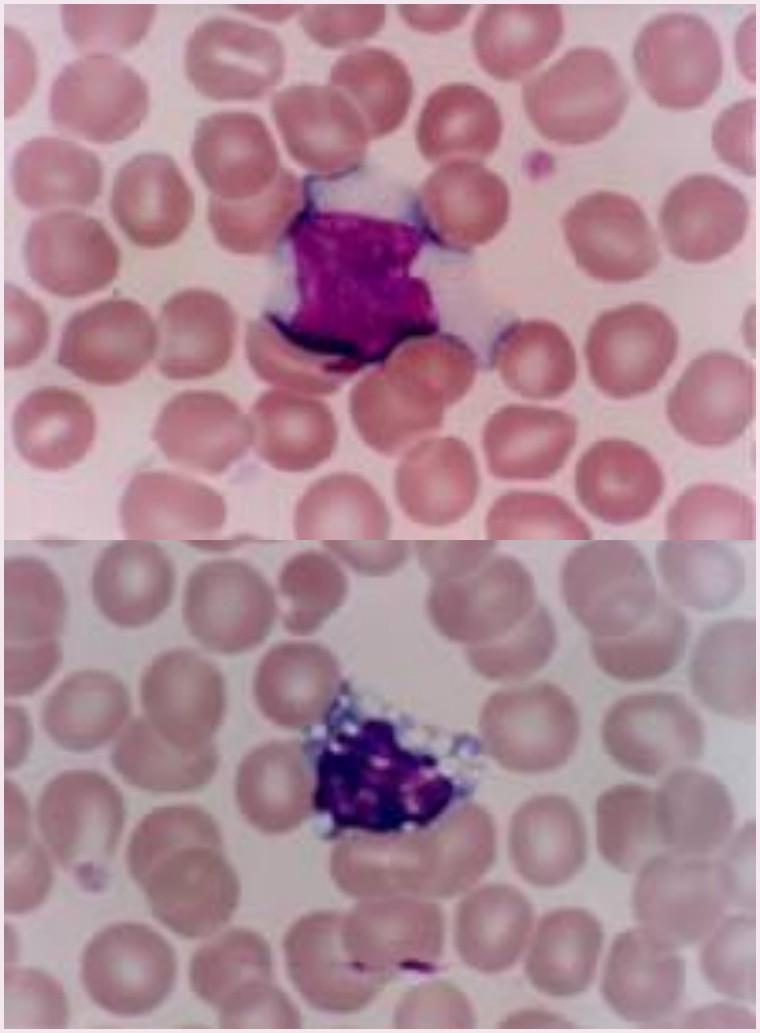


Lymphocytes, Variant Forms

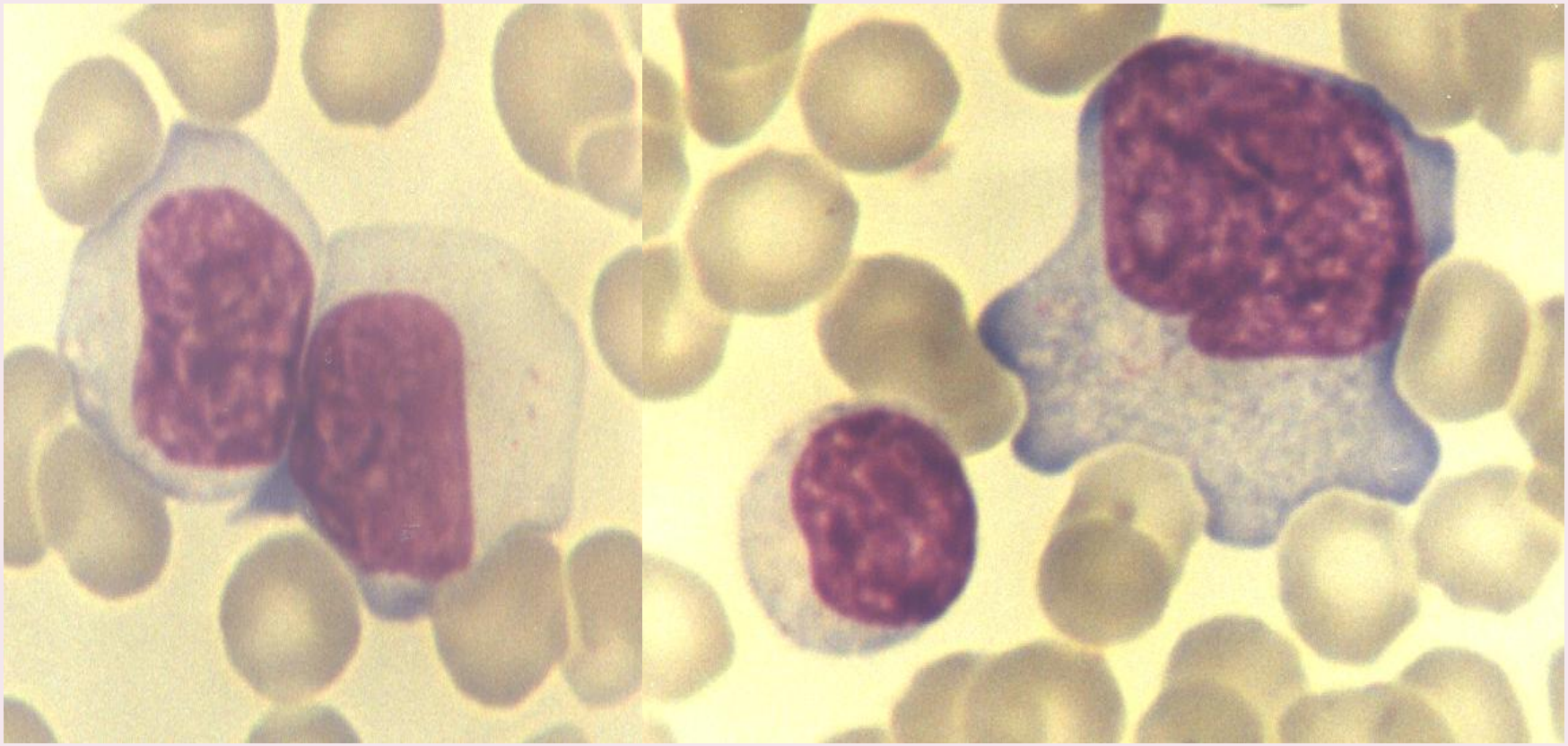


Lymphocytes, Variant Forms

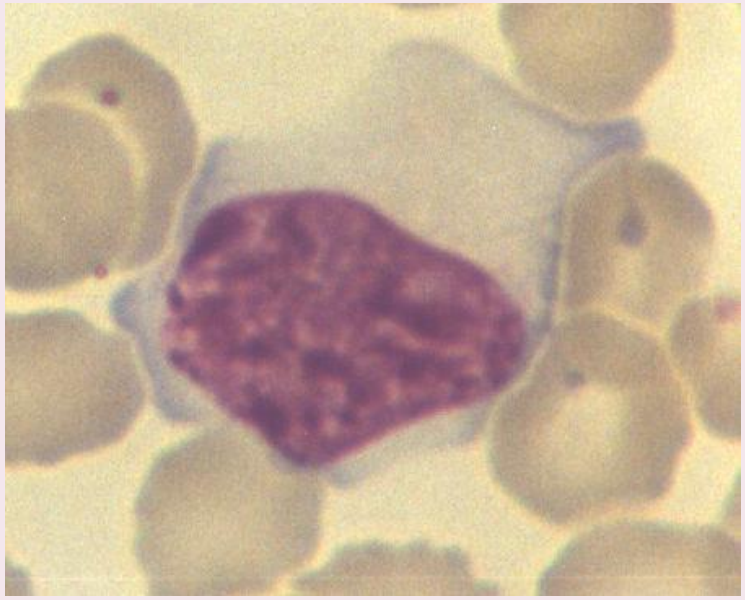


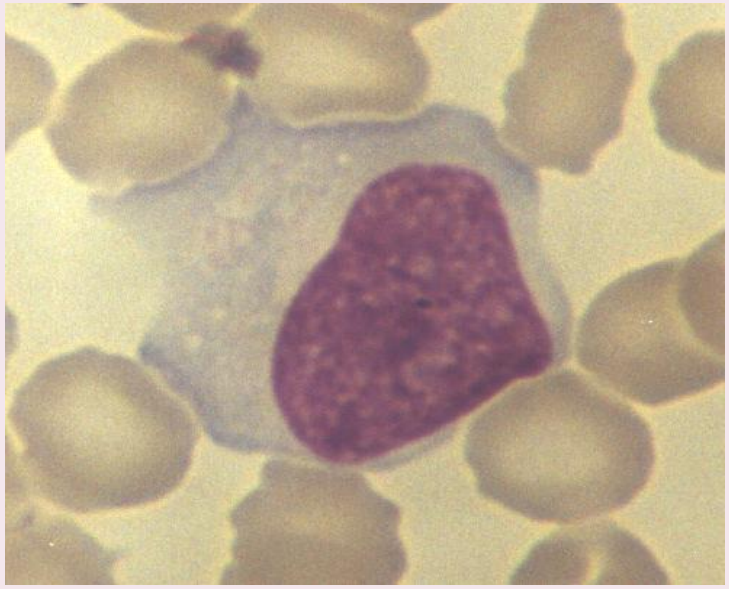


Lymphocytes, Variant Forms

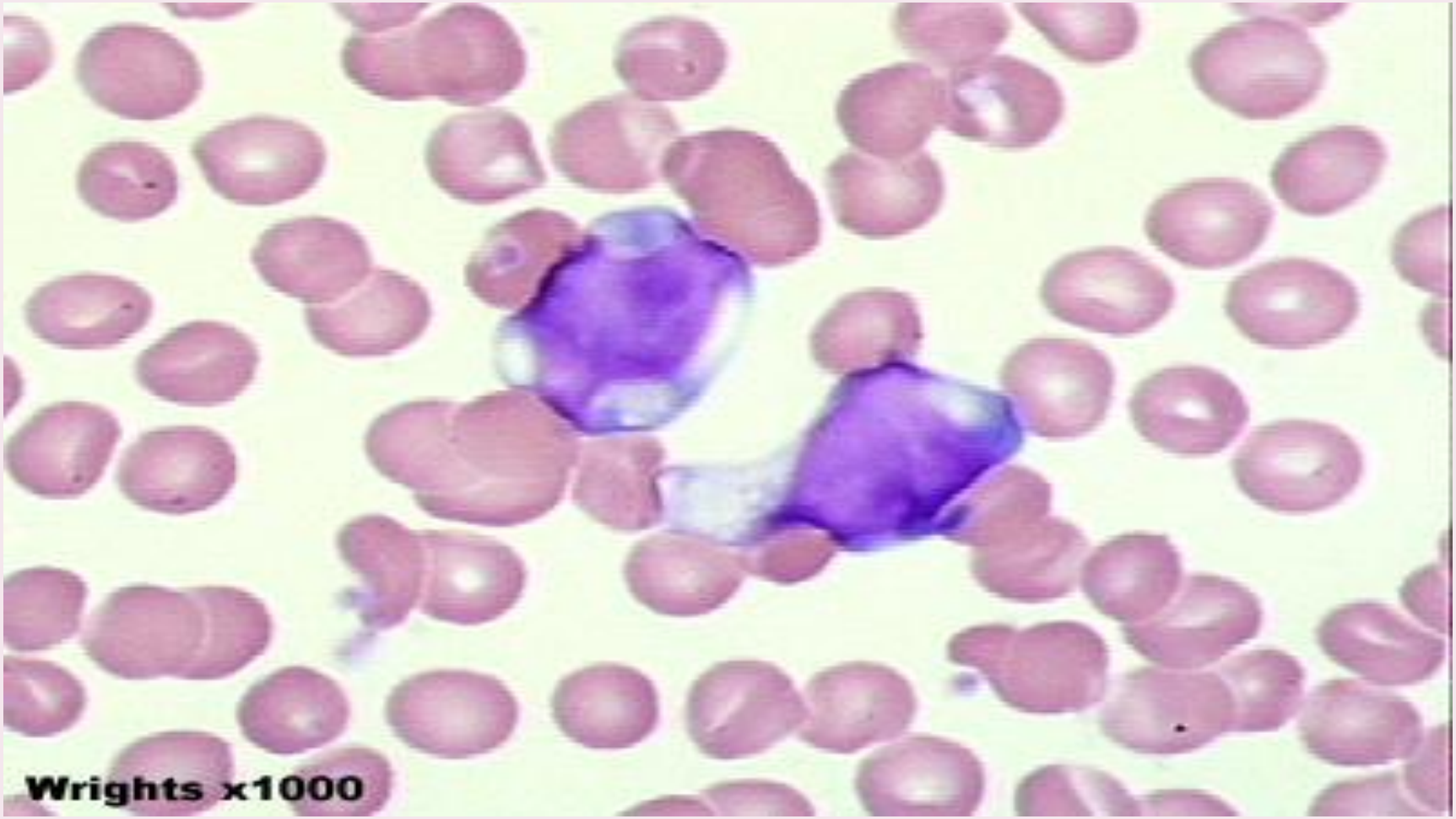


Lymphocytes, Variant Forms





Lymphocytes, Variant Forms



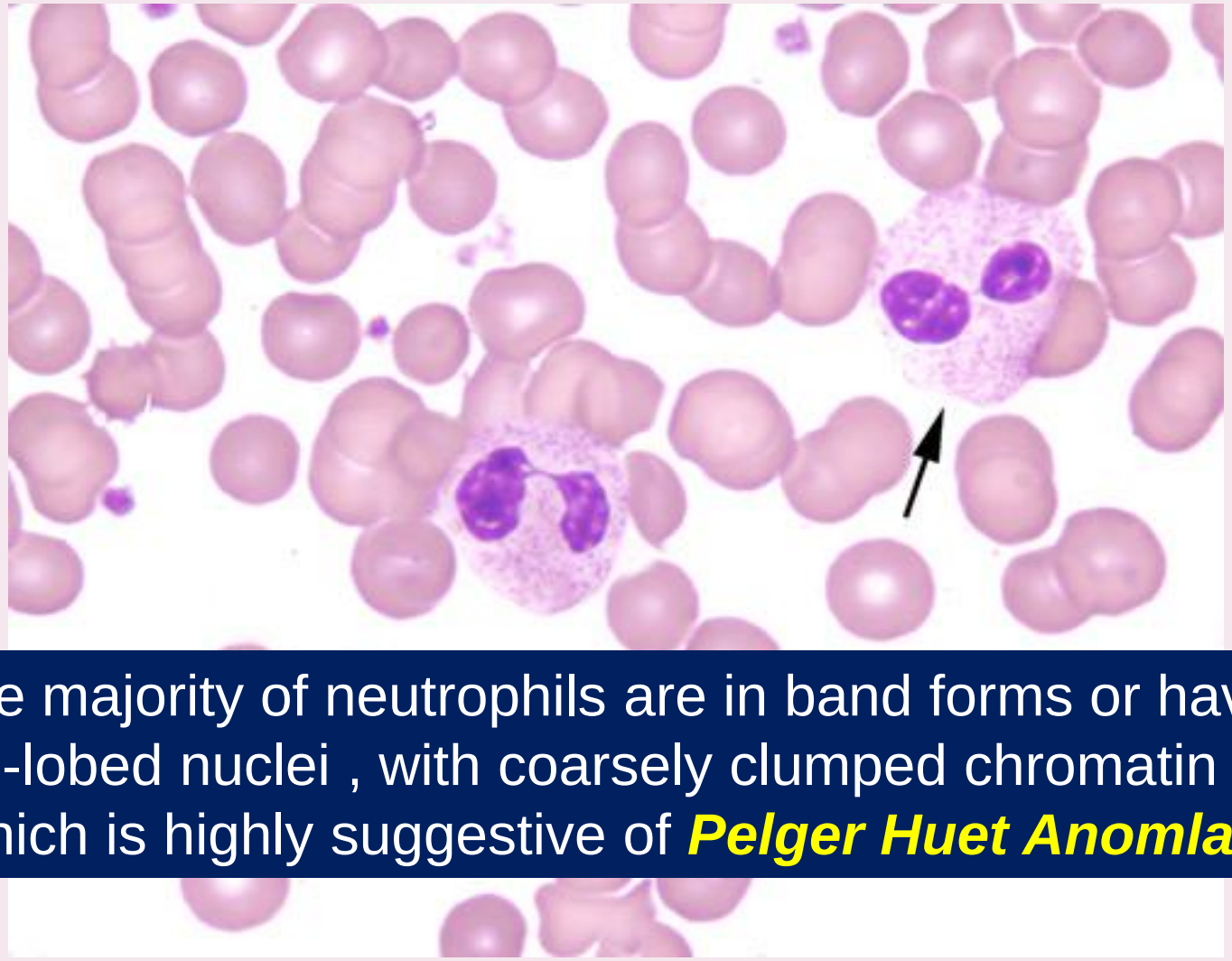
منوسیت تیپیک با سیتوپلاسم آبی-خاکستری و نامنظمی در هسته



منوسیت تیپیک با هسته پیچ خورده و واکوئلهای سیتوپلاسمی



What is your diagnosis? How do you report?

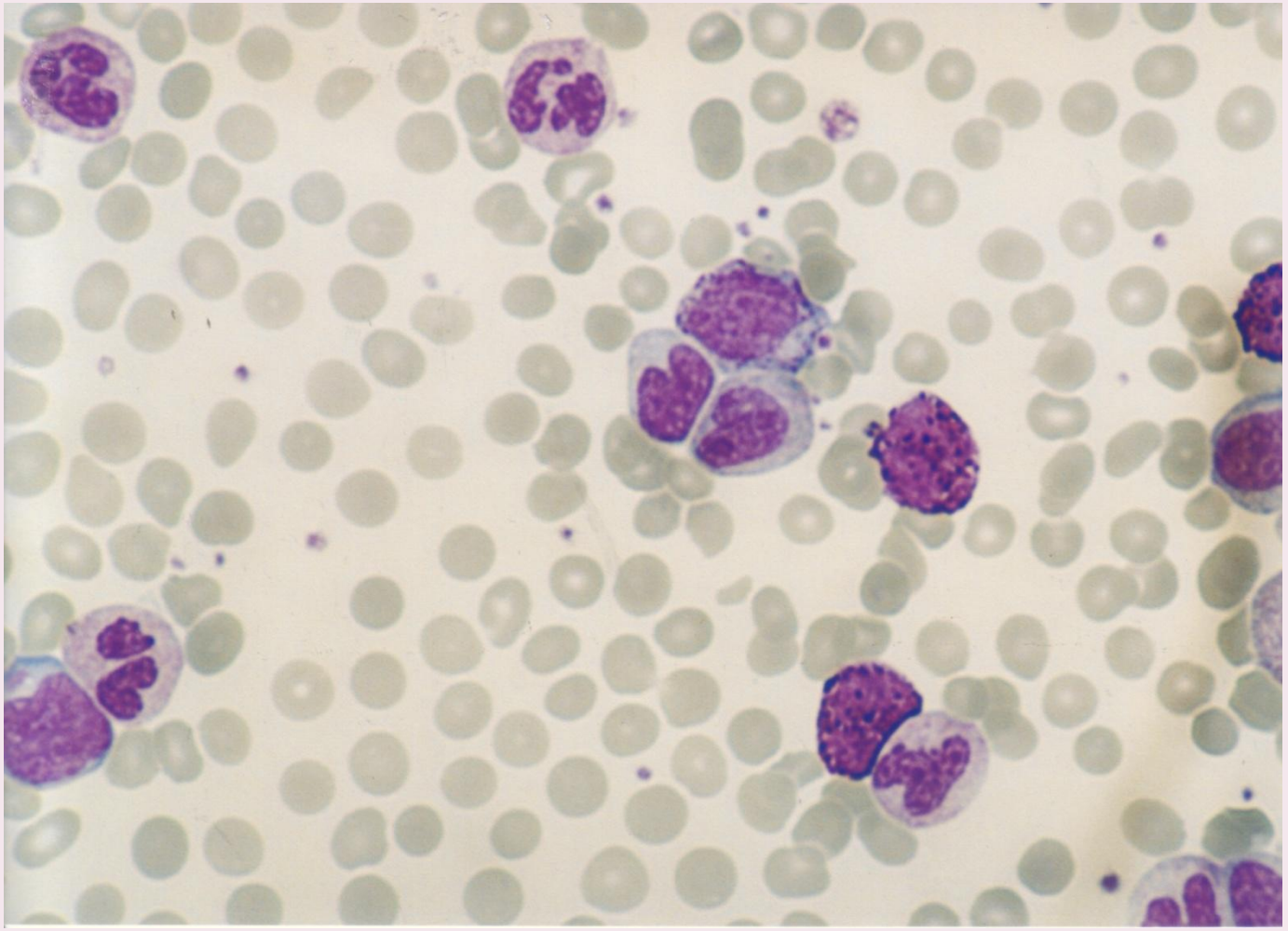


The majority of neutrophils are in band forms or have bi-lobed nuclei , with coarsely clumped chromatin , which is highly suggestive of ***Pelger Huet Anomlay***

Peripheral blood film of a patient with M5 AML. Despite only a slight reduction of the ‘platelet’ count the patient had major bleeding. Inspection of the film showed that there were ***many fragments of cytoplasm*** derived from leukaemic cells that were of similar size to platelets and accounted for an erroneous platelet count.



CML – Accelerated Phase

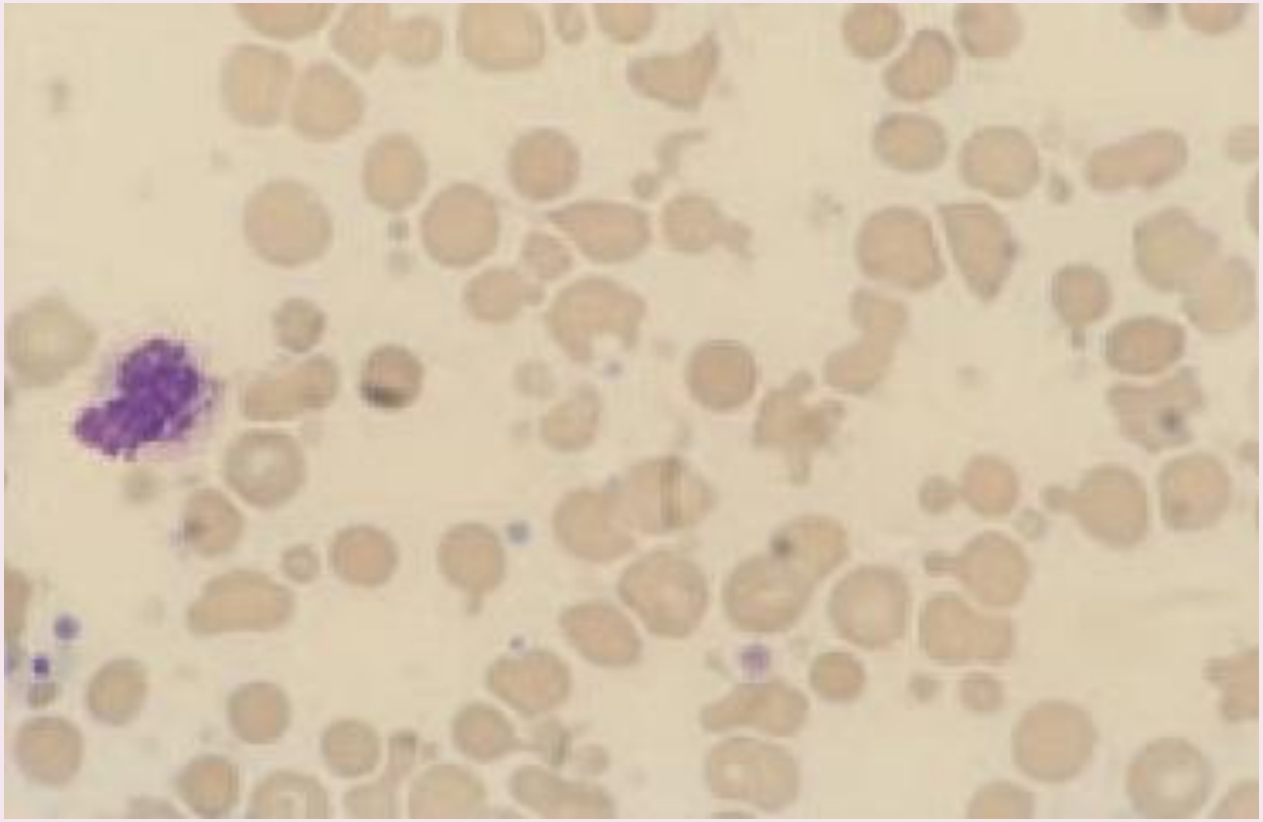


What is your interpretation?



Peripheral blood film showing storage artefact *a crenation (echinocytosis), a disintegrated cell* and a **neutrophil** with a **rounded pyknotic nucleus**.

What is your interpretation?



Peripheral blood film from a blood specimen that has been transported in a hot motor vehicle, showing red cell budding and fragmentation.

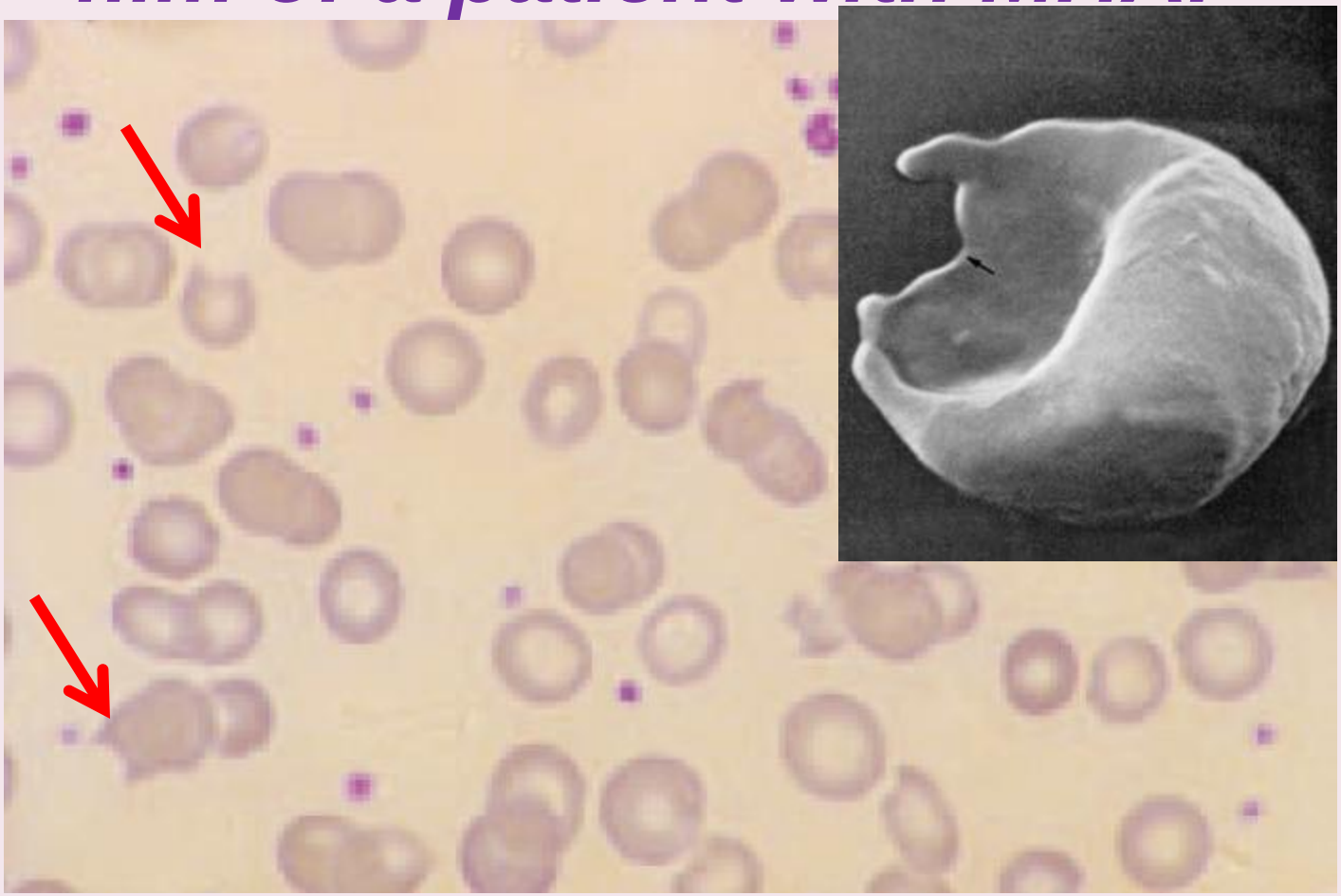
What is your interpretation?



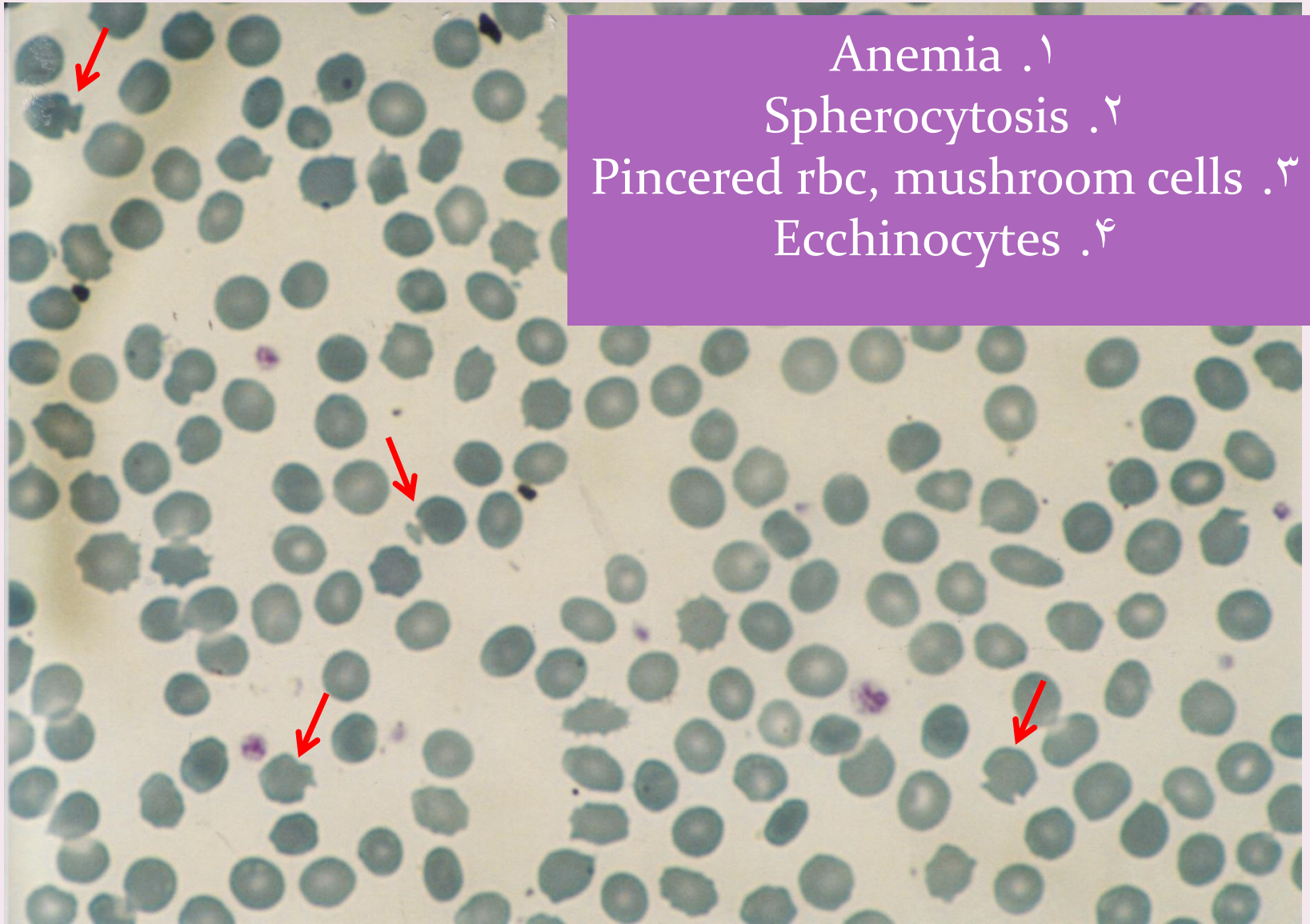
It is important not to confuse deformation of red cells due to a ***plasma abnormality*** with ***true poikilocytosis***. The presence of ***cryoglobulin*** can lead to remarkable deformation of red cells Because the cryoglobulin may be only ***weakly basophilic*** it may not be readily apparent. **The appearance of something extraneous indenting red cells provides a clue.**

What is your interpretation?

Keratocytes in the peripheral blood film of a patient with MHA.

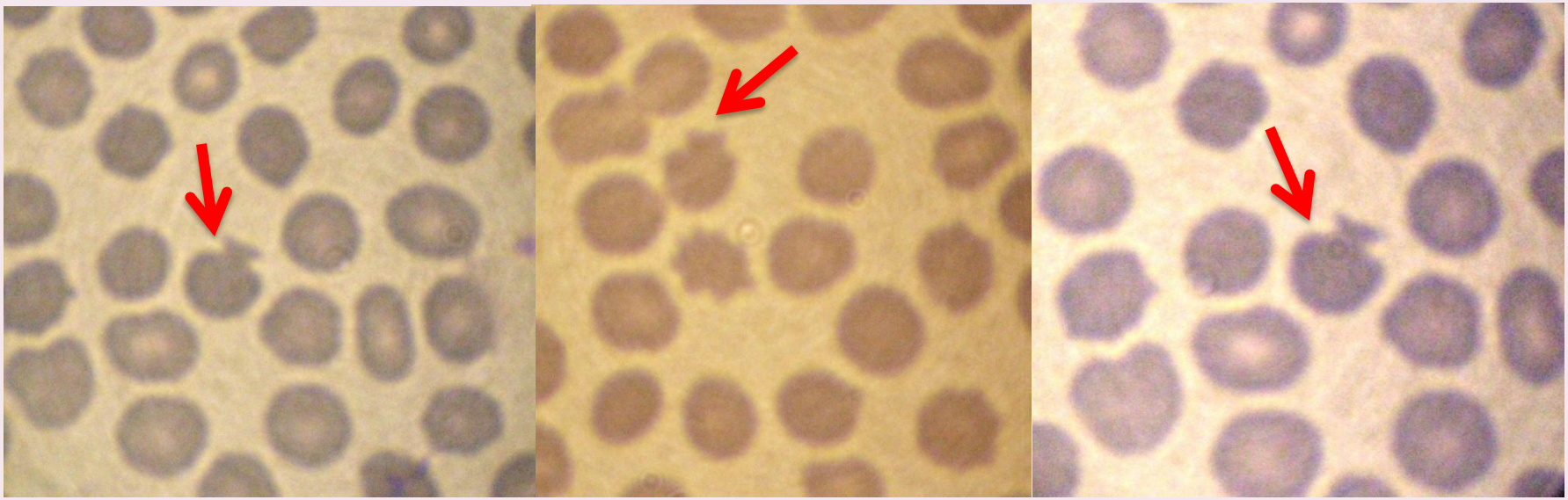


What is your idea about this film?

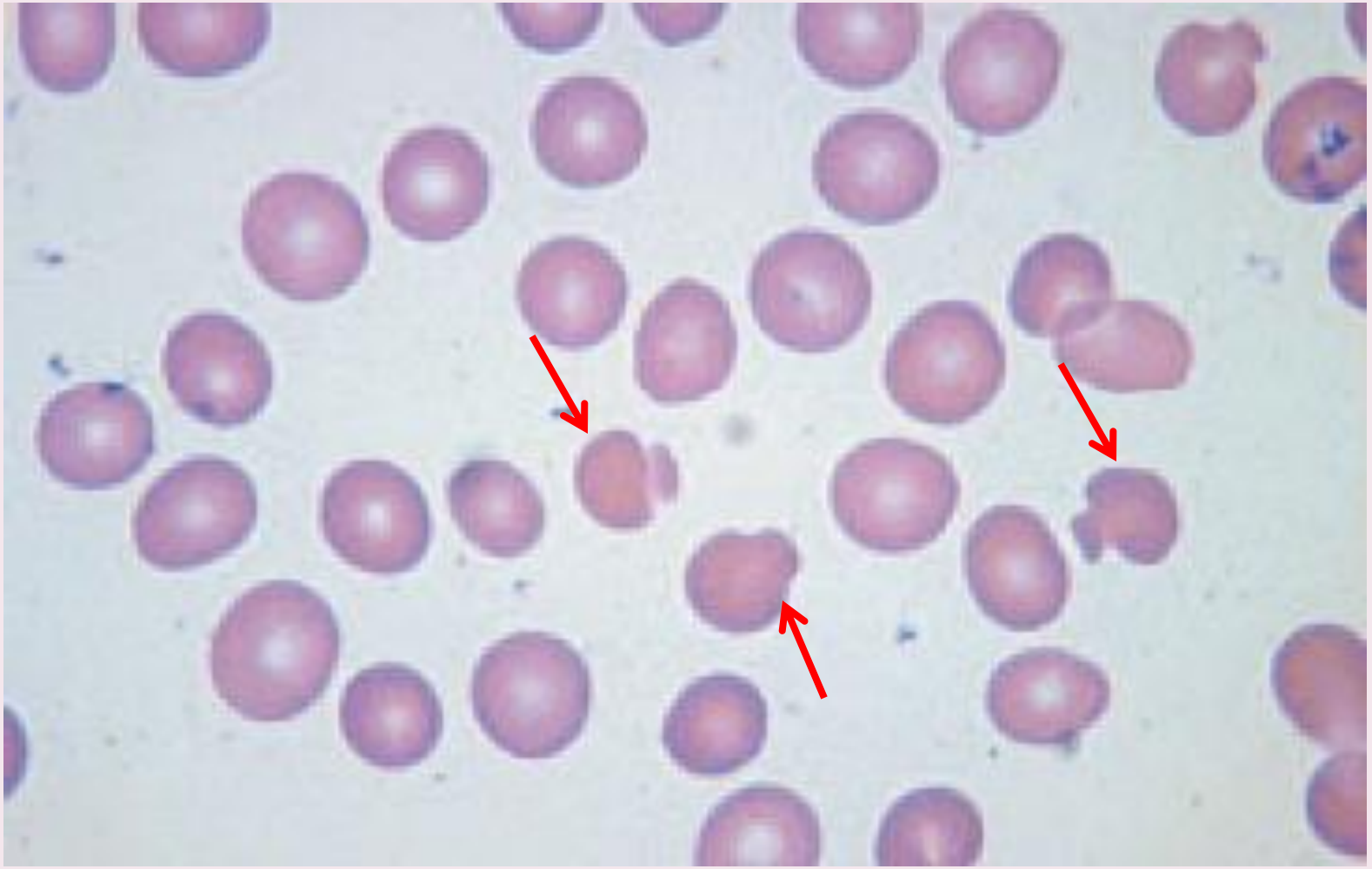


١. Anemia
٢. Spherocytosis
٣. Pincered rbc, mushroom cells
٤. Ecchinocytes

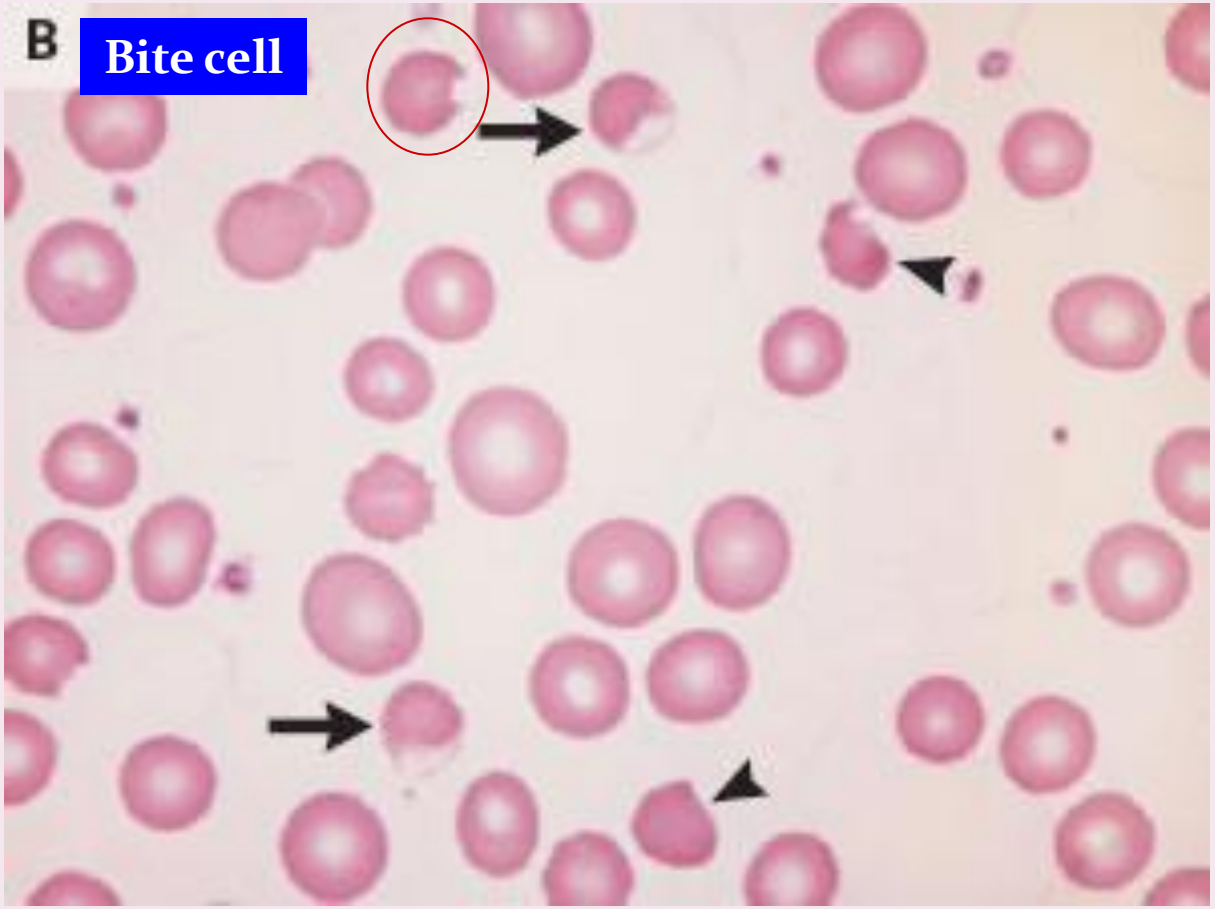
Pincered rbc, Hereditary Spherocytosis due to *Protein band 3 deficiency*



pincer or mushroom cells



Acute hemolysis in G6PD deficiency, with two “blister cells” (arrows), as well as polychromatic macrocytes and ***irregularly contracted cells*** (arrowheads).



Irregularly contracted rbc

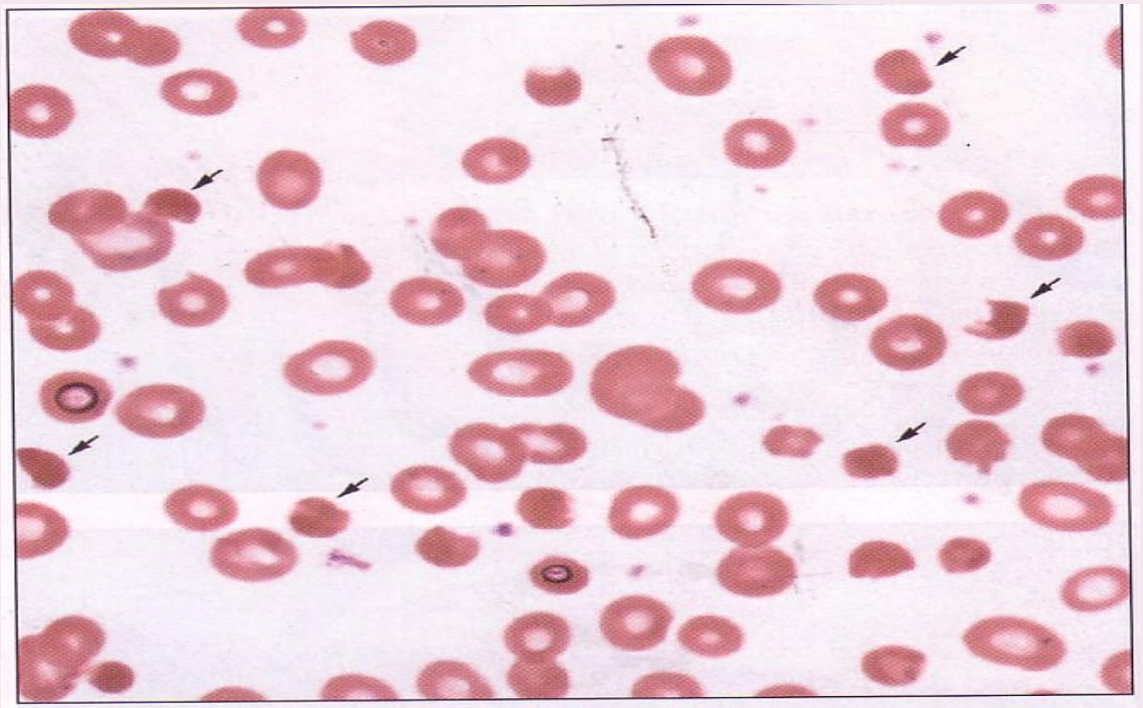
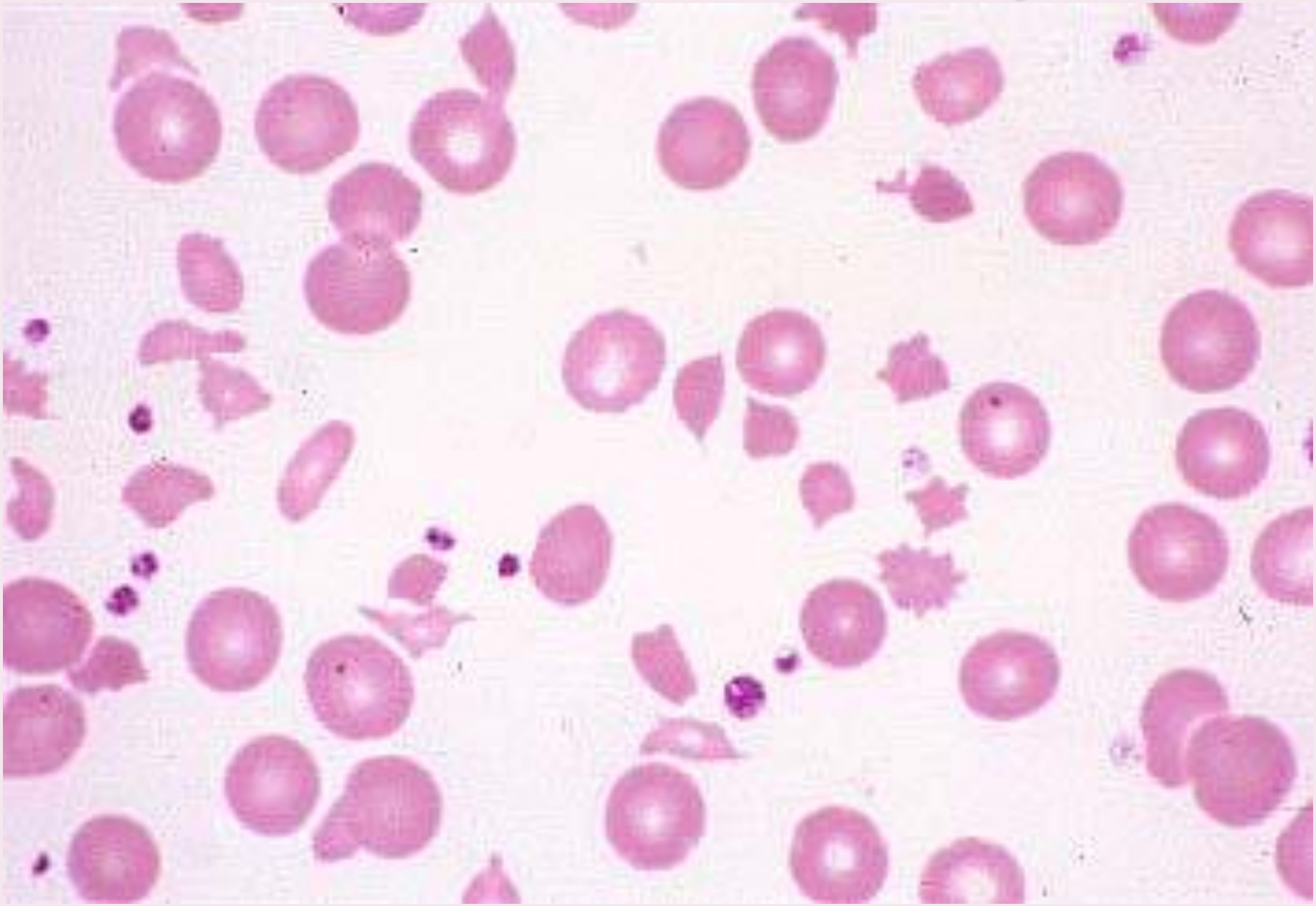


Figure 1.53 Oxidative hemolysis. Irregularly contracted cells are smaller than normocytic red blood cells in this blood film from a case of oxidative hemolysis. They do not have central pallor but, in contrast to spherocytes, they are irregular in shape and not spherical. The increased density of the irregularly contracted cells may give the hemoglobin a dark copper color. Occasional bite cells are present.

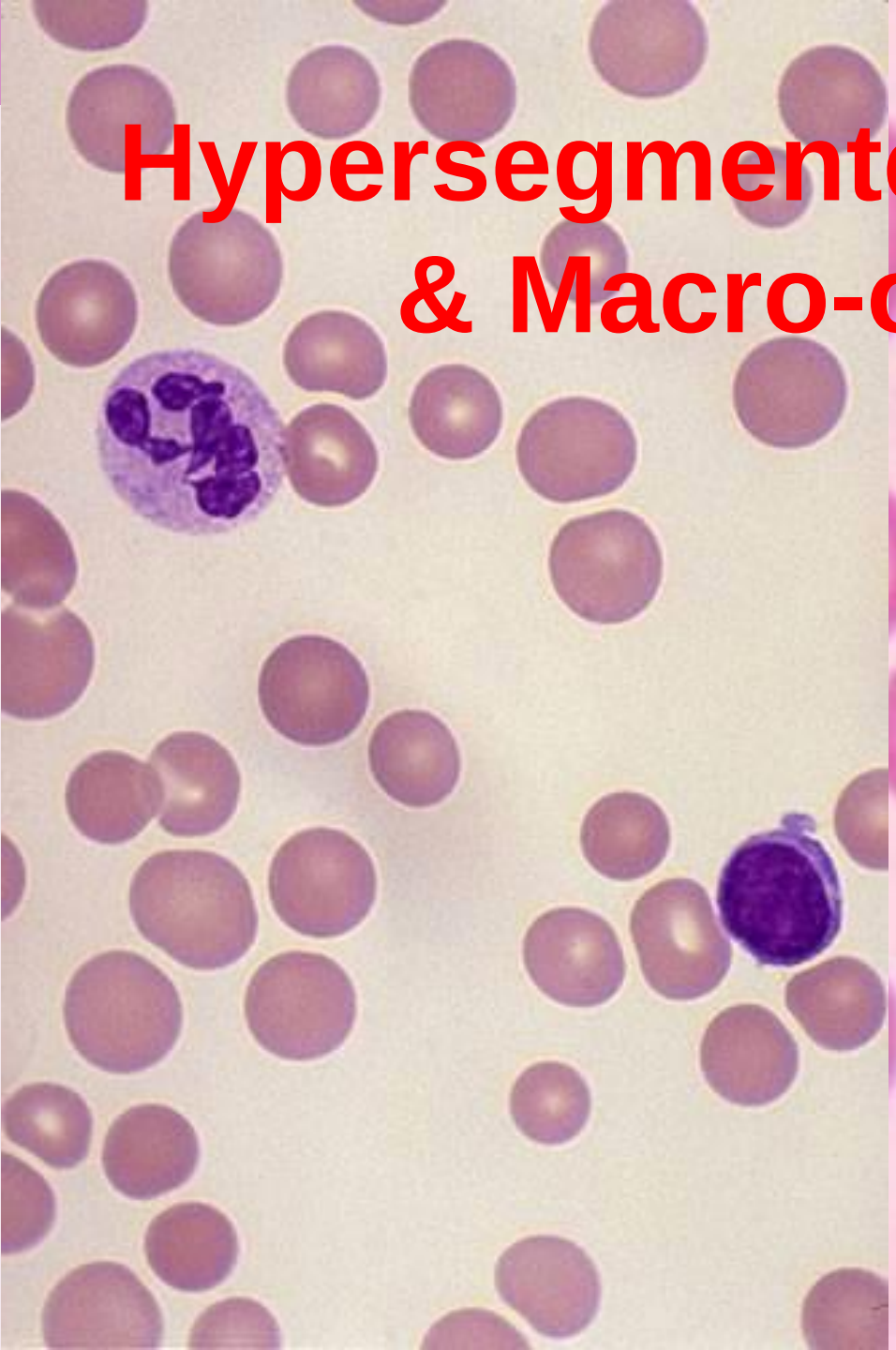
Sickle Cells

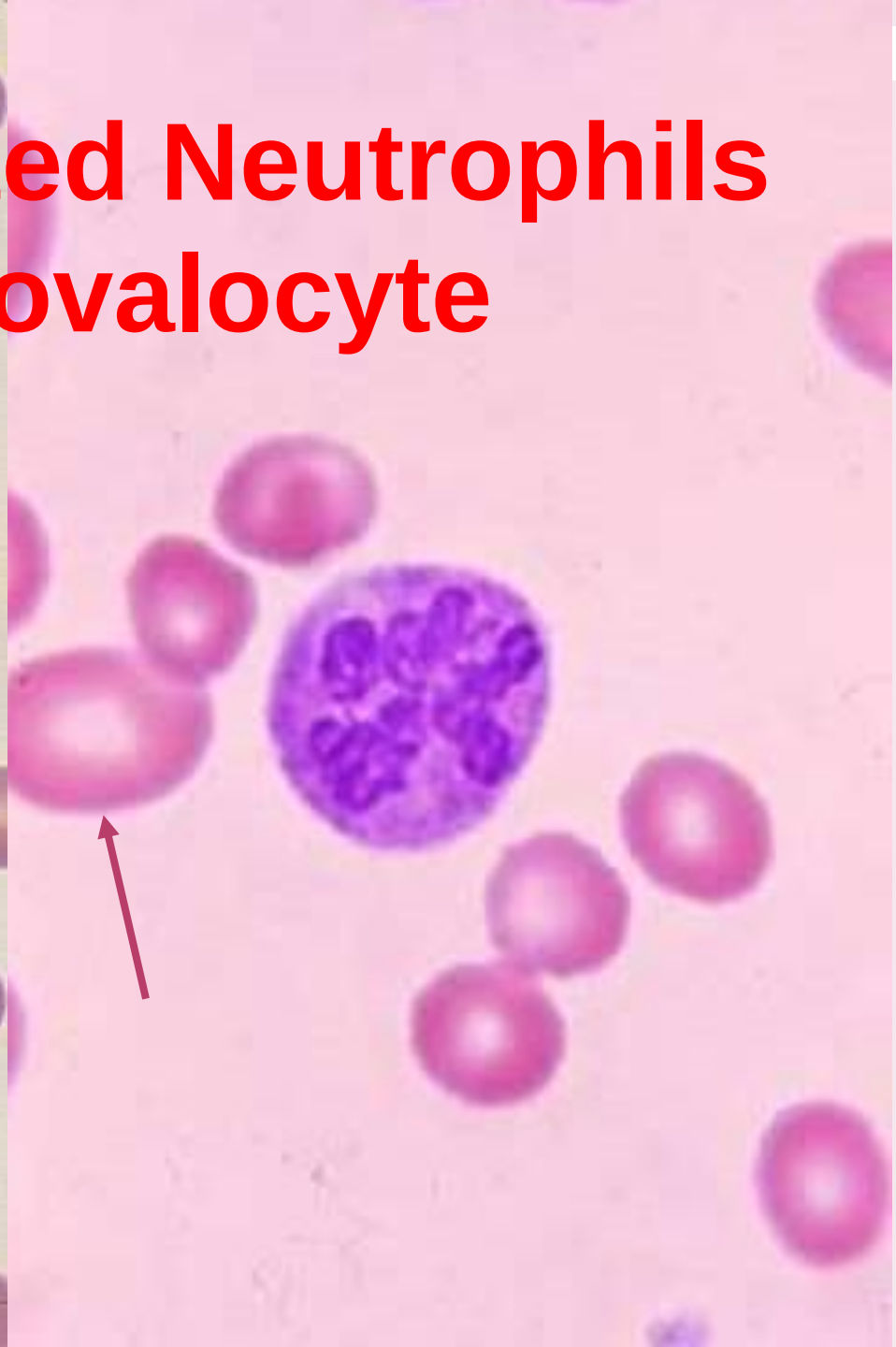


Mechanical Trauma - Schistocytes

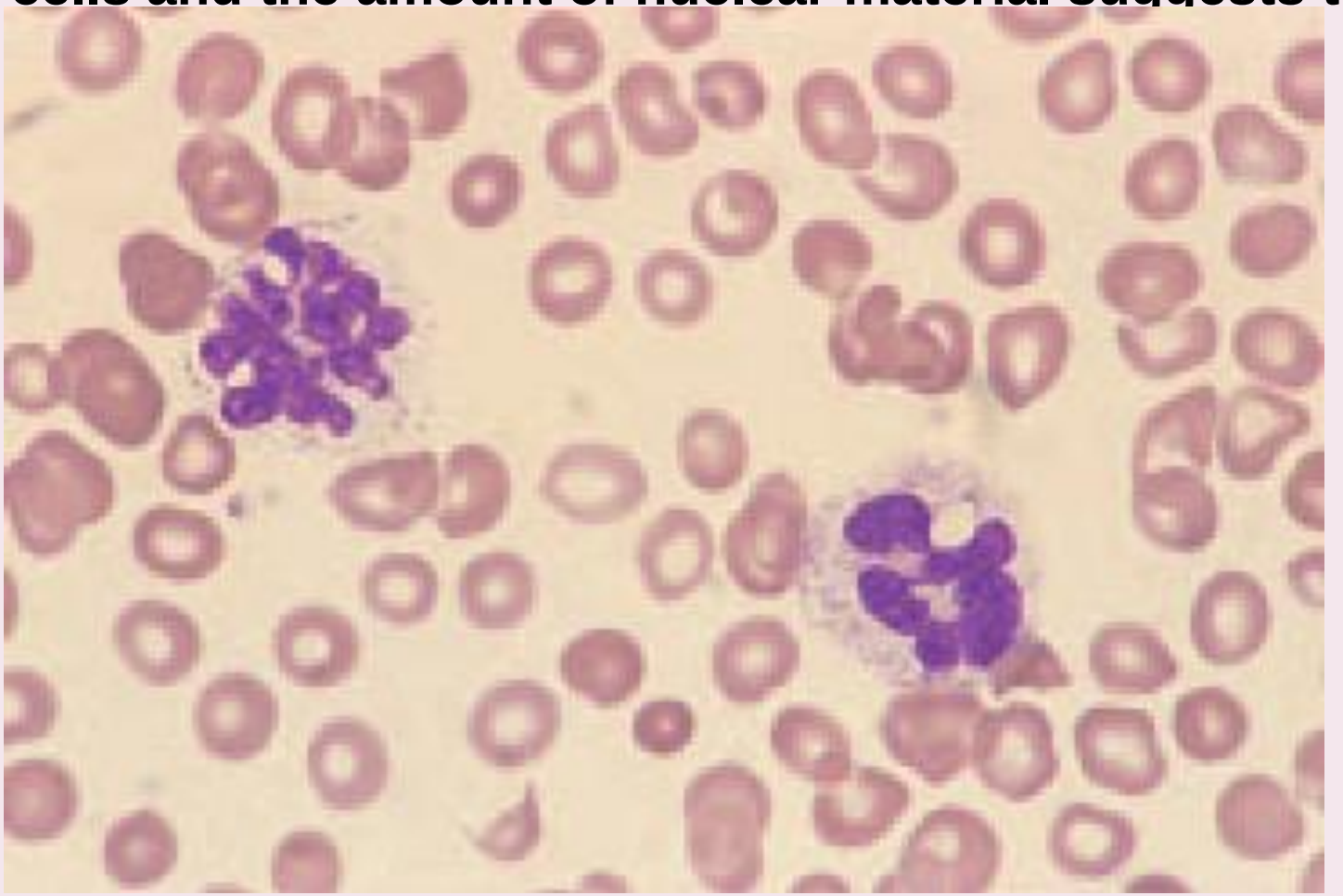


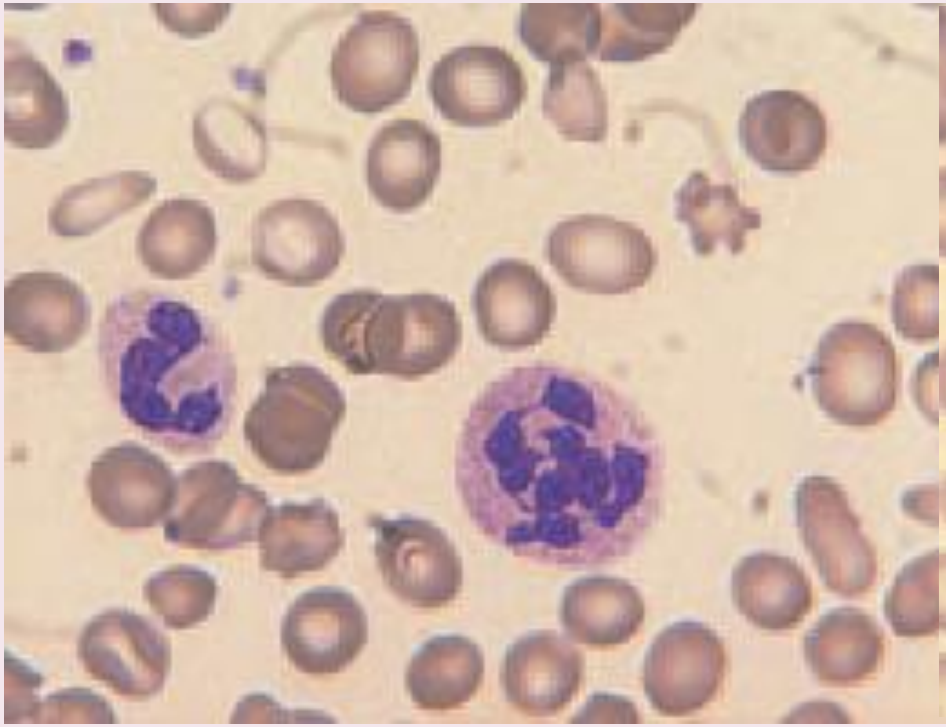
Hypersegmented Neutrophils & Macro-ovalocyte



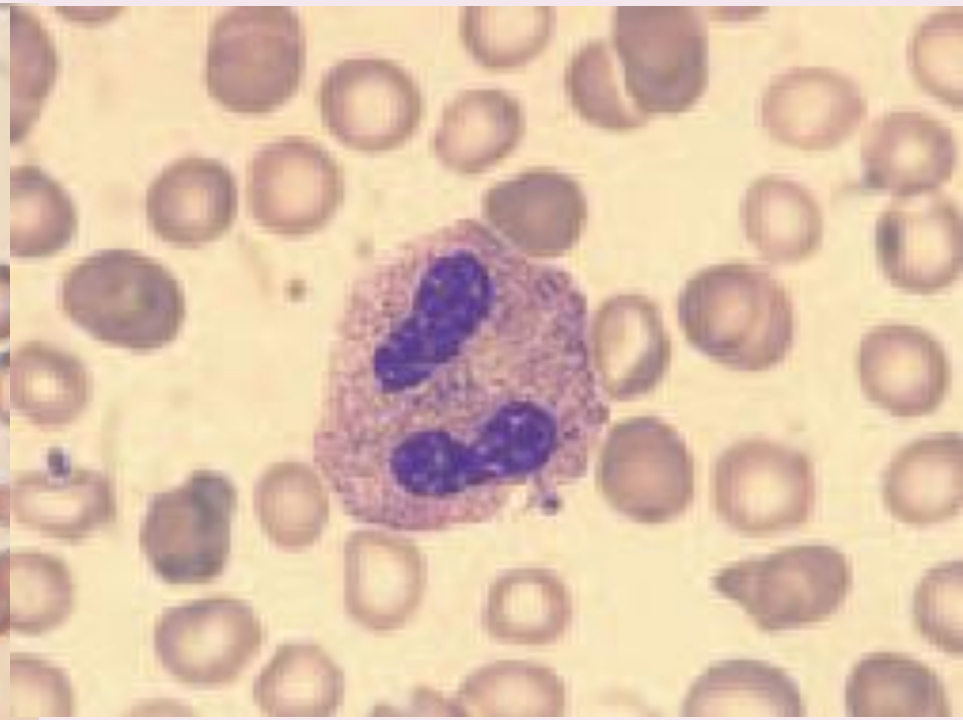


Peripheral blood film of a patient with a MDS showing two neutrophils. Both are macropolycytes and one shows a defect of nuclear segmentation resembling myelokathexis. The size of the cells and the amount of nuclear material suggests that



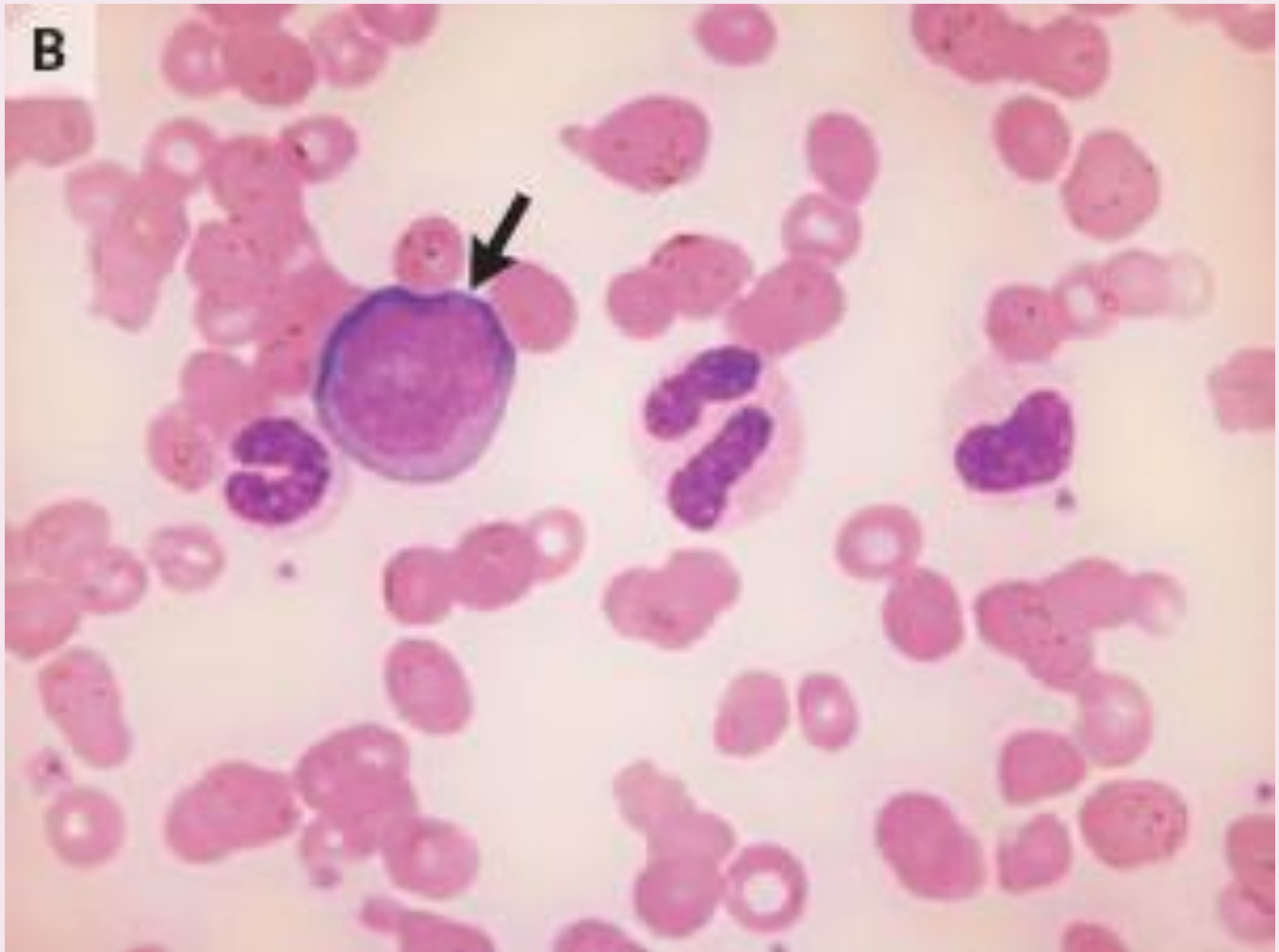


Peripheral blood film of a patient with a MDS showing a ***macropolycyte***, which is twice the size of the adjacent normal, neutrophil. The nucleus is also twice normal size and shows increased nuclear segmentation; it is likely that this is a tetraploid cell. In addition the film shows anisochromasia.



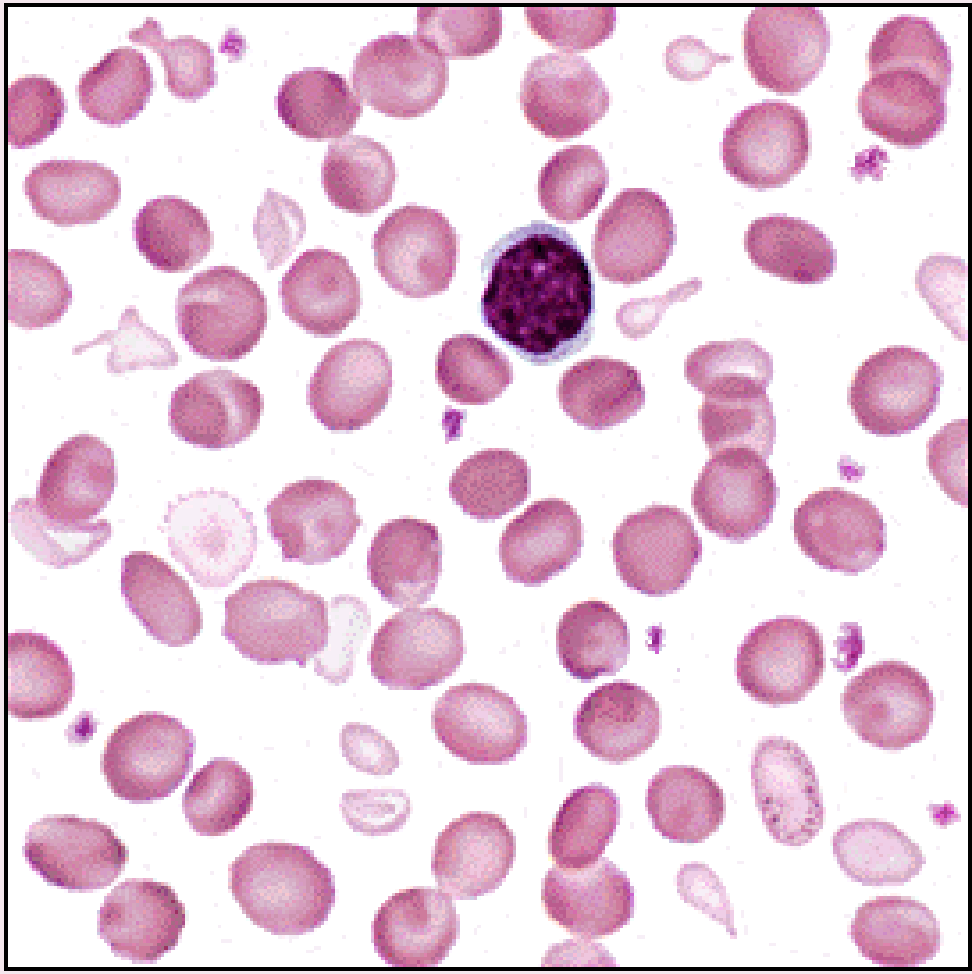
Peripheral blood film of a patient with CLL and reversible chlorambucil-induced myelodysplasia showing a binucleated tetraploid neutrophil.

shows ***MDS***, with a blast cell (arrow) and two neutrophils that have hypolobulated nuclei, one of which is binucleated and the other hypogranular.

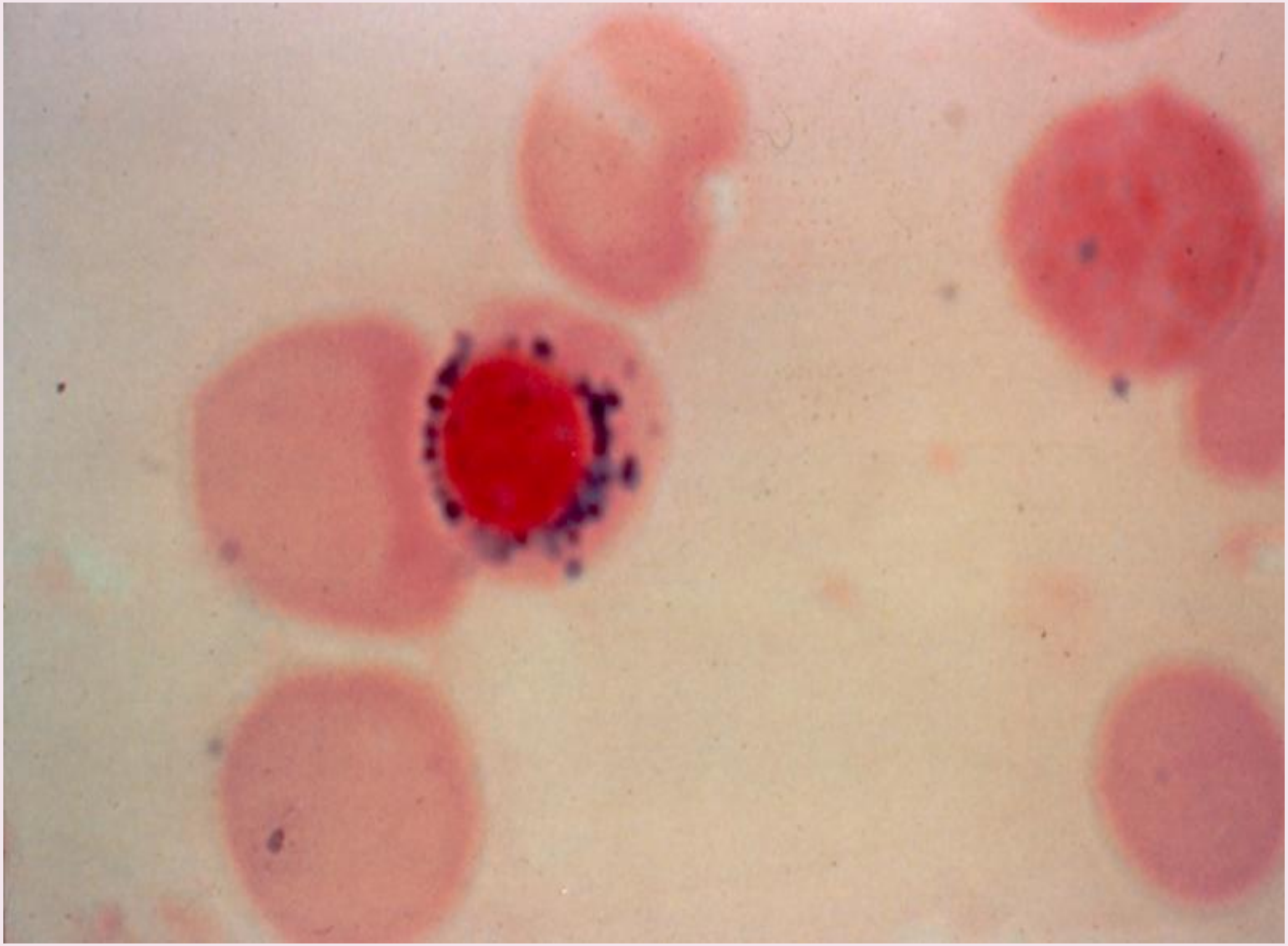


Sideroblastic Anemia

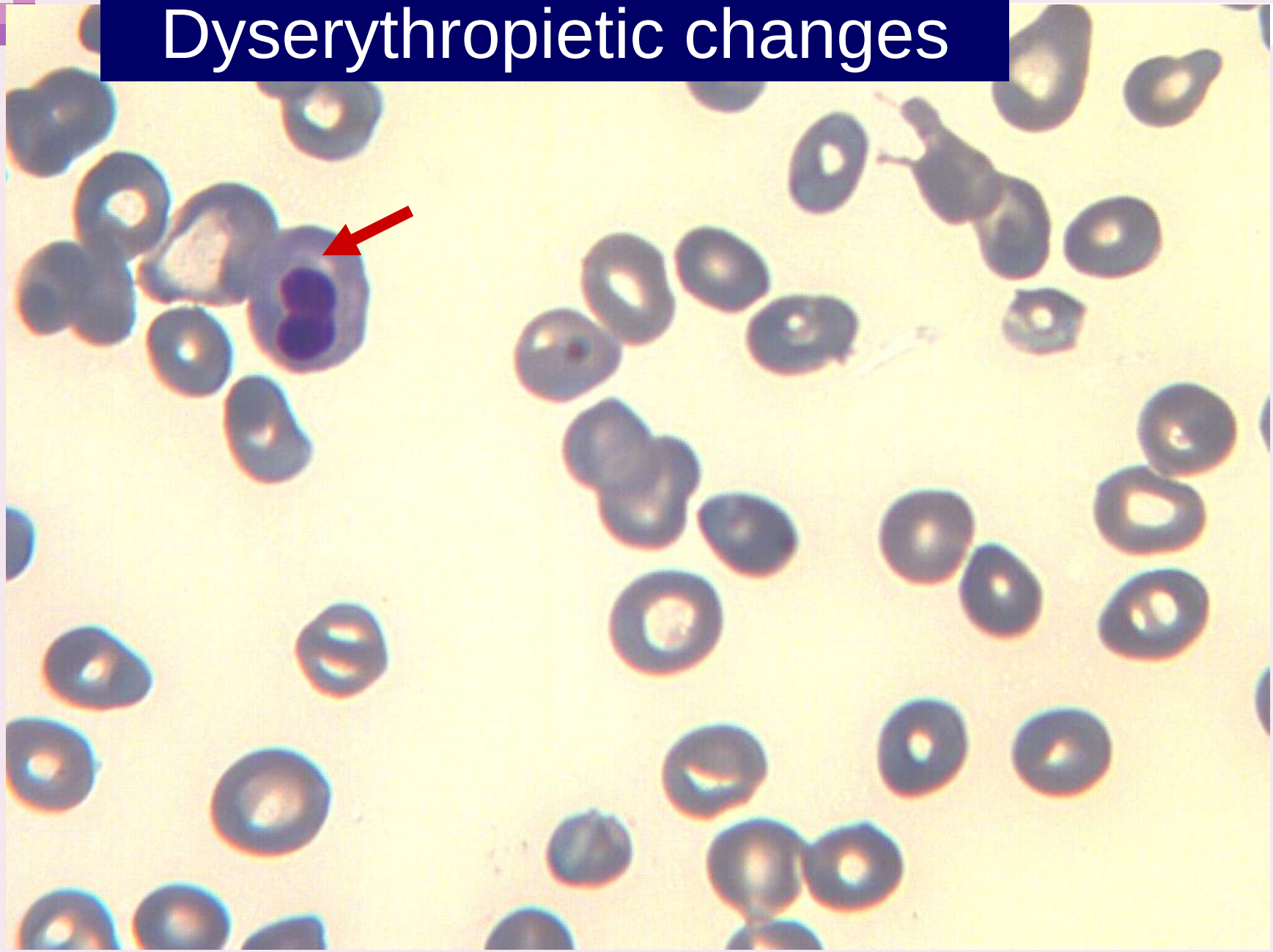
- SA characterized by hypochromic ,often microcytic rbc usually mixed with normochromic cells (dimorphism)



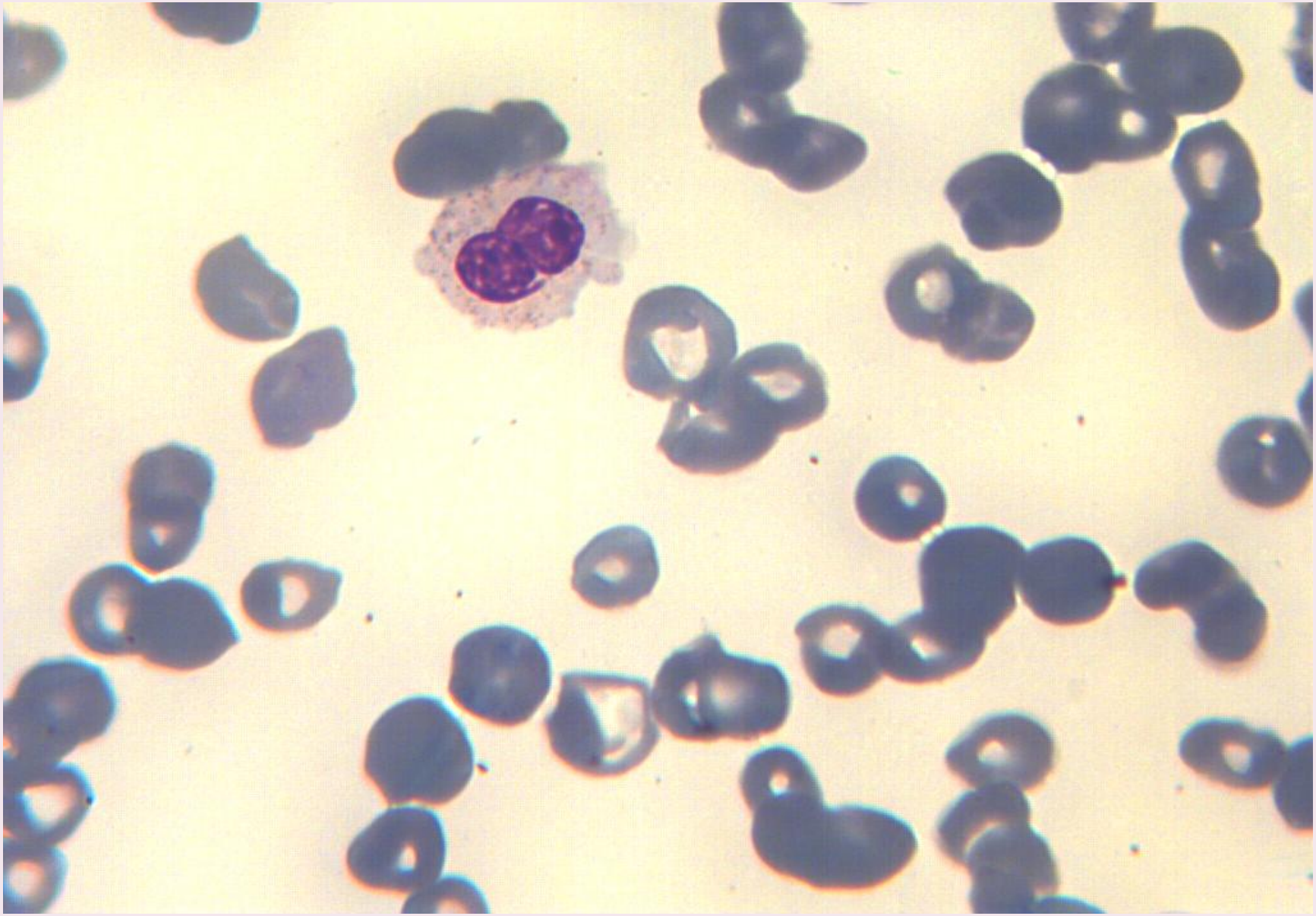
Ring(ed) Sideroblast



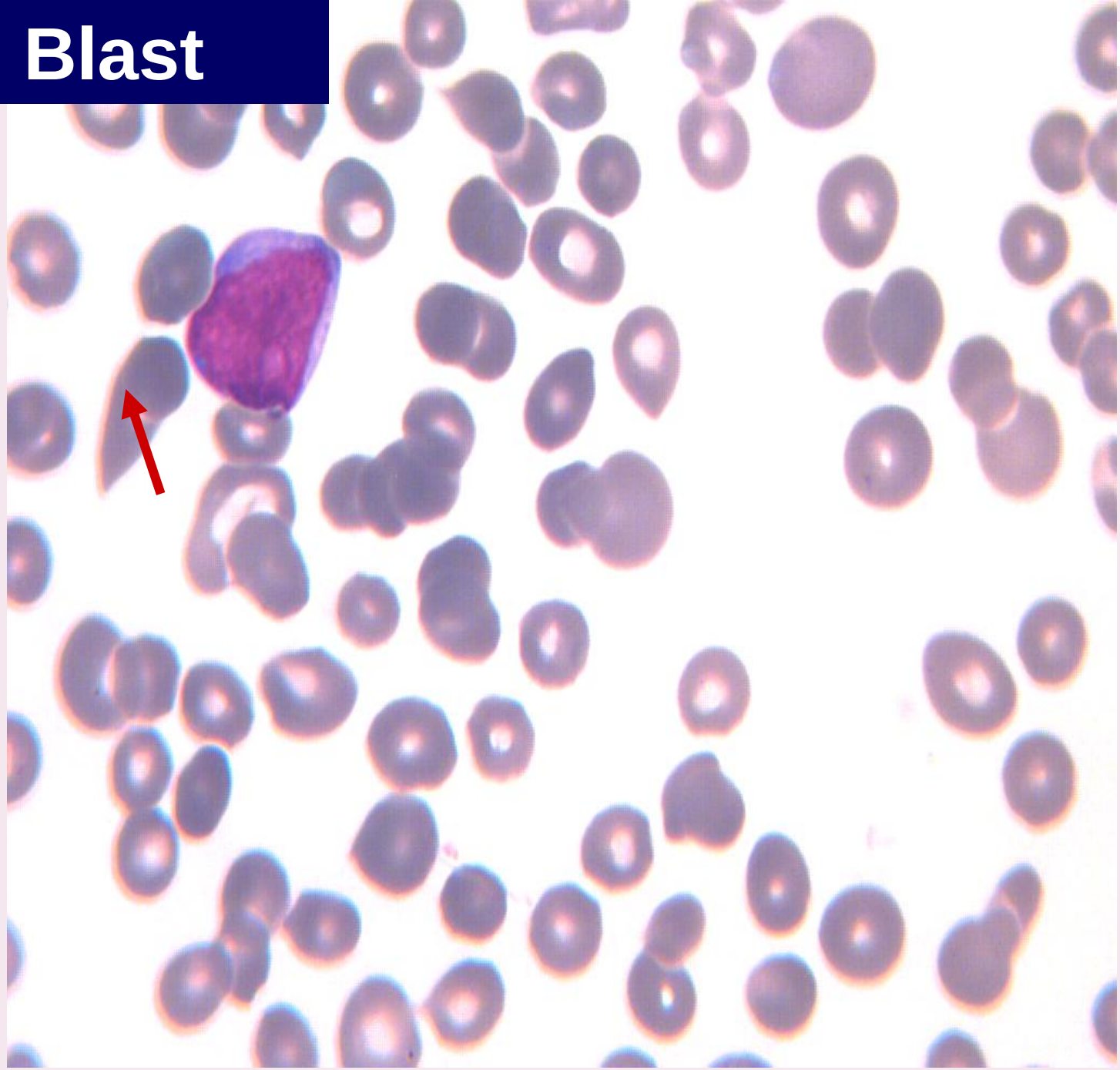
Dyserythropietic changes



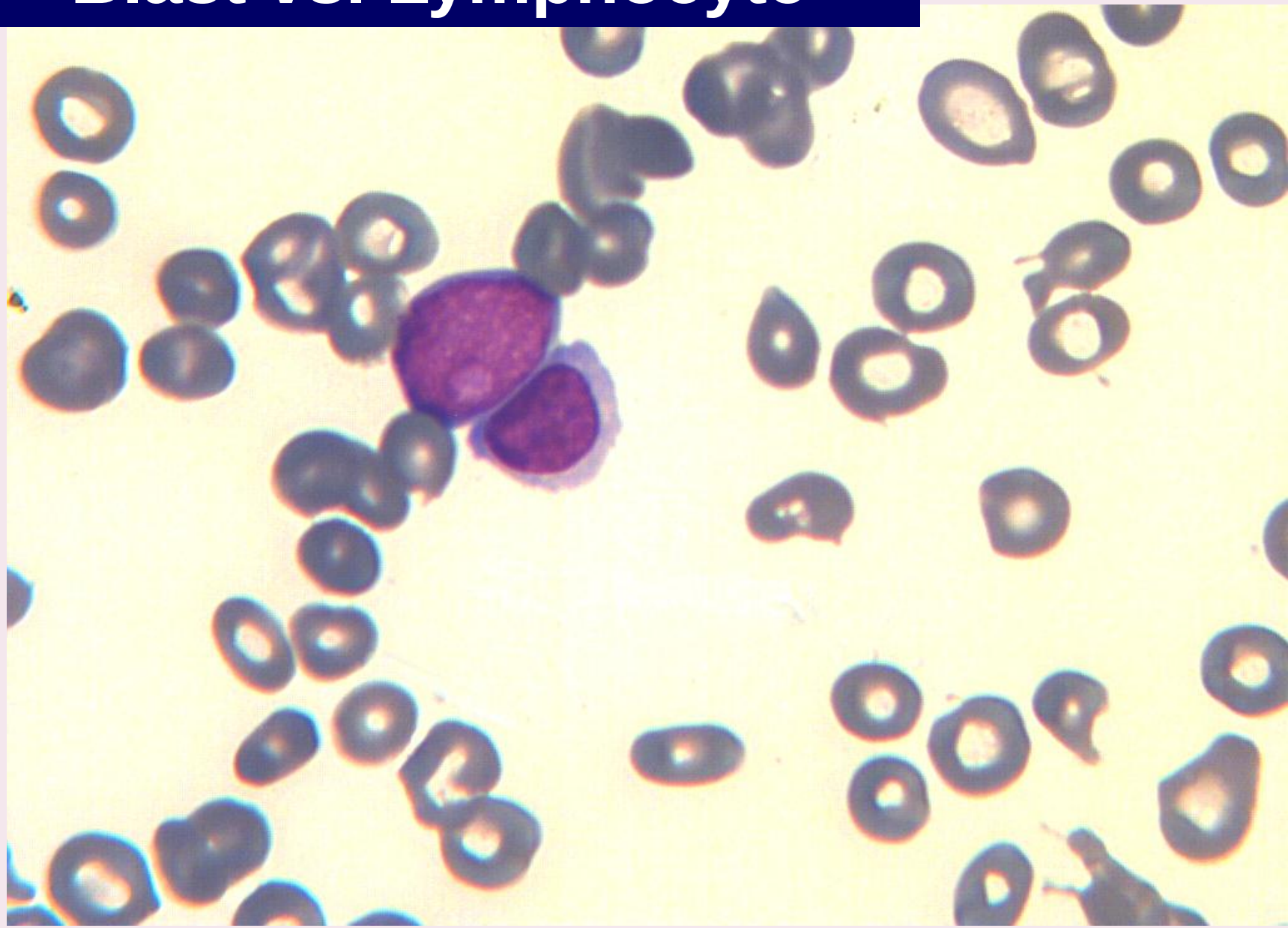
Hyposegmentation



Blast



Blast vs. Lymphocyte



Hypogranularity



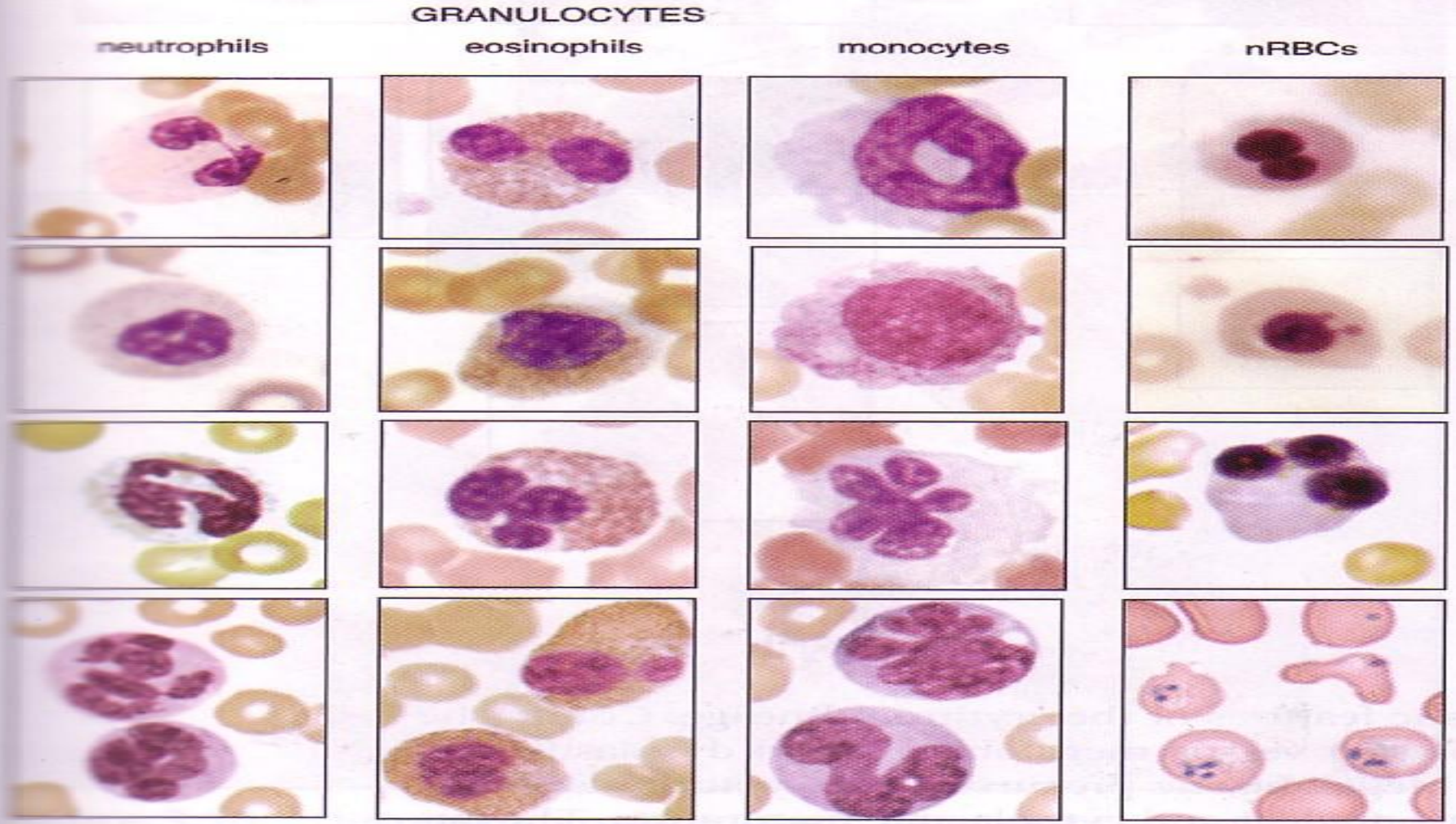


Figure 3.5 Dysplastic nuclear features in circulating cells. Composite image taken from several cases of myelodysplastic syndrome showing dysplastic nuclear features seen in circulating granulocytes and nucleated RBCs. The right lower figure shows numerous Pappenheimer bodies.

Hb H Disease

Anemia(Hb:7-10g/dl)

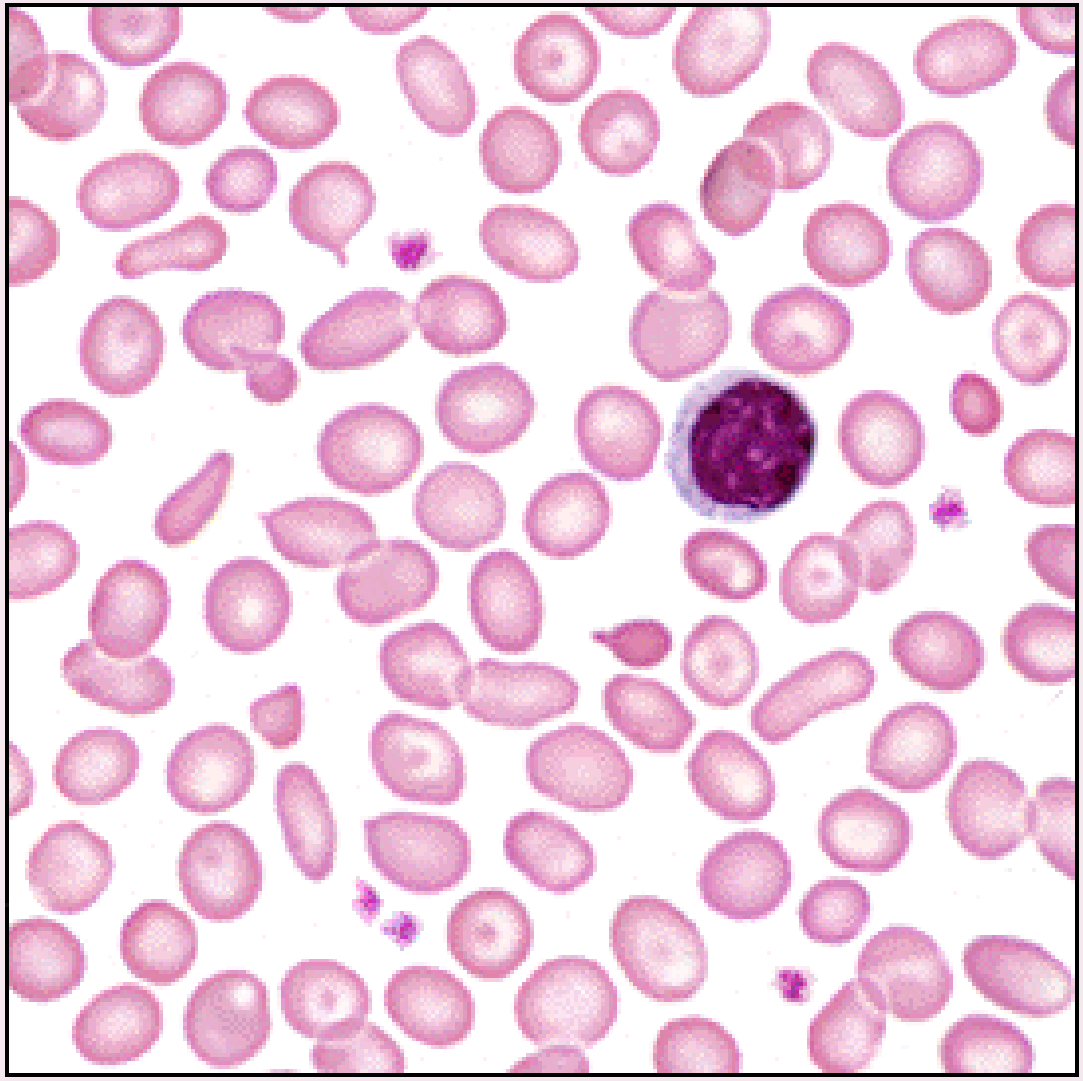
Abnormal rbc morphology

β-chain precipitation

Howell Jolly body

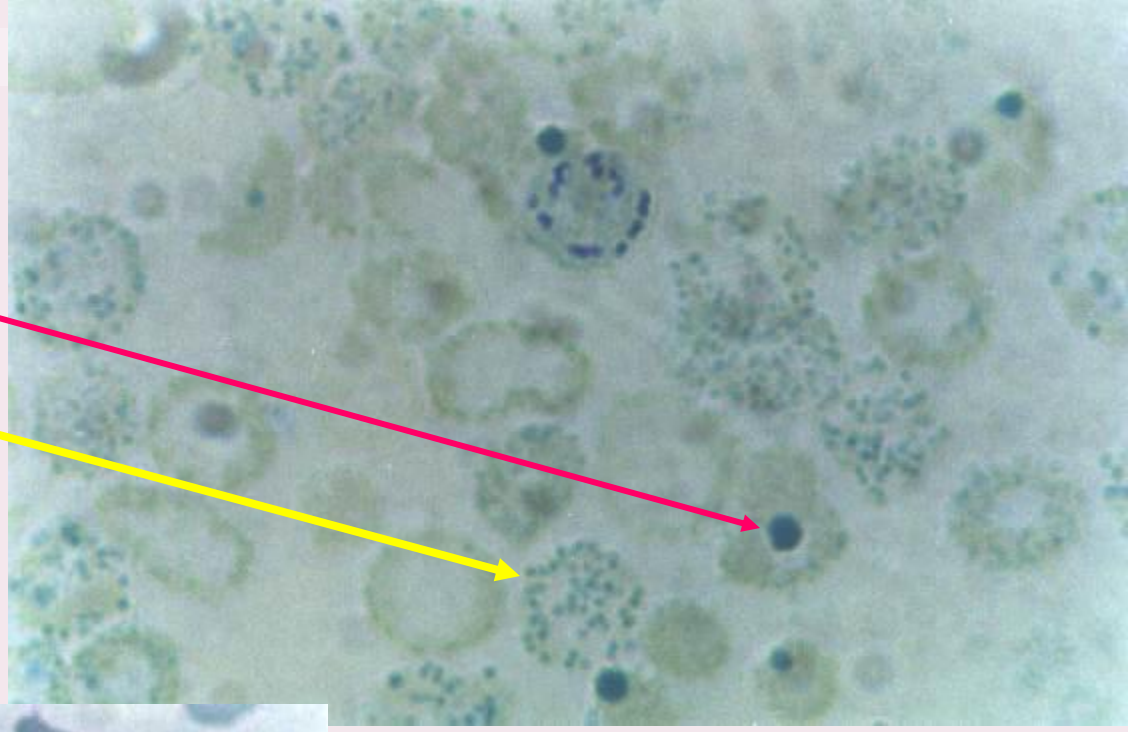


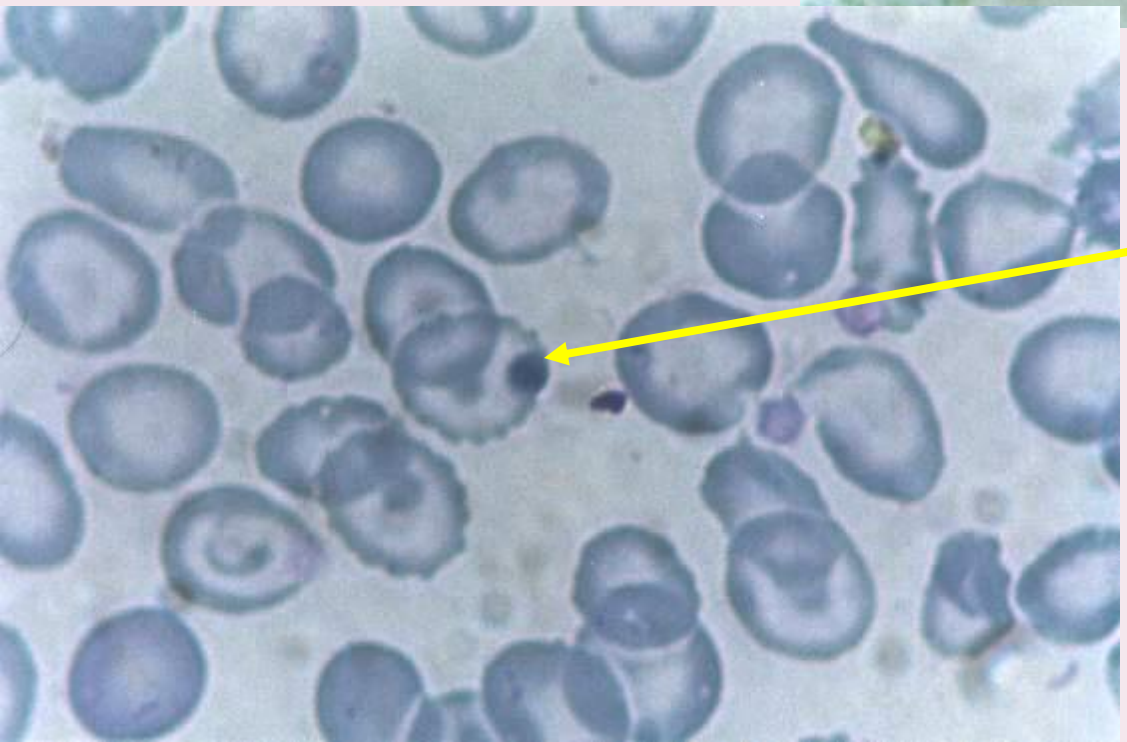
α-Thalassemia trait



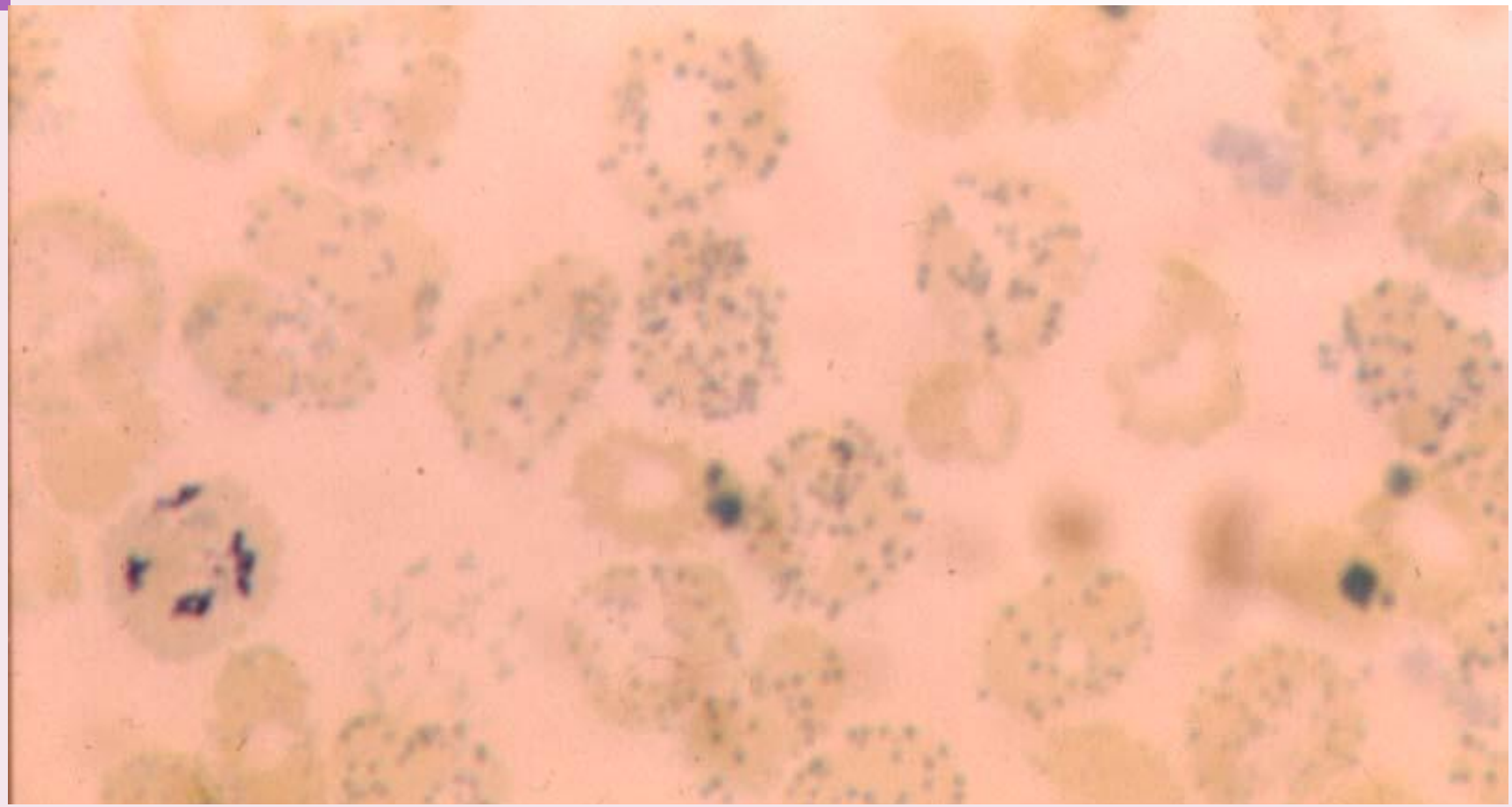
BCB STAIN

HEINZ BODIES
GOLF BALL
APPEARING RBC
RETICULOCYTE



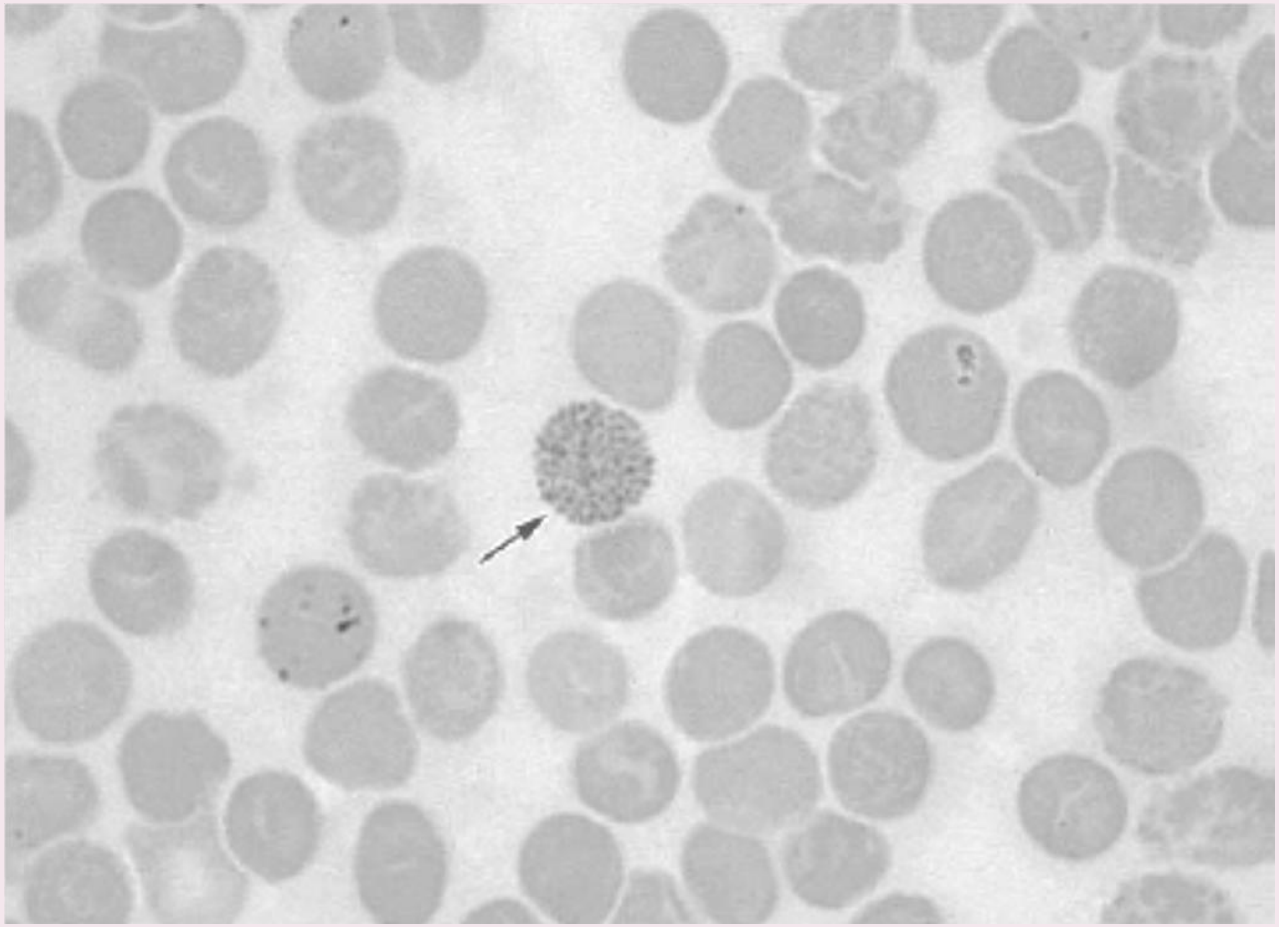


HEINZ BODY IN
GIEMSA STAIN



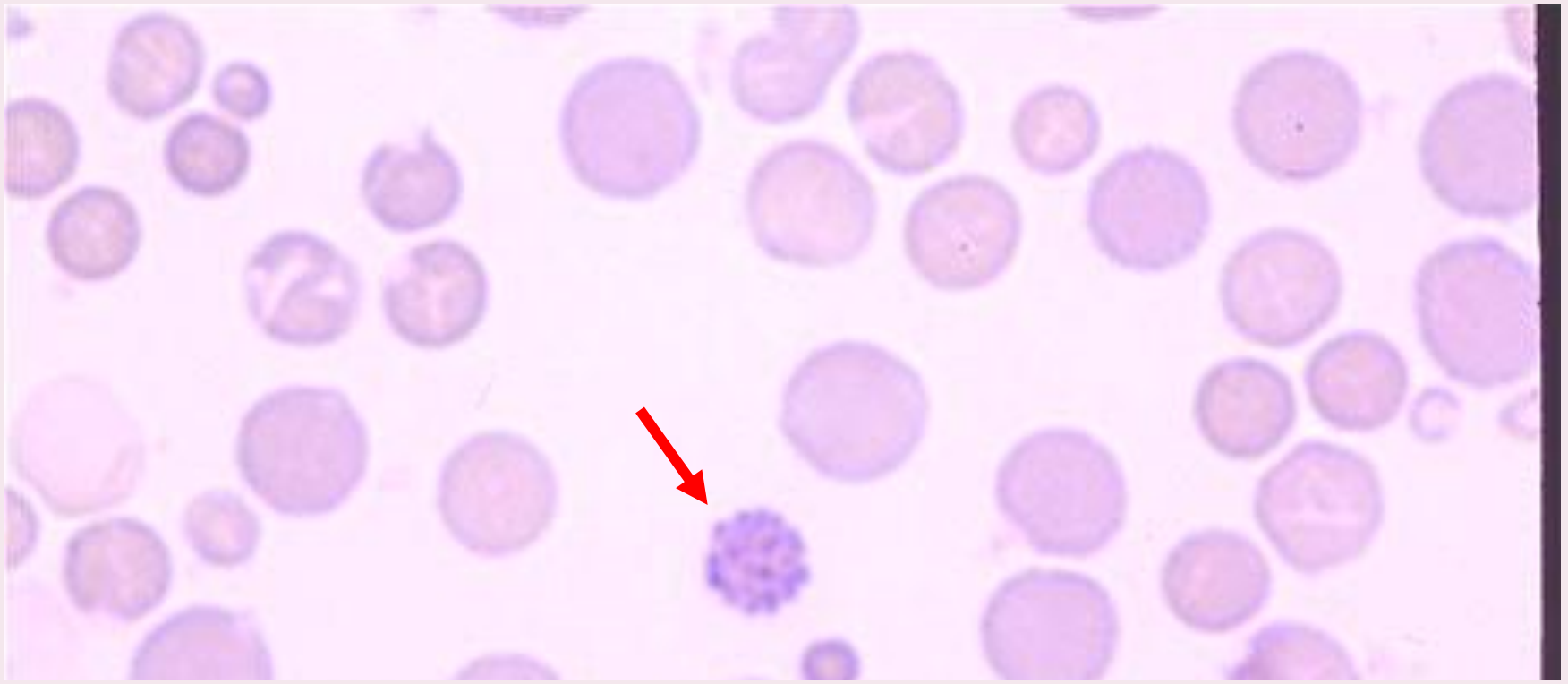
In the setting of Hb H disease, a disorder in which three of four a-globin chain genes are nonexpressed,30–100% of red cells contain typical inclusions.

Usefulness of brilliant cresyl blue staining as an auxiliary method of screening for -thalassemia



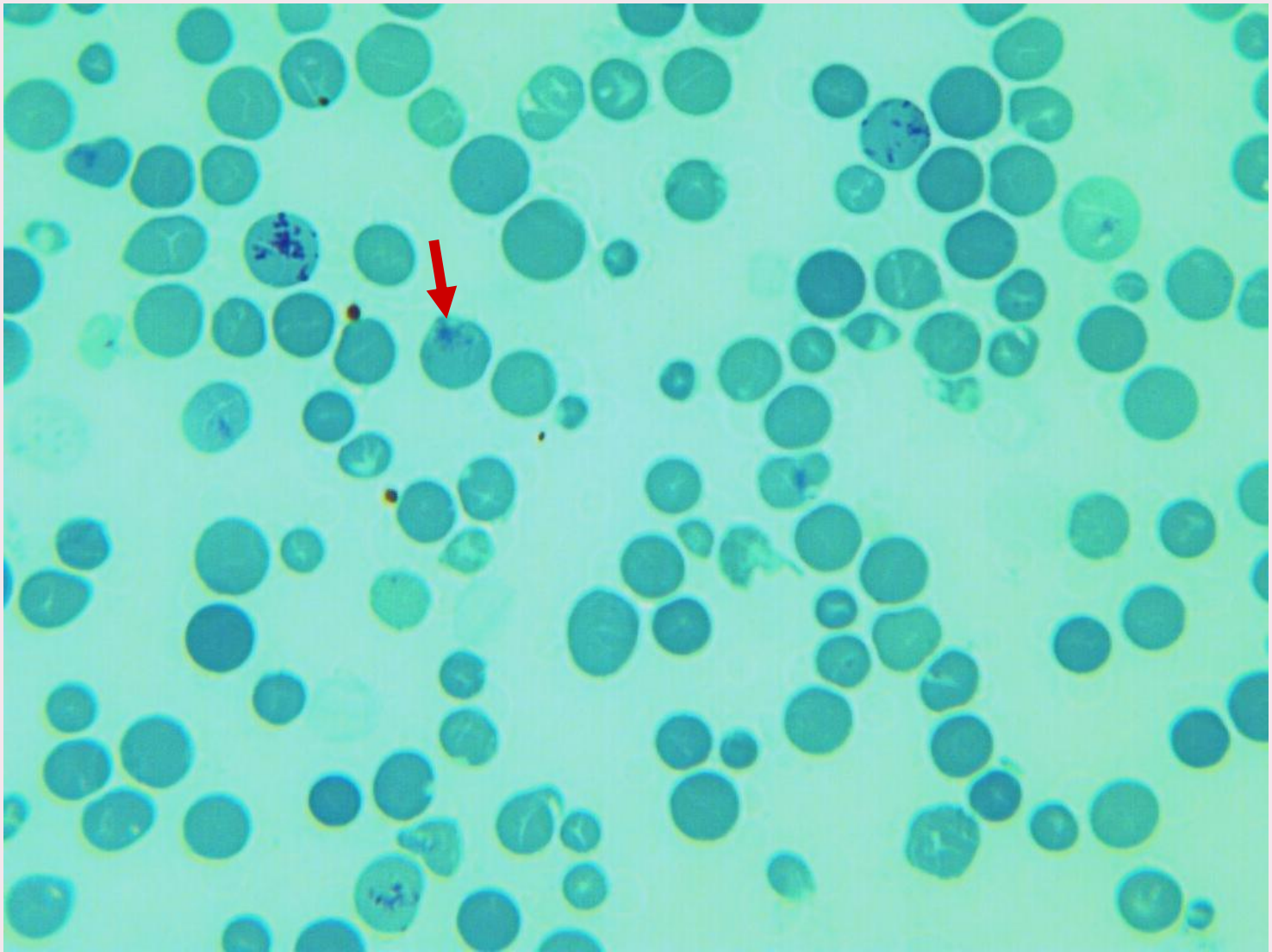
RBCs containing HbH inclusions on a BCB-stained smear in a patient with -thalassemia trait.

GOLF BALL APPEARING RBC

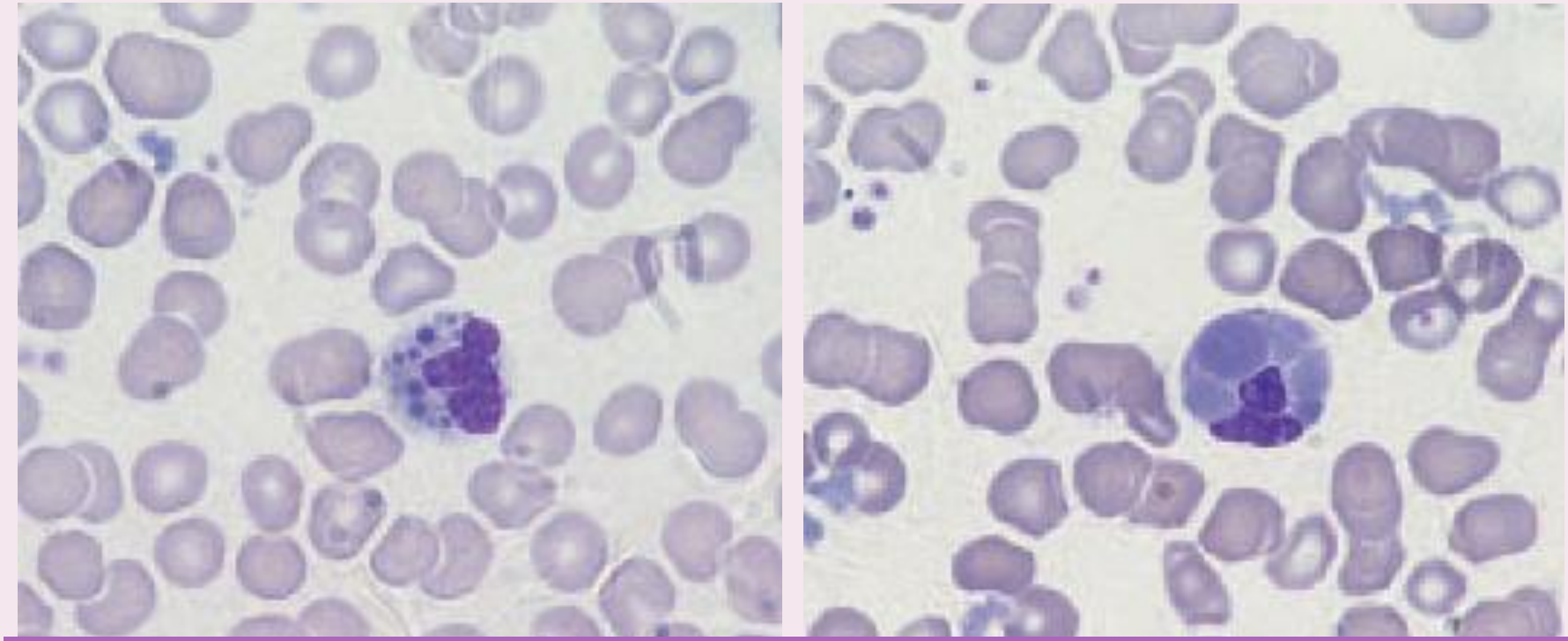


In α-thalassemia minor may be associated with as few as ***1 inclusion-containing cell in 1000–10000 cells*** .
The absence of Hb H inclusions therefore does not exclude thalassemia trait, but the presence of typical inclusions may be helpful in confirming a presumptive diagnosis.

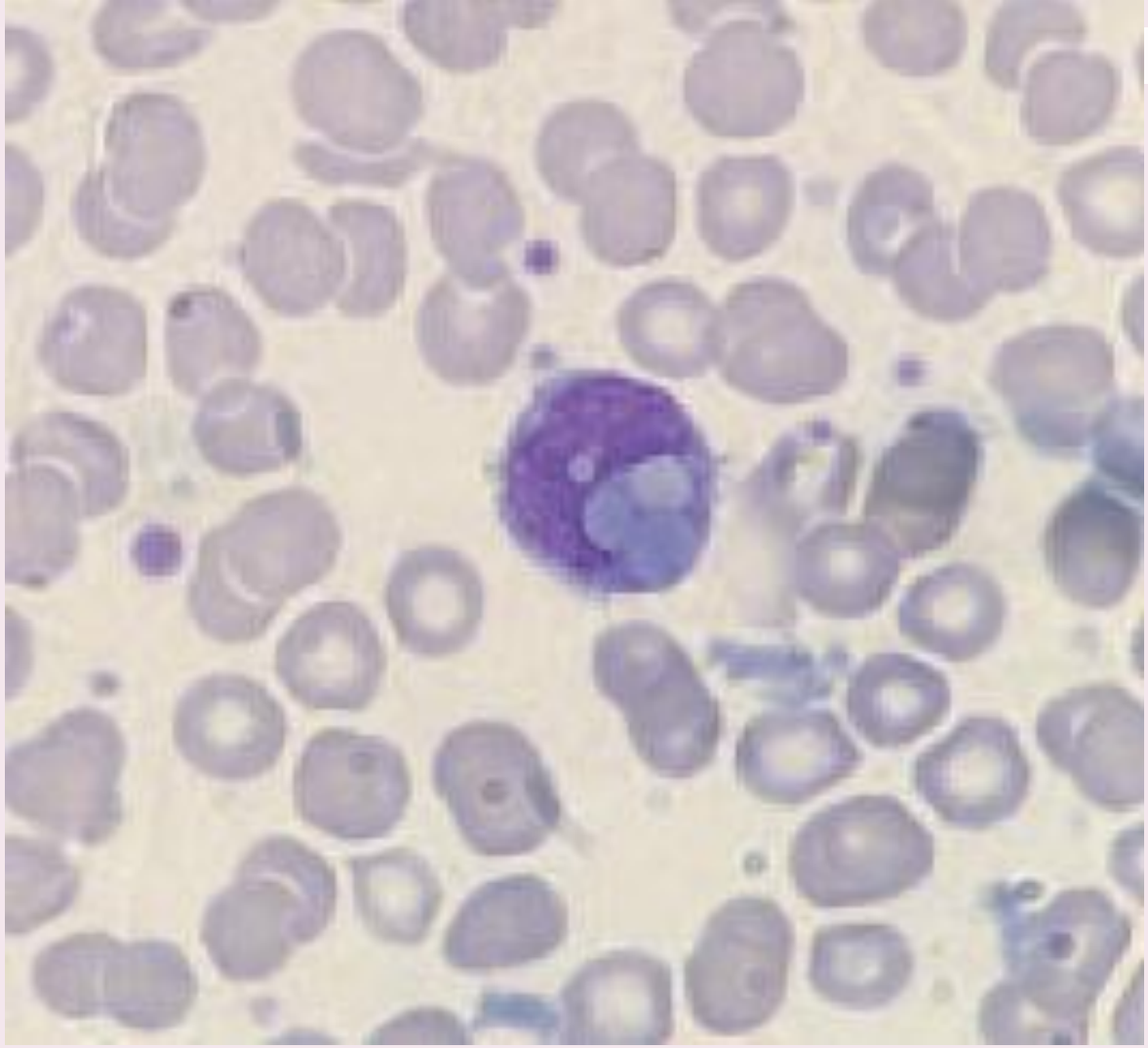
Alpha Chain Precipitation



Cryoglobulinaemia

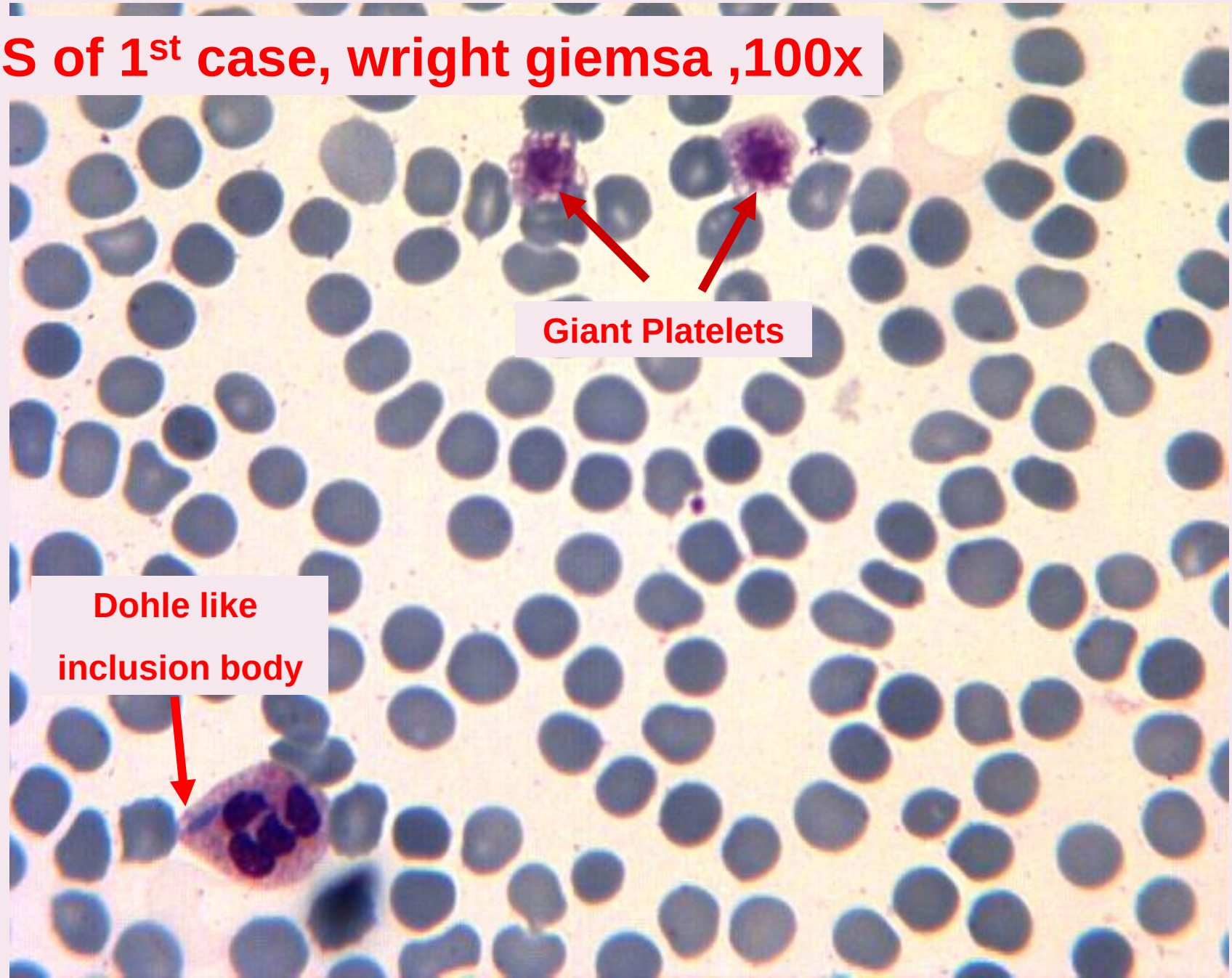


Peripheral blood film of a patient with ***cryoglobulinaemia*** showing cryoglobulin that has been ingested by neutrophils and appears as: (a) ***small round inclusions***; and (b) ***large masses*** filling the cytoplasm and displacing the nucleus. Some extracellular cryoglobulin is also present.

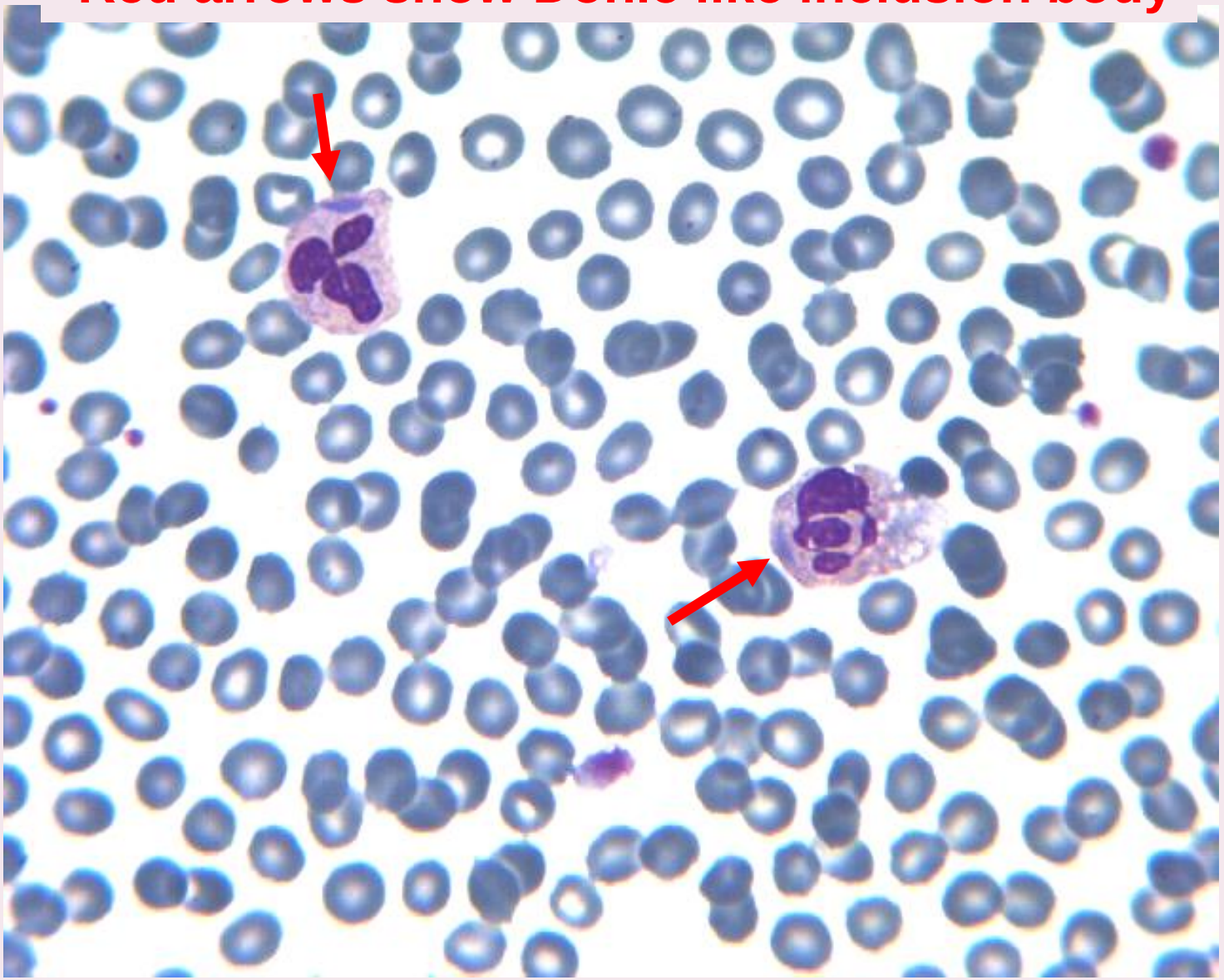


Peripheral blood film of a patient with cryoglobulinaemia showing cryoglobulin within a monocyte.

PBS of 1st case, wright giemsa ,100x

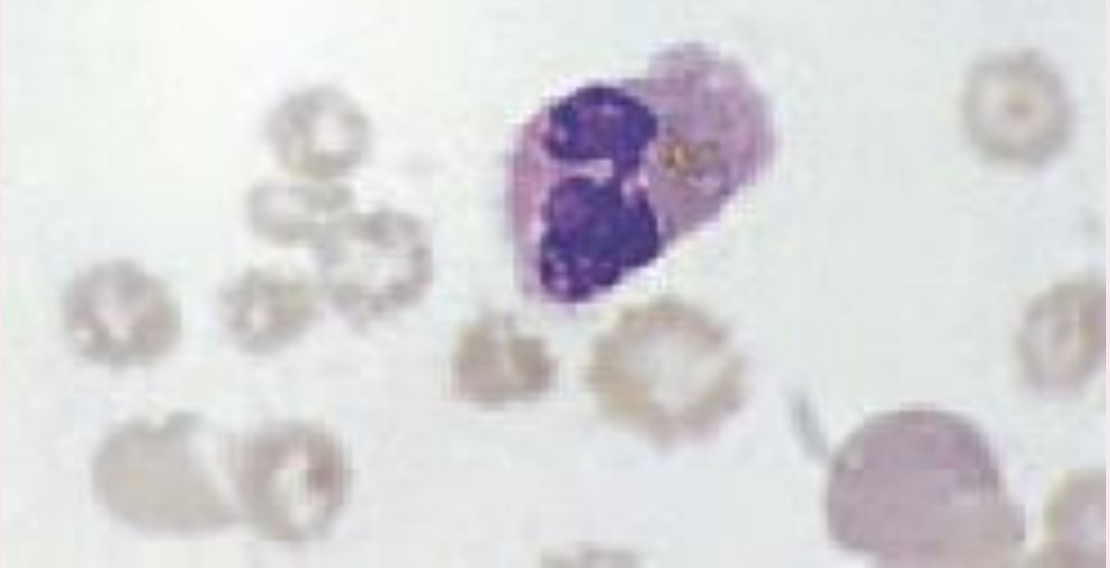


Red arrows show Dohle like inclusion body

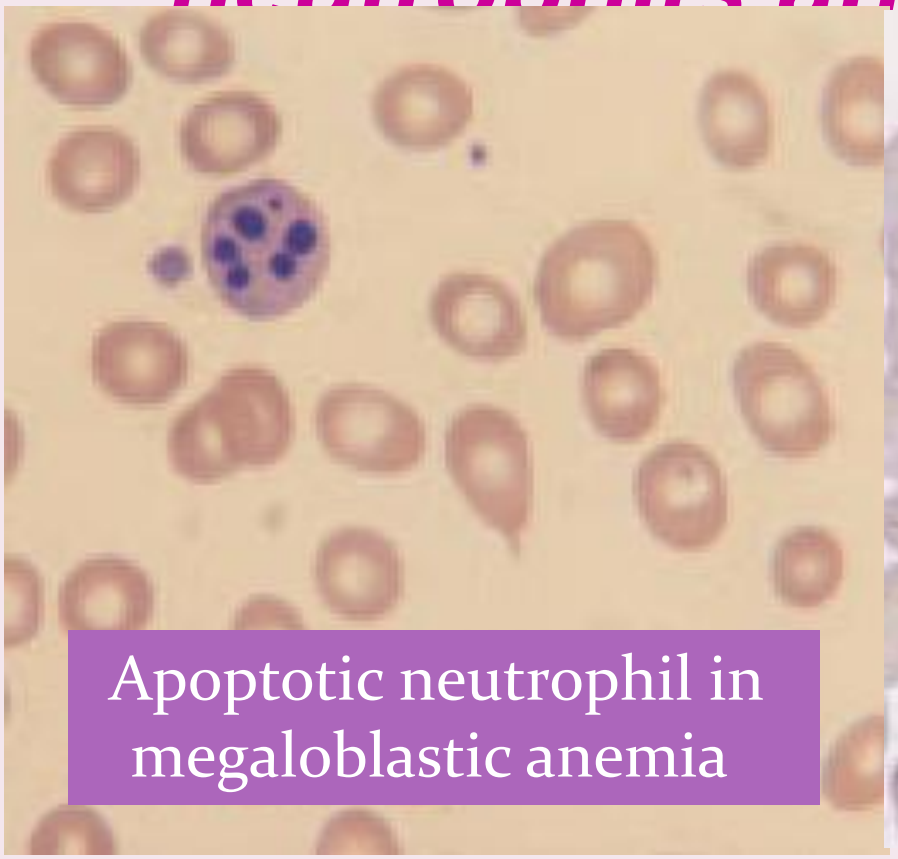


A neutrophil containing refractile bilirubin crystals

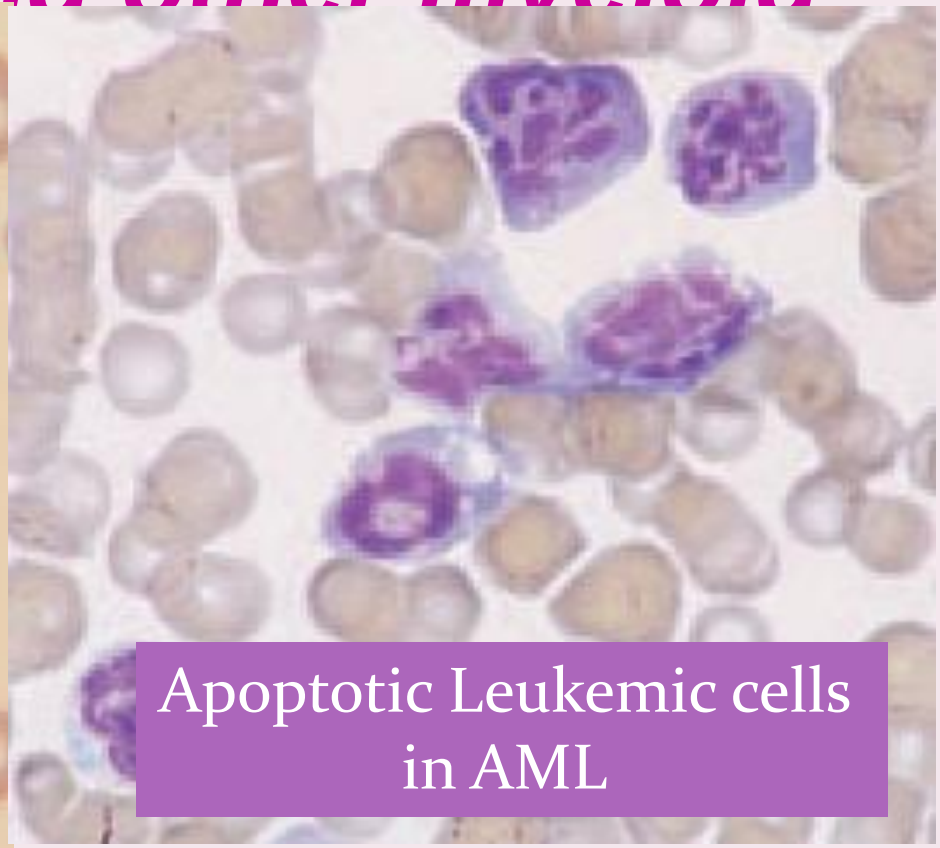
Rarely, **bilirubin crystals** are seen within neutrophils of infants and children with a markedly elevated plasma bilirubin; they are refractile and faintly yellow ;they have been found to form *in vitro* **when EDTA-anticoagulated blood is allowed to stand for at least 30 minutes**



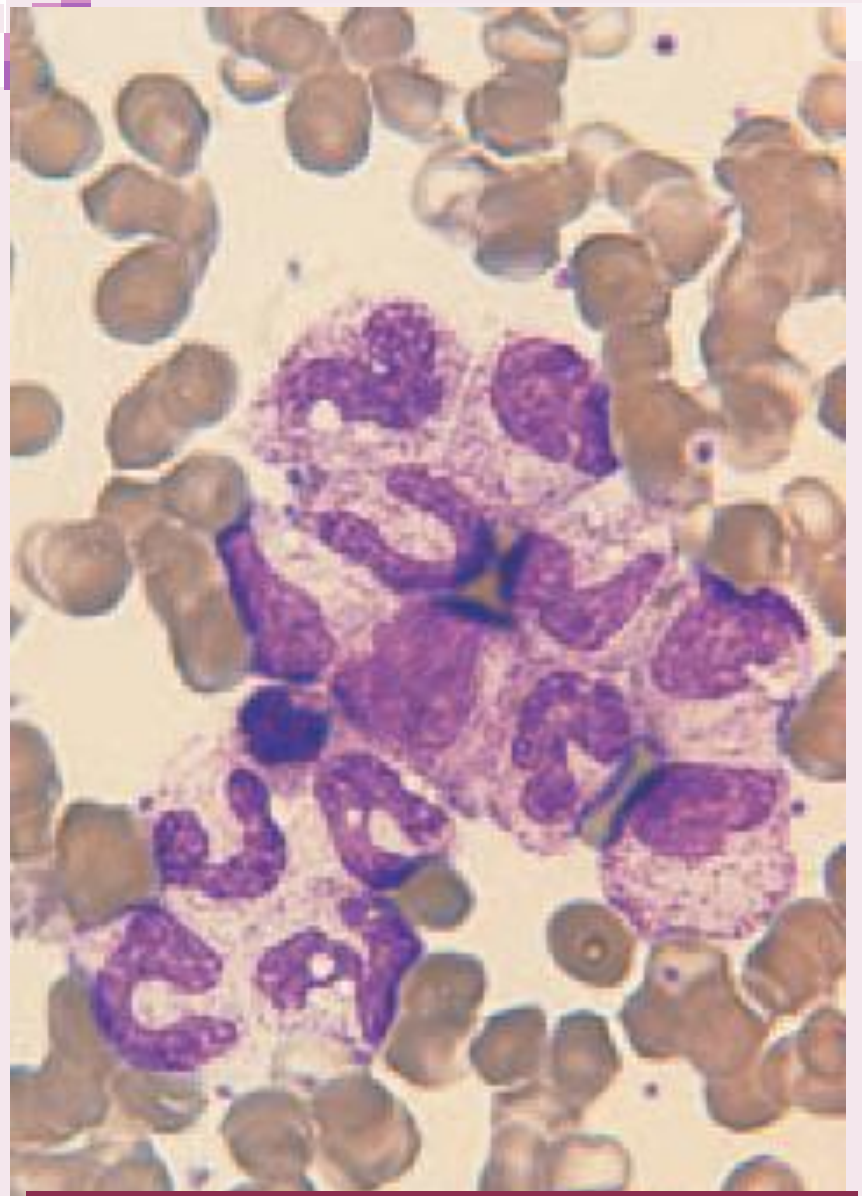
Necrobiotic (apoptotic) neutrophils and other myeloid



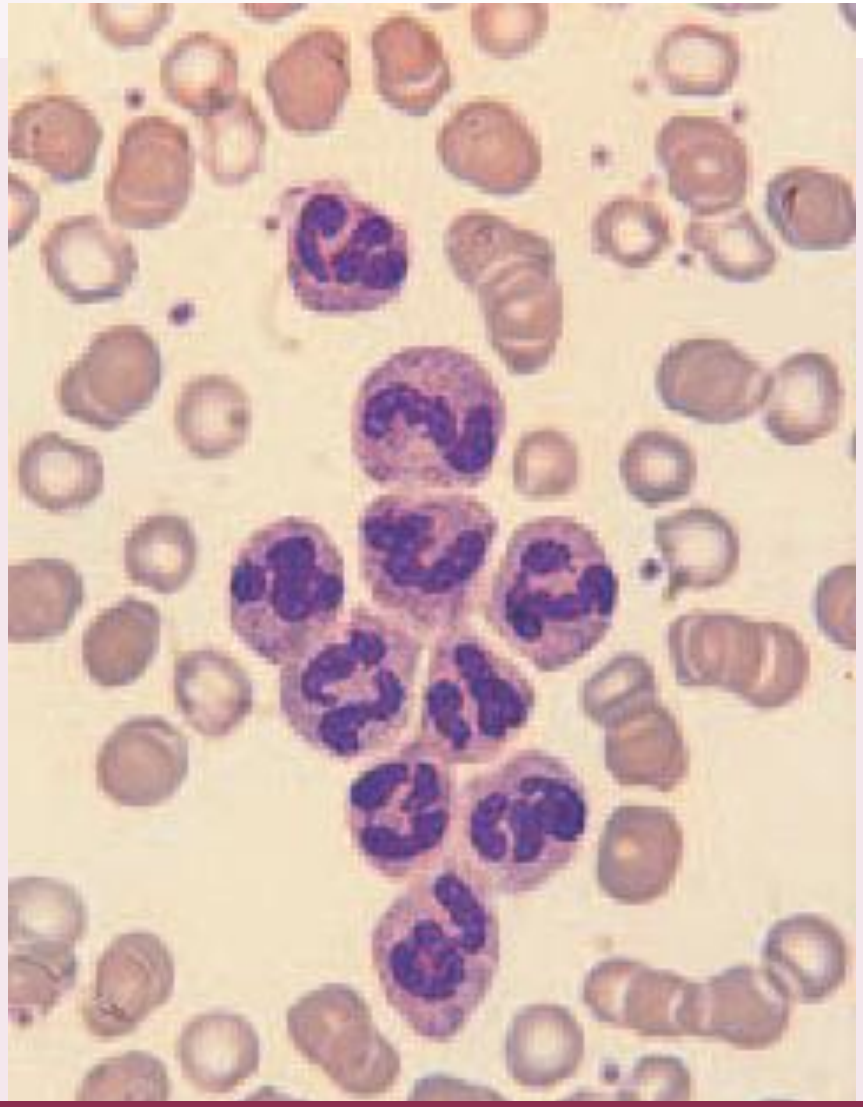
Apoptotic neutrophil in megaloblastic anemia



Apoptotic Leukemic cells in AML



patient with overwhelming sepsis



Patient with rheumatoid arthritis showing neutrophil aggregation caused by a **cold Ab**.

What is the main finding? What do you report?

Abnormal lymphoid cells with marked vacuolization, suspicious to storage diseases, Mucopolysaccharidosis



Giemsa staining

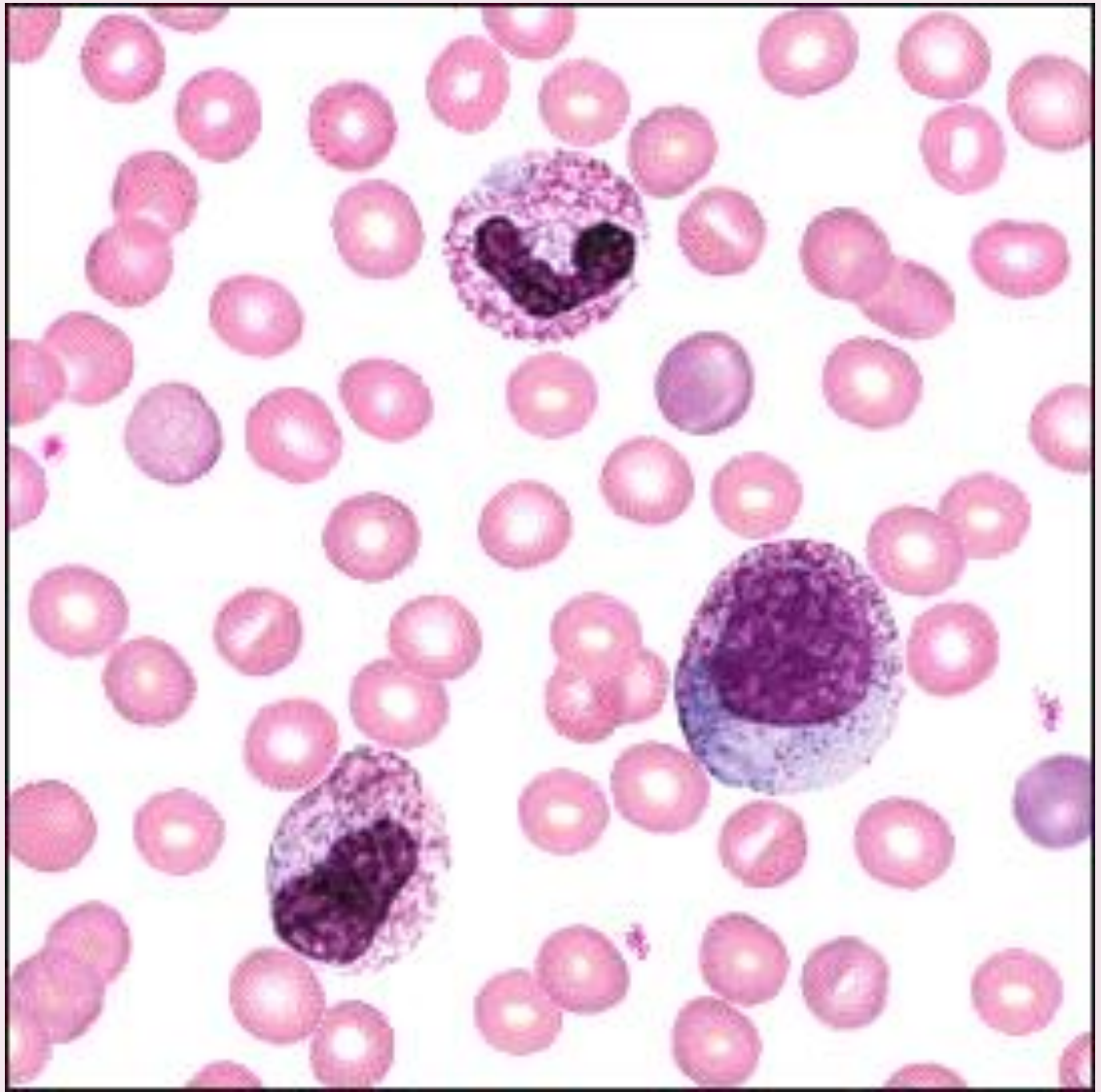


Wright staining

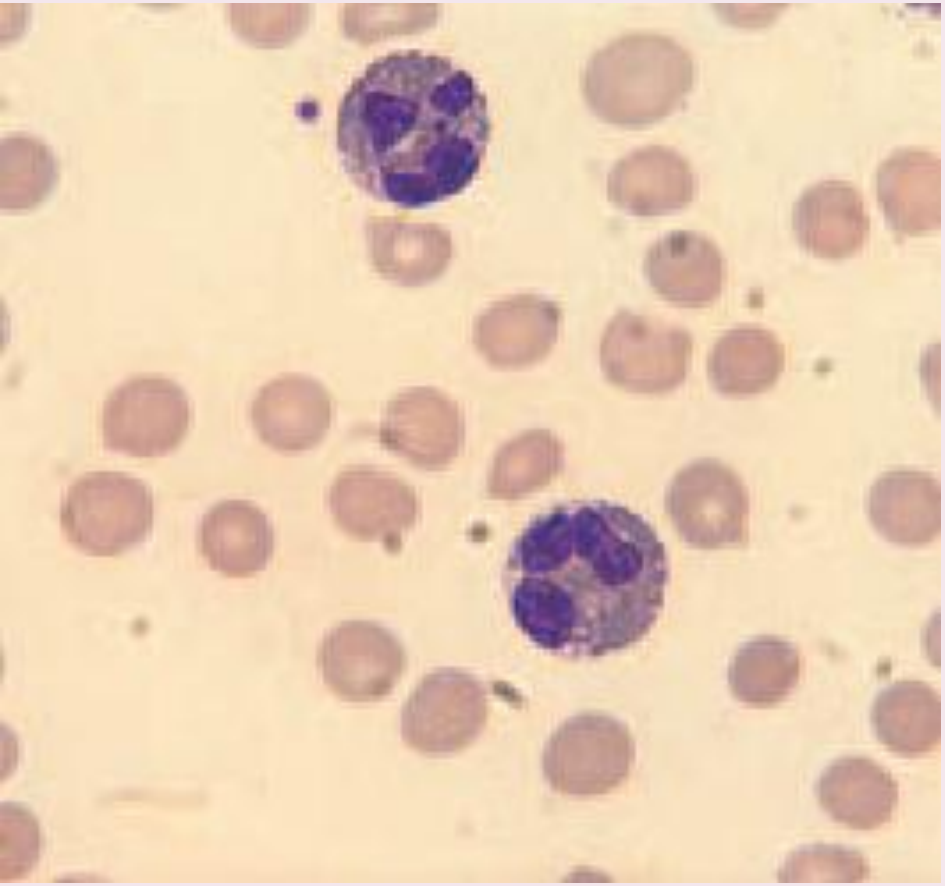
Shift to the left &
reactive changes
in neutrophils

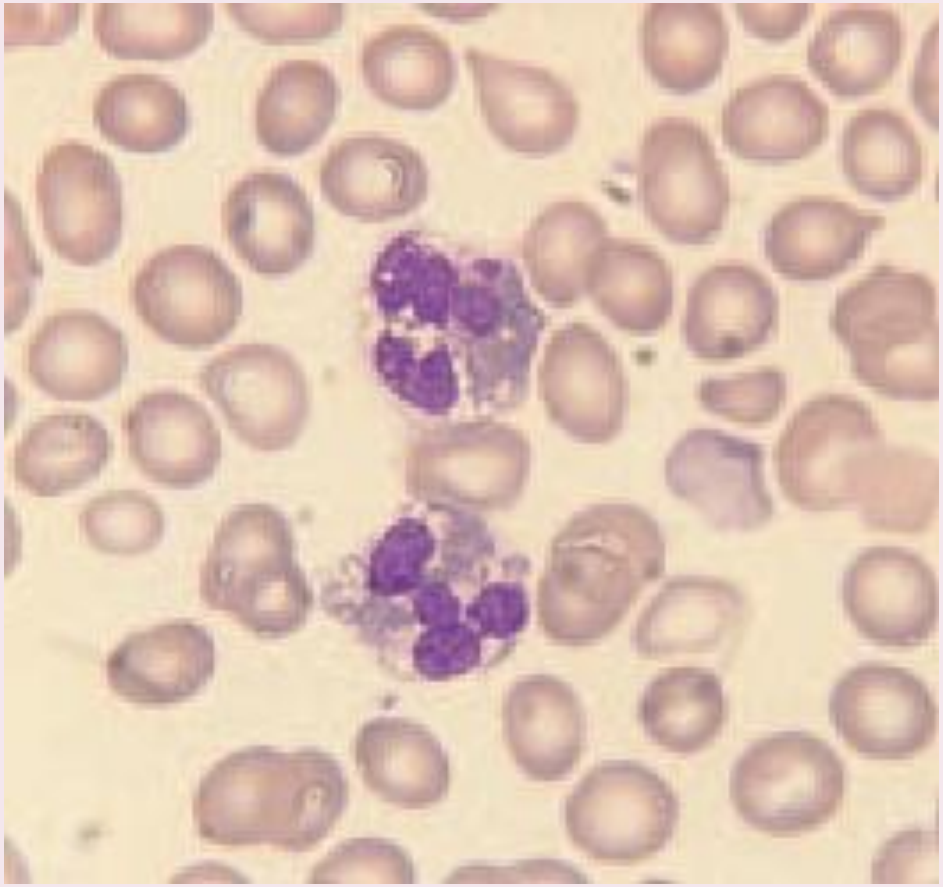
✓

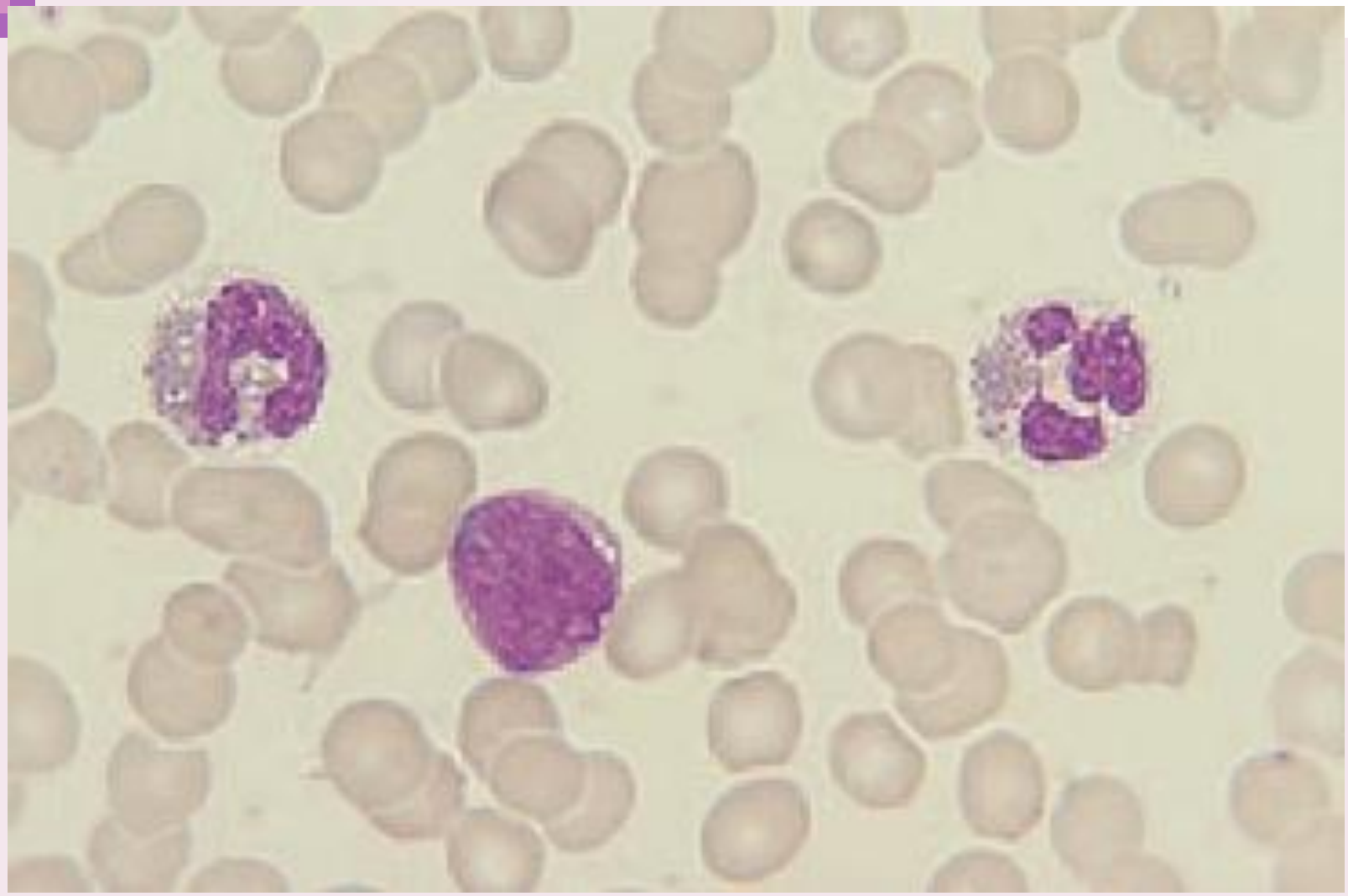
response to G-
CSF or GM-CSF
therapy.



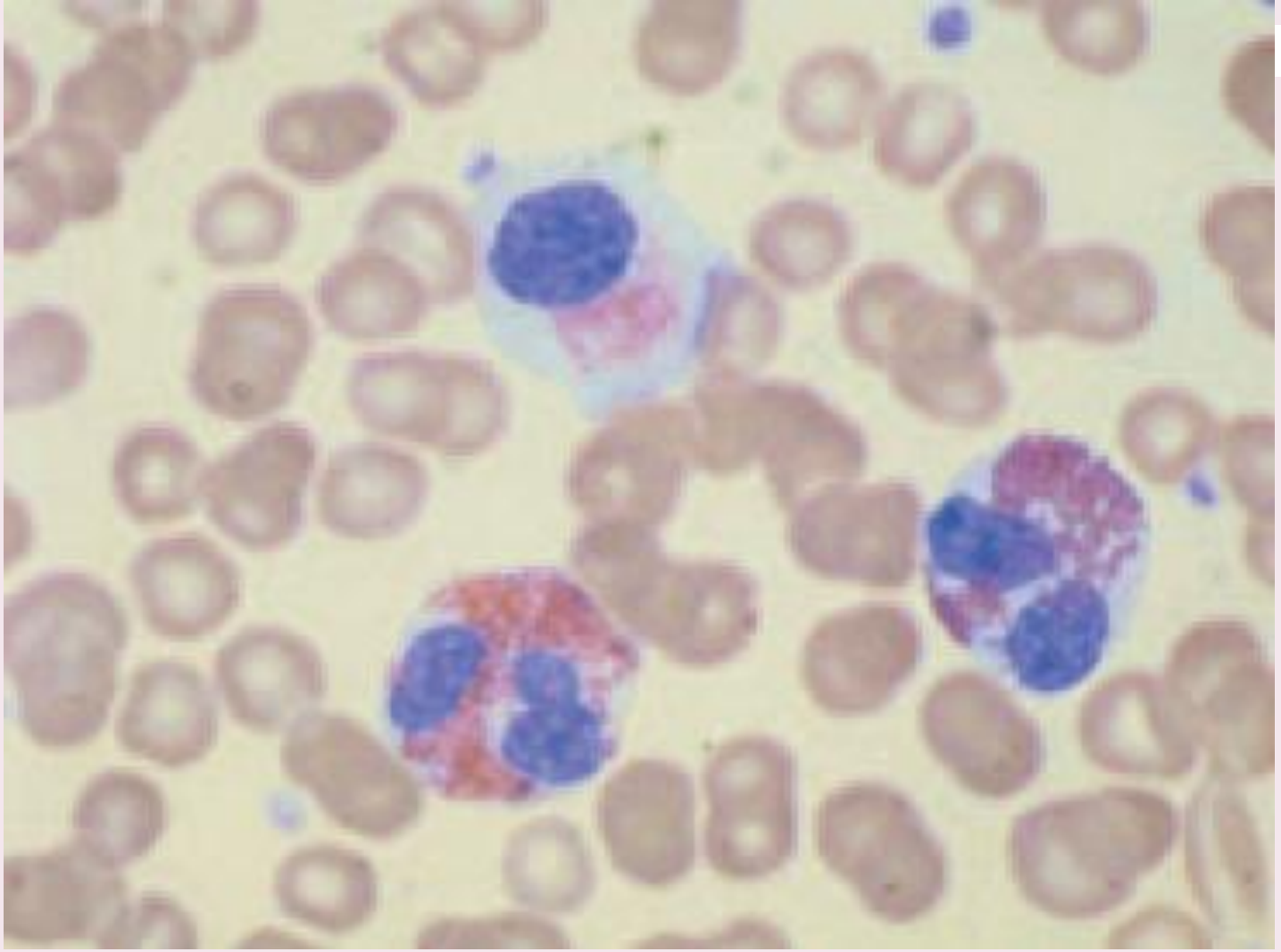
Idiopathic hypereosinophilic syndrome, HES



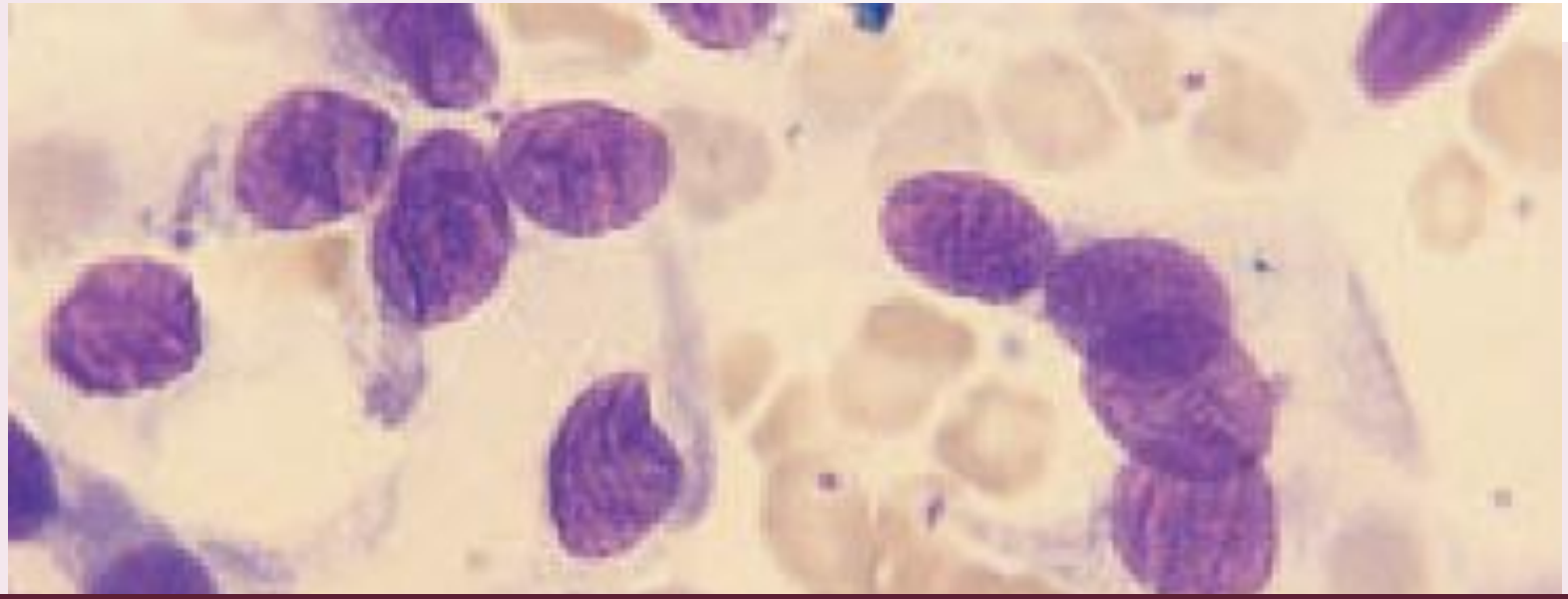




Peripheral blood film in eosinophilic leukaemia showing a blast cell and two vacuolated and partly degranulated eosinophils.



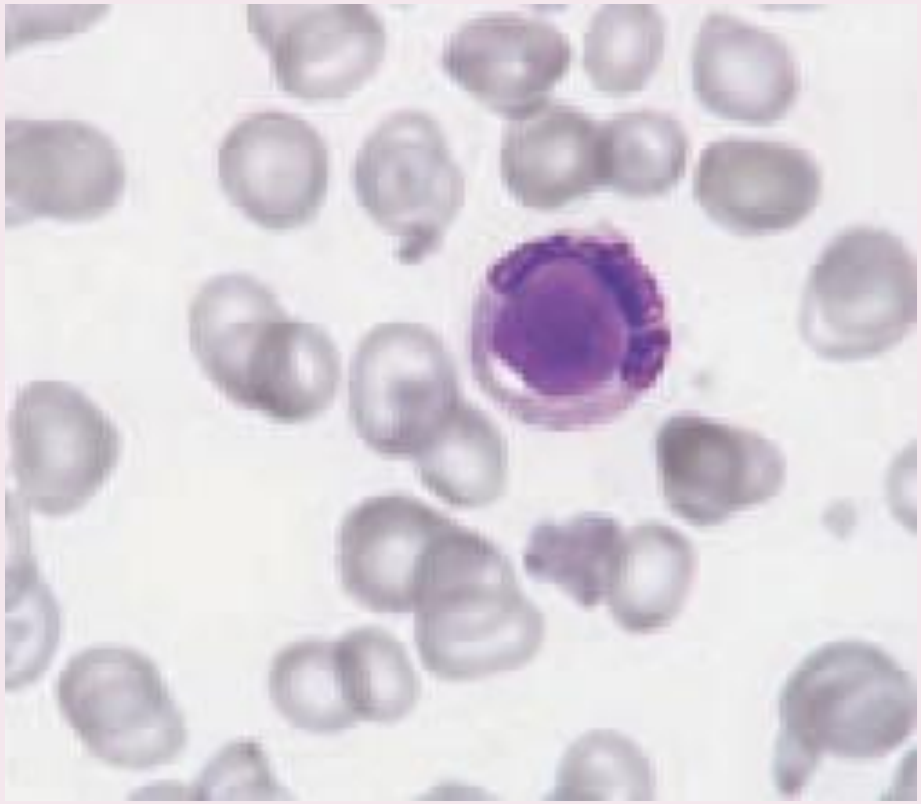
Peripheral blood film in a patient with eosinophilic leukaemia associated with a *FIP1L1-PDGFRA* fusion gene showing eosinophils with varying degrees of degranulation, one of which is nonlobulated.



Increased numbers of endothelial cells are present in conditions with ***vascular injury*** (e.g. rickettsial infection, peripheral vascular disease, CMV infection, thrombotic thrombocytopenic purpura (TTP), sickle cell disease and following coronary angioplasty) but even in such circumstances they are very infrequent.

Endothelial cells in a peripheral blood film made from a venous blood sample.

LE cell



The formation of lupus erythematosus (LE) cells is usually an in vitro phenomenon but they may be seen in the peripheral blood ,e.g. in patients with severe lupus erythematosus .