



اطلس خون شناسی

برای دانشجویان علوم پزشکی و سیراپزشکی

علی اصغر صفری فرد
کارشناس ارشد خون شناسی و بانک خون

safariardas@Gmail.com



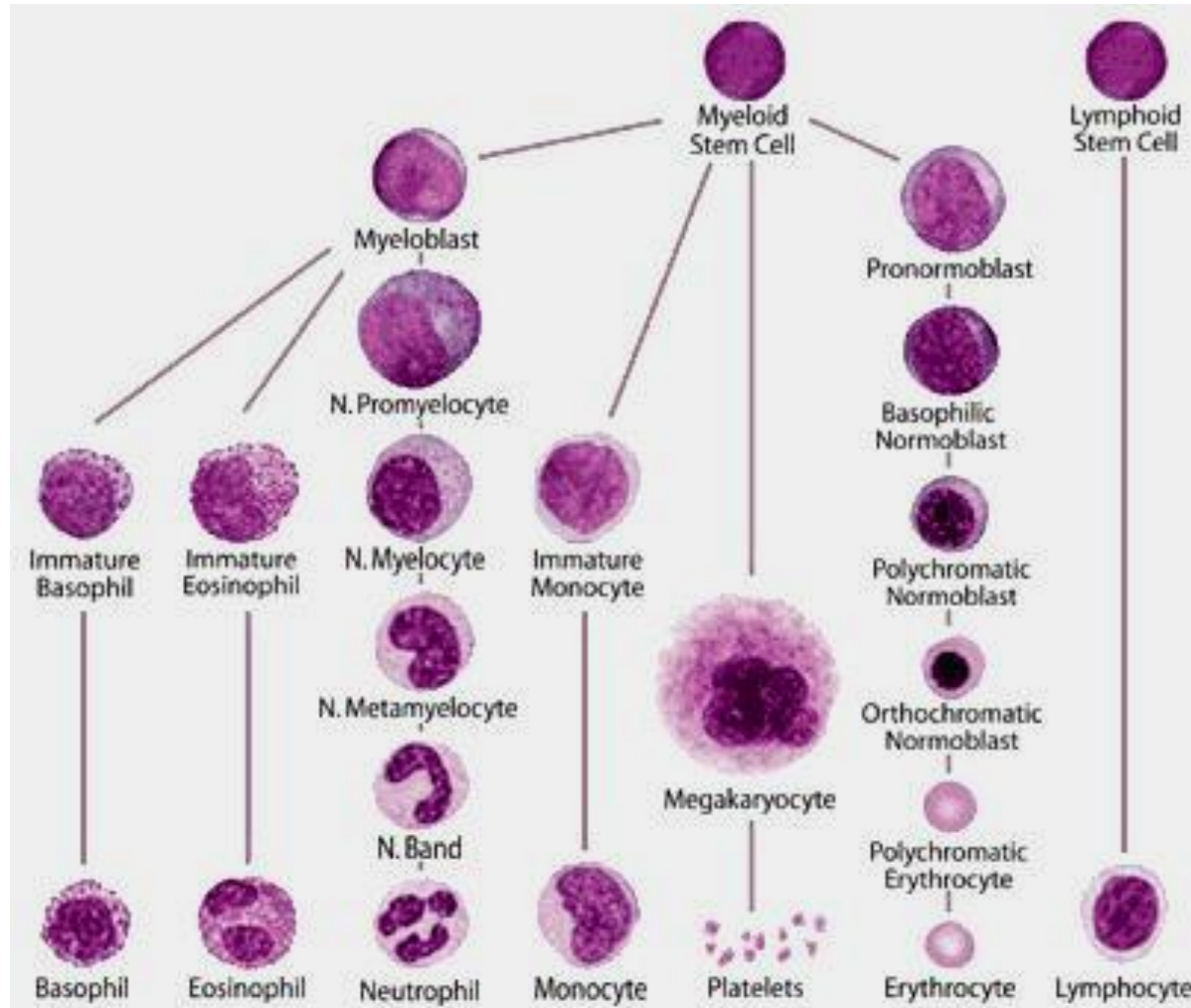
بسم الله الرحمن الرحیم

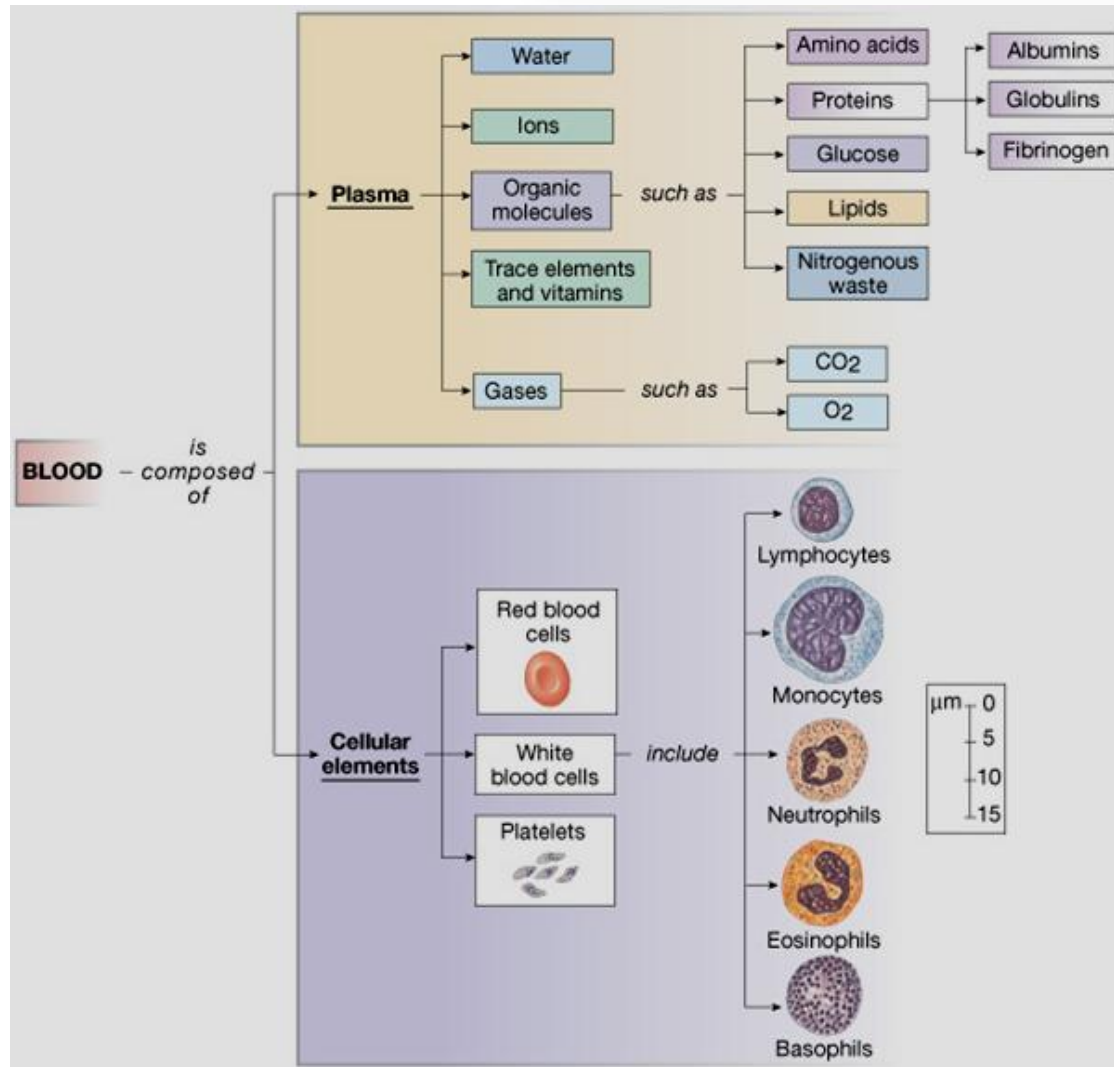


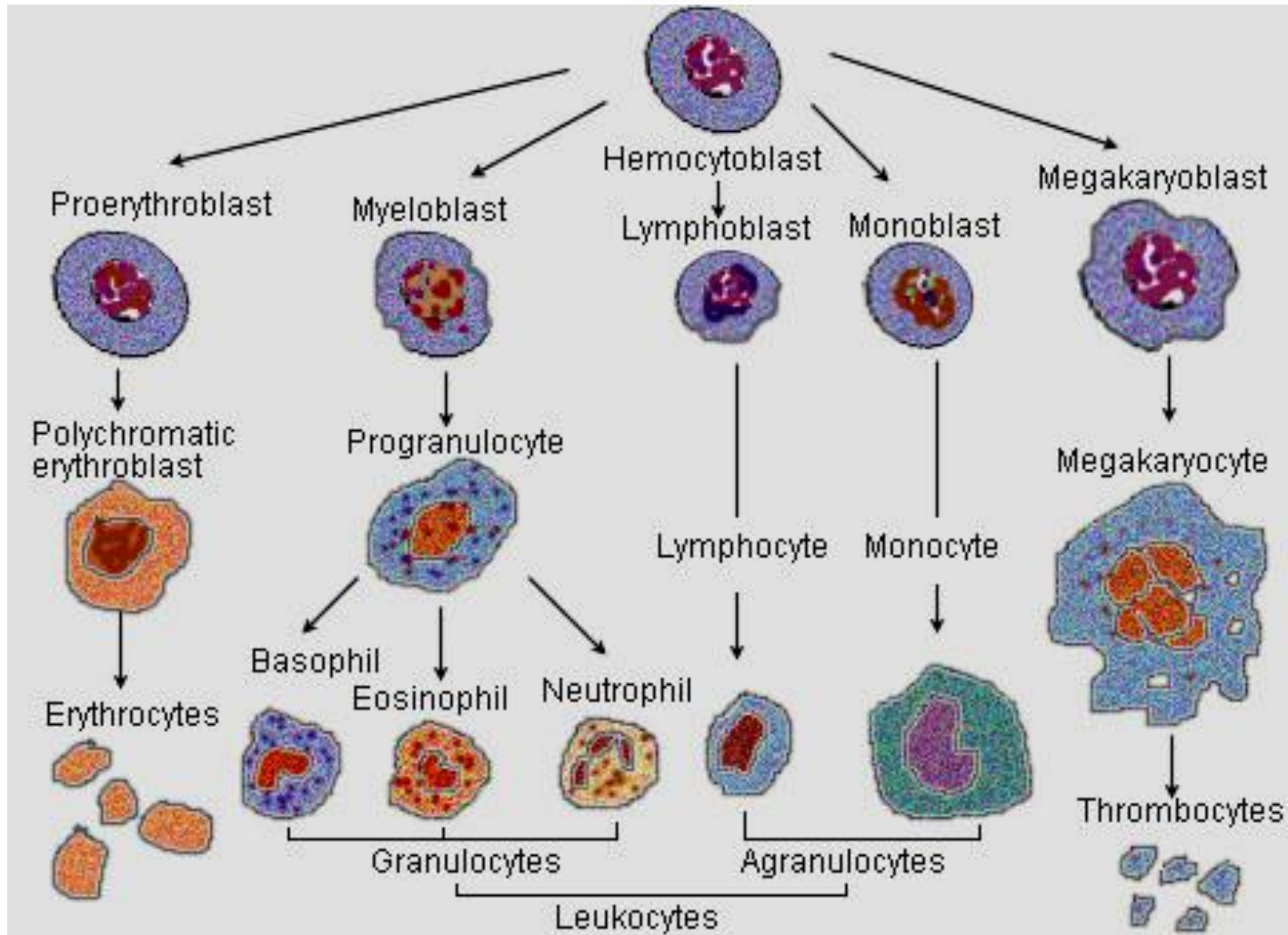
همراه با جناب دکتر علاء بنیان گزار سازمان انتقال خون ایران، شیراز، یکم اردو سیصد و هشتاد و نه

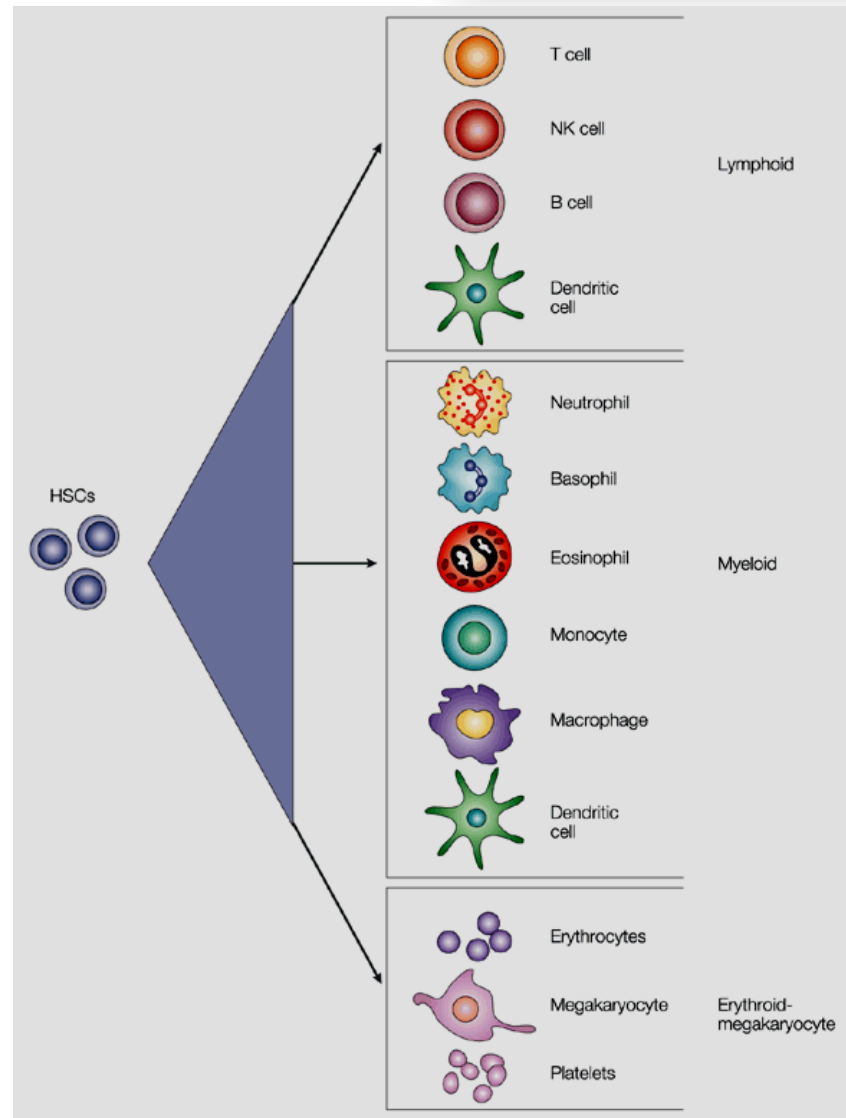
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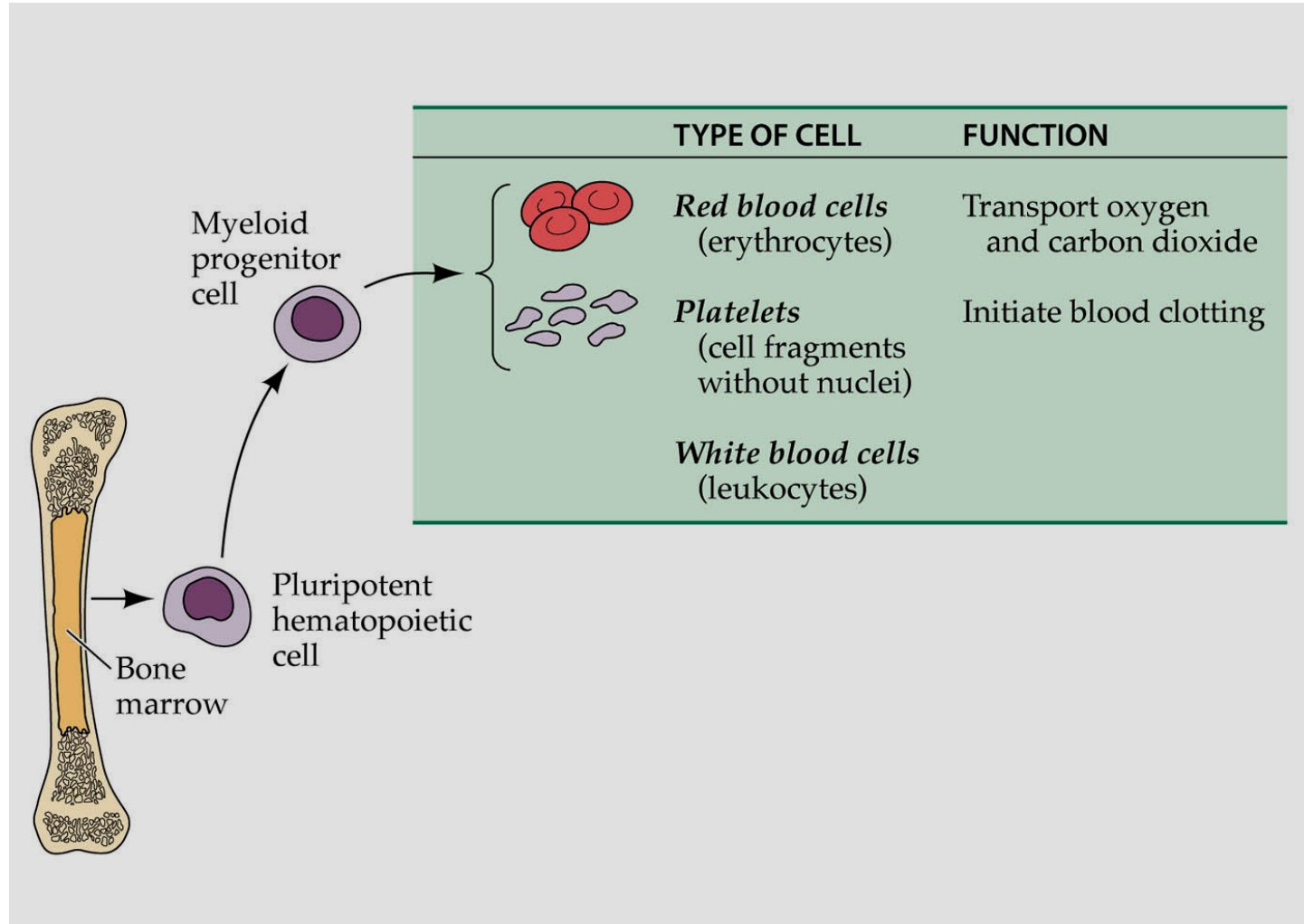


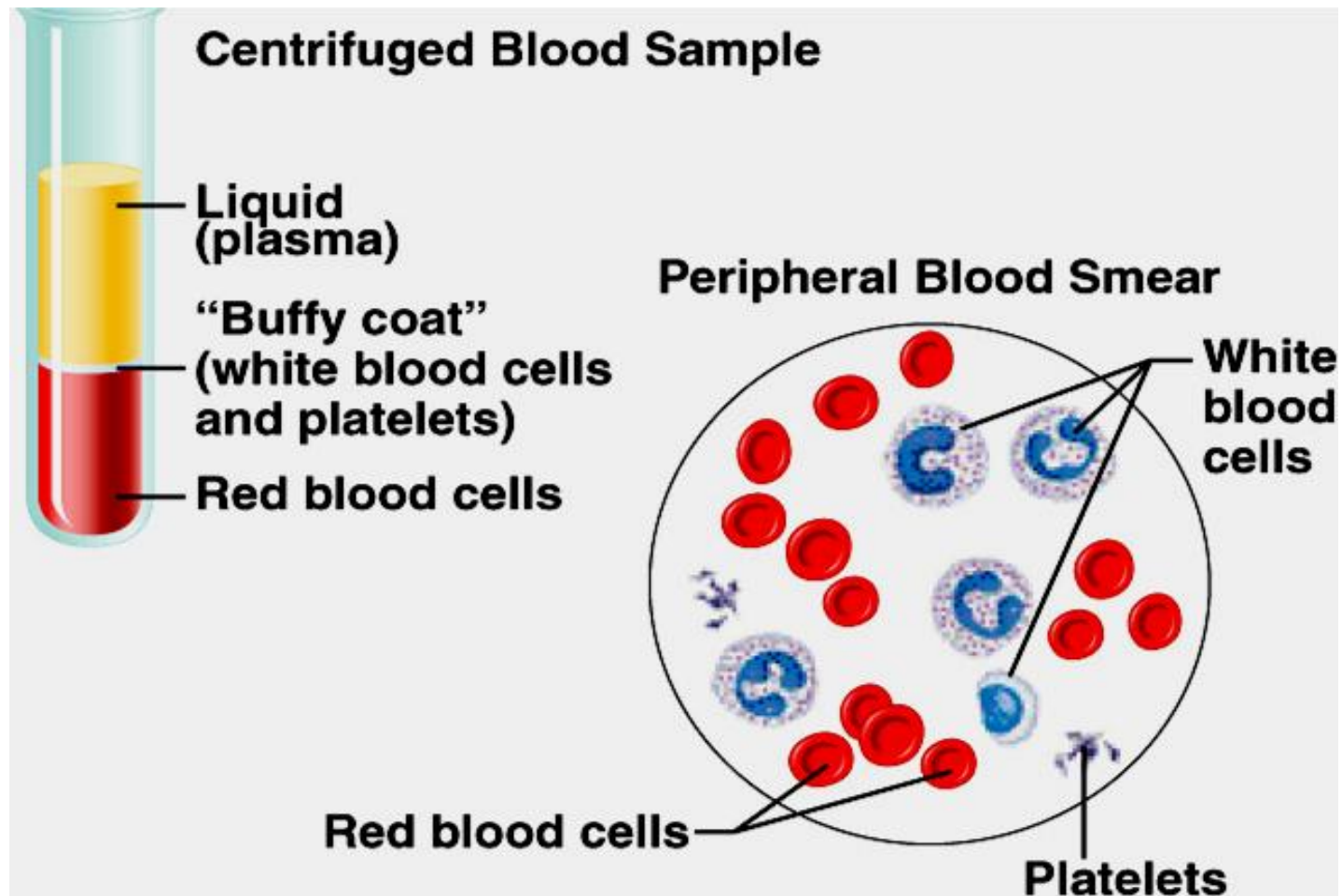




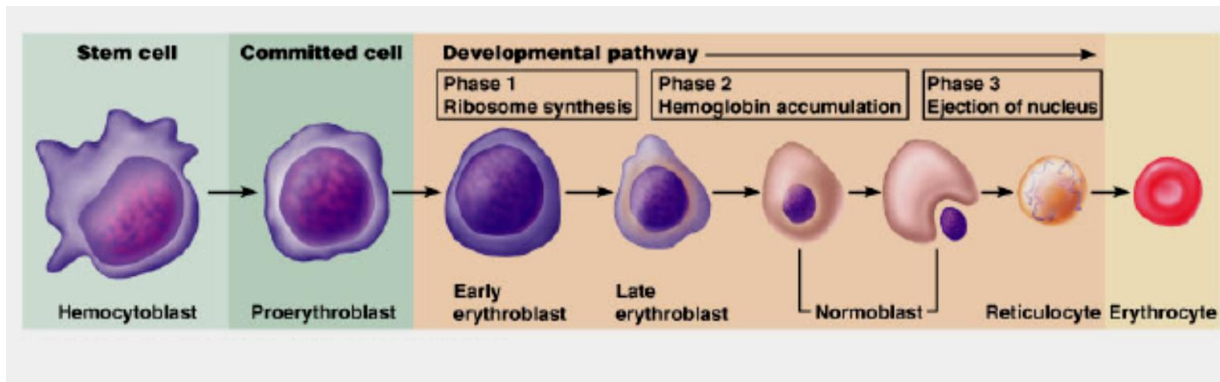
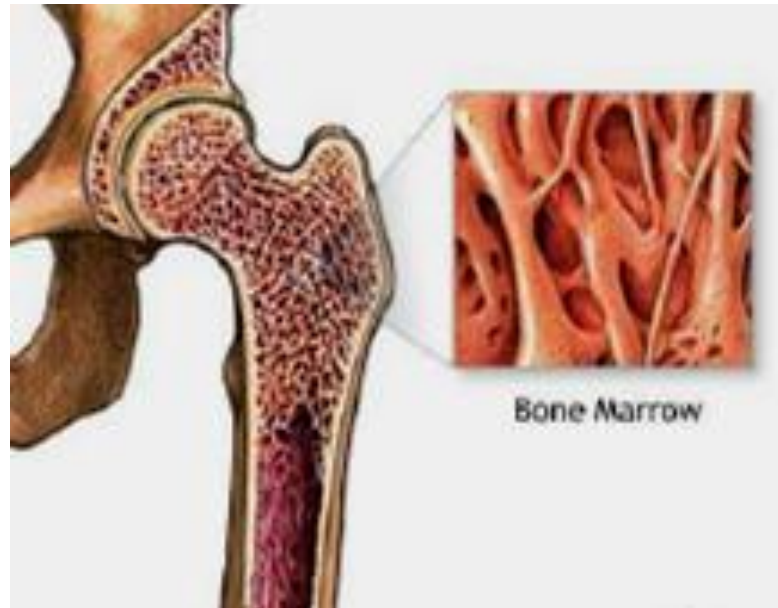


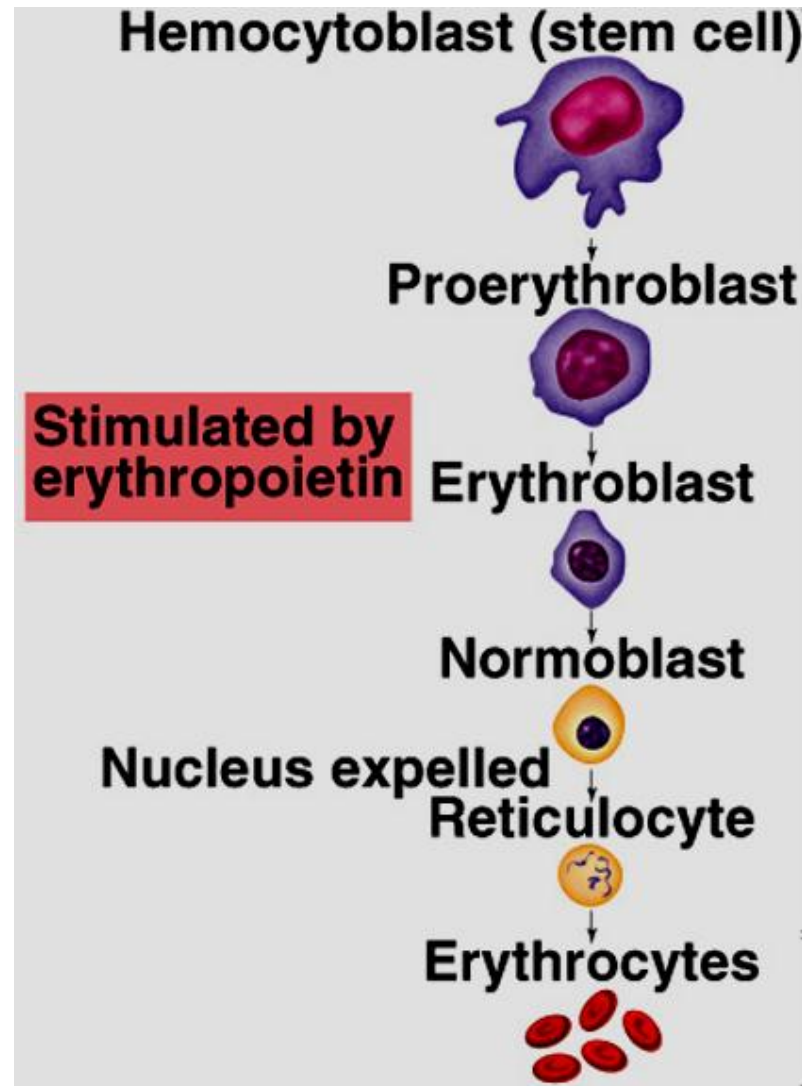




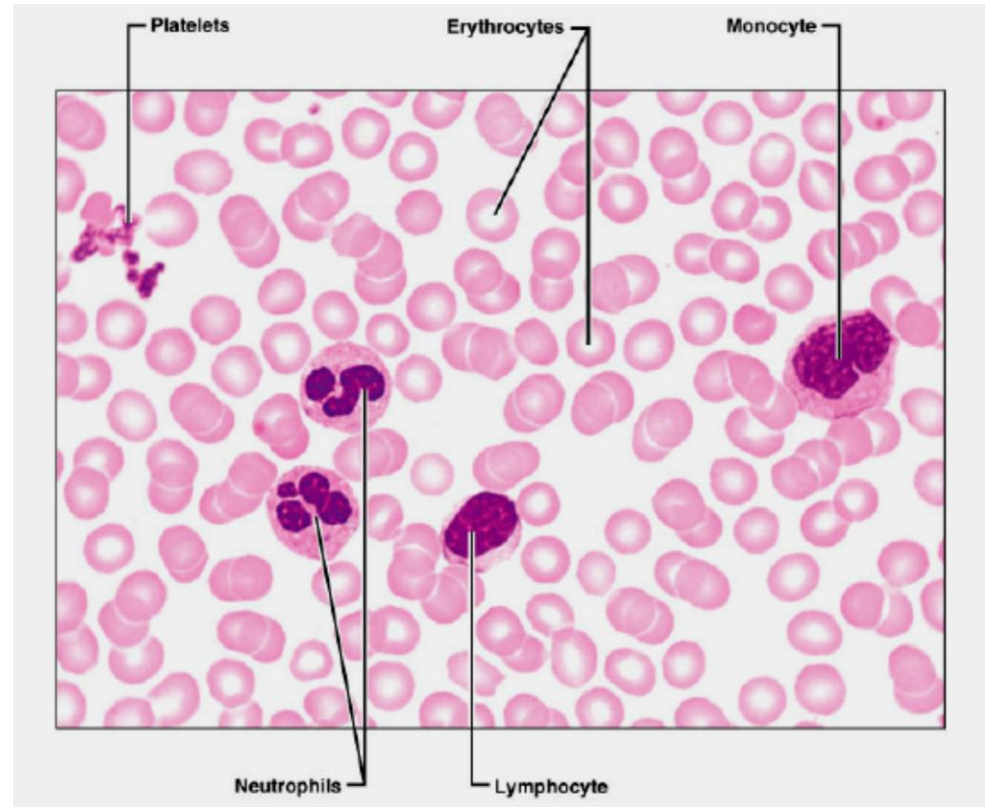


Erythropoiesis

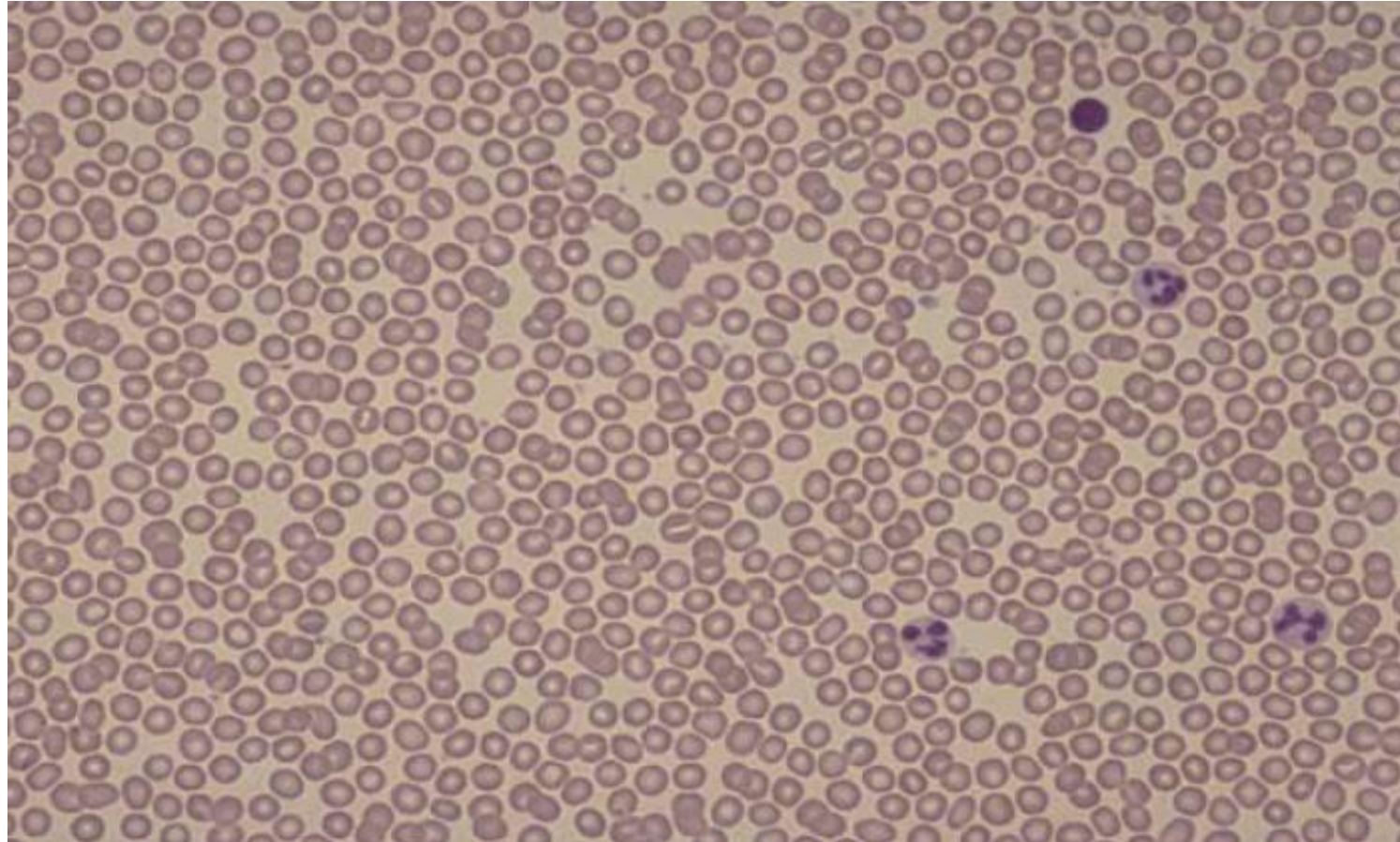




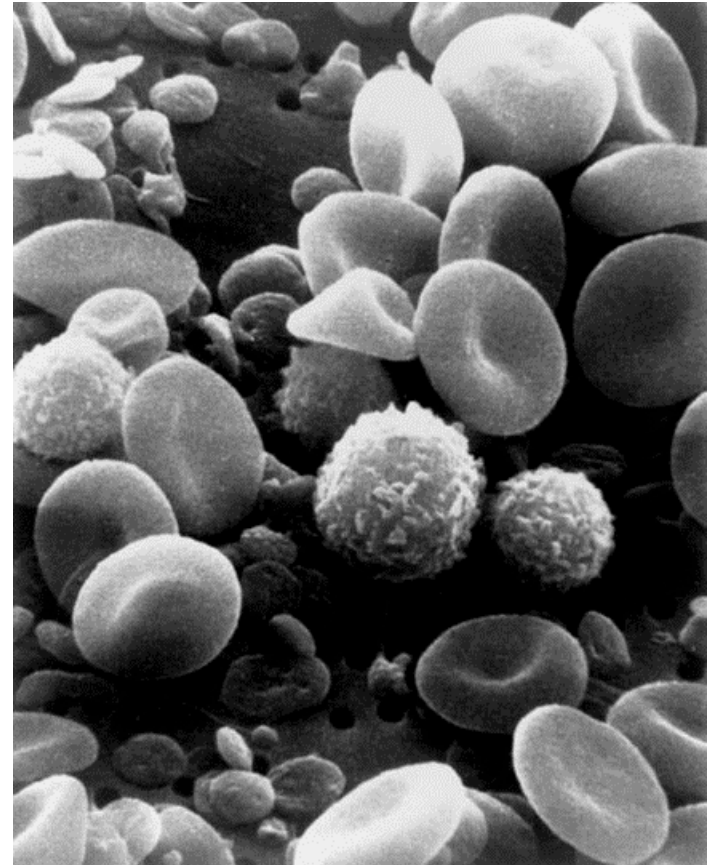
Normal blood film





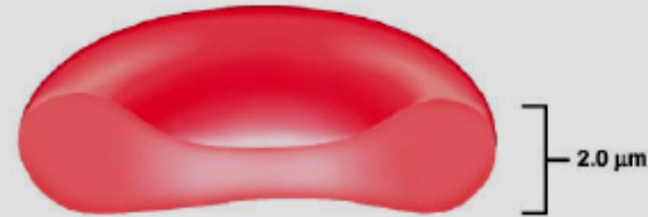


RBC

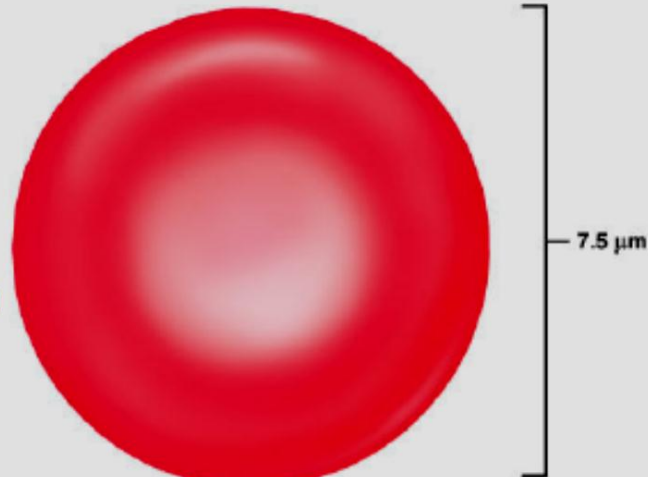


- Erythrocytes

- Biconcave discs
- Anucleate
- Life span - 120 days
- Normal values
 - Male 5.4 million / mm^3
 - Female 4.8 million / mm^3

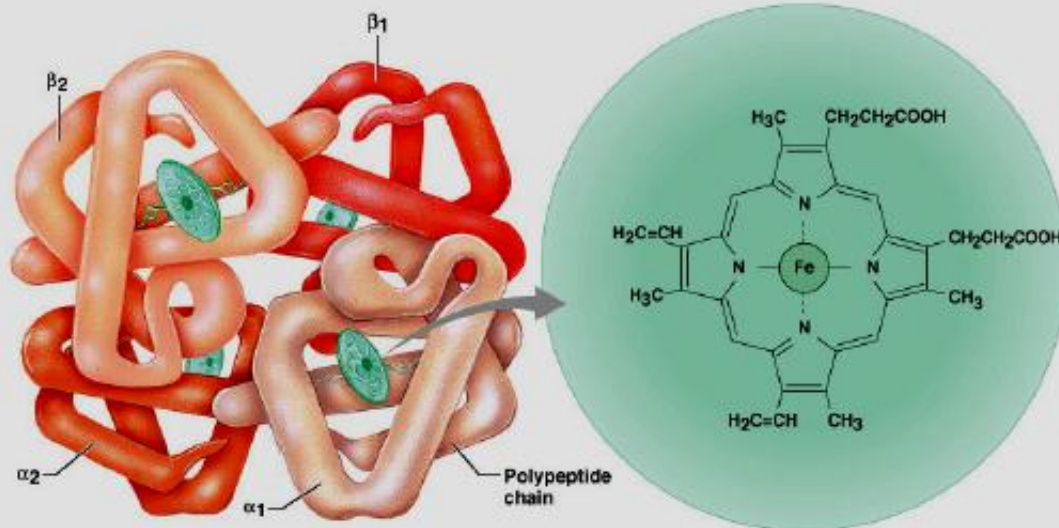


Side view



Top view

Contain Hemoglobin (Hb)

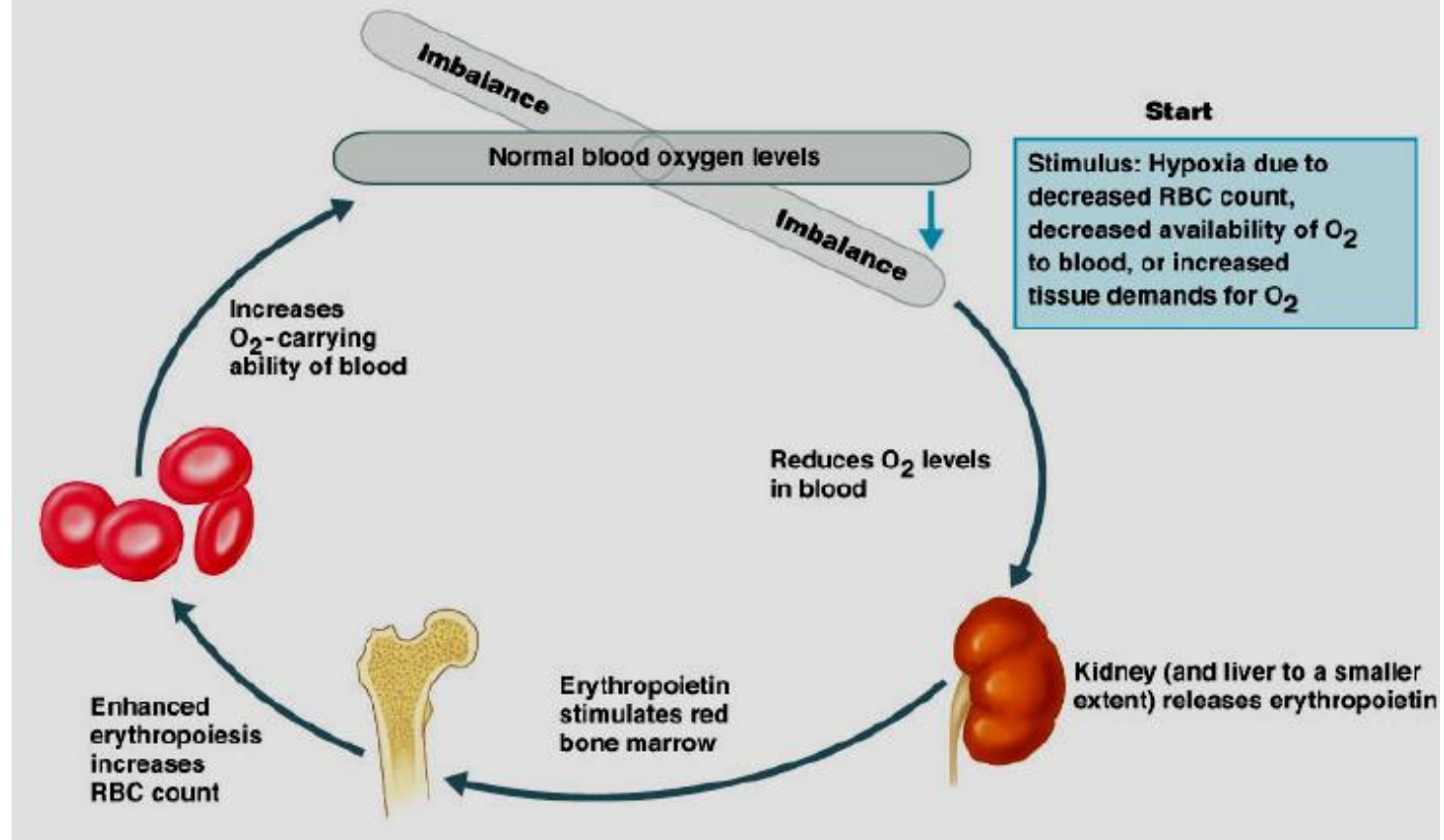


(a) Hemoglobin

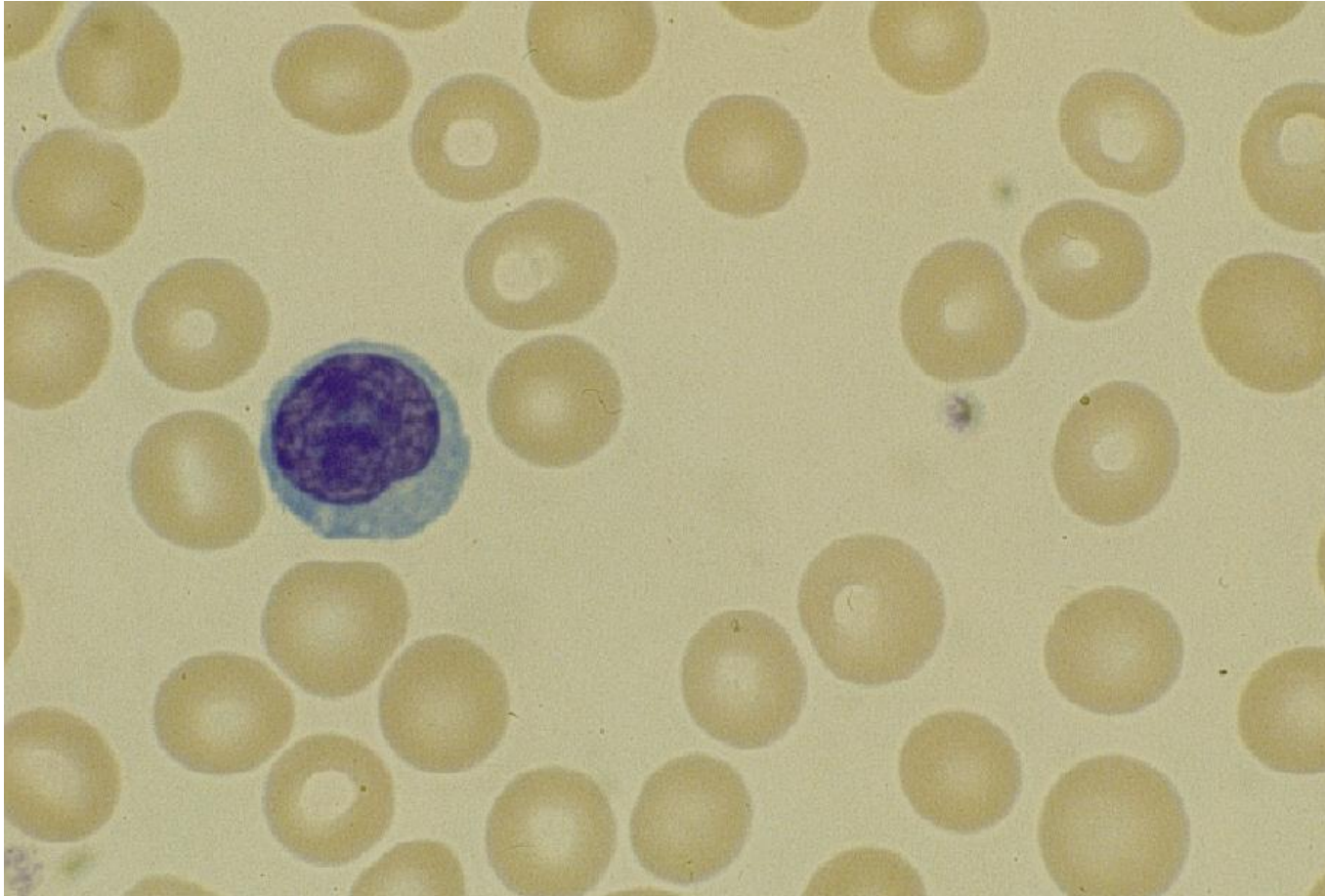
(b) Iron-containing heme group

- Made up of four protein chains
- Possess and iron containing heme group
- Carries oxygen (oxyhemoglobin) and carbon dioxide (carbaminohemoglobin)
- Normal Values
 - Male 13 – 18 g/dl
 - Female 12 – 16 g/dl

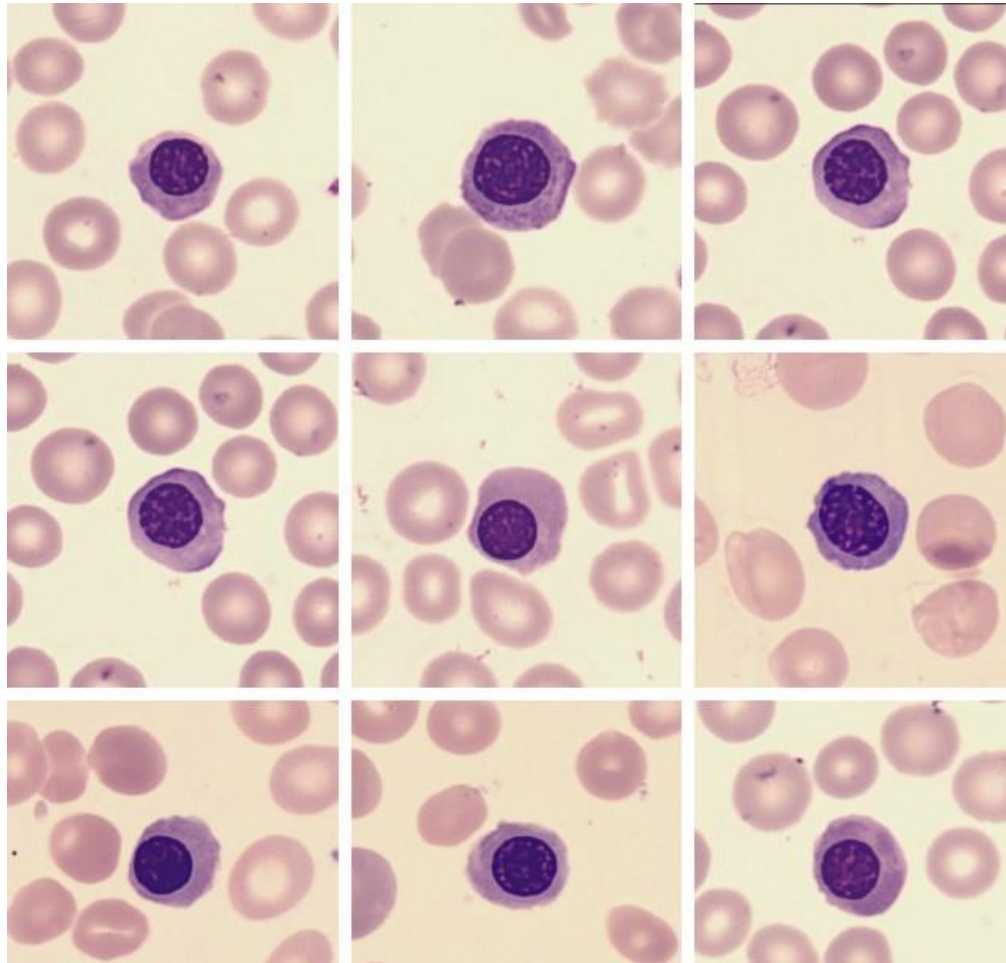
- Regulation and Requirements for Erythropoiesis

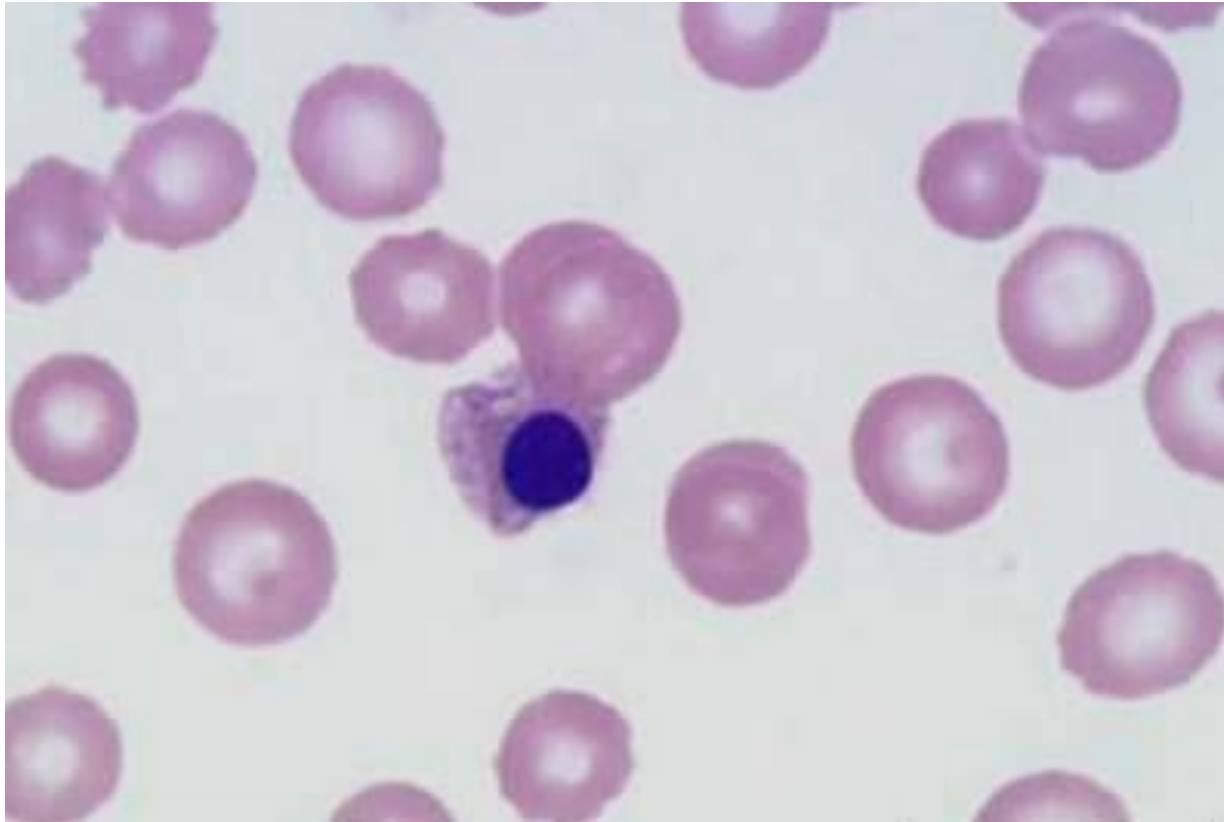


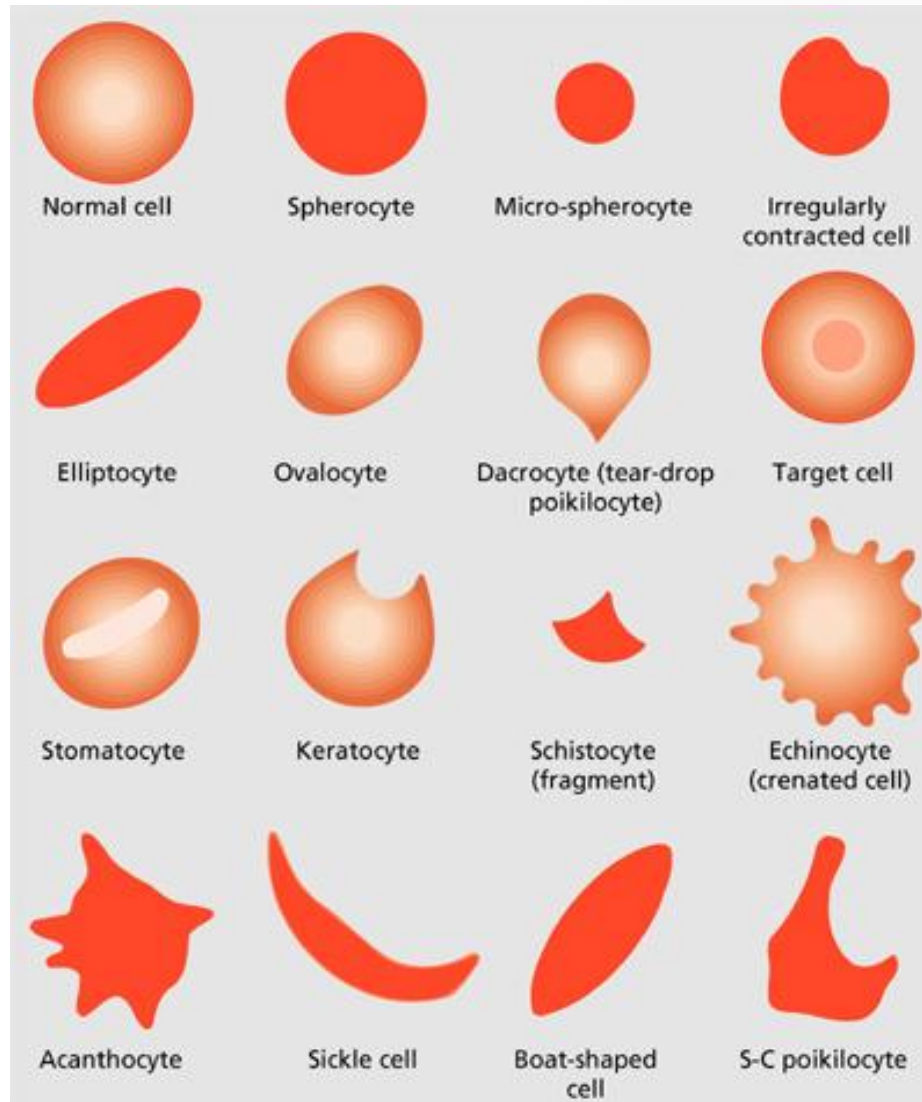
Normochromic normocytic red cells



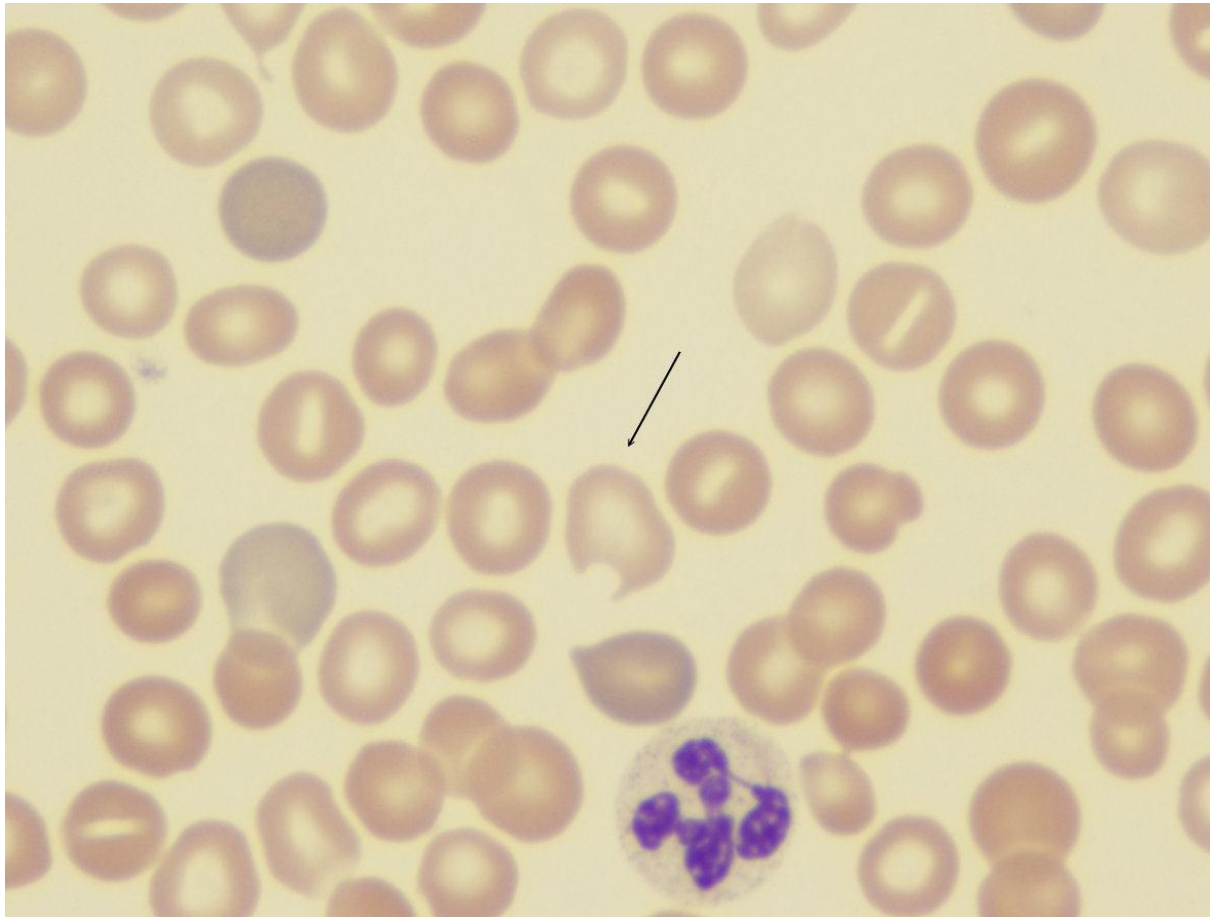
NRBC





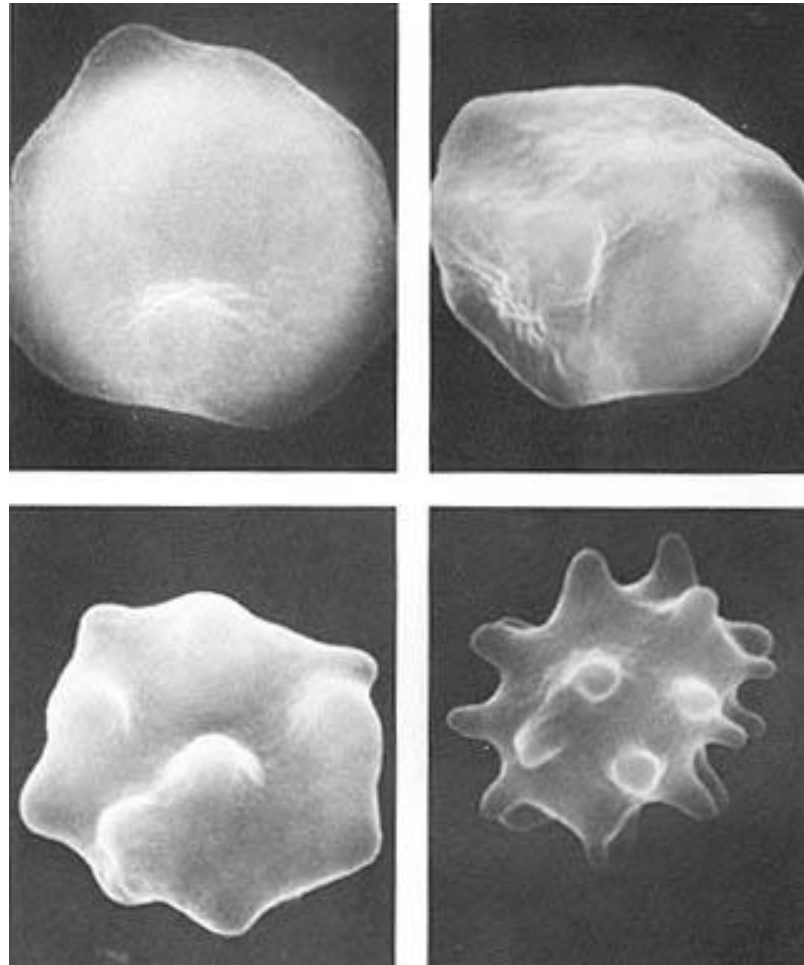


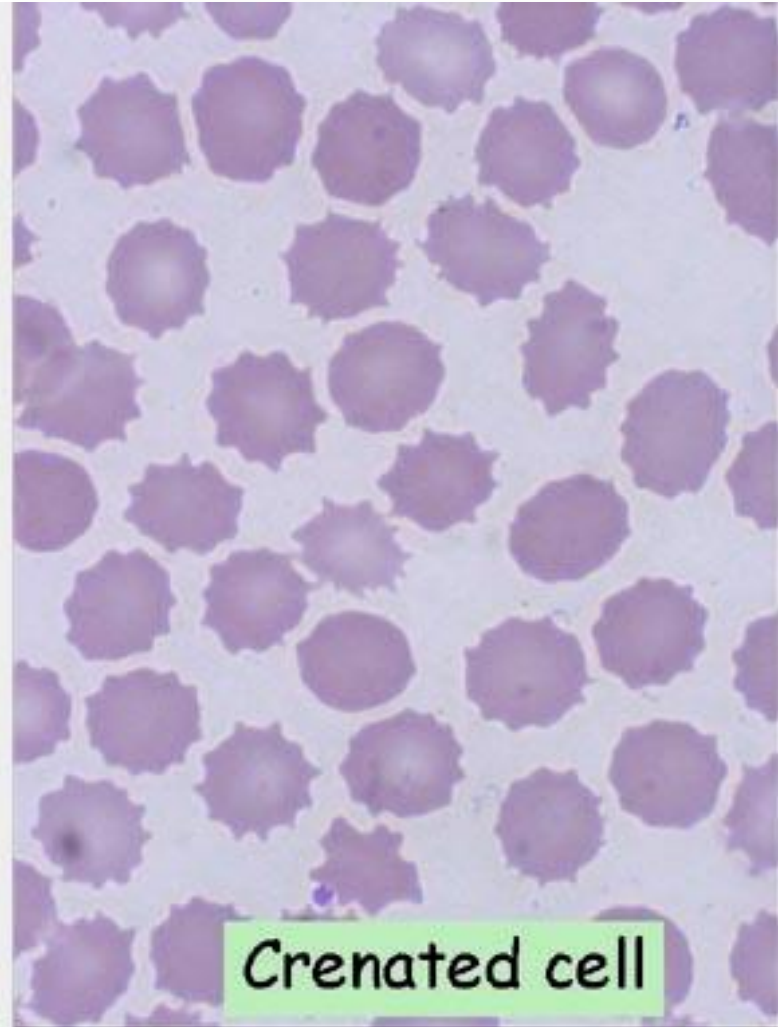
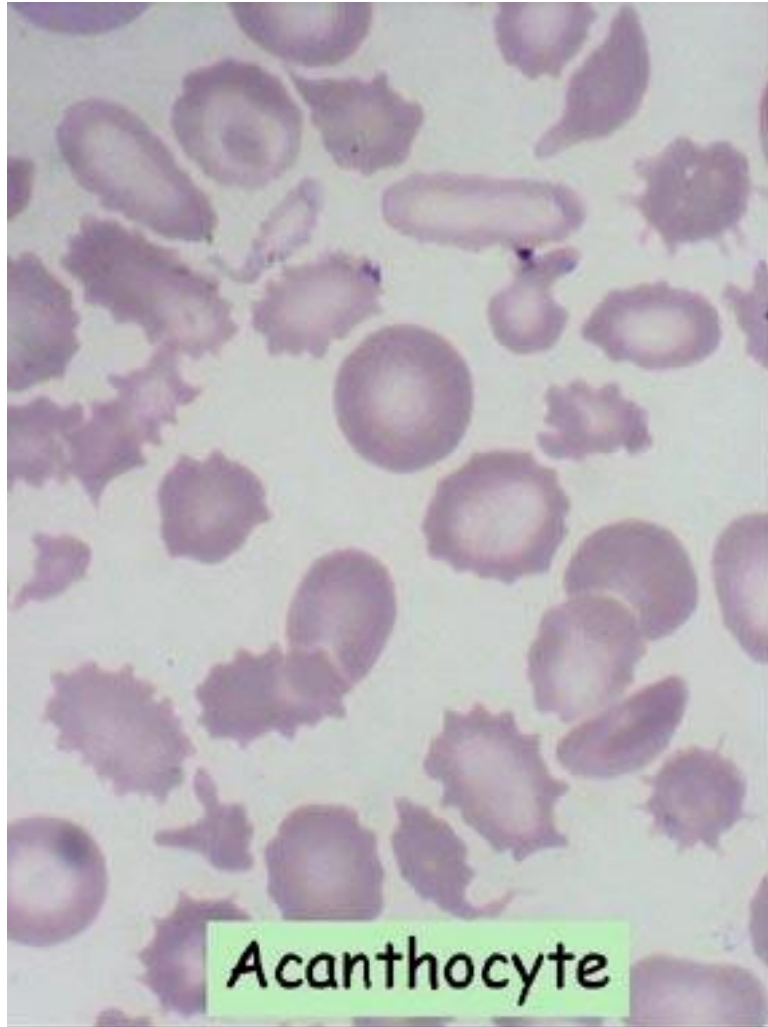
Bite cell



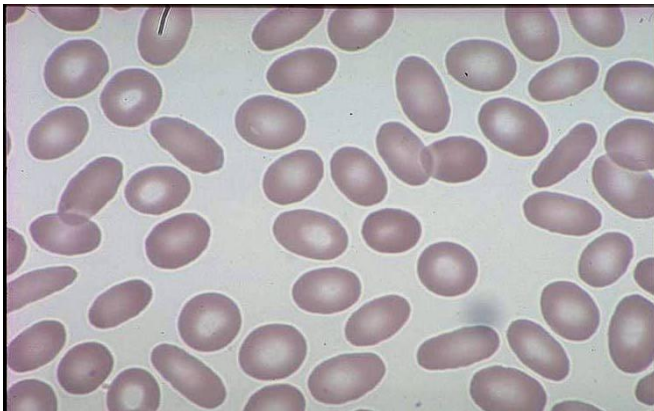
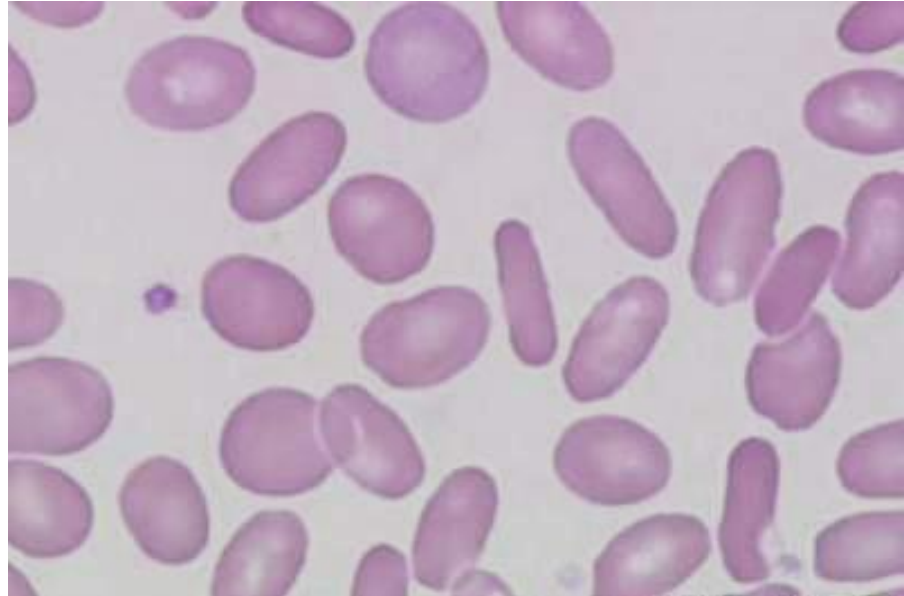
Echinocyte (Burr cell)

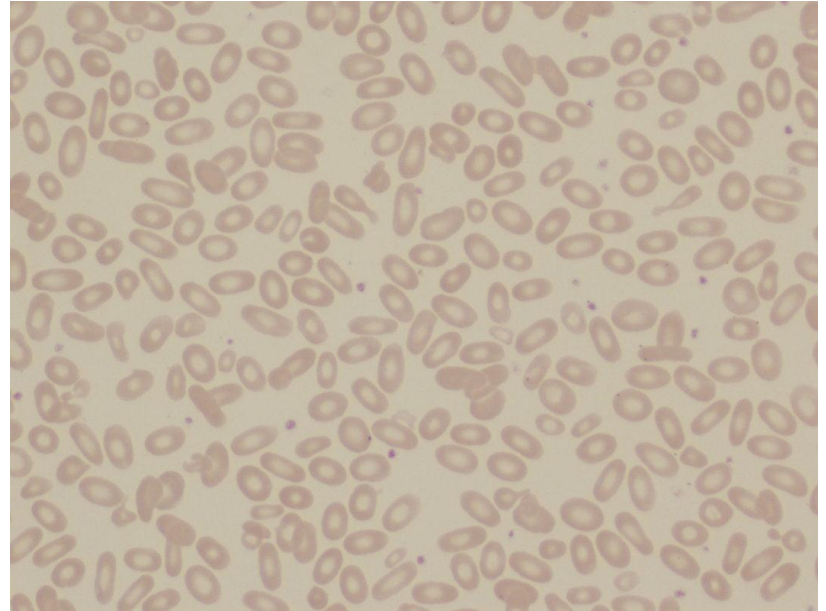
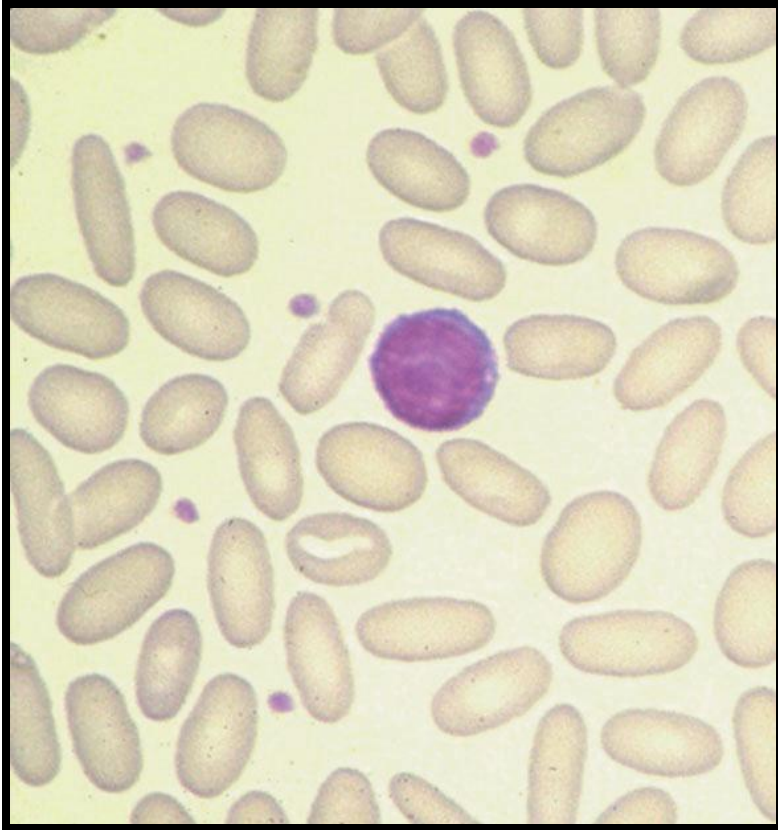




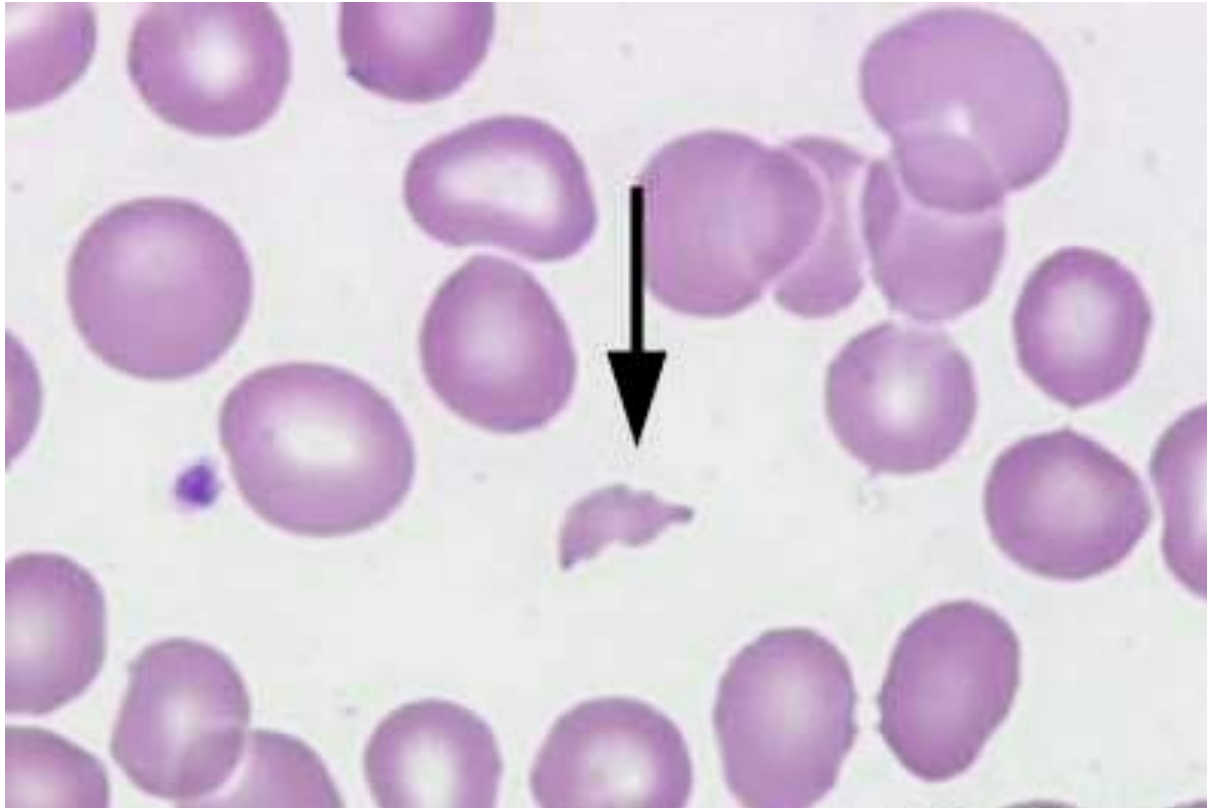


Elliptocytes

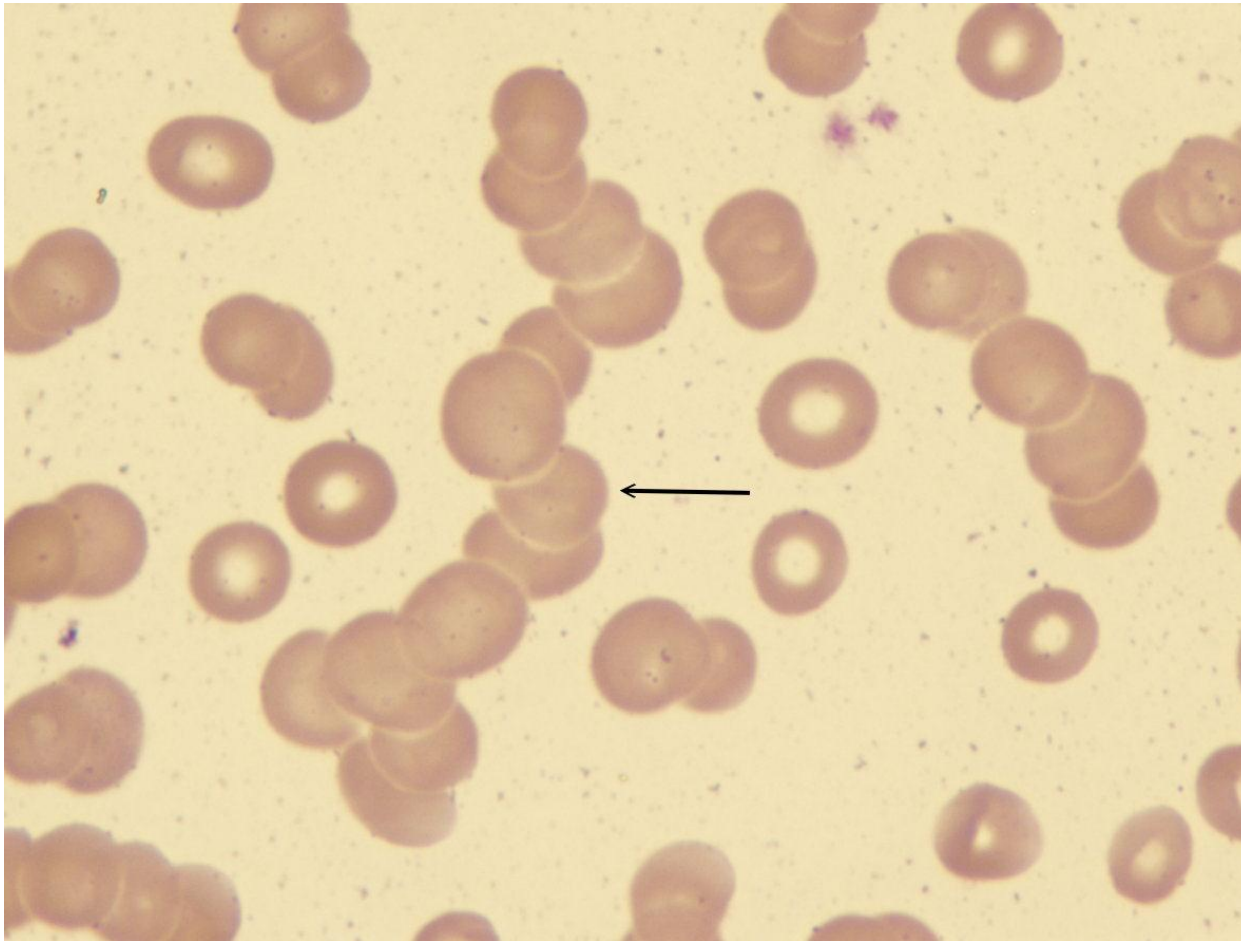


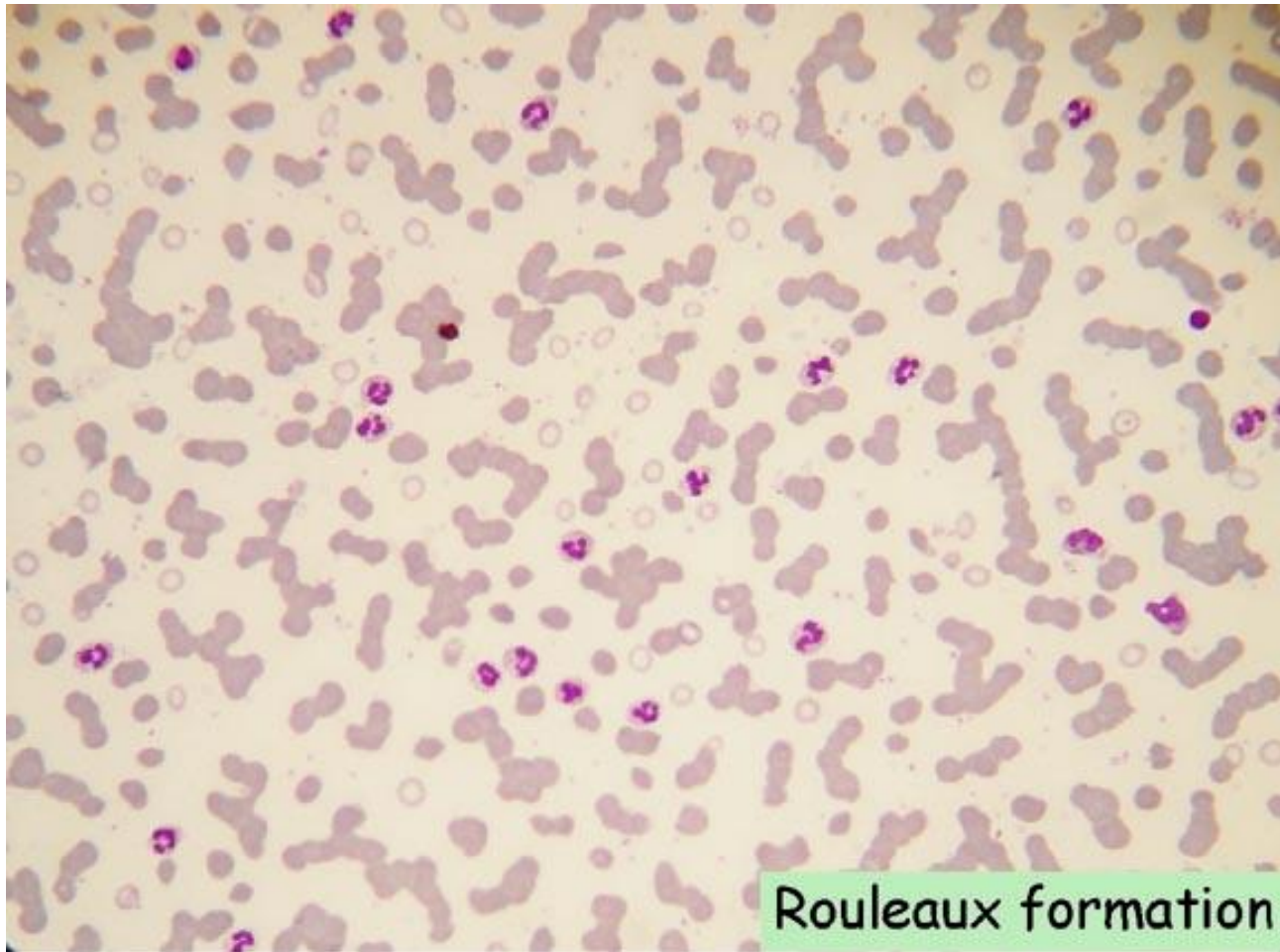


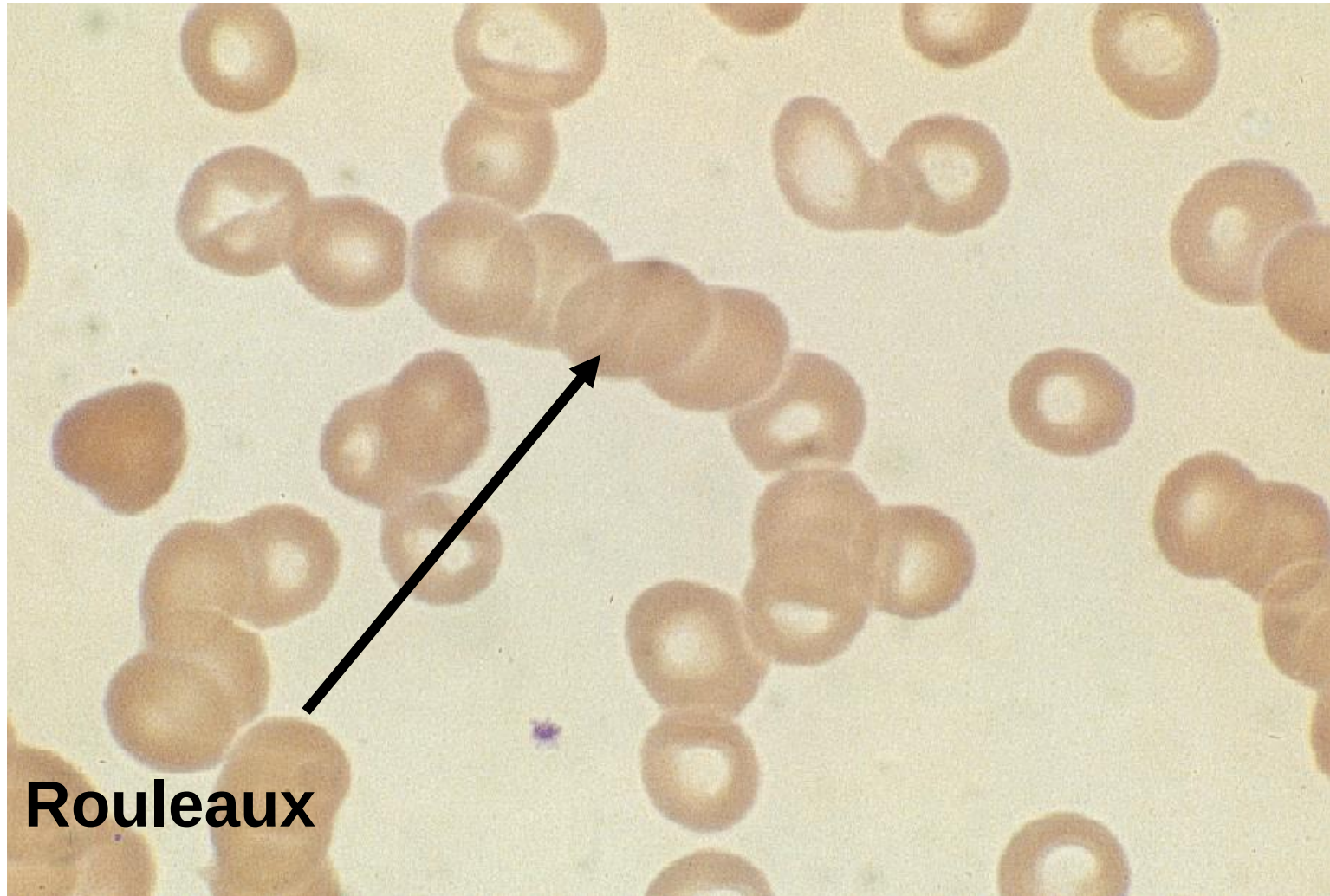
Schistocyte



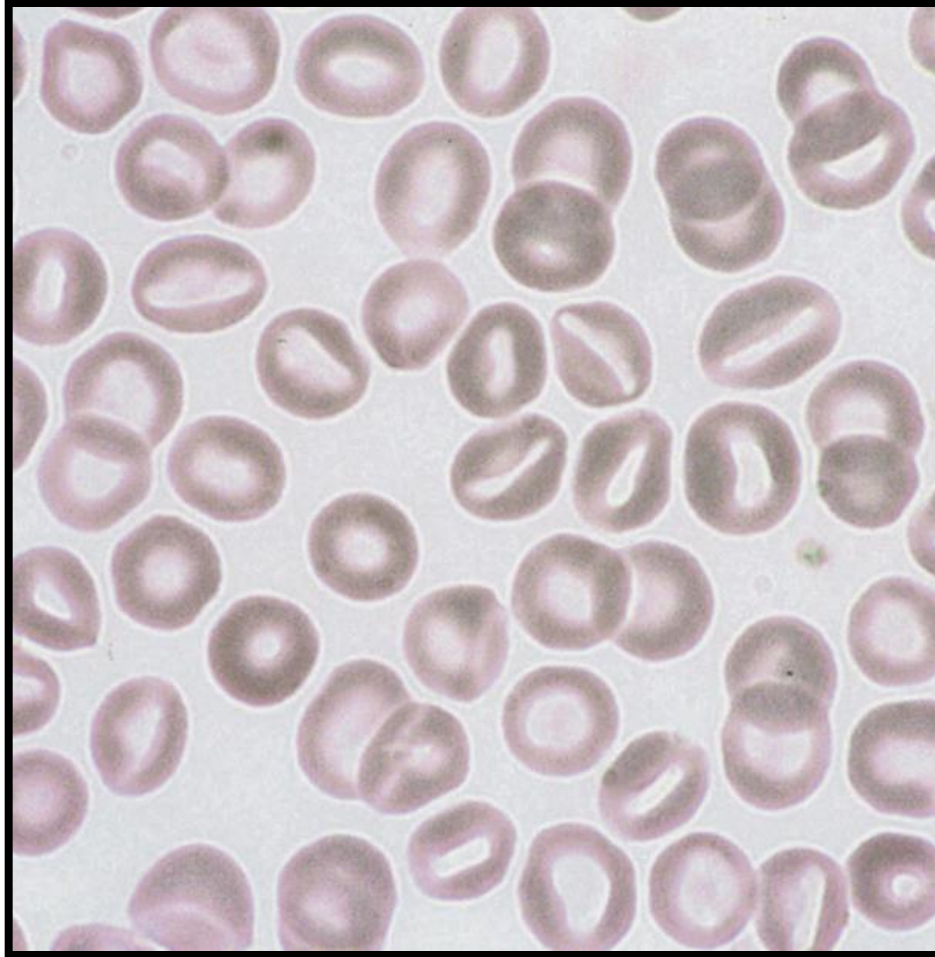
Rouleaux Formation

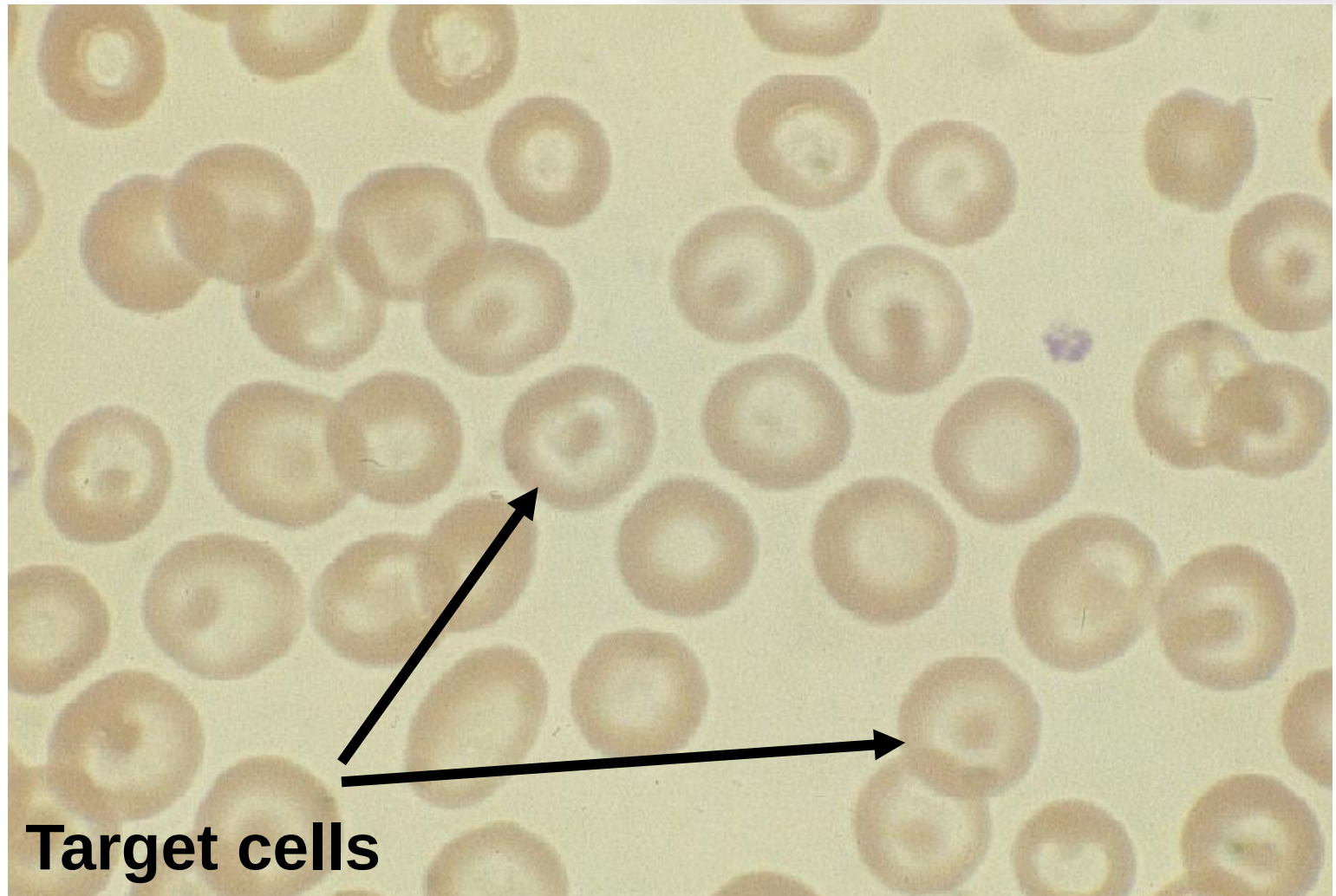


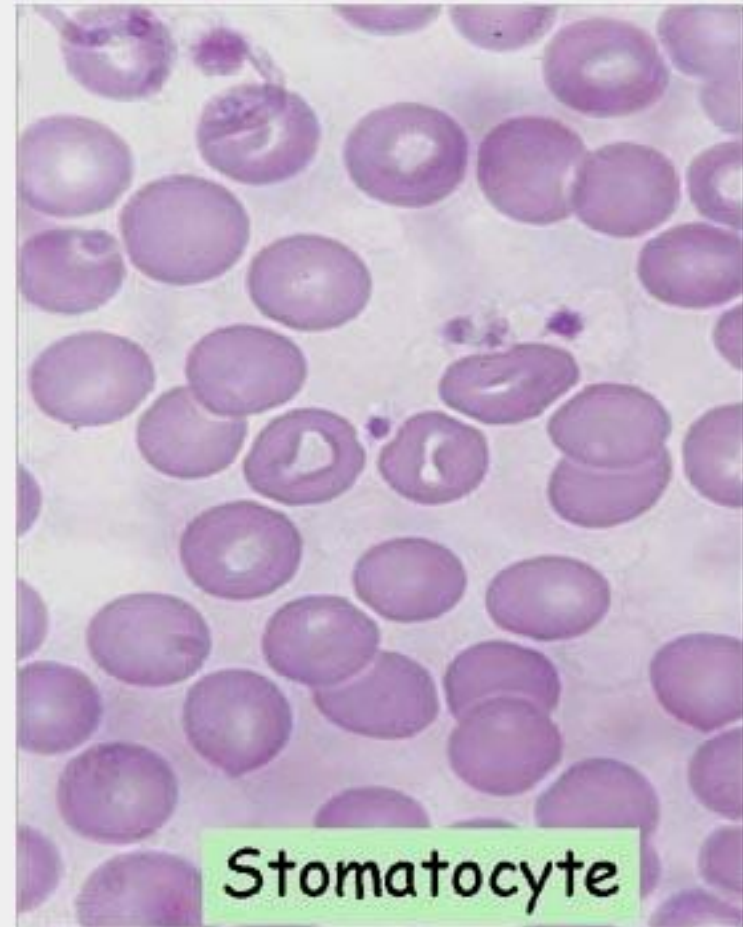
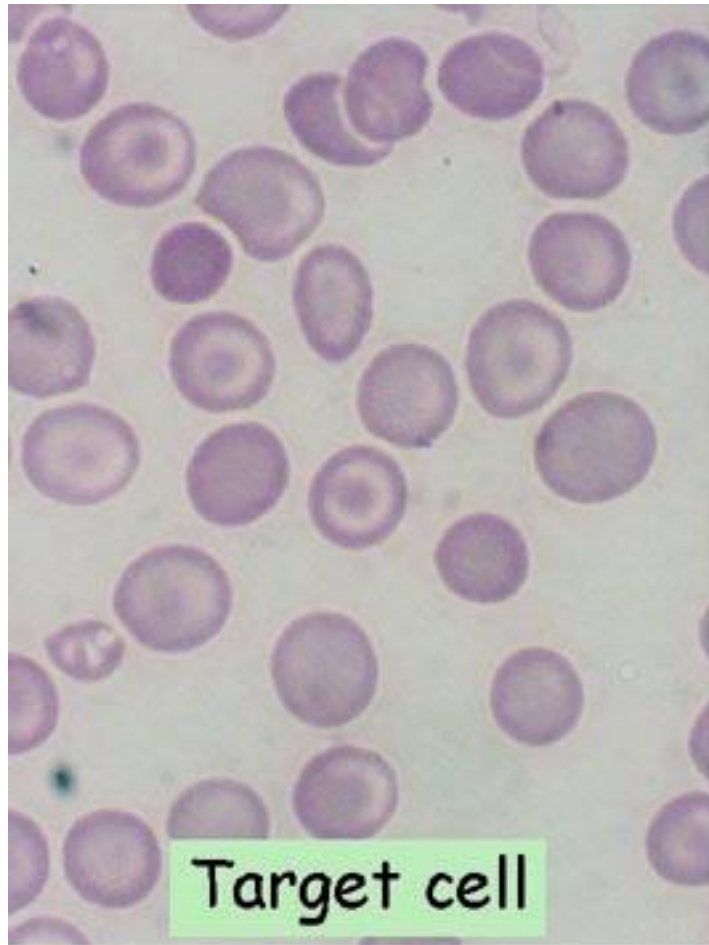


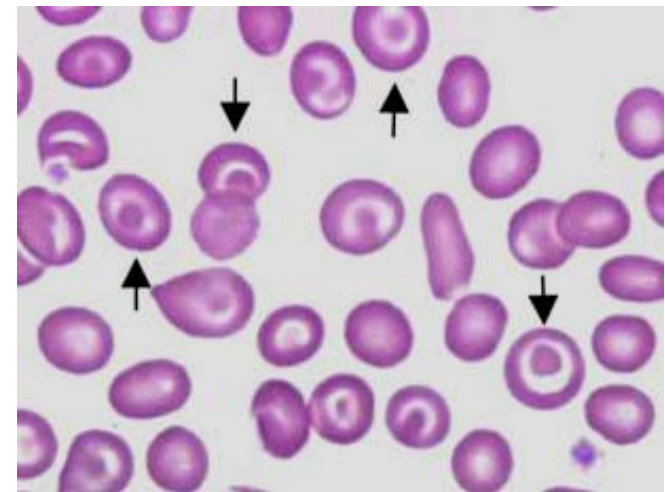
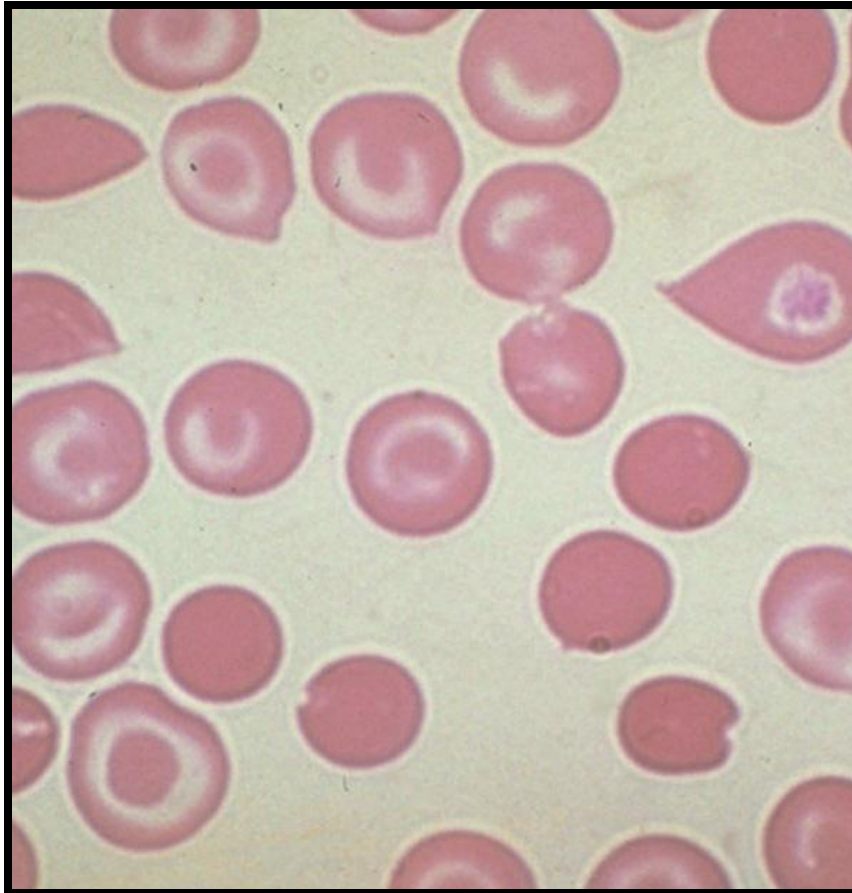


Stomatocyte

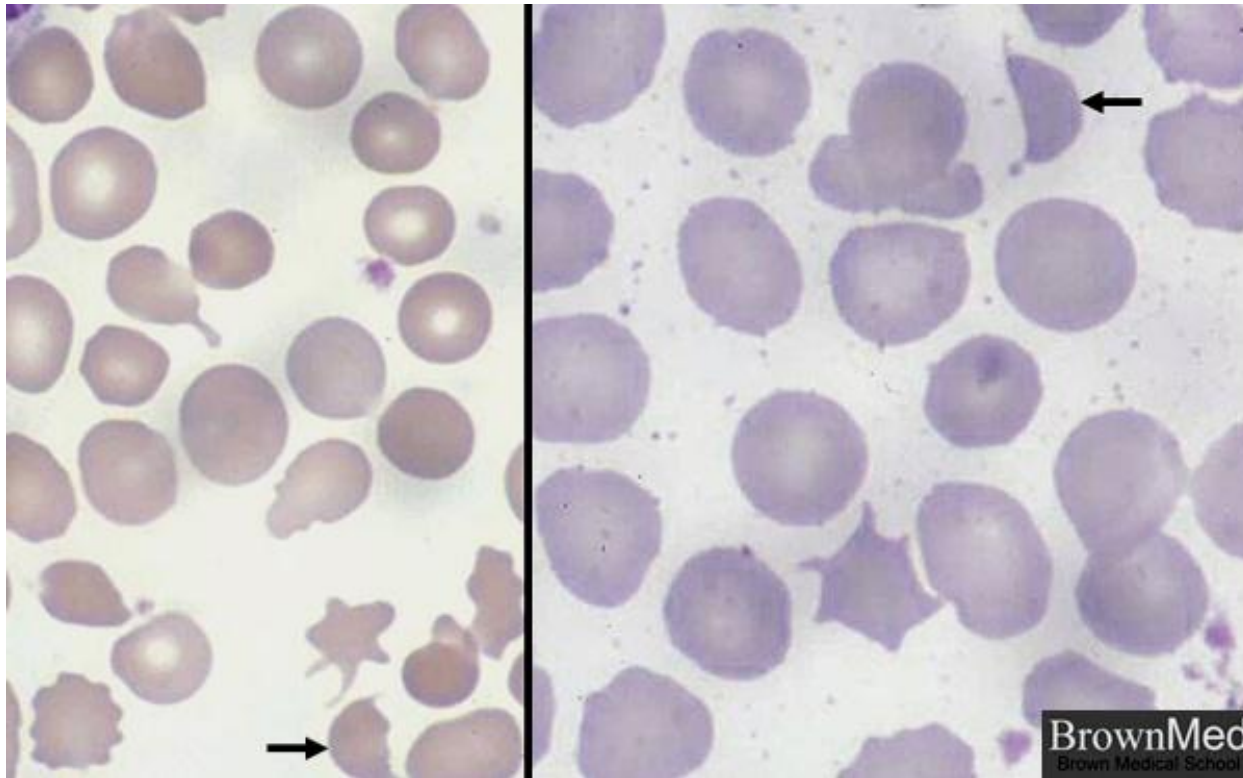




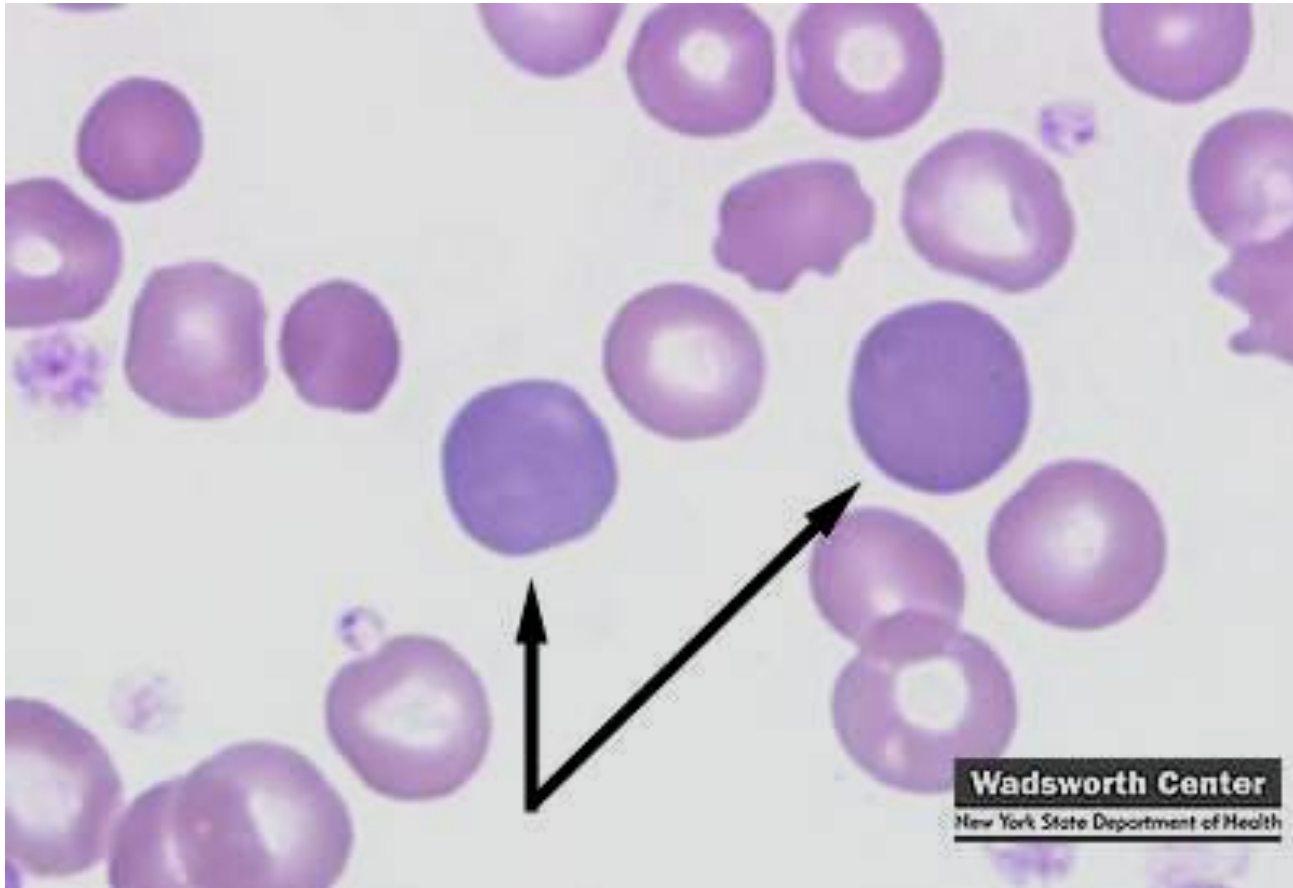


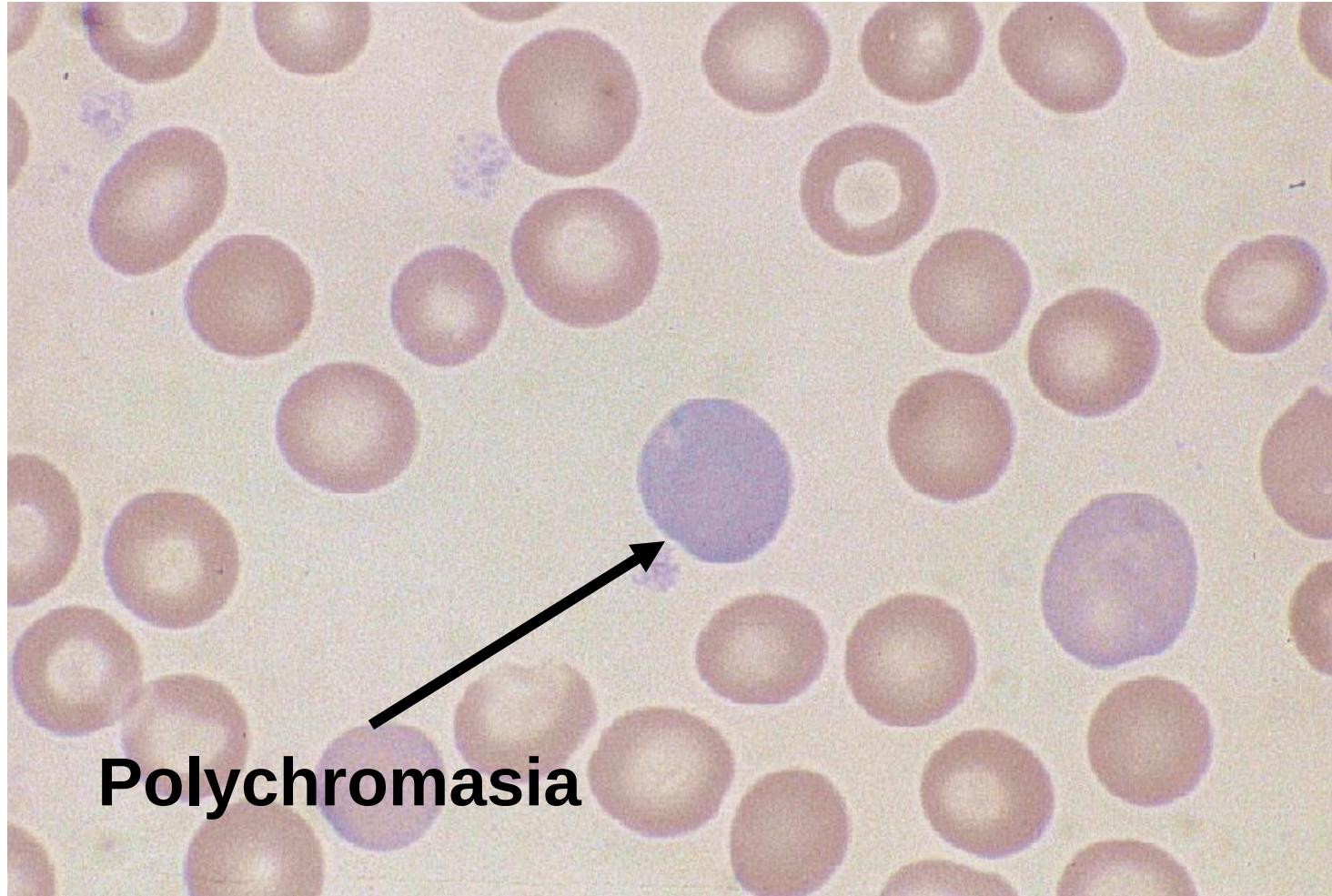


Helmet Cells

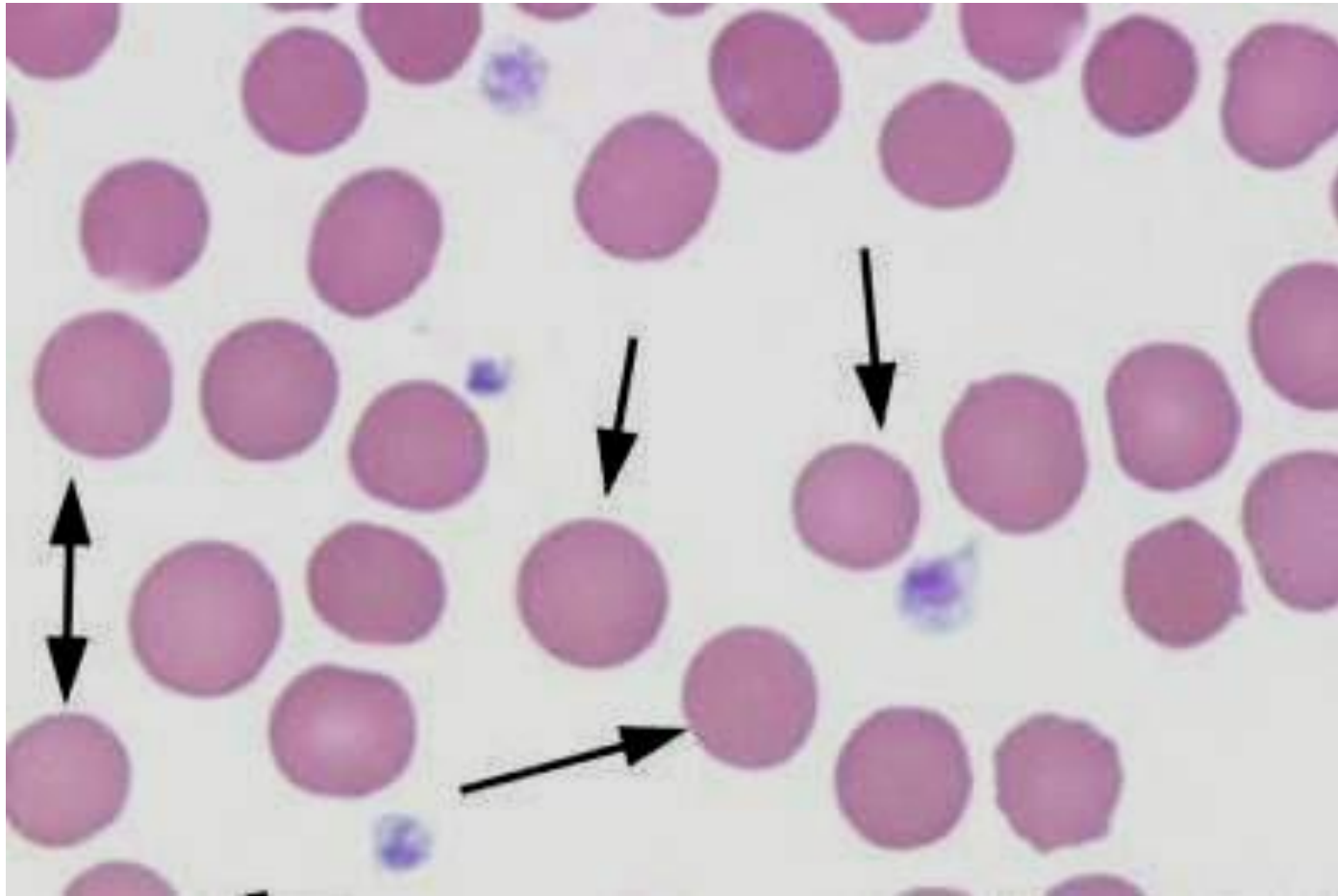


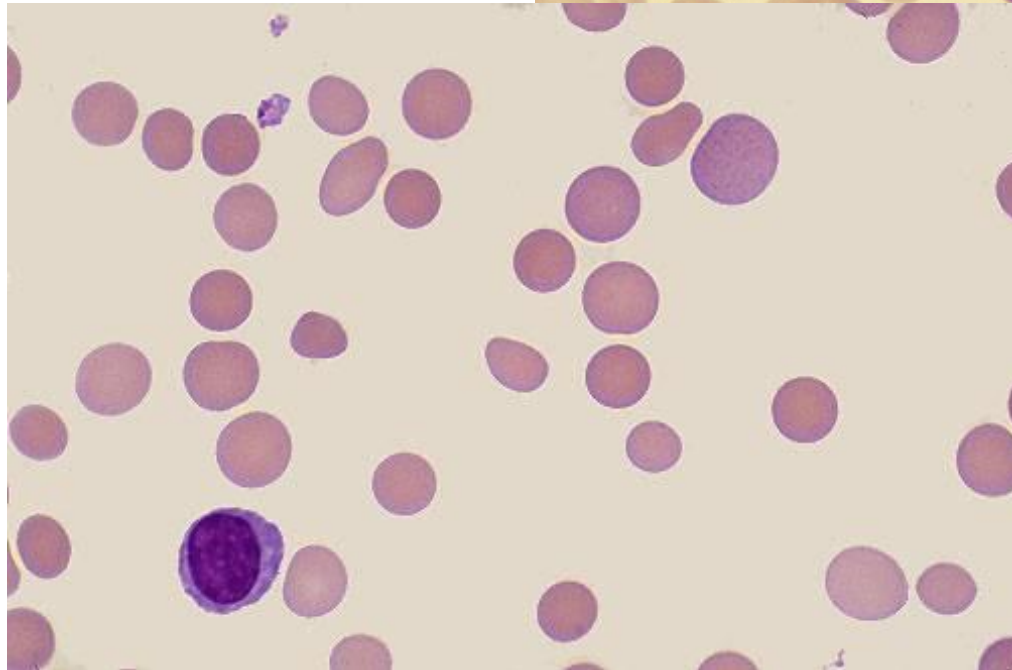
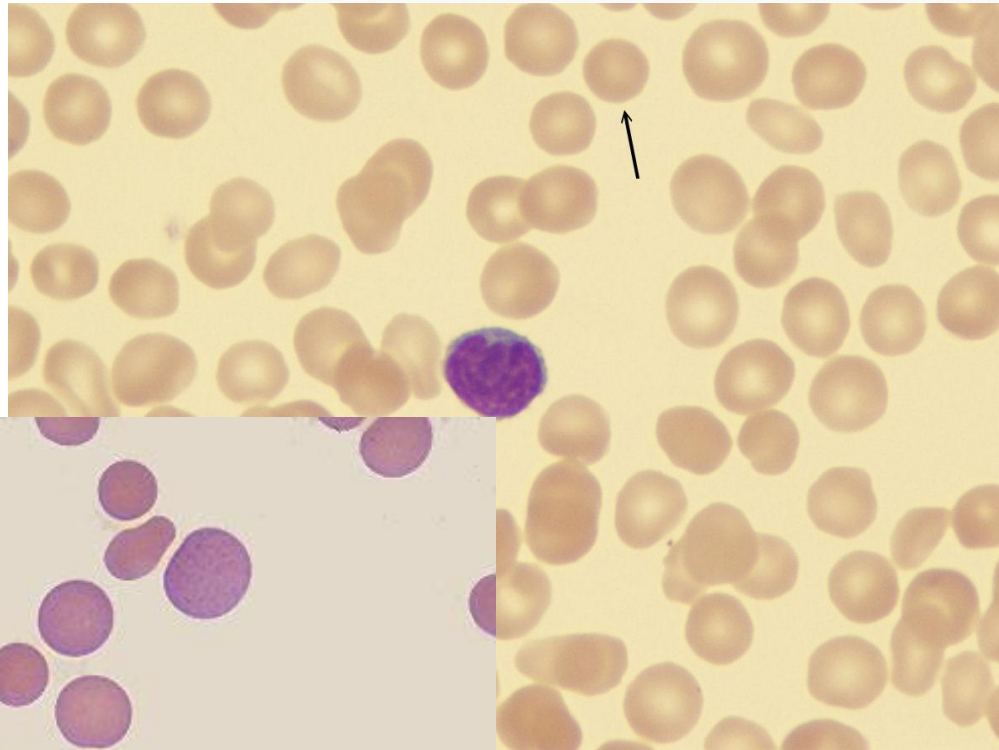
Polychromasia

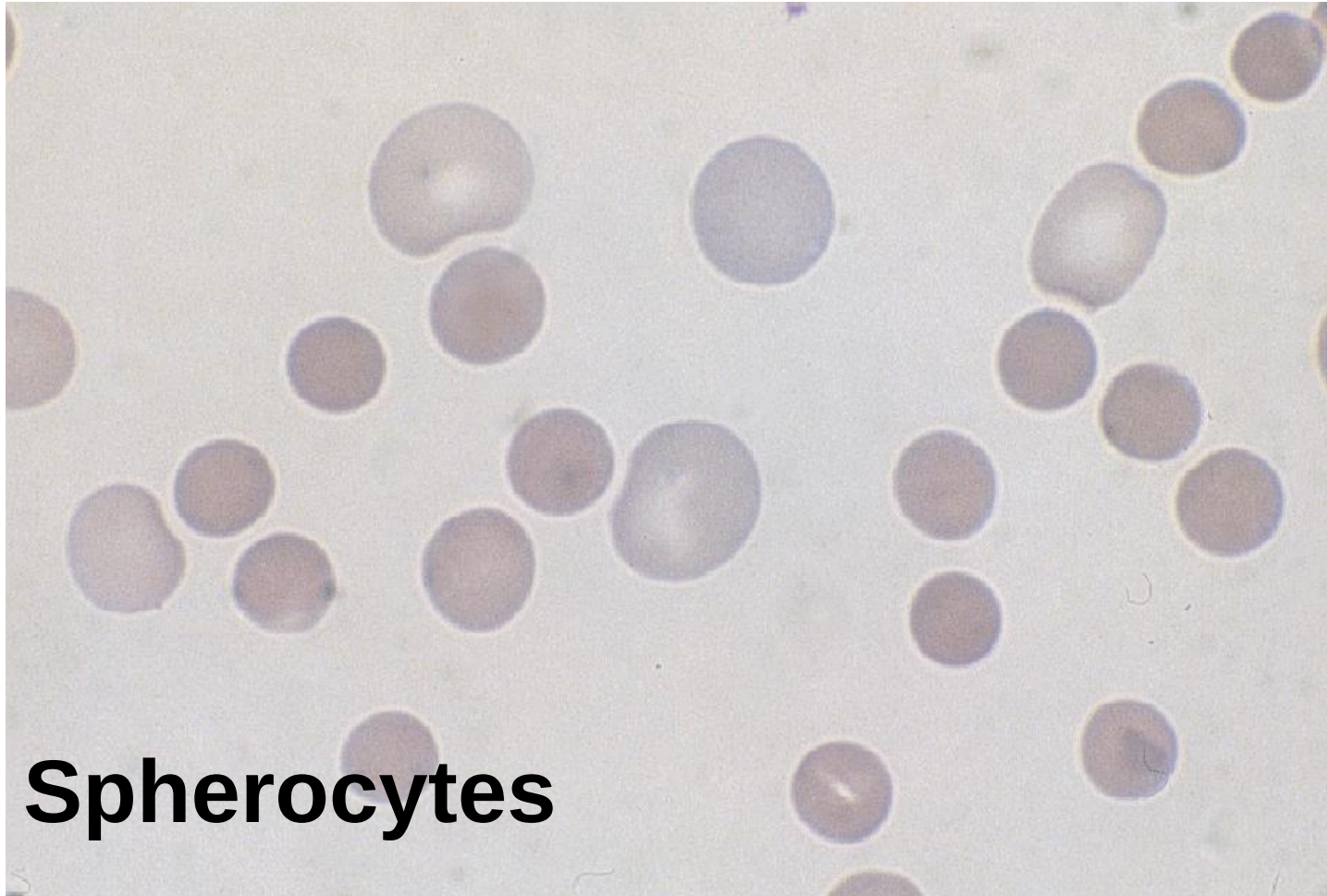




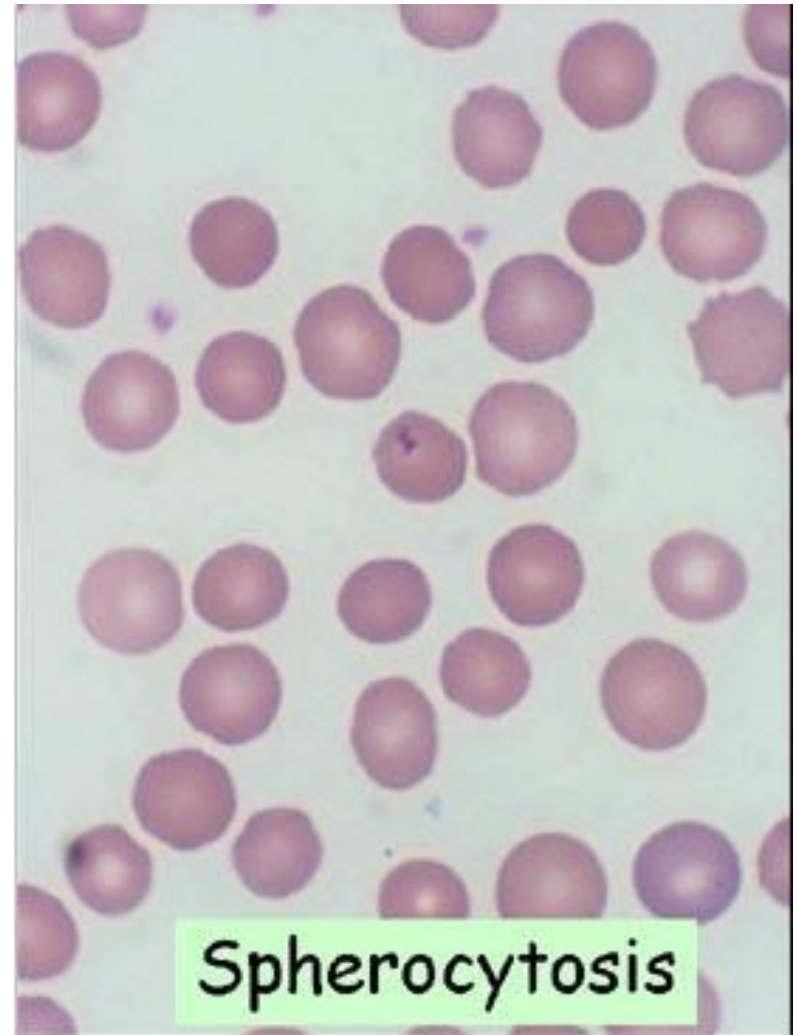
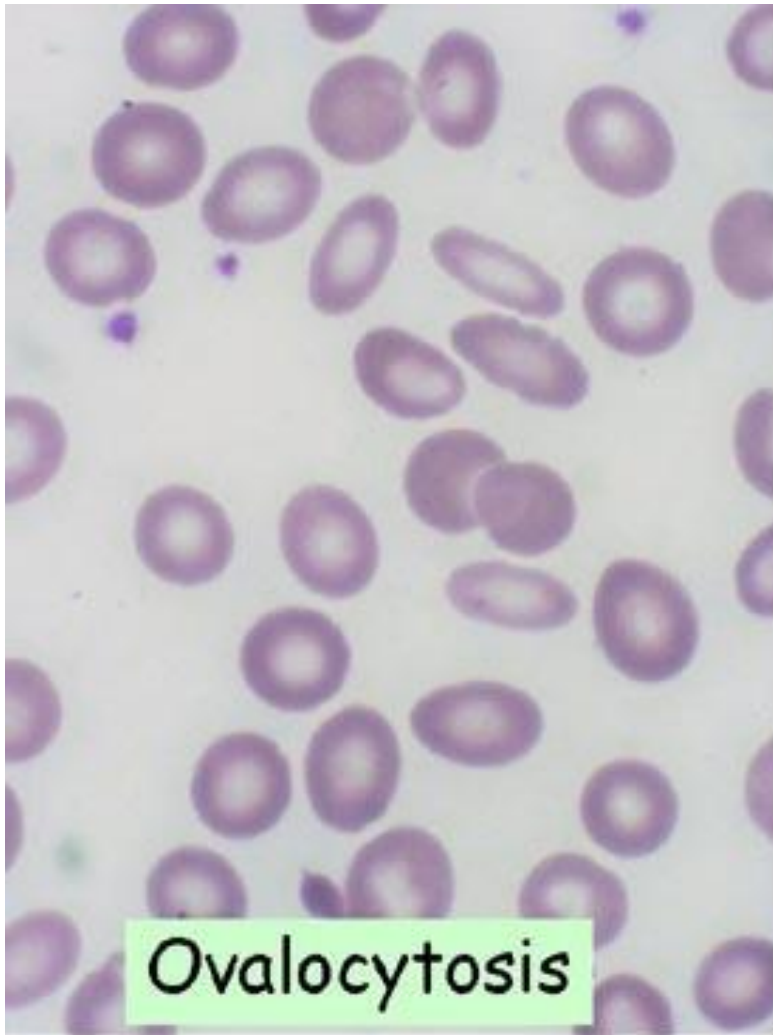
Spherocyte



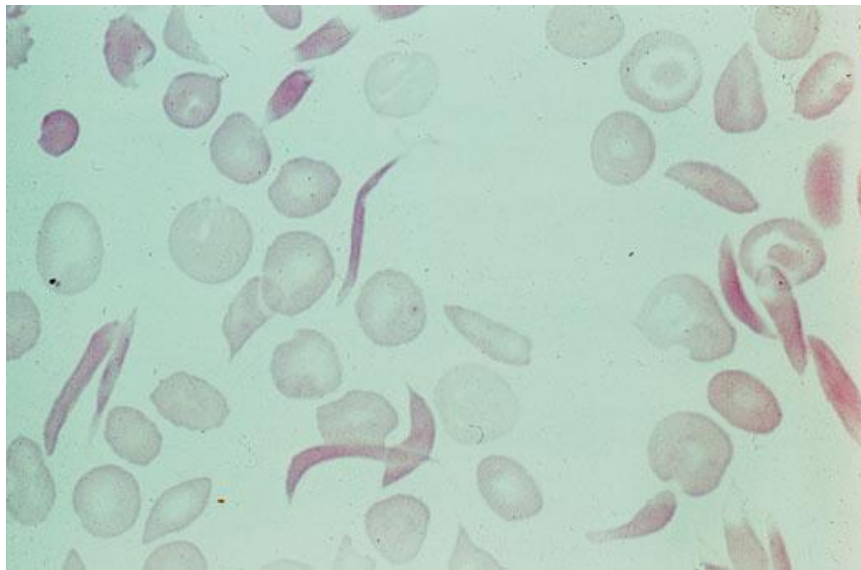




Spherocytes

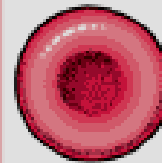


Sickell Cell



Red Blood Cell Shapes

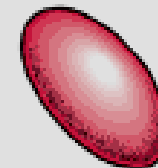
Normal red blood cells are flexible and disk-shaped, thicker at the edges than in the middle. In several hereditary disorders, red blood cells become spherical (in hereditary spherocytosis), oval (in hereditary elliptocytosis), or sickle-shaped (in sickle cell disease).



Normal
cell



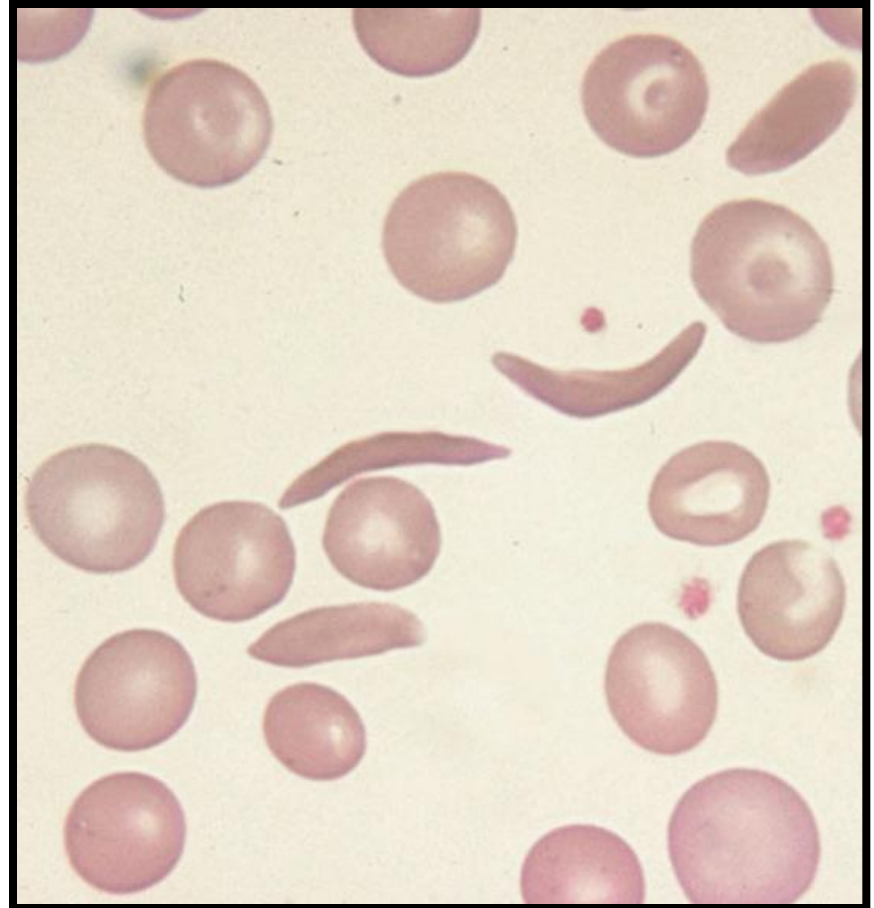
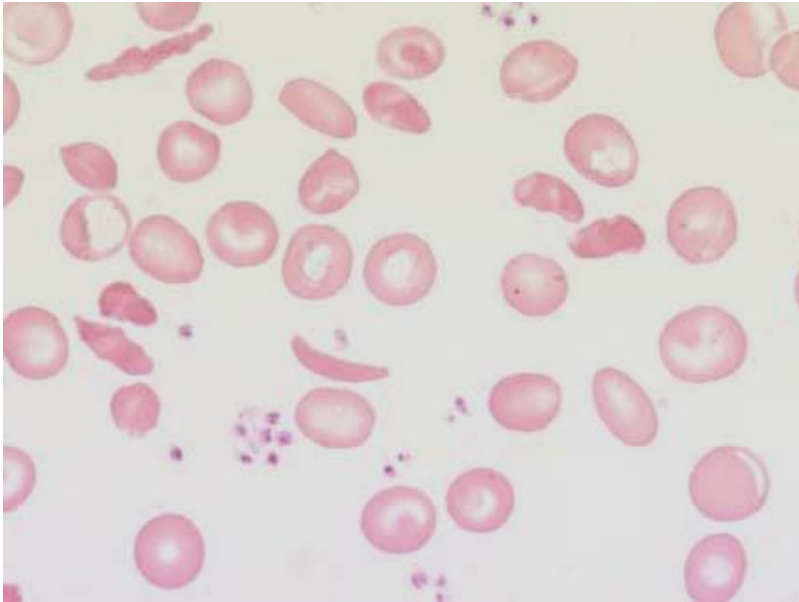
Spherical
cell

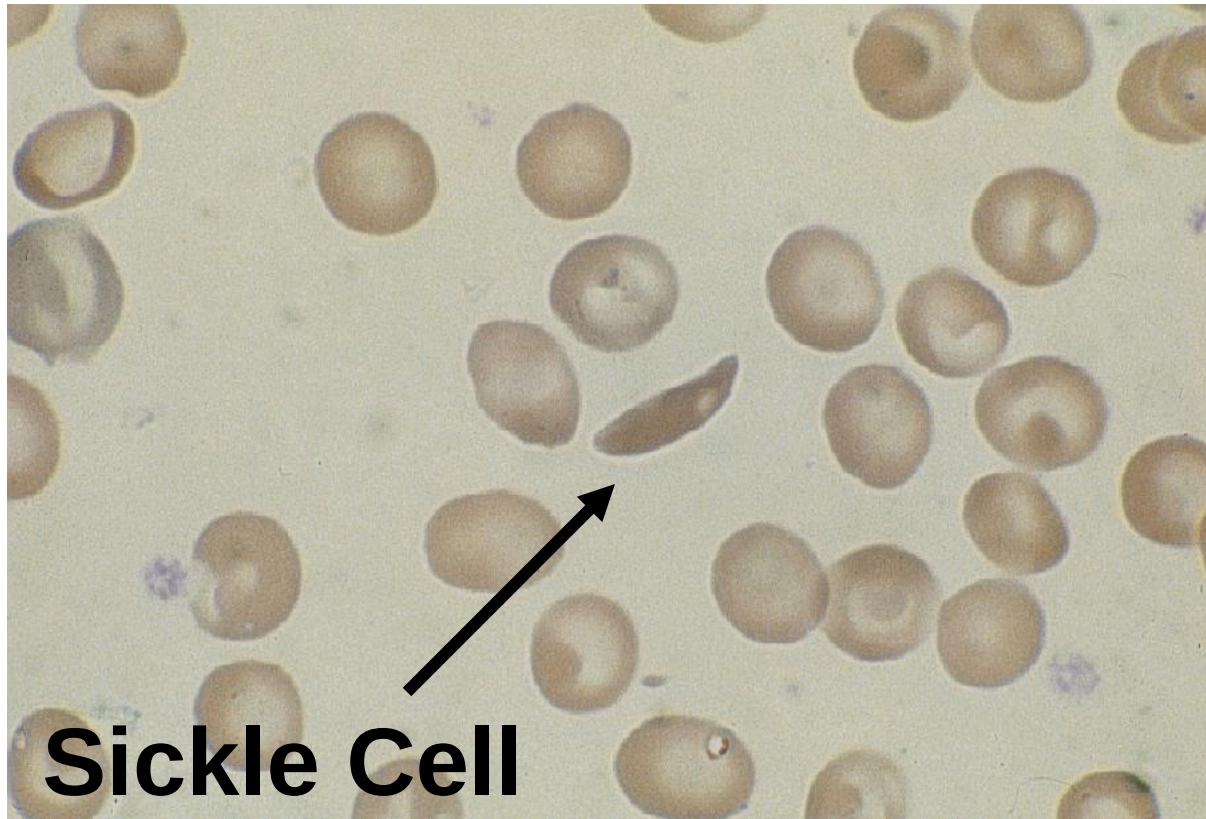


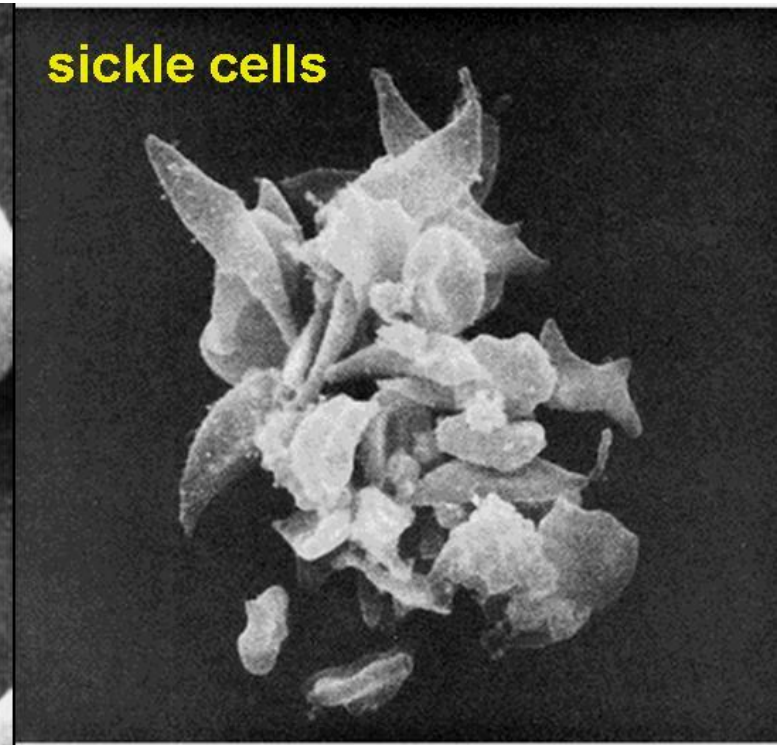
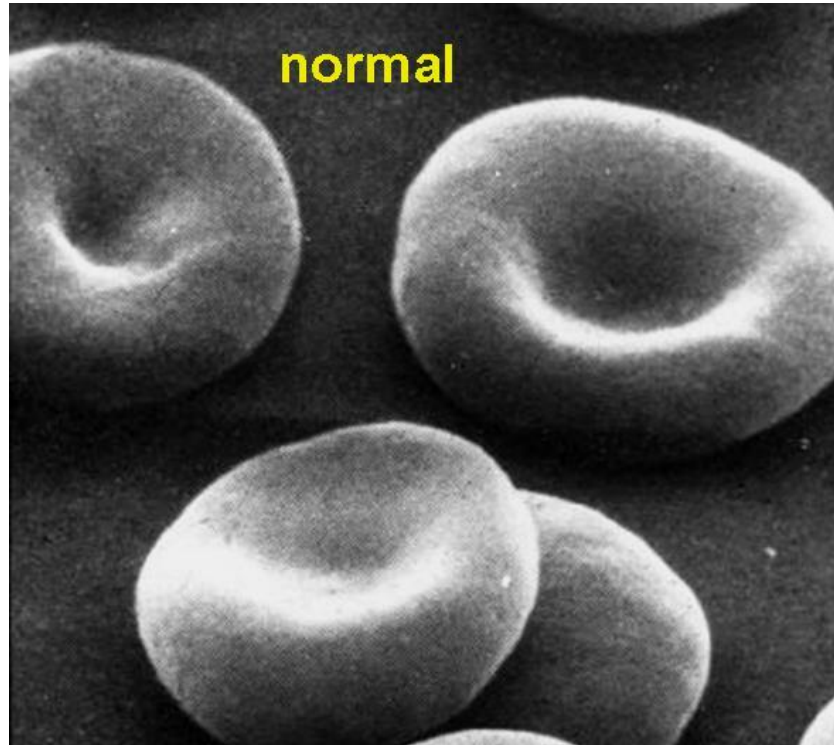
Oval
cell



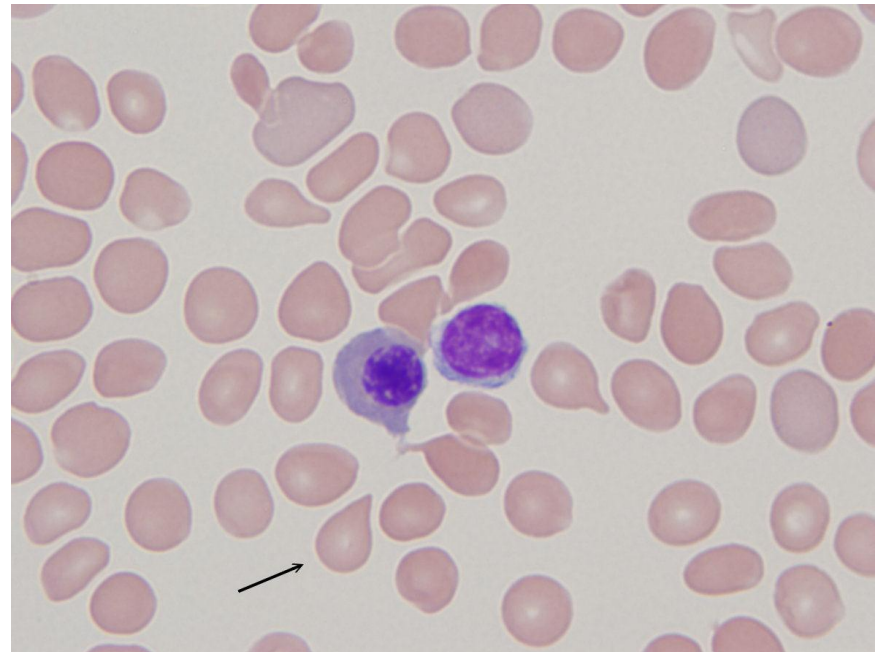
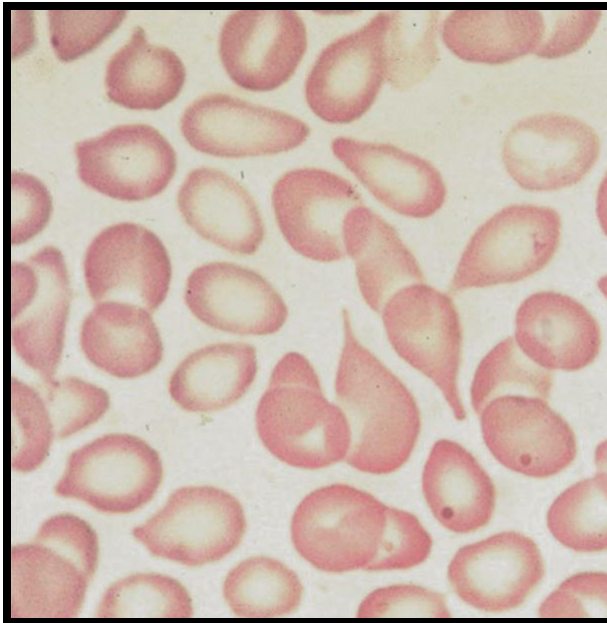
Sickle
cell

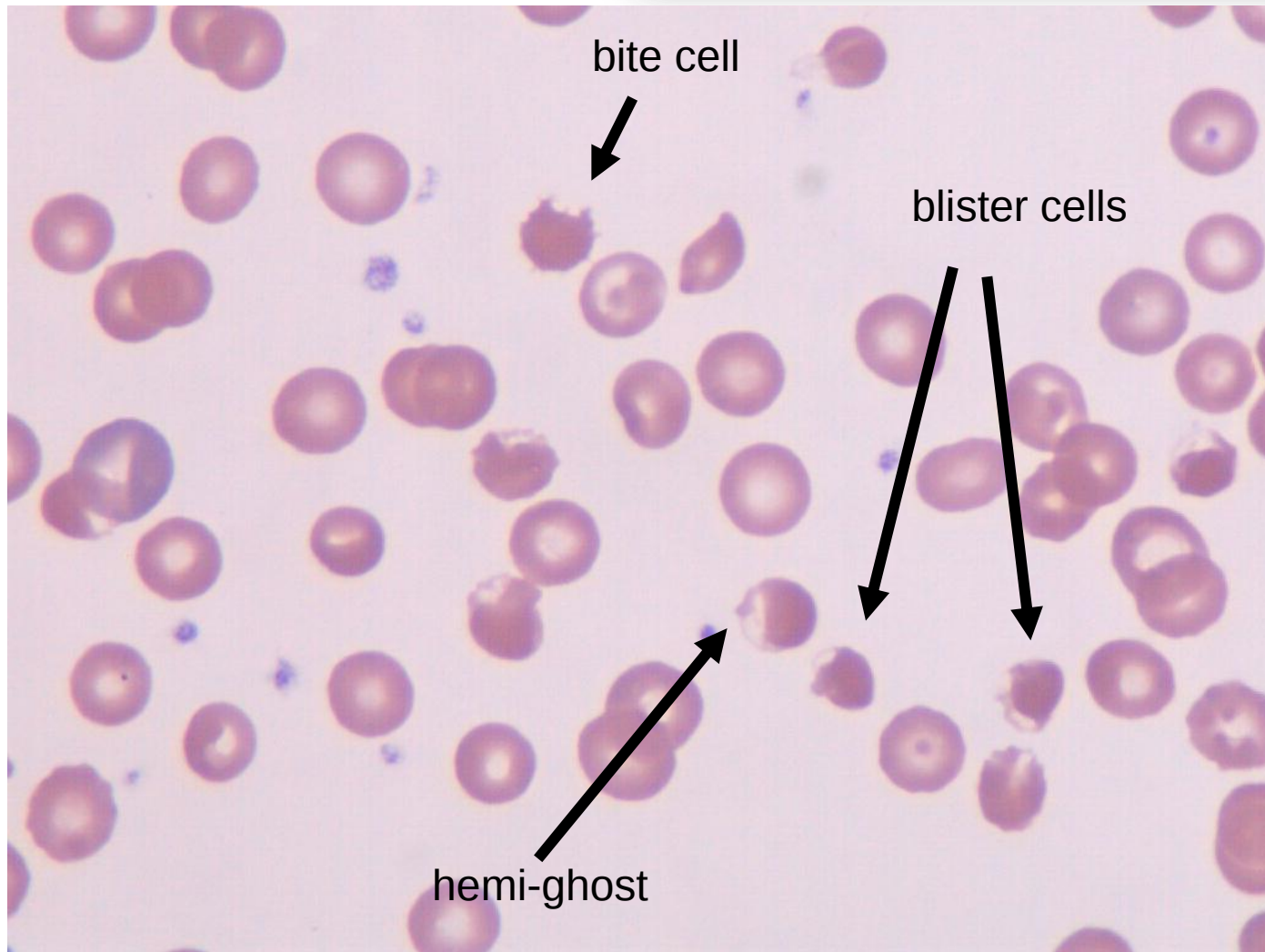


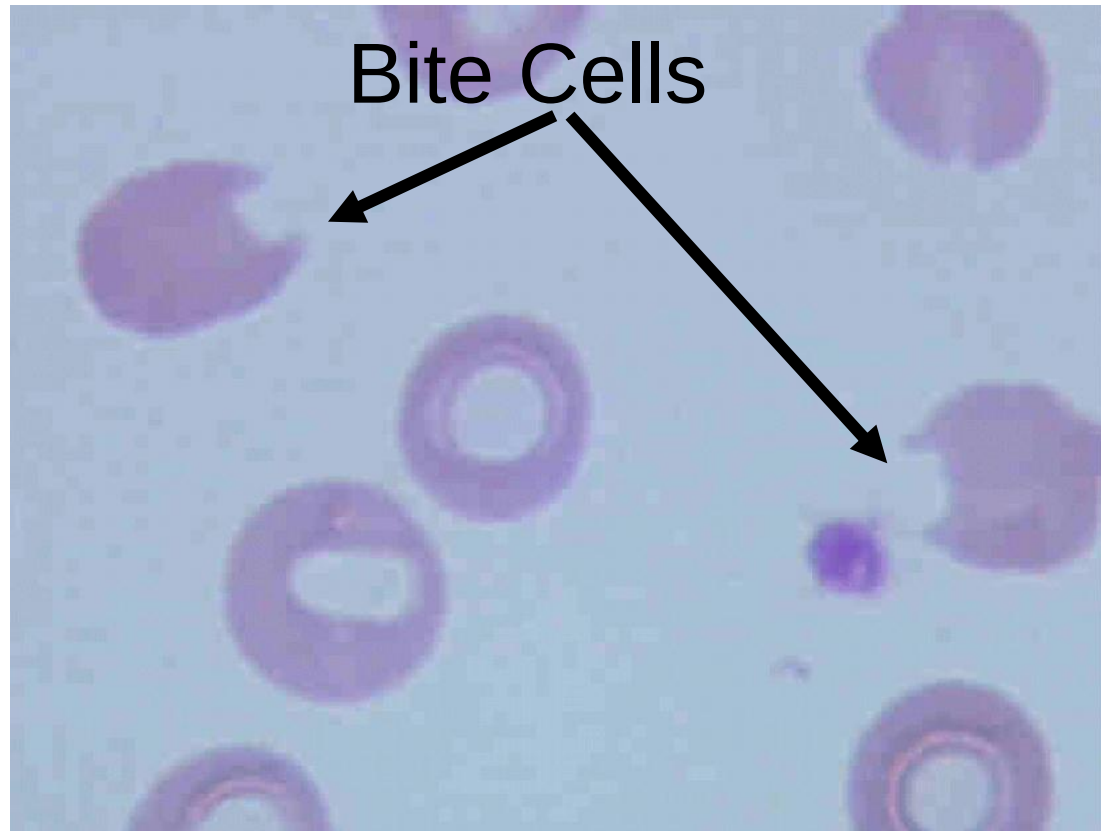




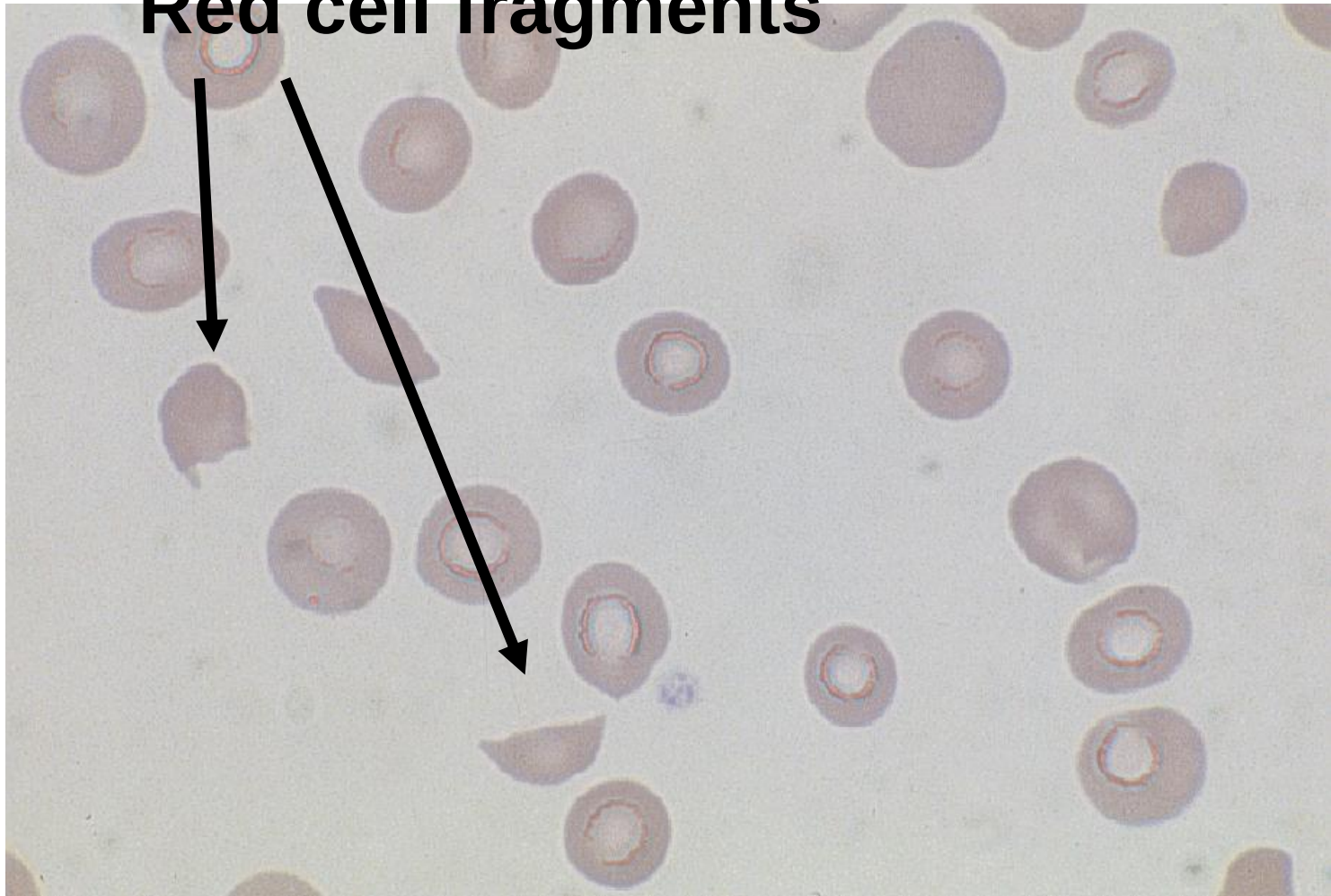
Teardrop cells (dacrocytes)



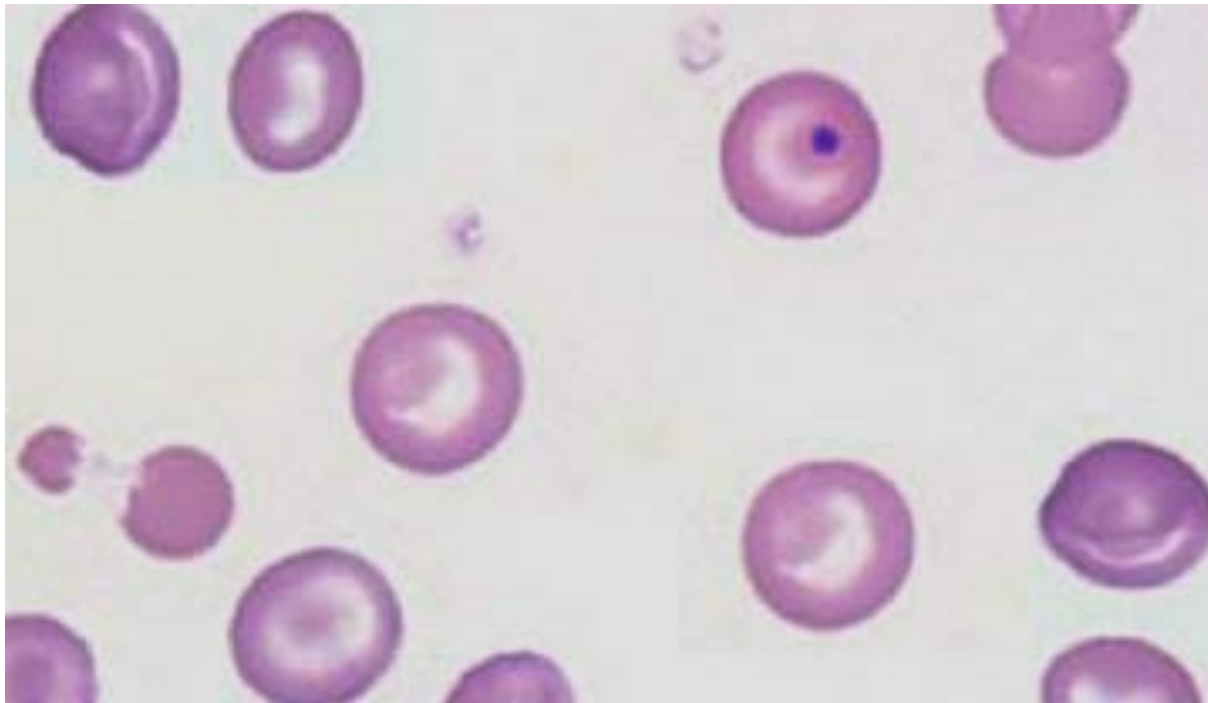


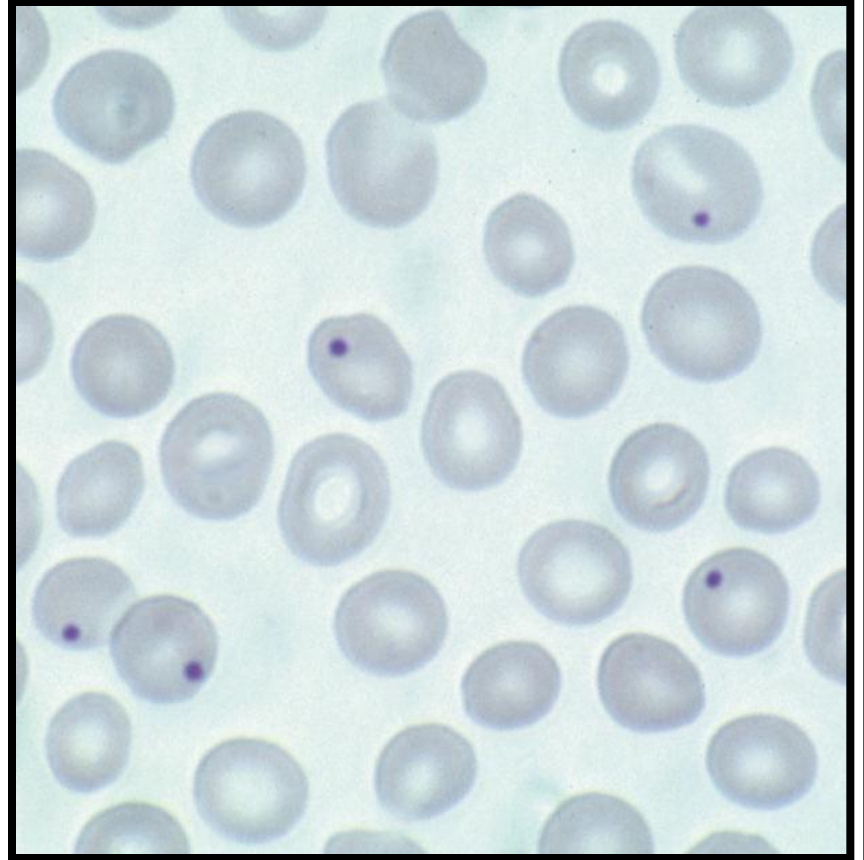
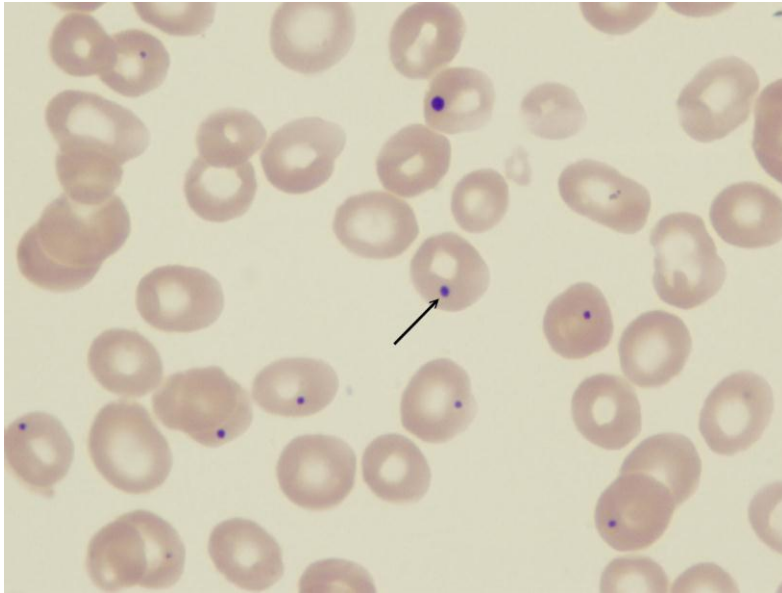


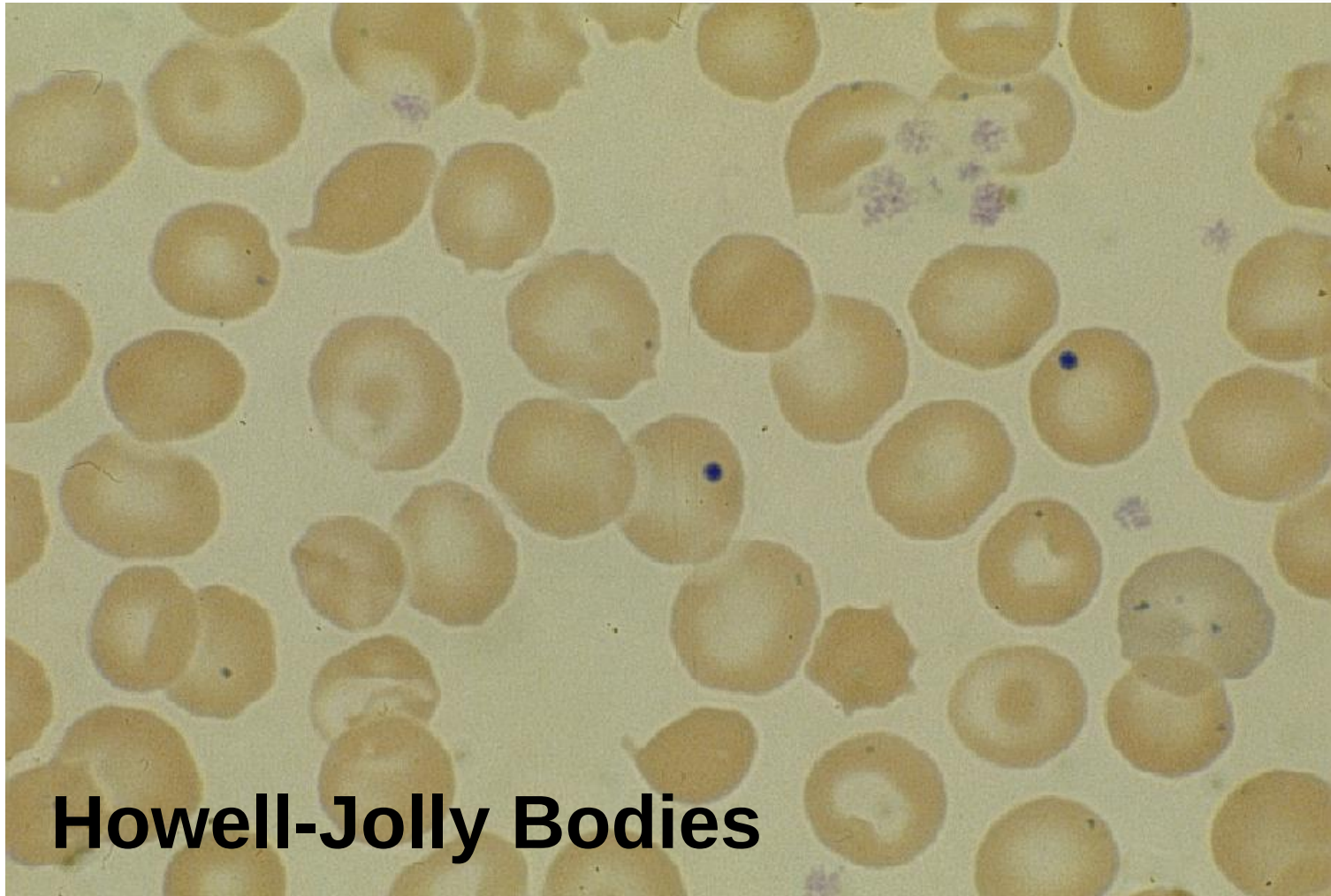
Red cell fragments



Howelljolly body

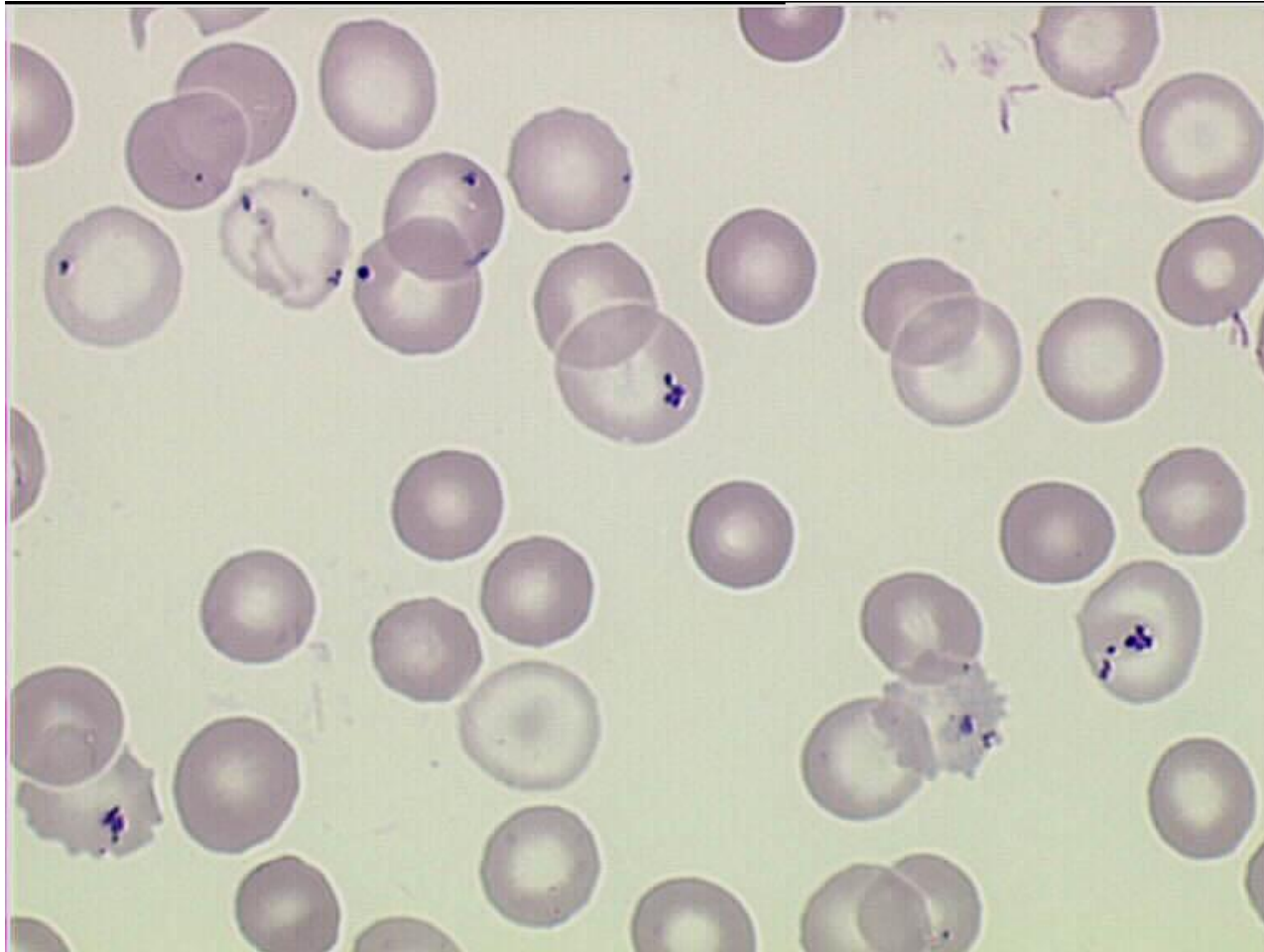




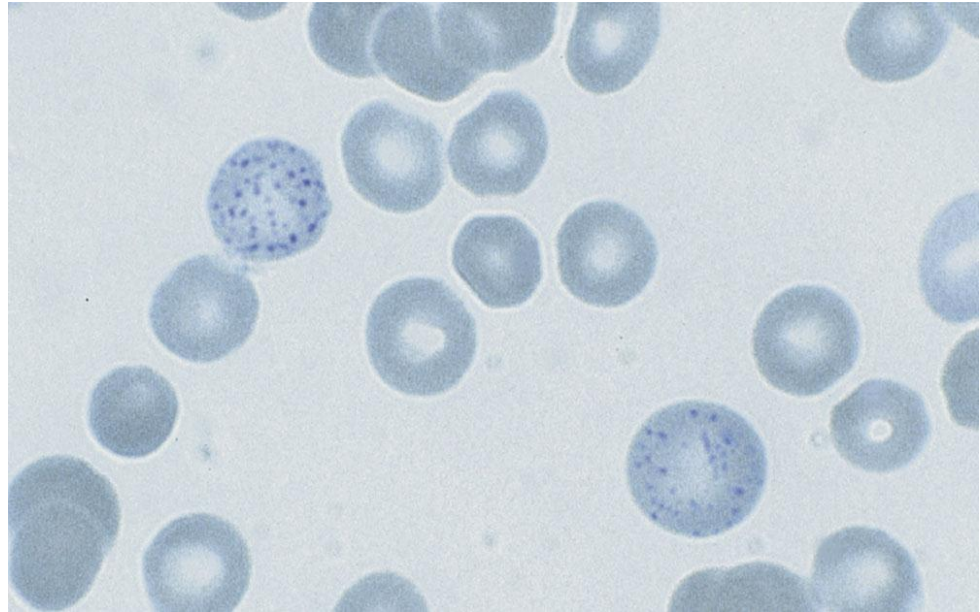


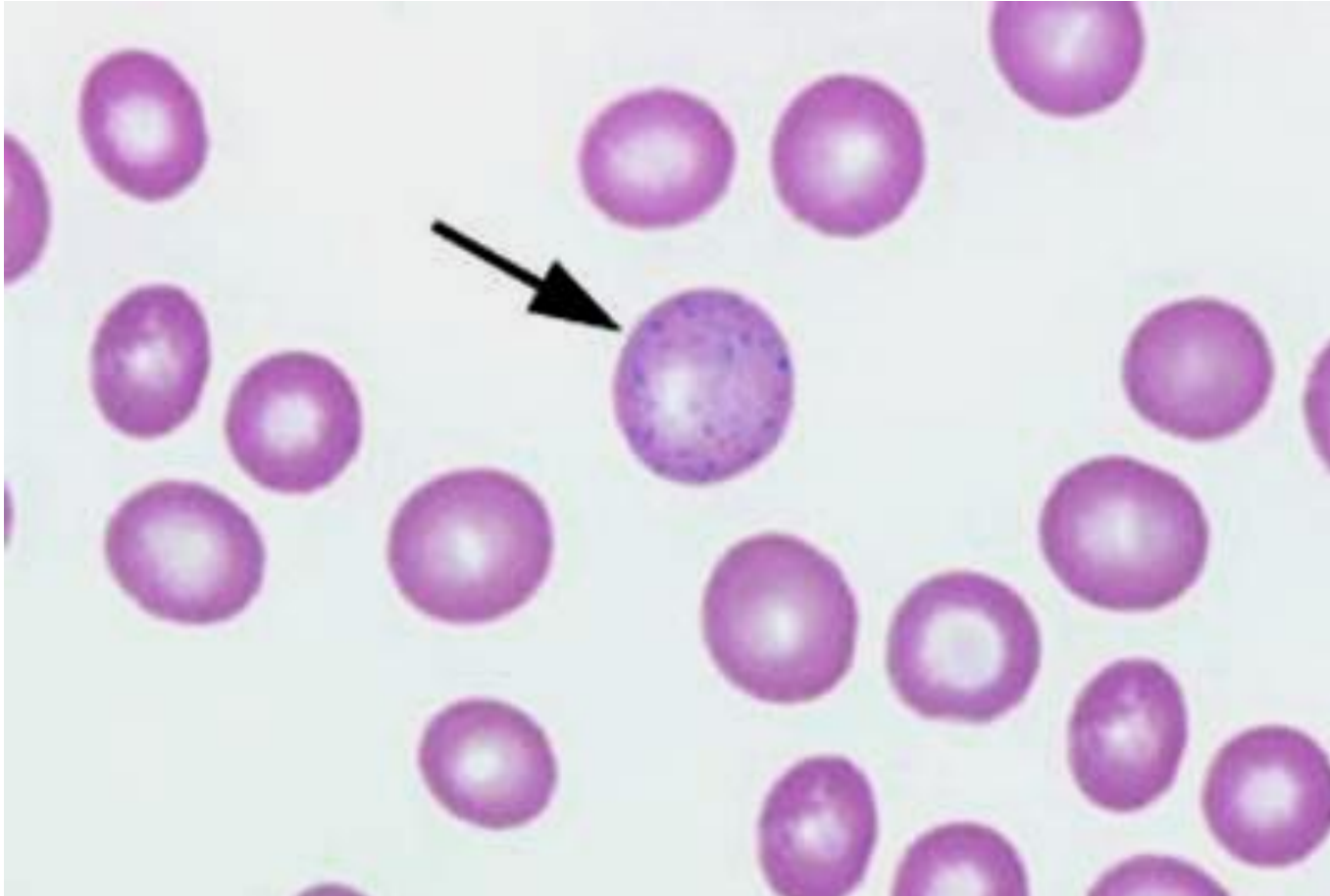
Howell-Jolly Bodies

Pappenheimer bodies

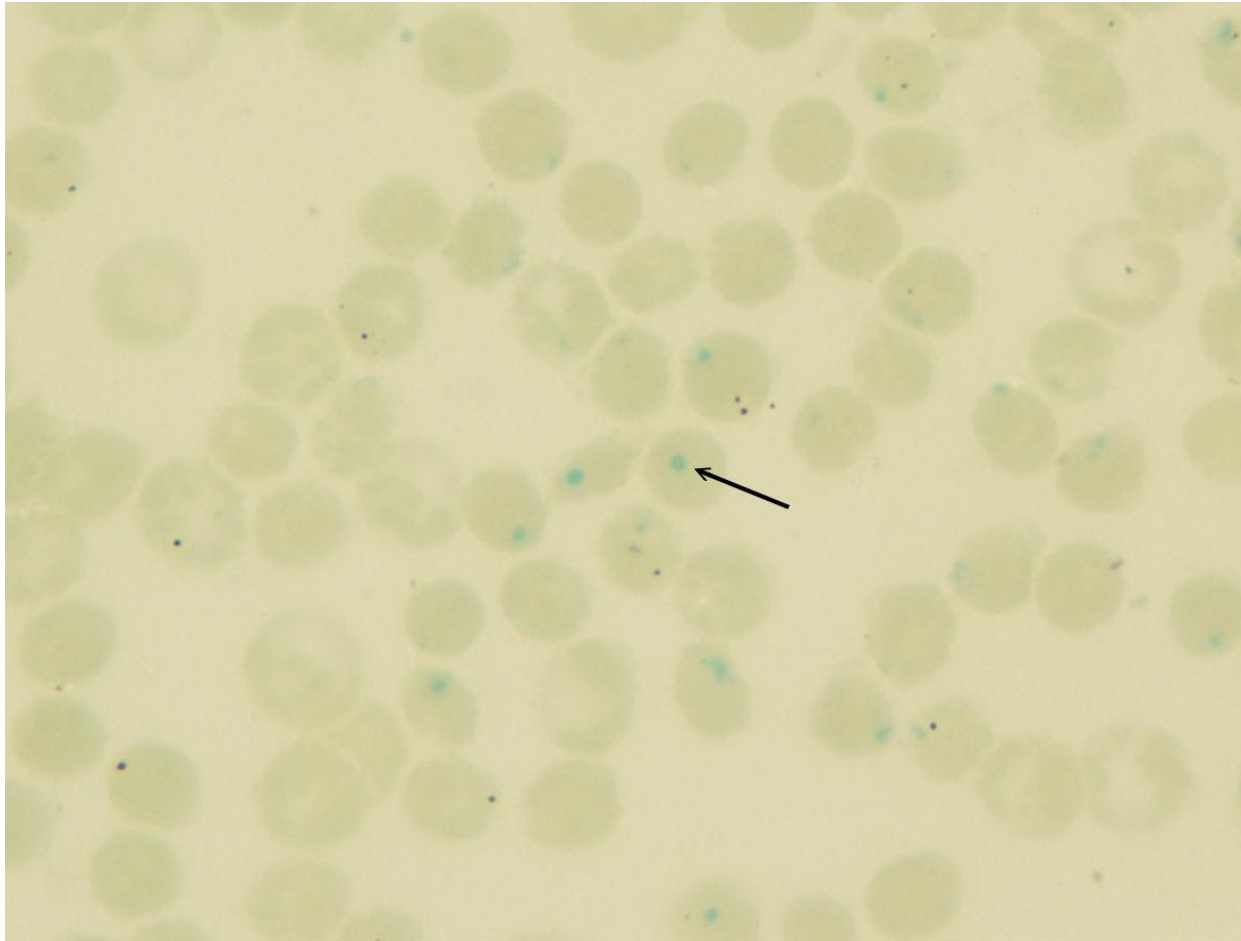


Basophilic stippling

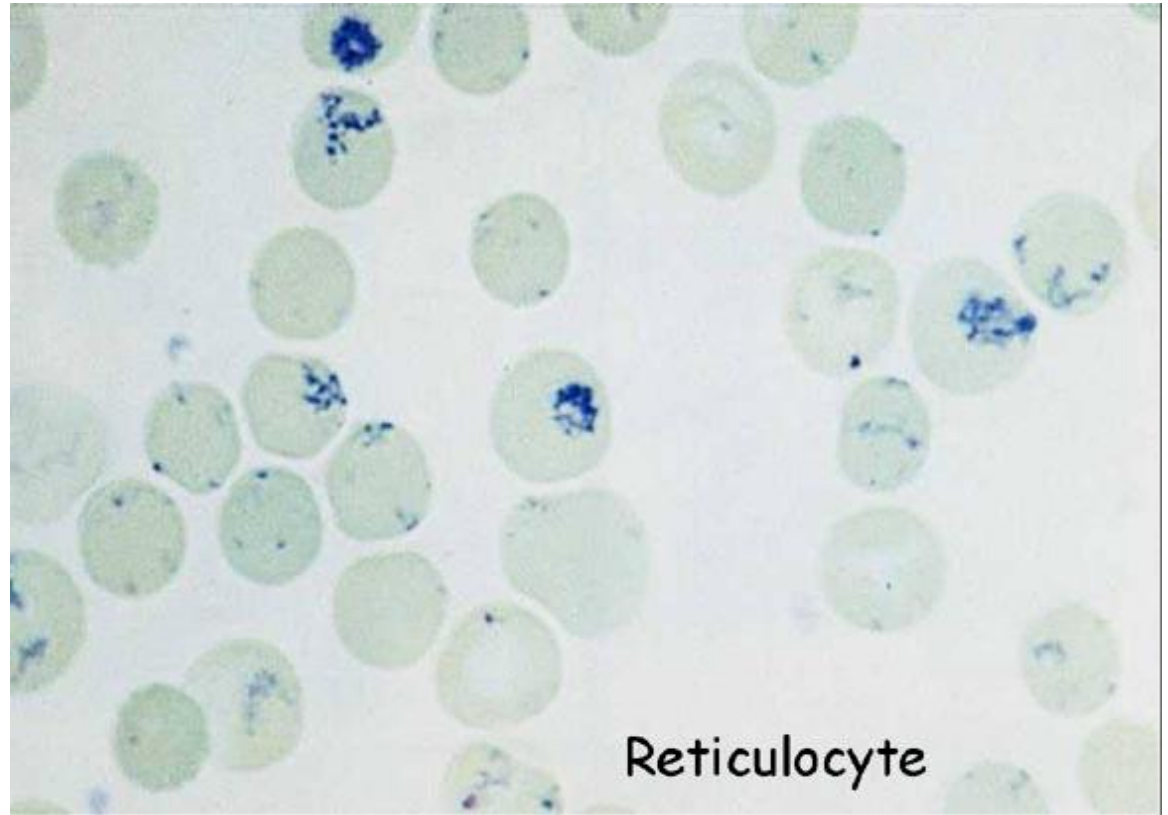
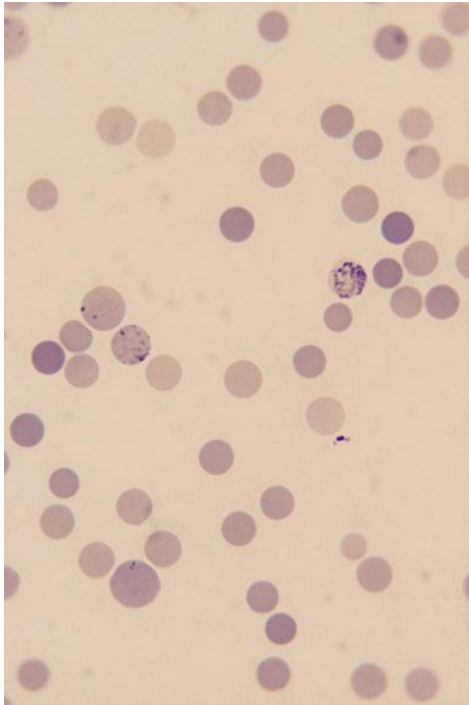


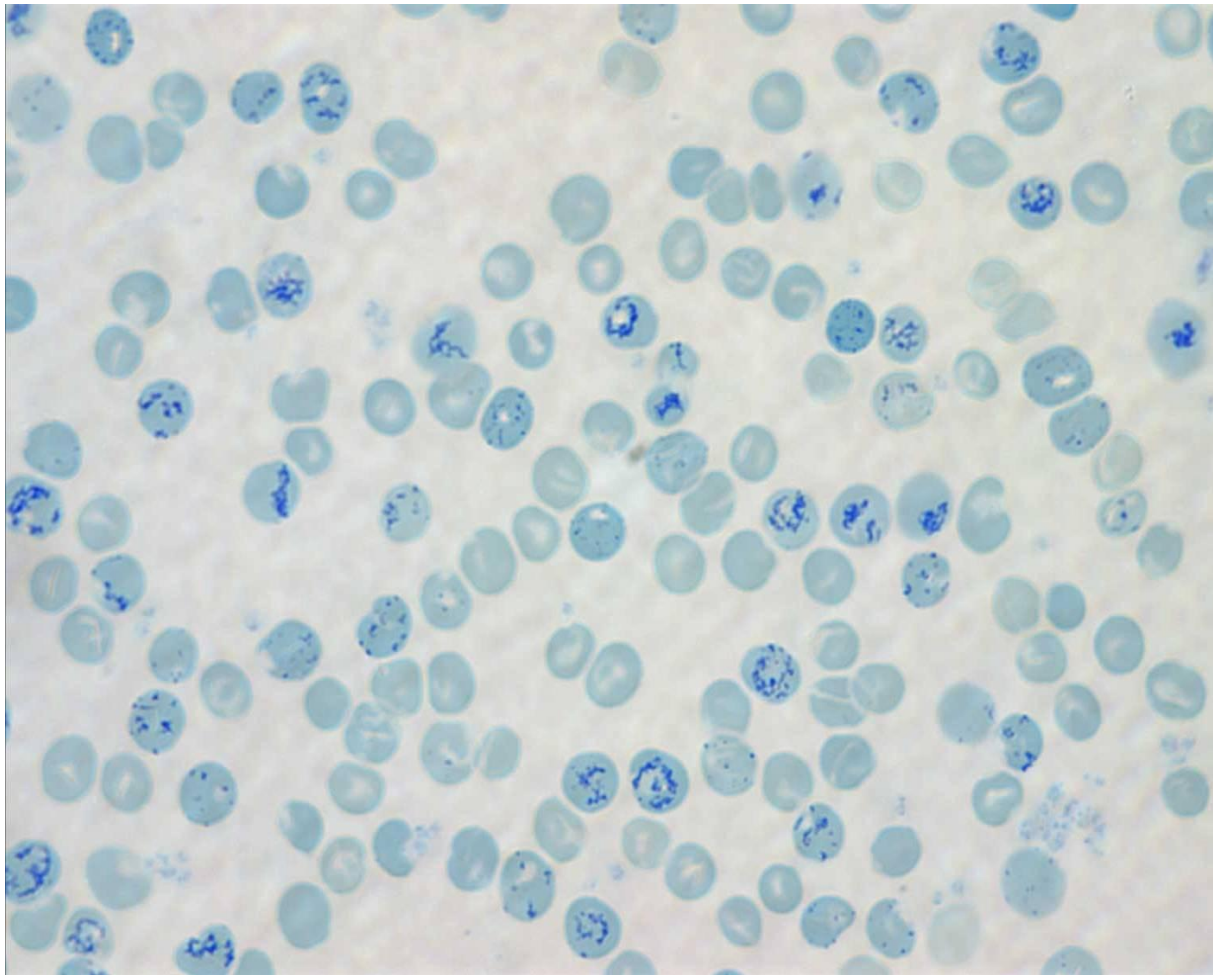


Heinz Bodies

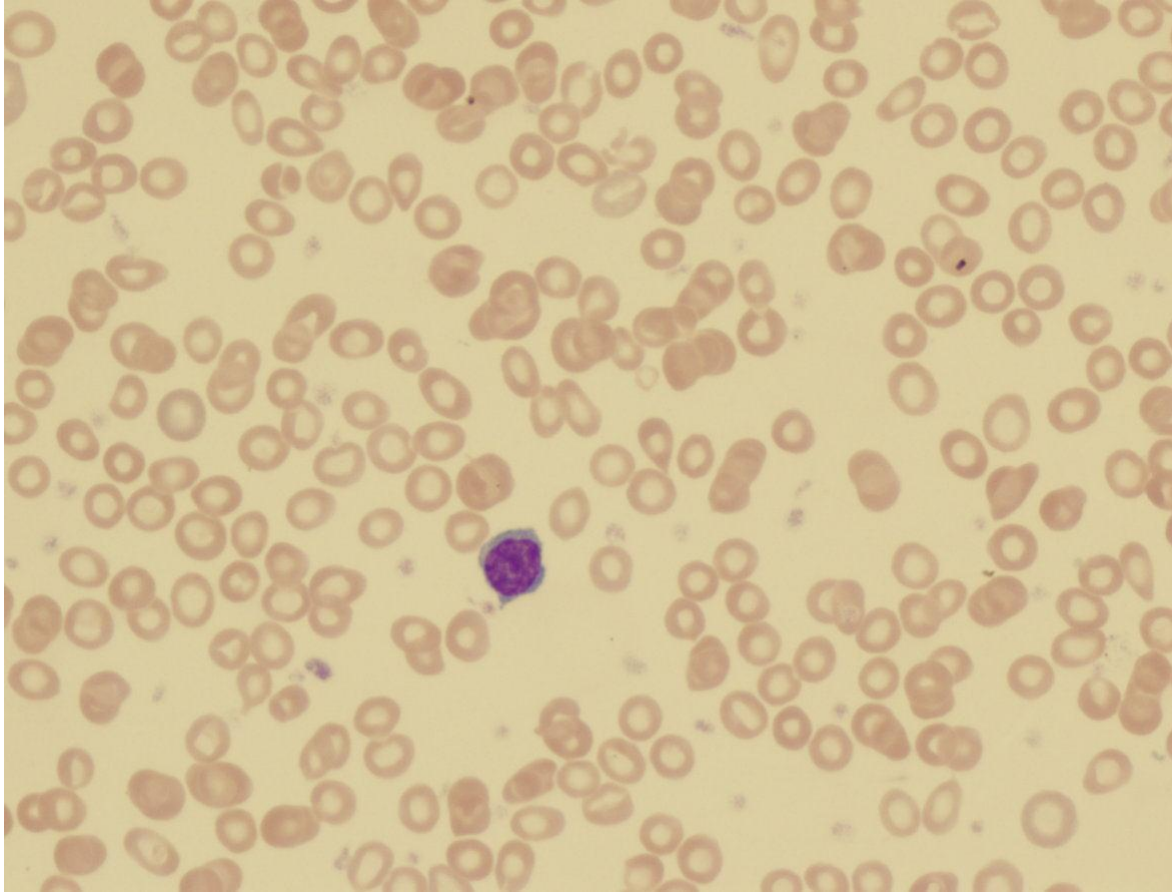


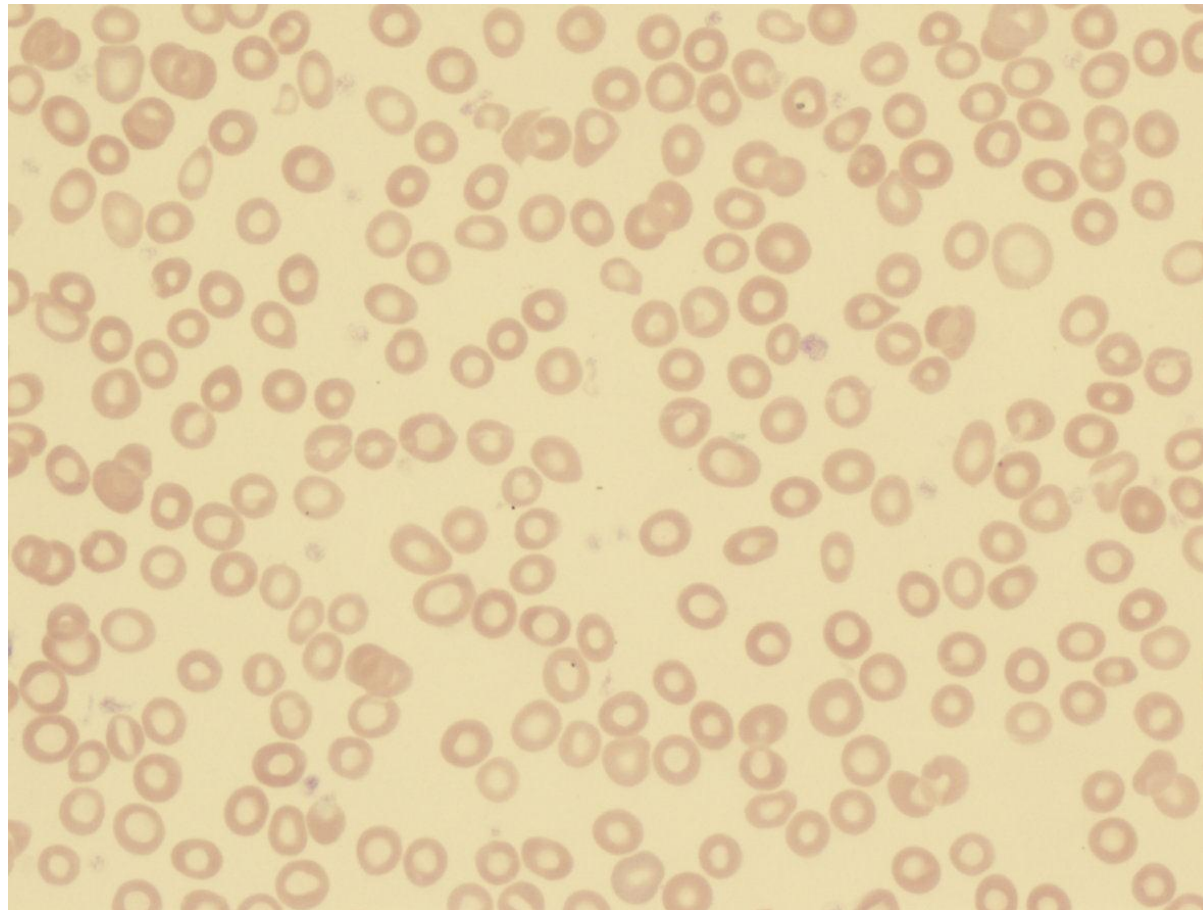
Reticulocyte

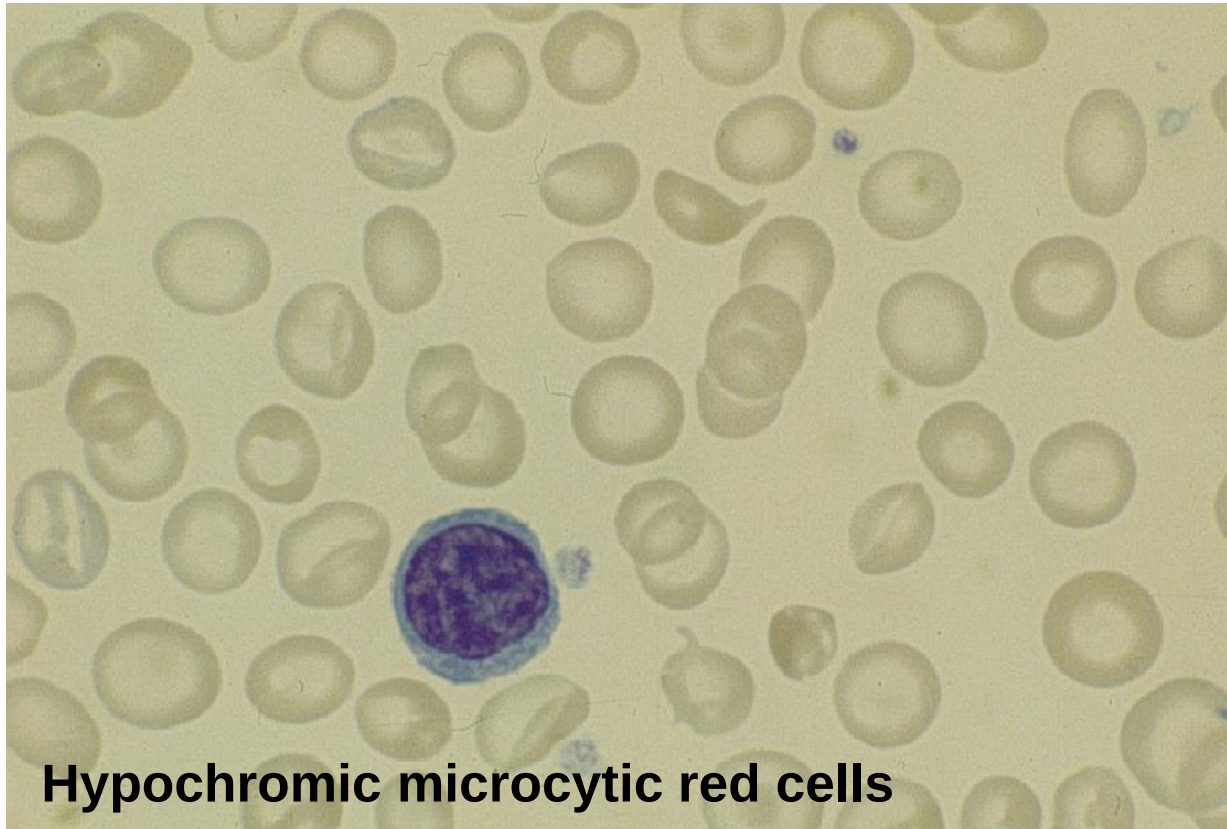




Microcytic Hypchromia

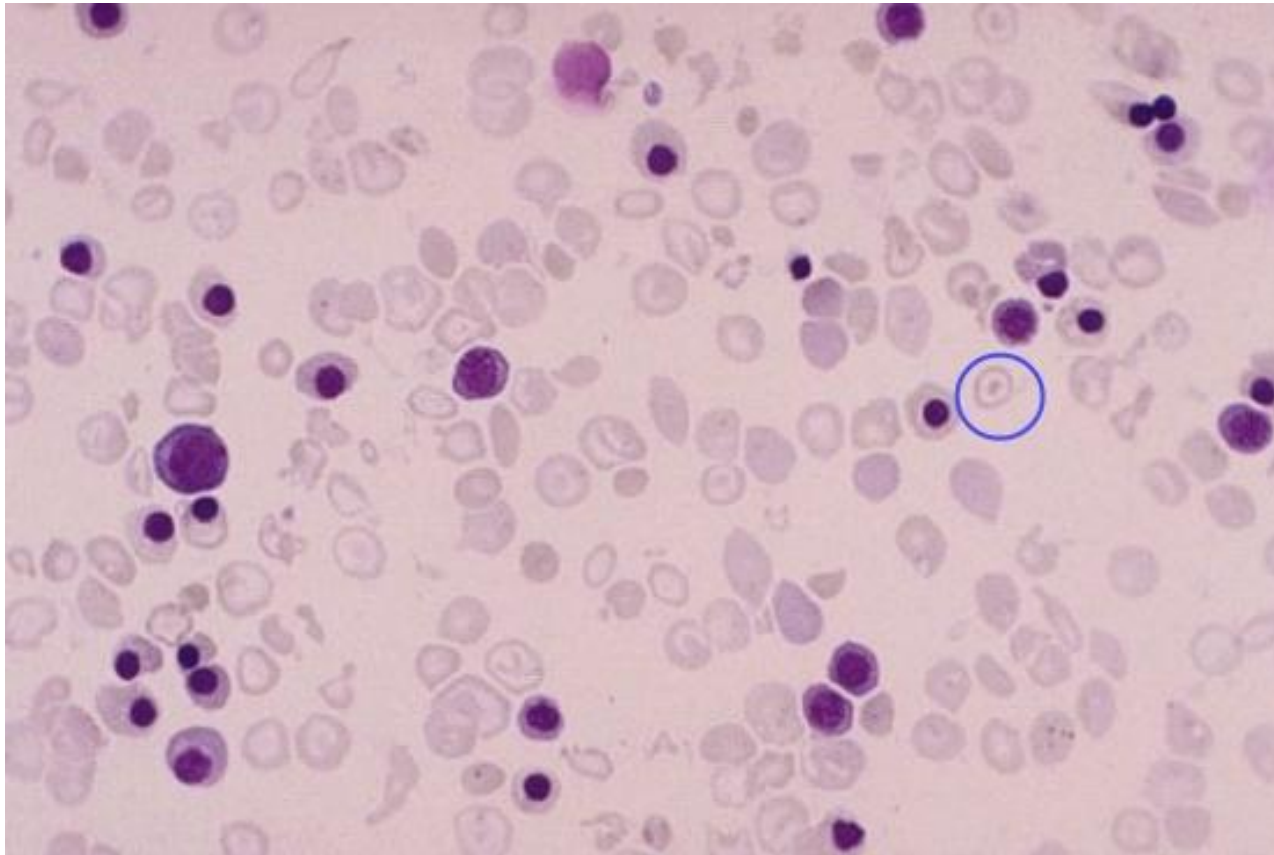






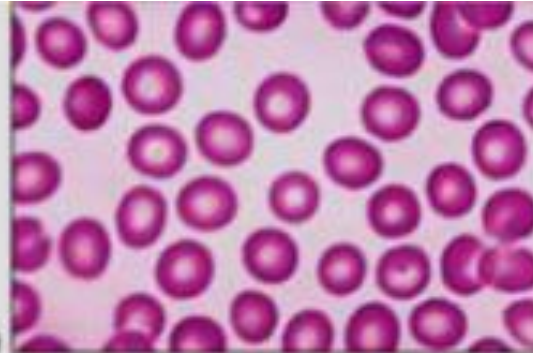
Hypochromic microcytic red cells

Anisopoikilocytosis



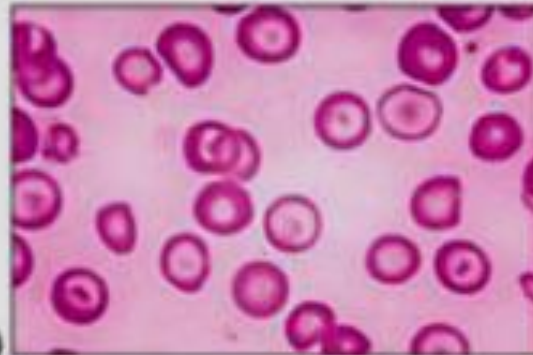
Normal RBCs

(a)

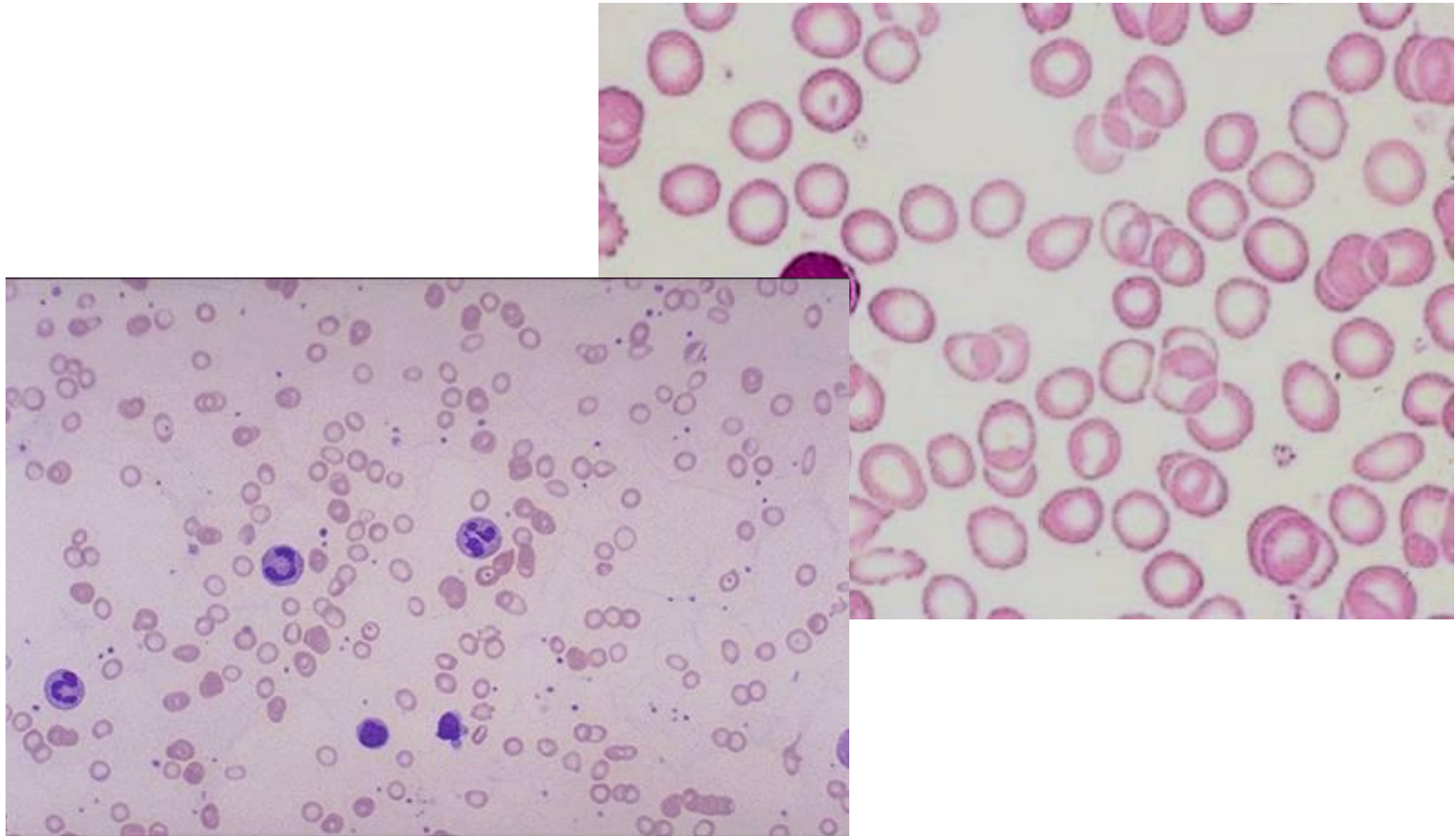


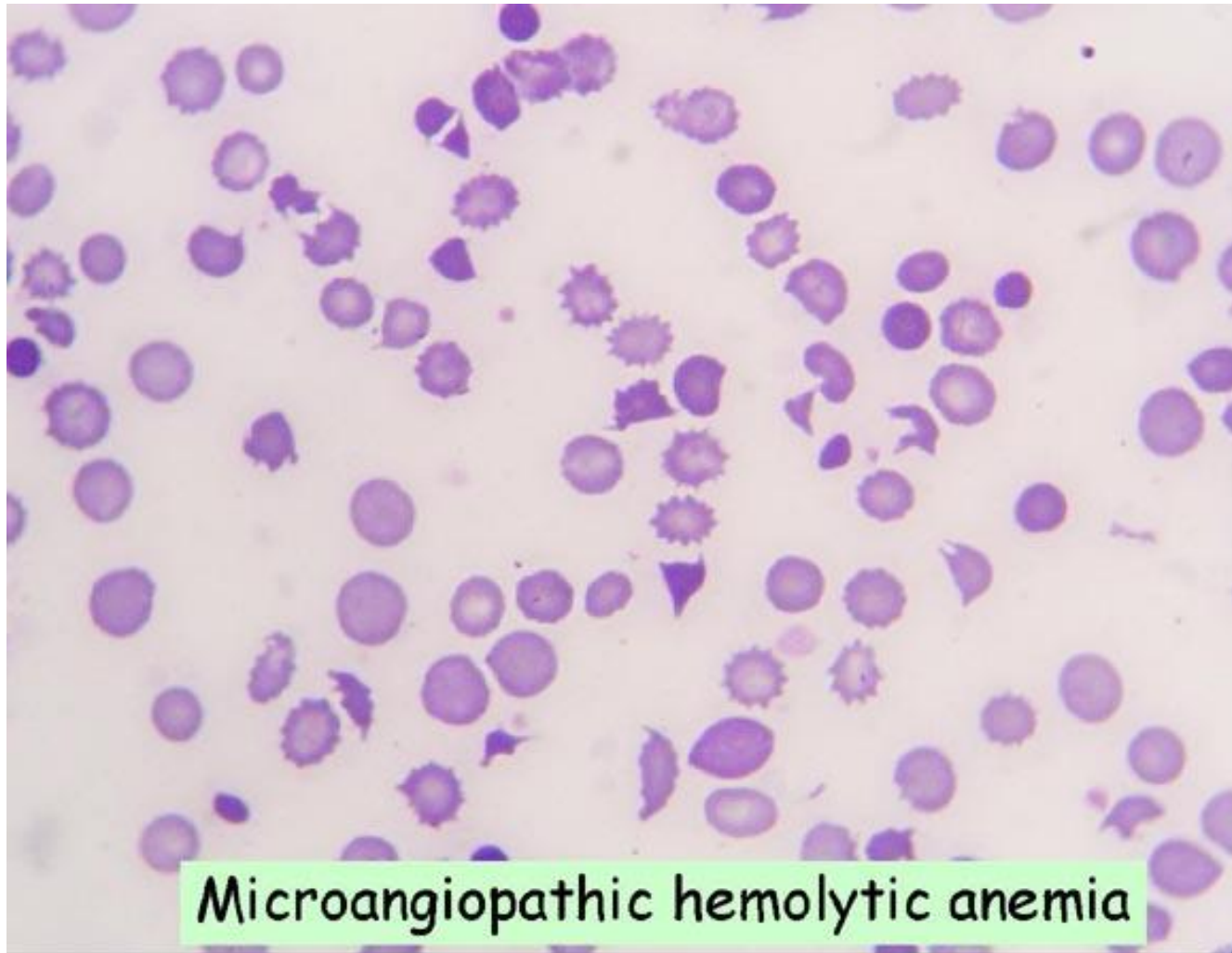
**RBCs of person with
hypochromic anemia**

(b)

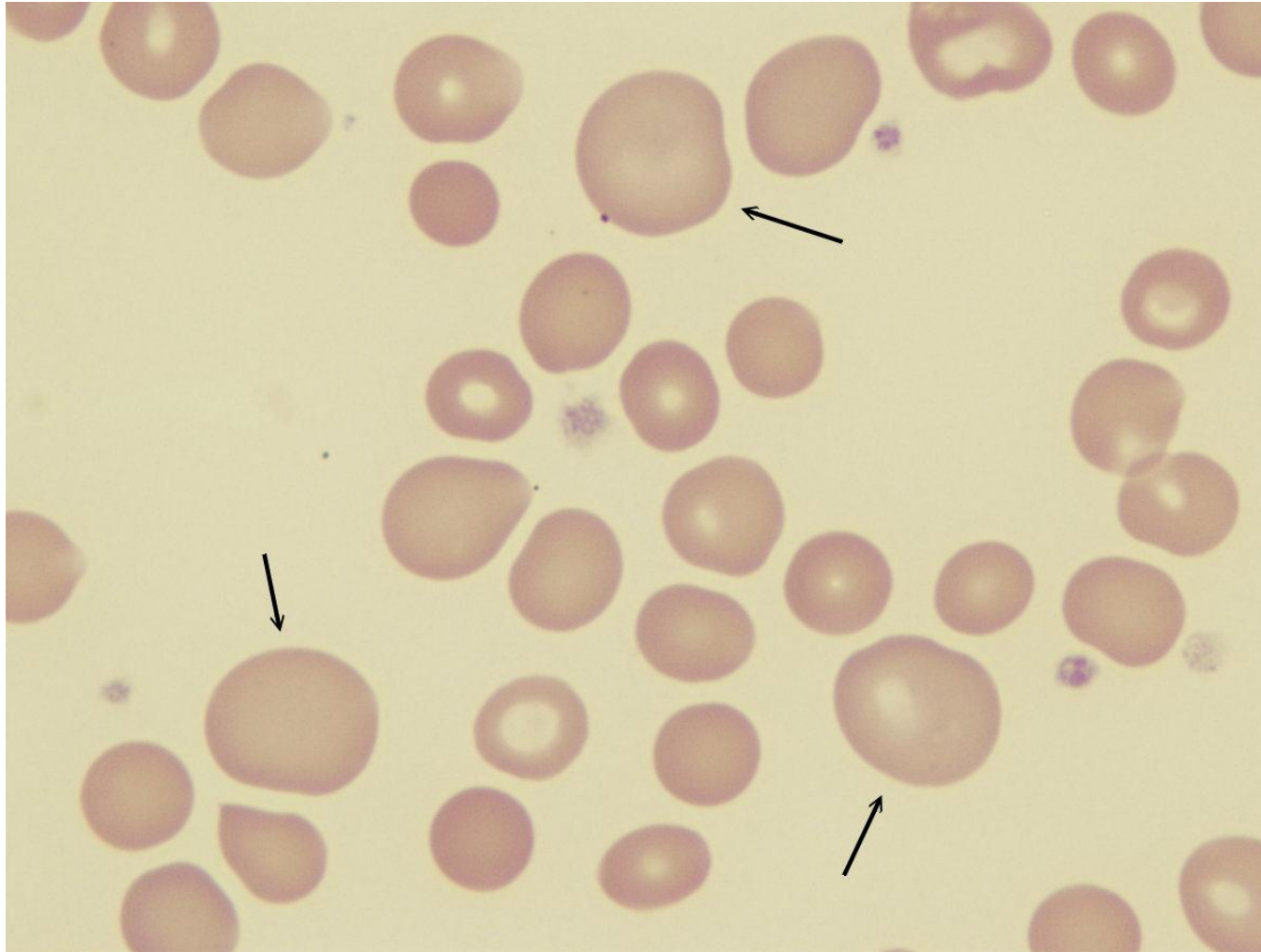


Severe microcytic, hypochromic anemia





Macrocytes



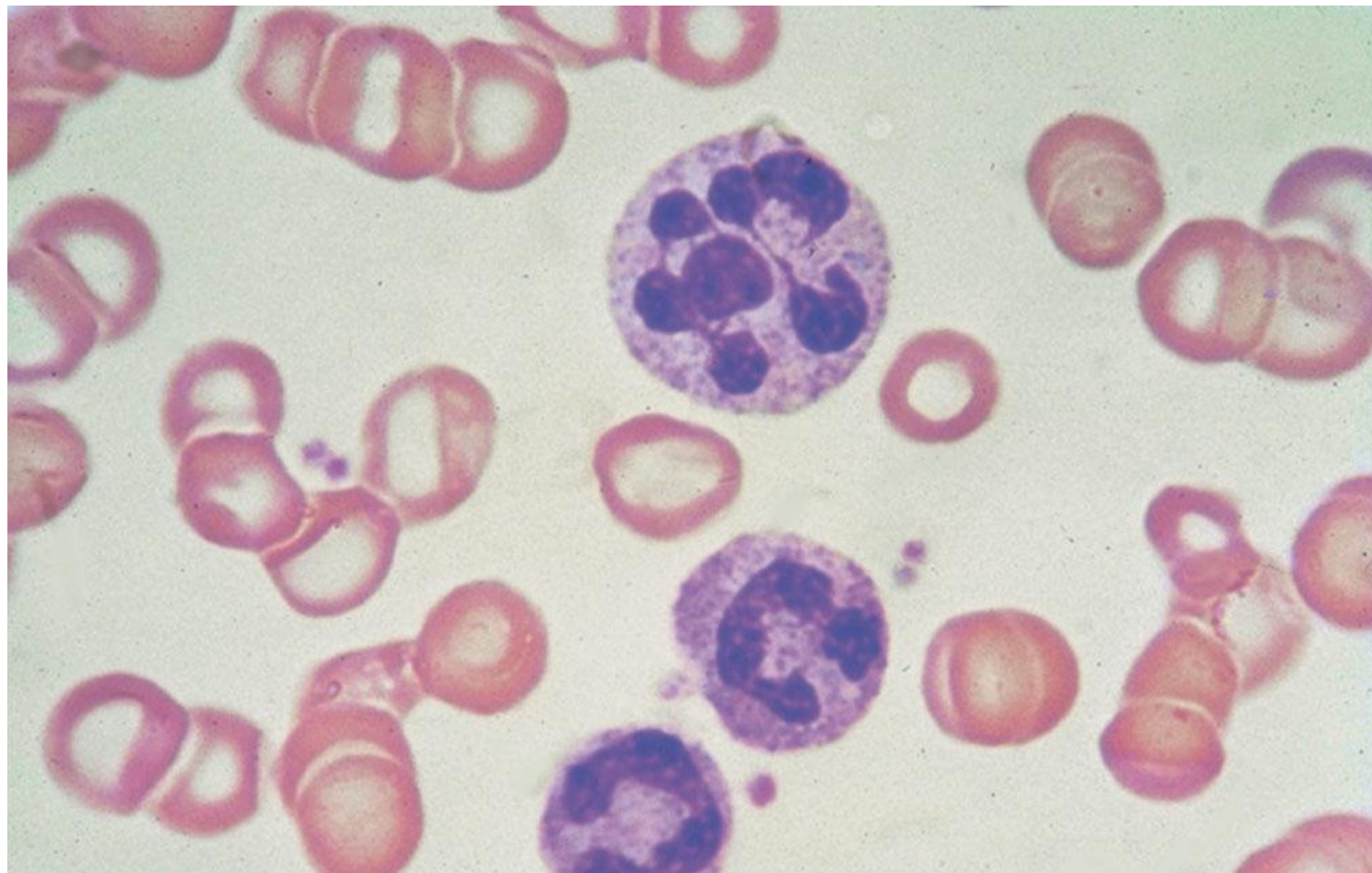
Megaloblastic Anemia

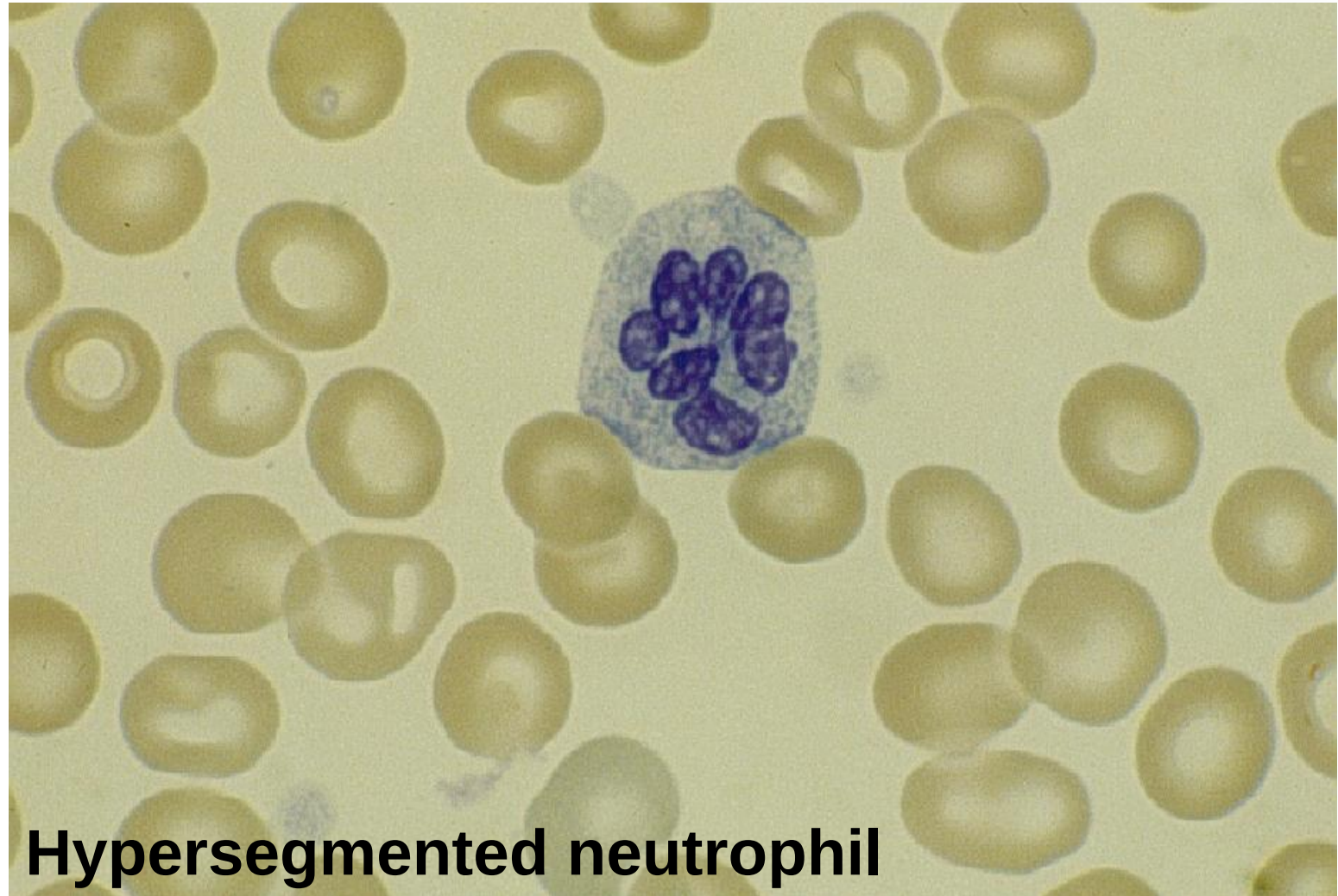




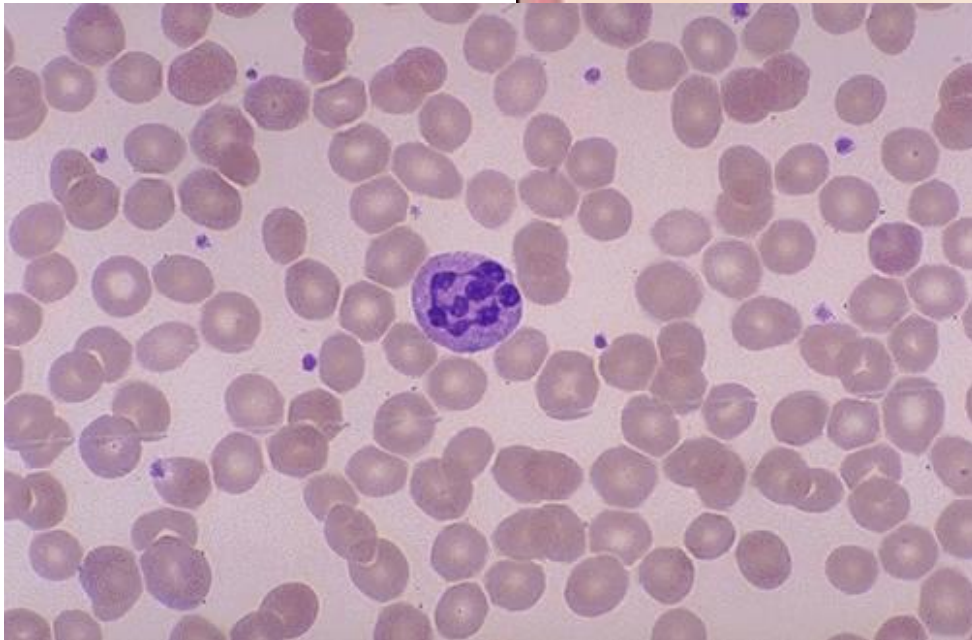
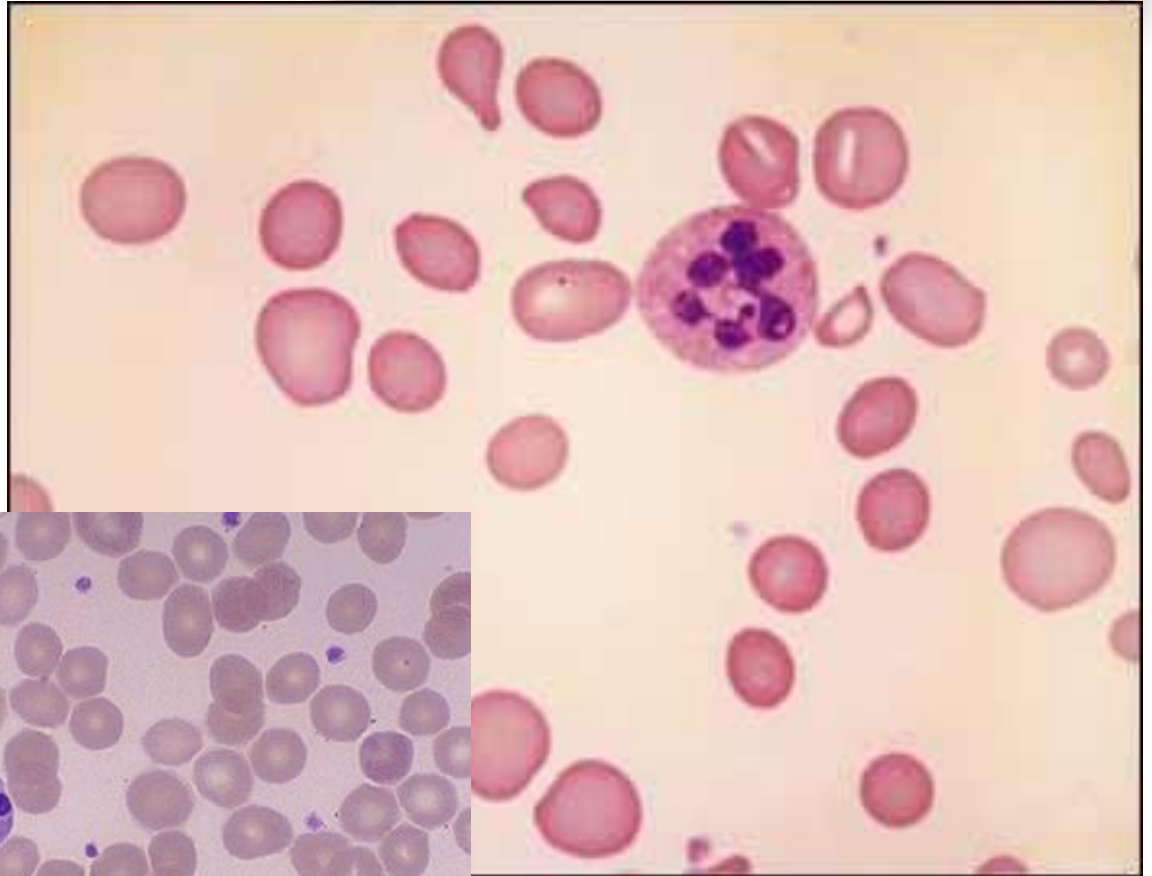
Macrocytic red cells

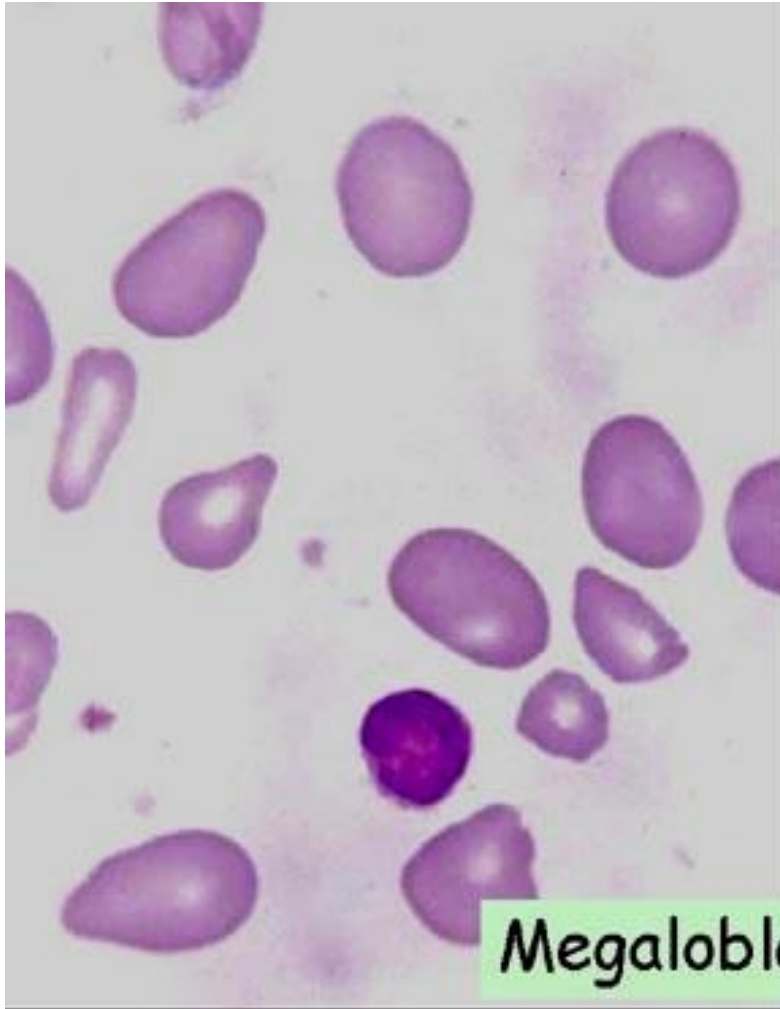
Megaloblastic Anemia, Hyper segment





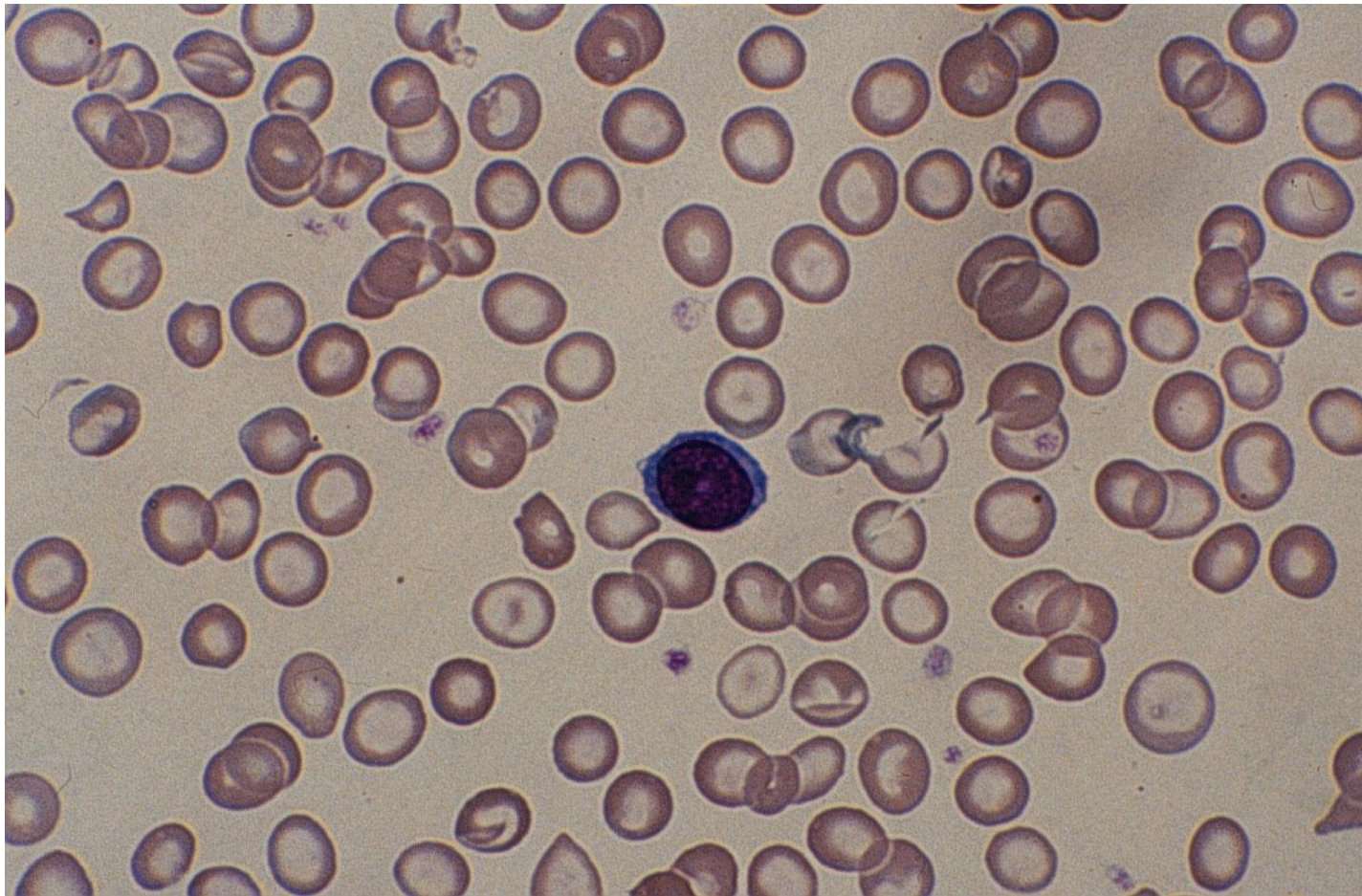
Hypersegmented neutrophil

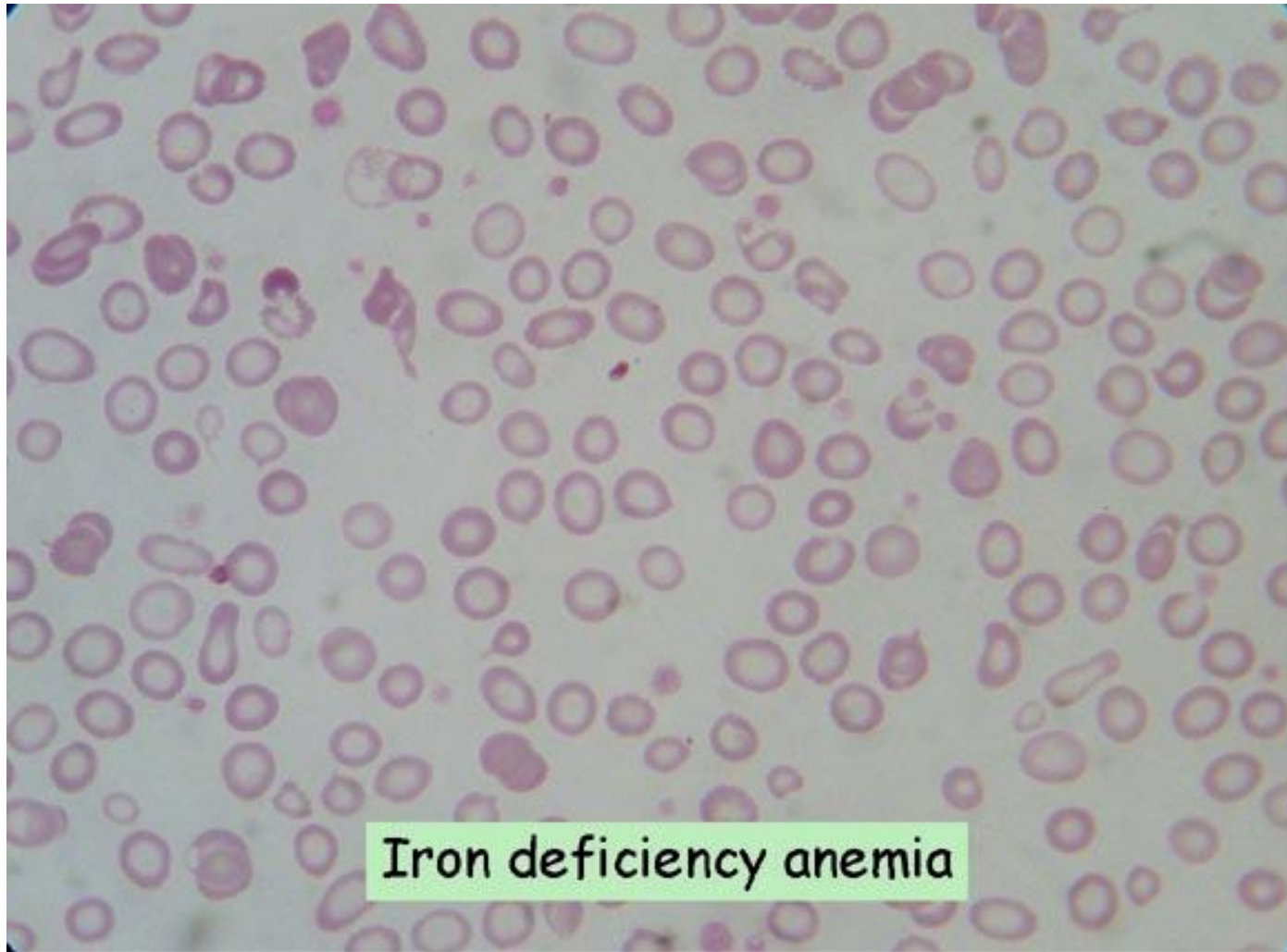




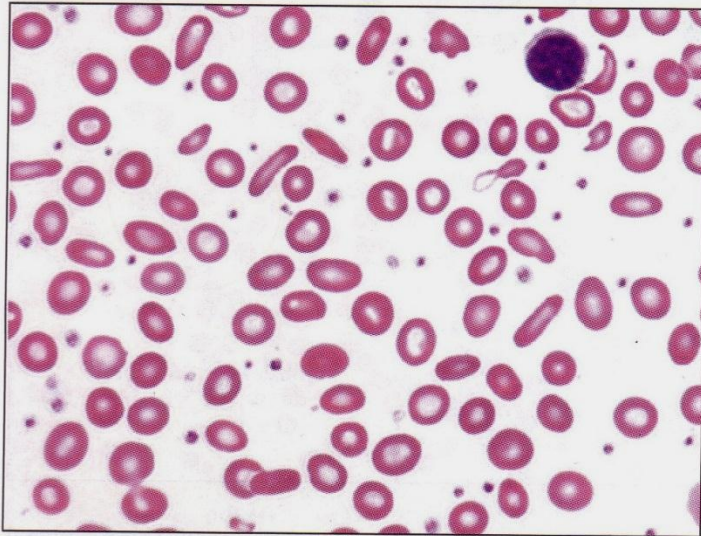
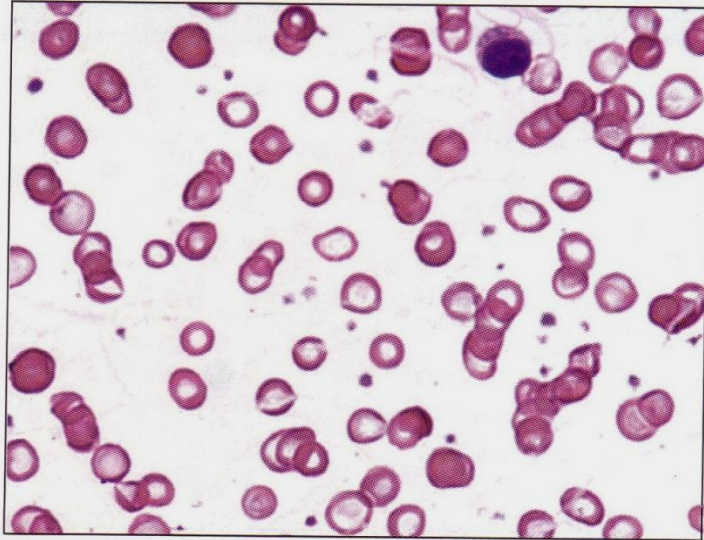
Megaloblastic anemia

Iron Deficiency

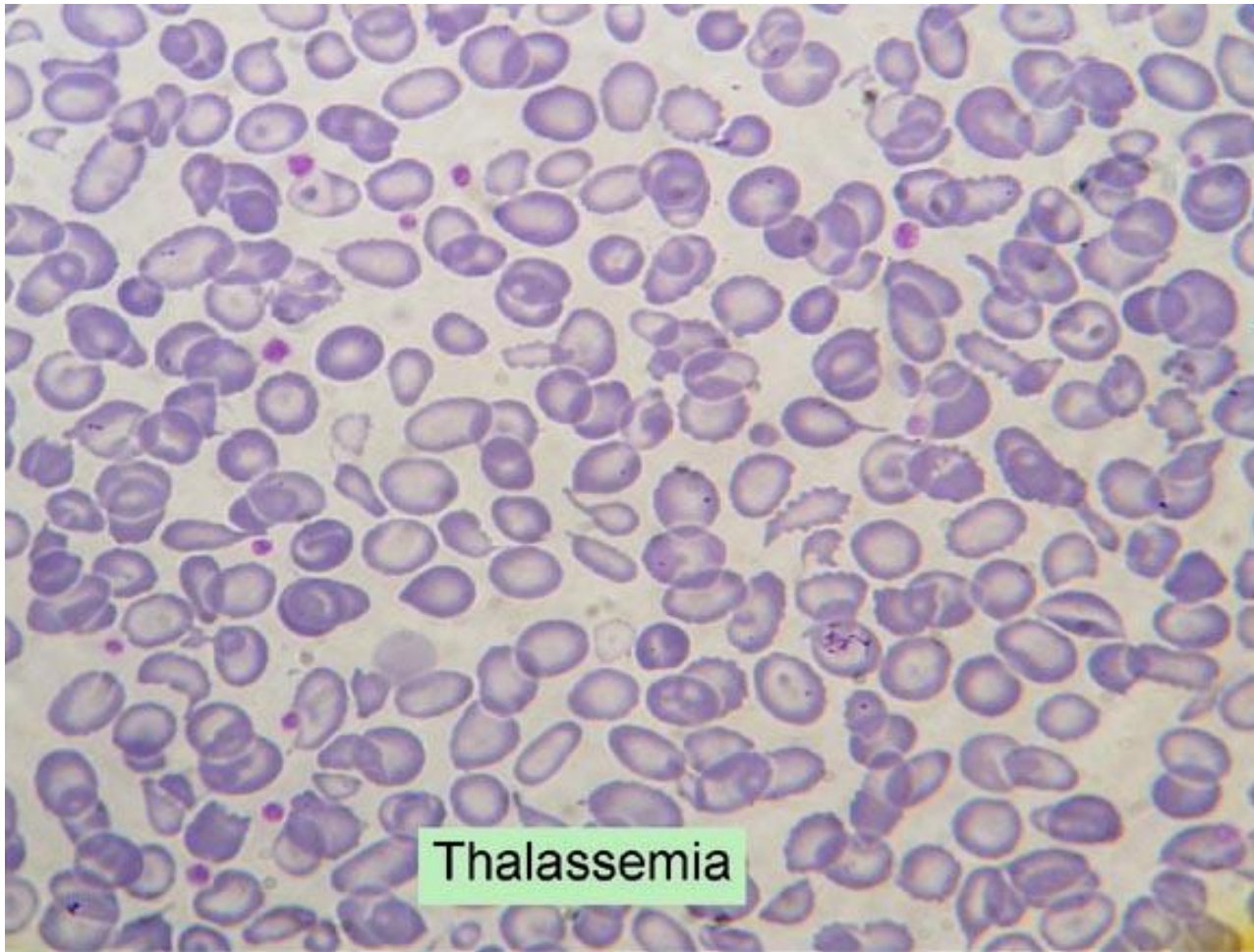


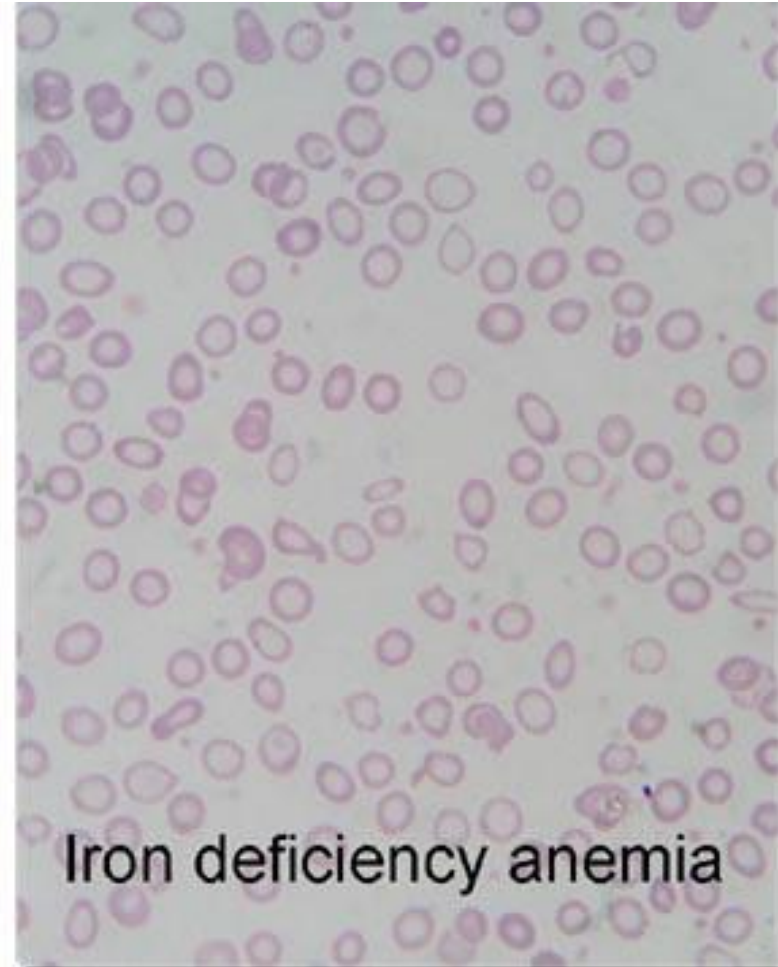
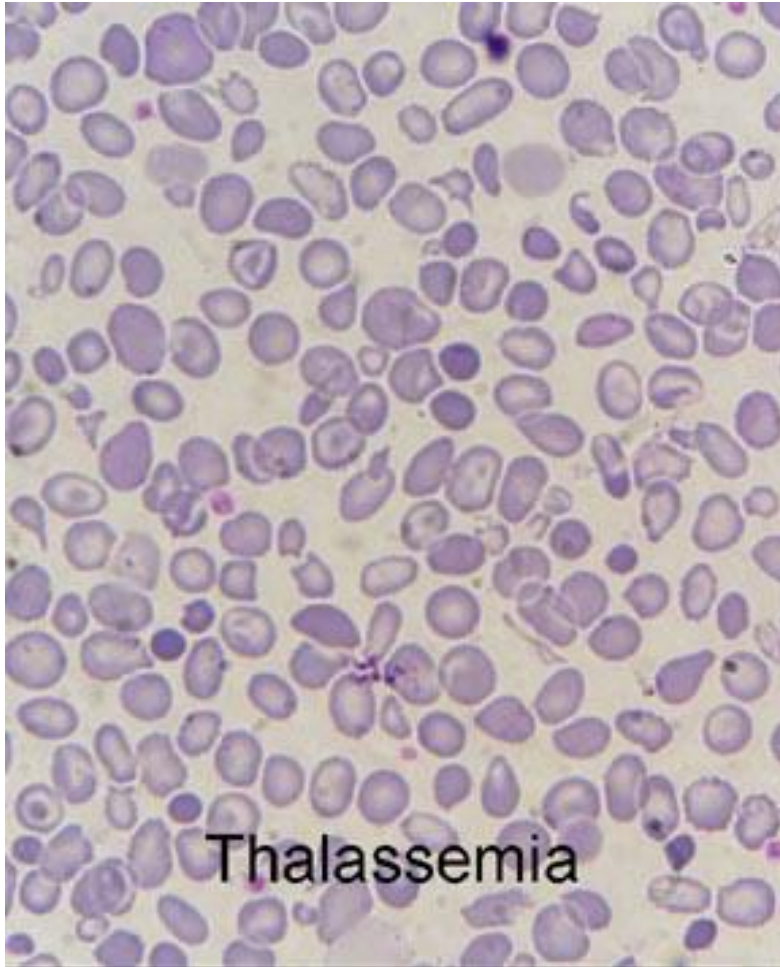


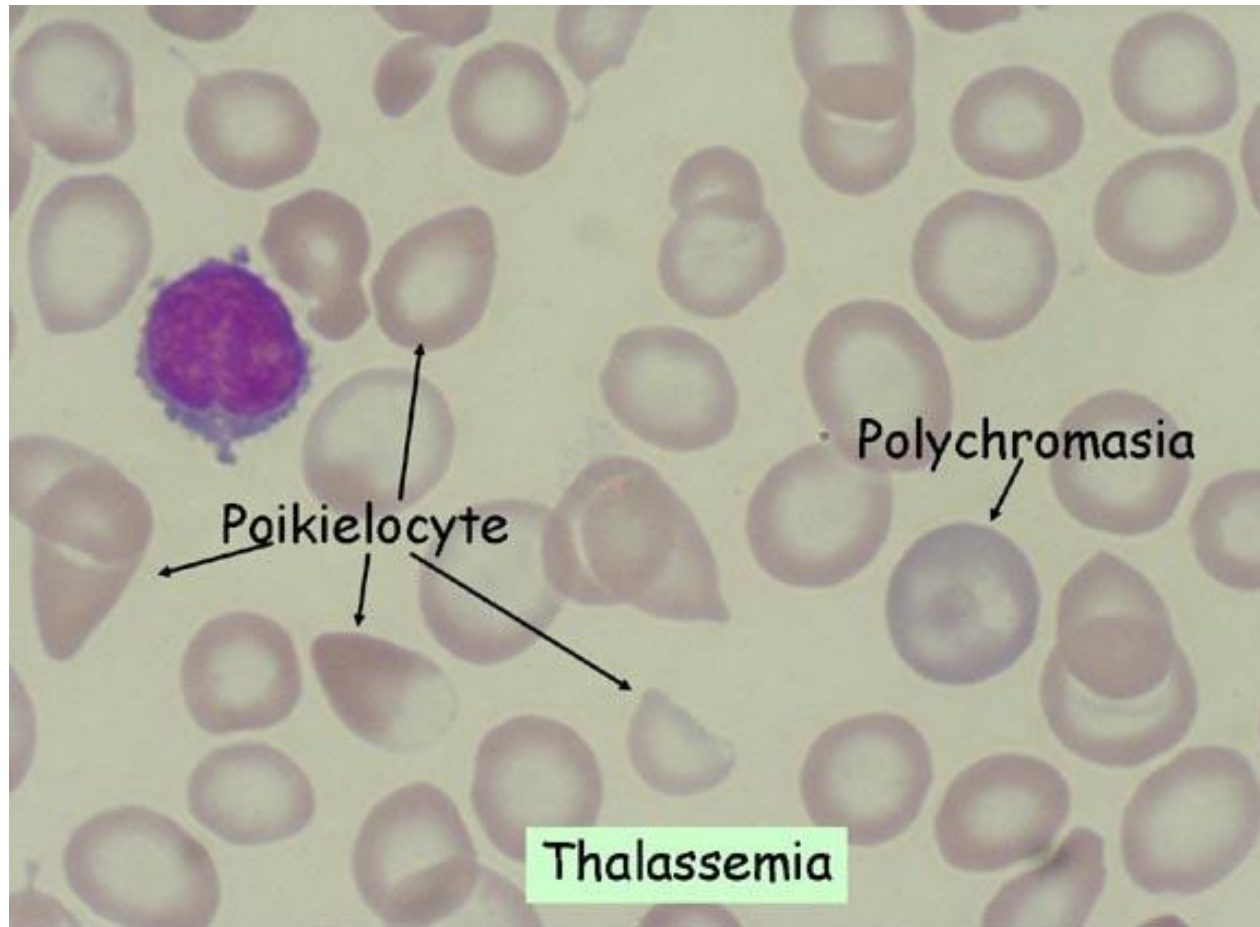
Iron deficiency anemia

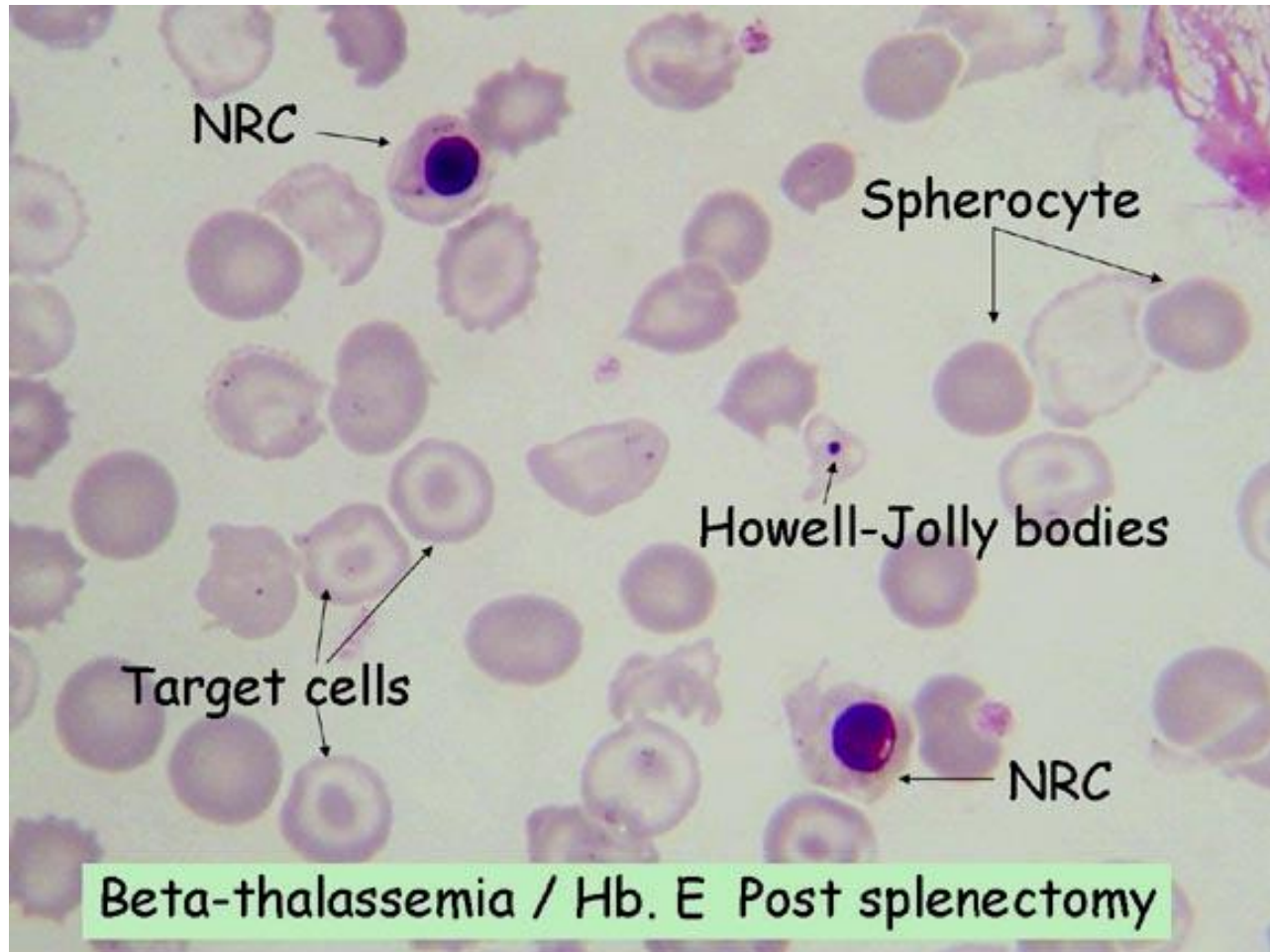


Iron deficiency blood films. *Top panel:* Microcytic blood film. This peripheral blood film demonstrates microcytosis. Red blood cell size can be visually estimated by comparing with the size of a small mature lymphocyte nucleus. Microcytic red blood cells should be smaller than the condensed nucleus of a mature lymphocyte. *Bottom panel:* Poikilocytosis and microcytosis that include numerous pencil cells are shown in this iron deficiency blood film. The degree of poikilocytosis has been observed to correlate with the degree of iron deficiency anemia.

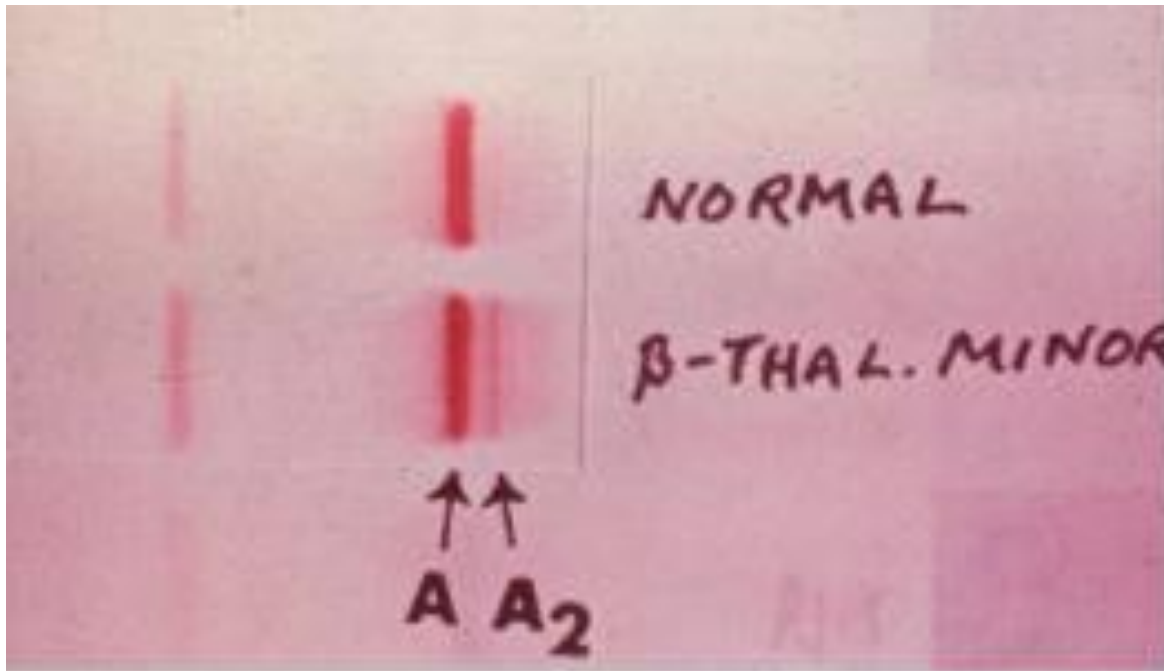




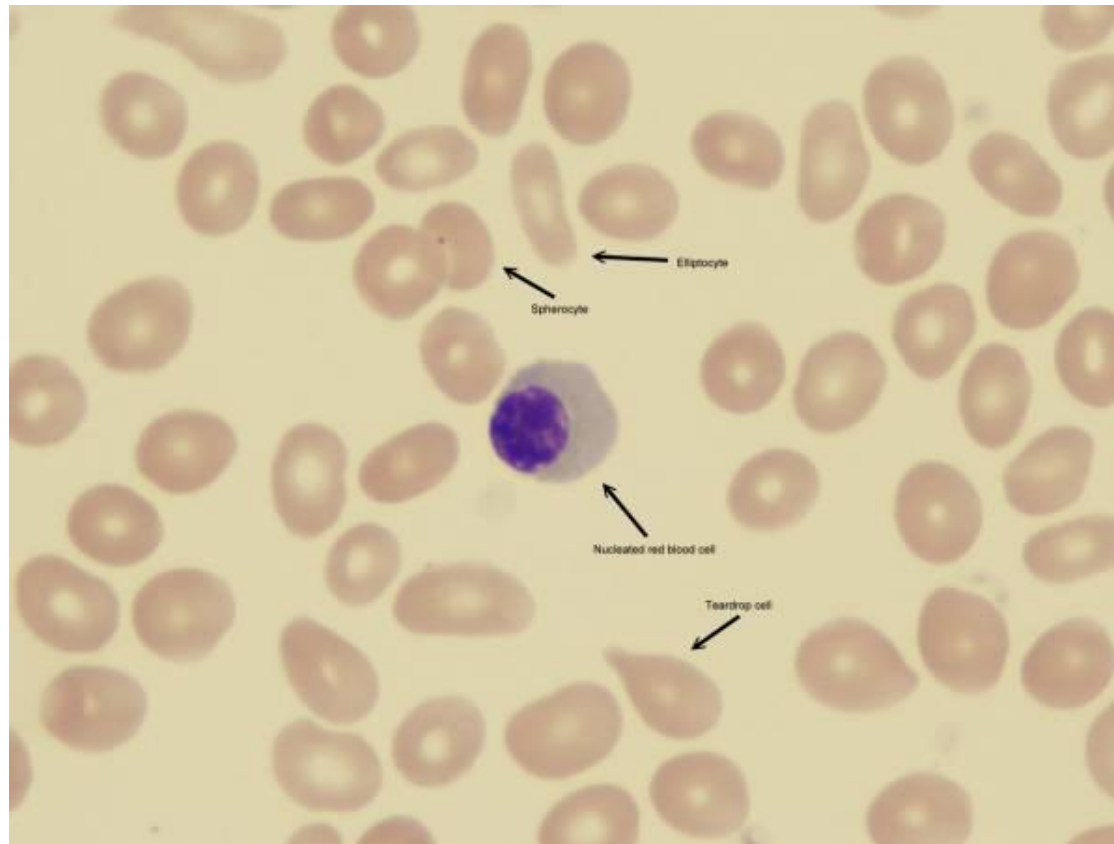


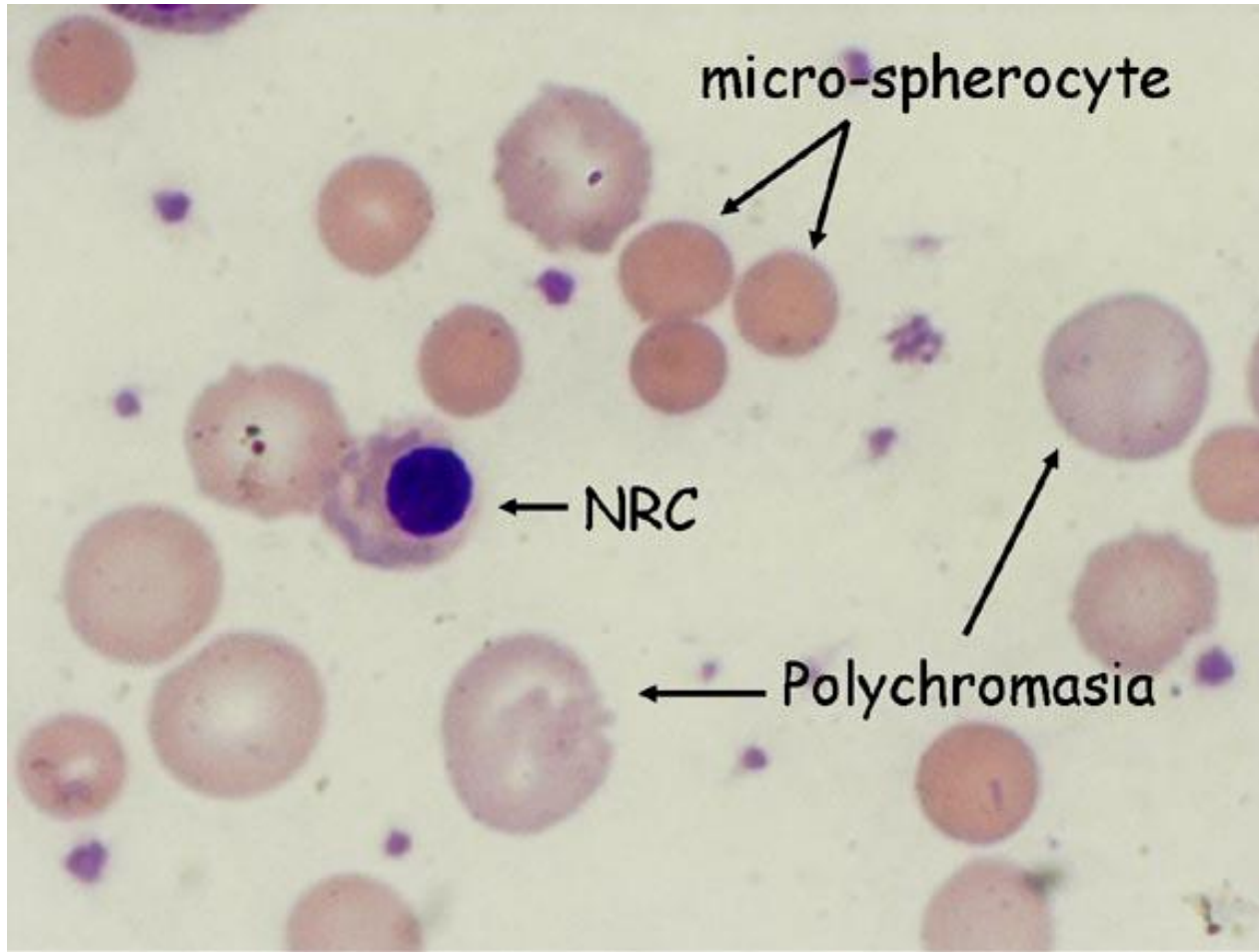


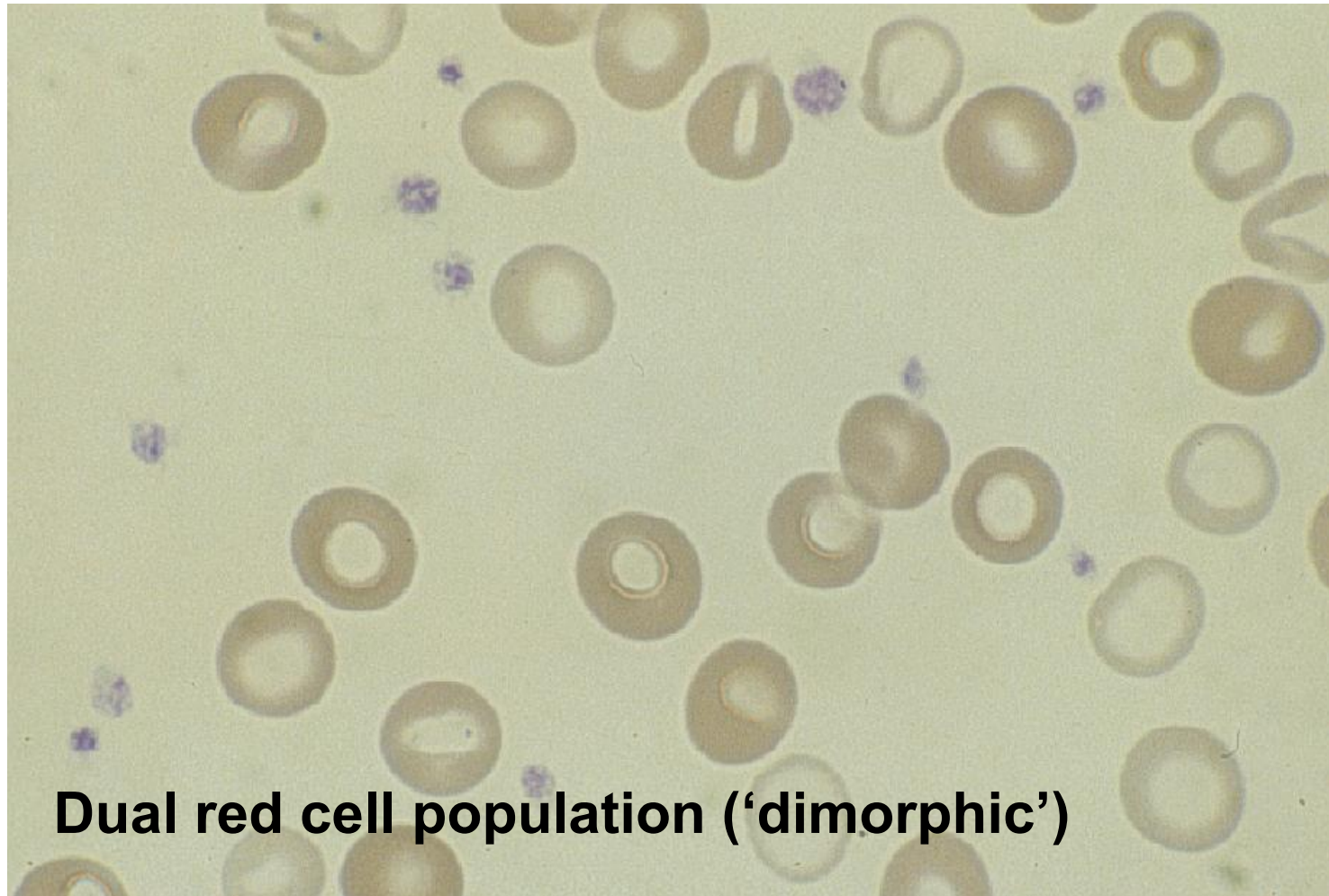
Thalassemia minor



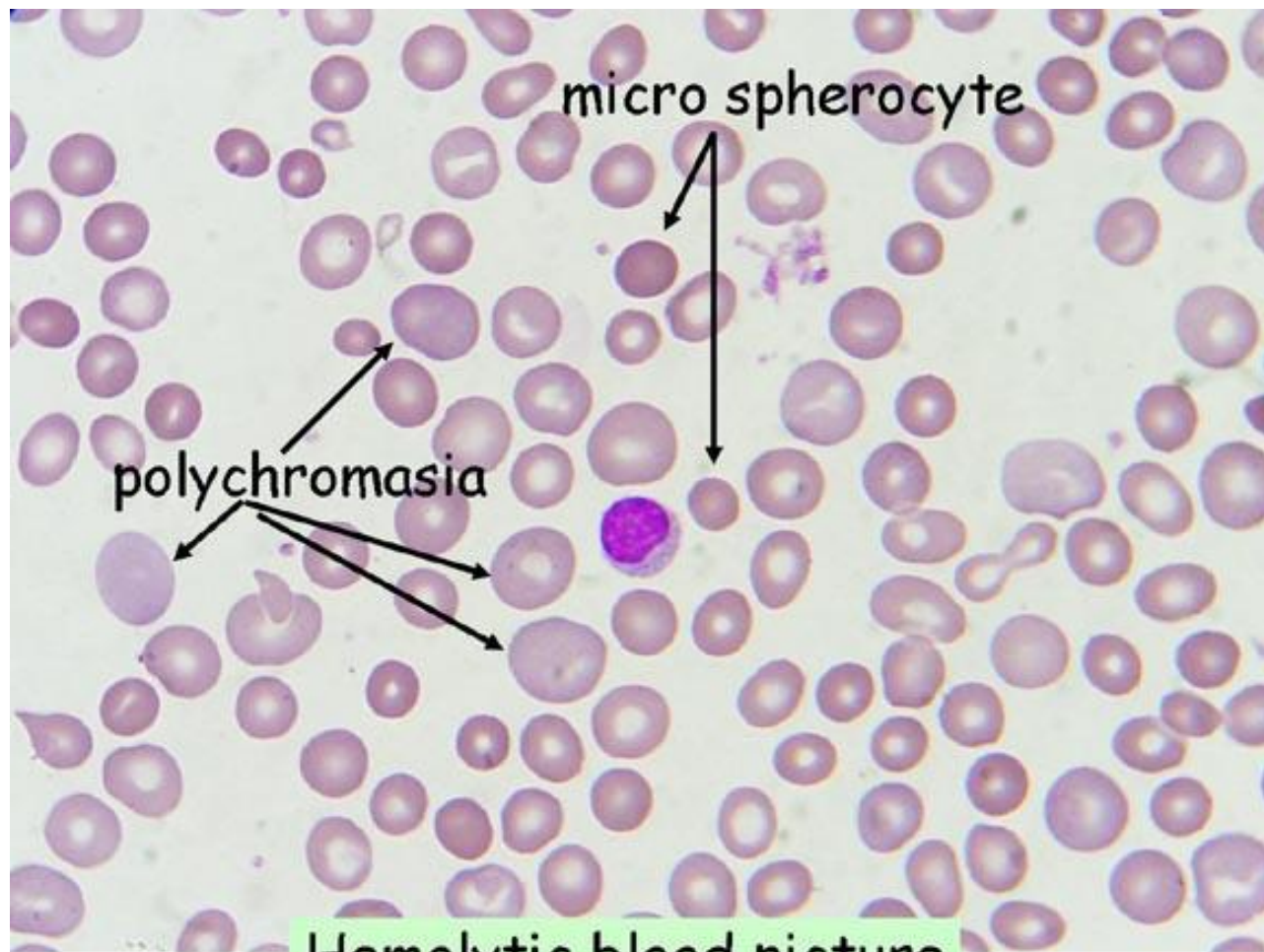
NRBC with Anisopoikilocytosis





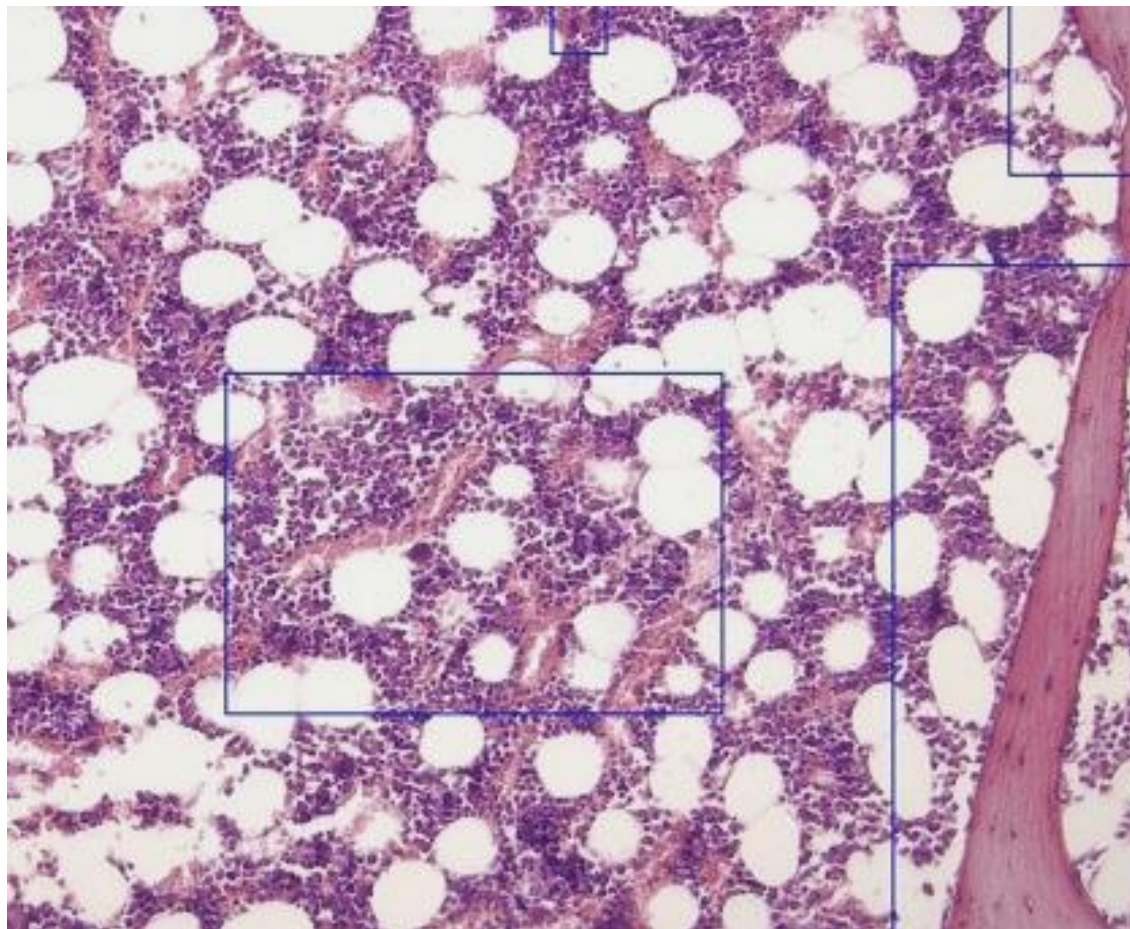


Dual red cell population ('dimorphic')

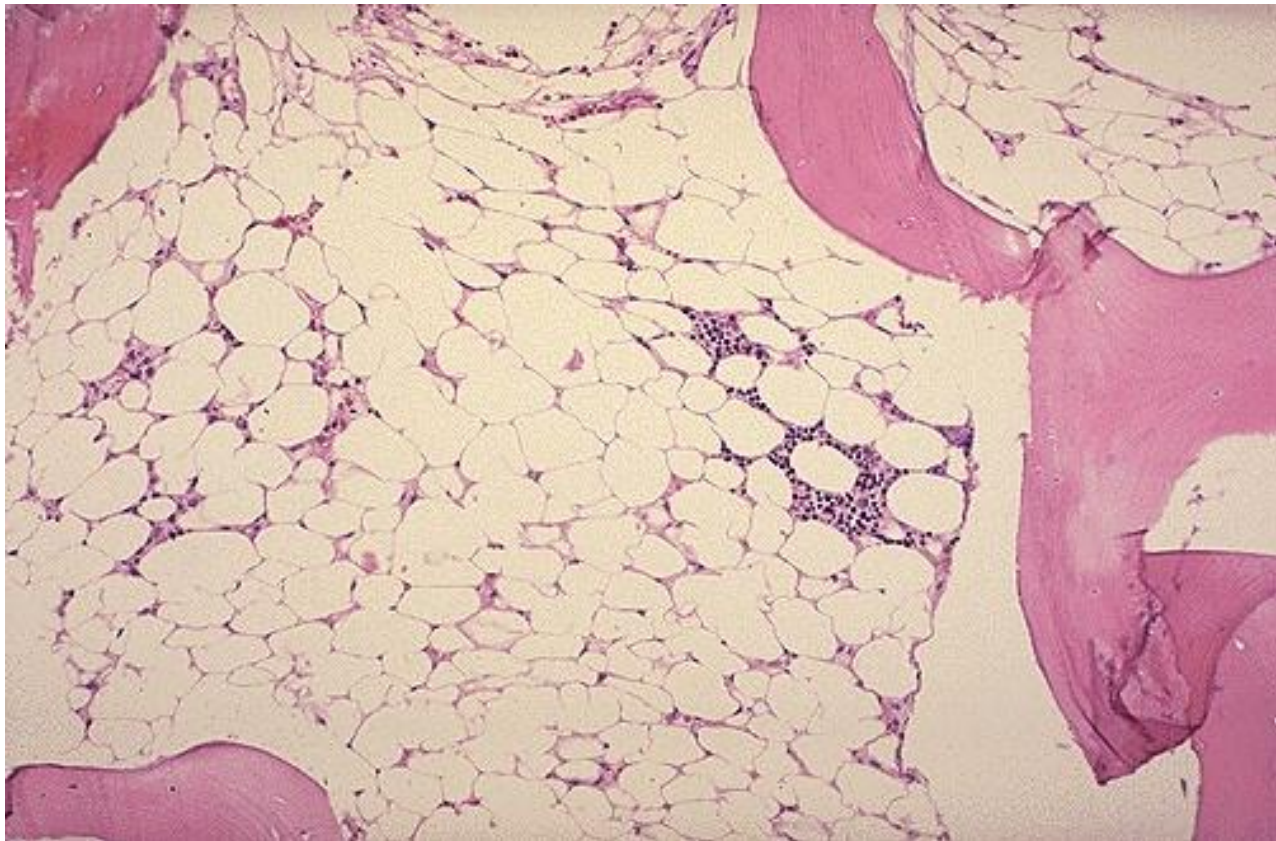


Hemolytic blood picture

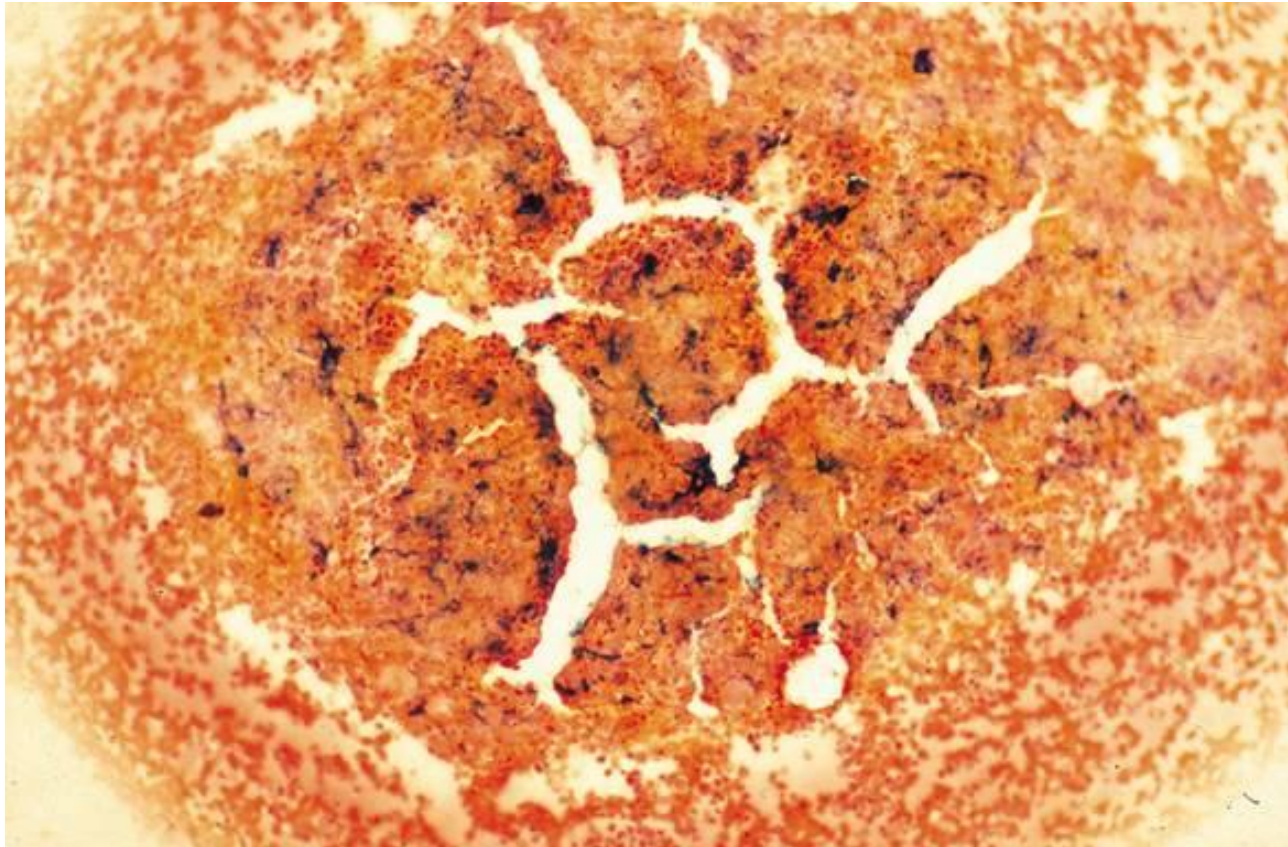
Bone marrow, normal



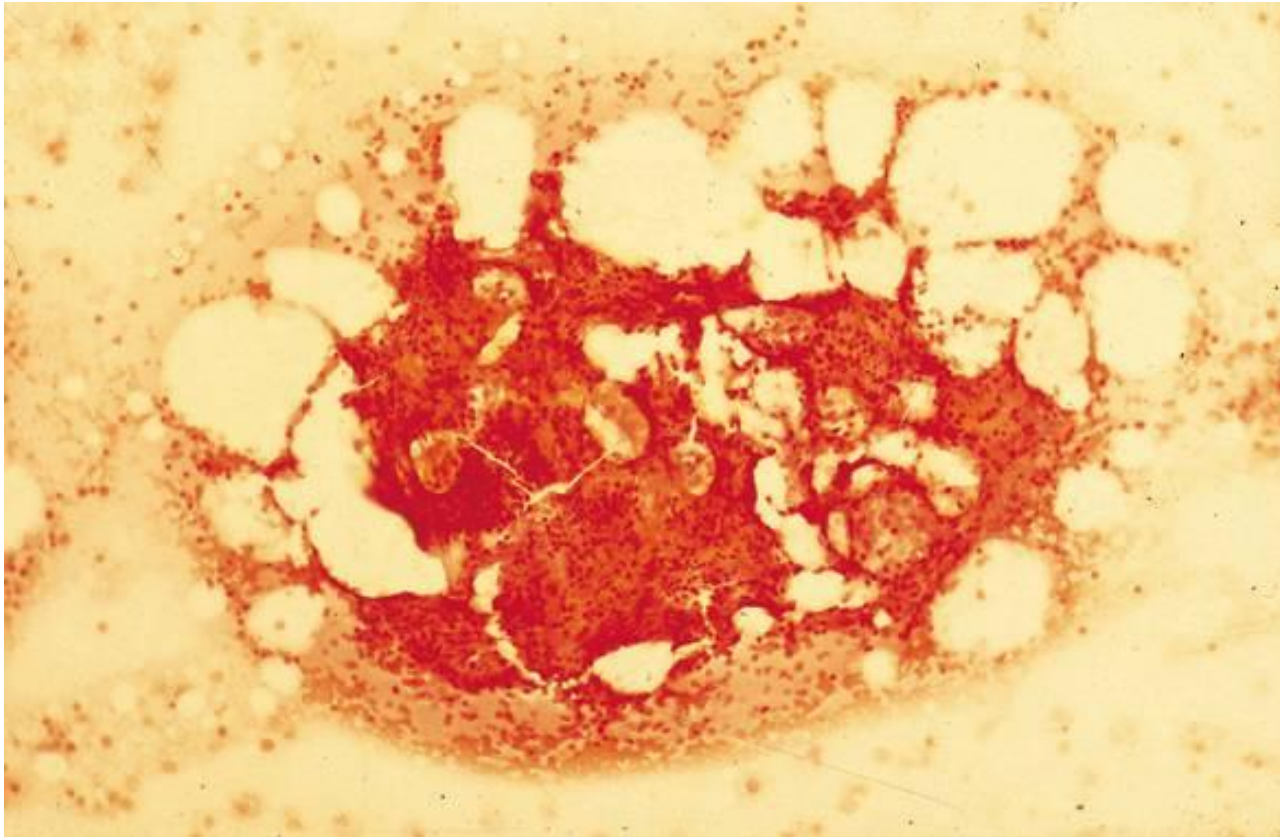
Aplastic anemia

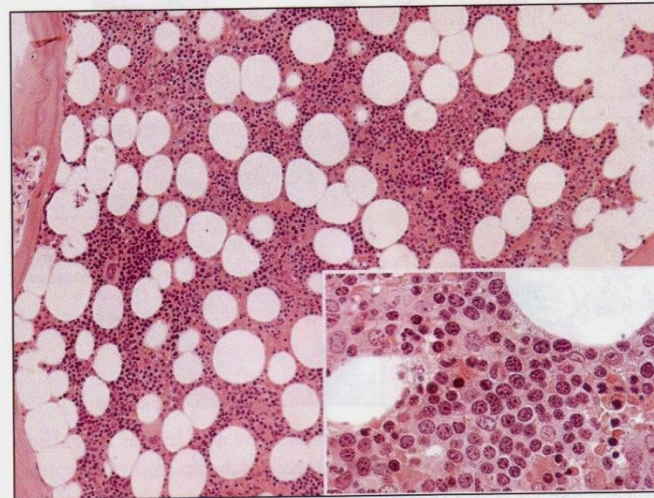
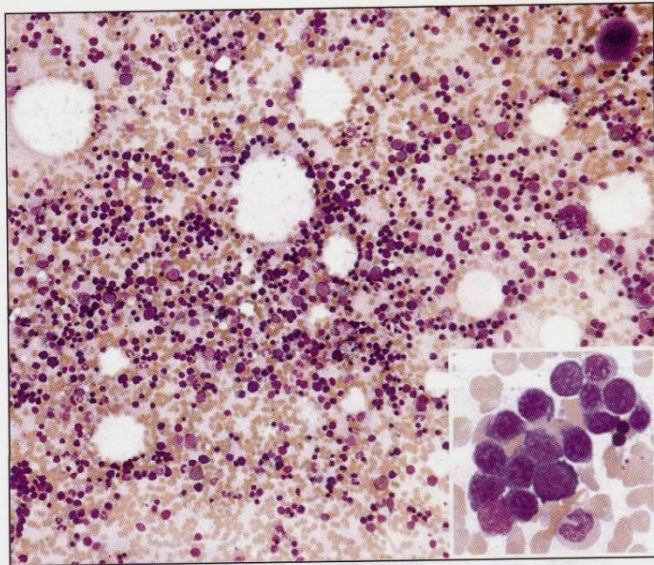


Bone marrow + Iron

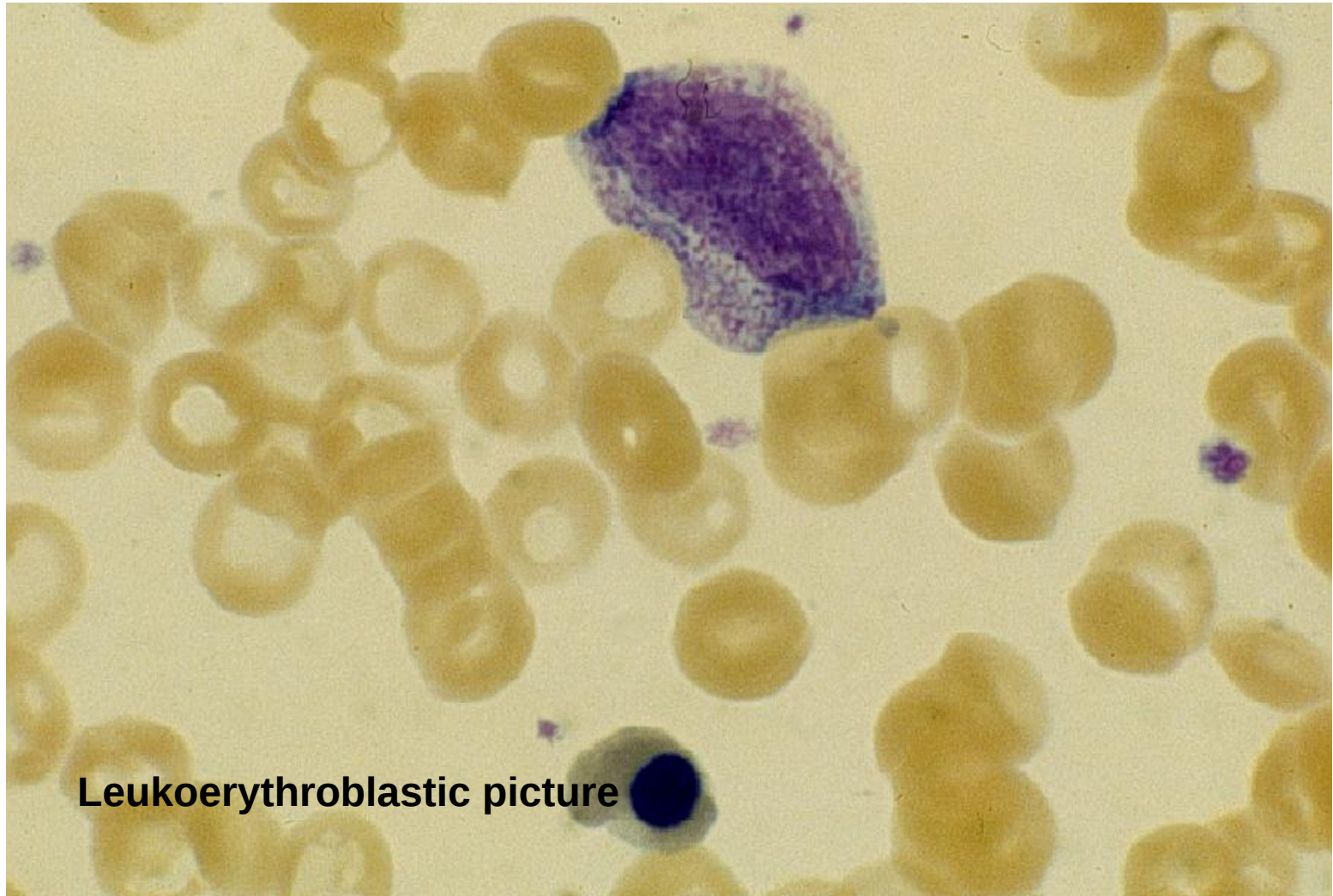


Bone marrow - Iron



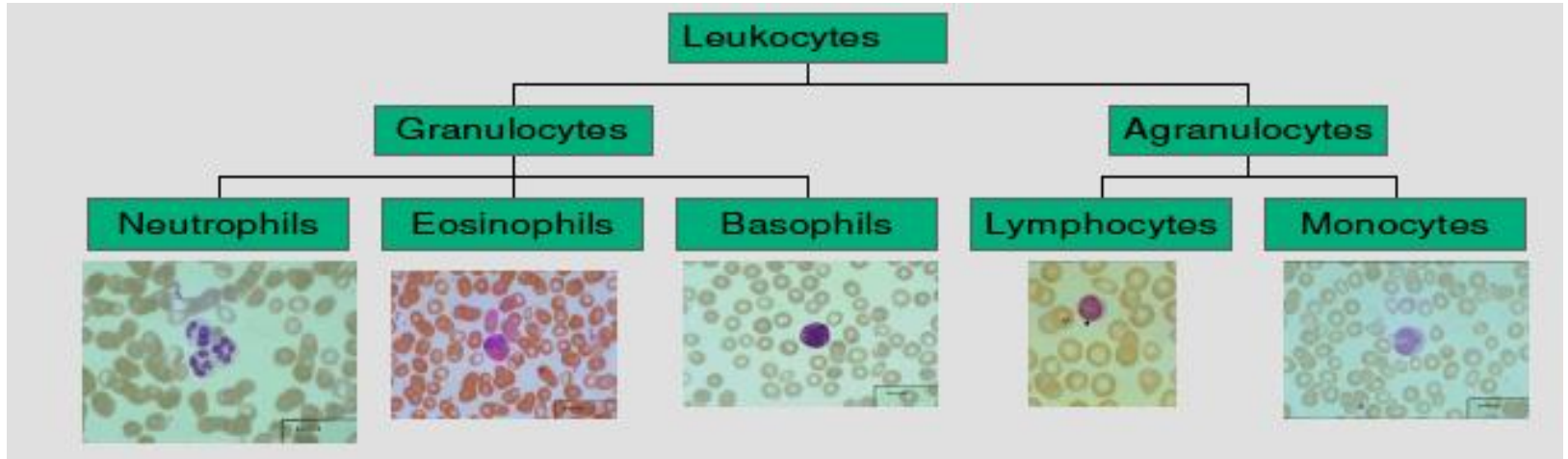


Bone marrow in thalassemia. Top and bottom panels show bone marrow aspirate and biopsy, respectively, from a case of thalassemia trait. The bone marrow has increased numbers of erythroid precursors (a low myeloid to erythroid ratio) related to the increased peripheral RBC destruction in this disease.



Leukoerythroblastic picture

WBC



Neutrophils



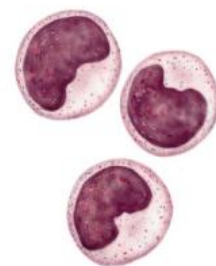
Eosinophils



Basophils

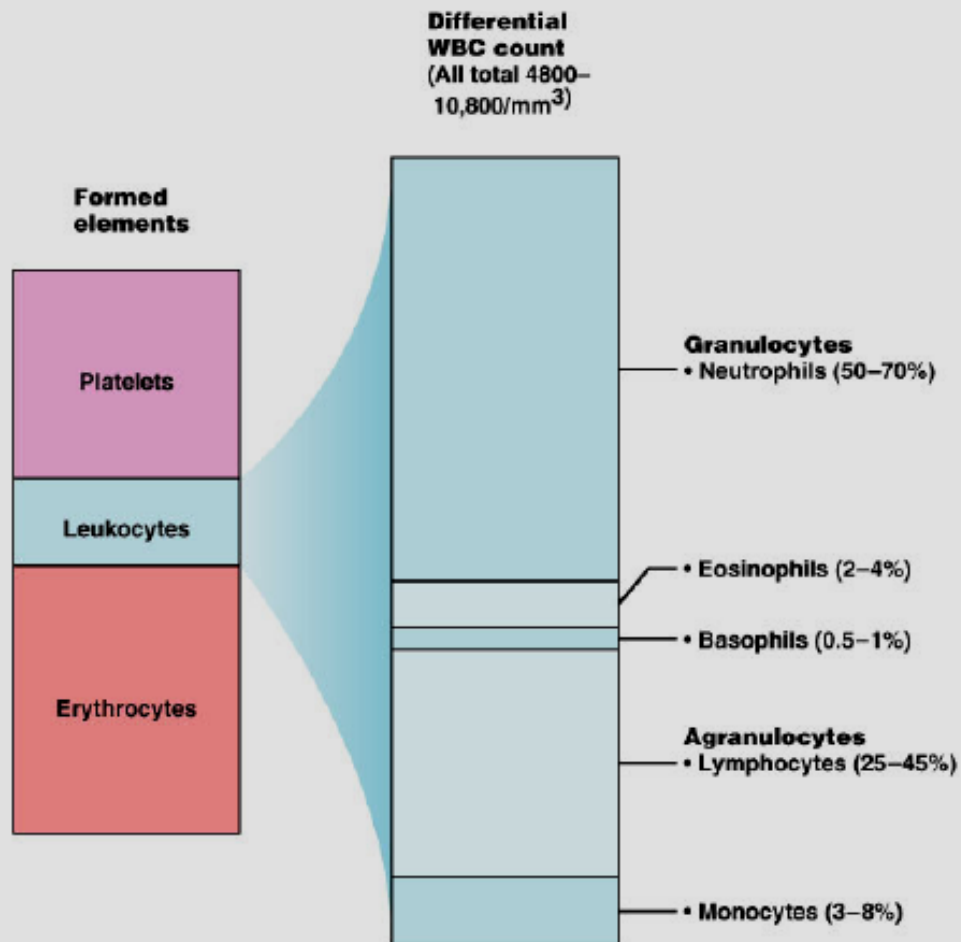


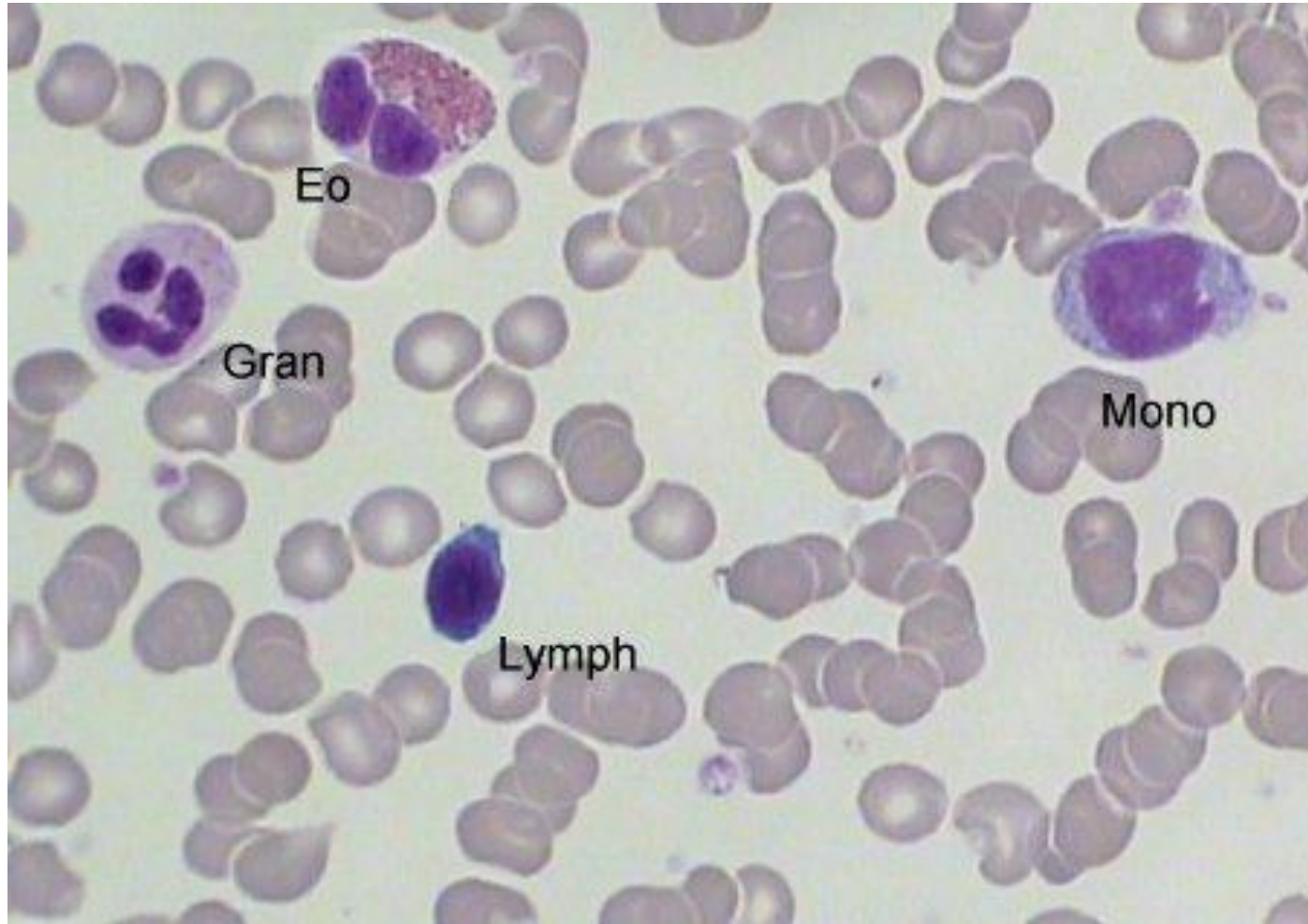
Lymphocytes



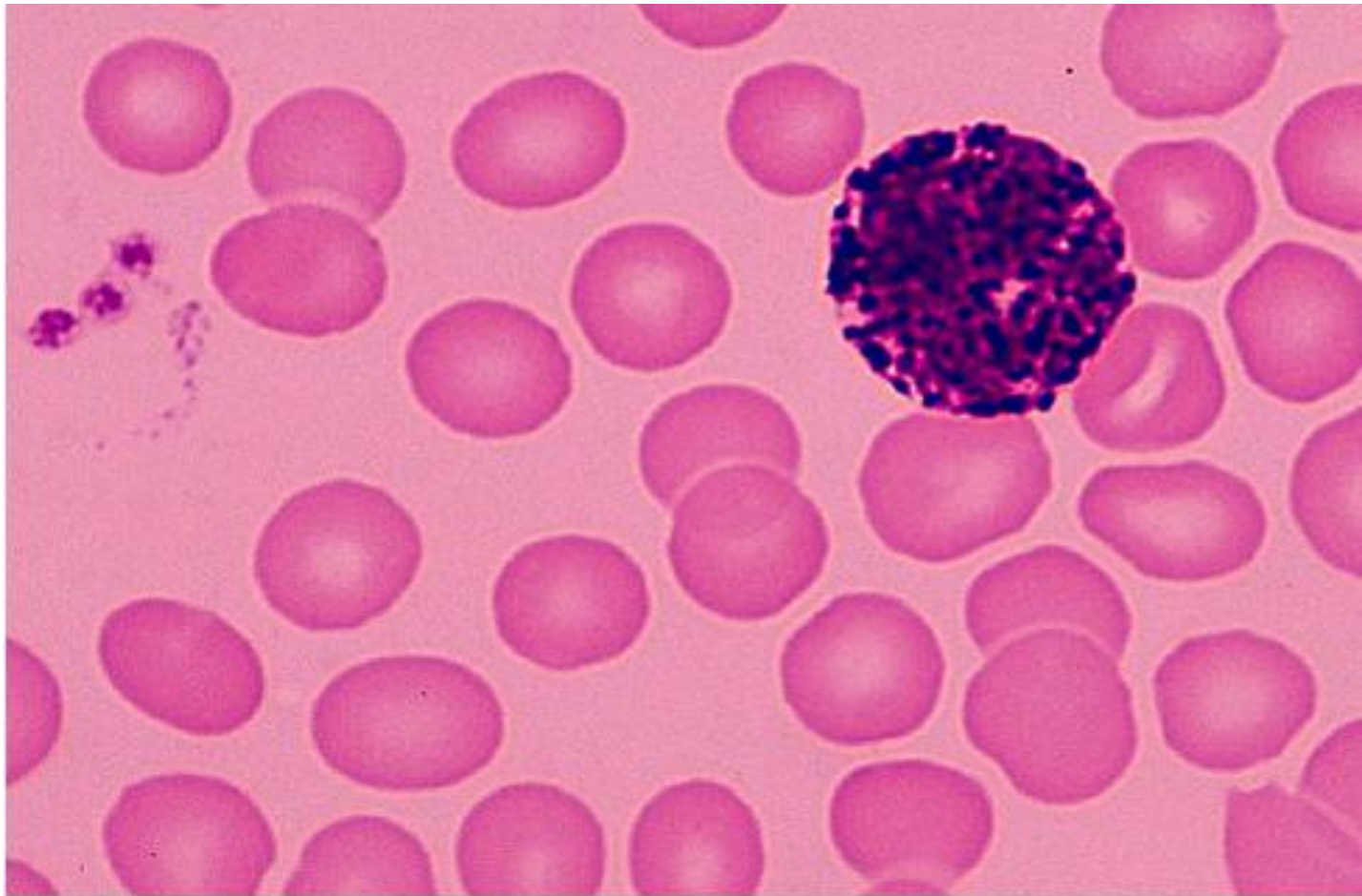
Monocytes

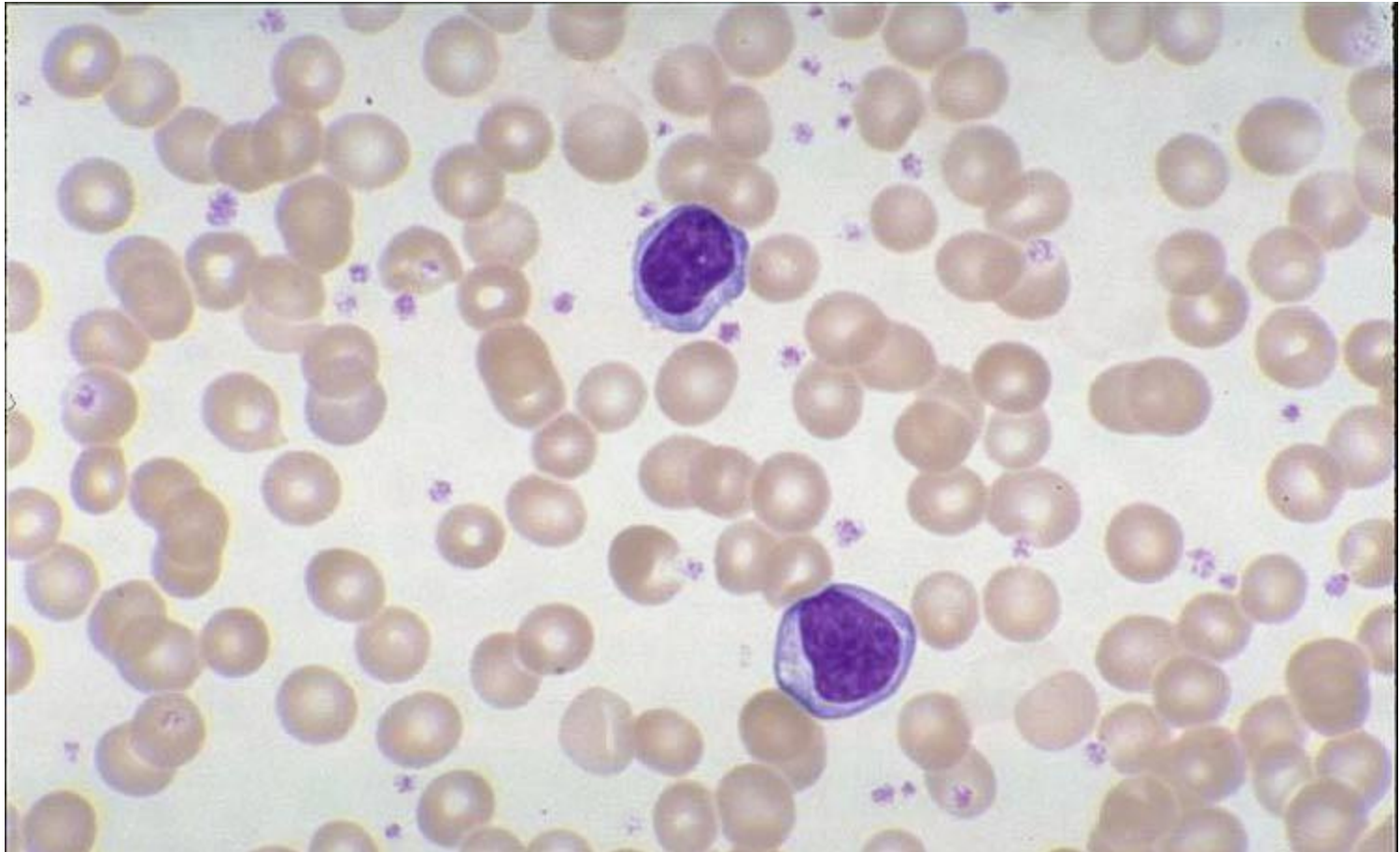
Differential WBC Count



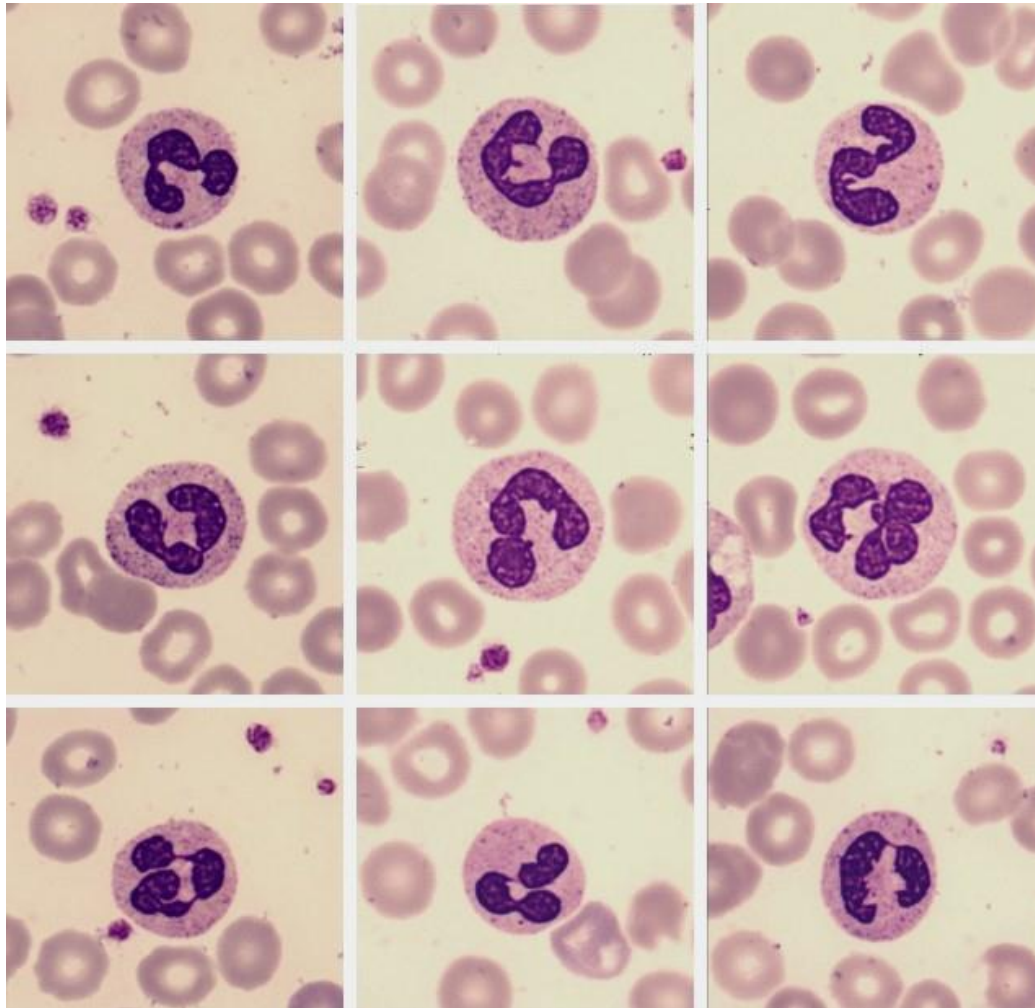


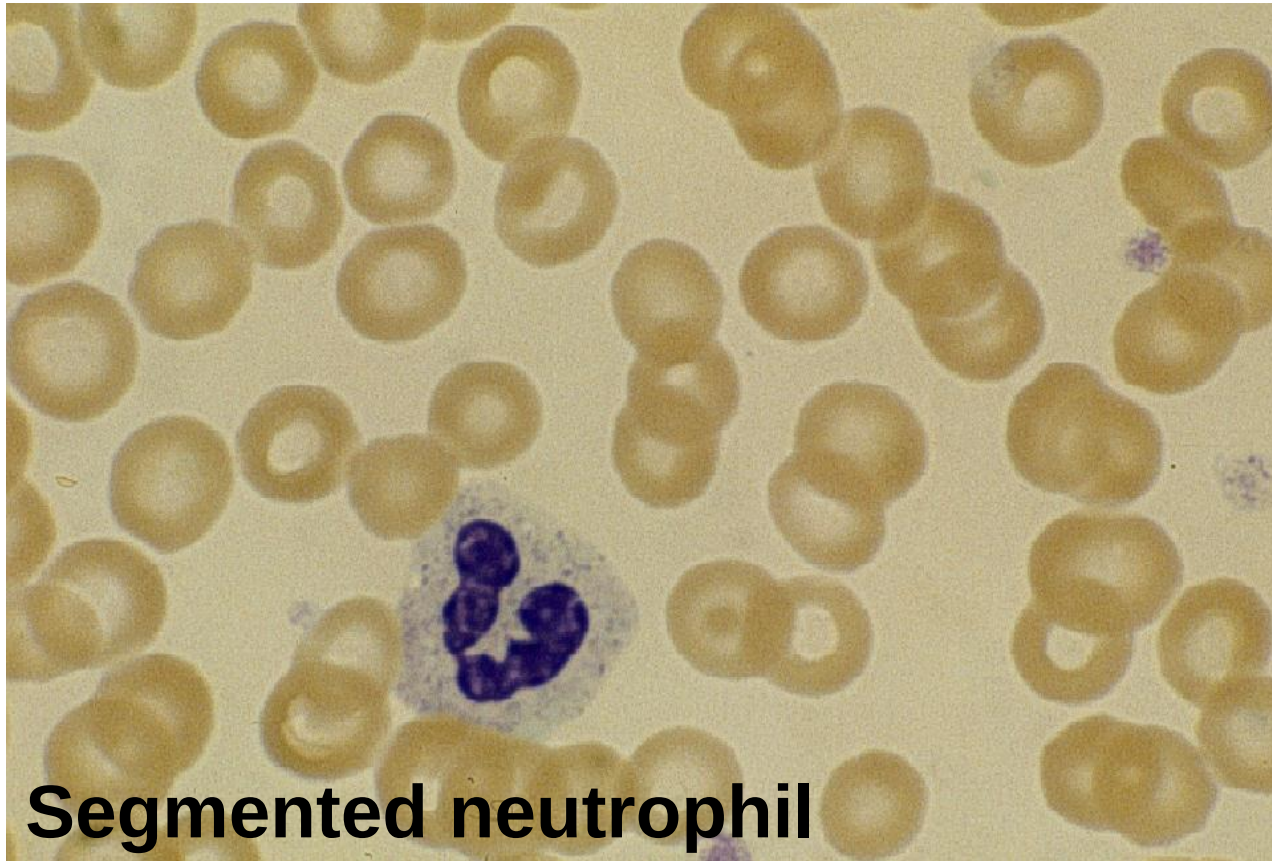






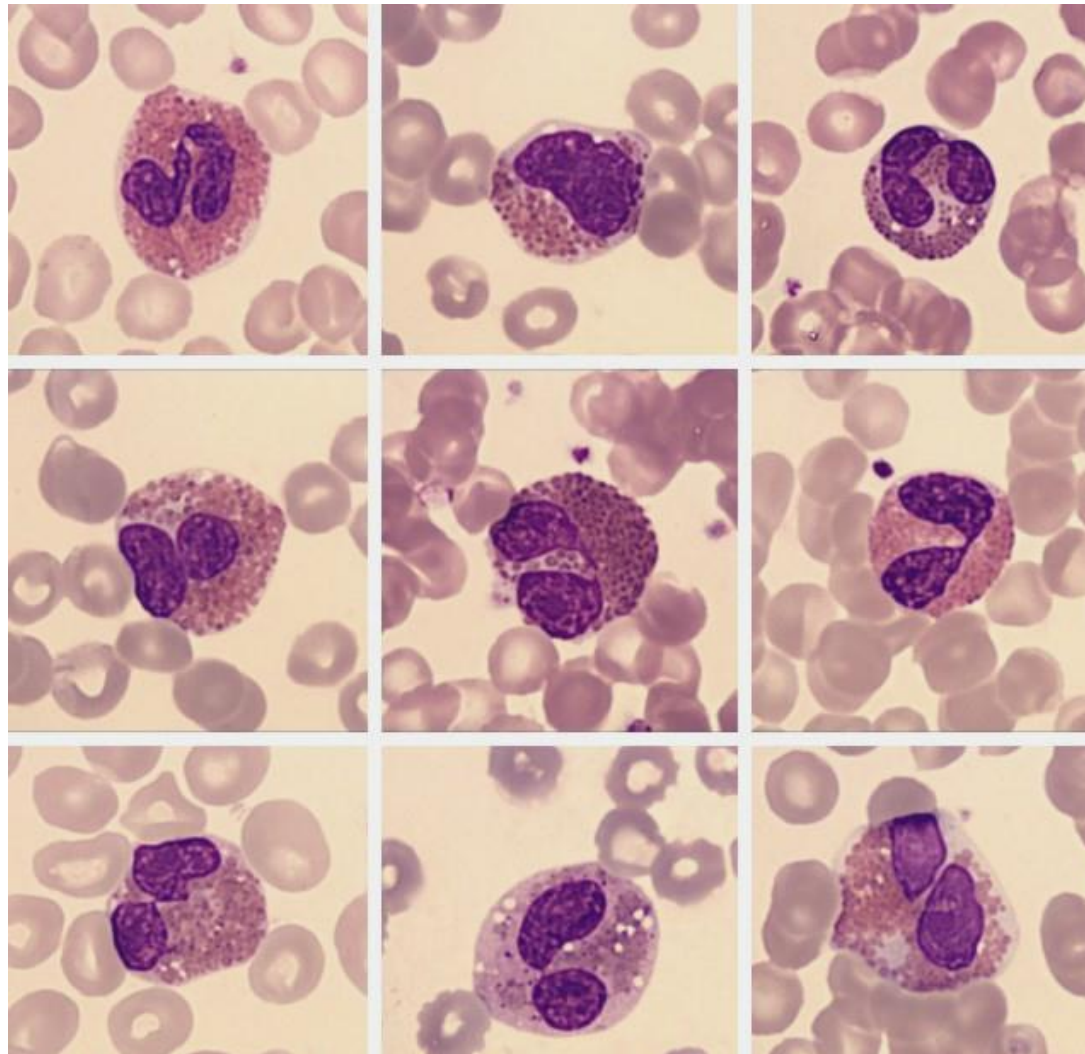
Neutrophile





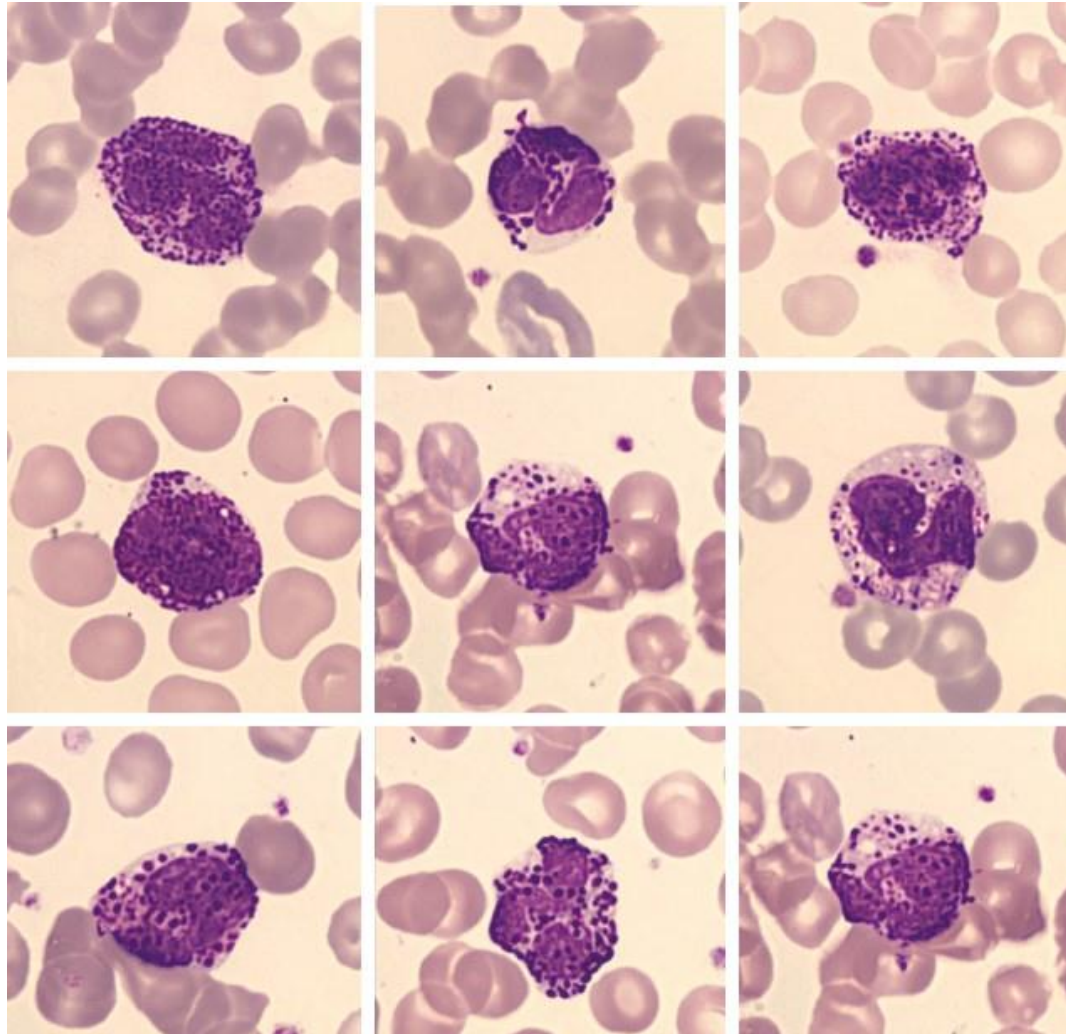
Segmented neutrophil

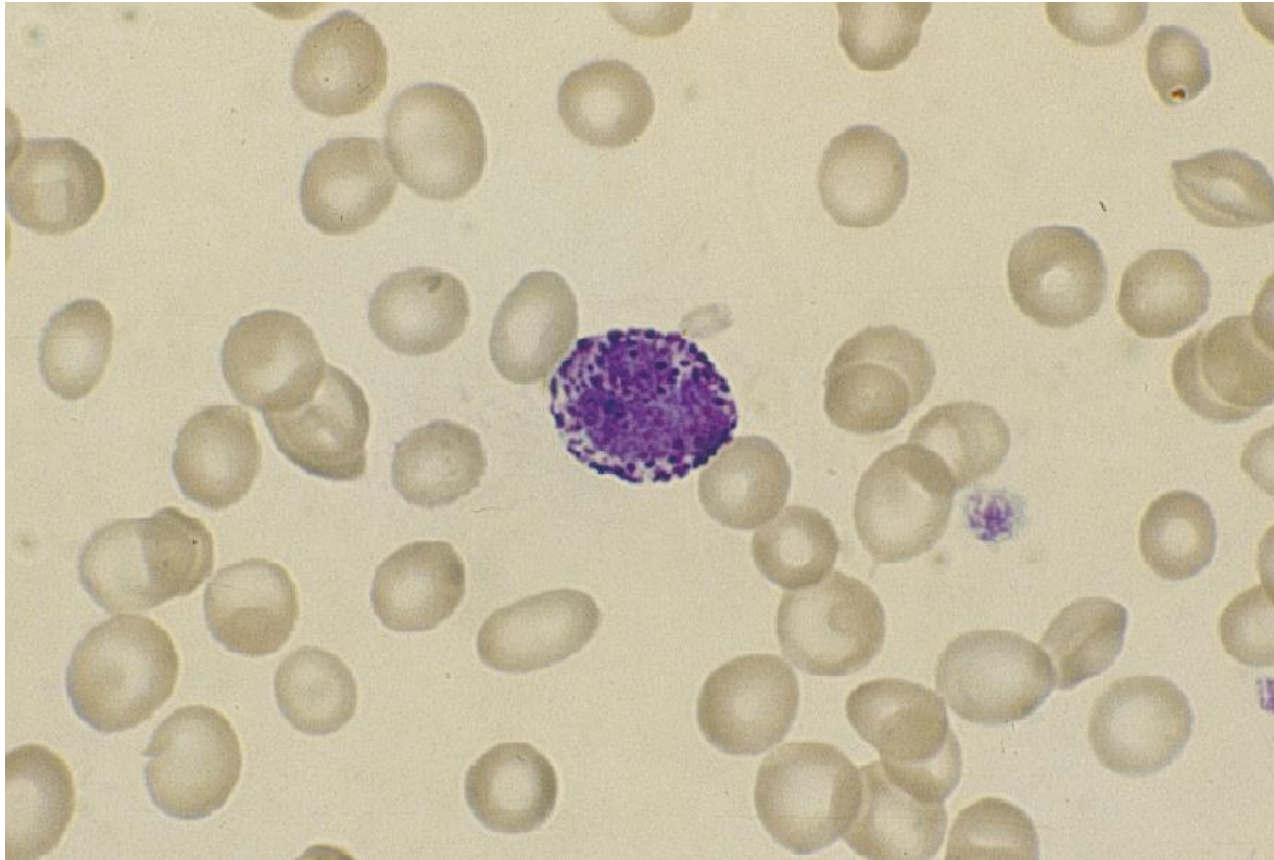
Eosinophil



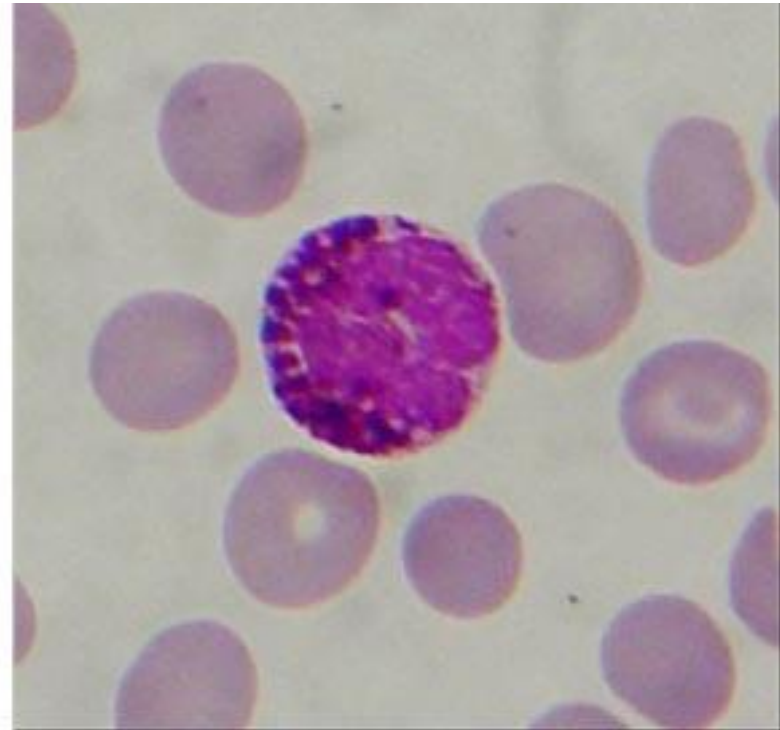
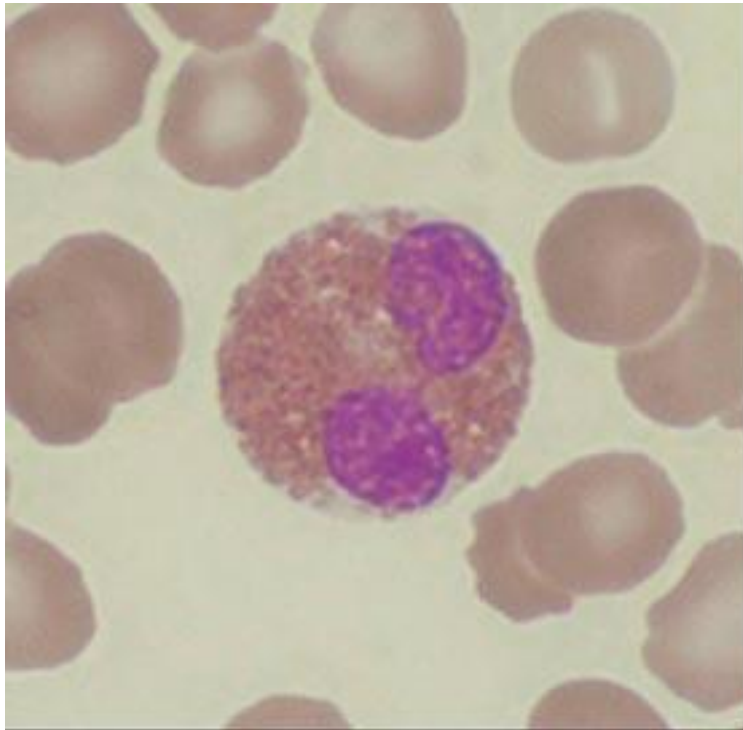


Basophil

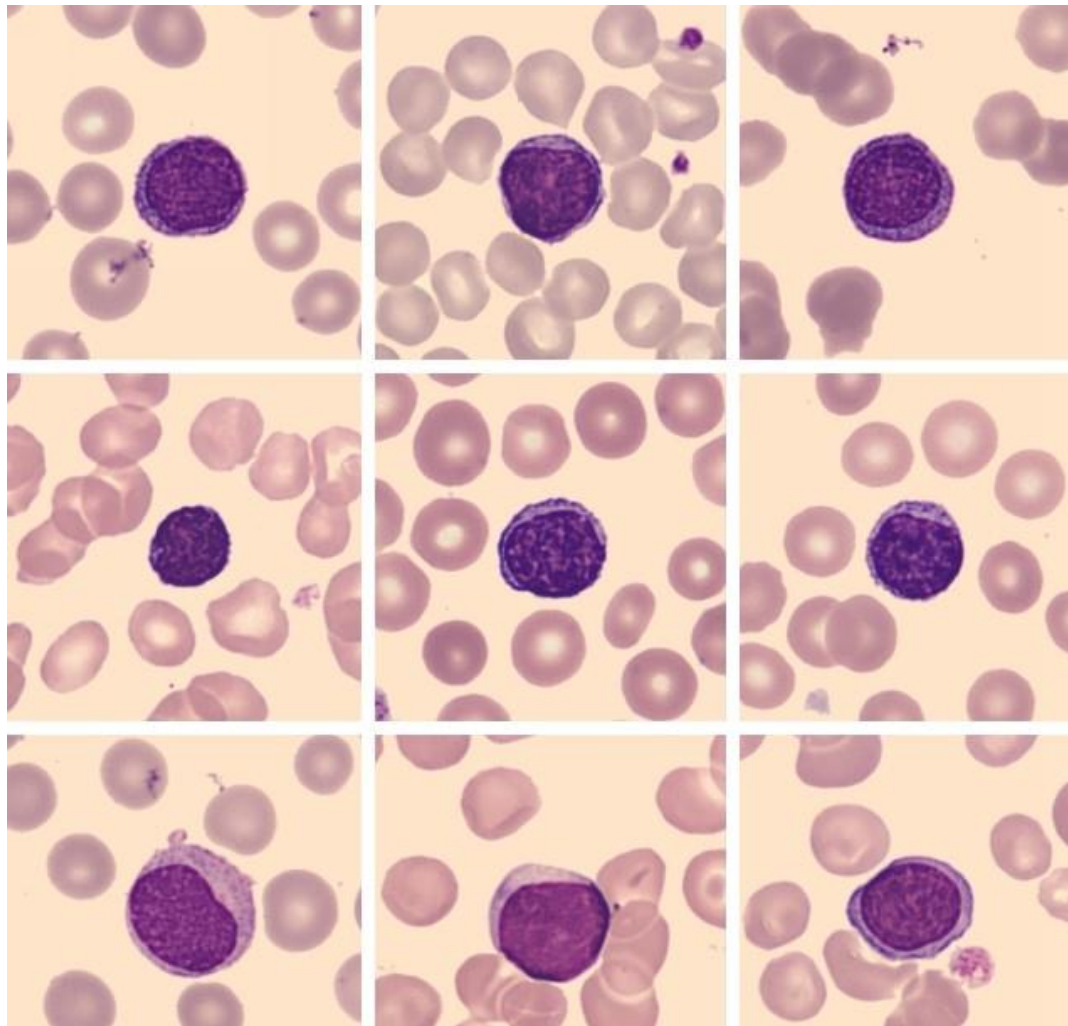


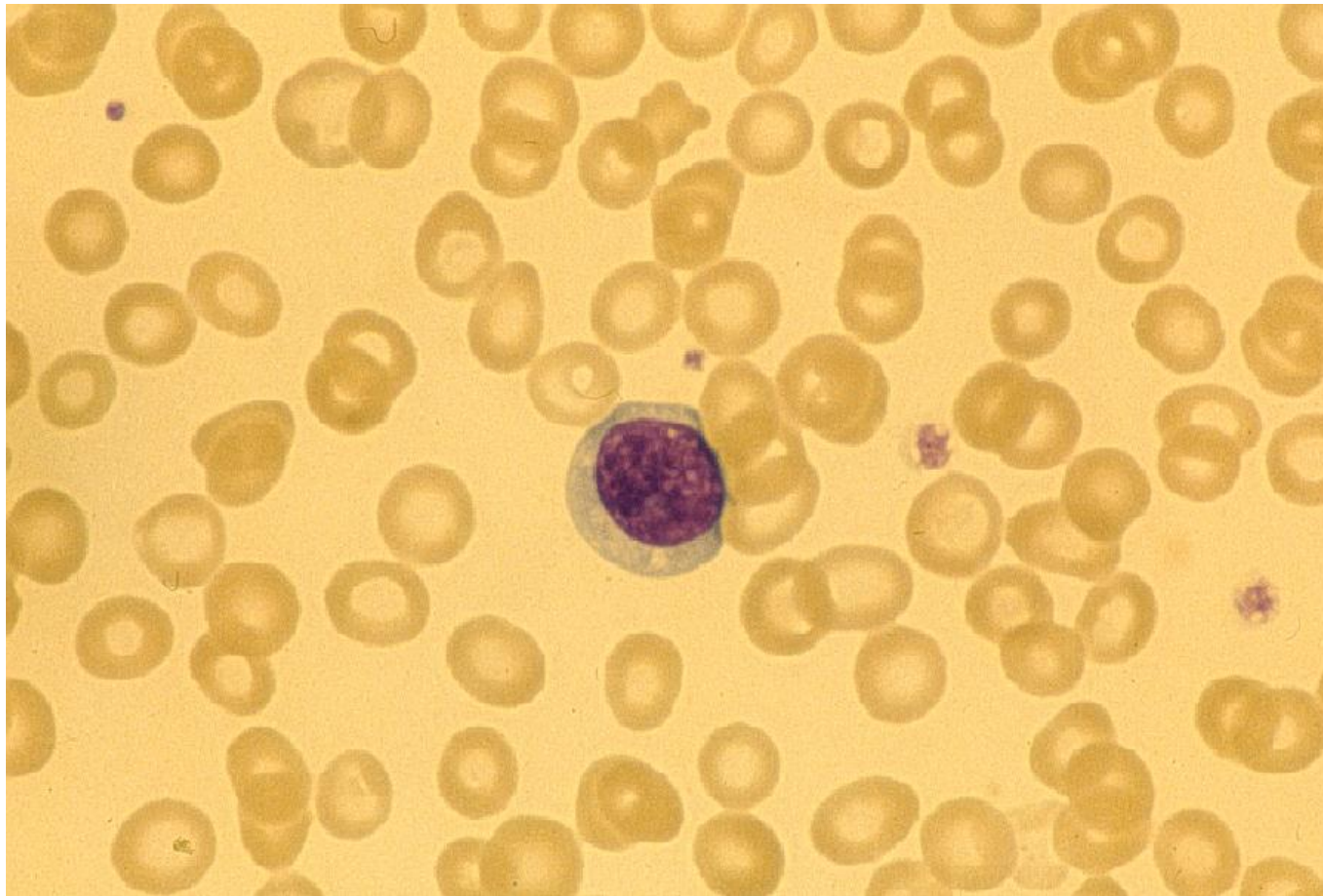


Eosinophil and Basophil

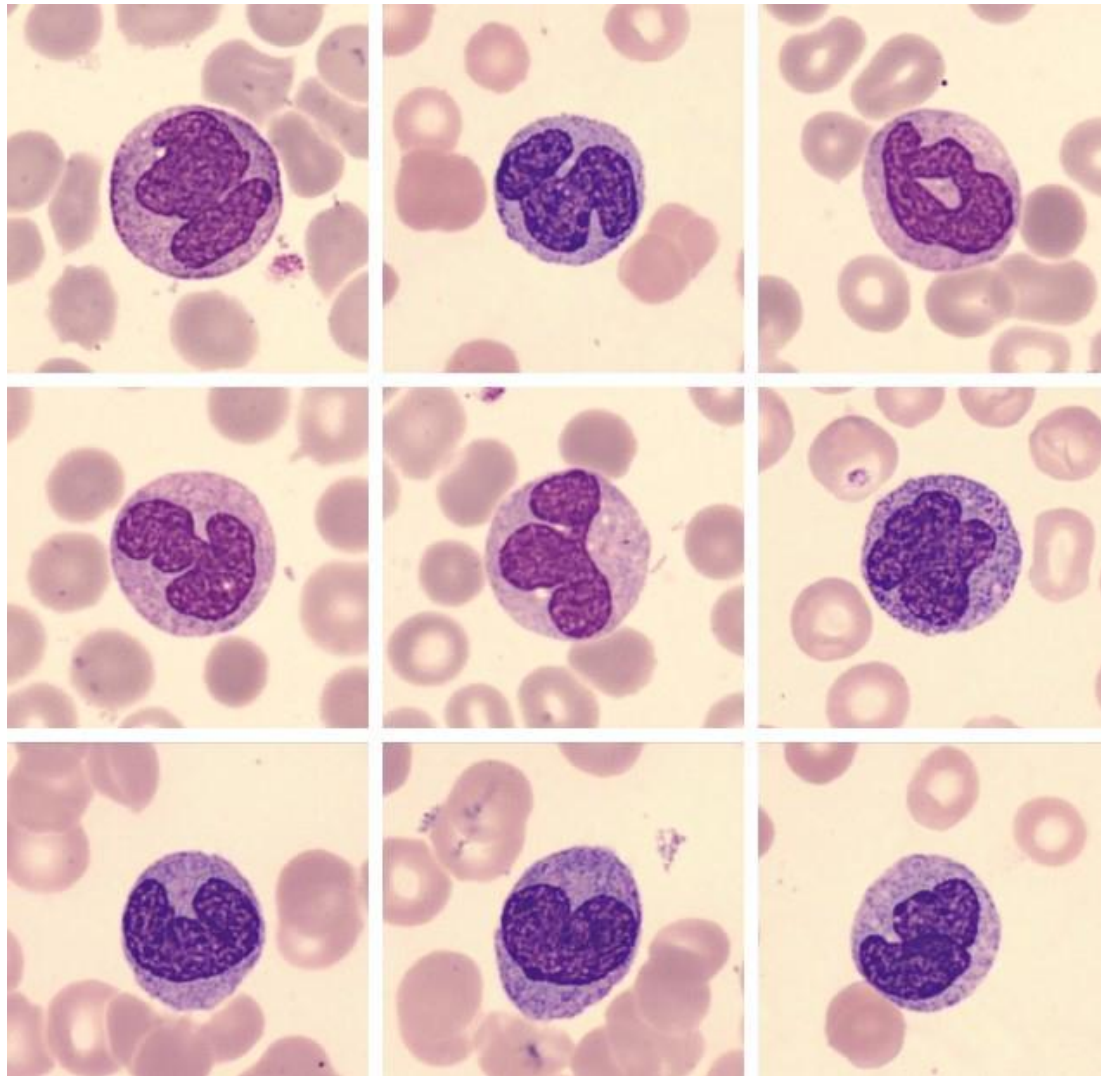


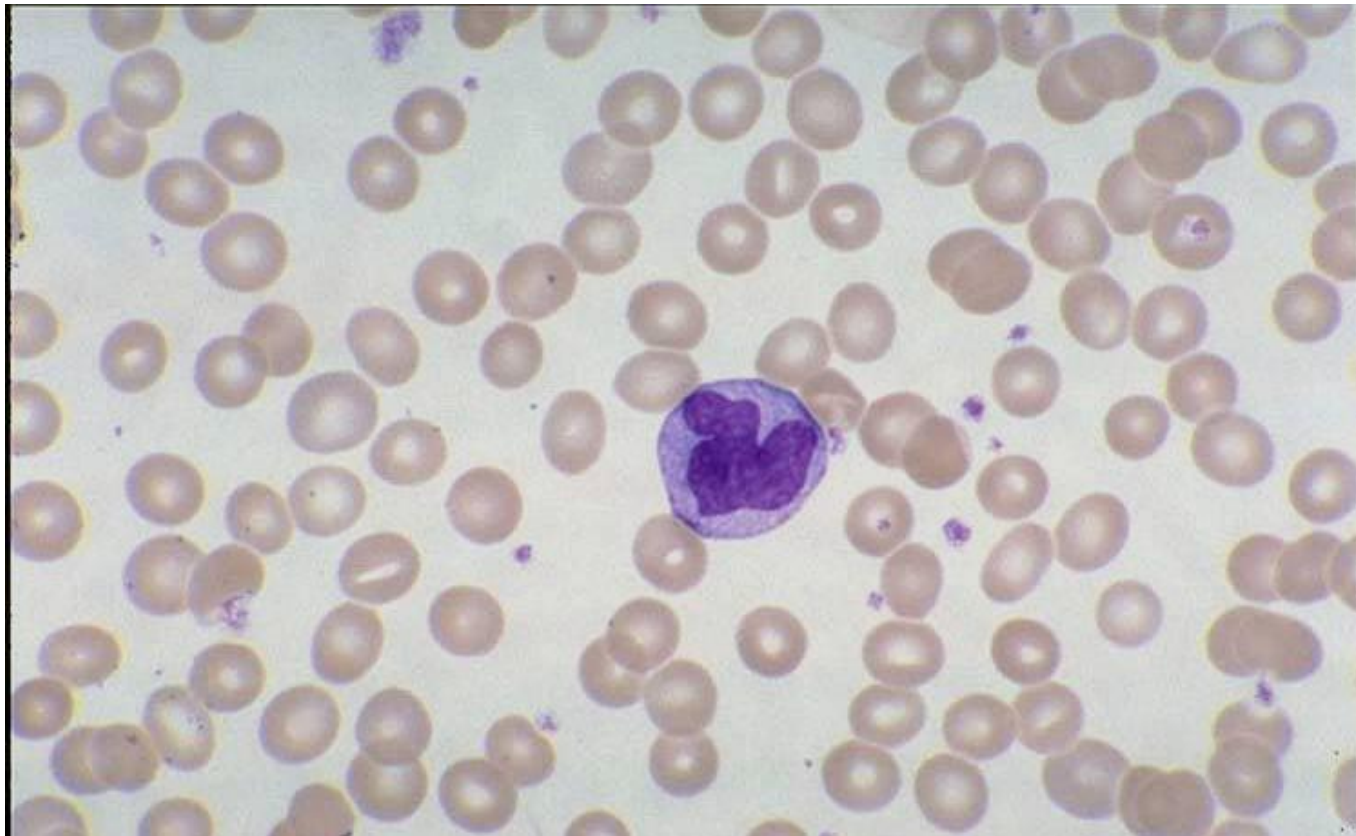
Lymphocyte

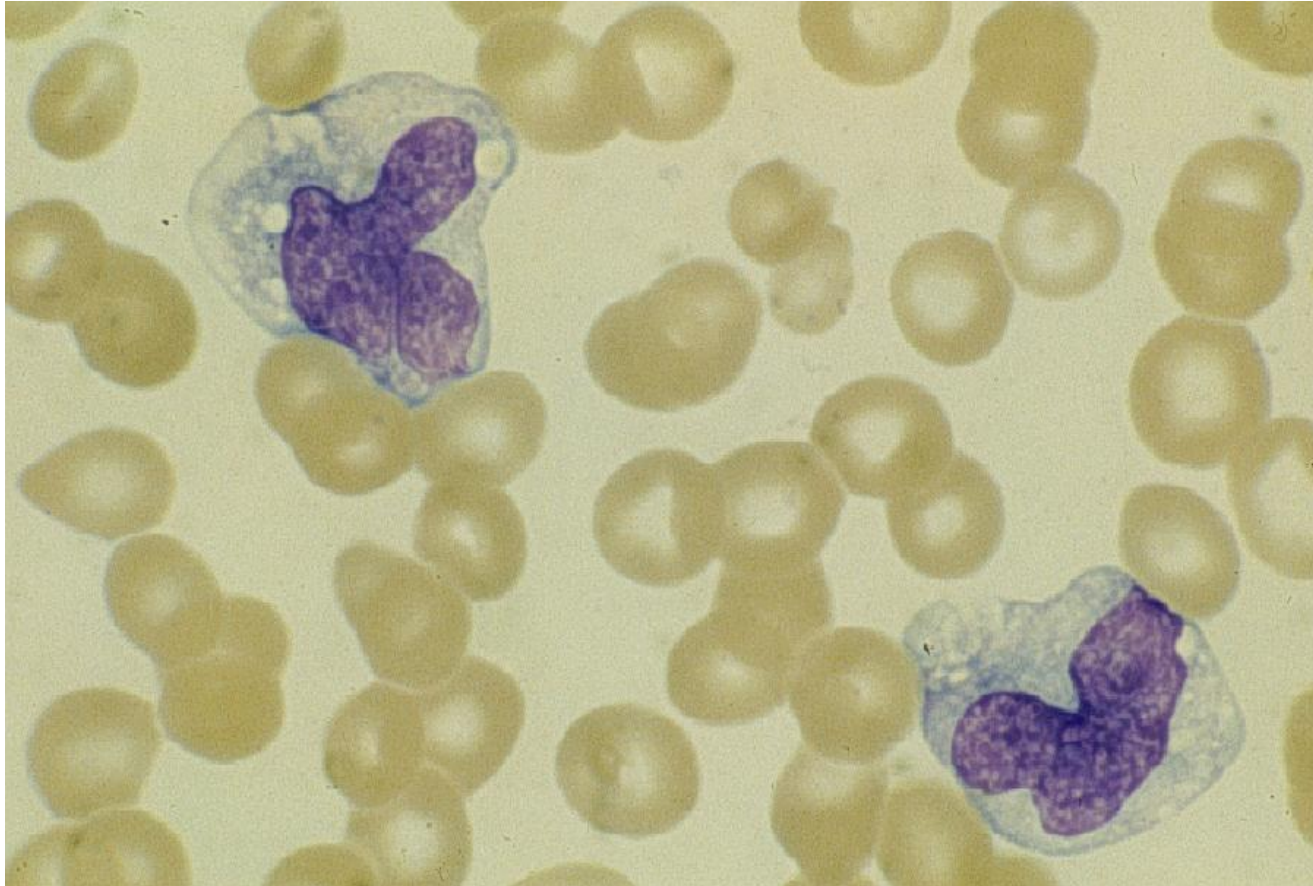


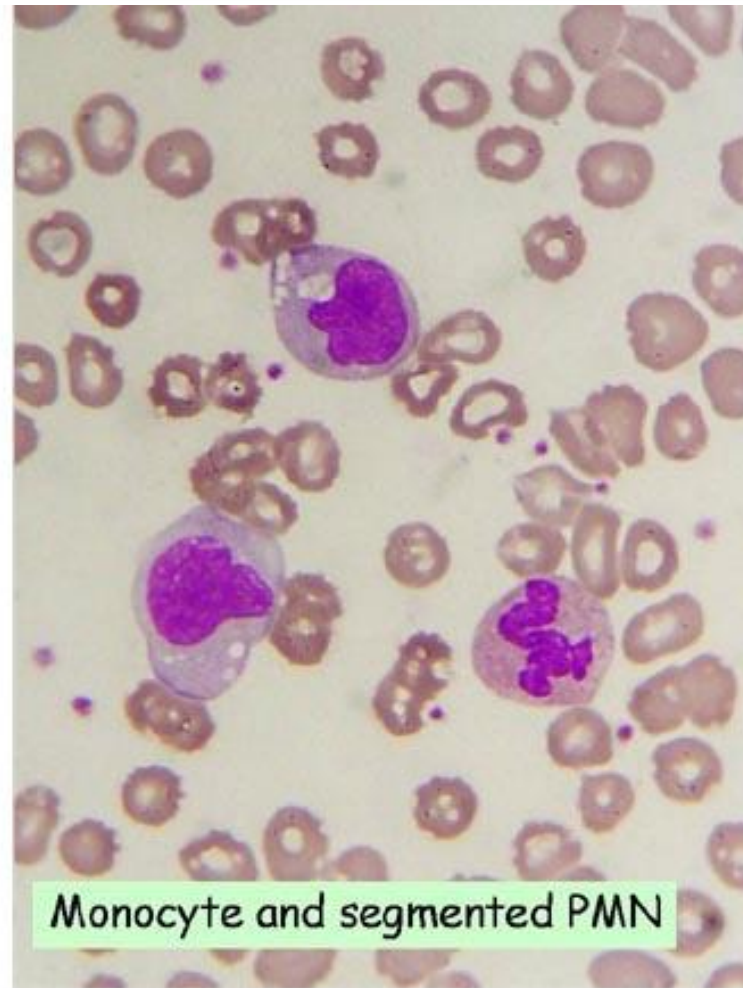


Monocyte

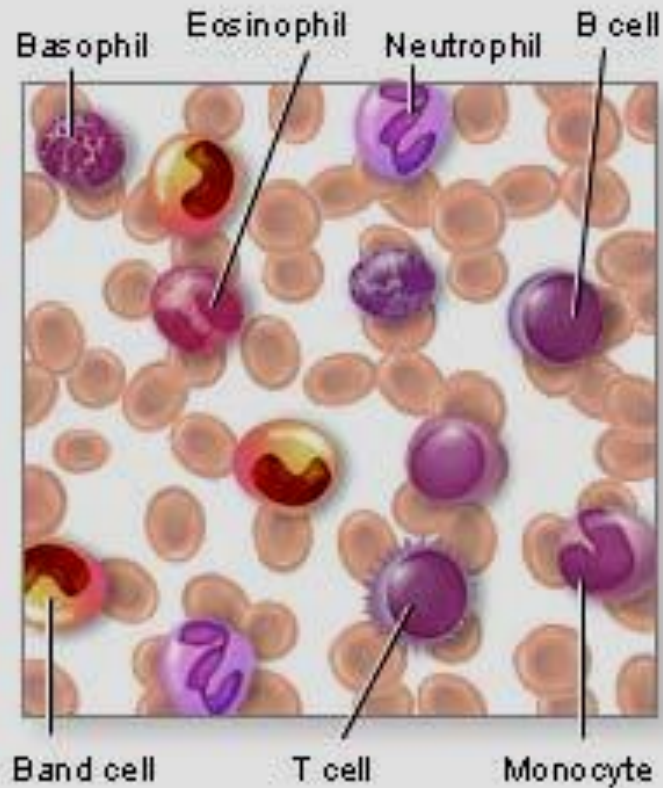




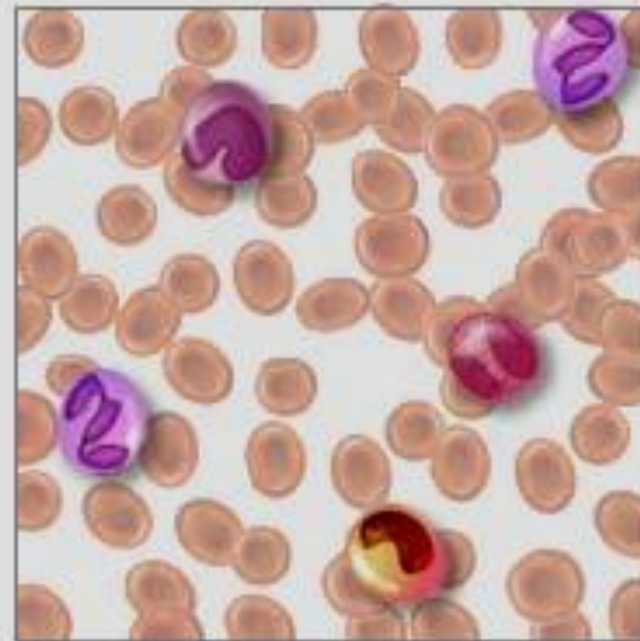


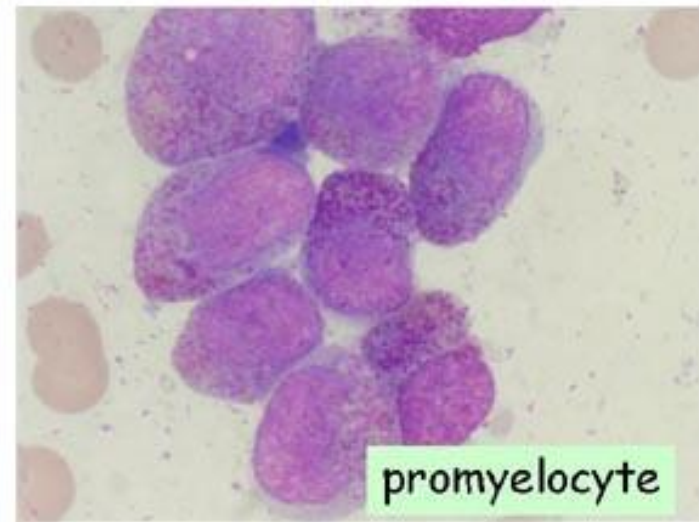
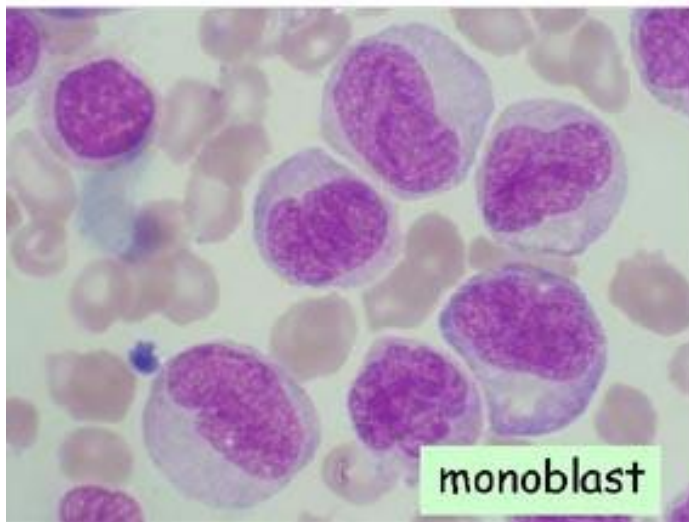
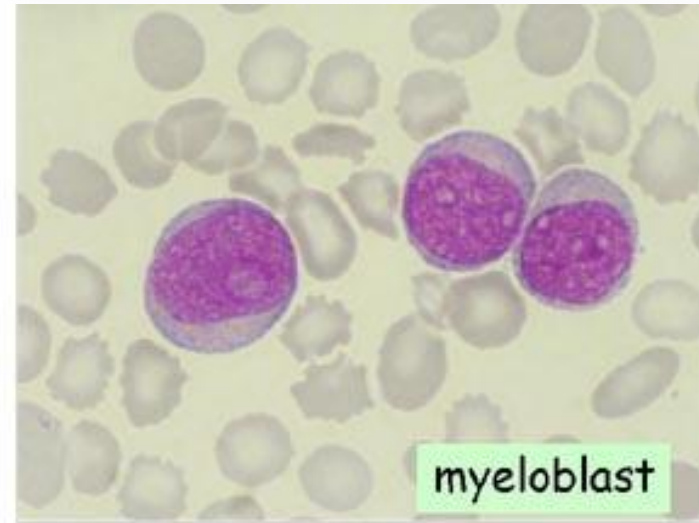
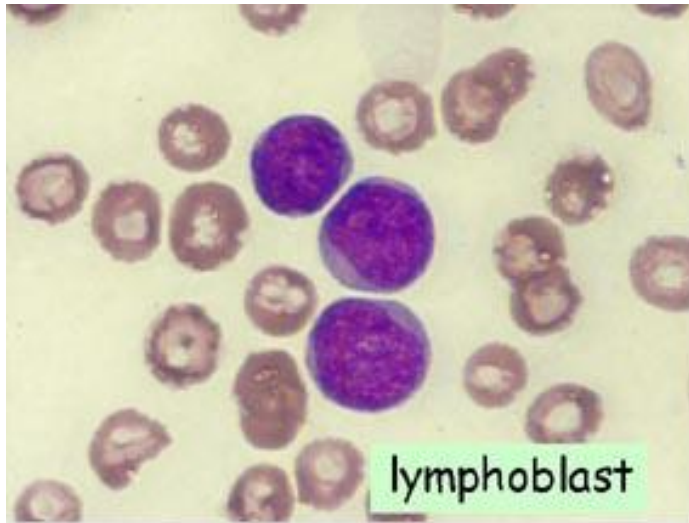


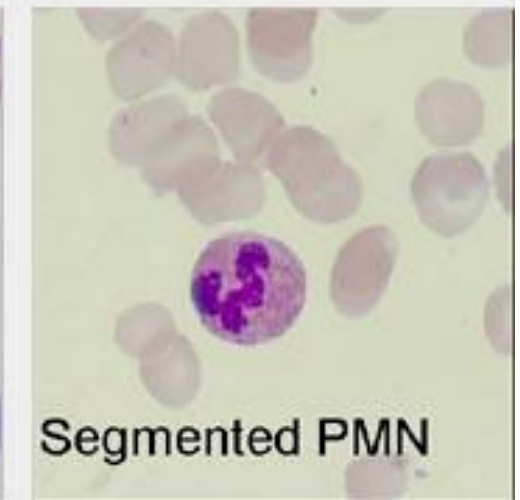
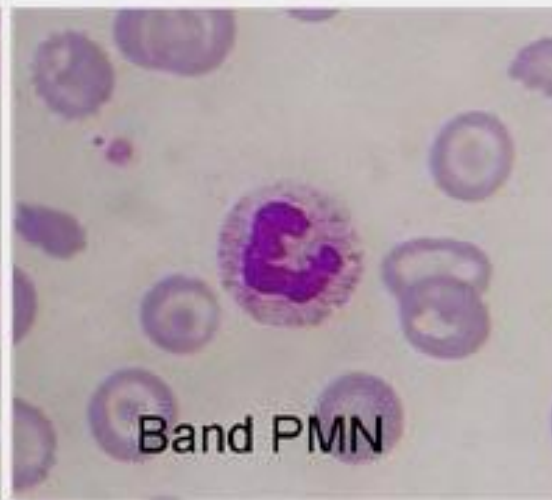
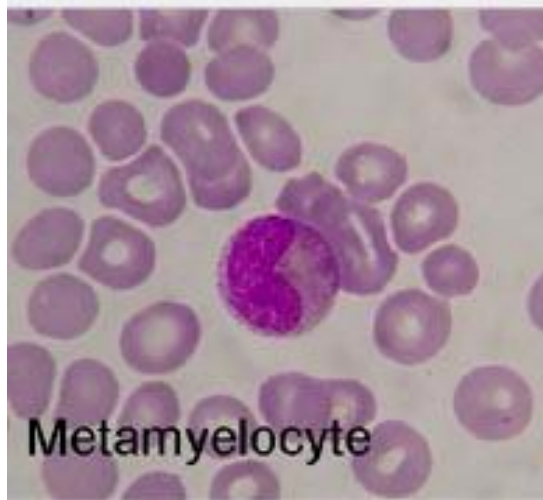
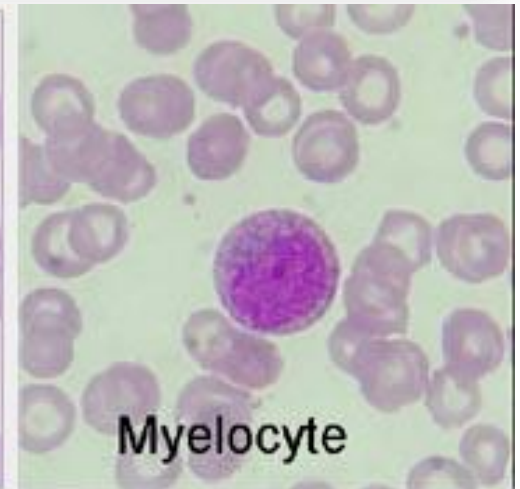
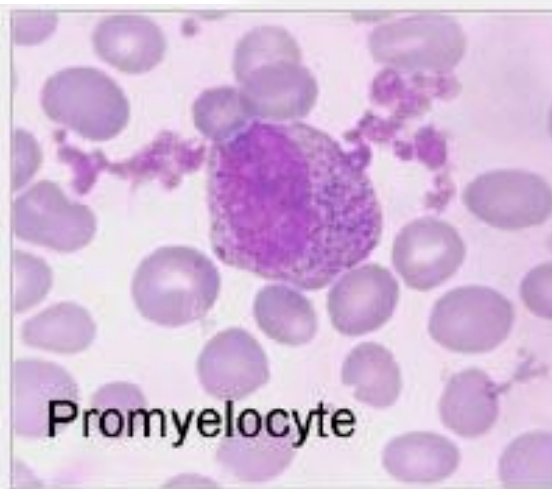
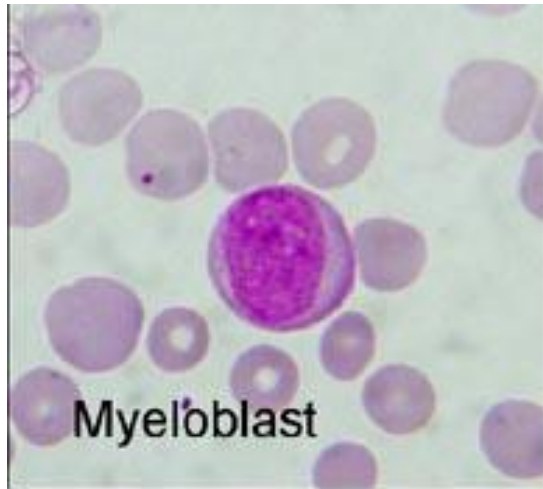
High WBC count

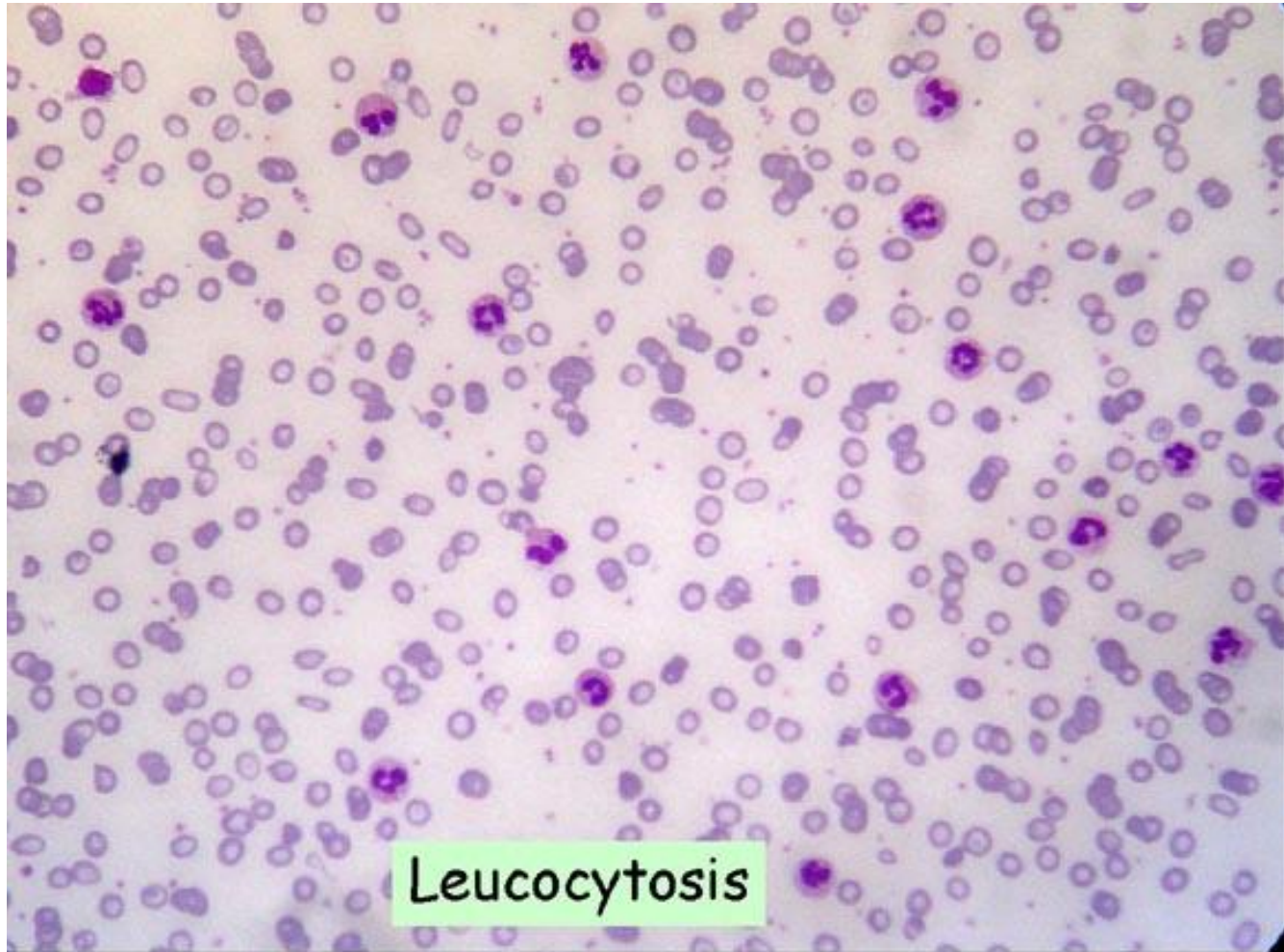


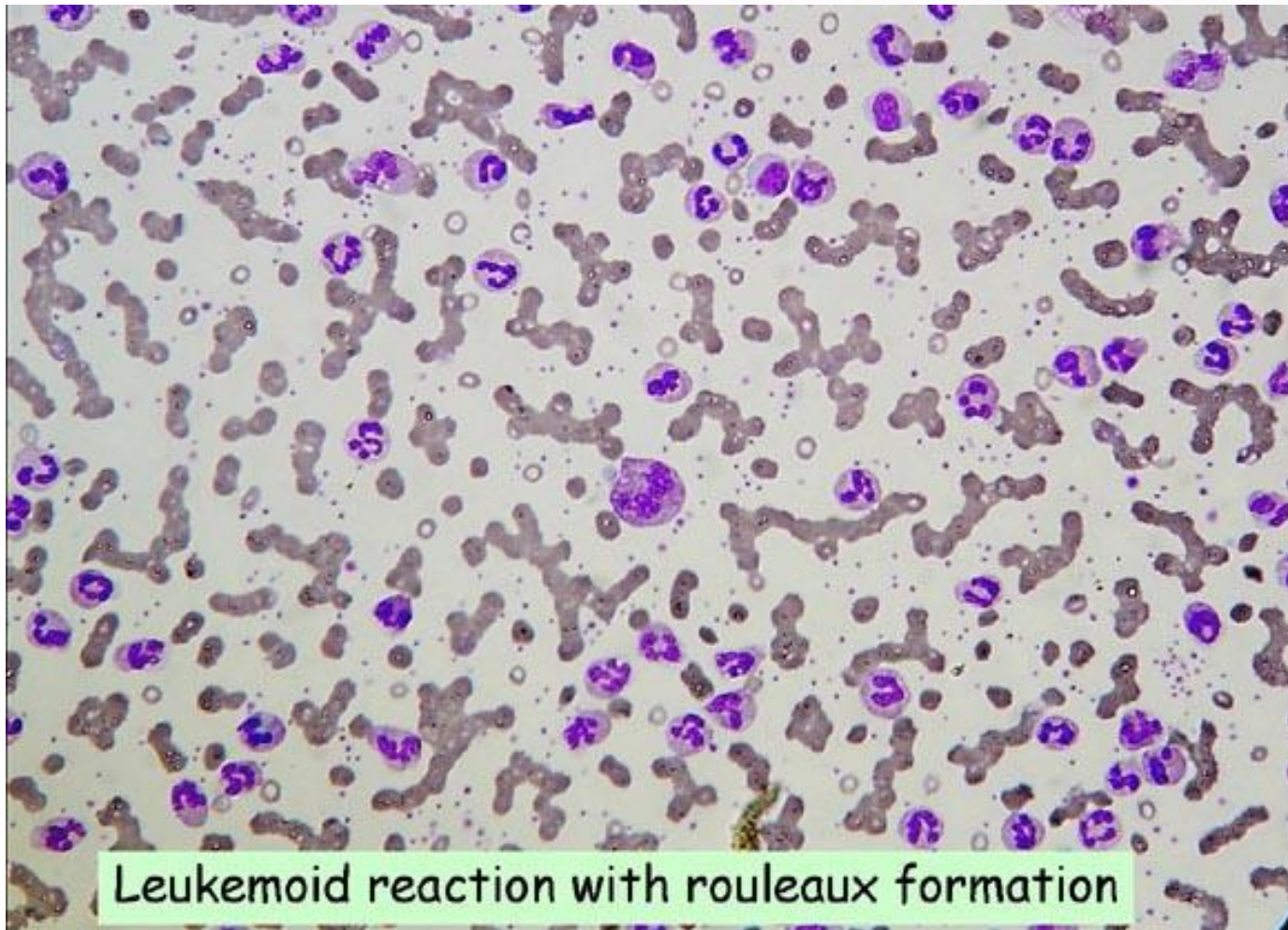
Low WBC count

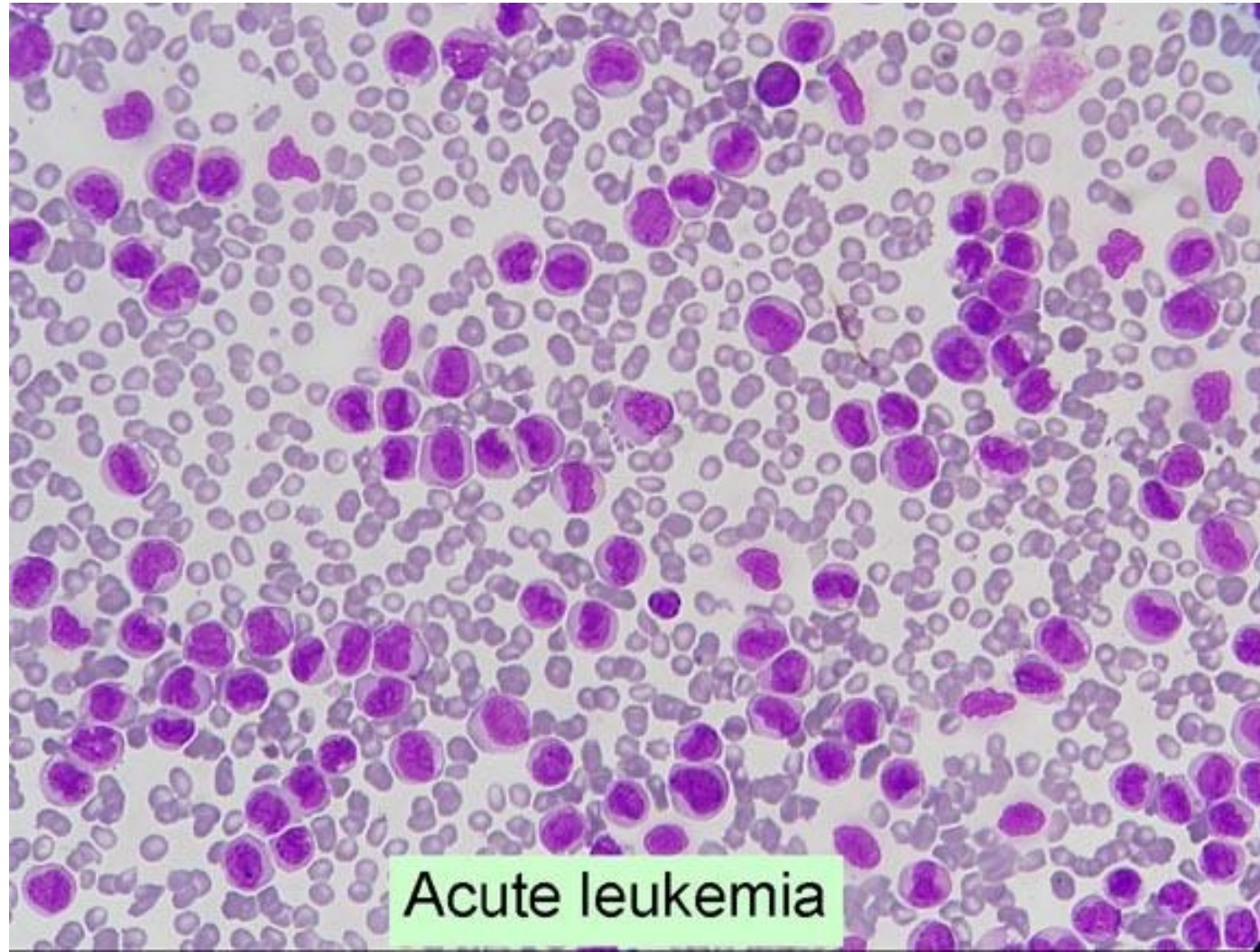




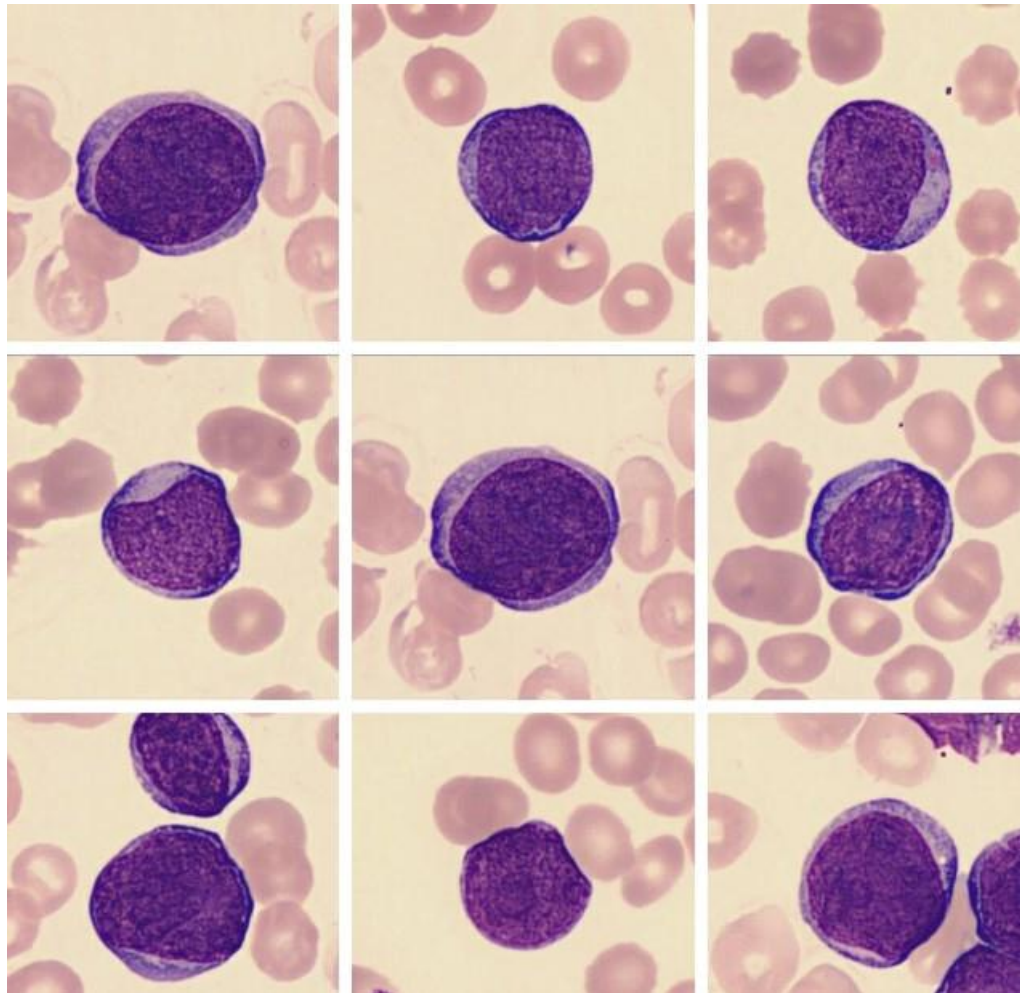








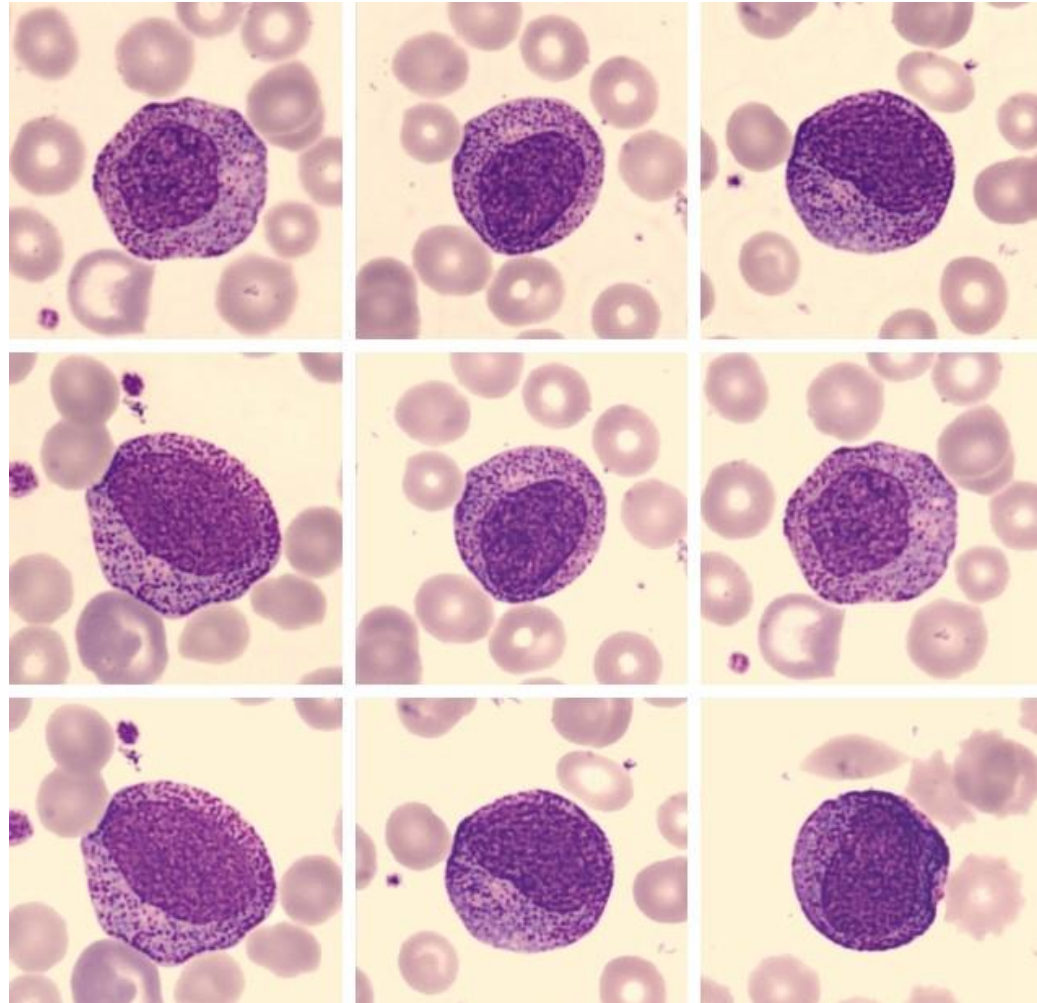
Myeloblast



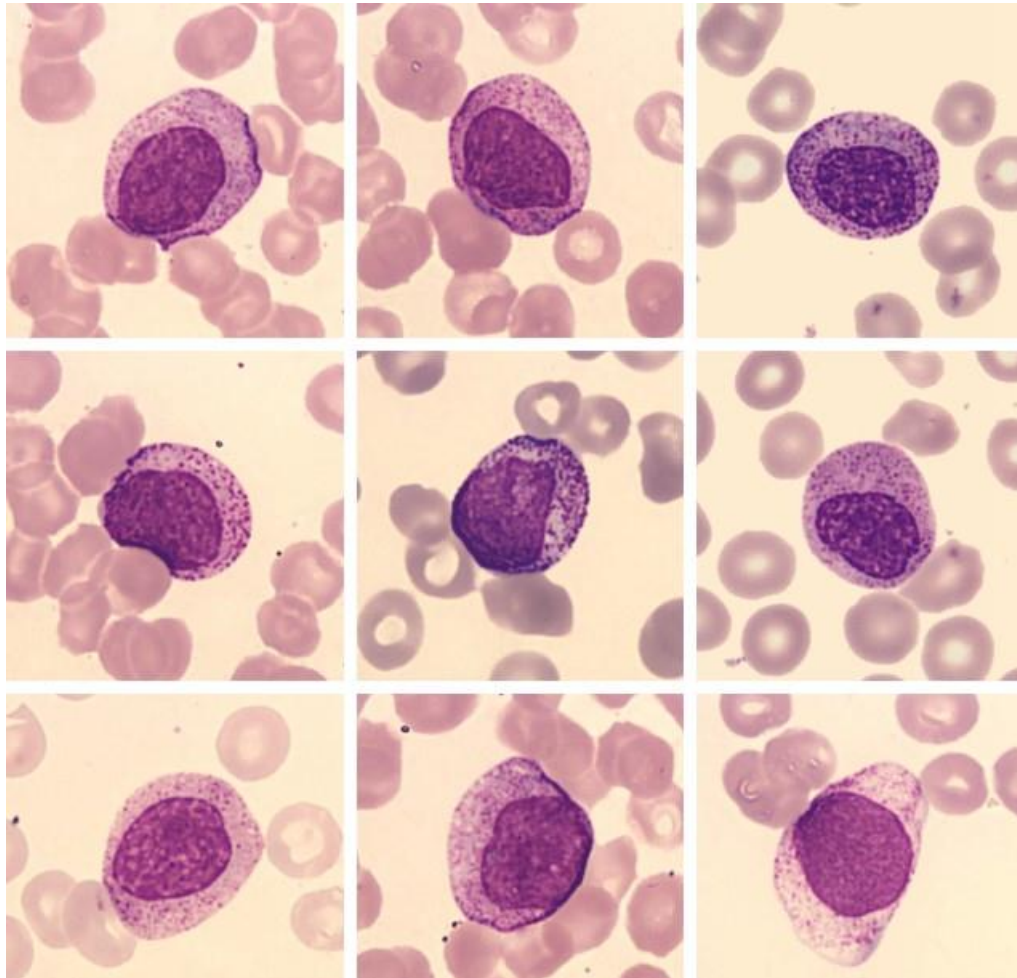
Myeloblast



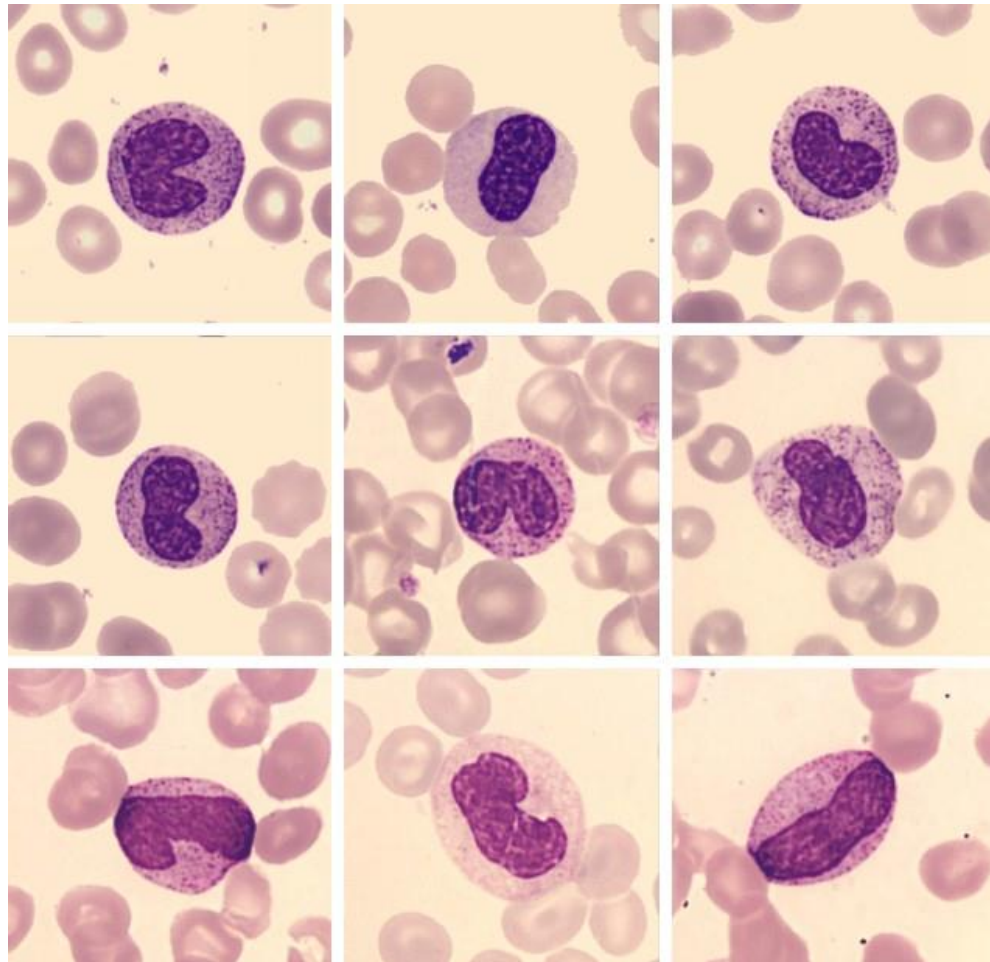
Promyelocyte



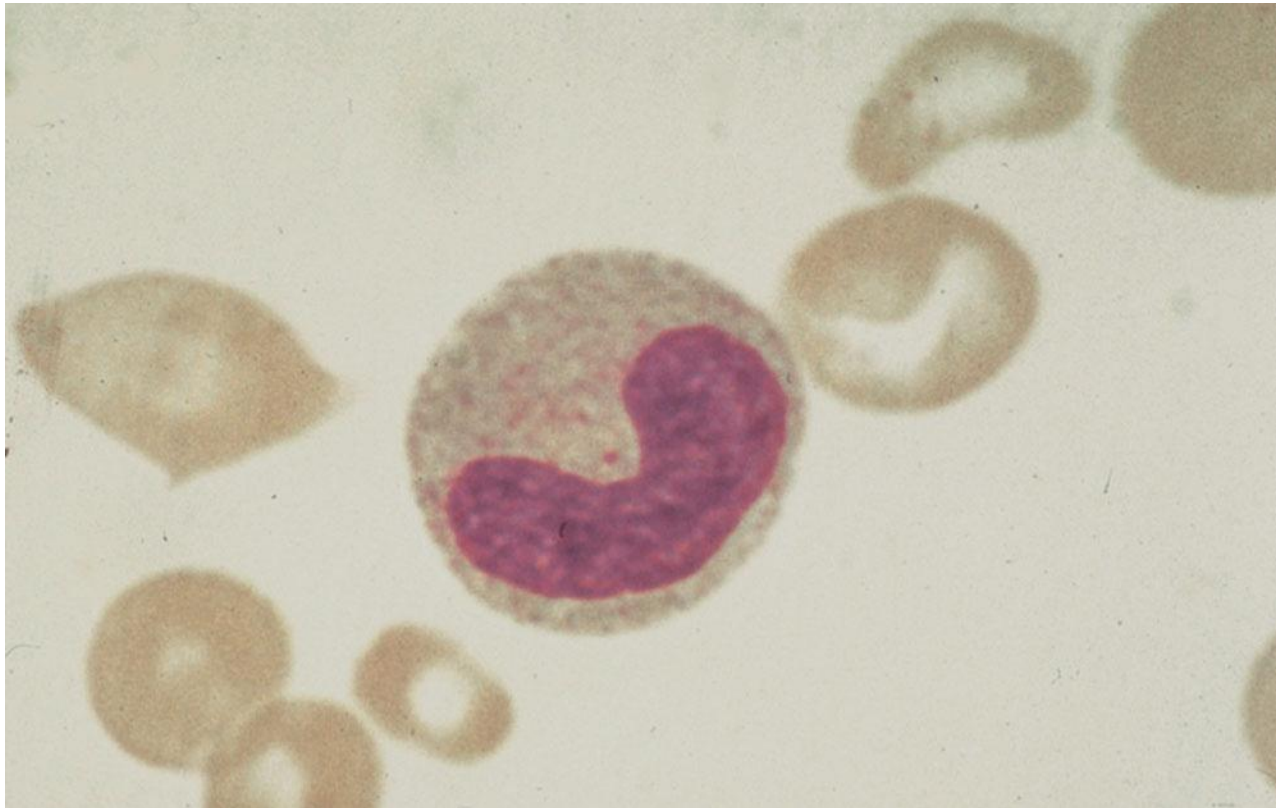
Myelocyte



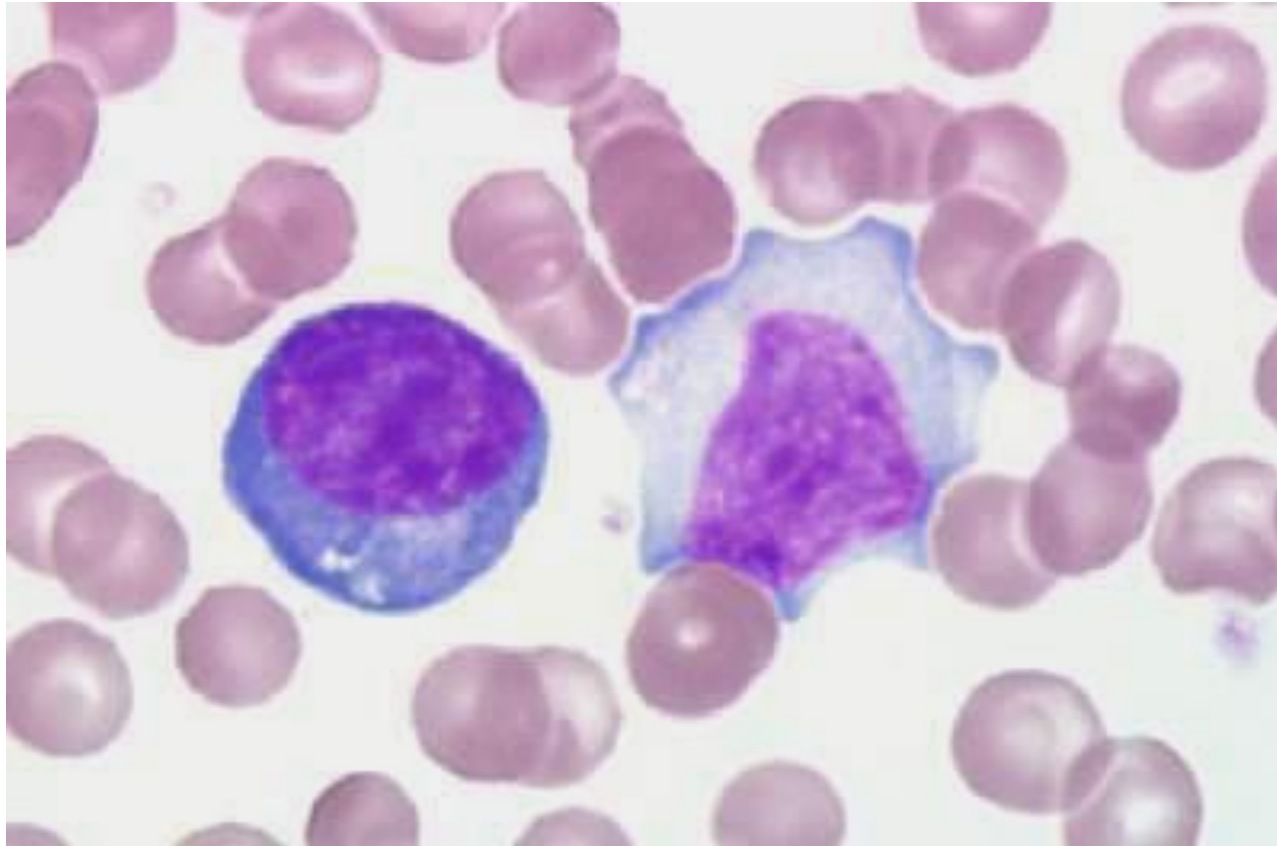
Metamyelocyte

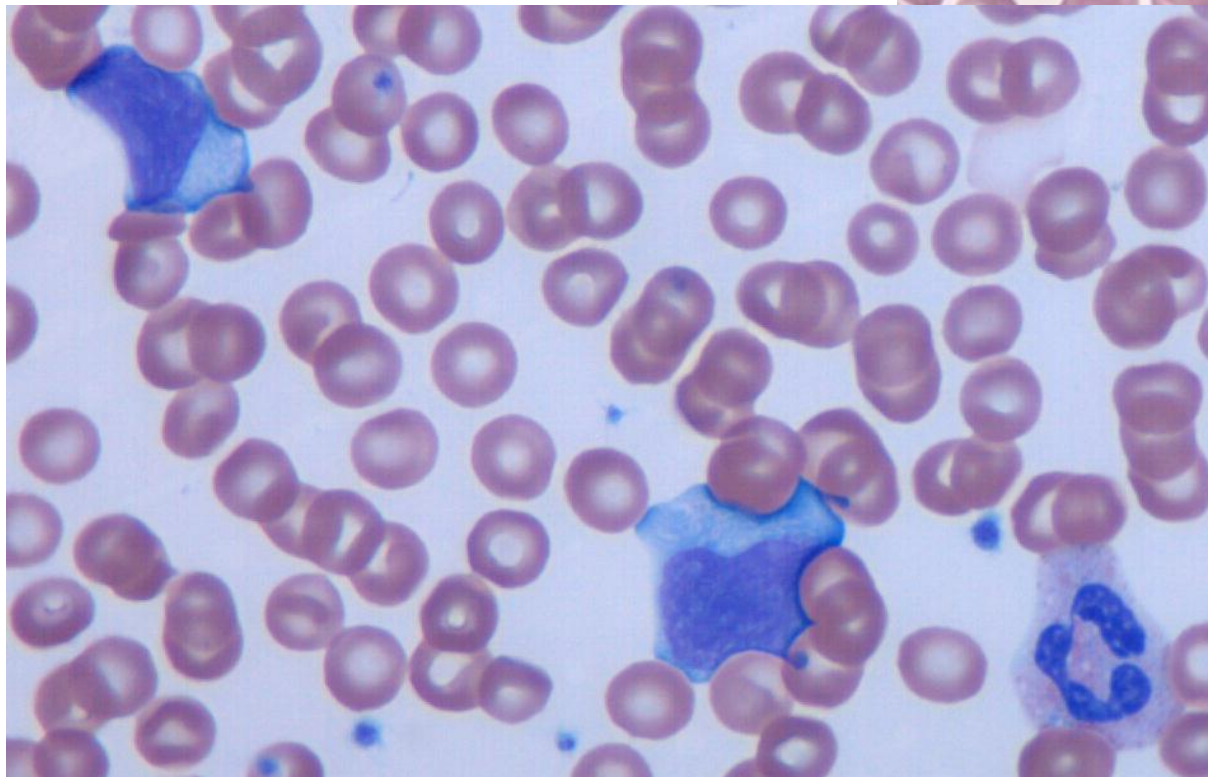
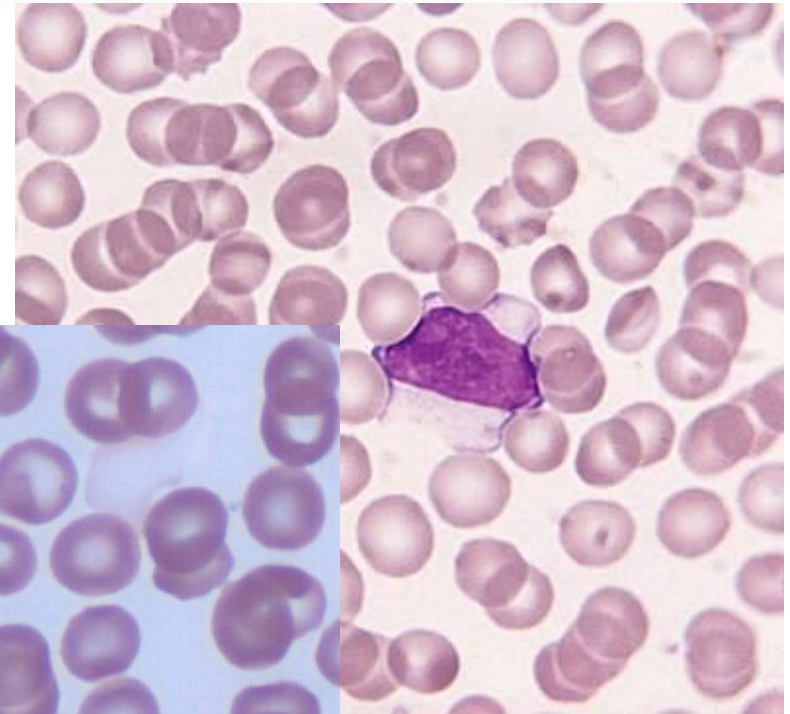


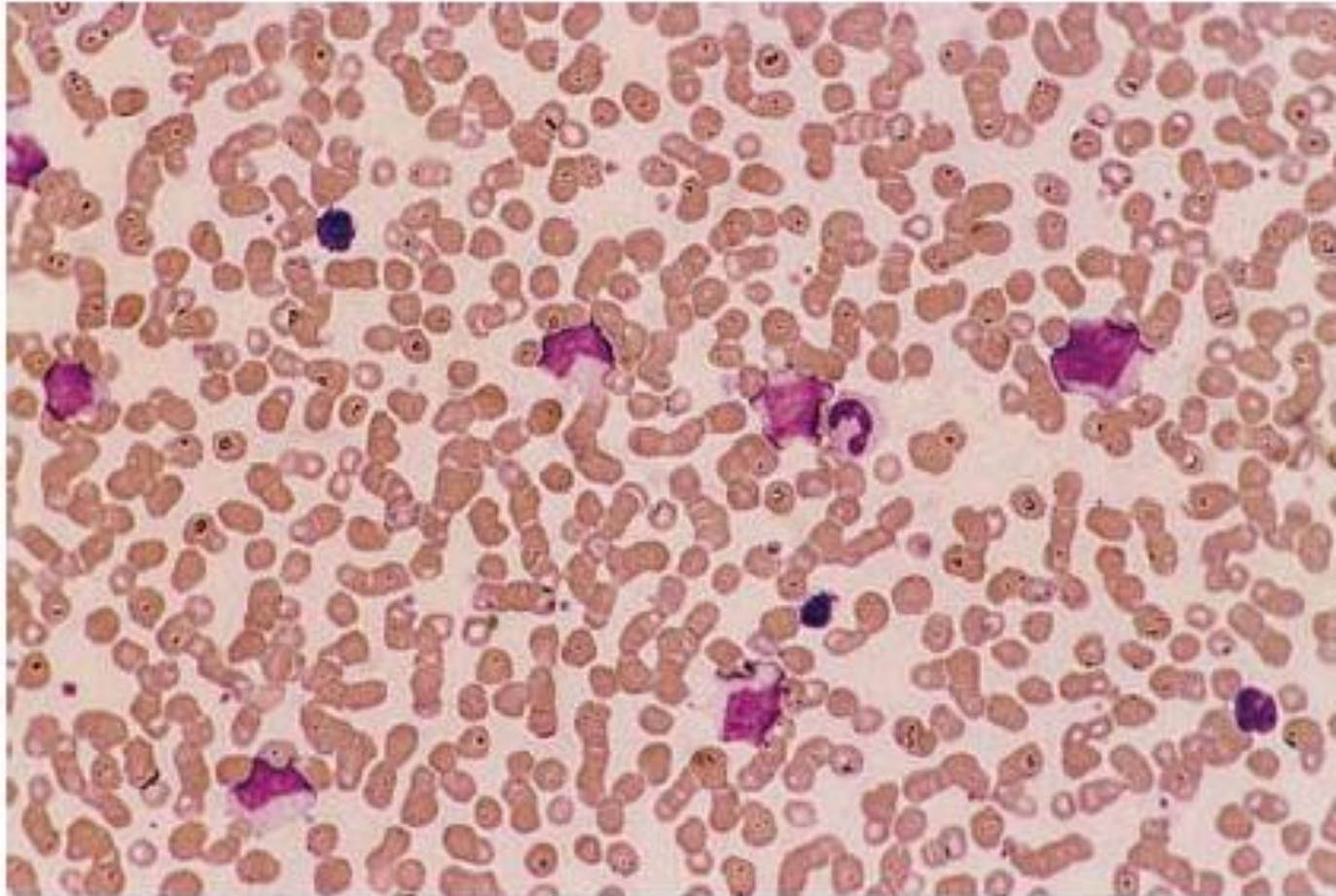
Band cell



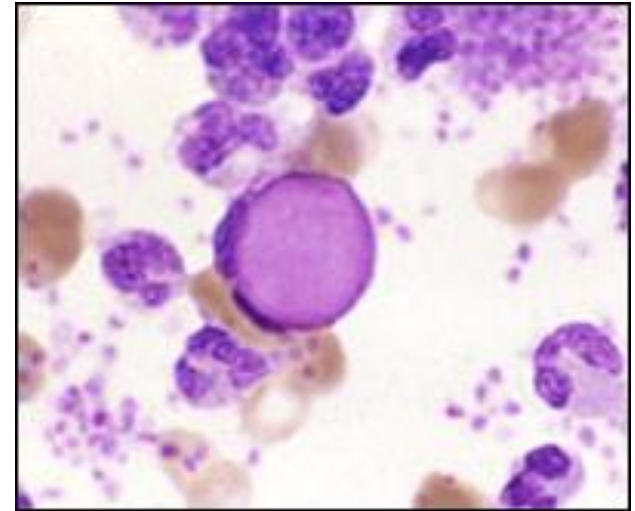
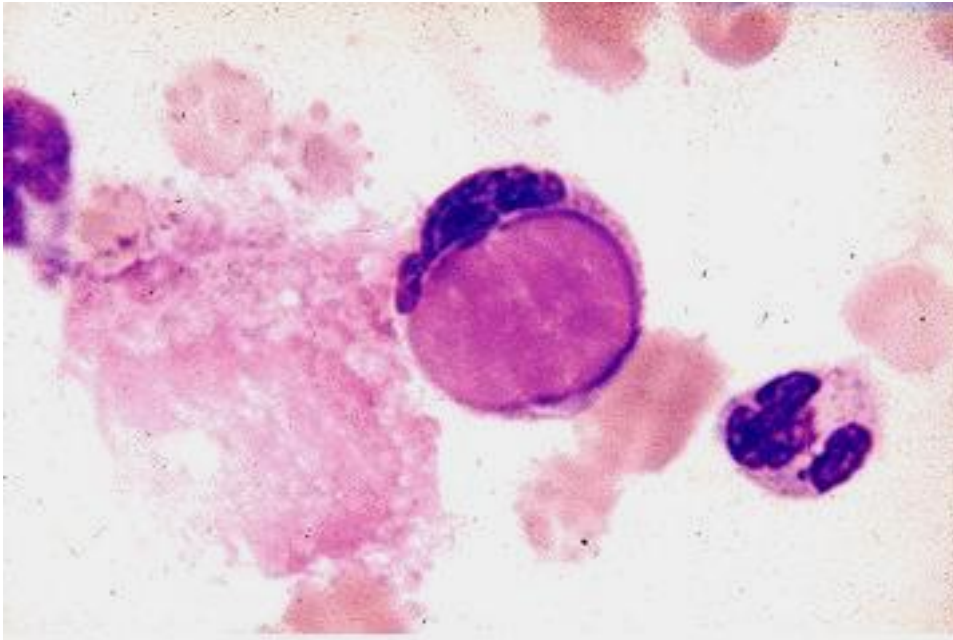
Atypical lymph

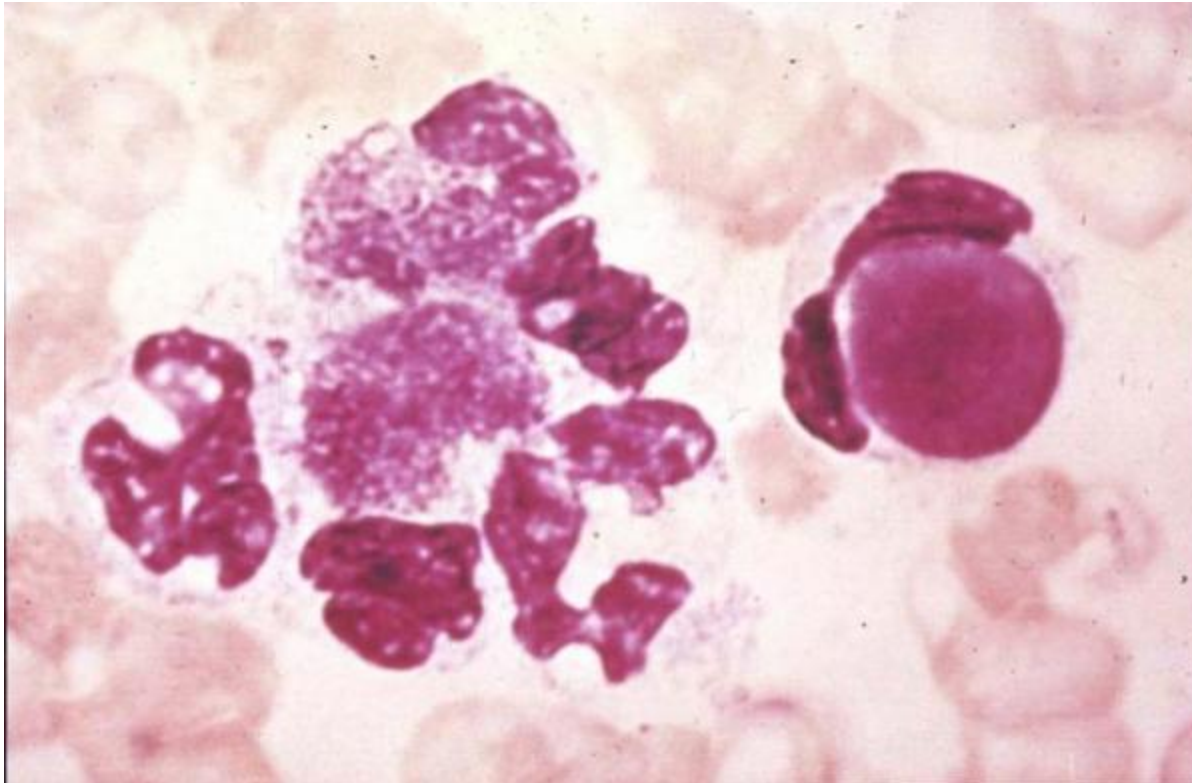




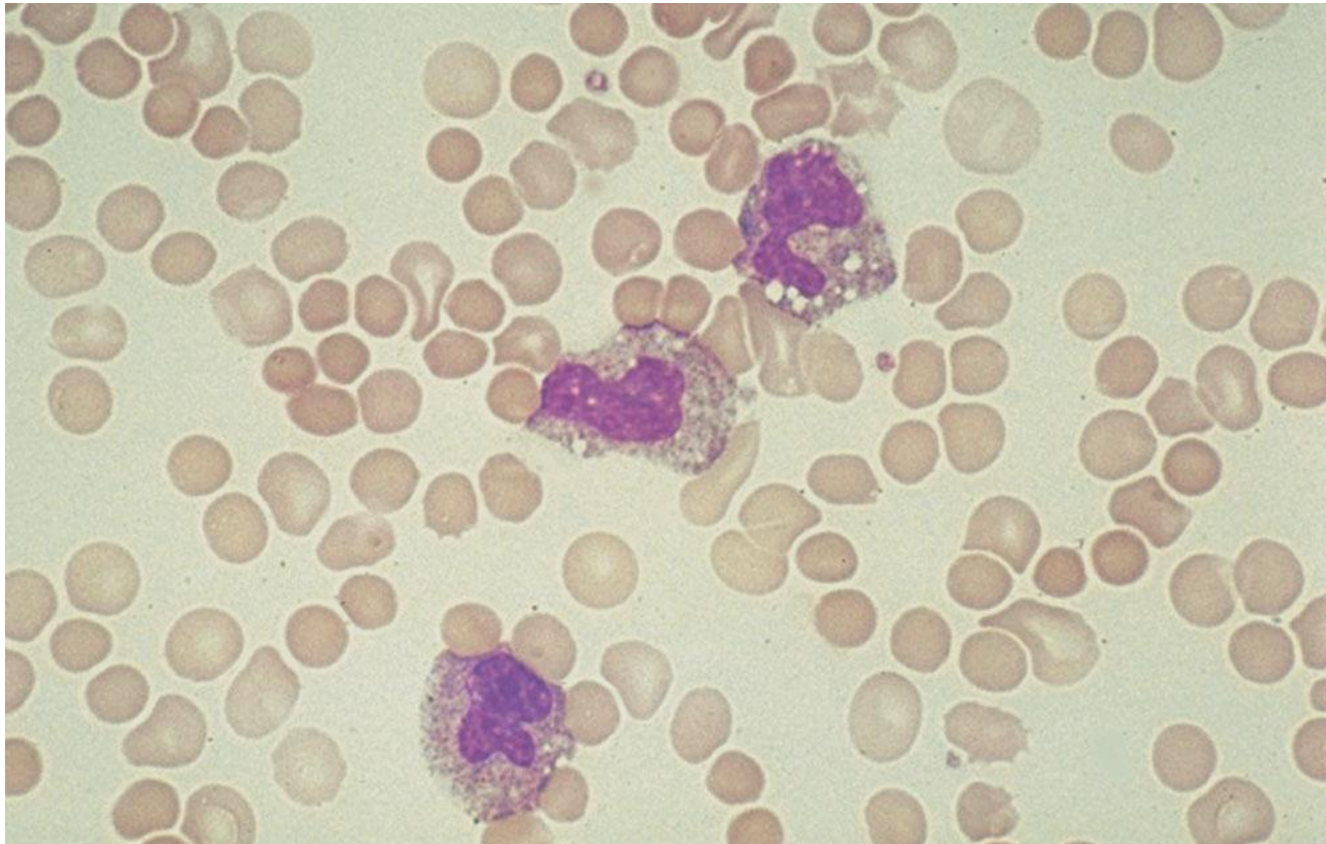


LE cell

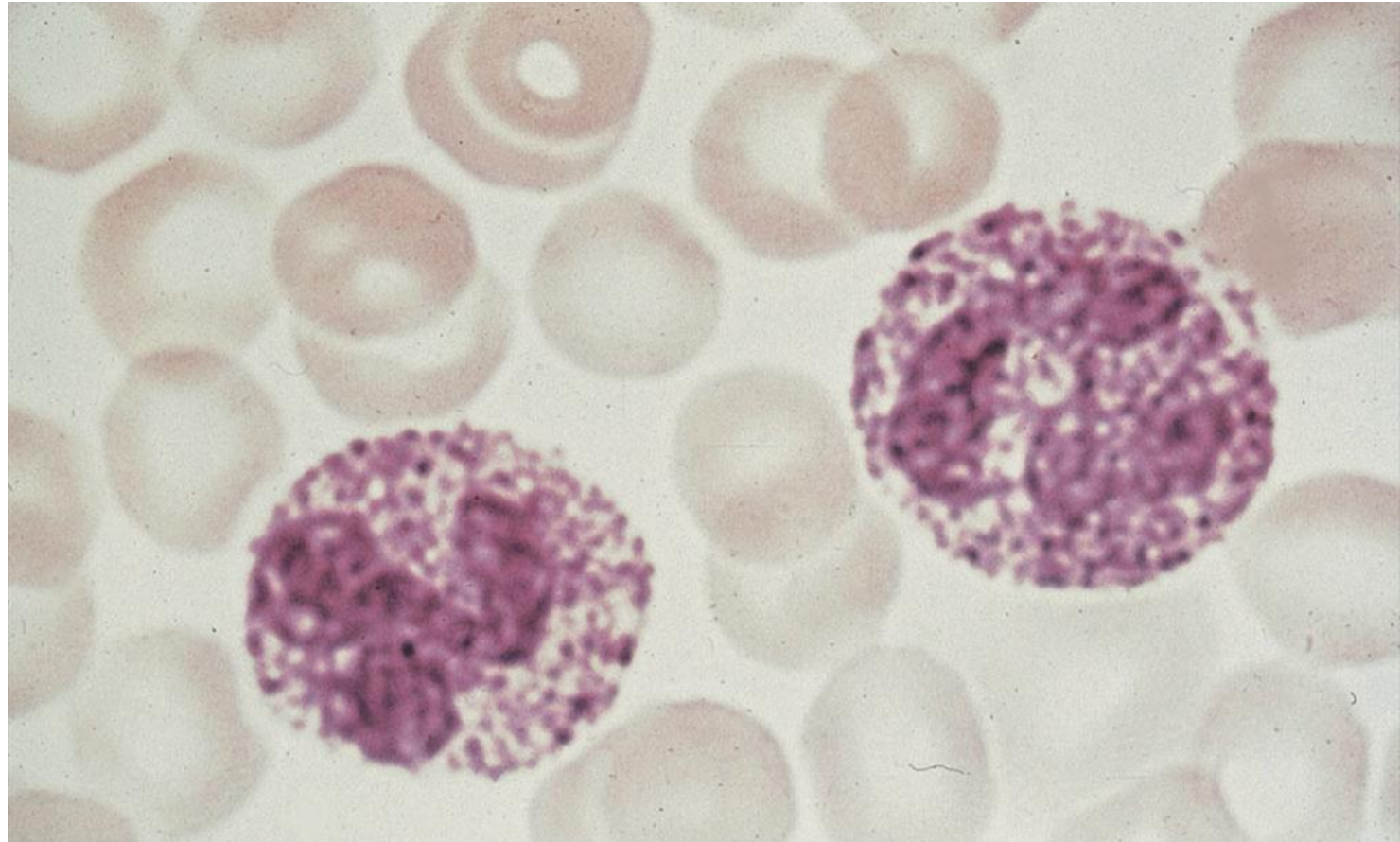




Activated Monocyte



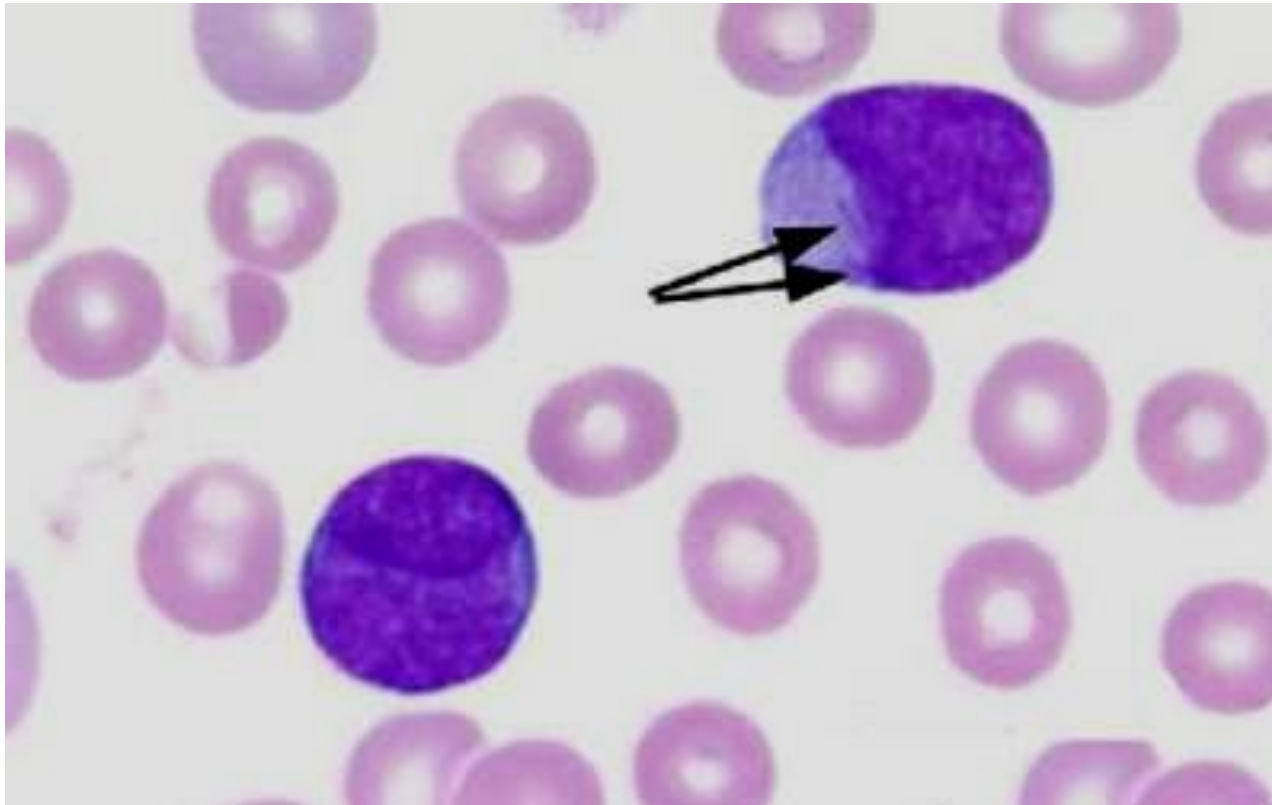
Toxic granulation



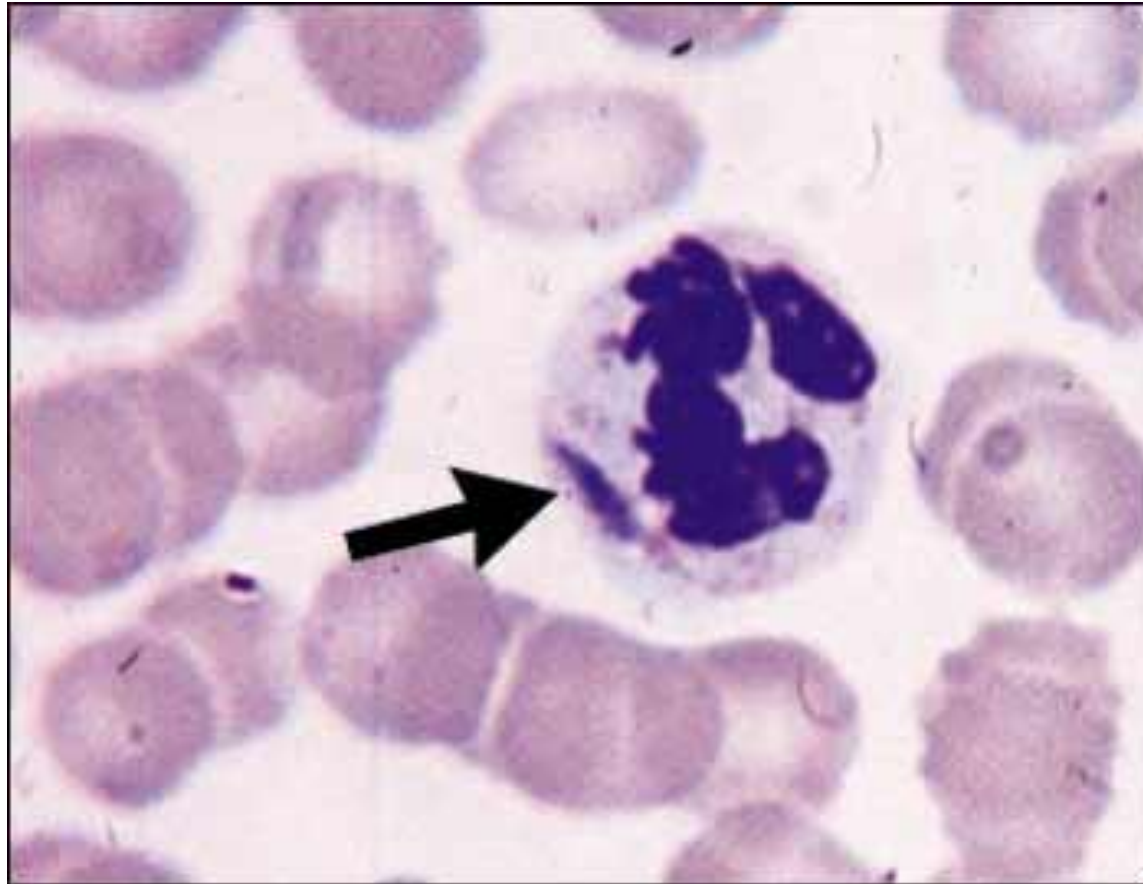
Dohle body



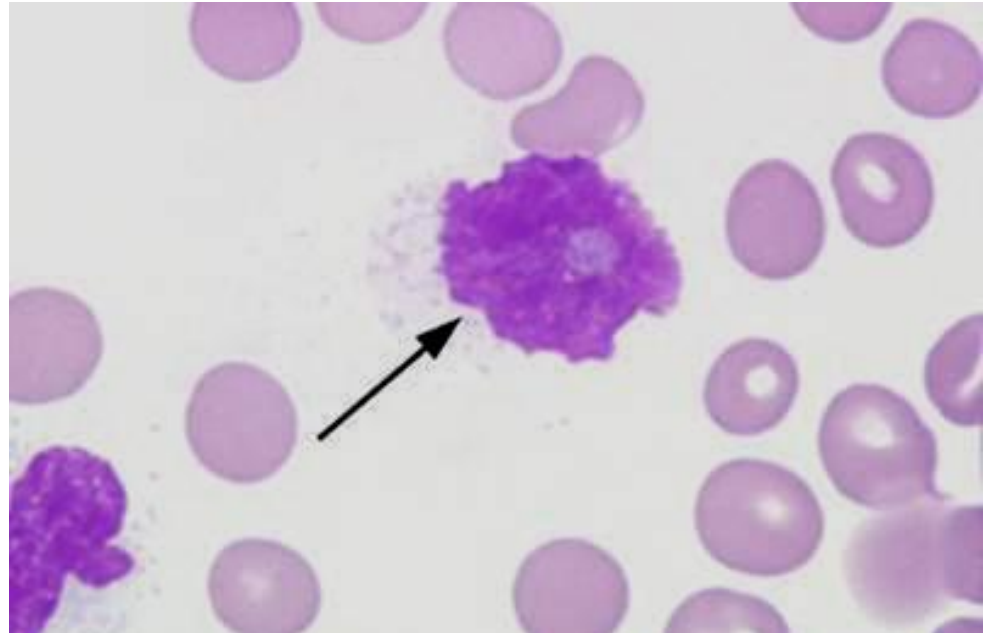
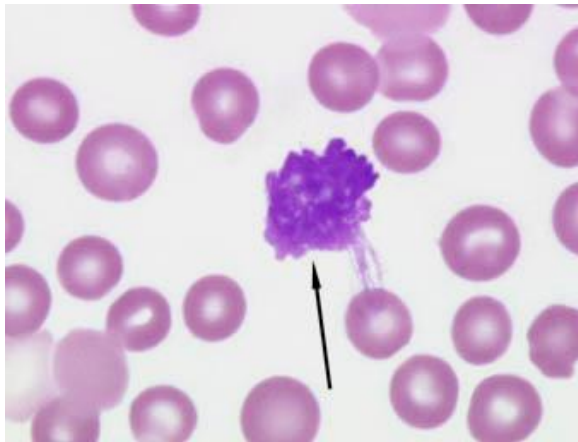
Auer rod



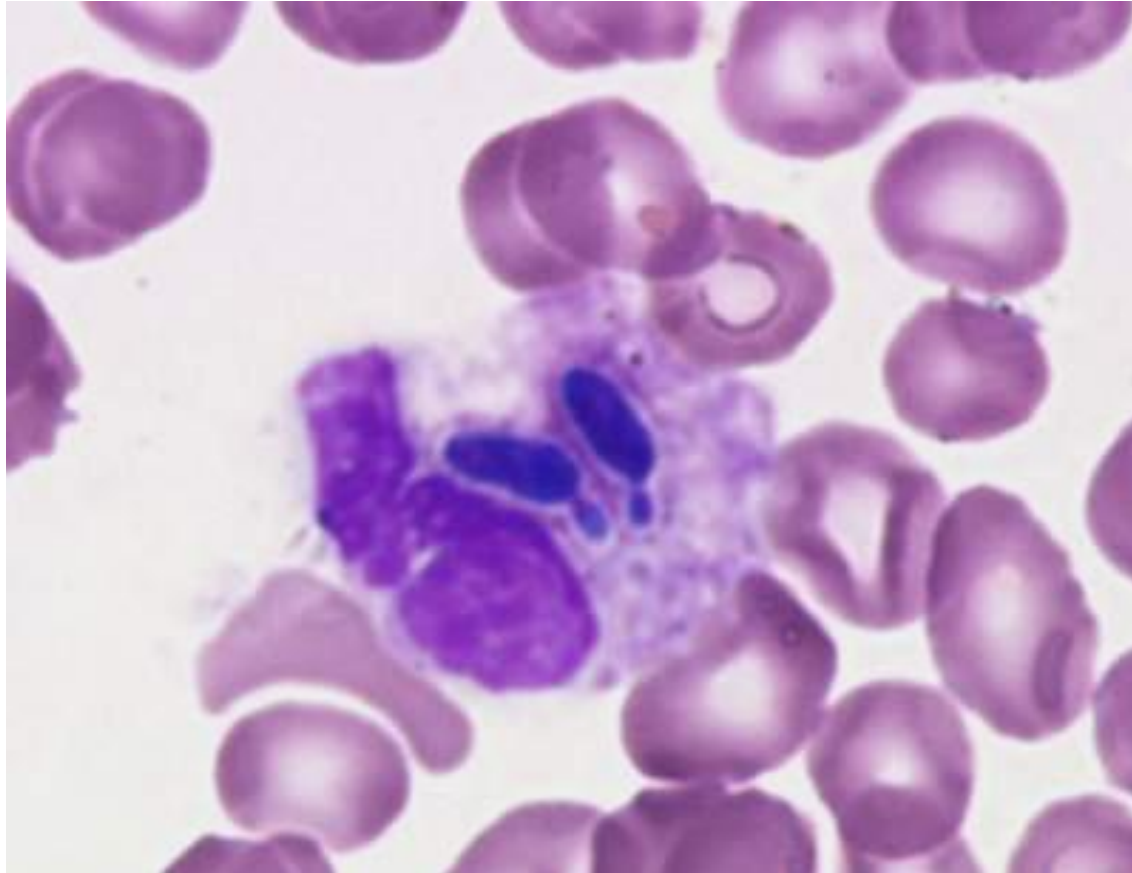
May Hegglin anomaly



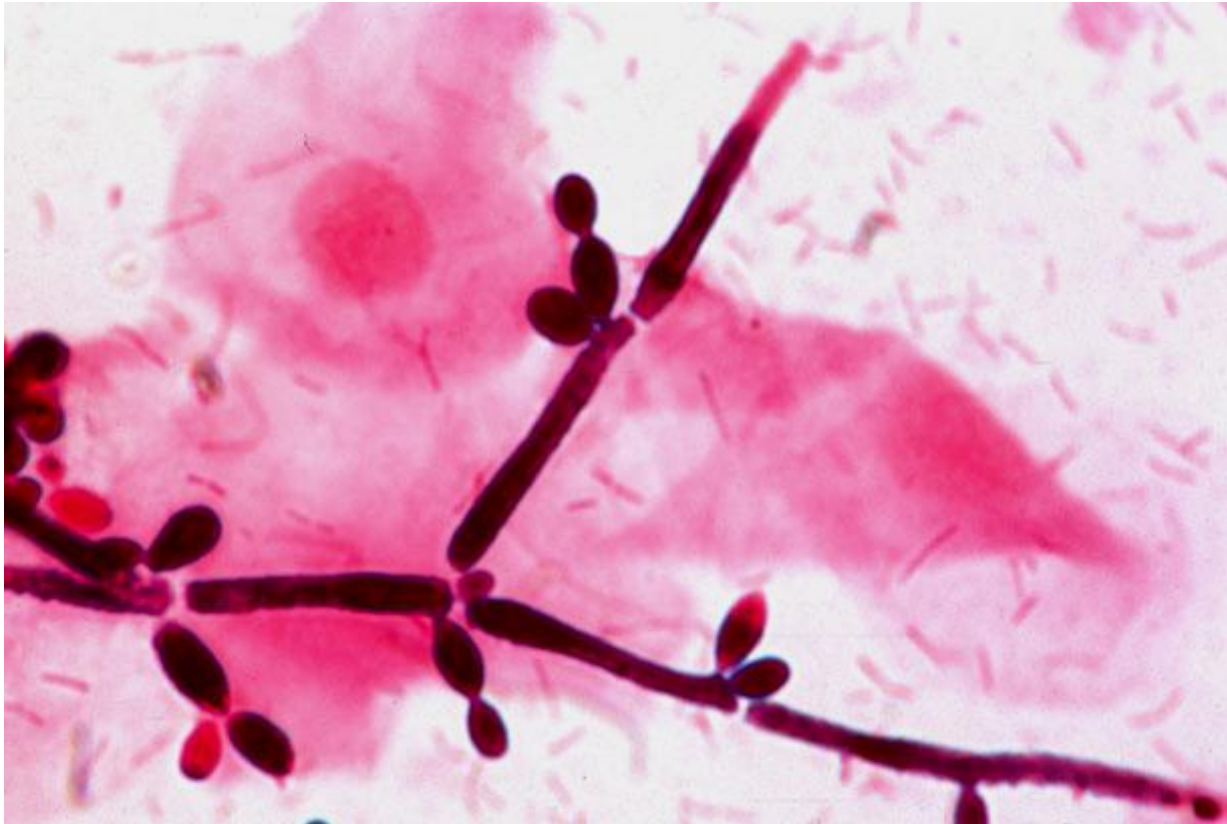
Smudge (Basket cell)



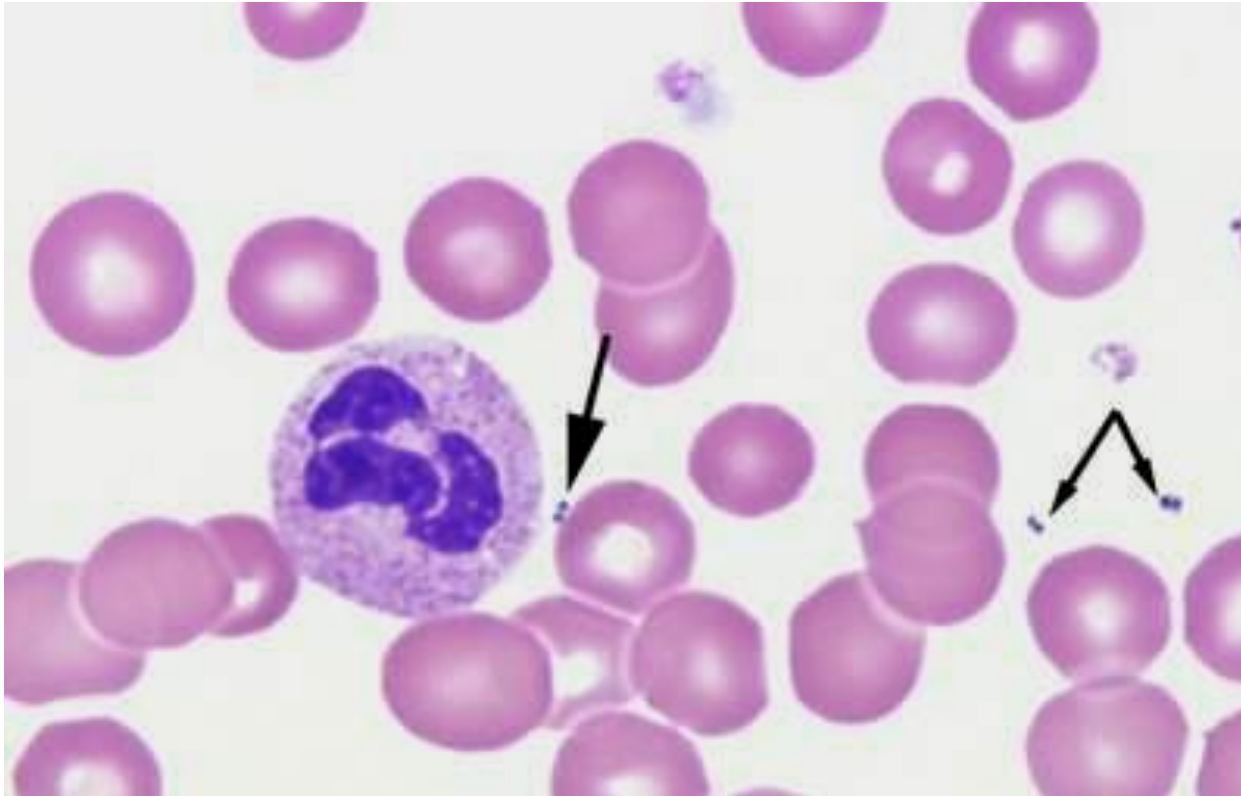
Yeast



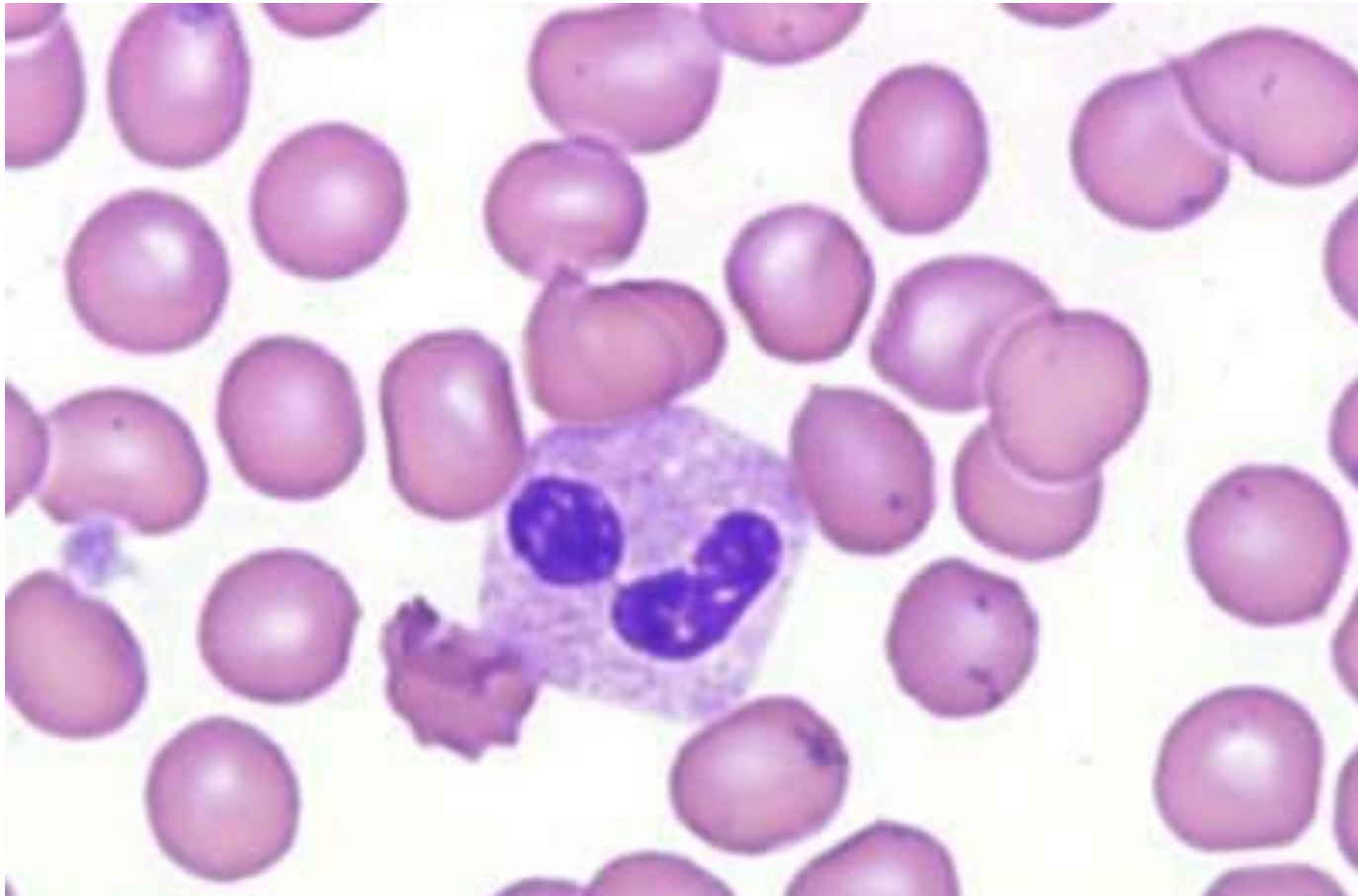
Candida Albicans

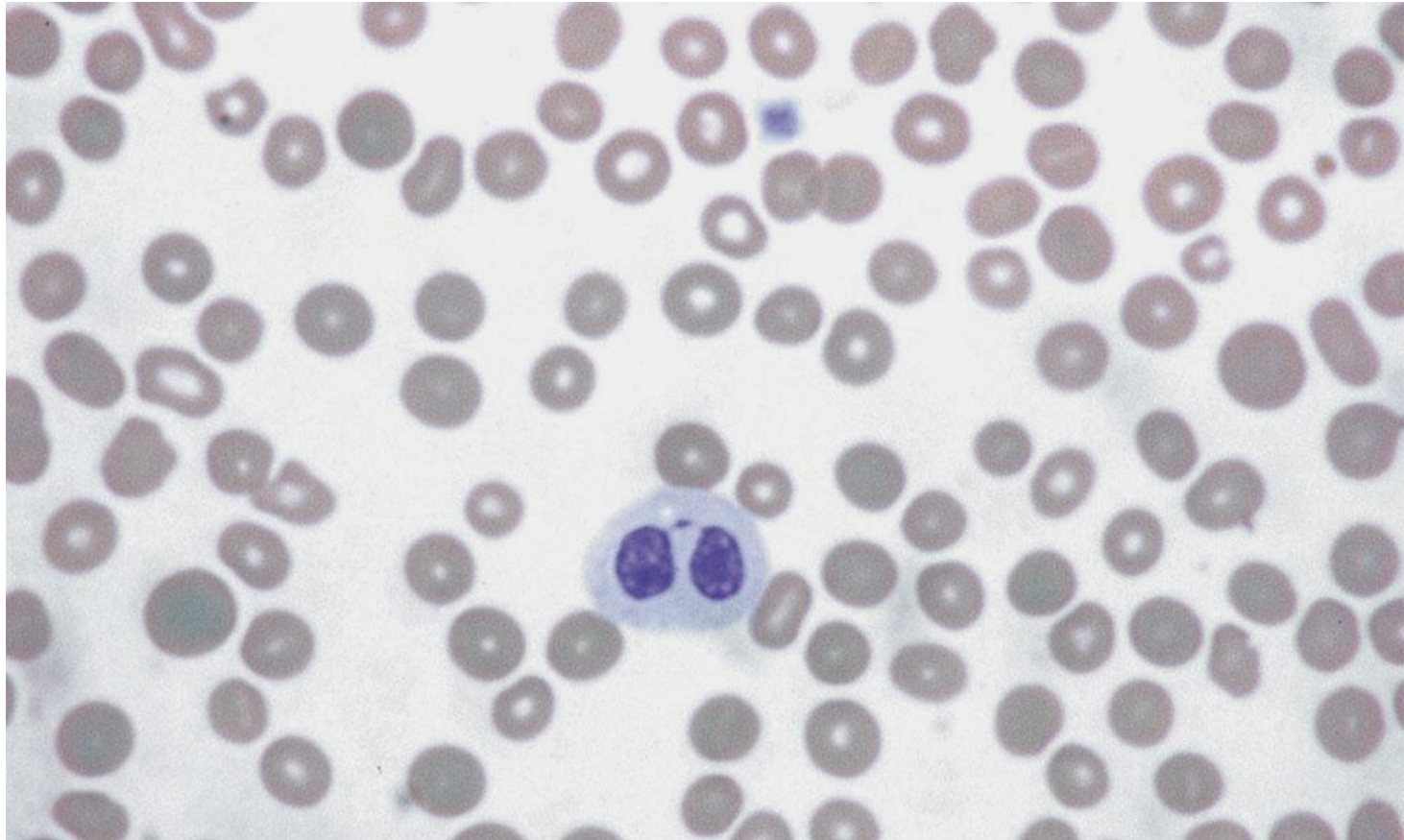


Bacteria



pelgerhuet

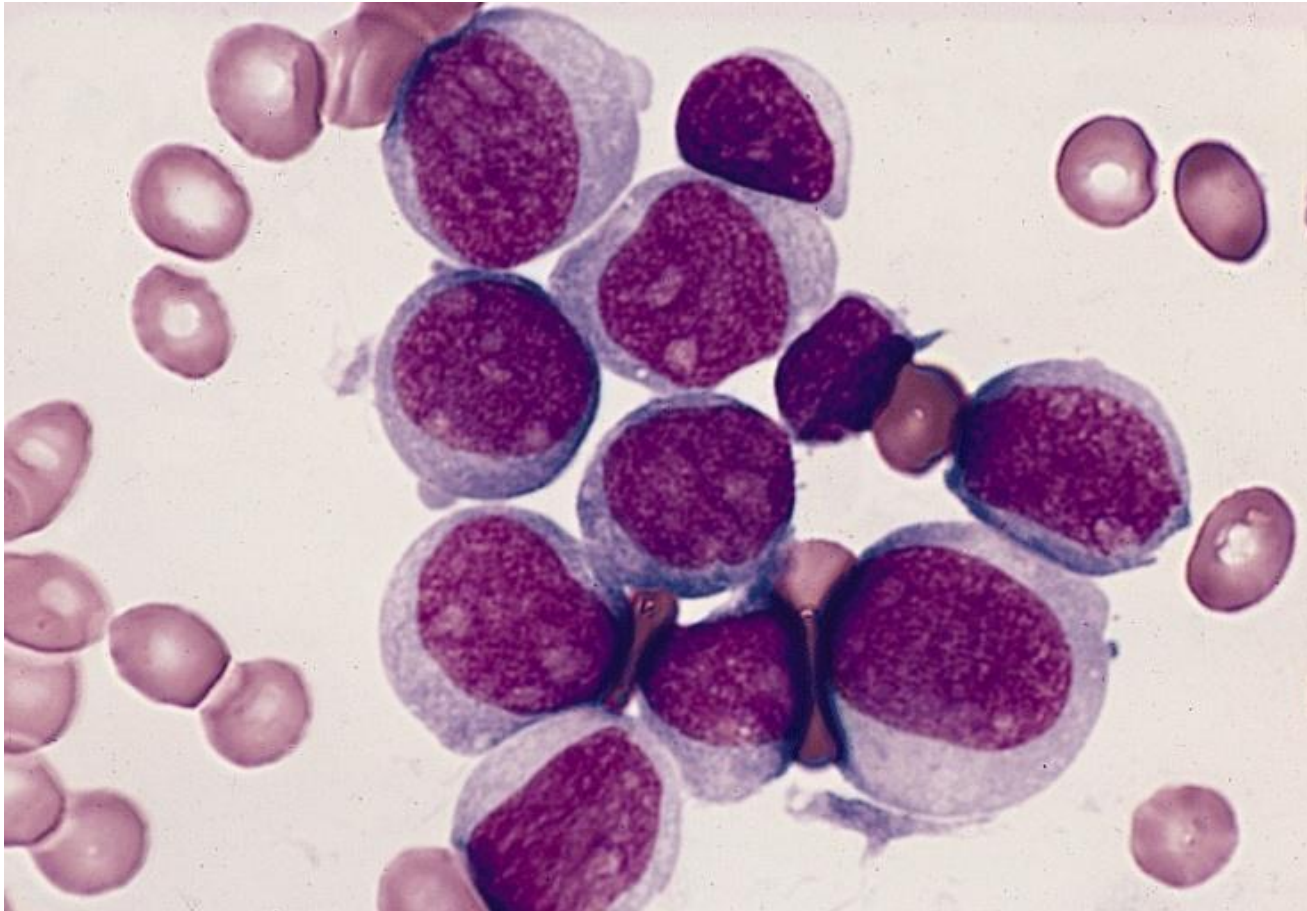




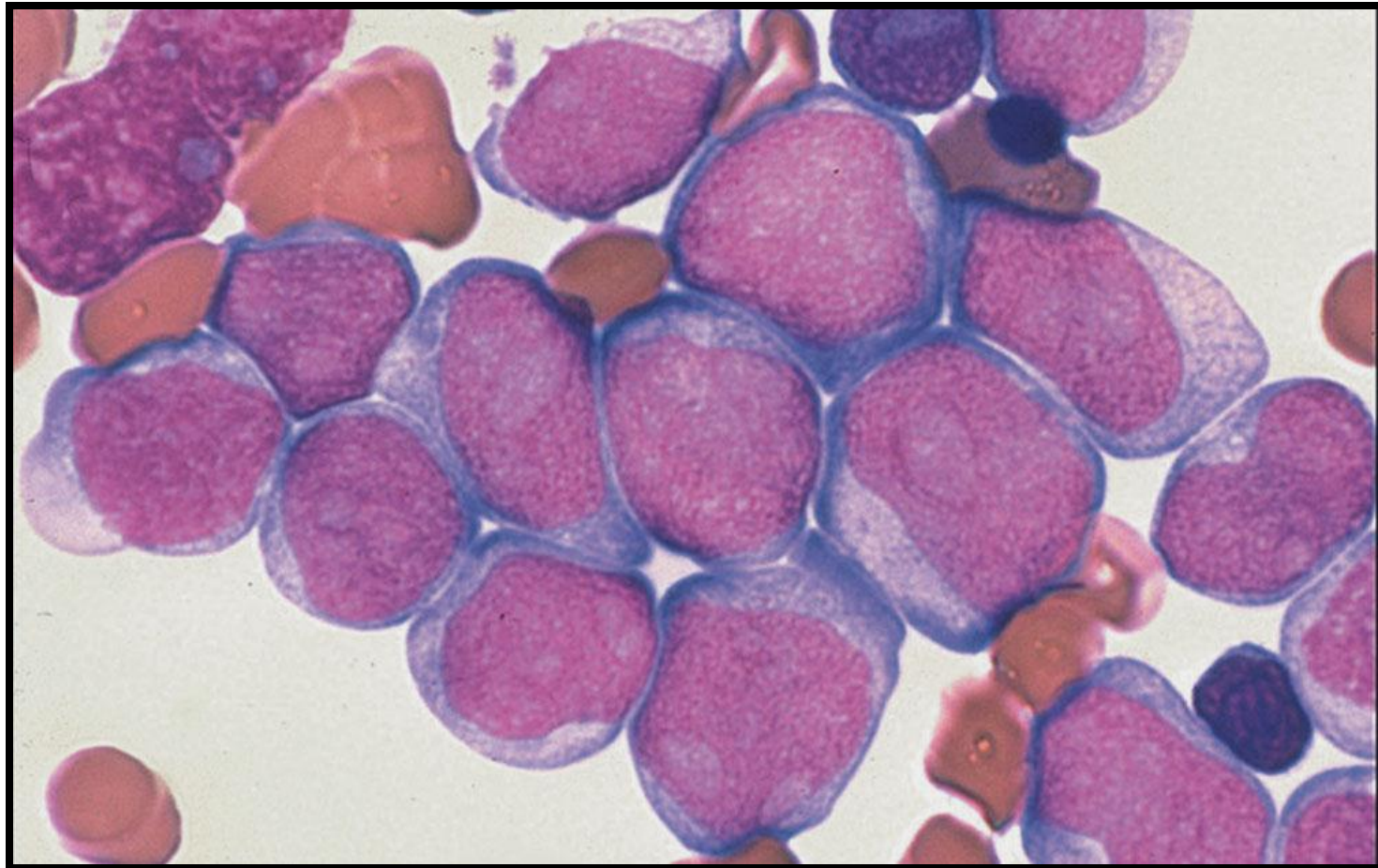


Blast Cell

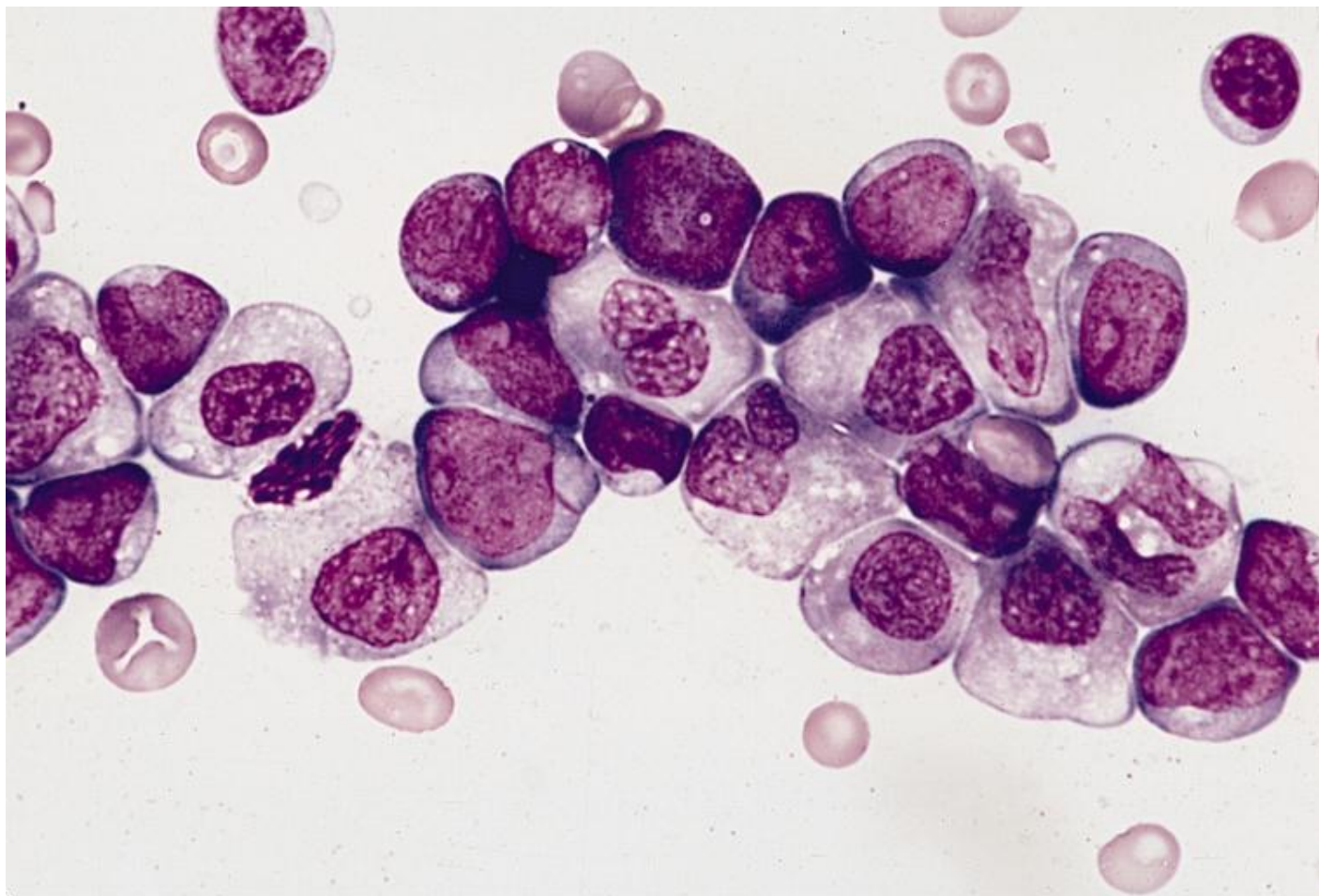
AML-M1



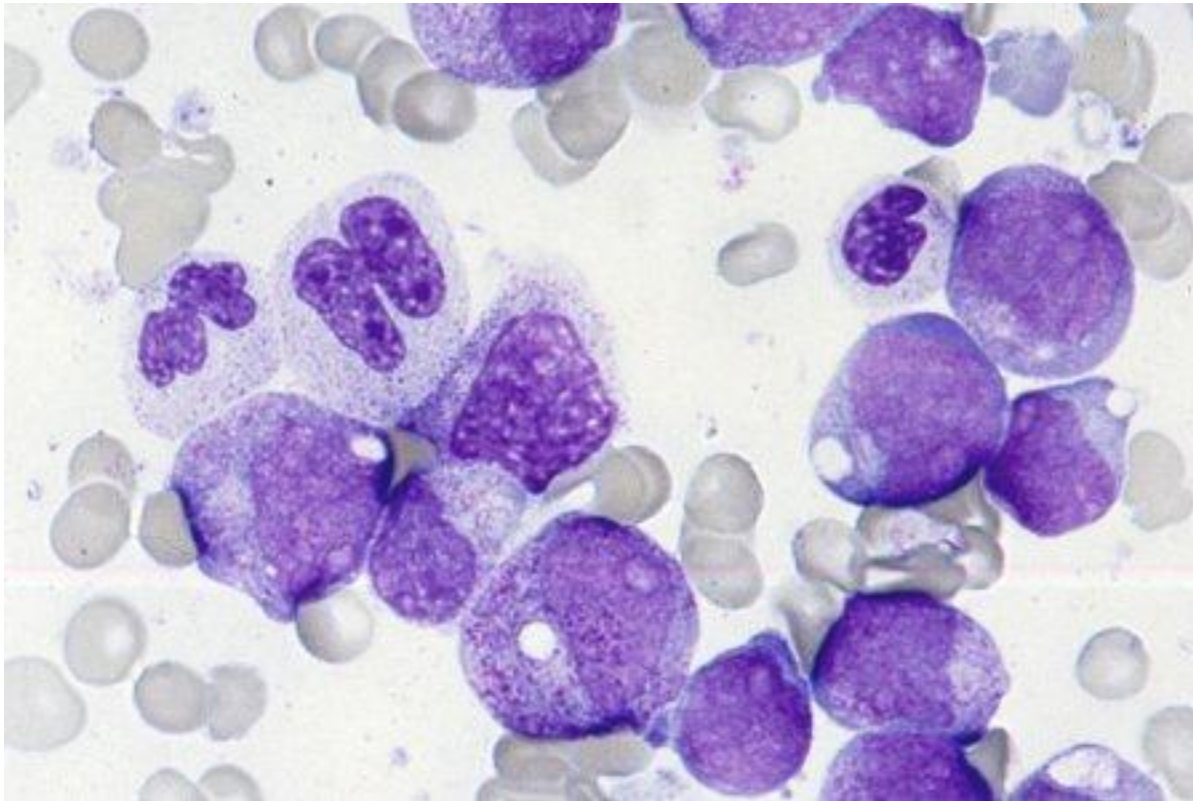
AML-M1



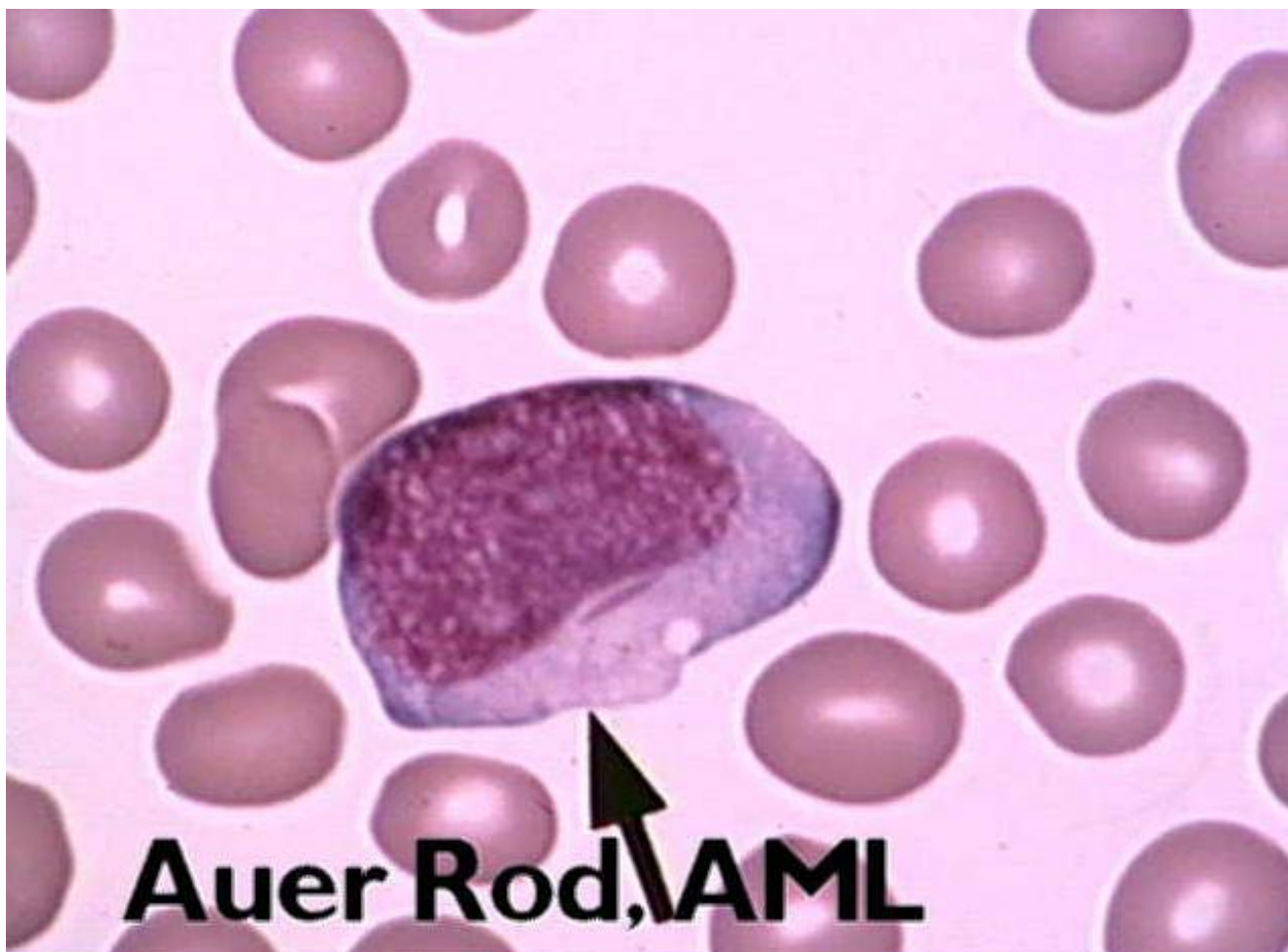
AML-M2



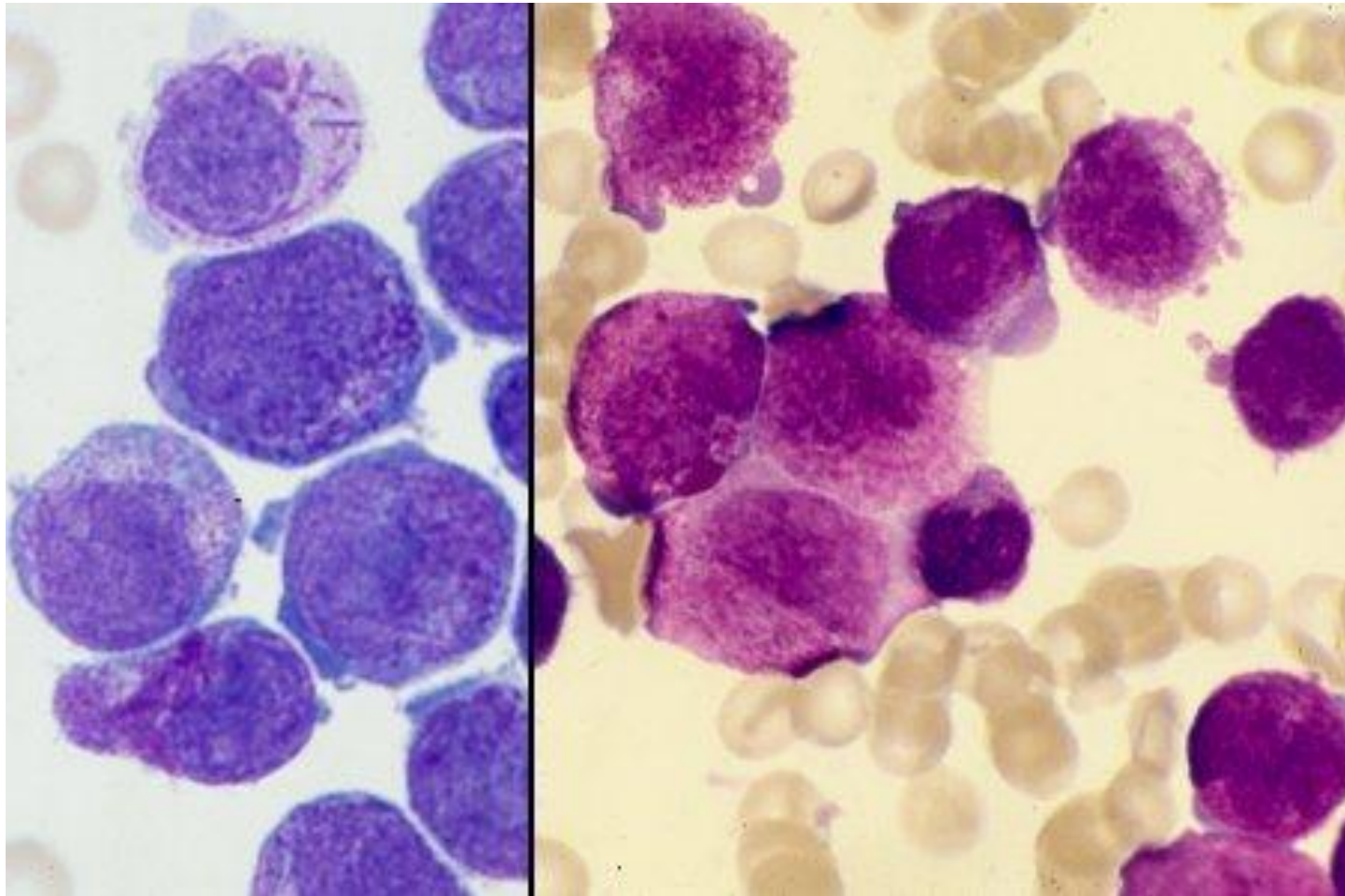
AML-M2



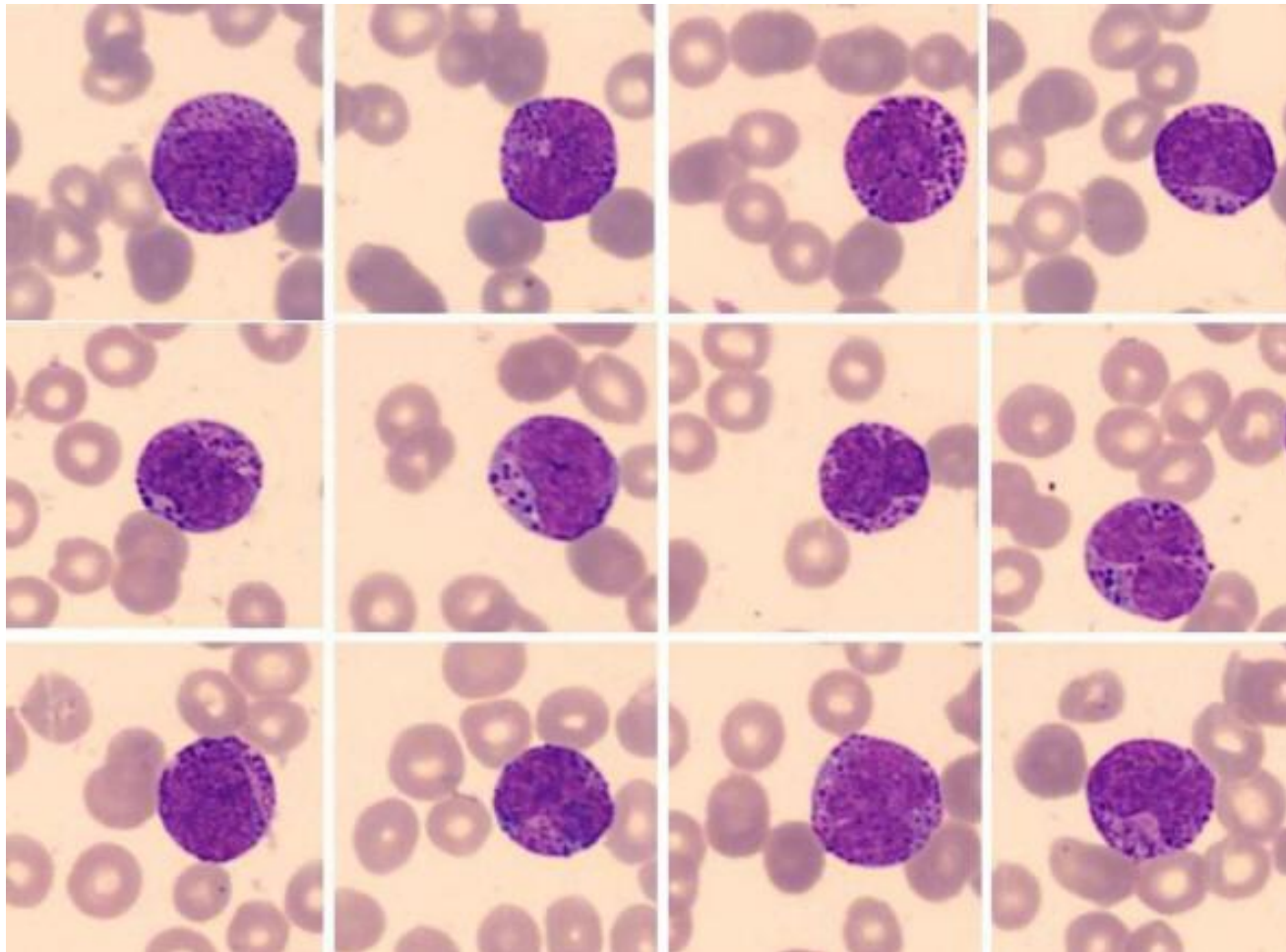
AML-M3



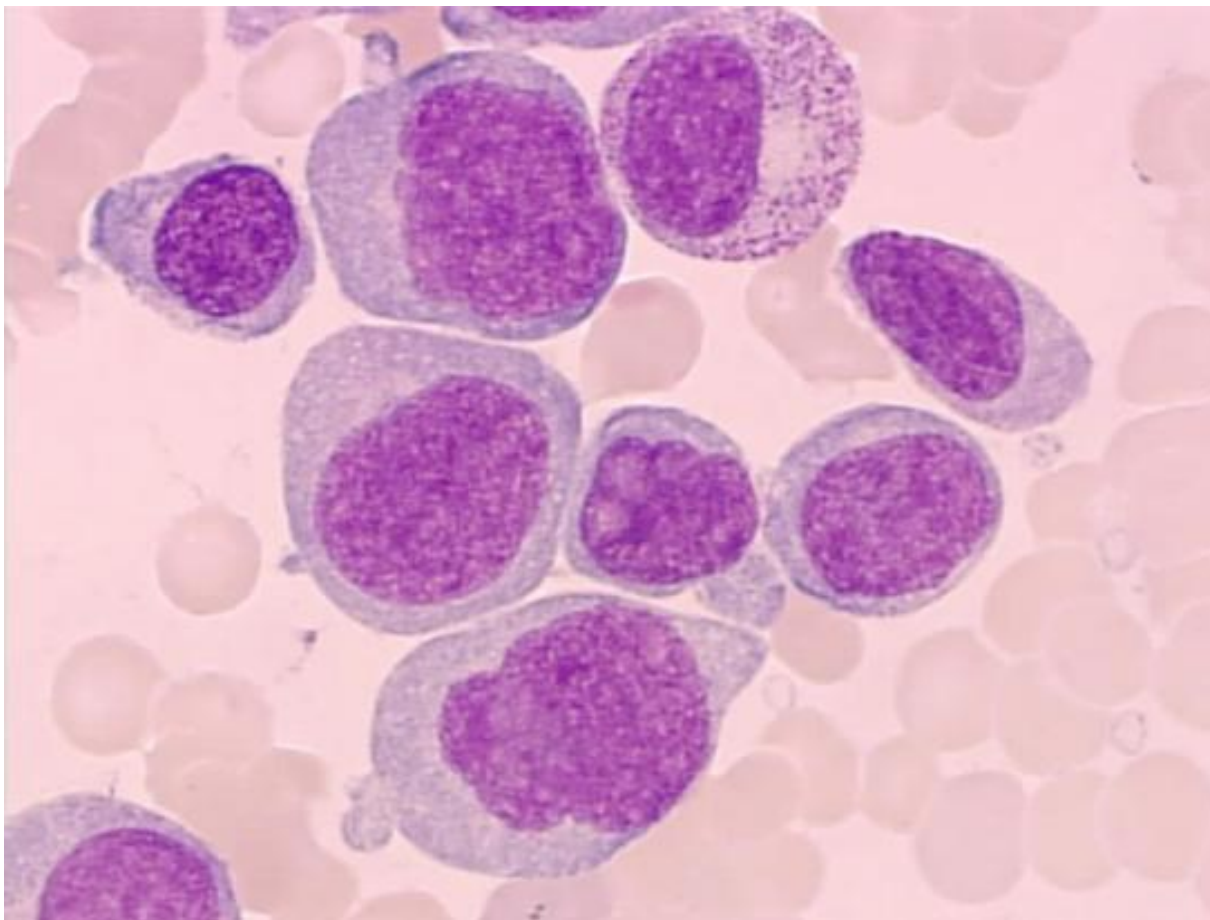
AML-M3

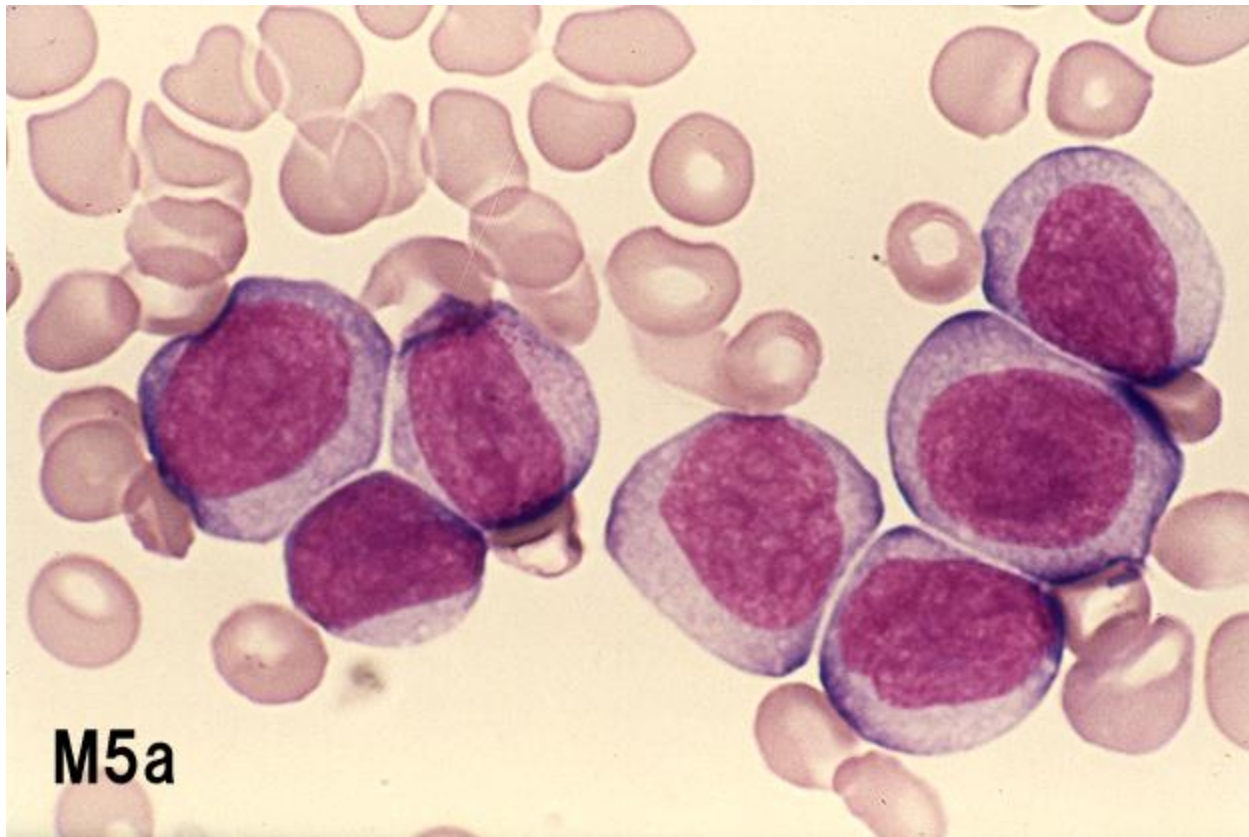


AML-M4

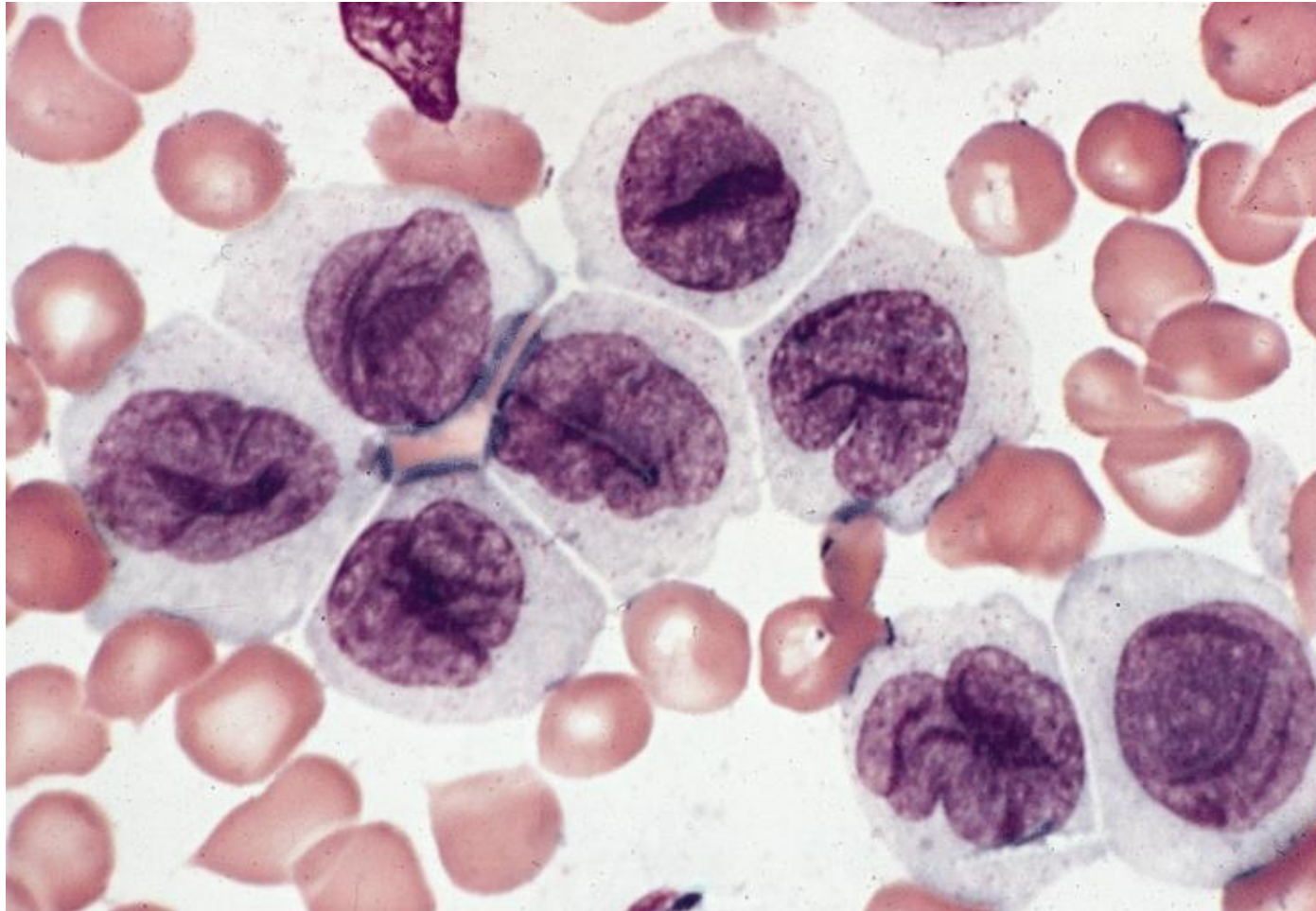


AML-M5a

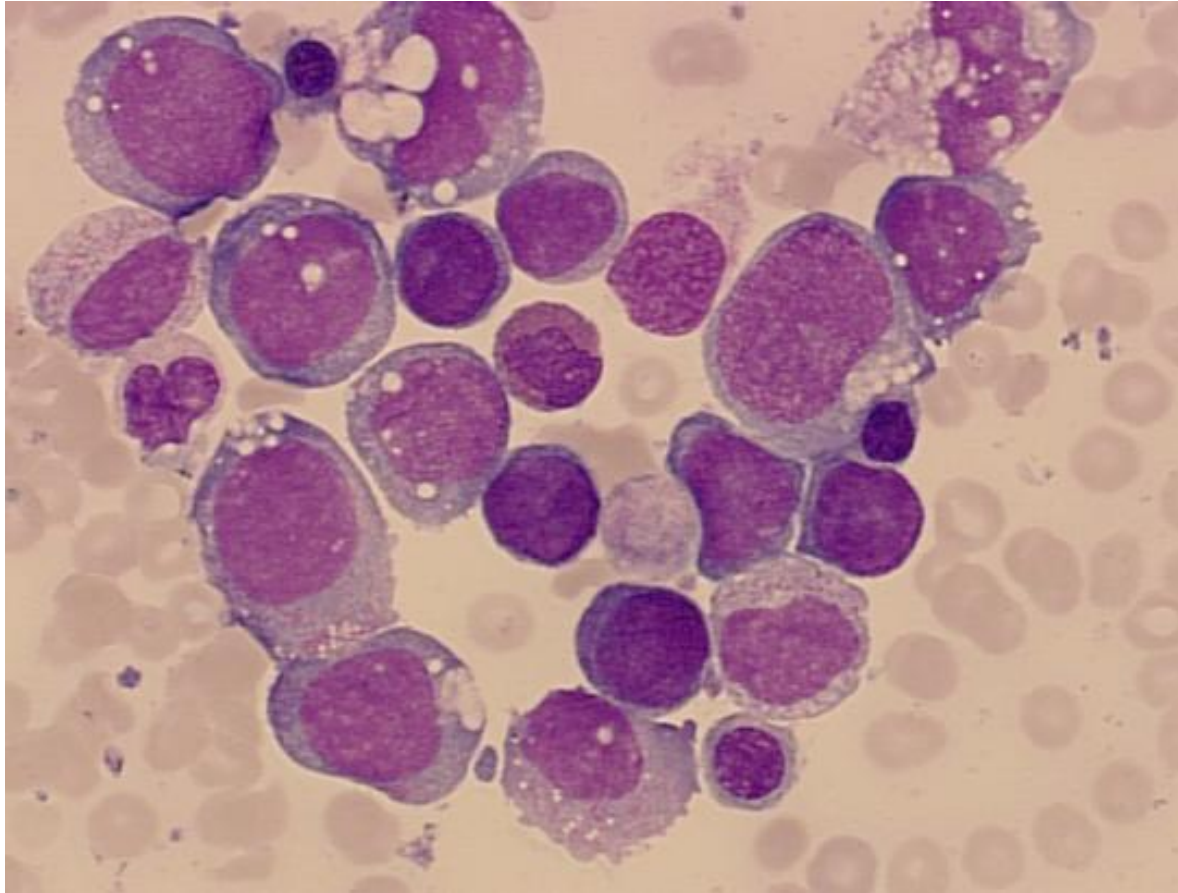




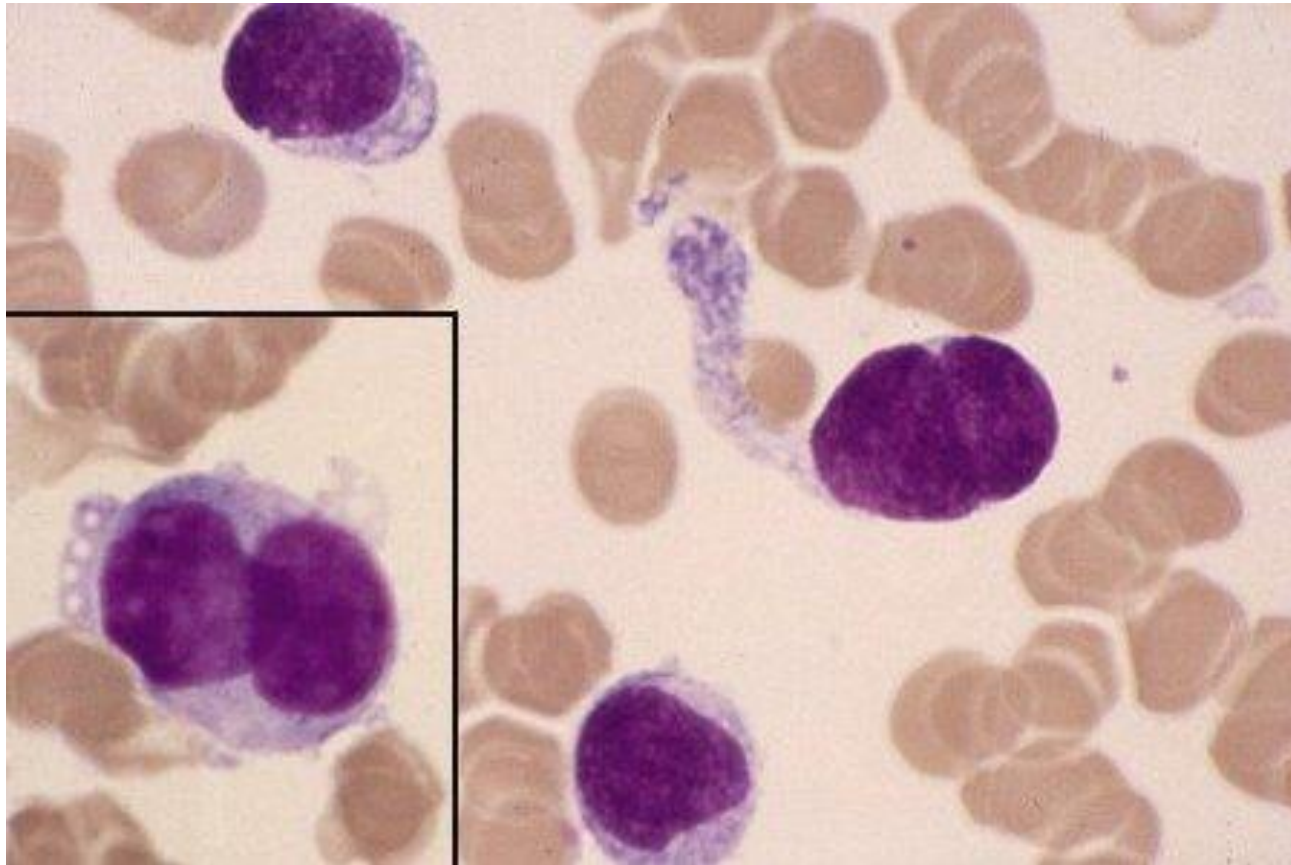
AML-M5b

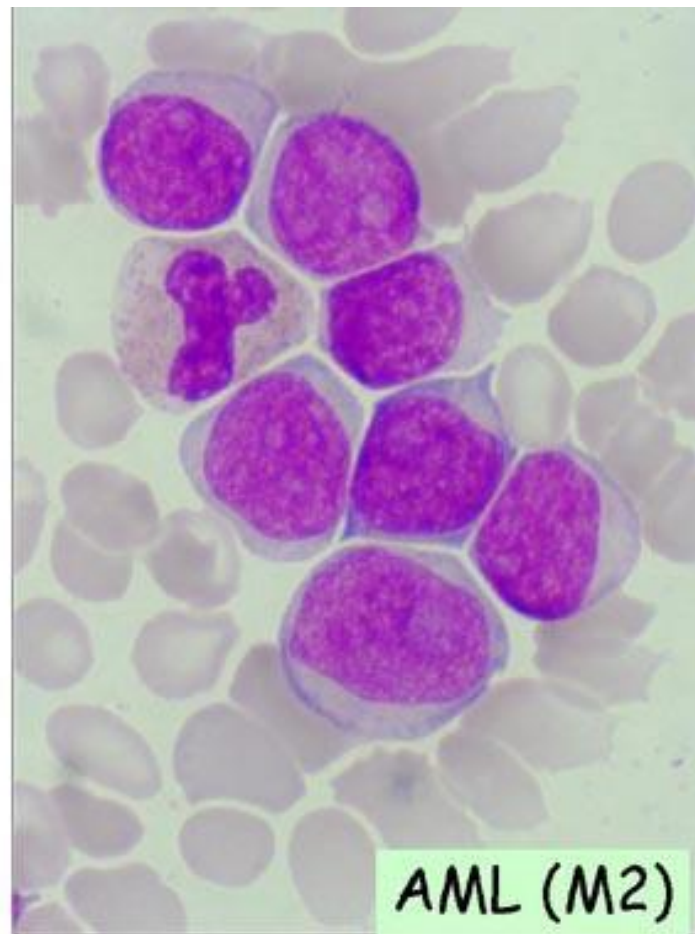
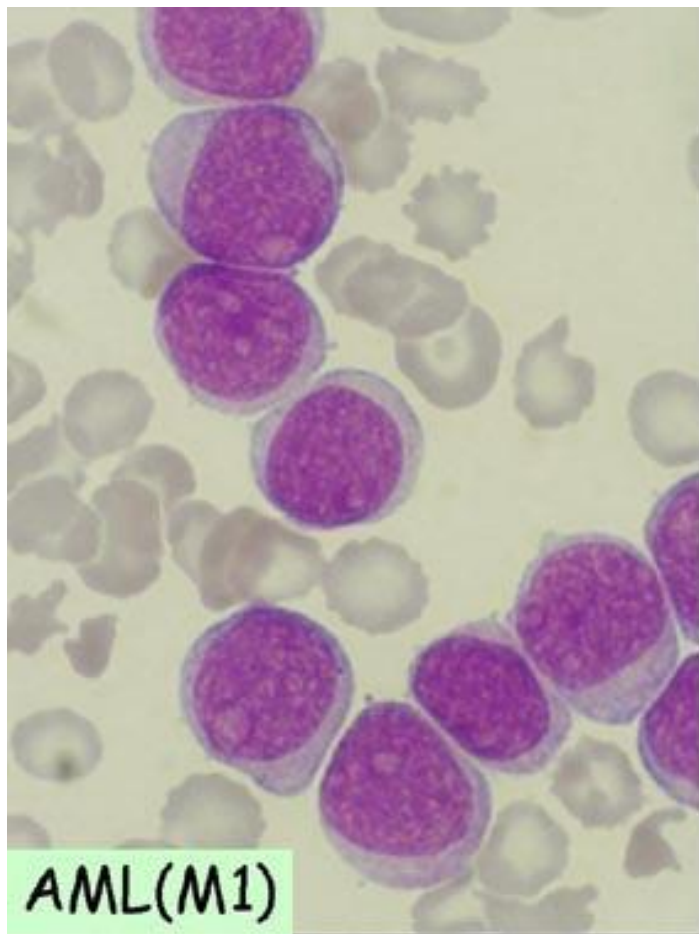


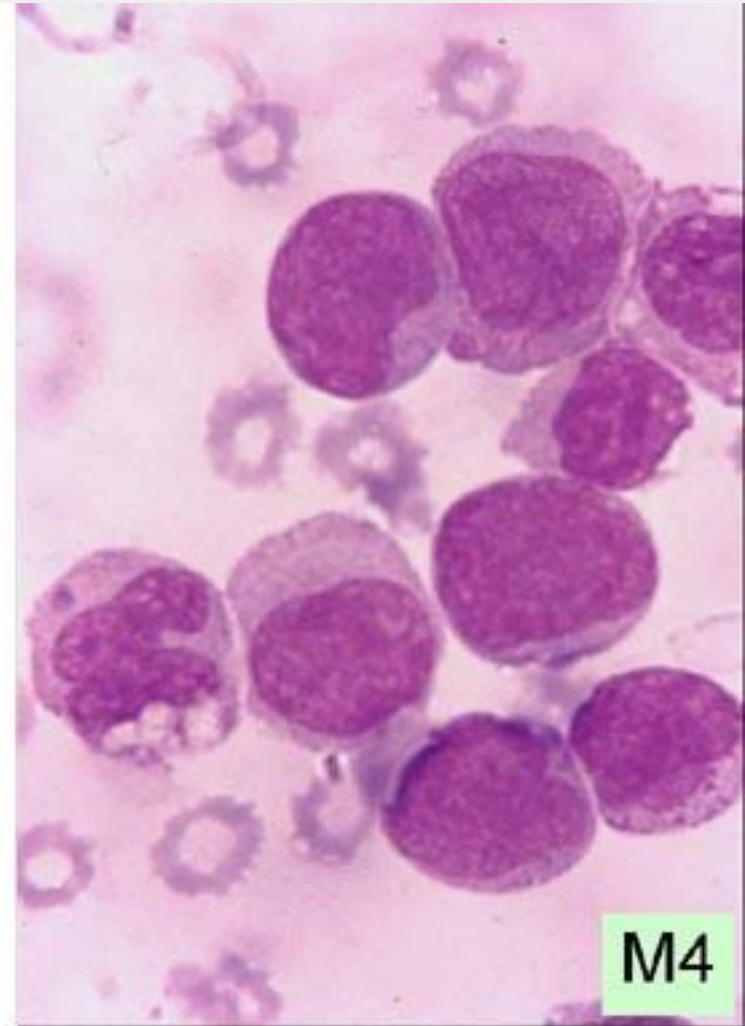
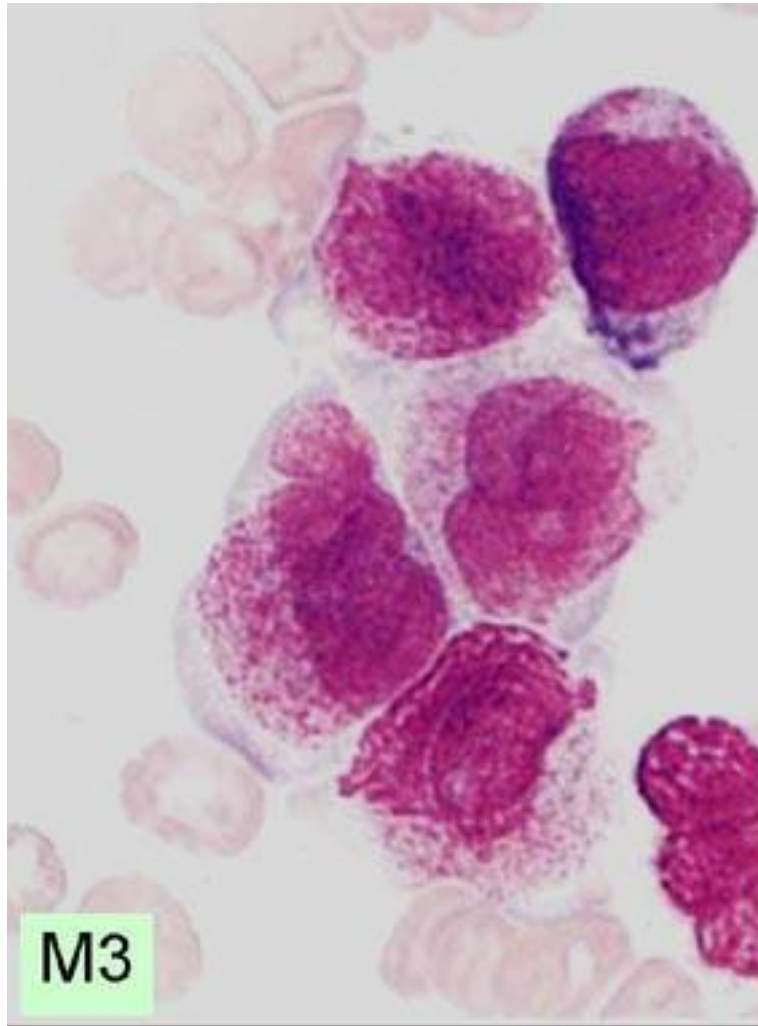
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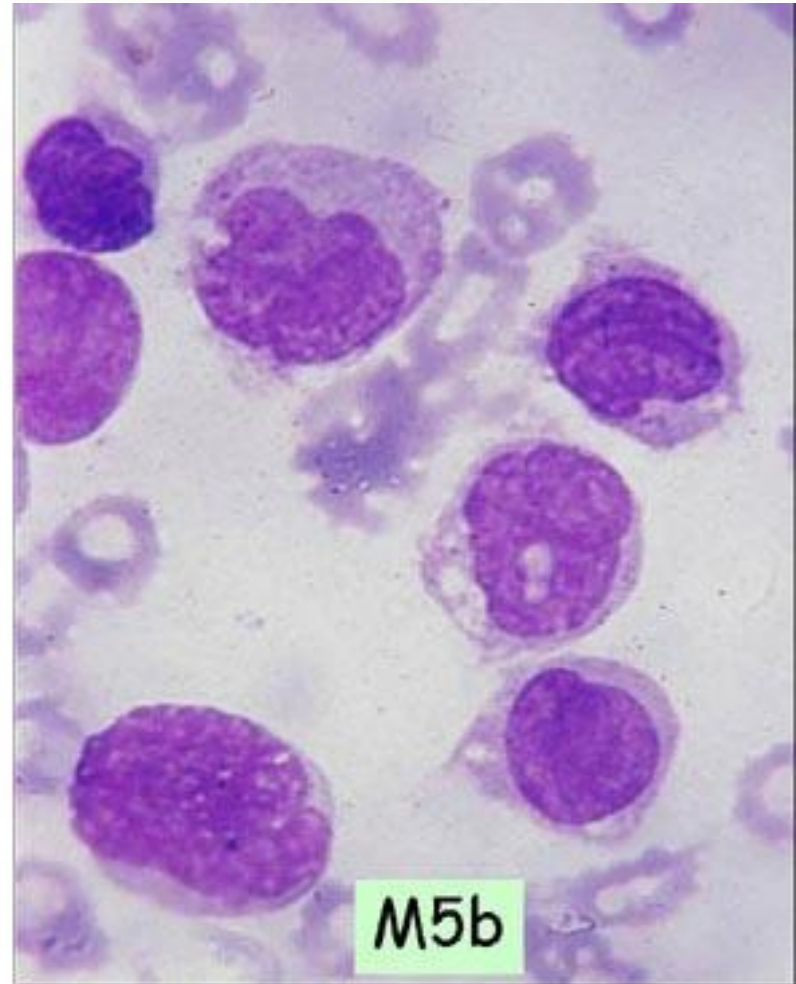
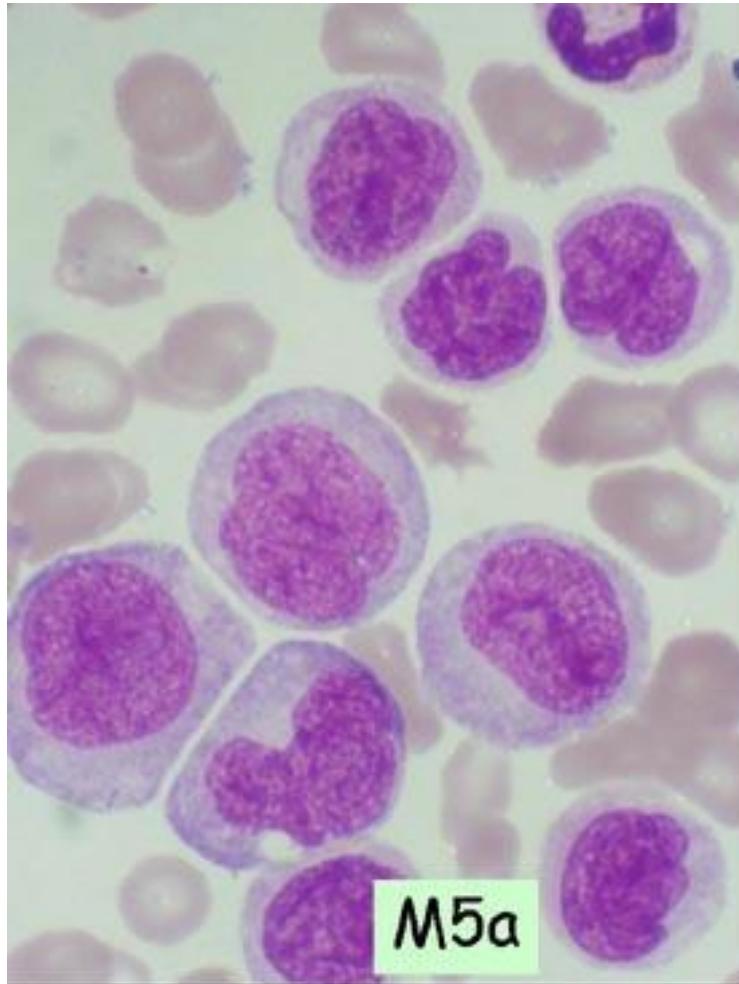


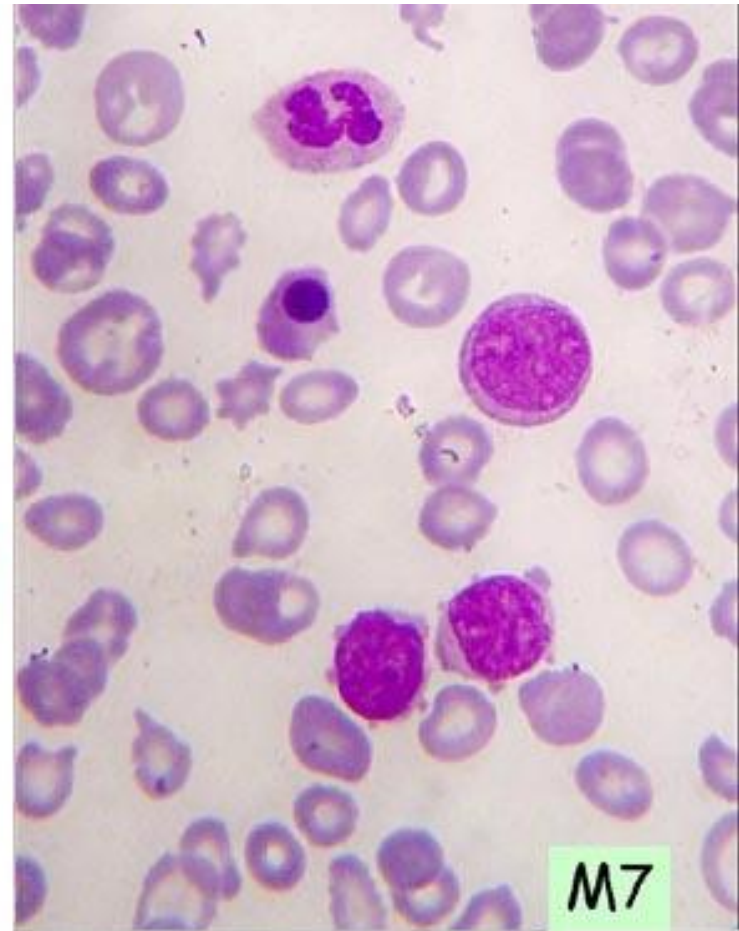
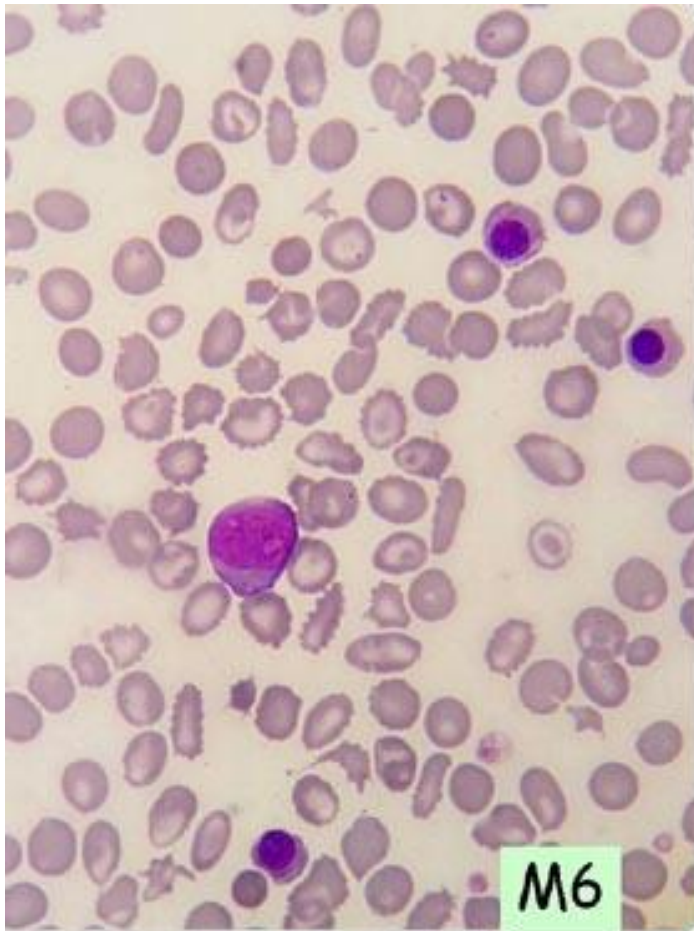
AML-M7



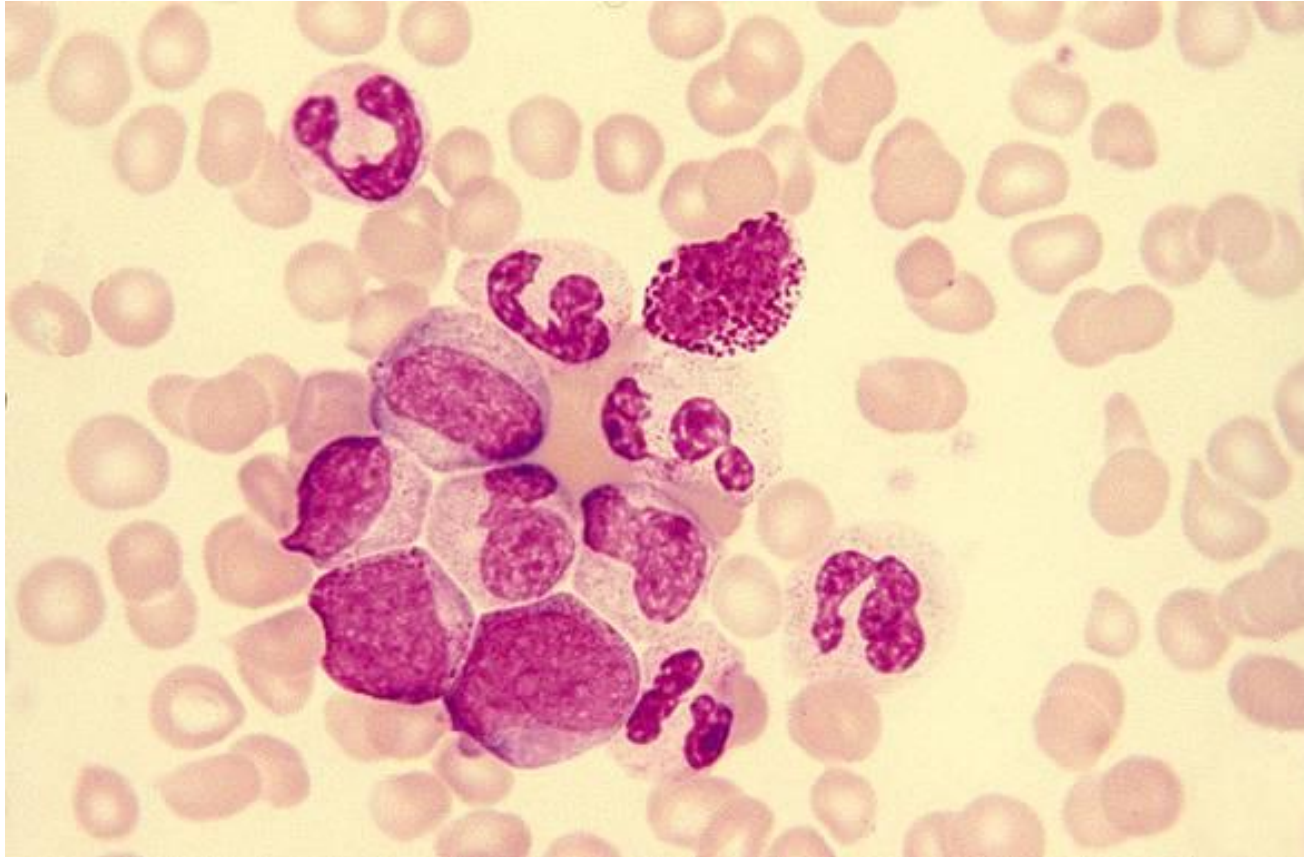


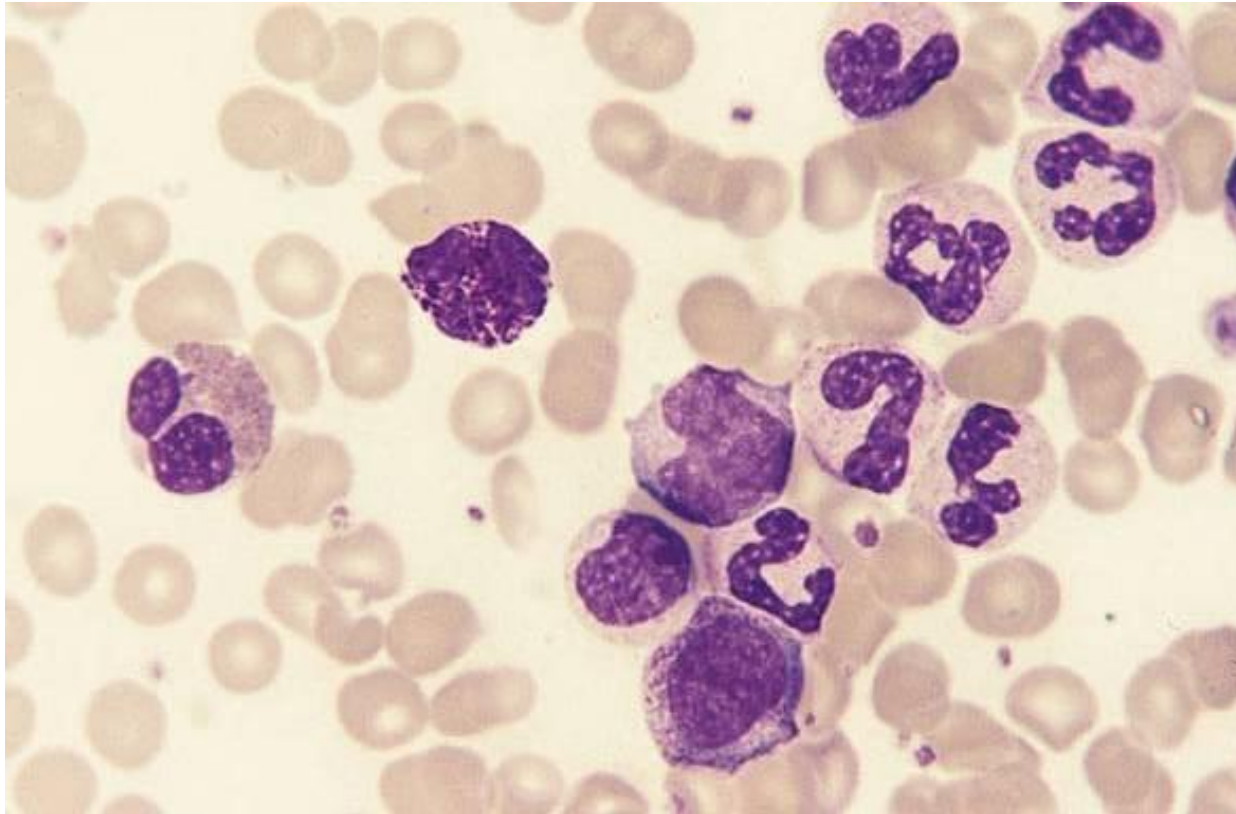


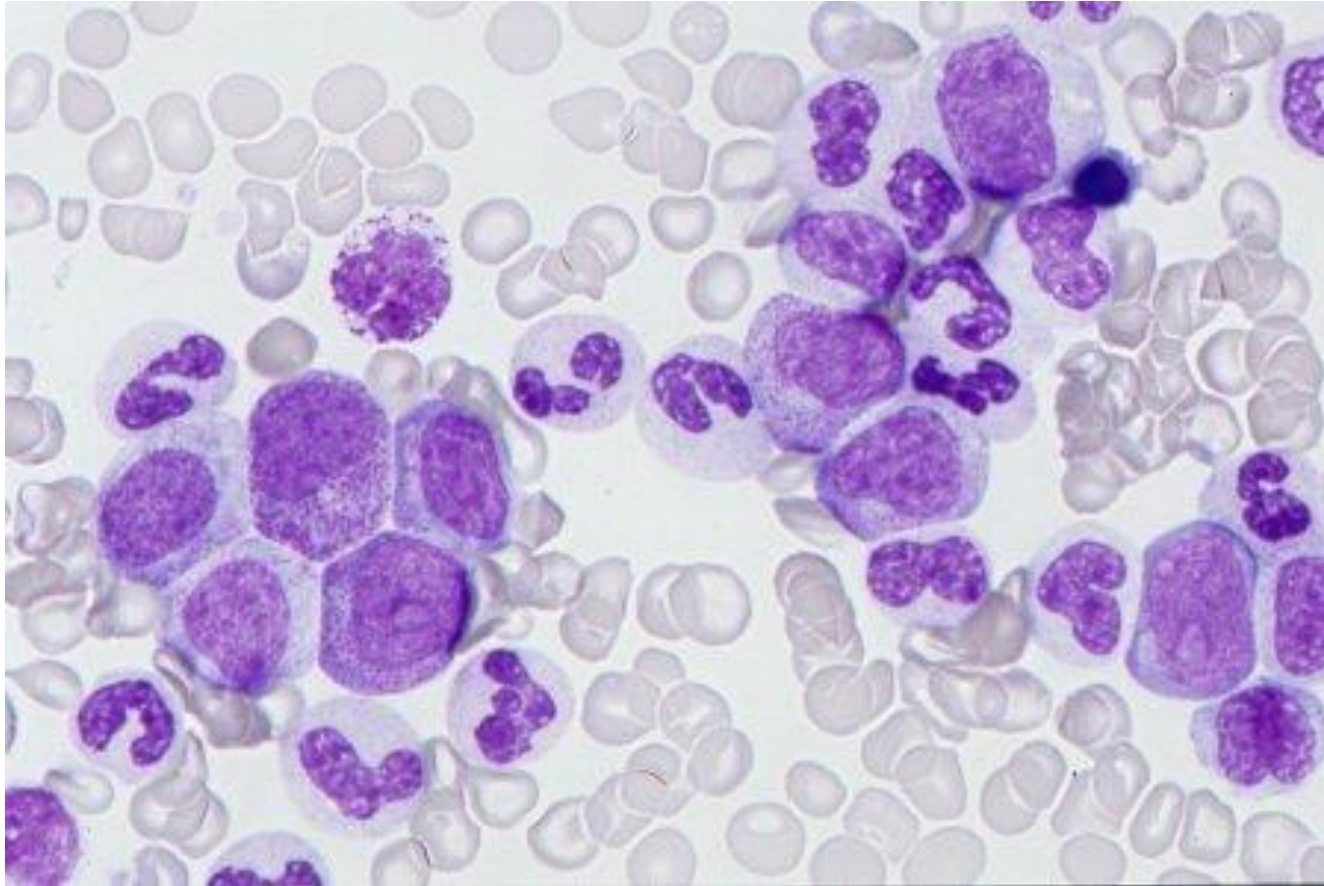


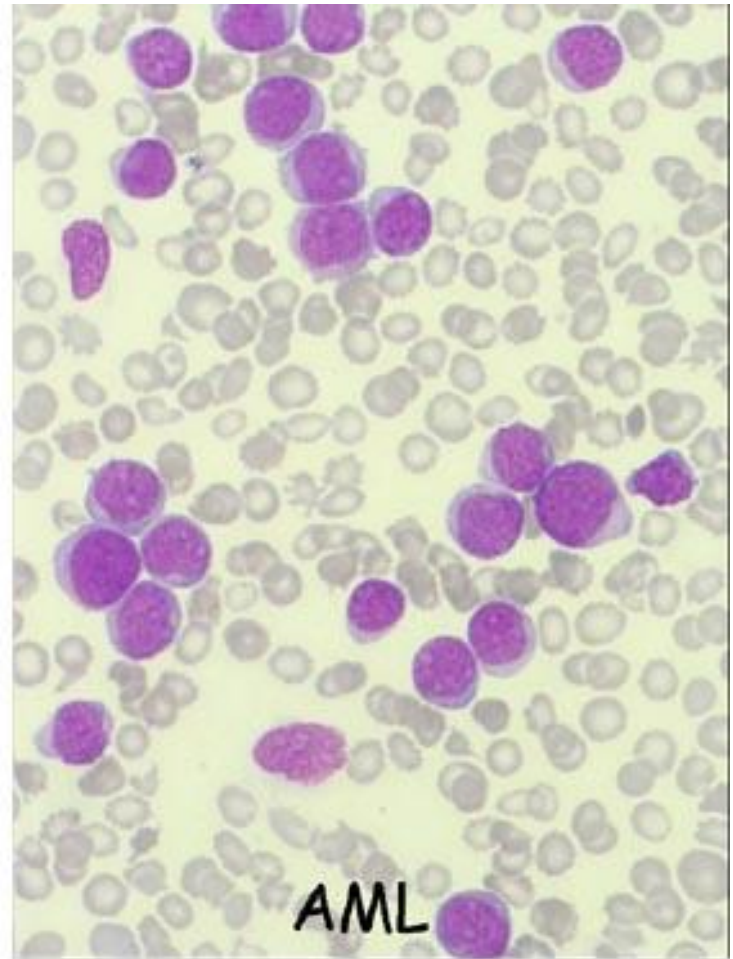
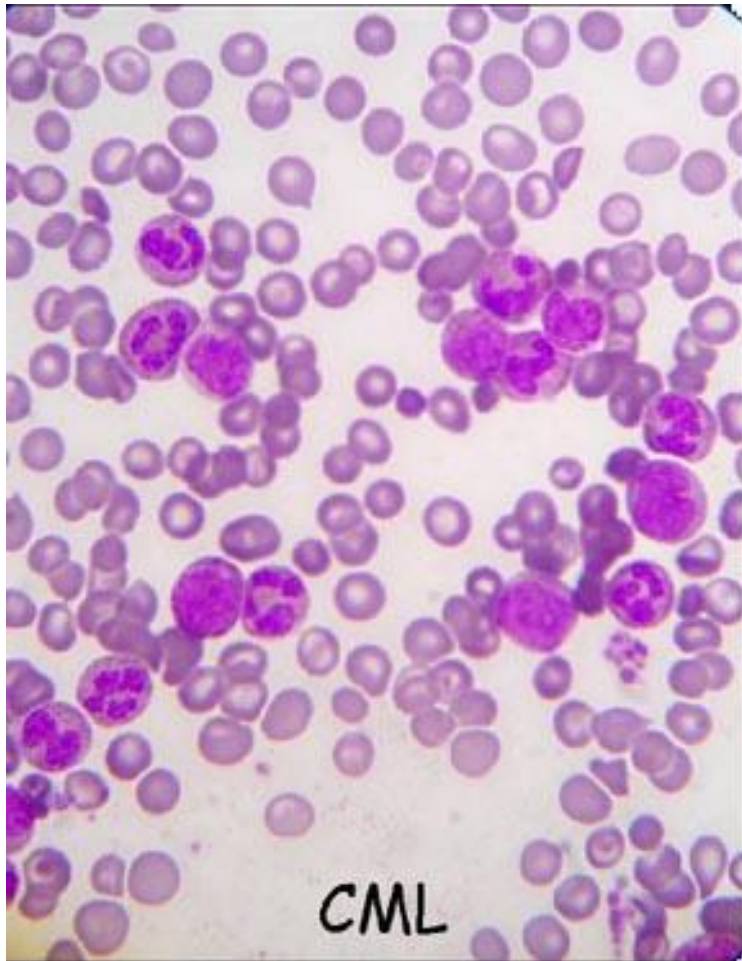


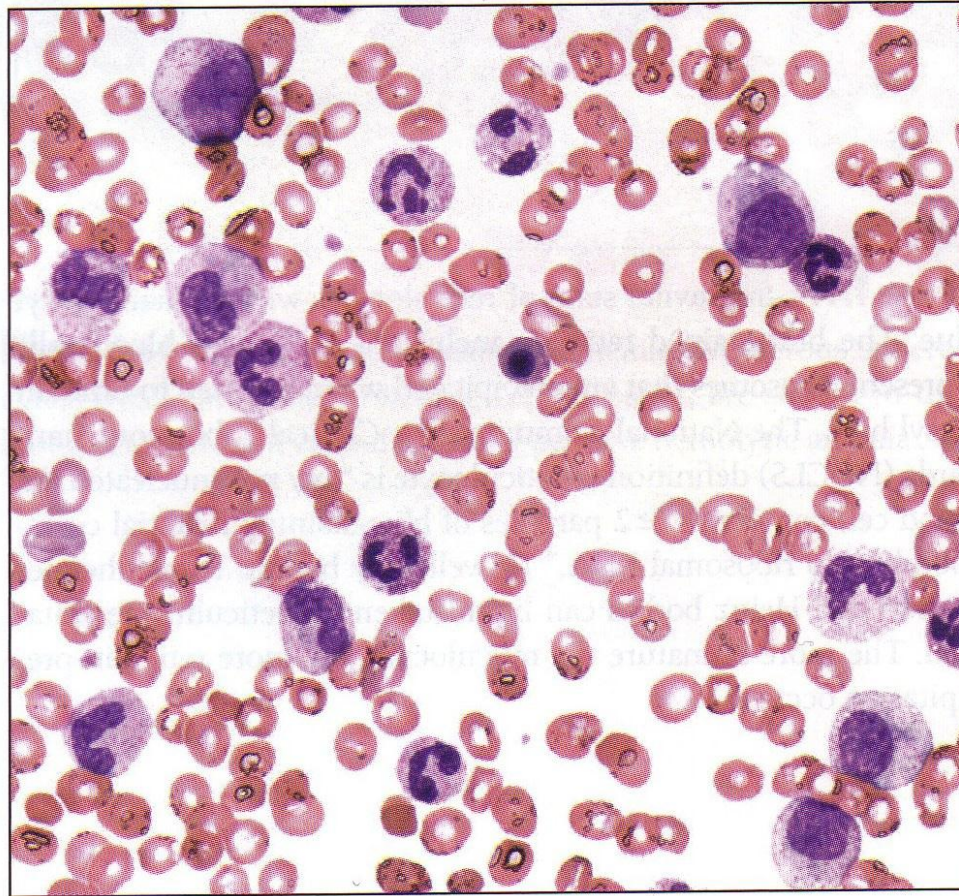
CML





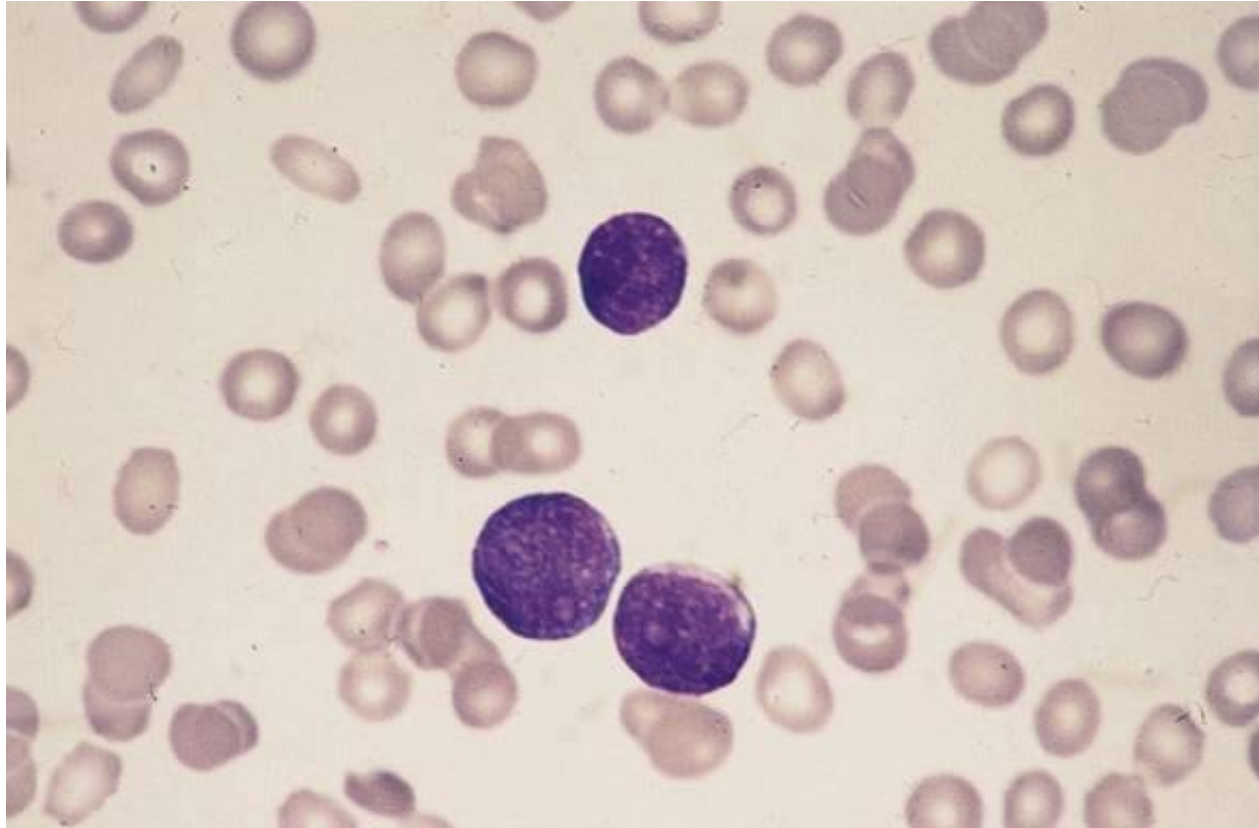




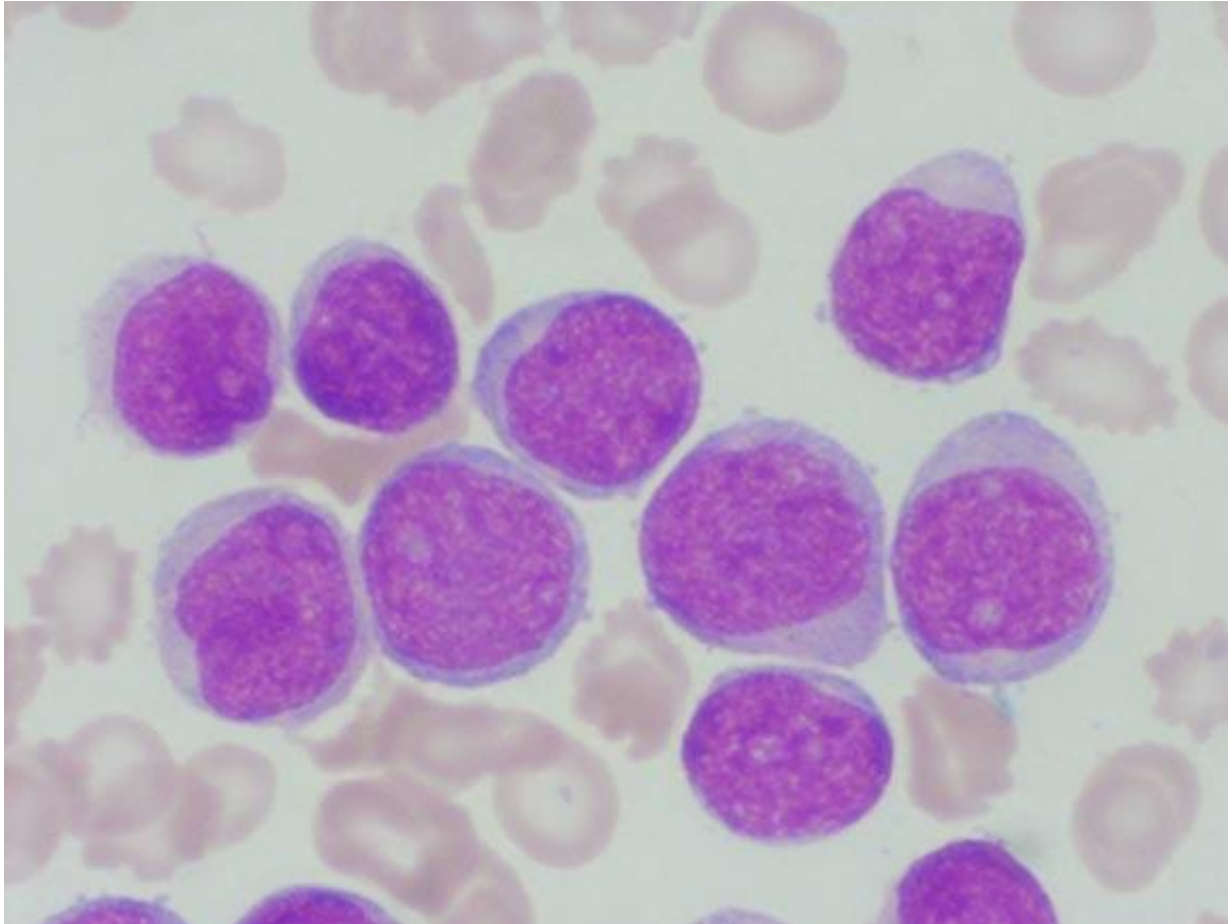


Leukoerythroblastic picture. Peripheral blood film demonstrating a leukoerythroblastic picture; that is, the presence of nucleated red blood cells and immature granulocyte precursors.

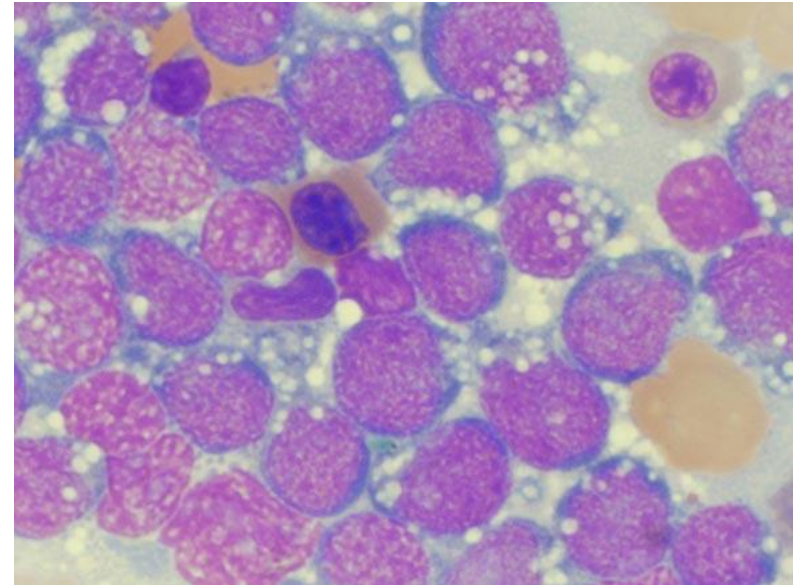
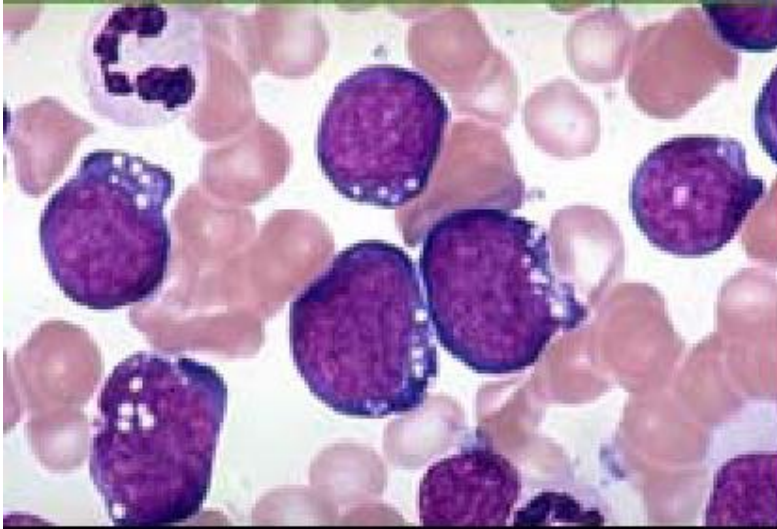
ALL-L1

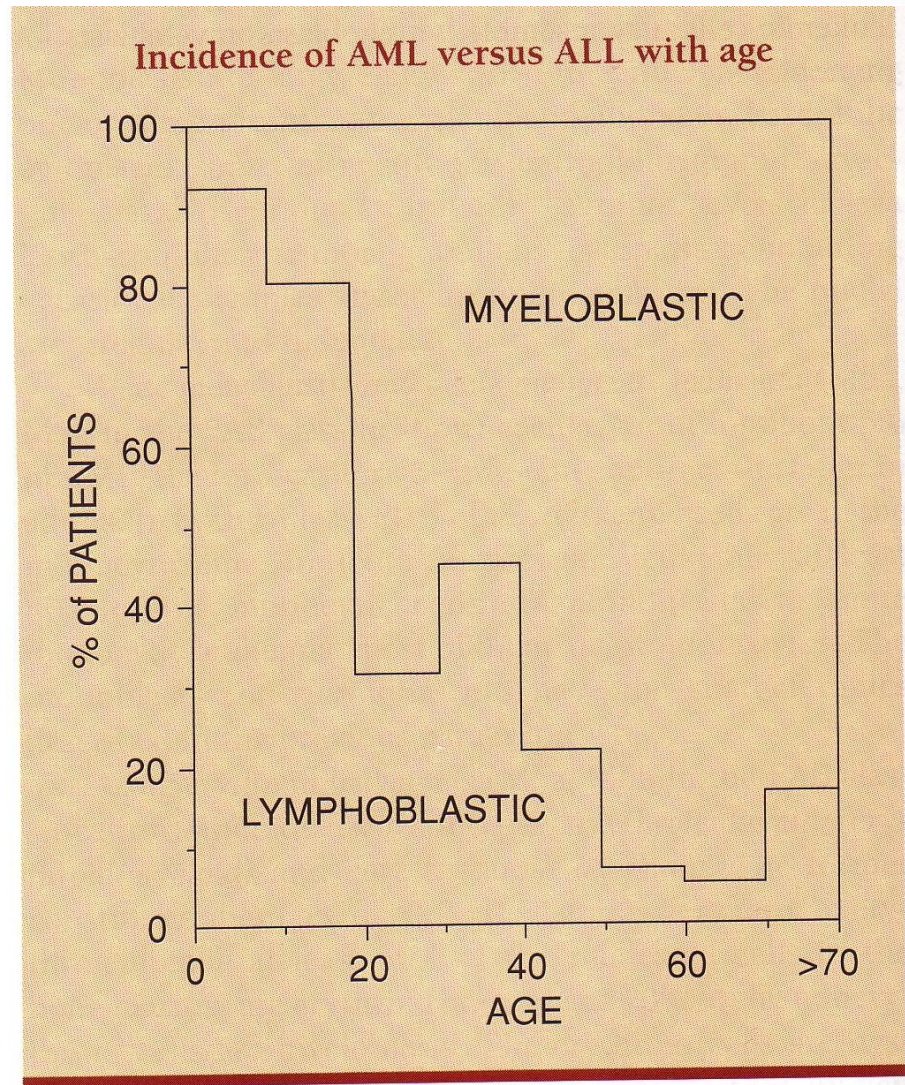


ALL-L2

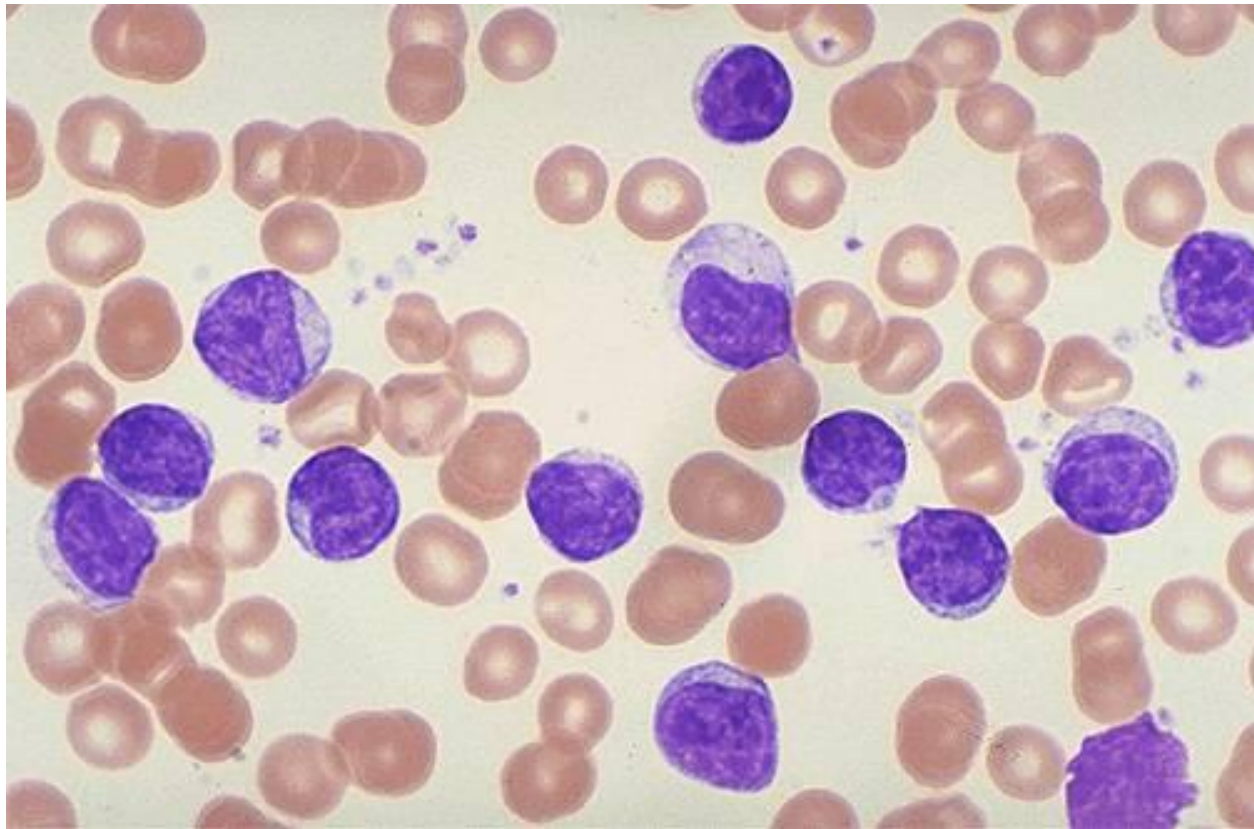


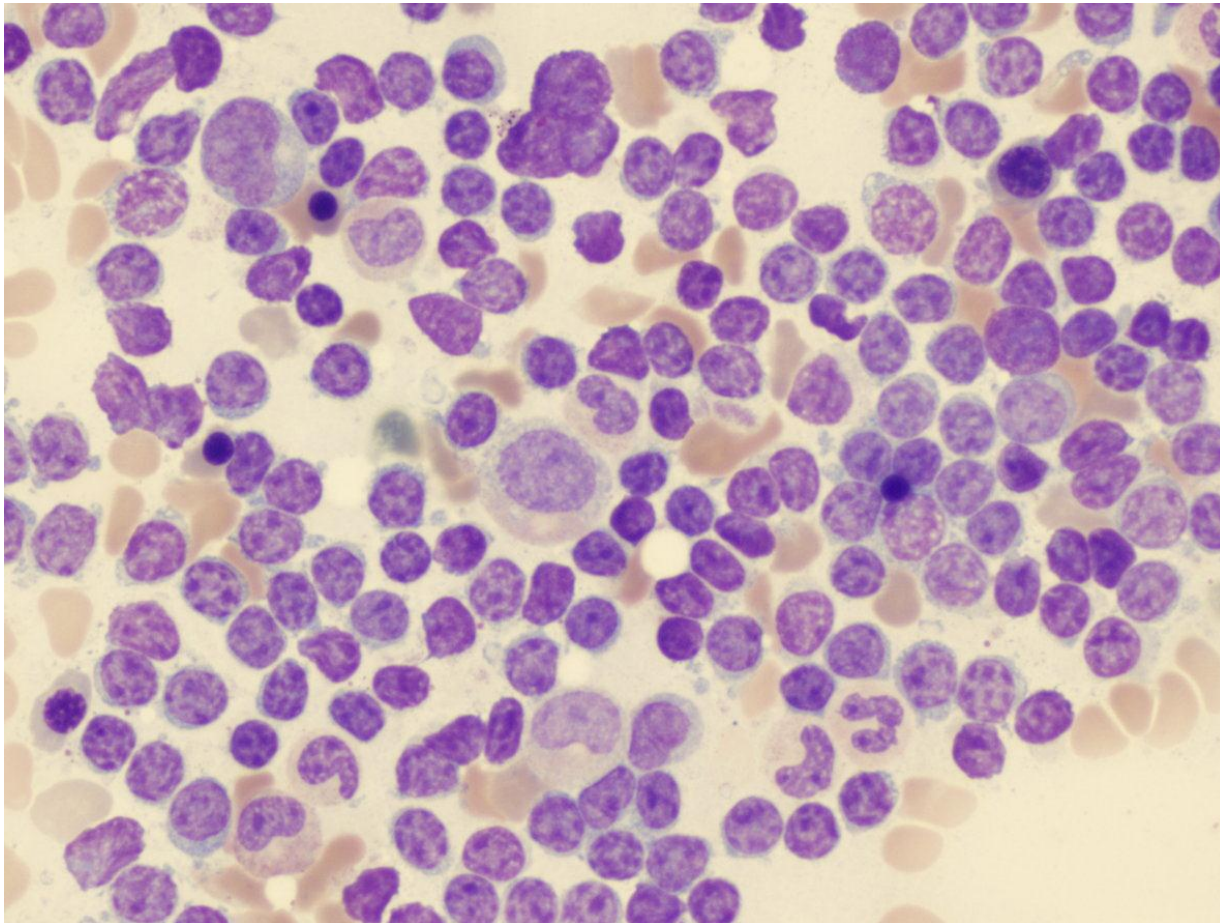
ALL-L3 (Burkitt Leukemia)

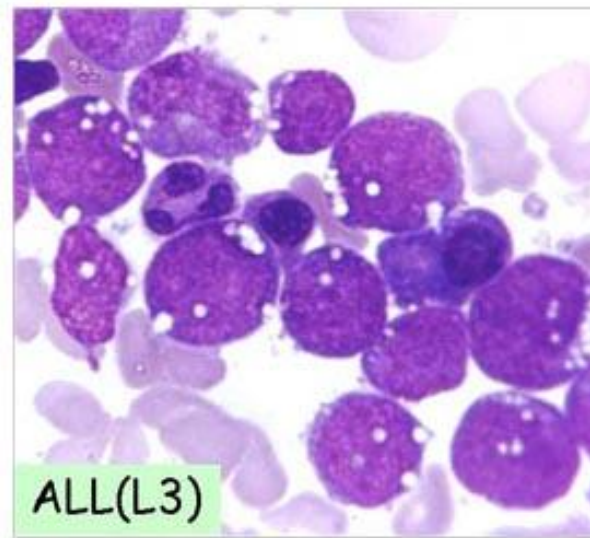
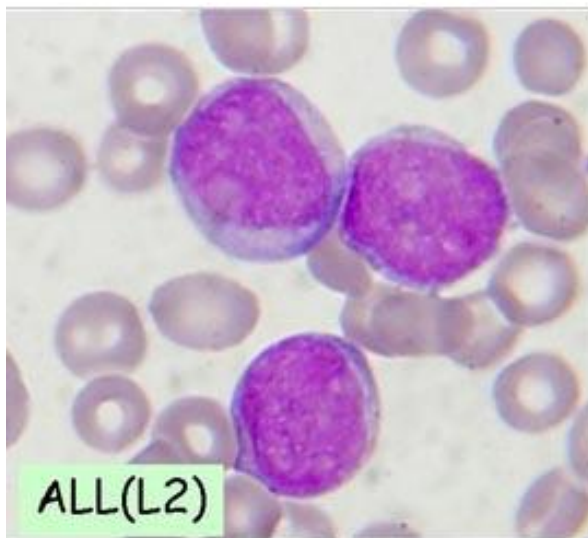
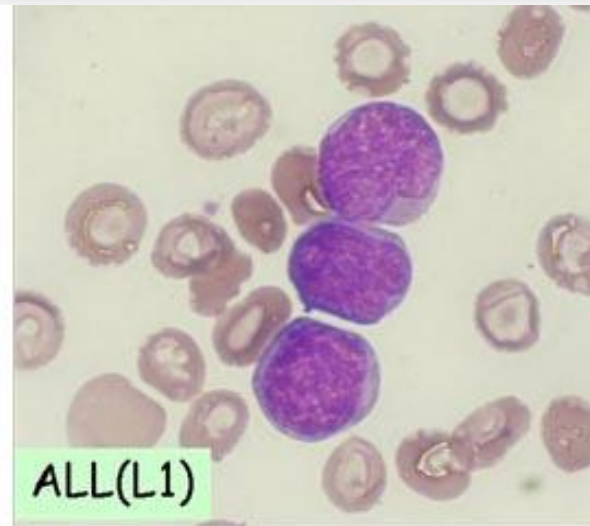
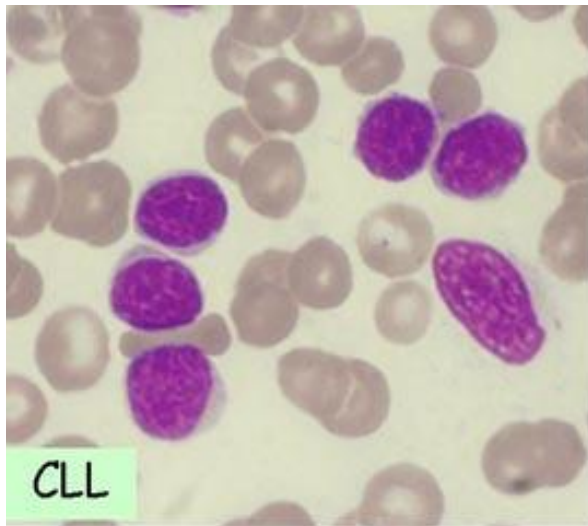


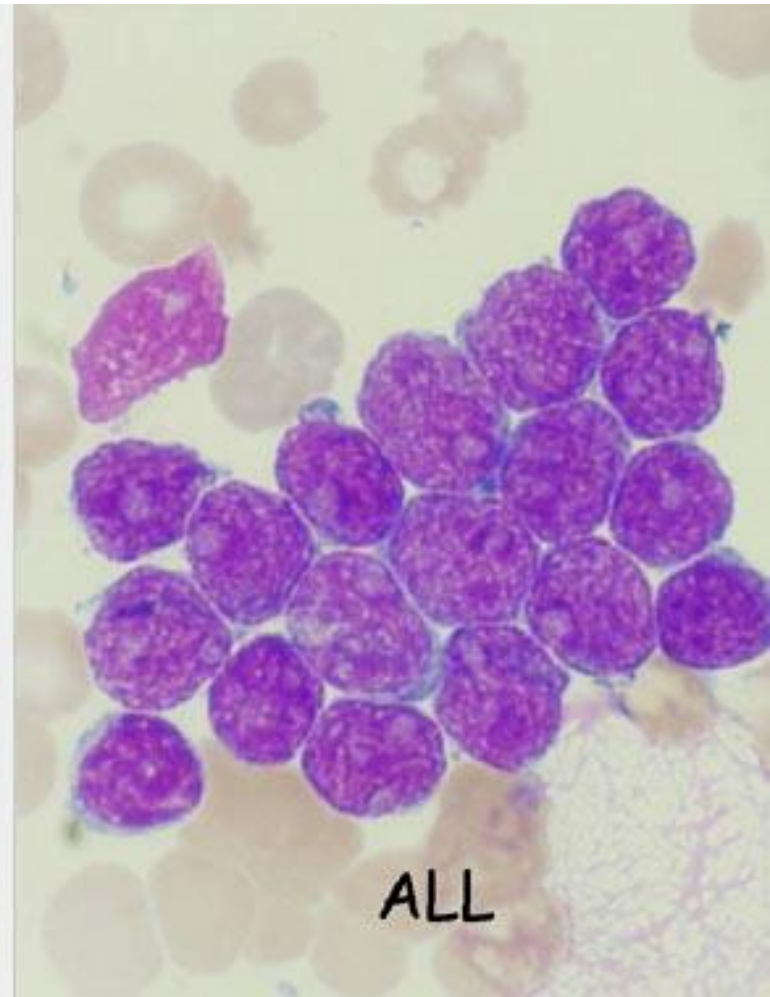
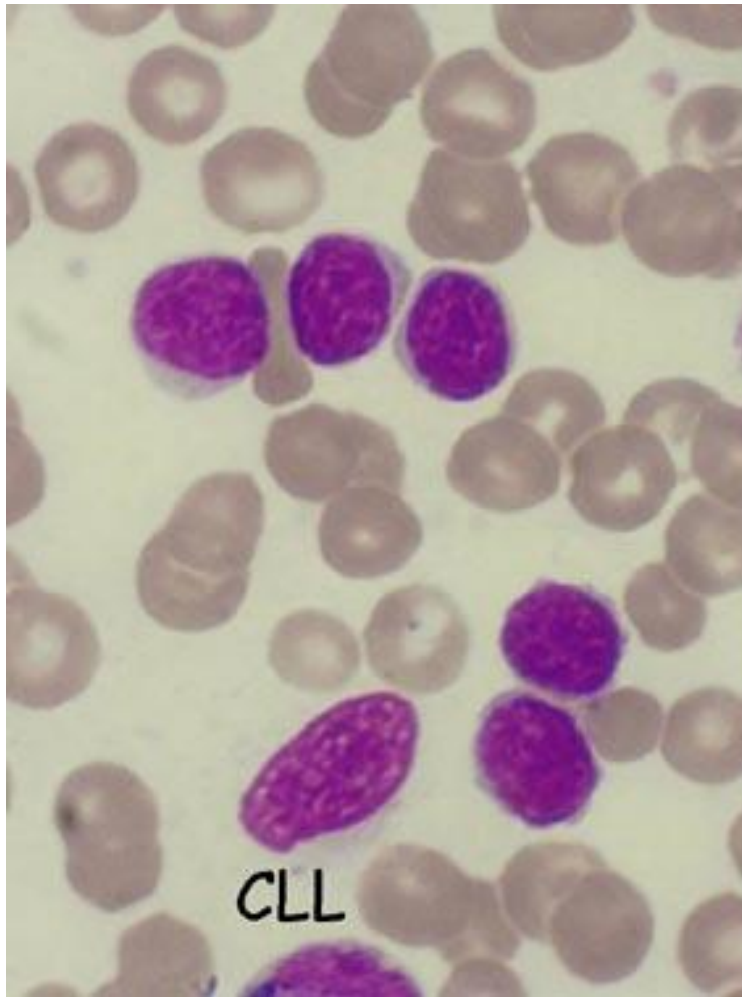


CLL

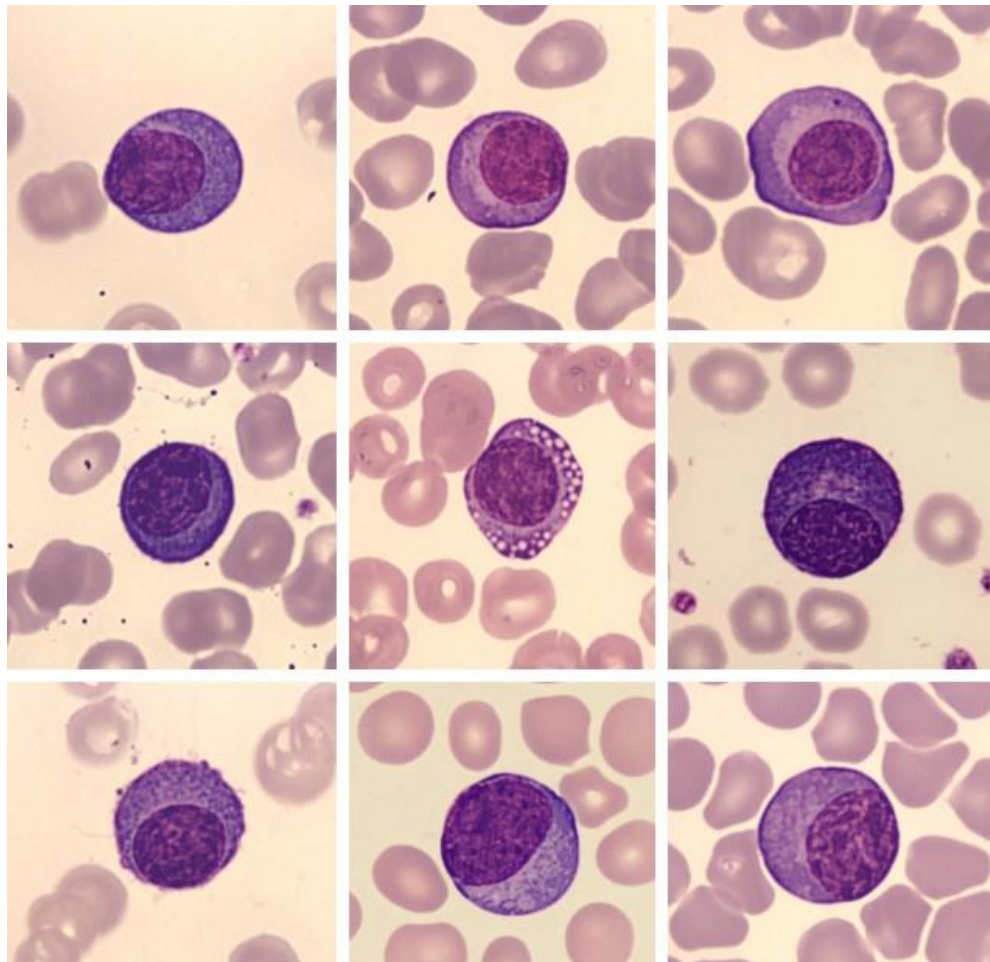


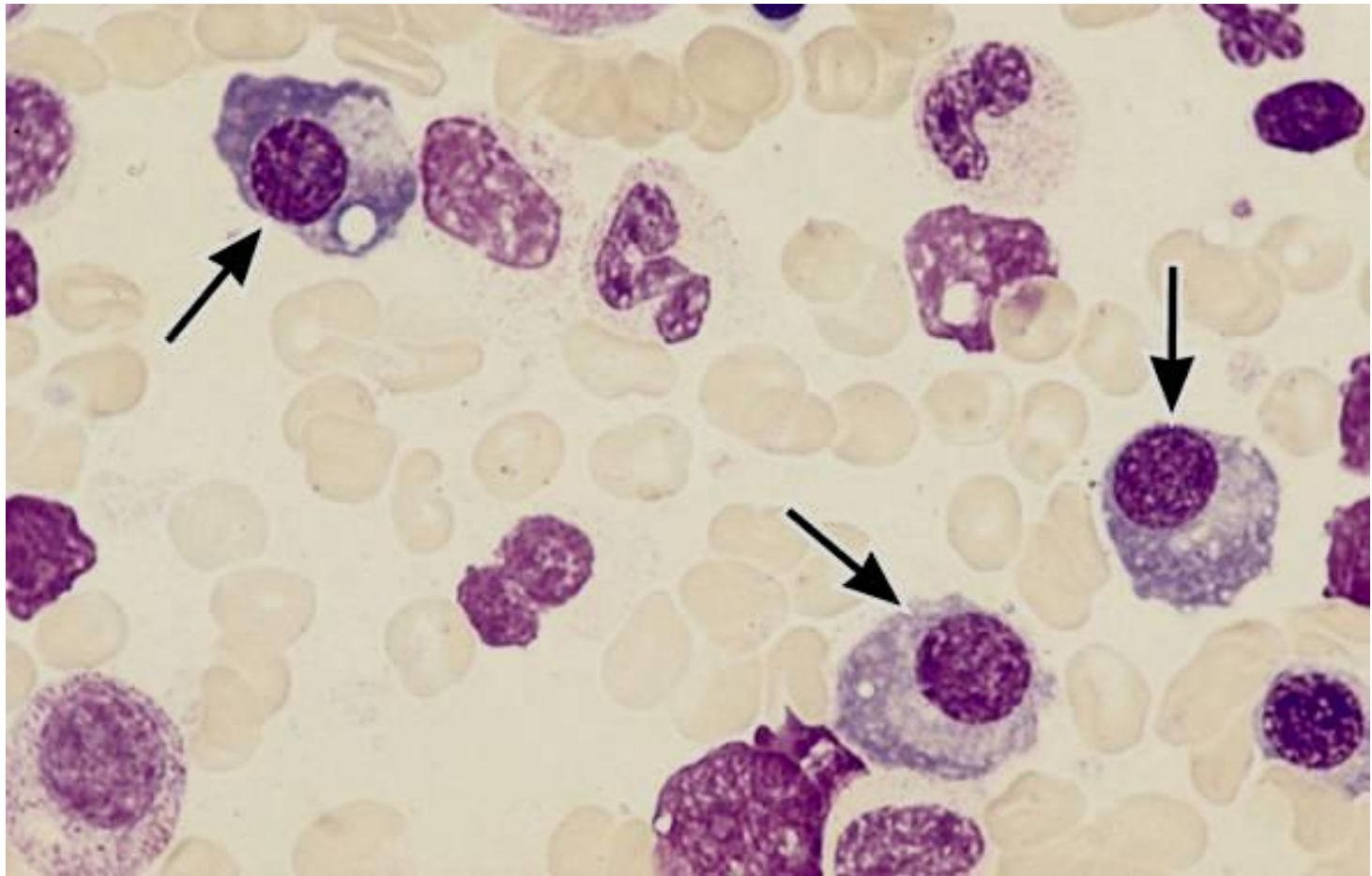


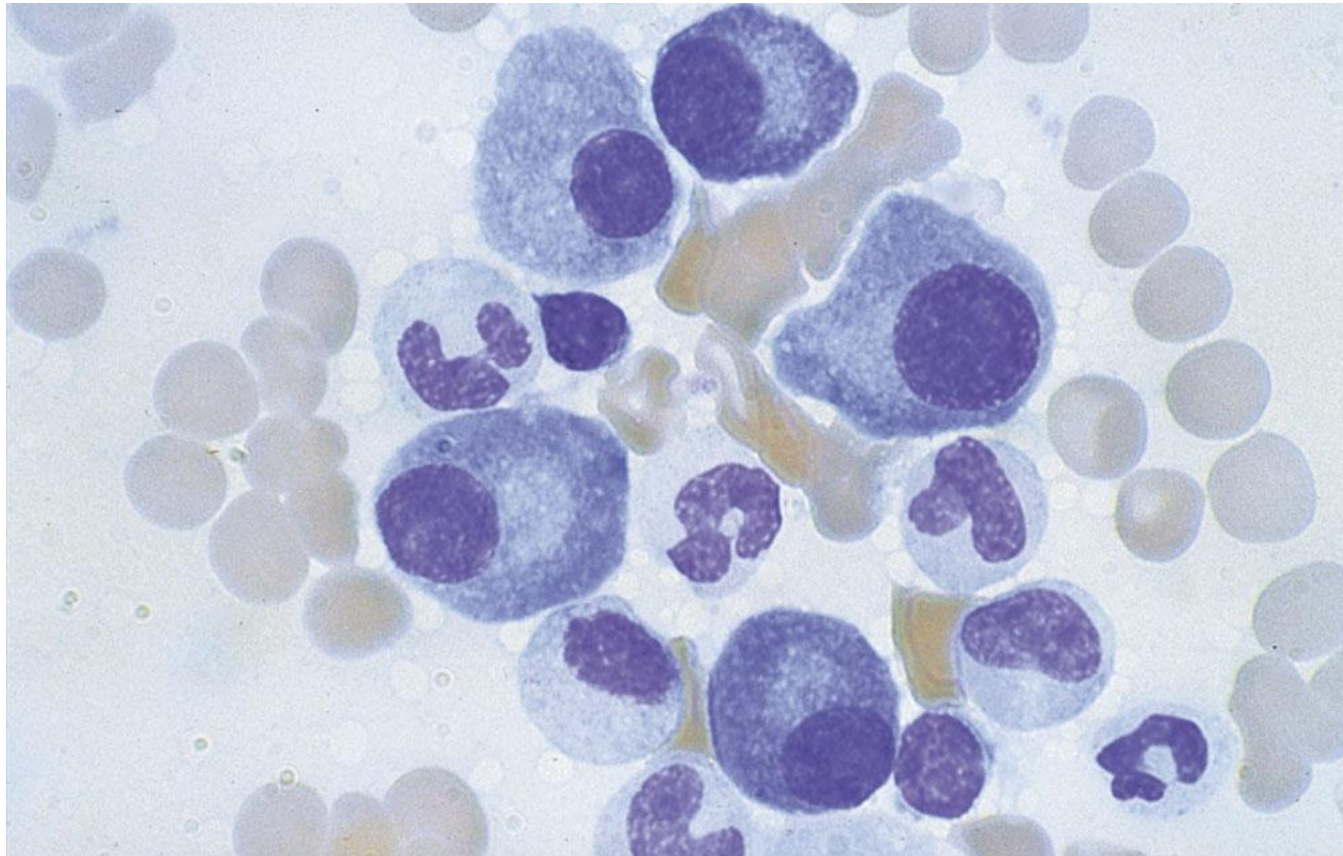




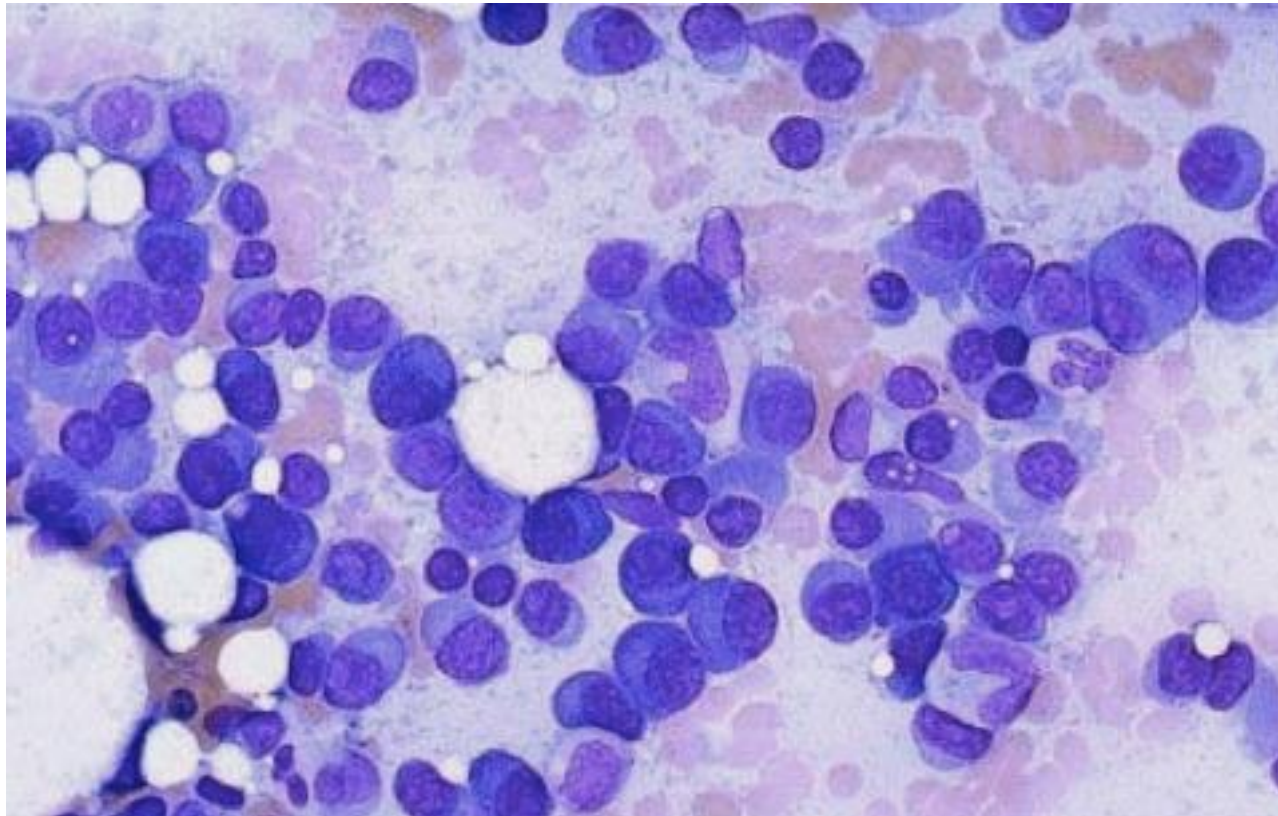
Plasma cell



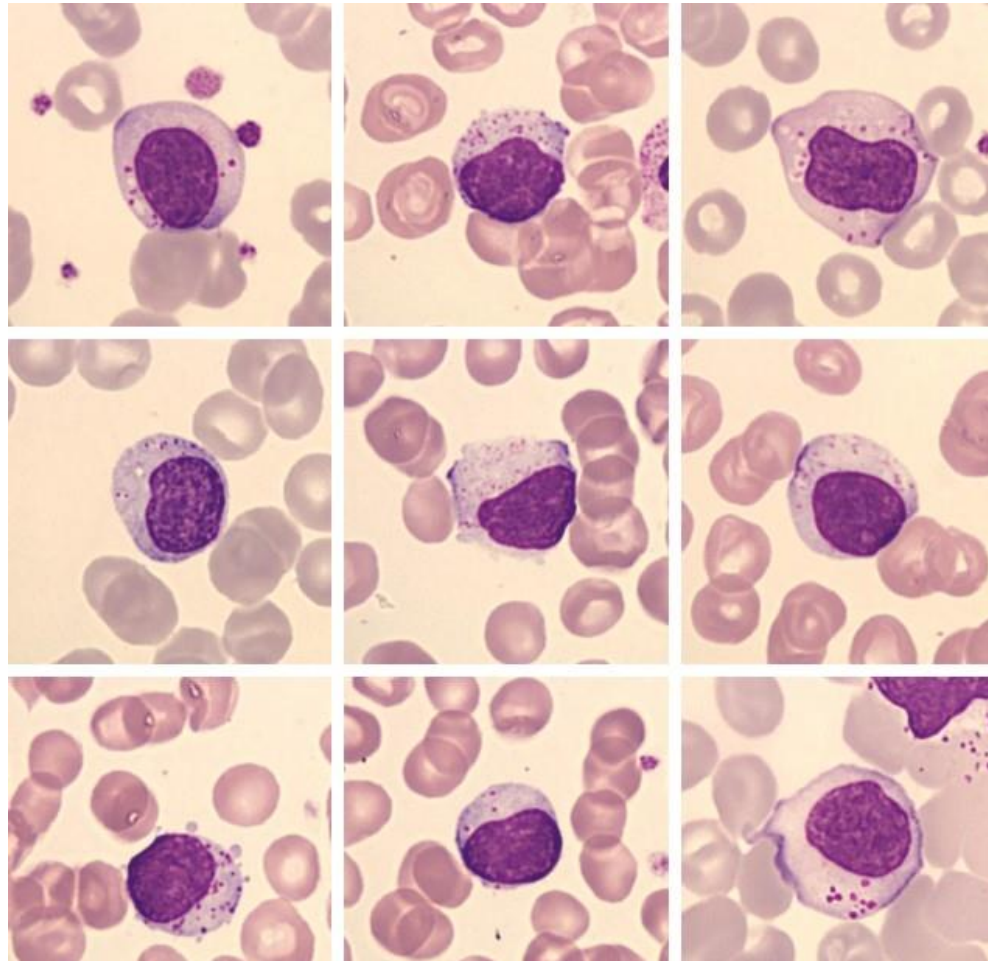


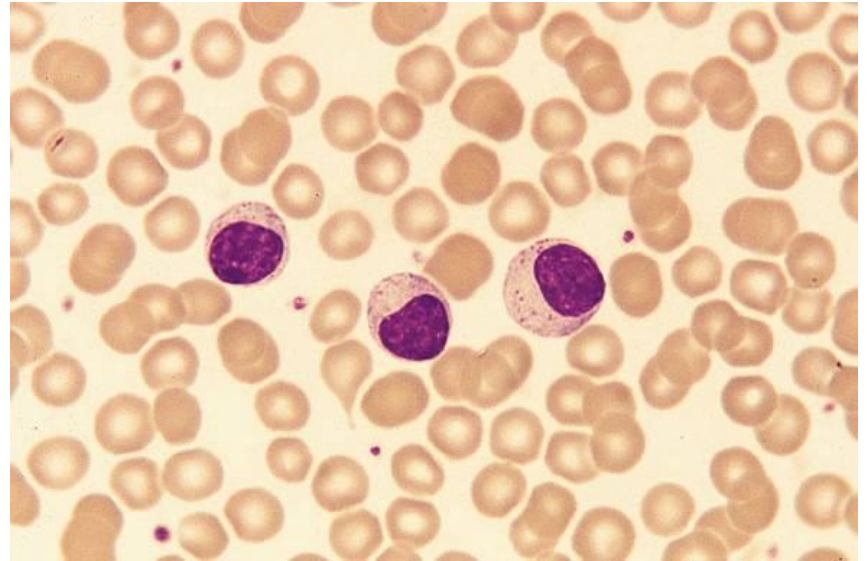
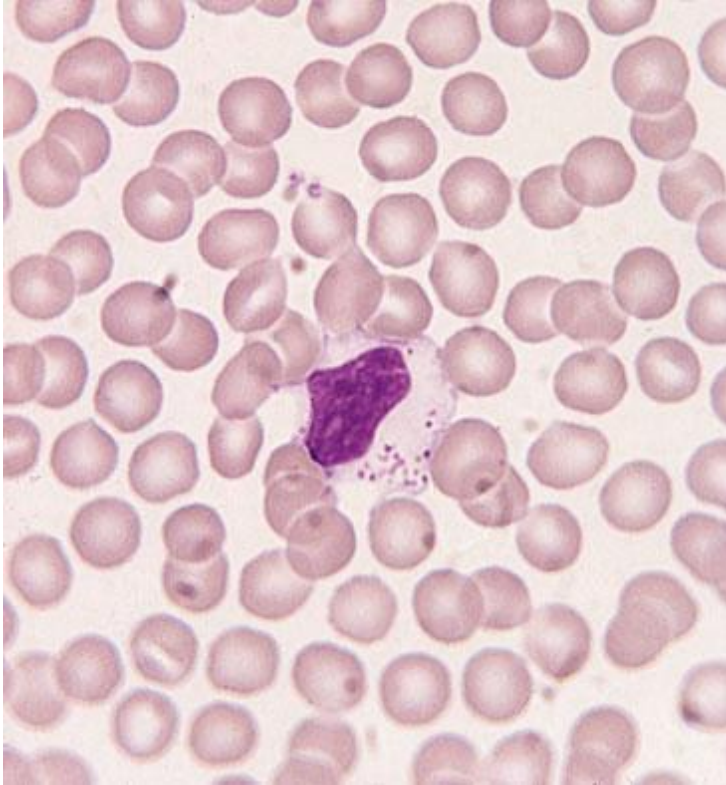


Multiple myeloma

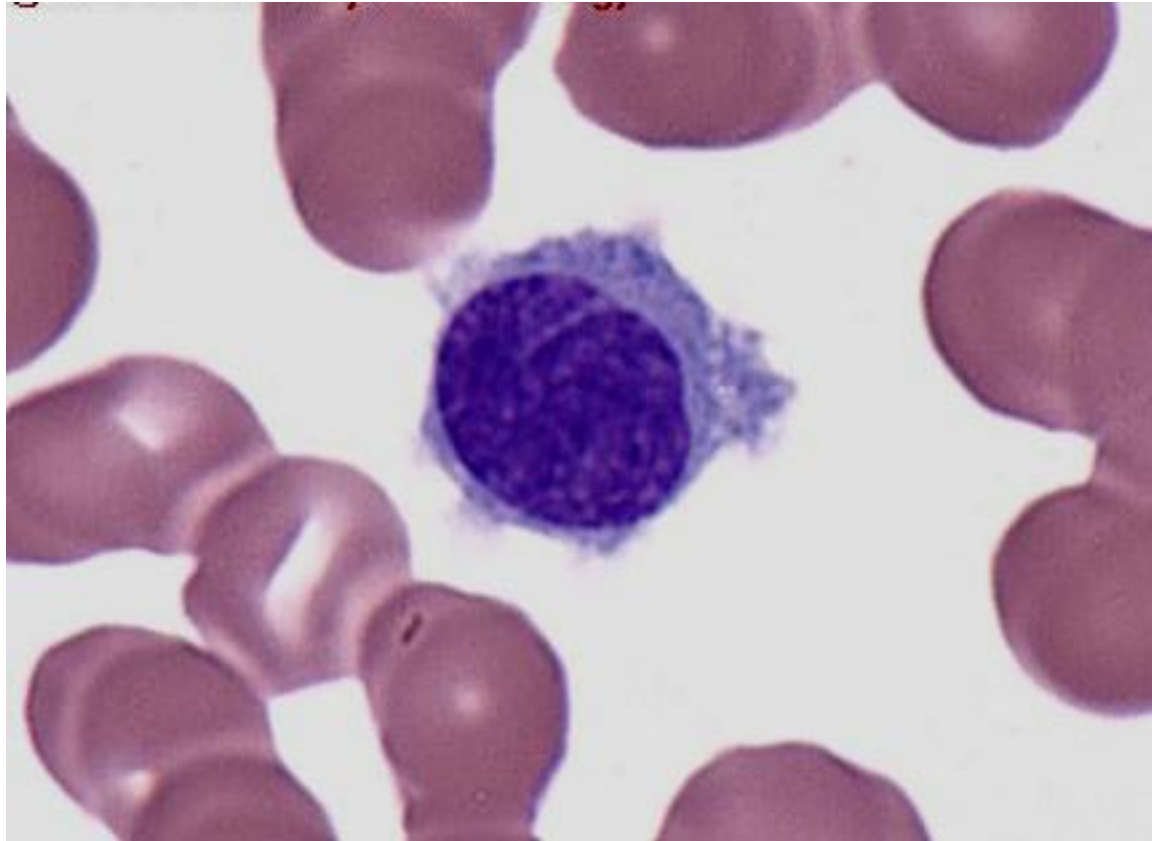


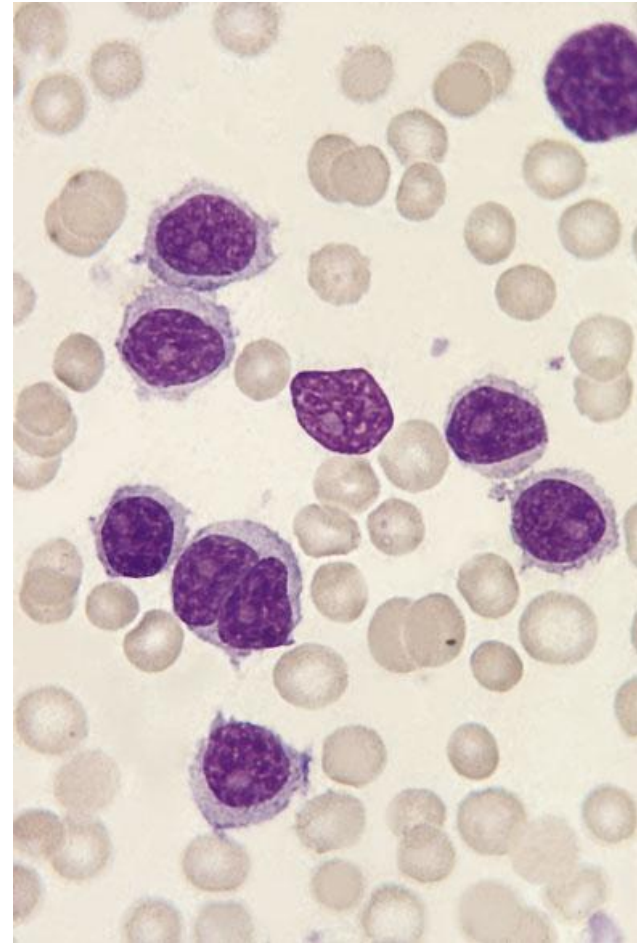
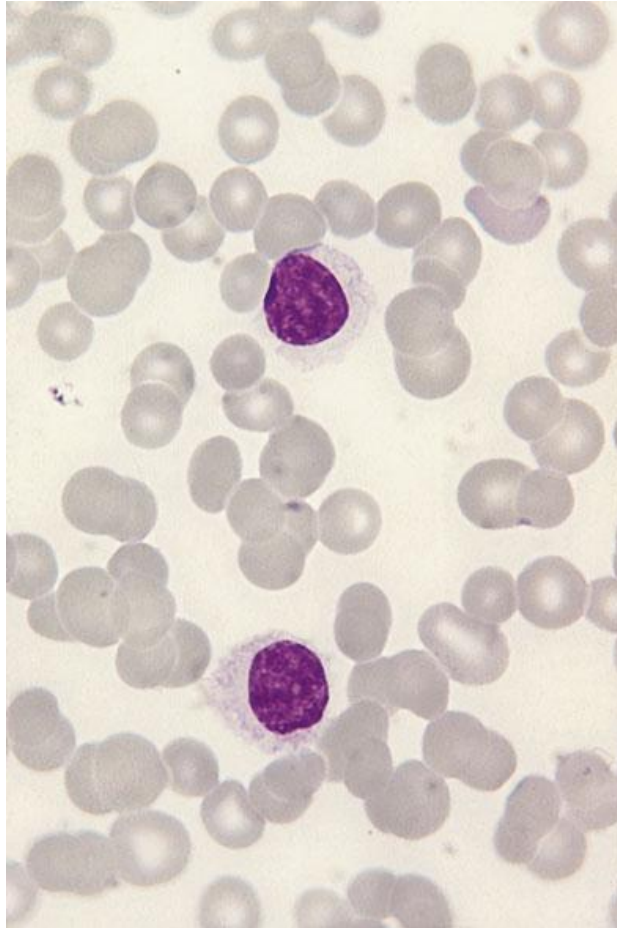
LGL



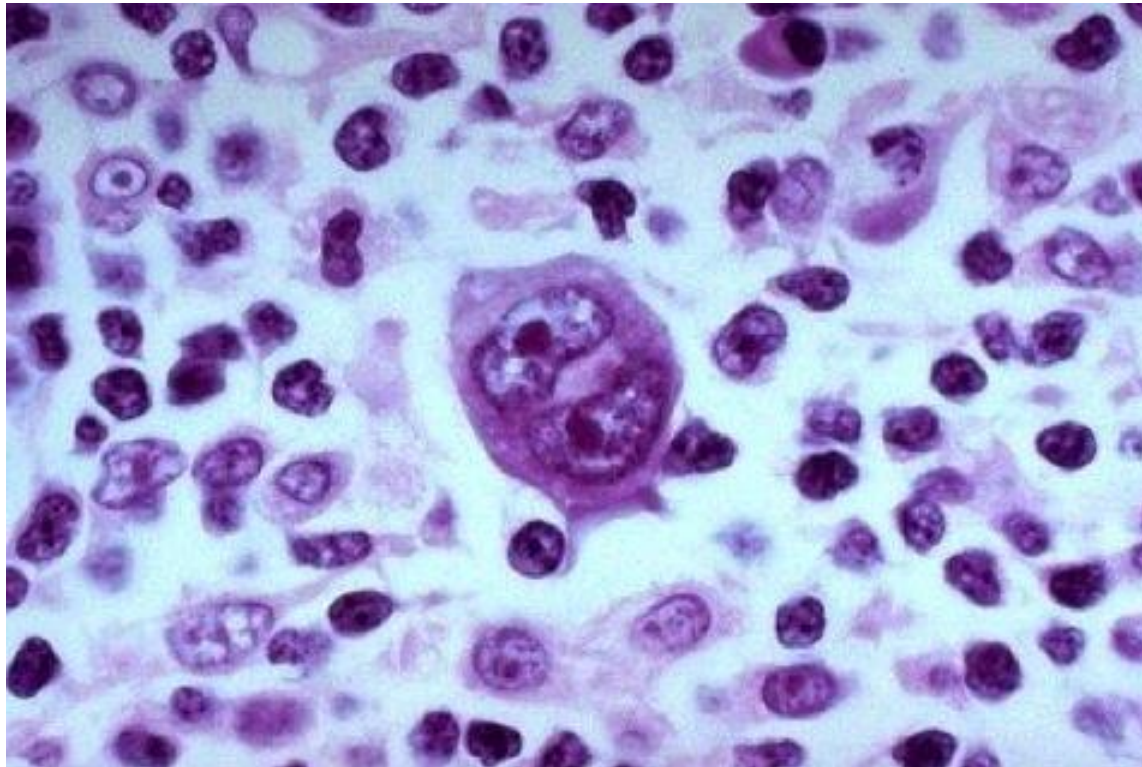


Hairy cell leukemia





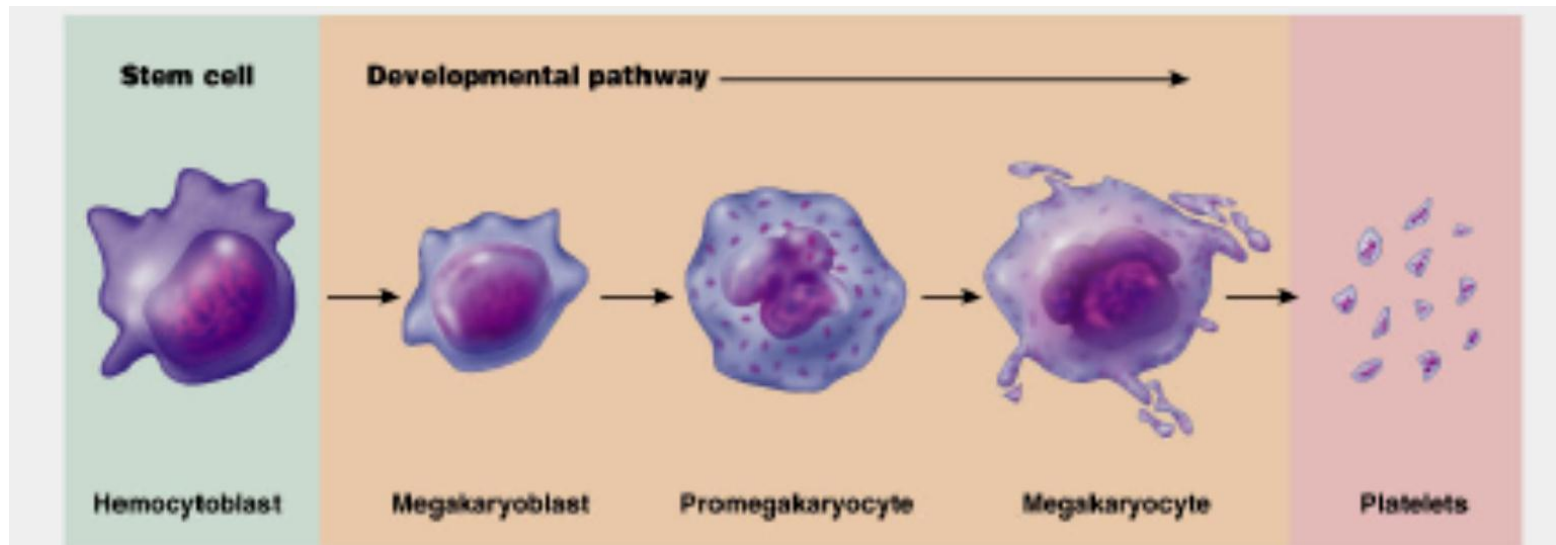
Reed-Sternberg Cell

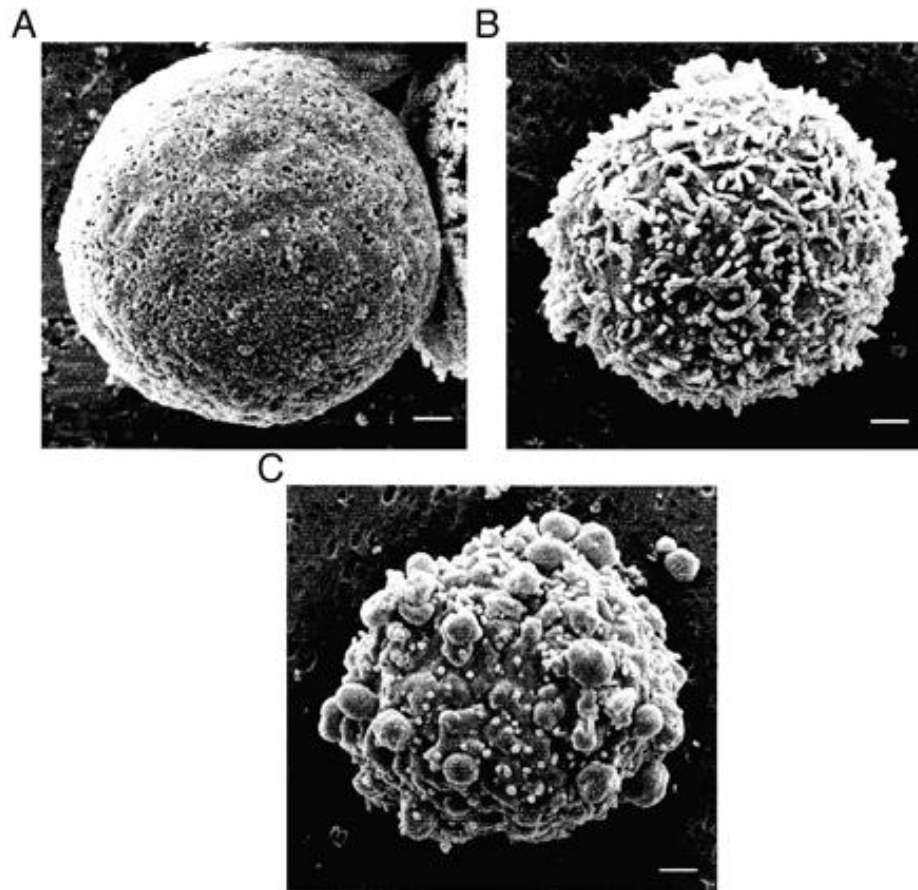


Myeloid Blasts	Granulocytes & Monocytes	Immature B Cells	Mature B Cells	Plasma Cells	Immature T Cells	Mature T/NK Cells
CD34	CD4	CD10	CD19	CD19	CD1a	CD2
CD38	CD10	CD19	CD20 ^c	CD38	CD2	CD3
CD45	CD11b	CD20 ^c	CD10	CD45	CD3	CD4
CD117	CD13	CD34	CD38	Cyto ^d κ	CD4	CD5
CD2 ^a	CD14	CD38	CD45	Cyto ^d λ	CD5	CD7
CD5 ^a	CD15	CD45	κ	CD56 ^a	CD7	CD8
CD7 ^a	CD16	HLA-DR	λ		CD8	CD10
CD56 ^a	CD33	κ	CD5 ^a		CD10	CD16
	CD38	λ	CD11c ^b		CD34	CD45
	CD45	TdT	CD22 ^{b,c}		CD38	CD56
	CD64	CD13 ^a	CD23 ^b		HLA-DR	TCR-α/β
	HLA-DR	CD33 ^a	CD25 ^b		TdT	TCR-γ/δ
	CD56 ^a		CD52 ^b		CD13 ^a	CD25 ^c
			CD103 ^{a,b}		CD33 ^a	CD30 ^c
			FMC7 ^b		CD117 ^a	CD52 ^c
			ZAP-70 ^a			

Platelets

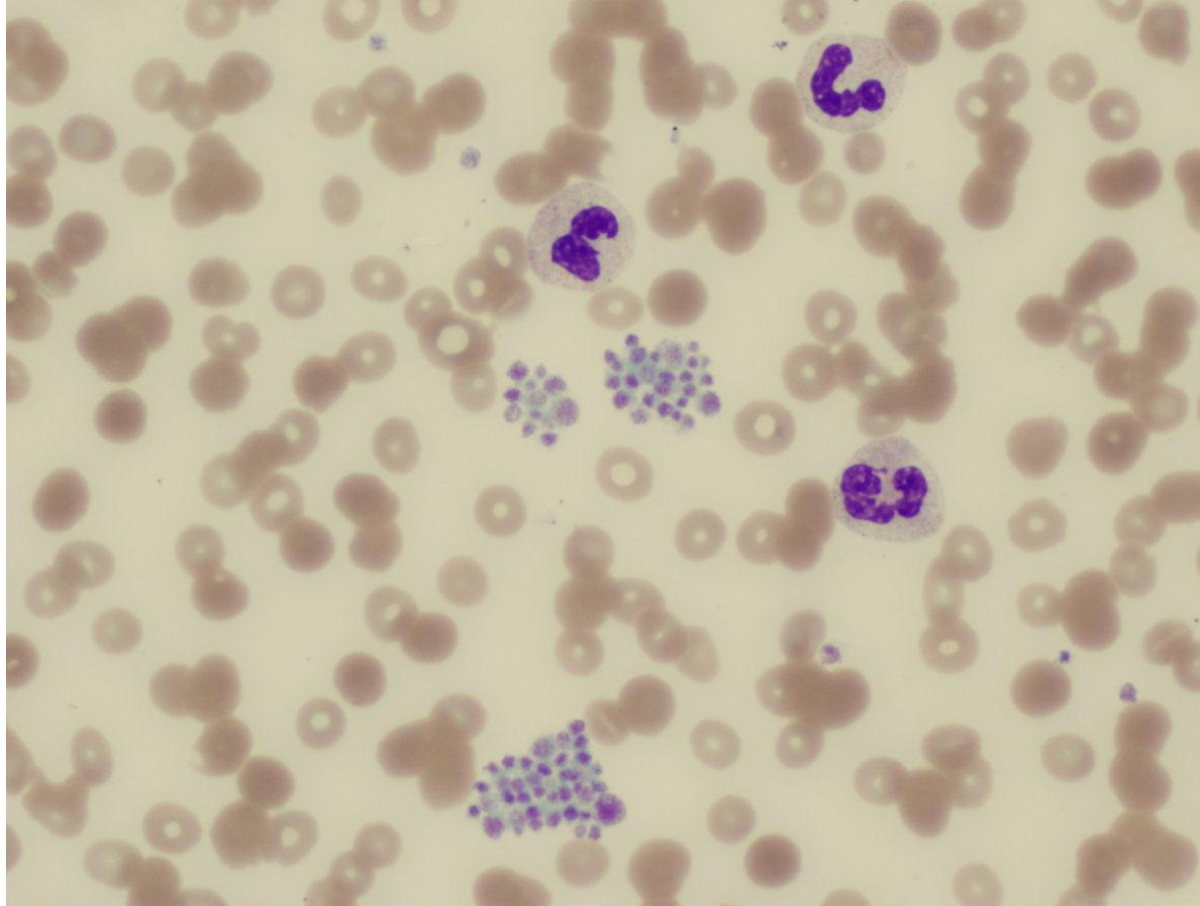
Platelet Formation



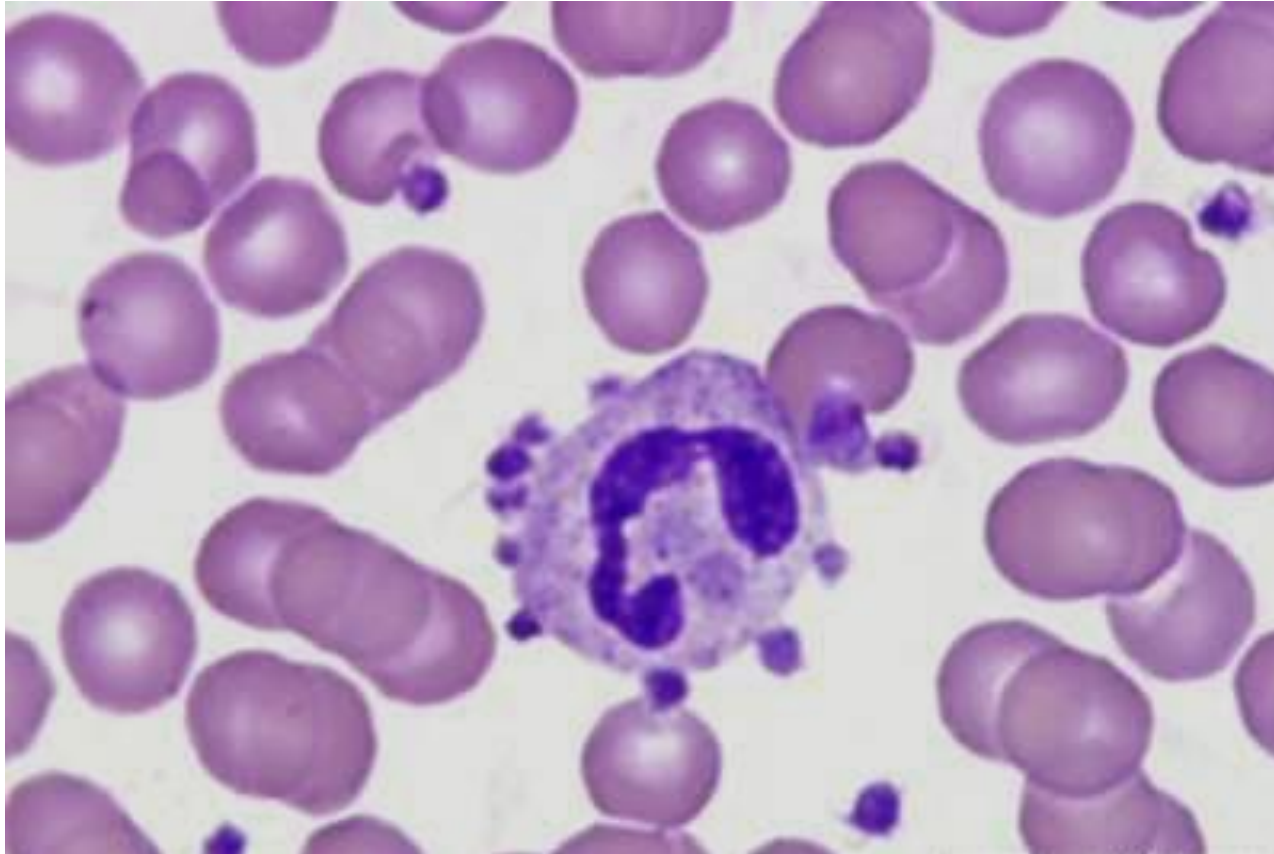


Megakaryocyte and platelets production

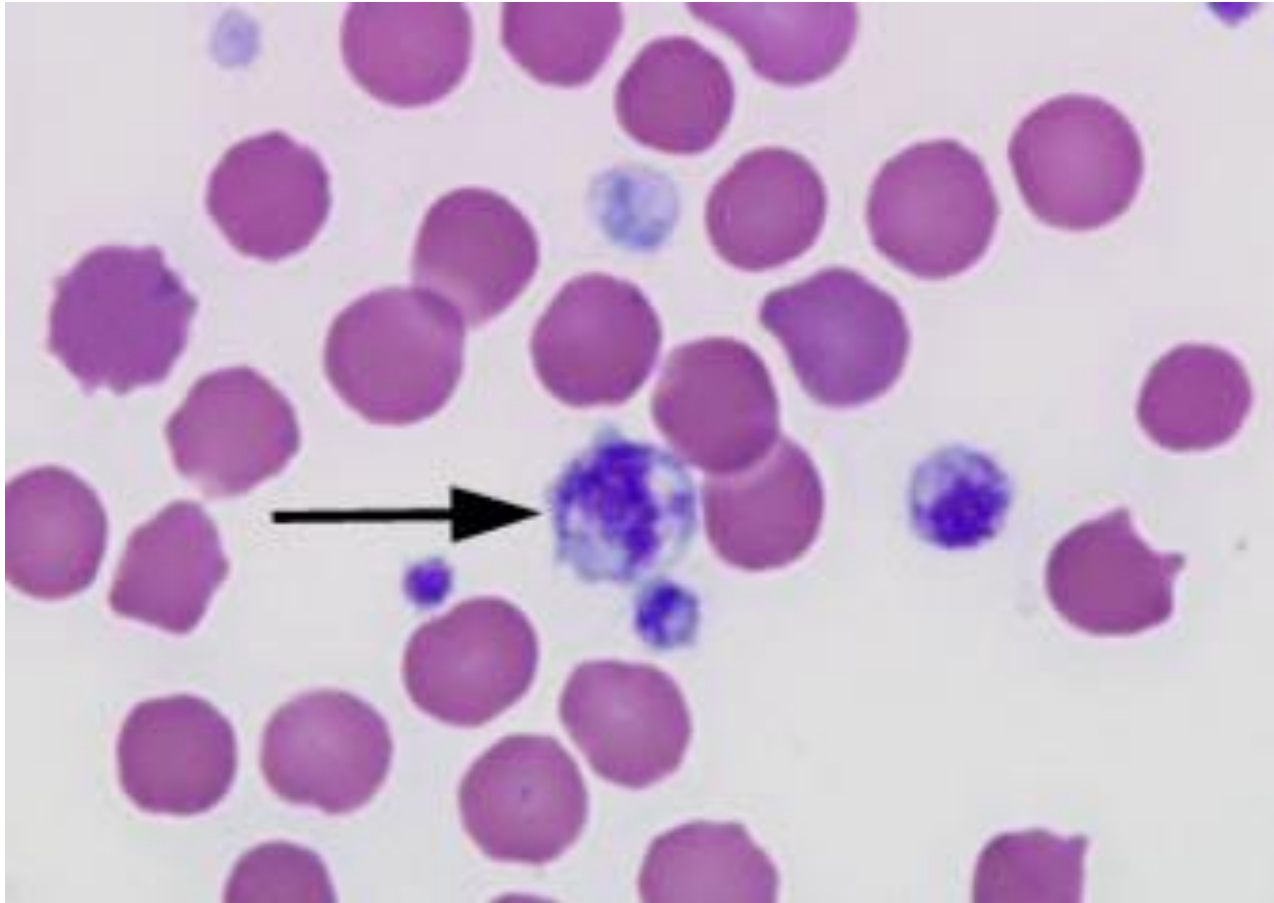
Platelet clumping

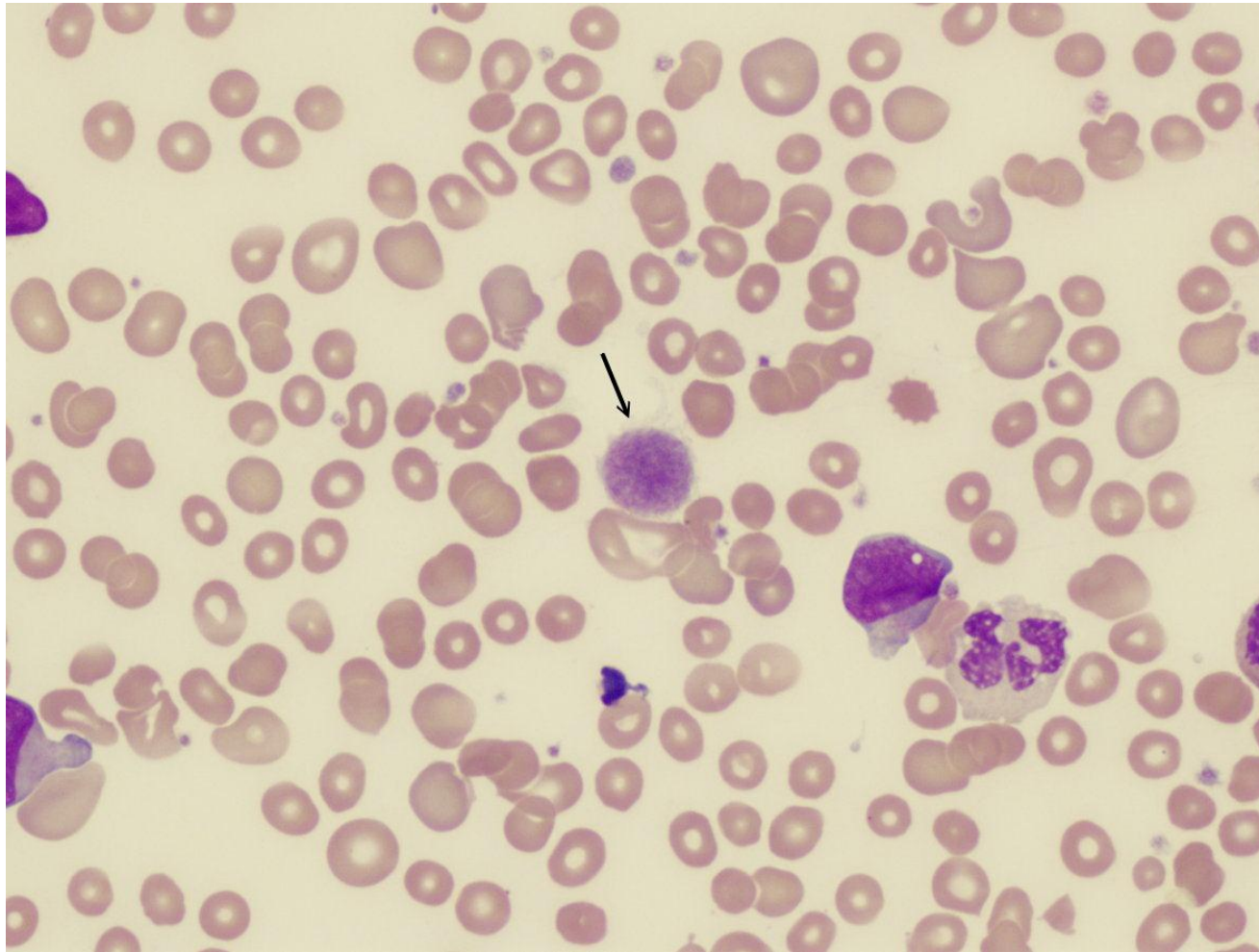


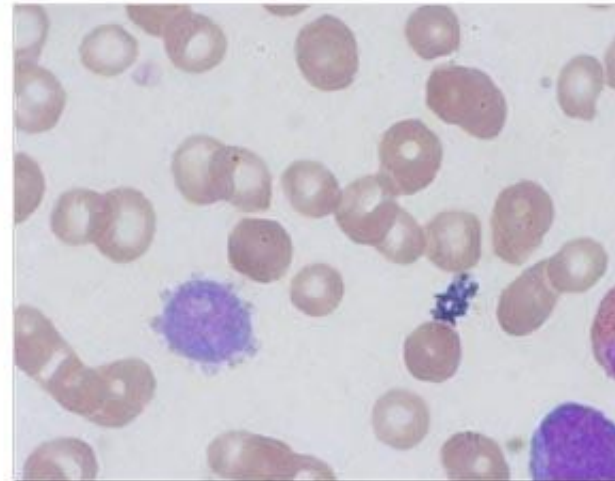
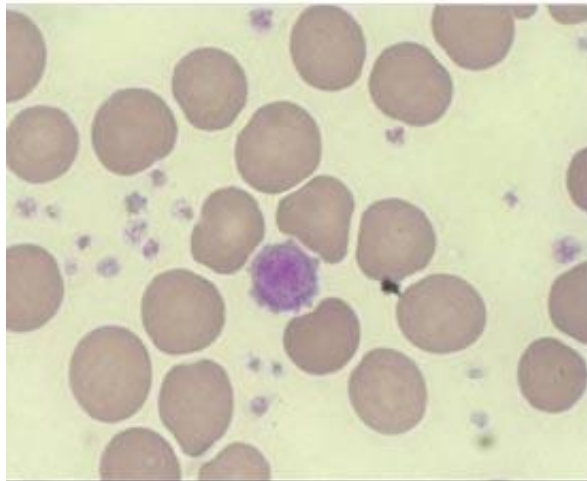
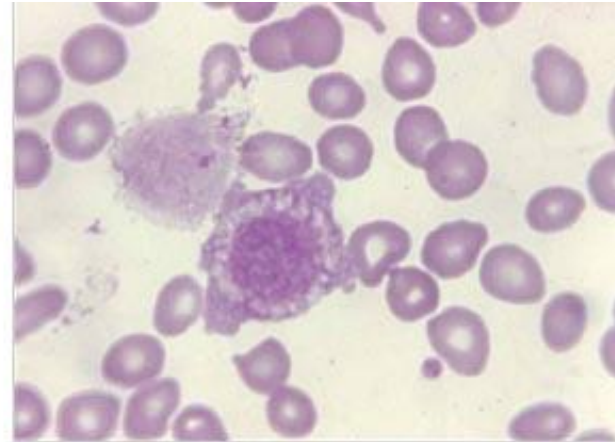
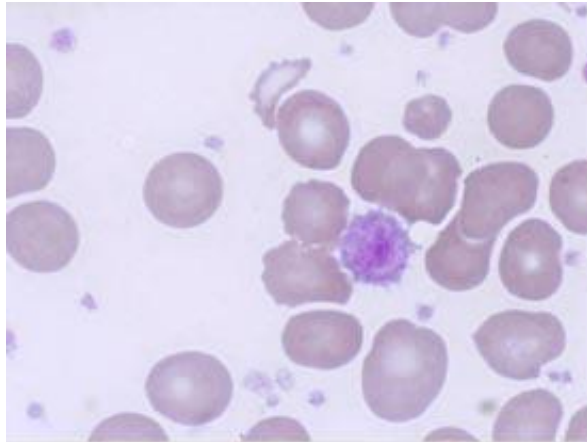
Platelet satellitosis



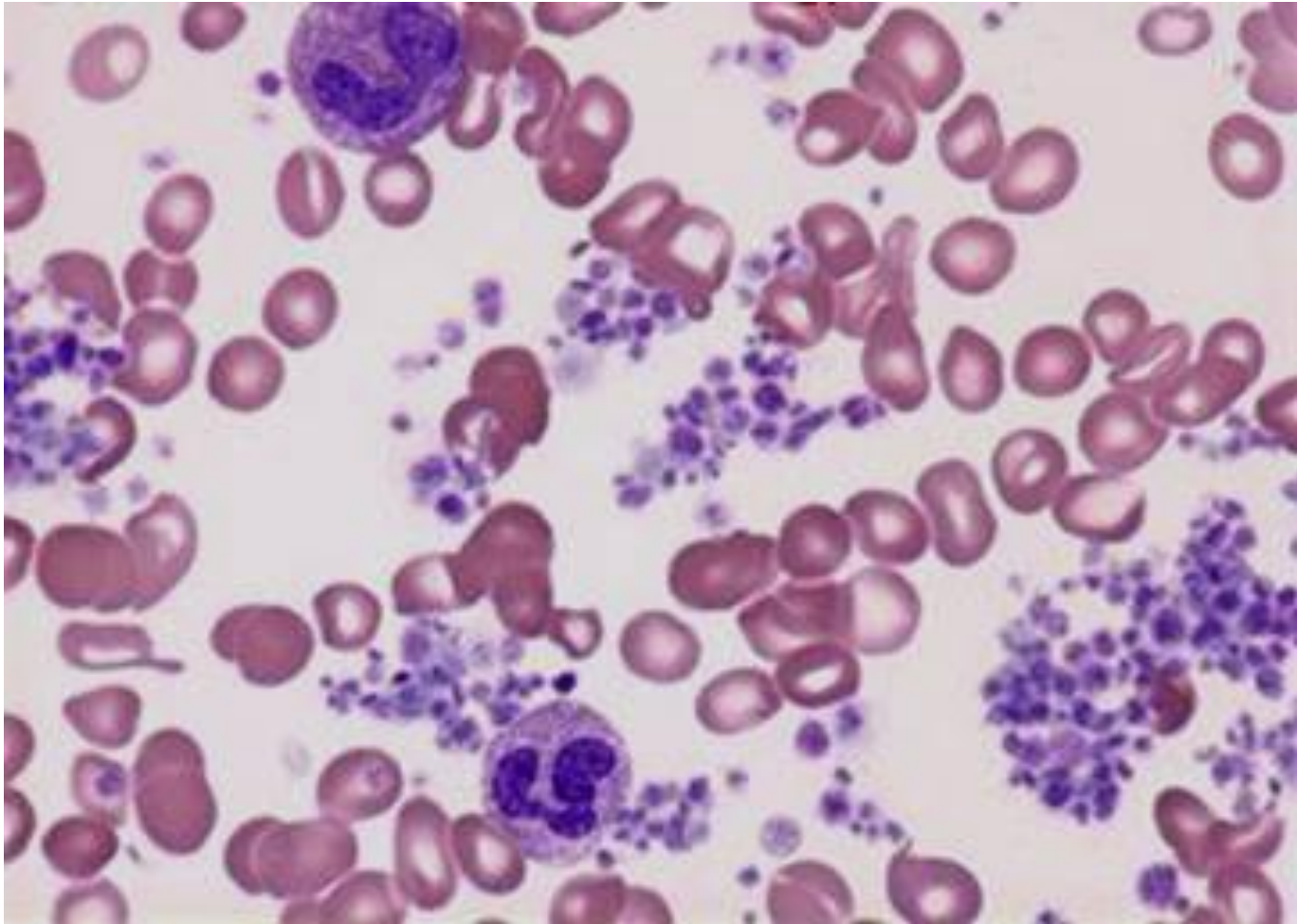
Giantplatelet

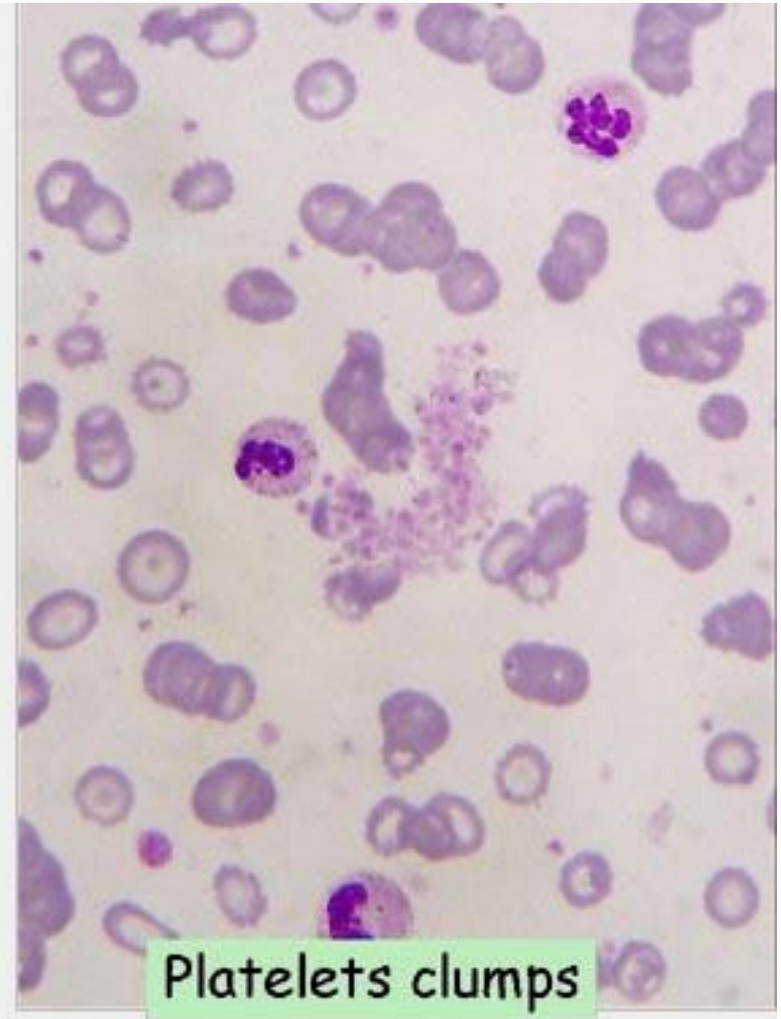
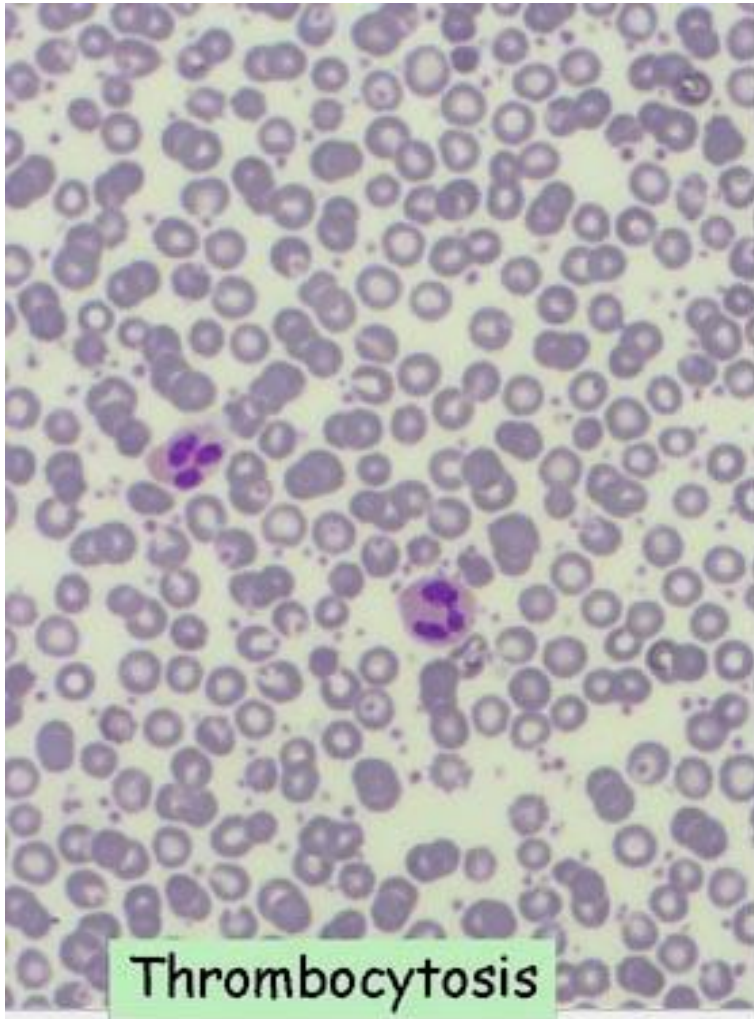


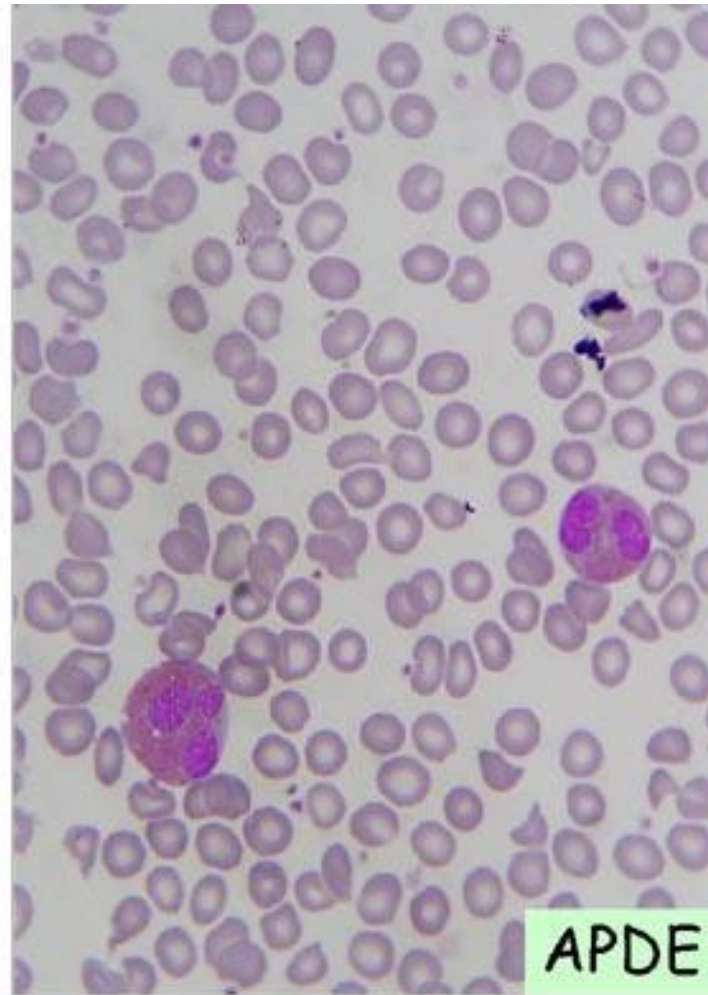
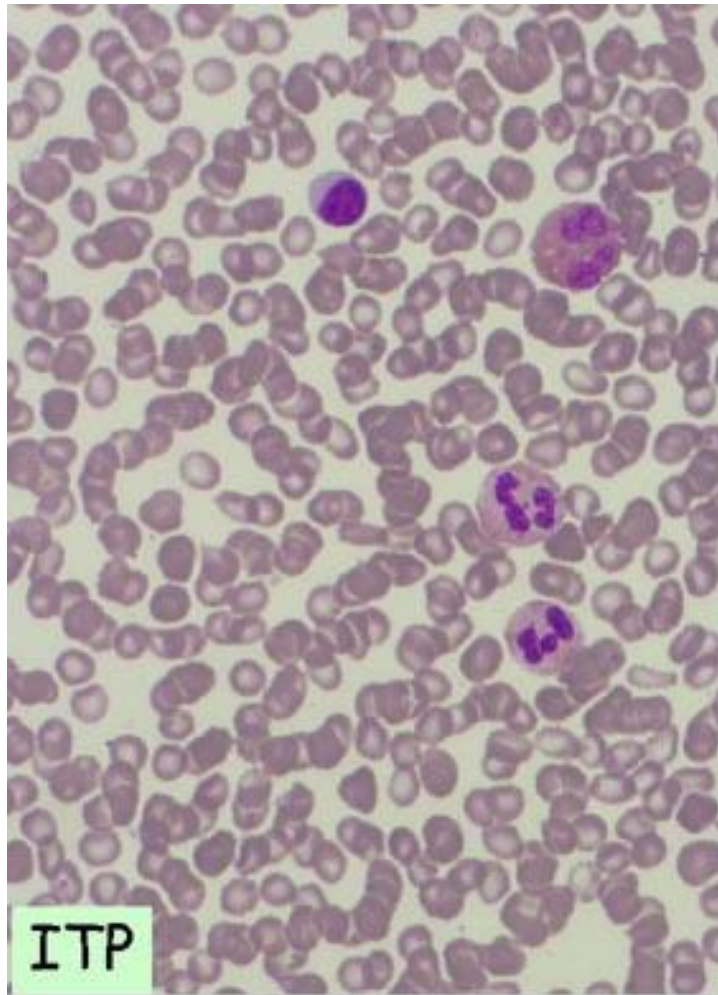


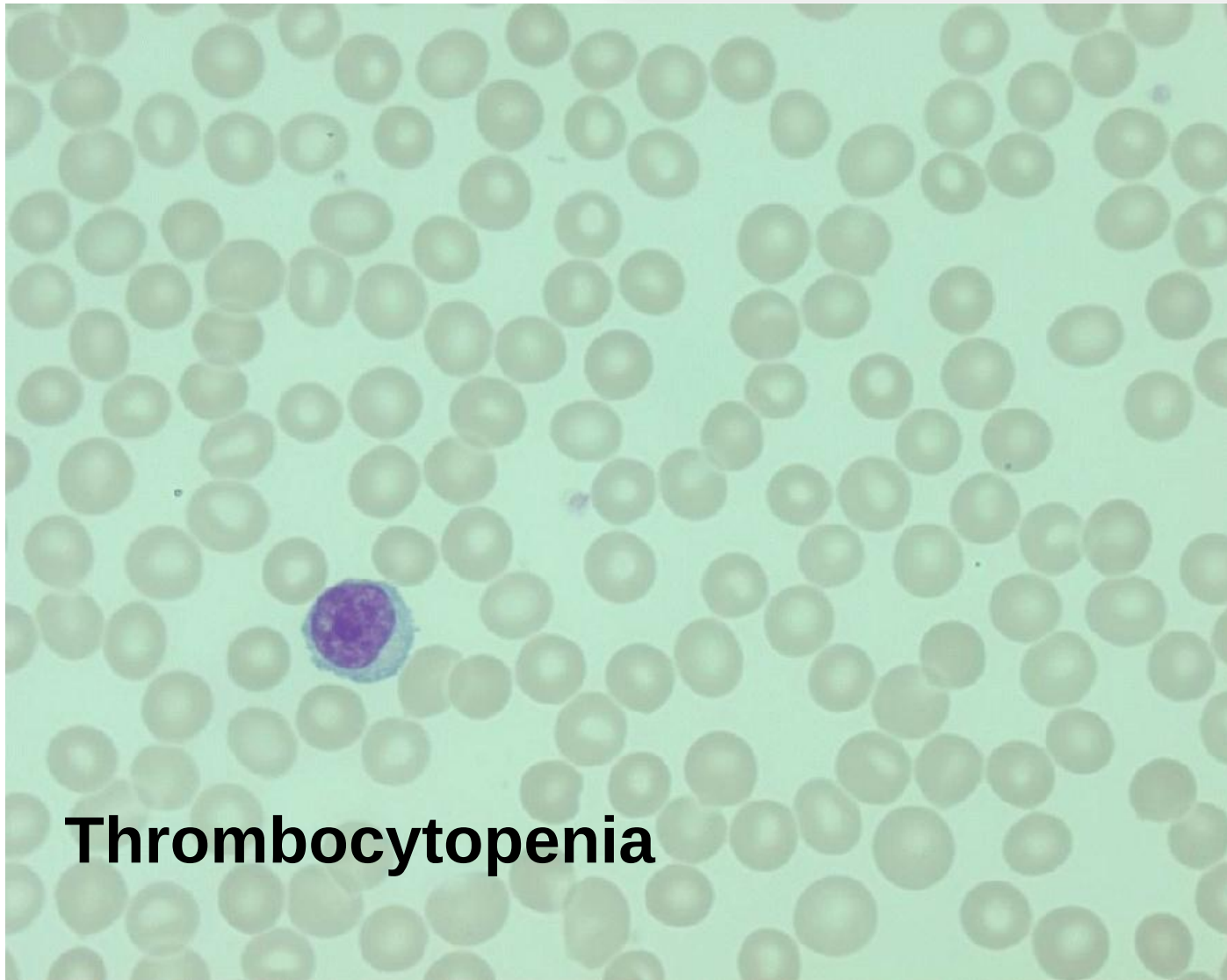


Platelet Clumping



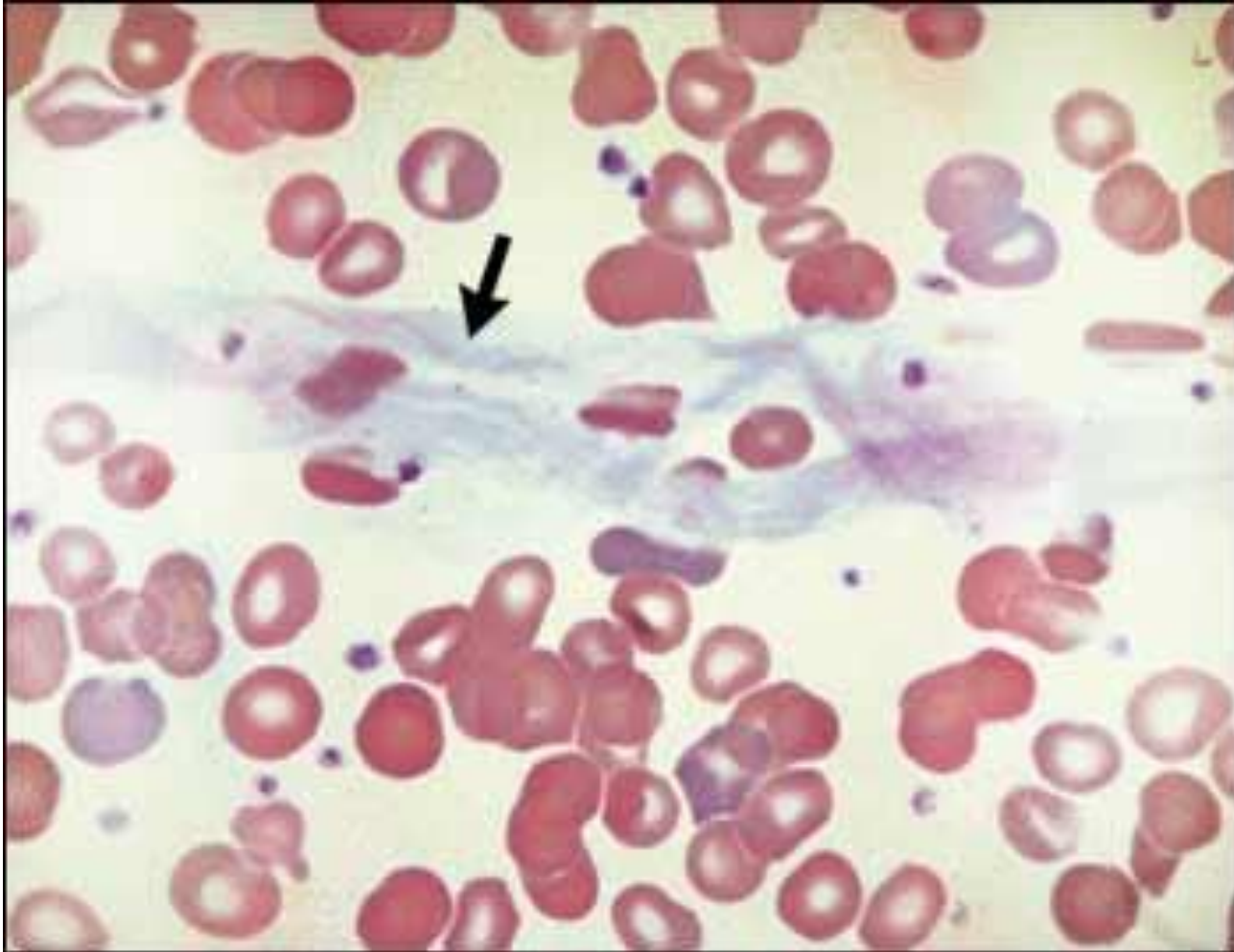






Thrombocytopenia

Fibrin strands





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