

Krvetvorba (hemopoéza)

Kmenové buňky

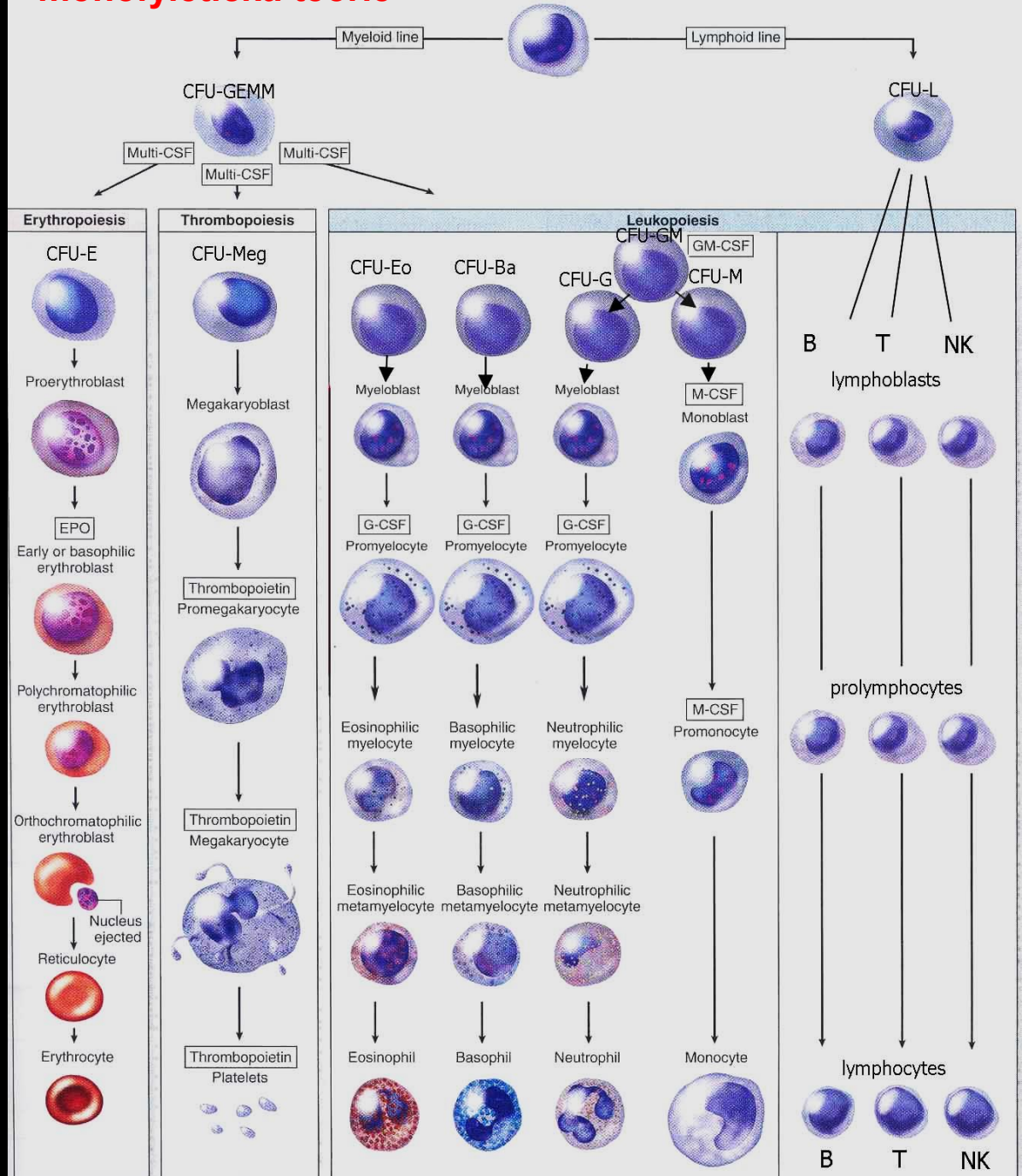
Progenitorové buňky (CFU)

Prekursorové buňky (blasty)

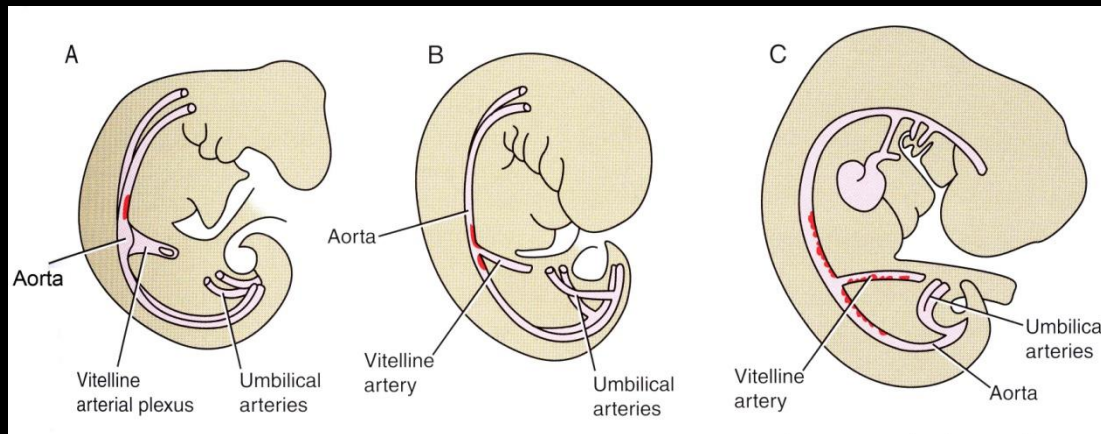
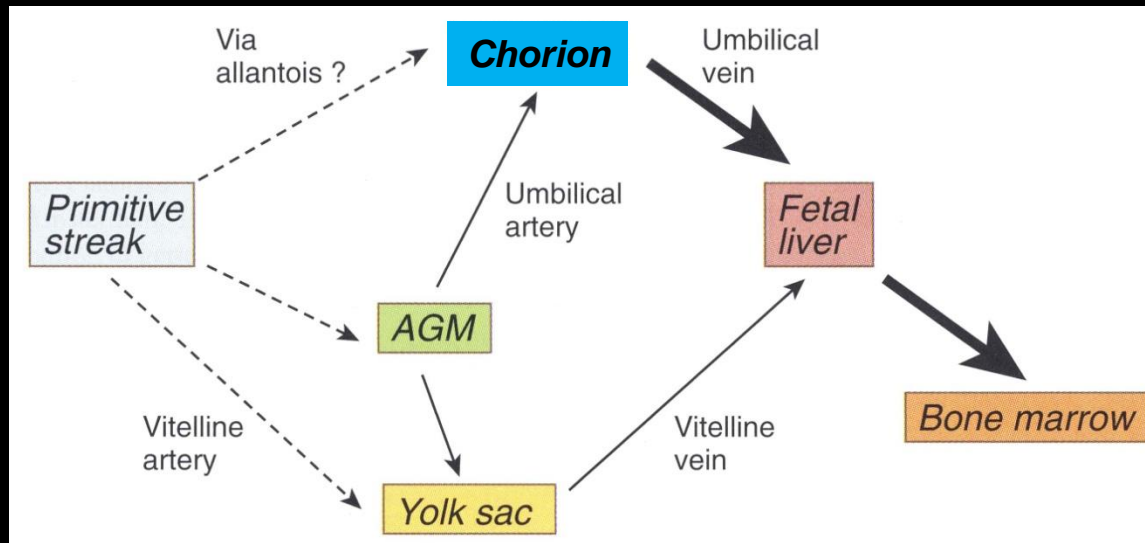
Zralé buňky

monofyletická teorie

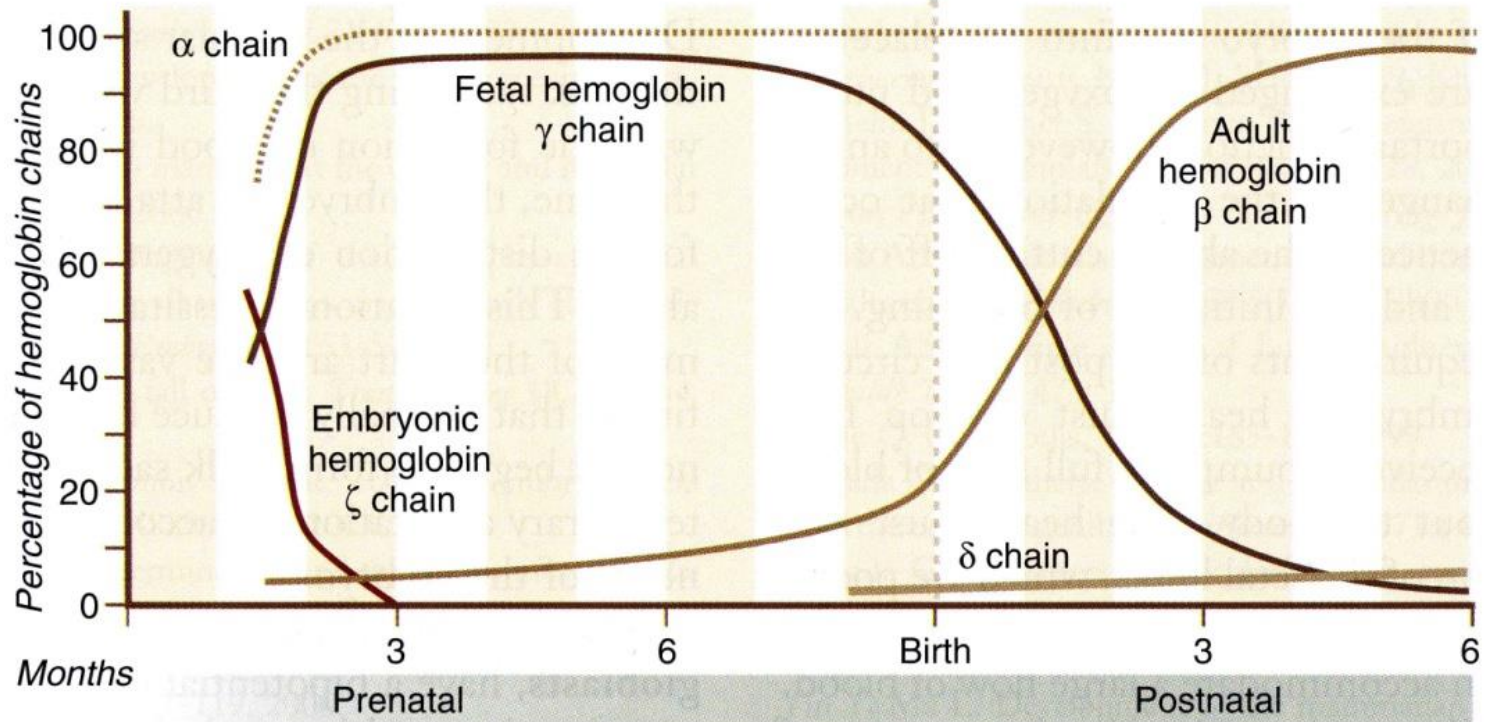
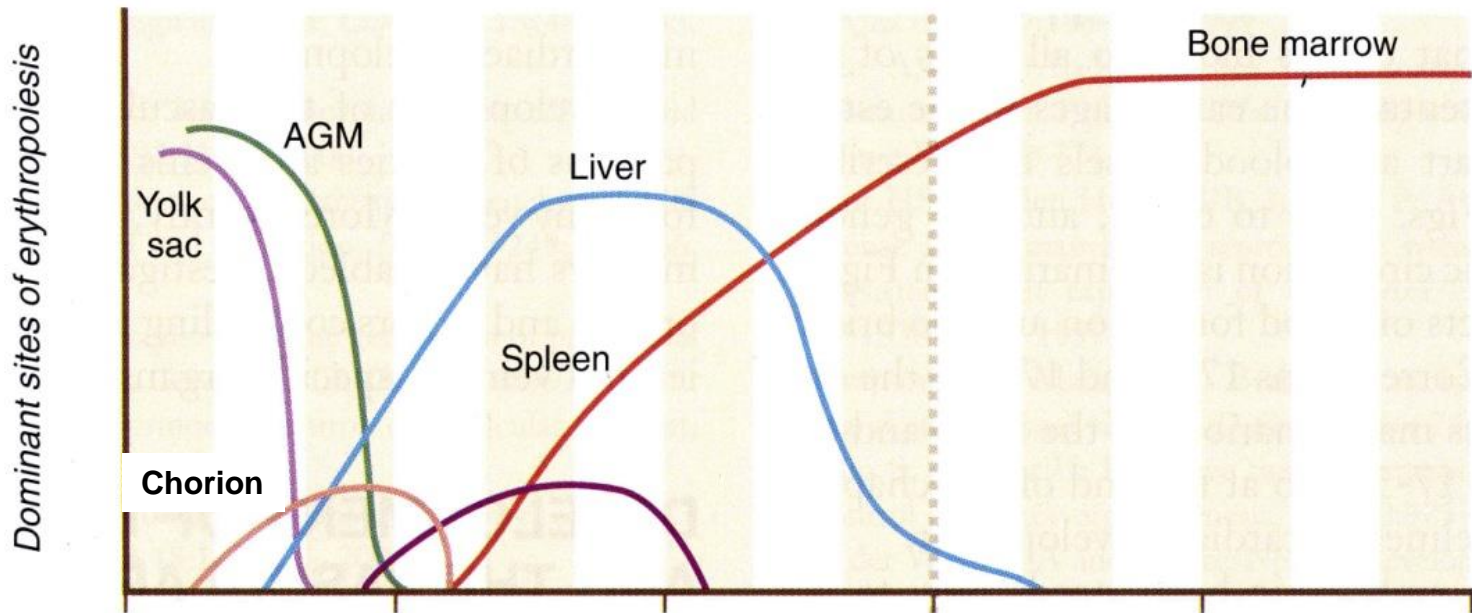
Pluripotent stem cell (HSC)

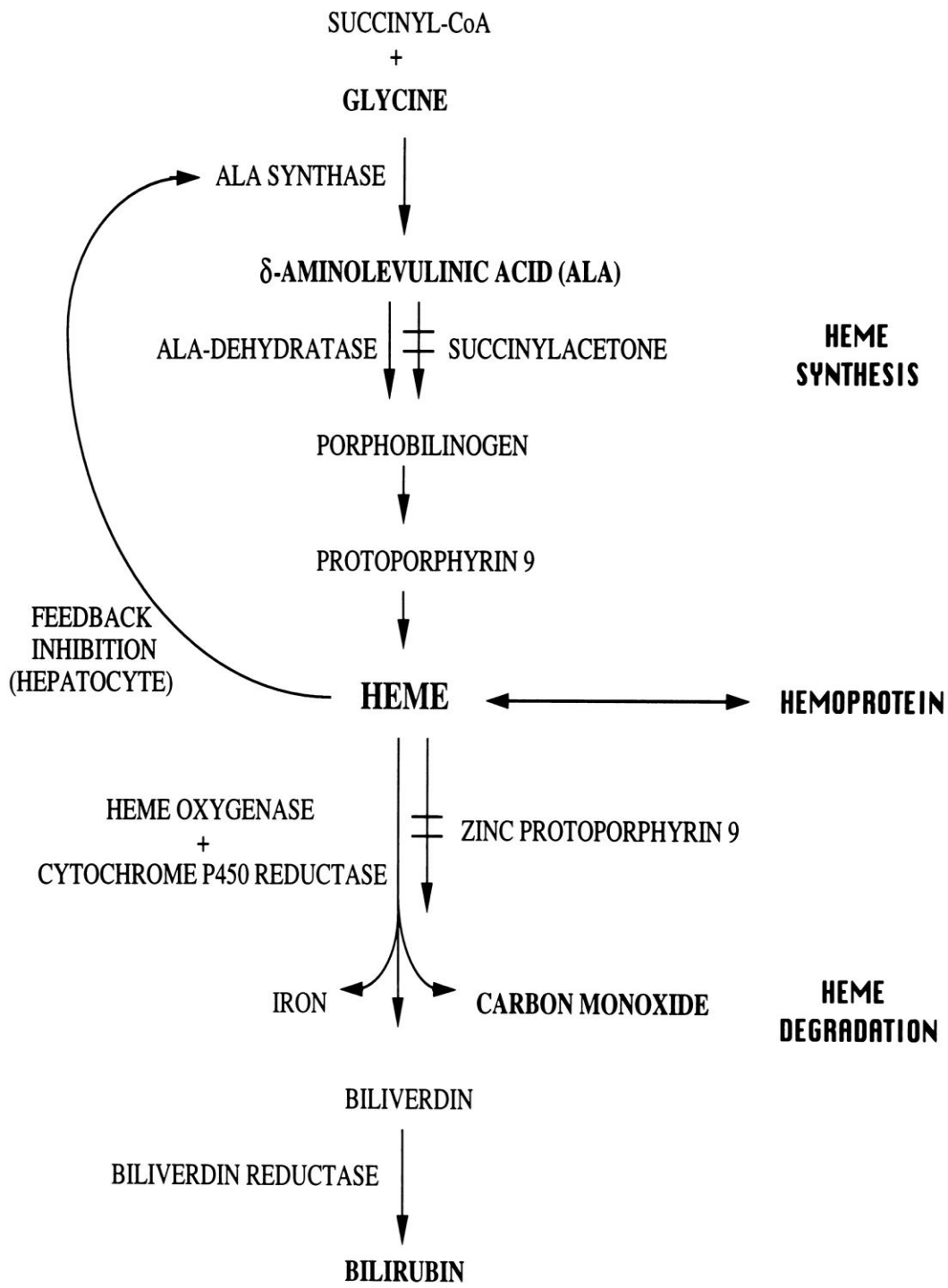


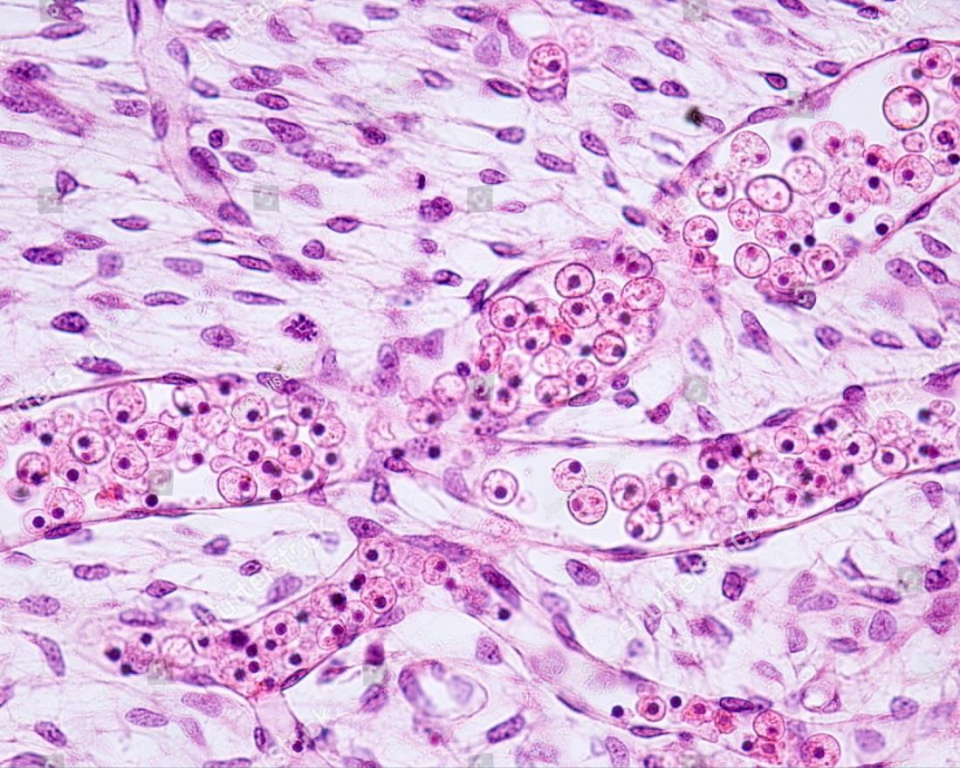
Vývoj krve tvorby



AGM = aorta, genitální lišta, mesonephros





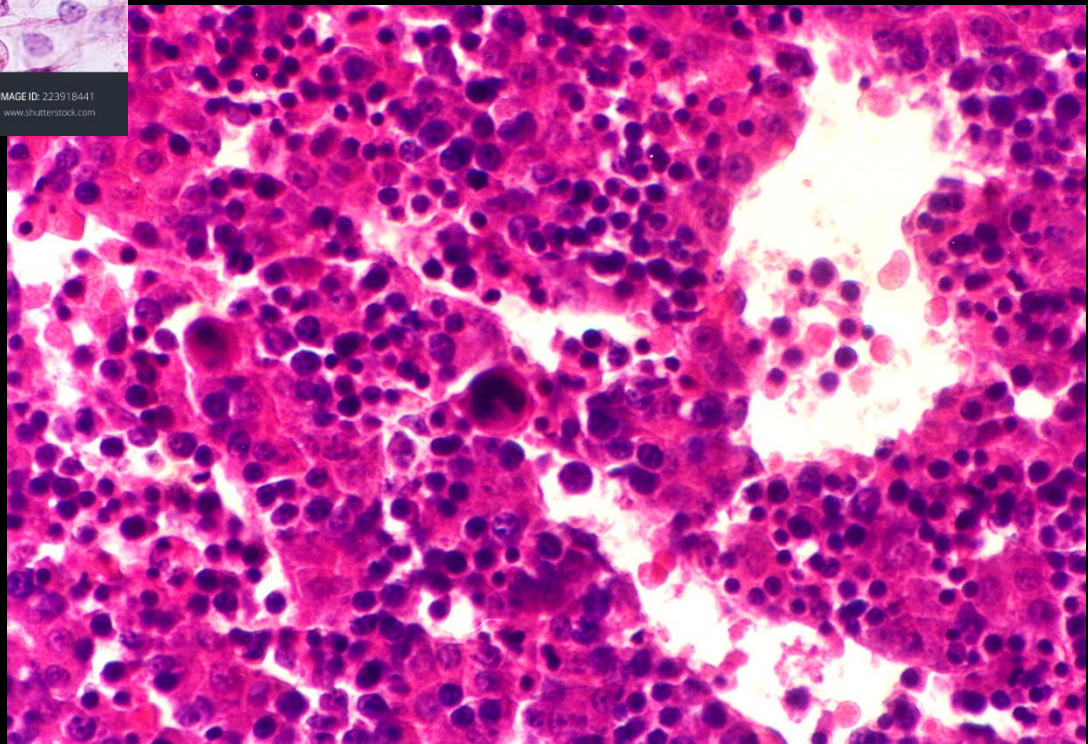


Fetální játra

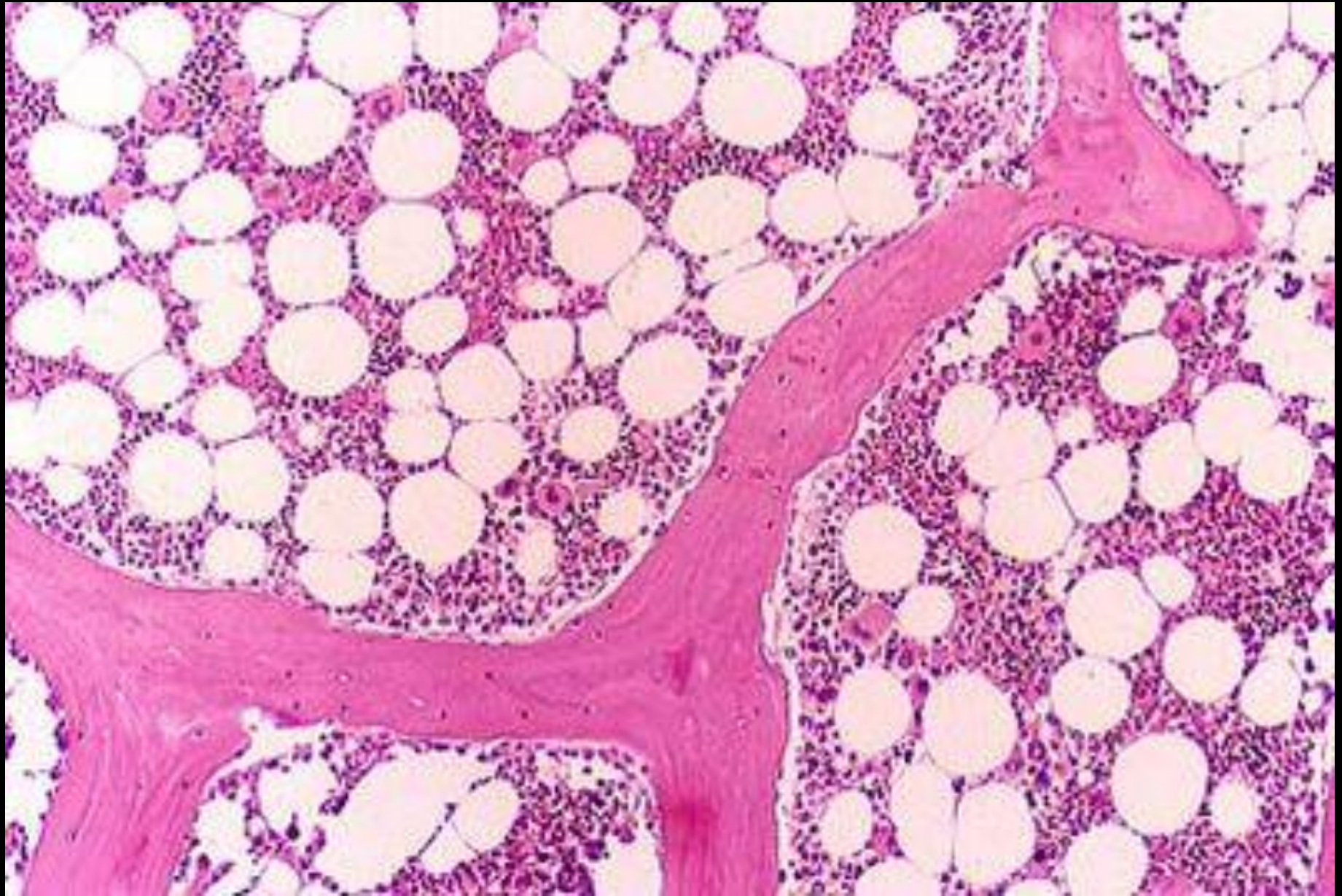
shutterstock

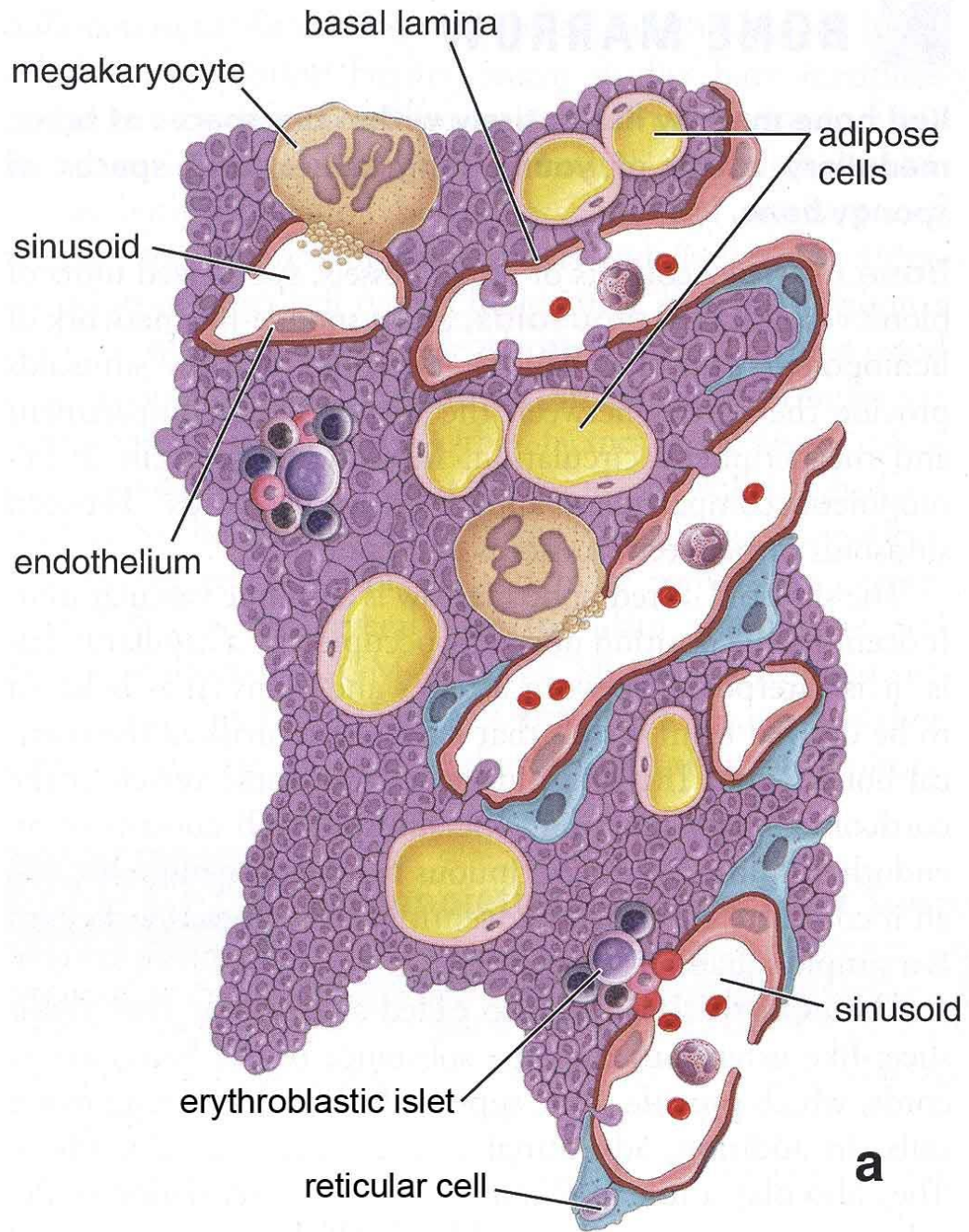
Embryonální krvinky

IMAGE ID: 223918441
www.shutterstock.com



Kostní dřeň



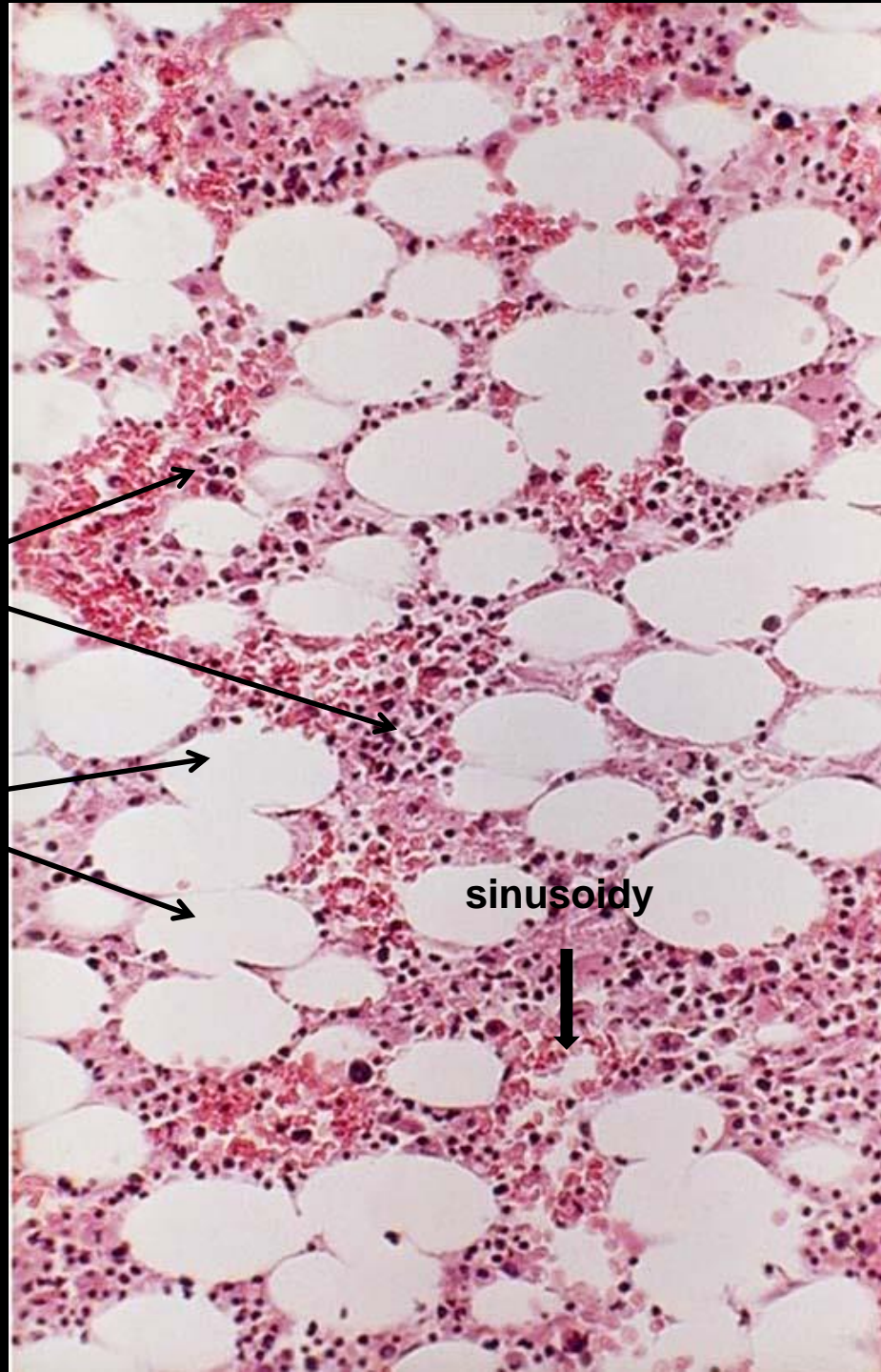


hemopoetické ostrůvky

adipocyty

sinusoidy

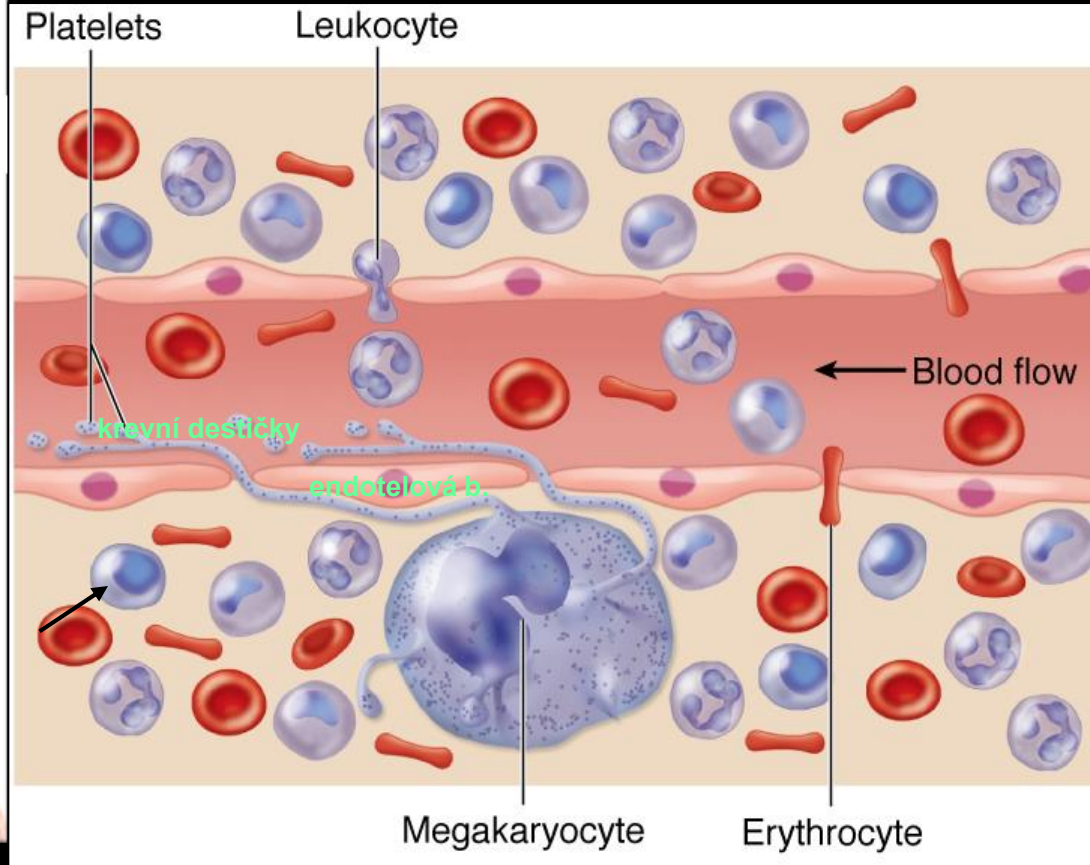
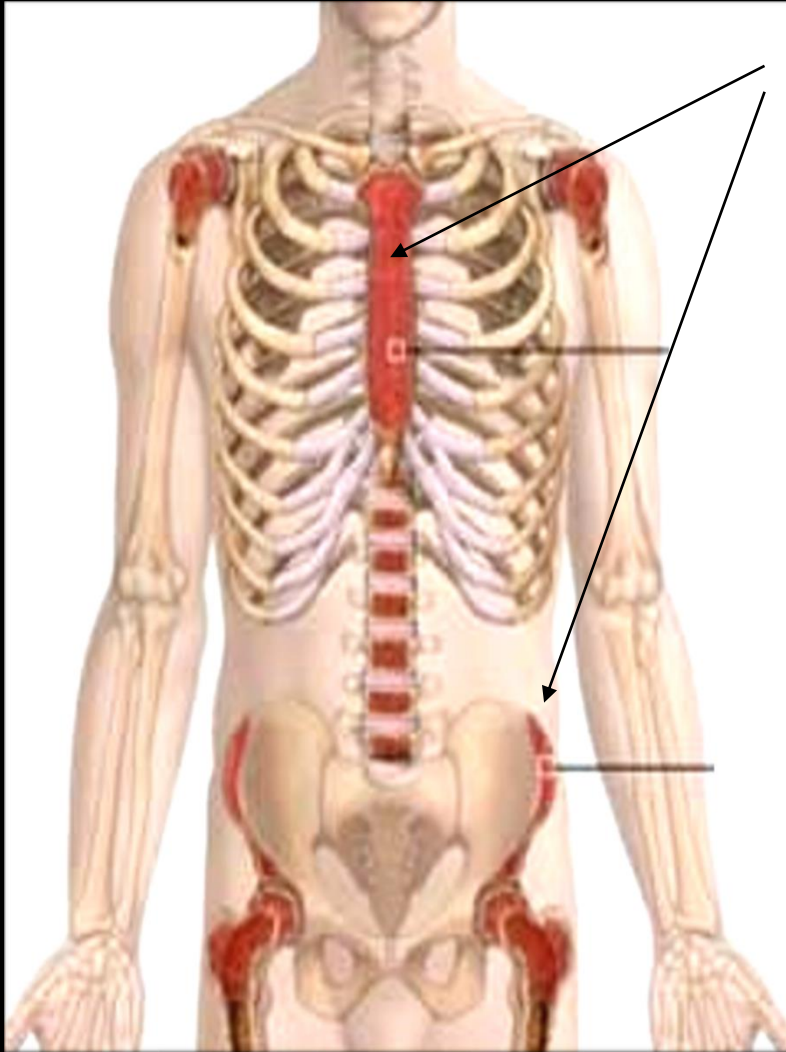
retikulární vazivo



Červená kostní dřeň:

dospělost:

+ ploché kosti lebky



Aspirace kostní dřeně vs trepanobiopsie

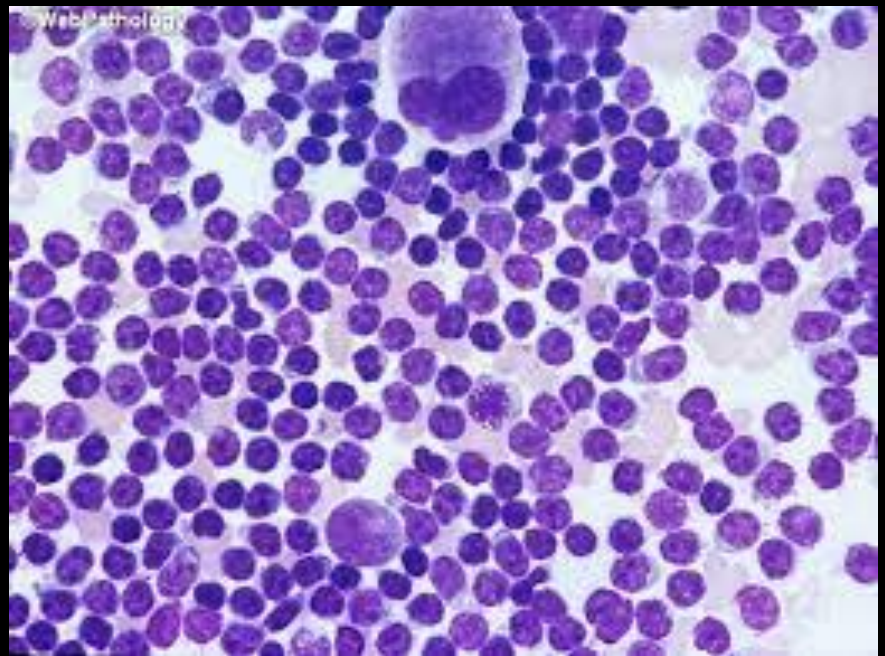
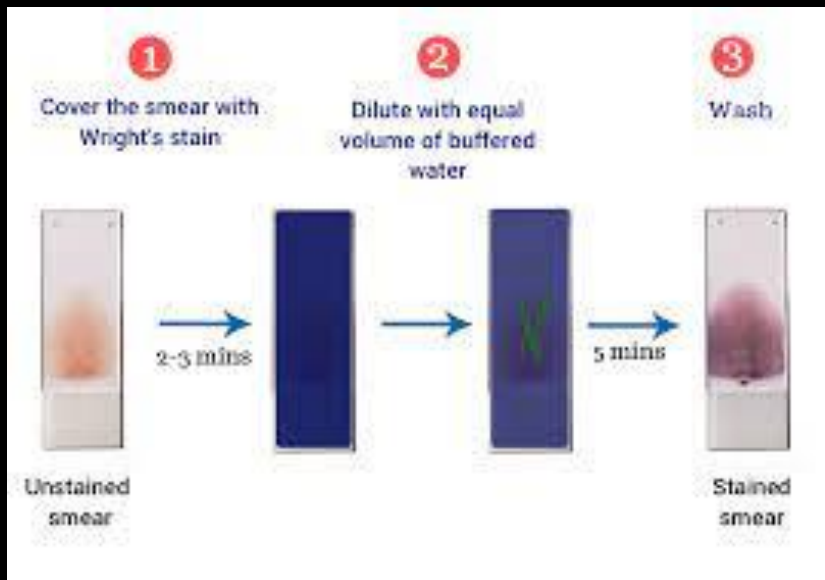
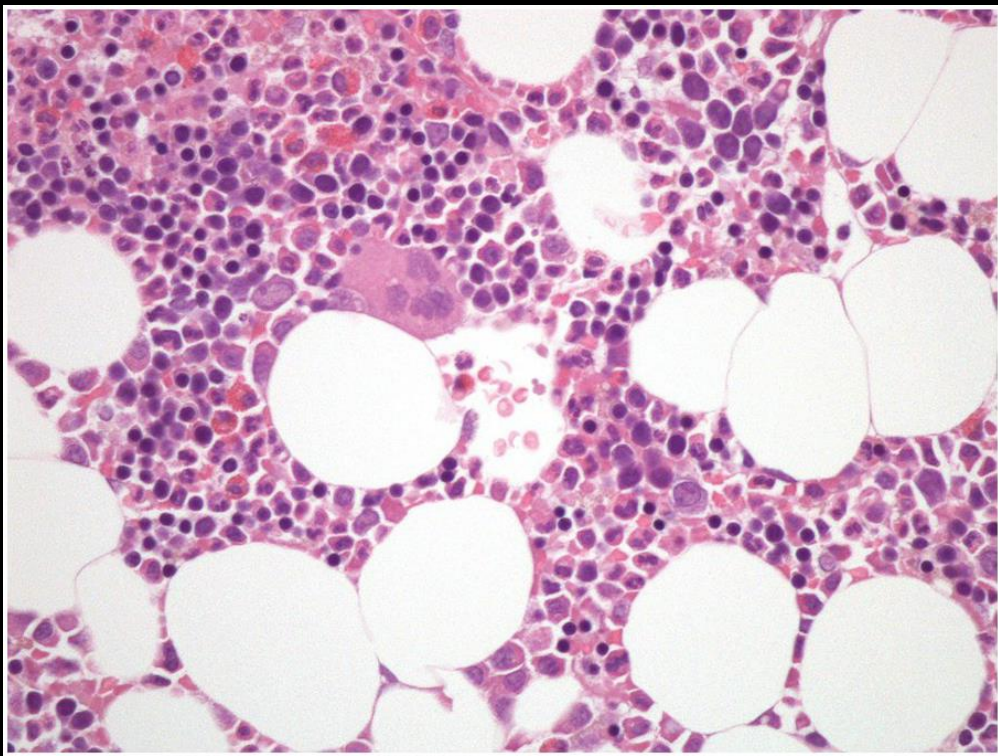
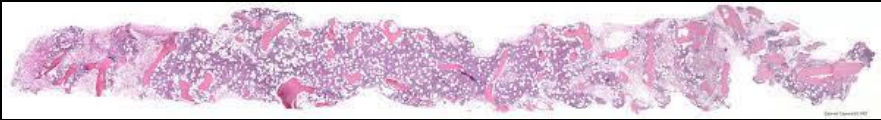
Bone Marrow Aspiration

Trephine Biopsy

Cytology

Histology





Vývoj červených krvinek, erythropoéza



velikost buňky



velikost jádra



kondenzace jádra



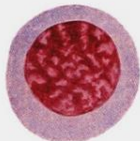
basofílie (ribosomy)



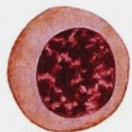
eosinofílie (hemoglobin)



Proerythroblast



Basophilic erythroblast



Polychromatophilic erythroblast



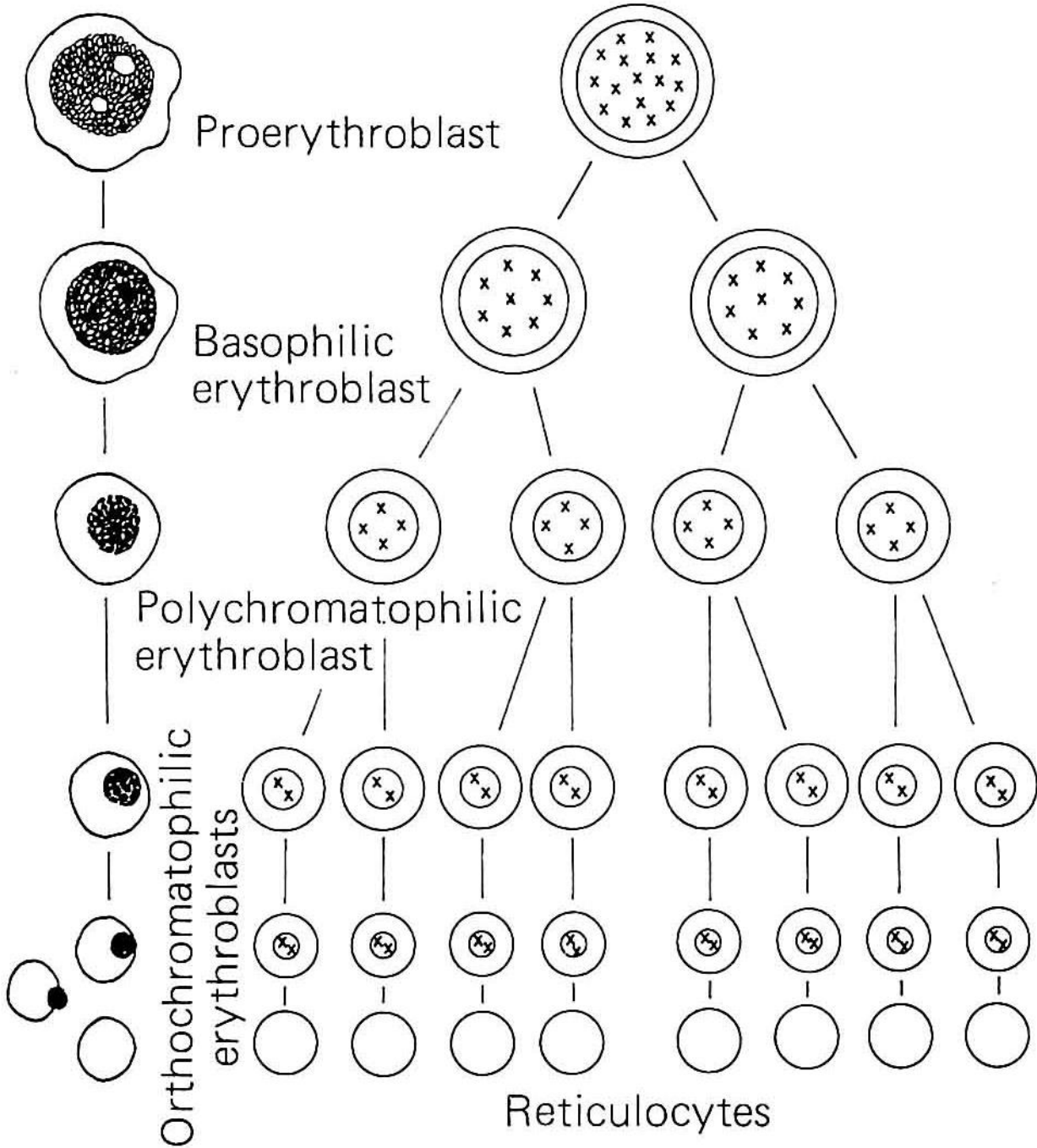
Orthochromatophilic erythroblast



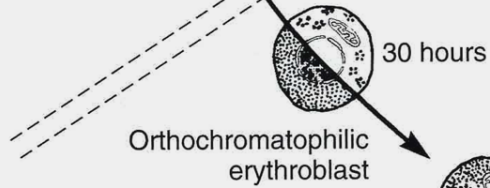
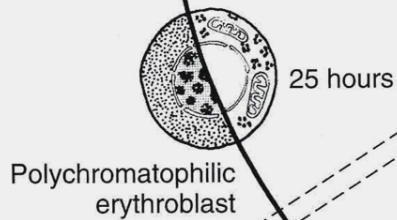
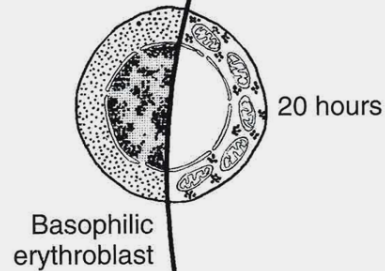
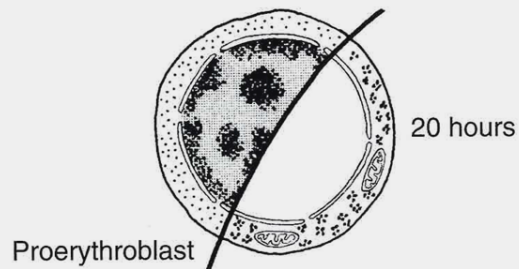
Reticulocyte



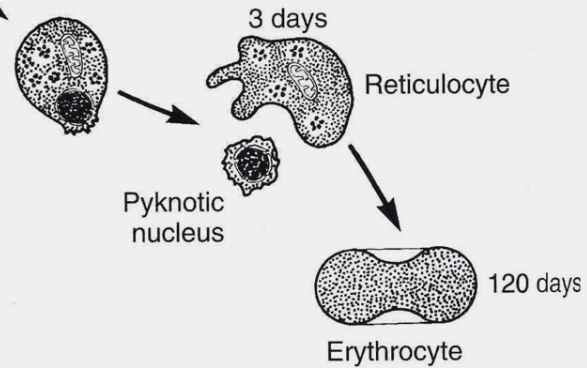
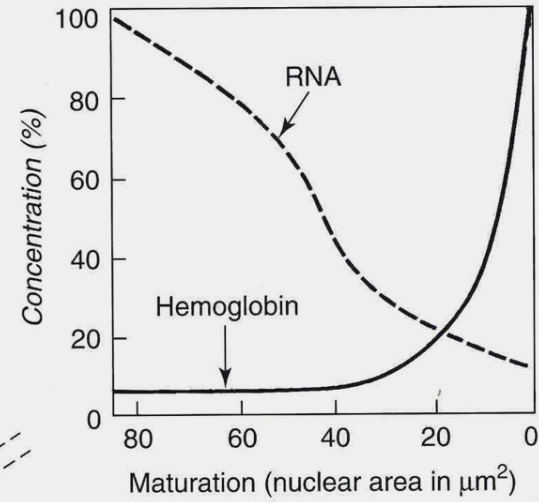
Erythrocyte



**Mitosis occurs
in these stages**



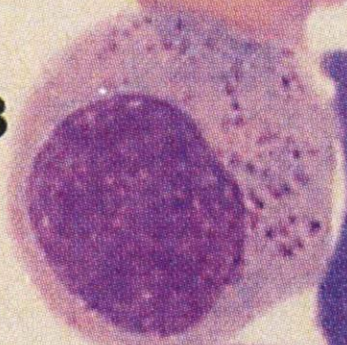
**No mitosis occurs
in these stages**



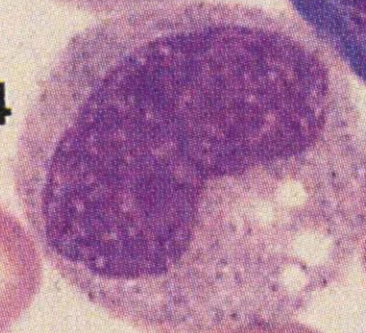
P = proerythroblast

P

3



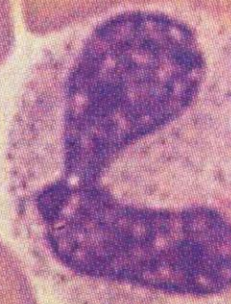
4

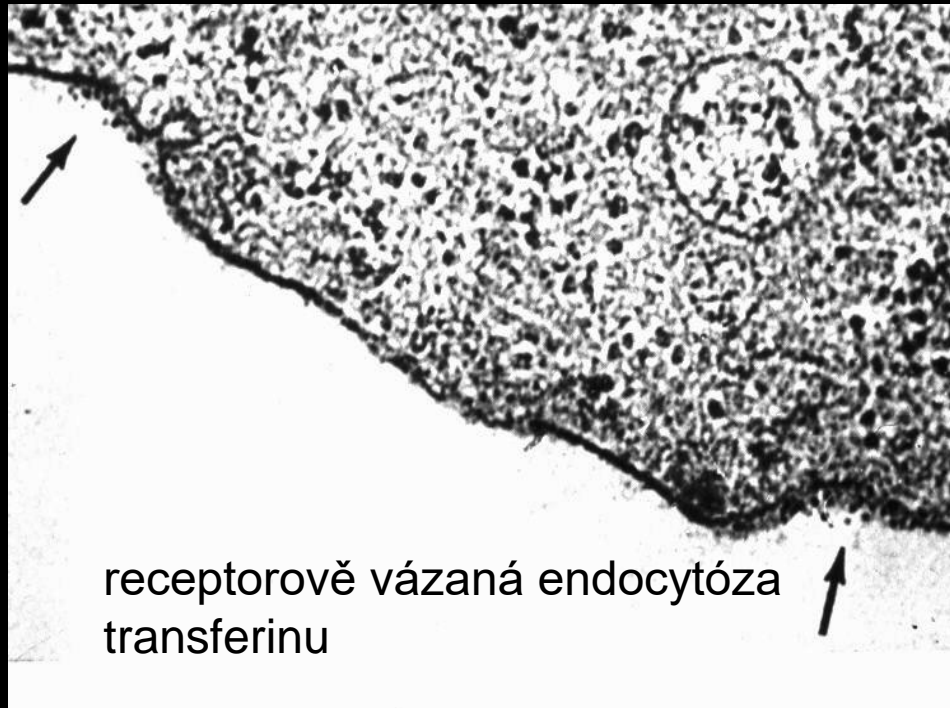
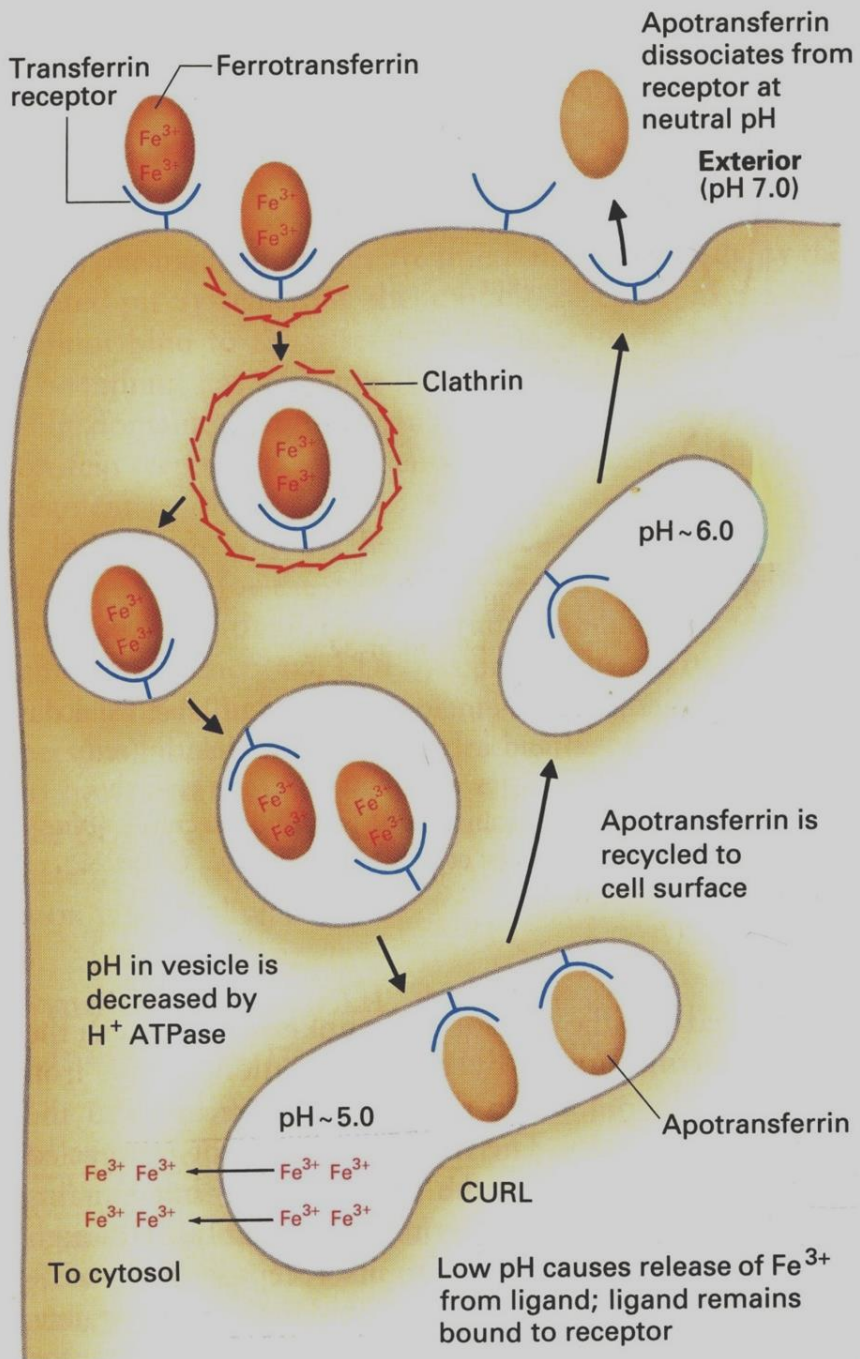


6

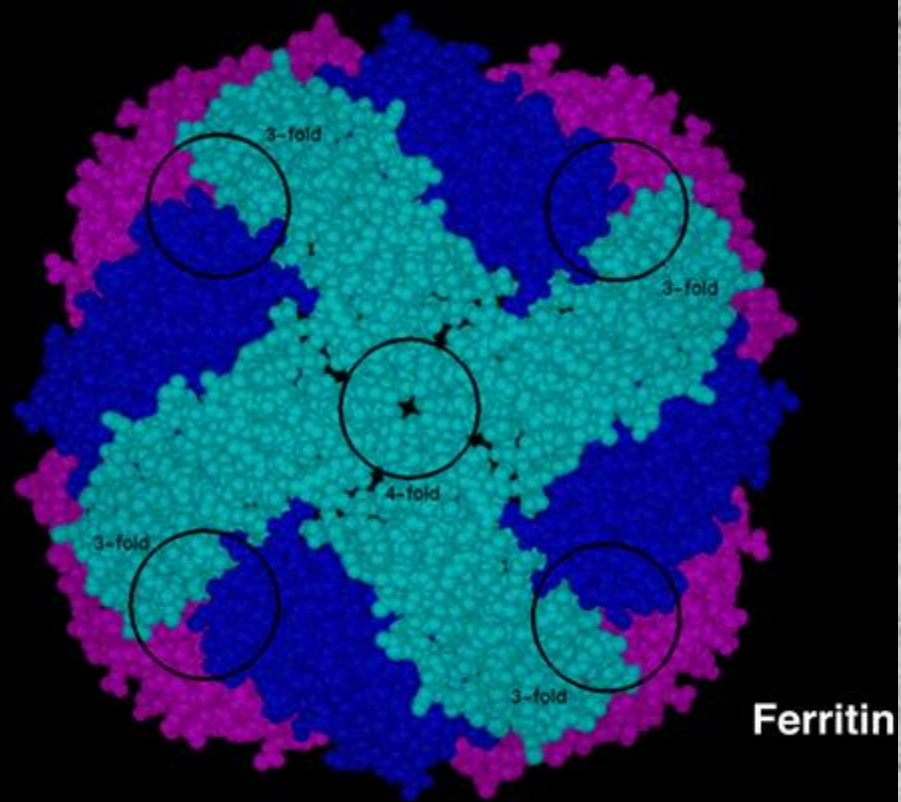


5

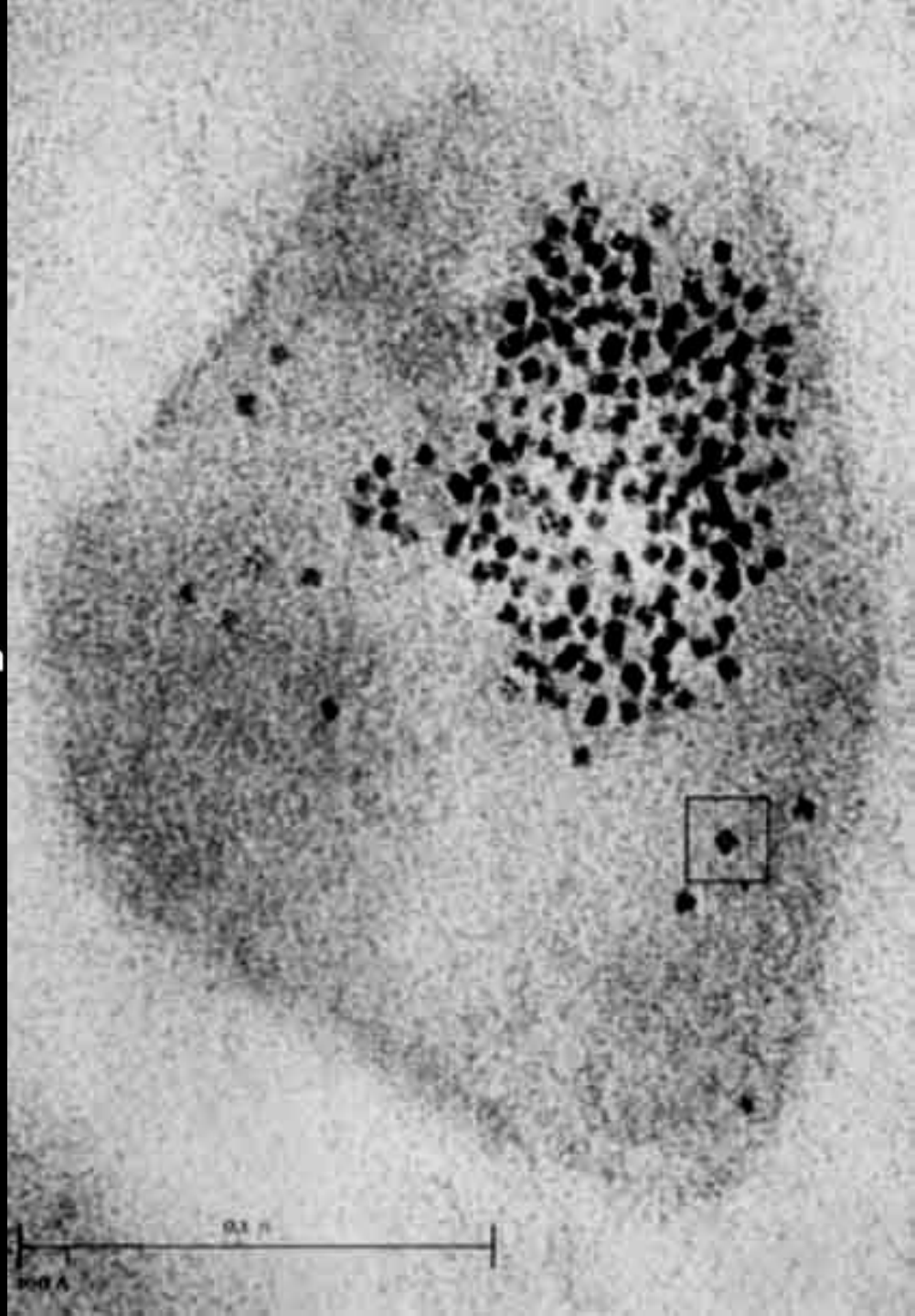




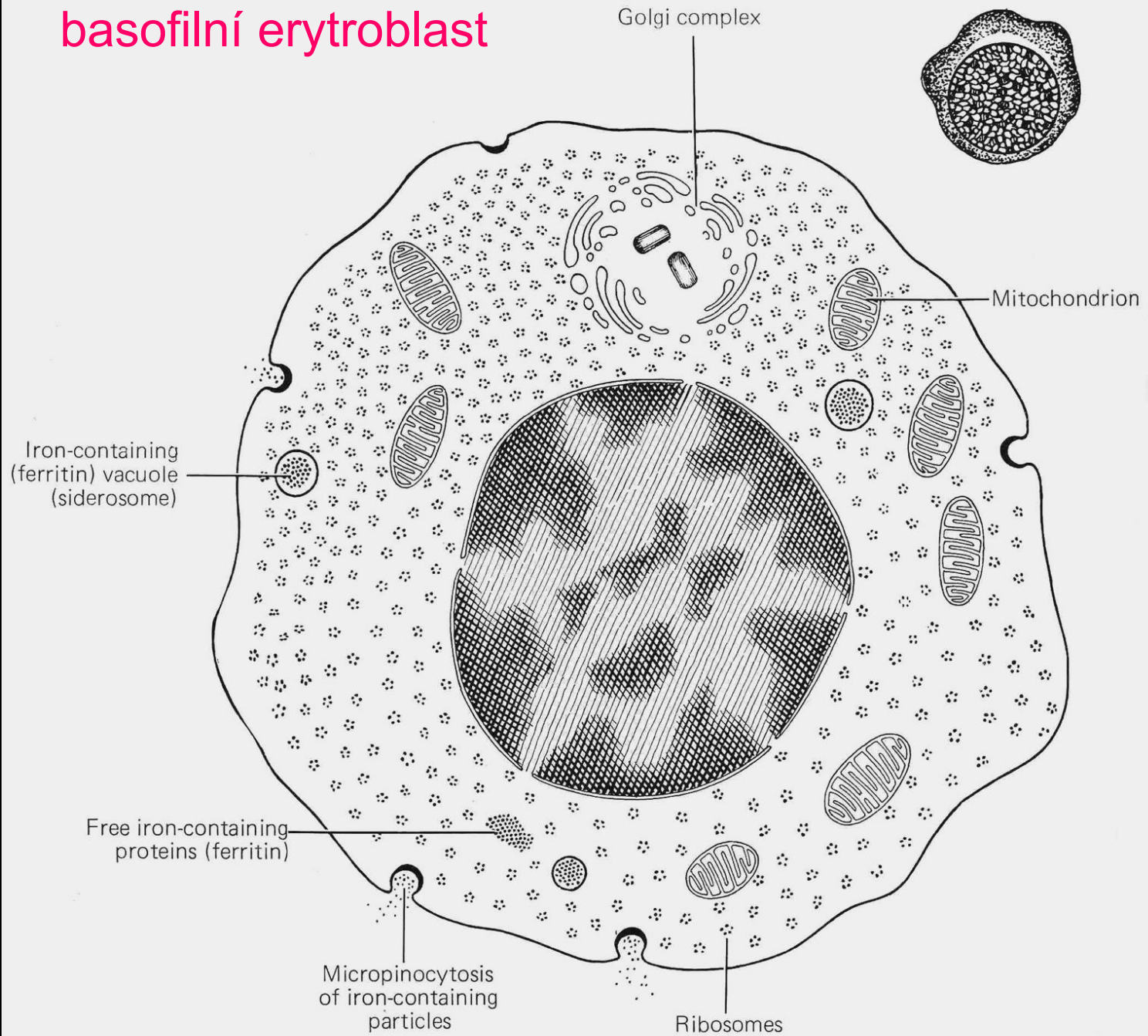
receptorově vázaná endocytóza transferinu



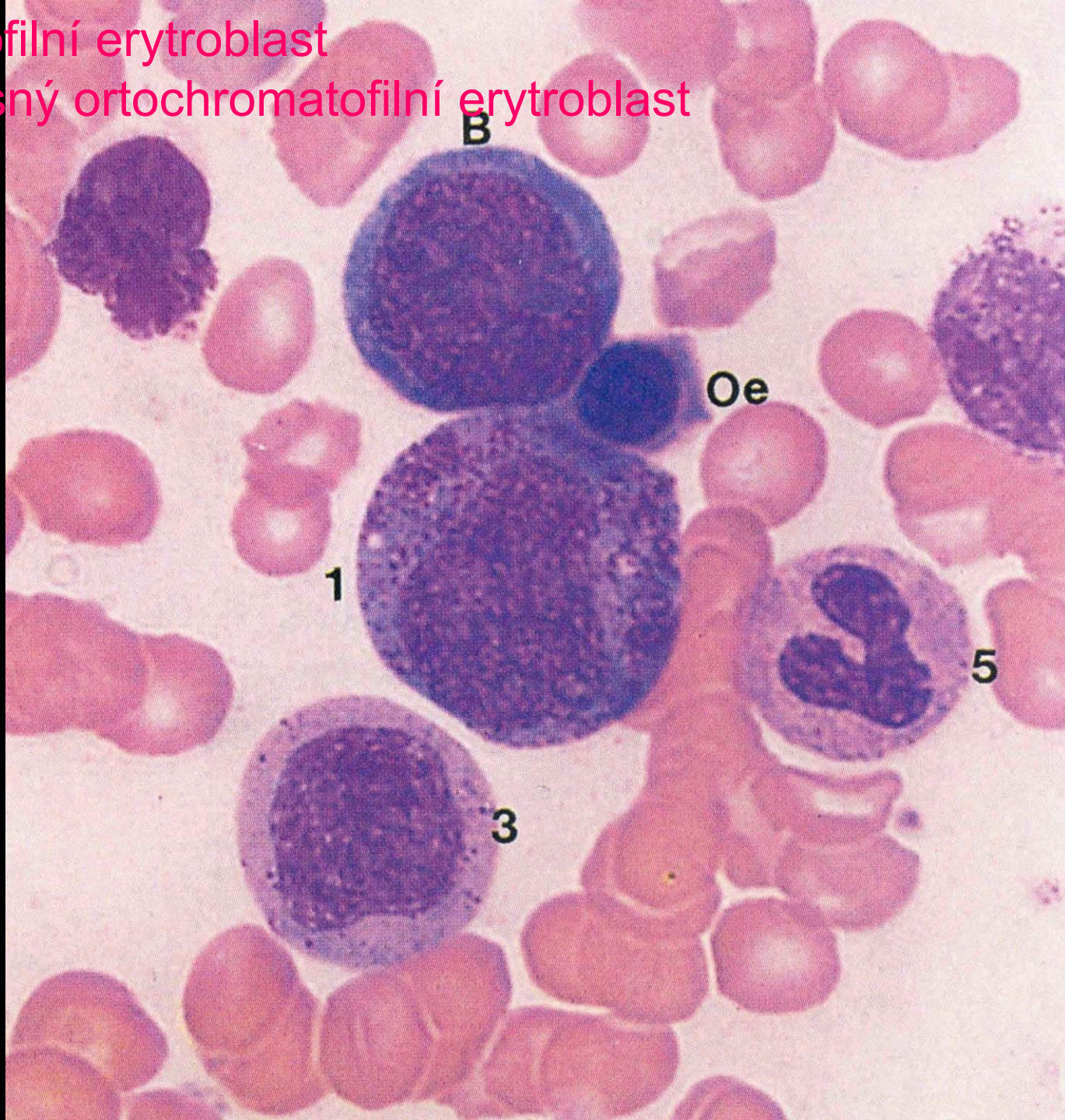
Ferritin
Ø 8 nm



basofilní erythroblast

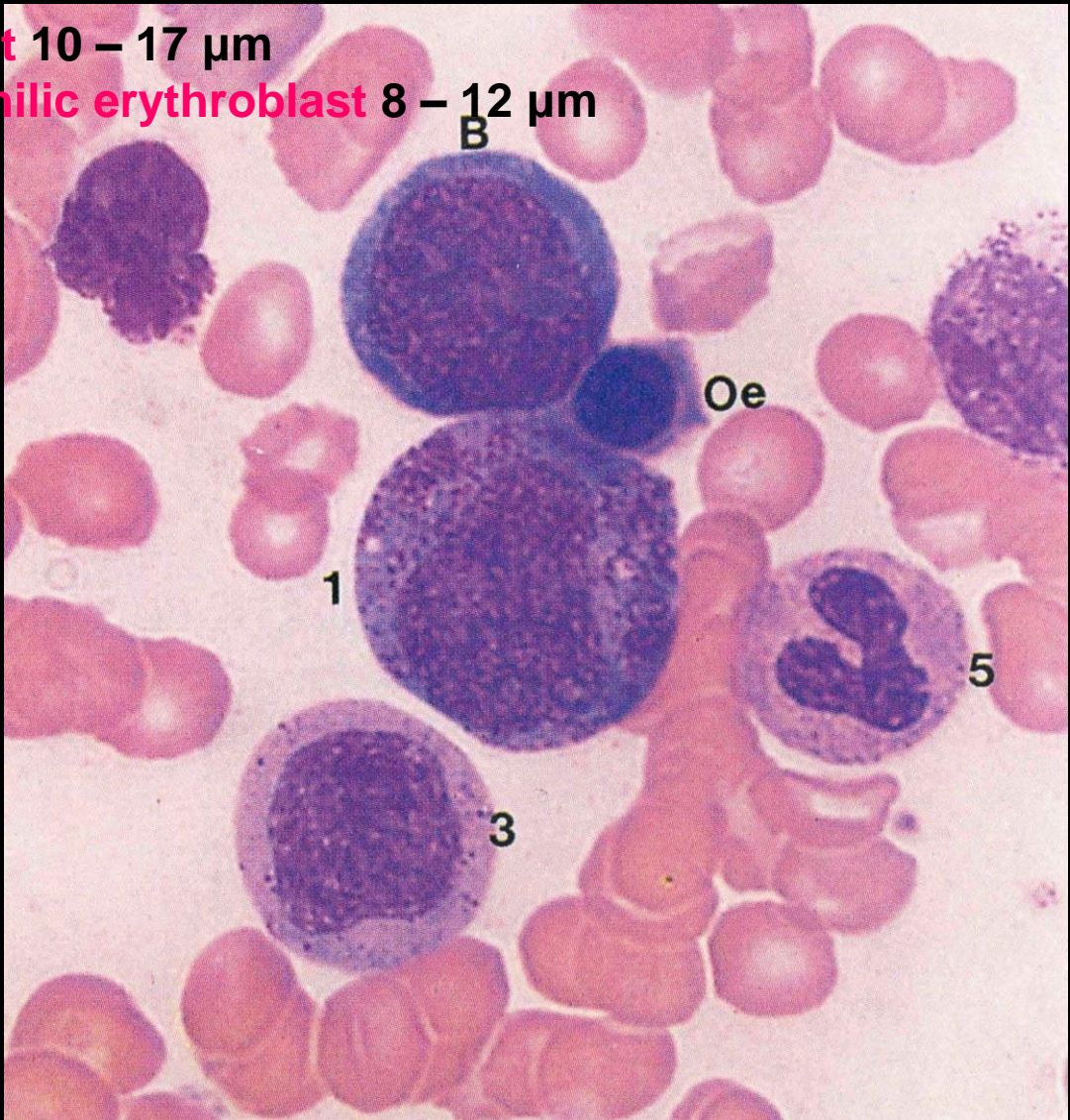
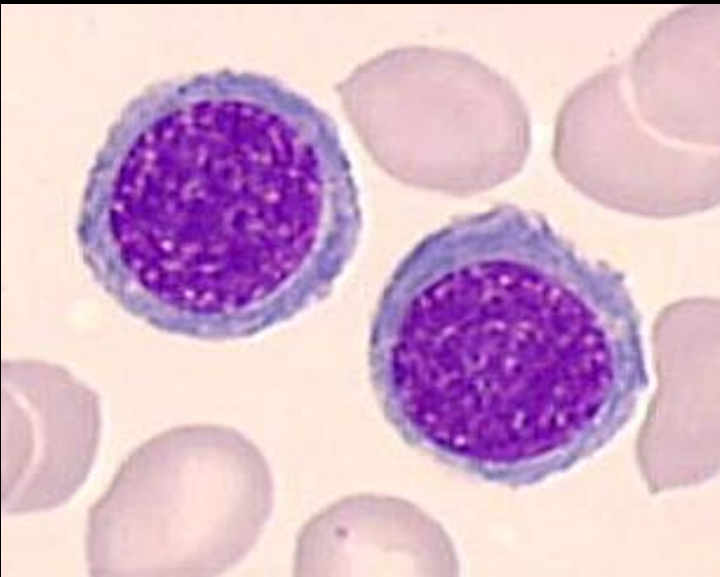


B = basofilní erythroblast
Oe = časný ortochromatofilní erythroblast

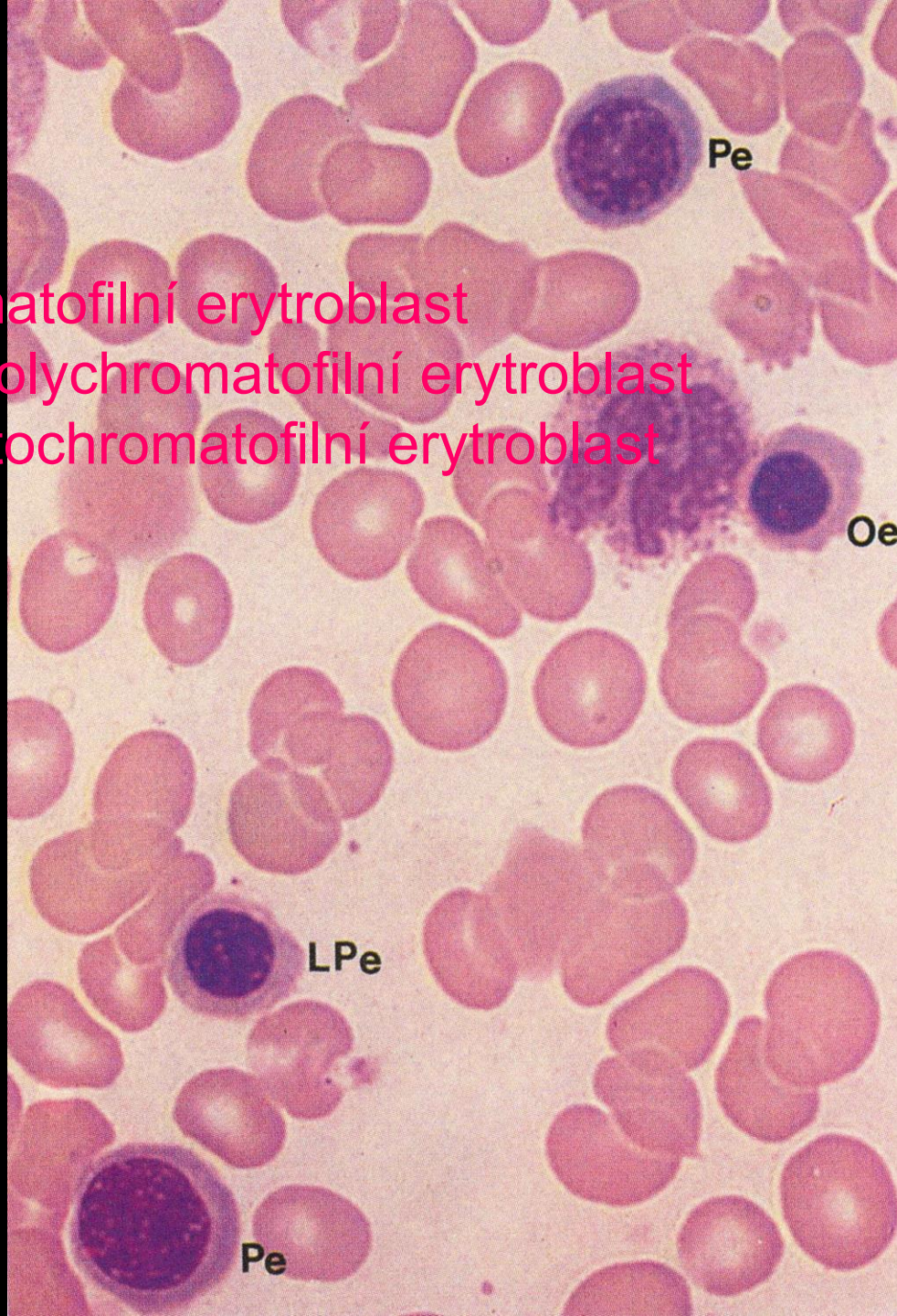


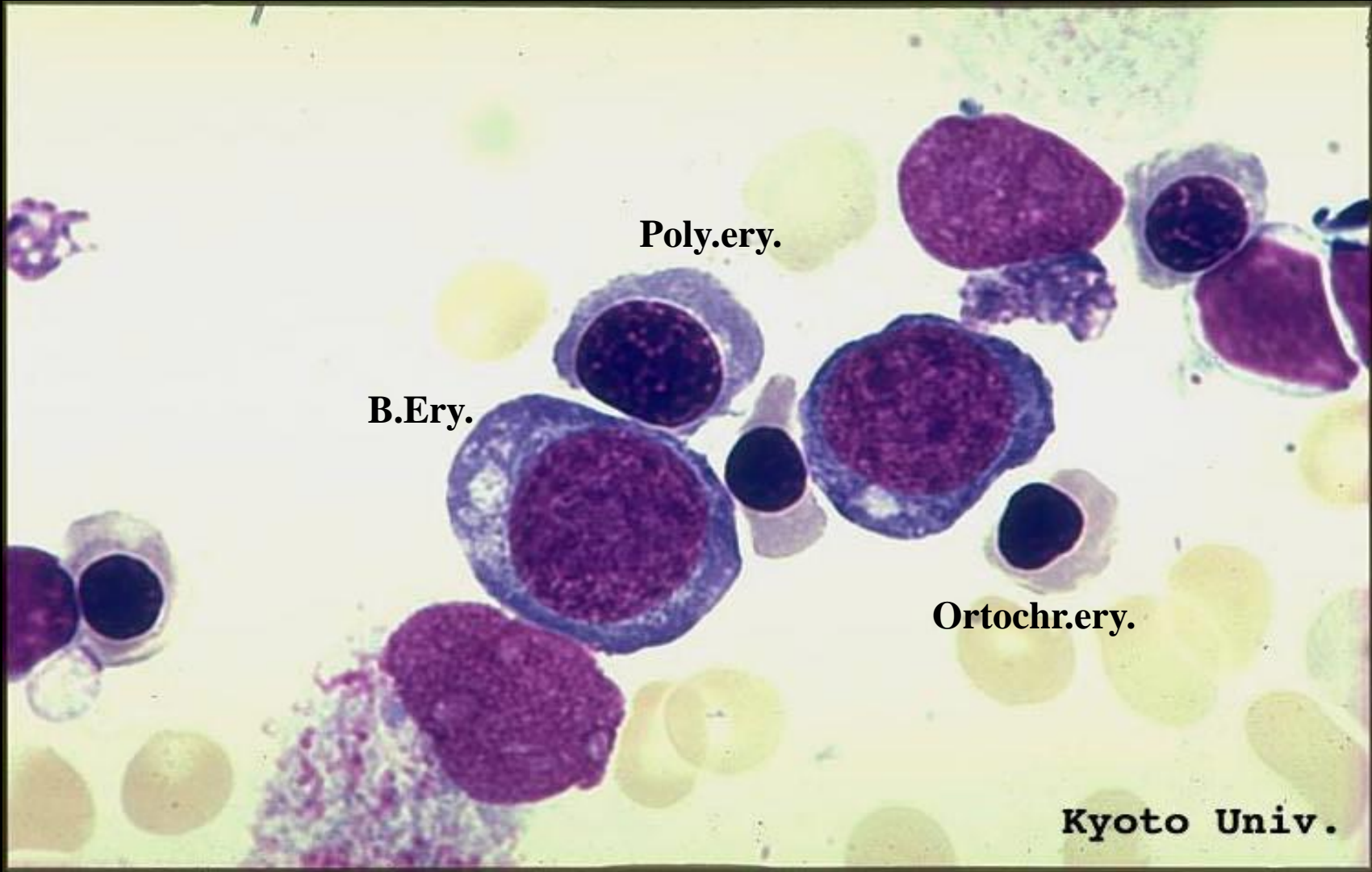
B = basophilic erythroblast 10 – 17 μ m

Oe = early orthochromatophilic erythroblast 8 – 12 μ m



Pe = polychromatofilní erytroblast
LPe = pozdní polychromatofilní erytroblast
Oe = pozdní ortochromatofilní erytroblast



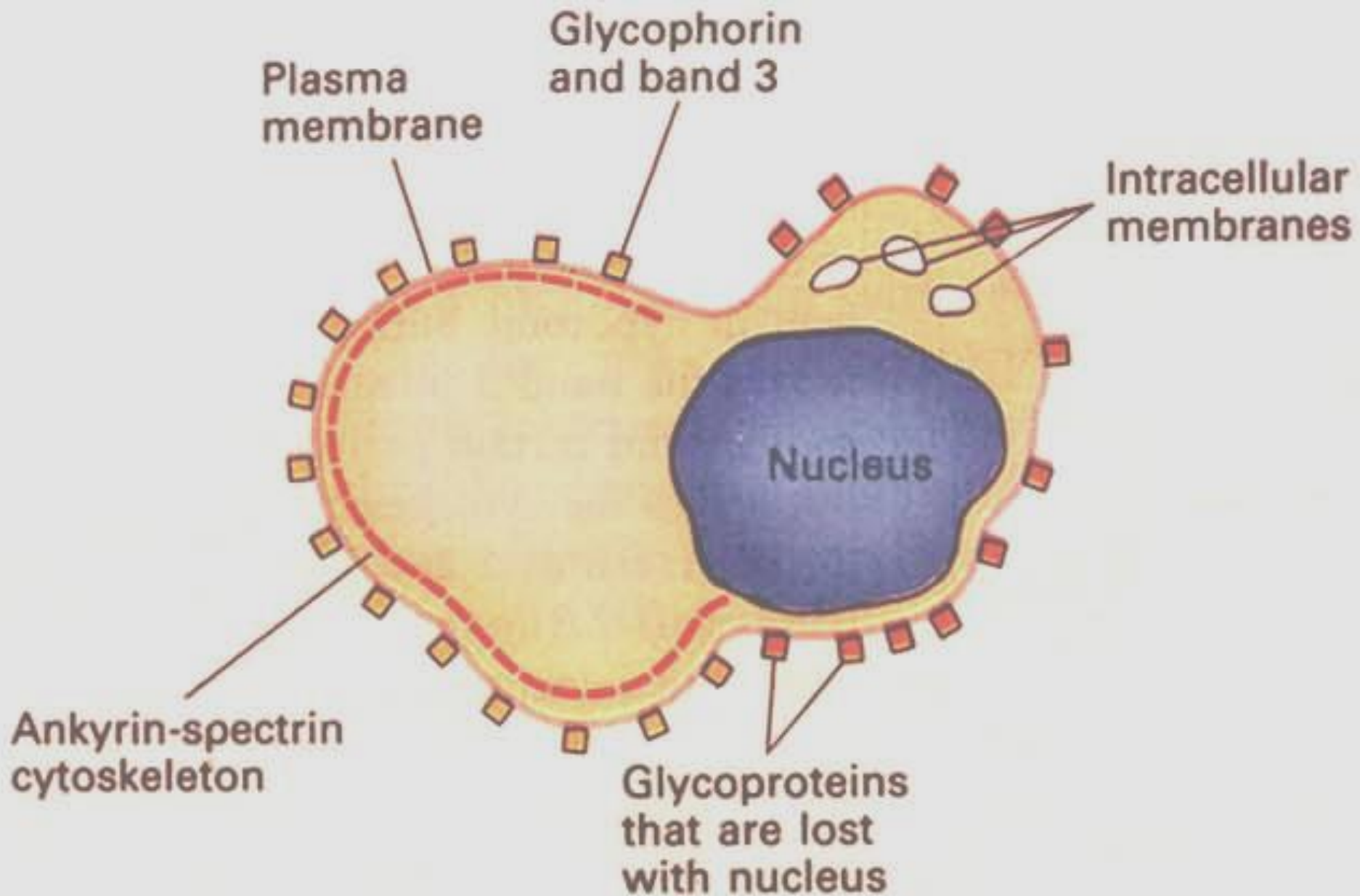


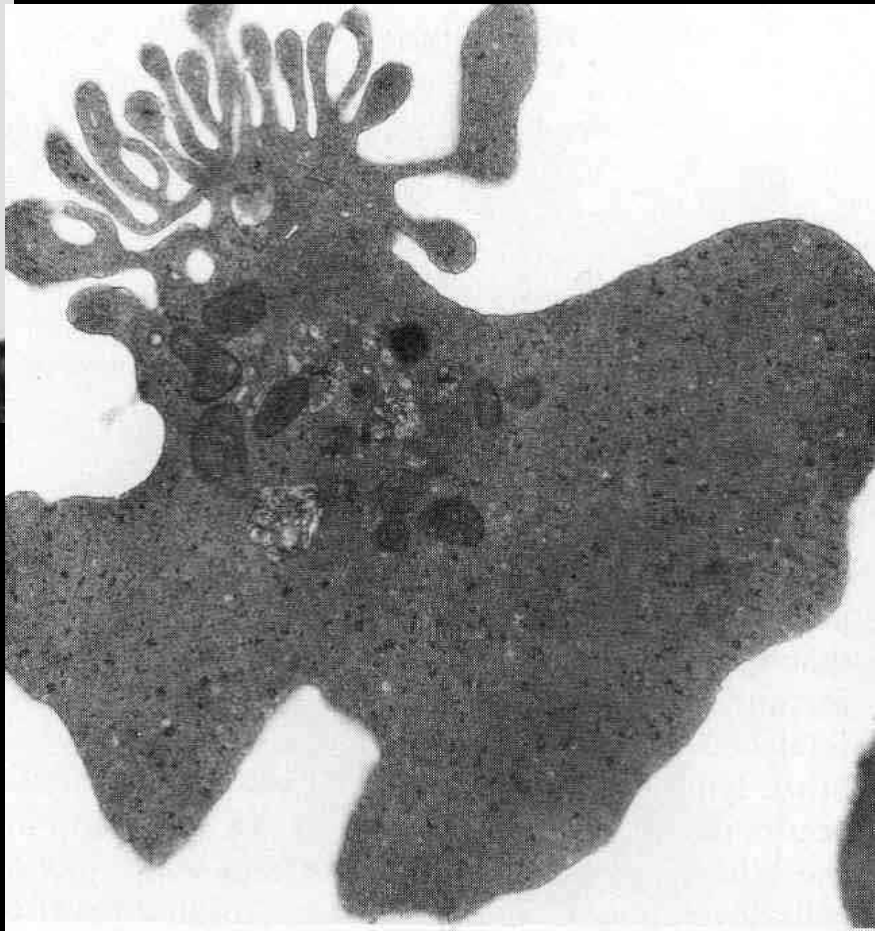
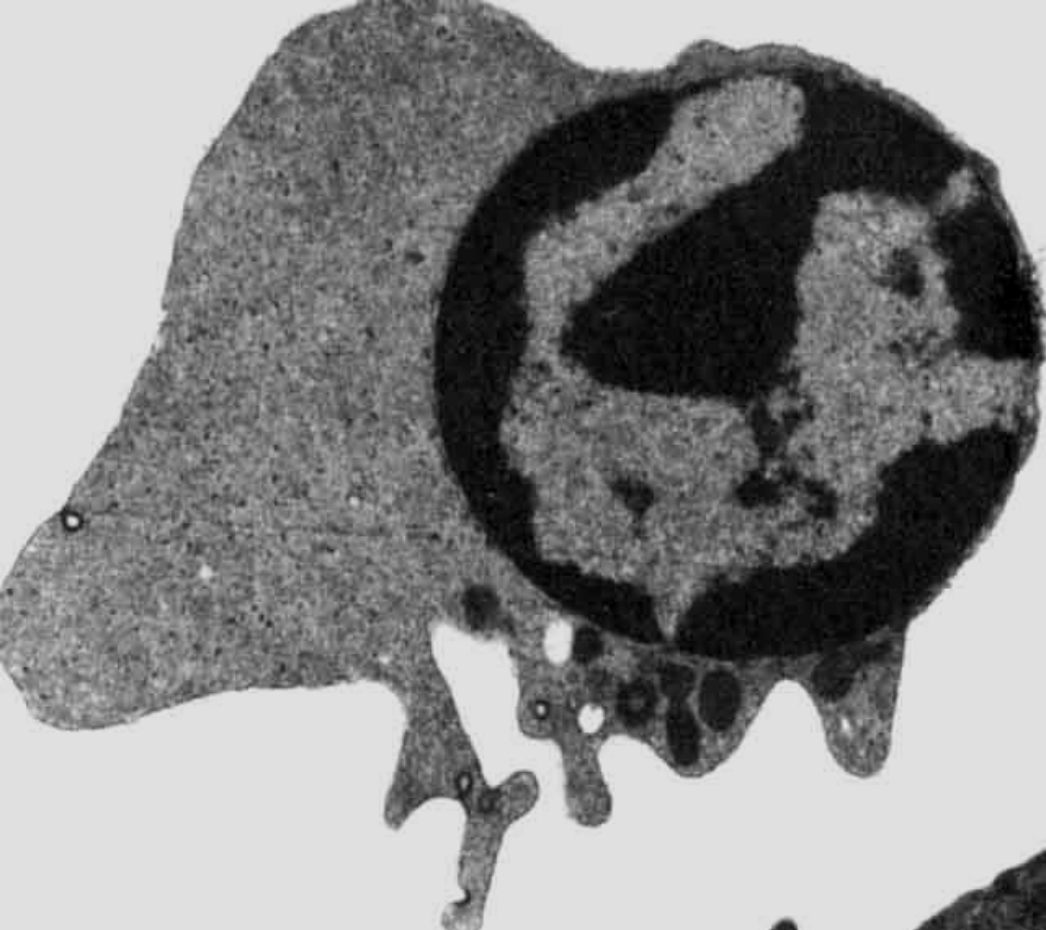
B.Ery.

Poly.ery.

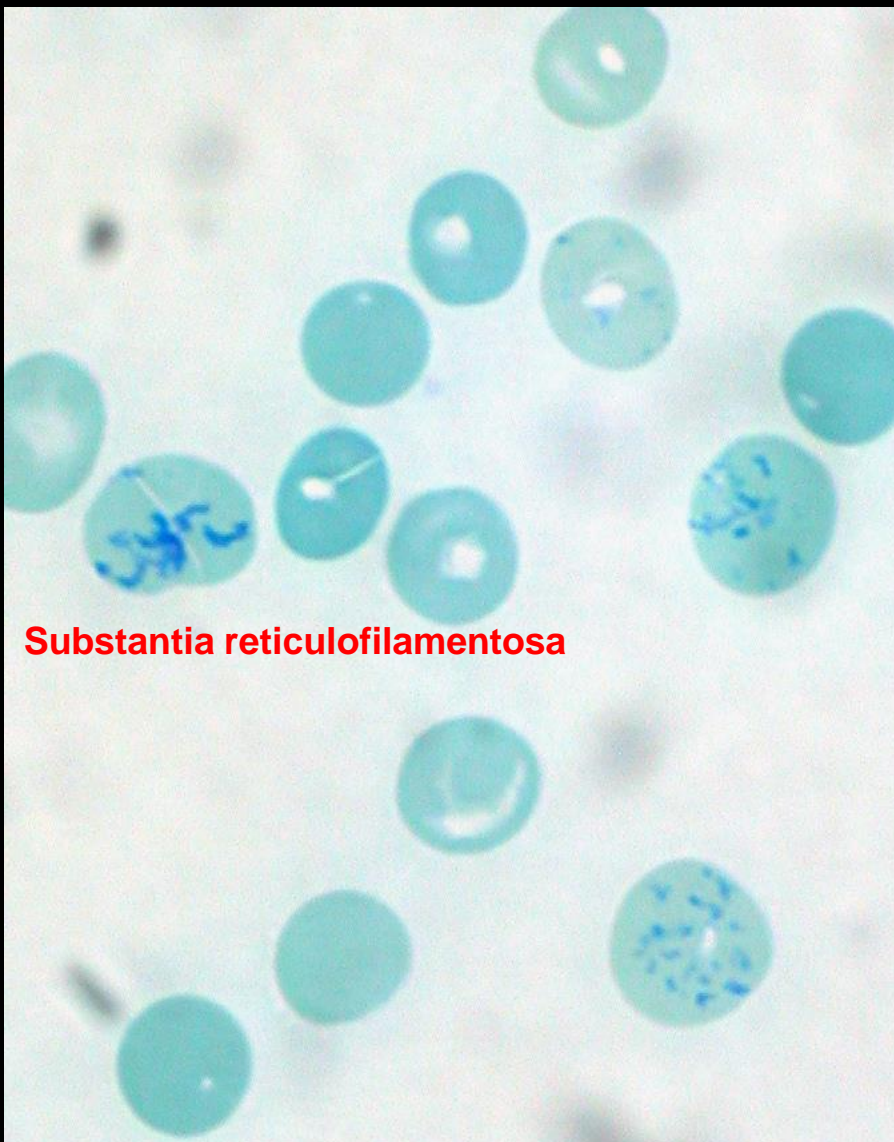
Ortochr.ery.

Kyoto Univ.





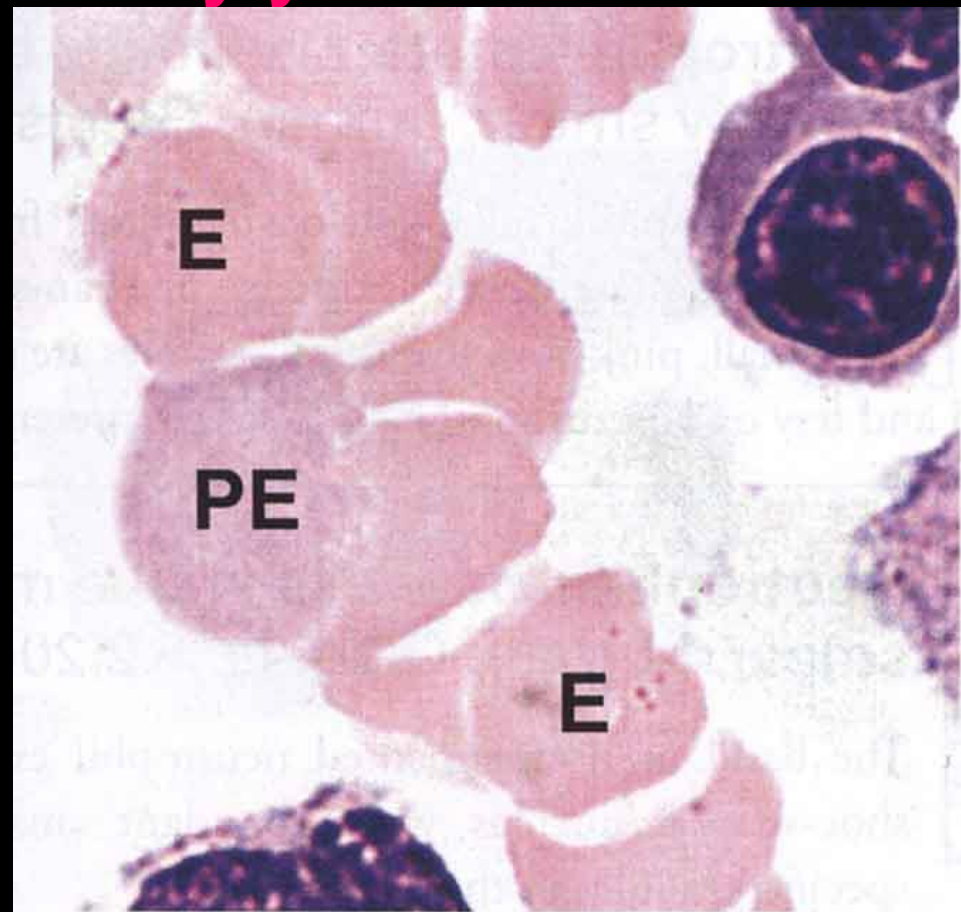
Retikulocyty



Substantia reticulofilamentosa

(supravitální barvení, brilant kresylová modř)

https://upload.wikimedia.org/wikipedia/commons/9/99/Reticulocytes_Human_Blood_Supravital_Stain.jpg



polychromatophilic erythrocyte
(reticulocyte)

Pawlina W.: Histology, a Text and Atlas, Wolters Kluwer 2016

0,5 – 2,5 % v periferní krvi

Fragmenty jádra v erythrocytech

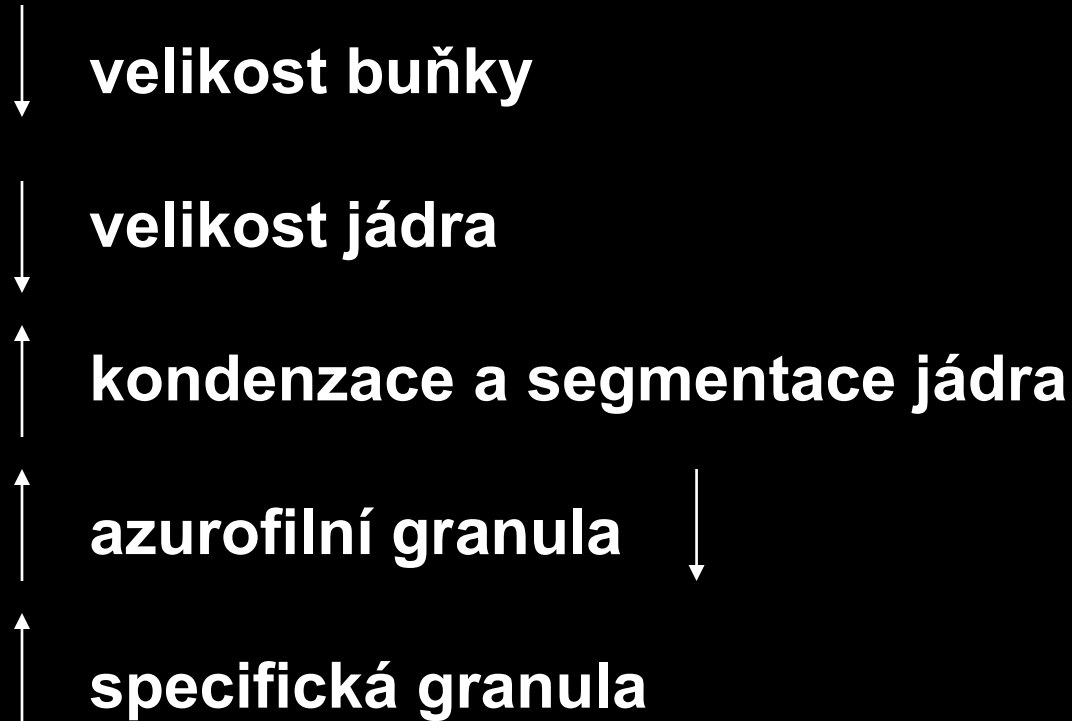


Howellovo – Jollyho tělísko



Cabotův prstenec

Vývoj granulocytů, granulopoéza, myelopoéza



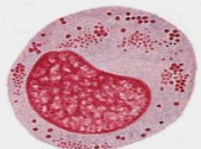
CFU-G CFU-Eo CFU-Ba



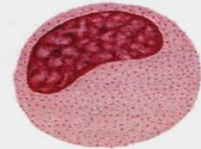
Myeloblast



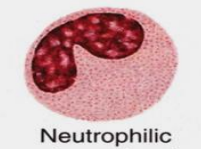
Promyelocyte



Early neutrophilic myelocyte



Late neutrophilic myelocyte



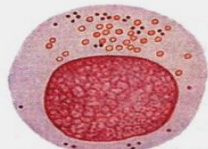
Neutrophilic metamyelocyte



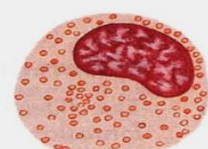
Band cell



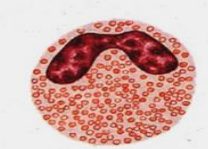
Mature neutrophil



Early eosinophilic myelocyte



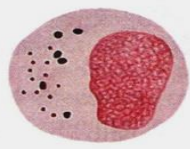
Late eosinophilic myelocyte



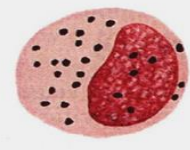
Eosinophilic metamyelocyte



Mature eosinophil



Early basophilic myelocyte



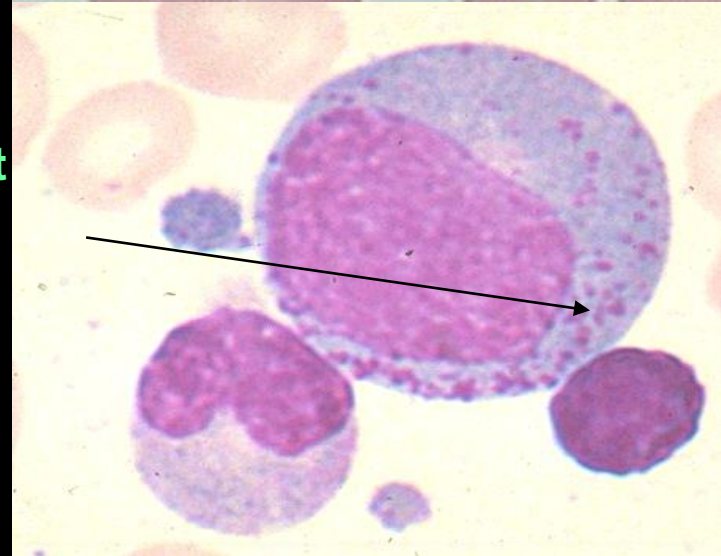
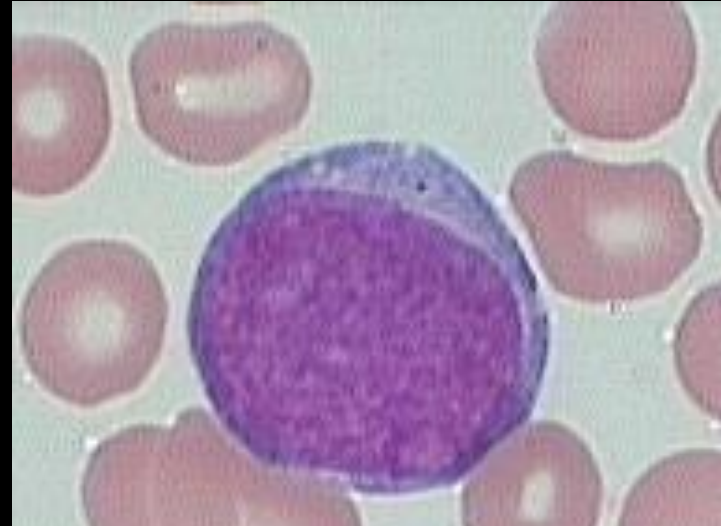
Late basophilic myelocyte

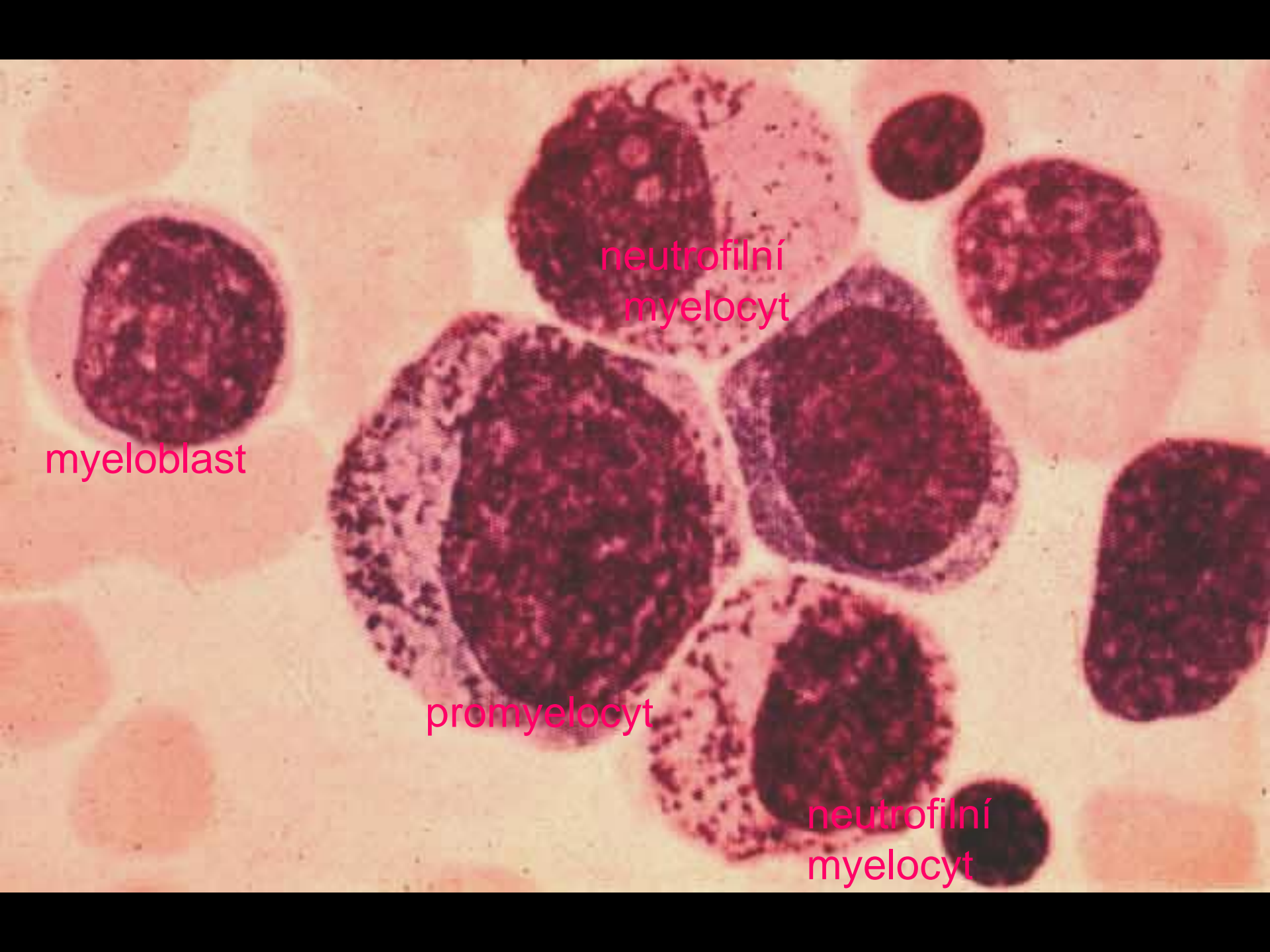


Mature basophil

**Myeloblast
10 – 20 μm**

**Promyelocyte
15 – 24 μm
Azurofilní granula**



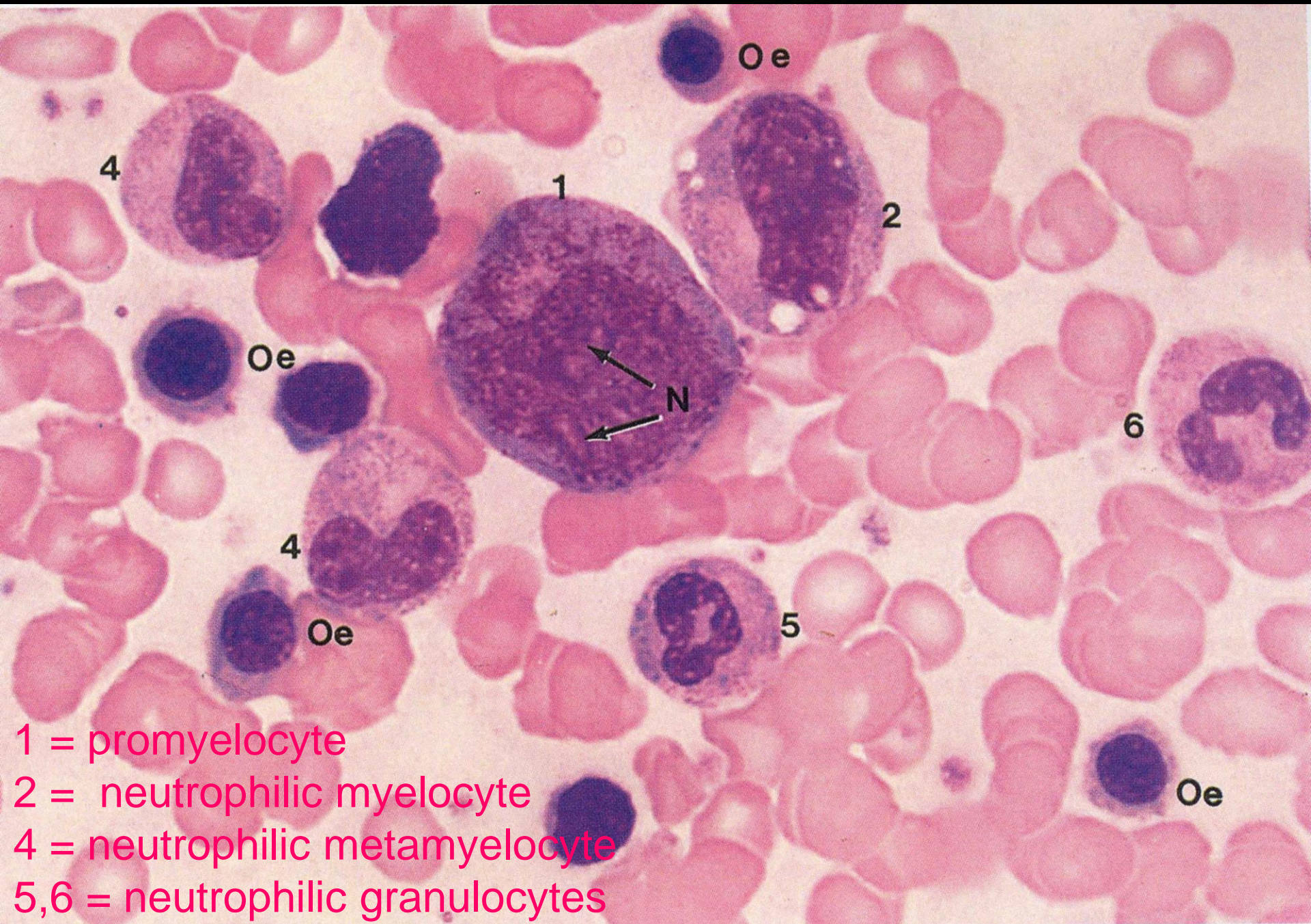


myeloblast

neutrofilní
myelocyt

promyelocyt

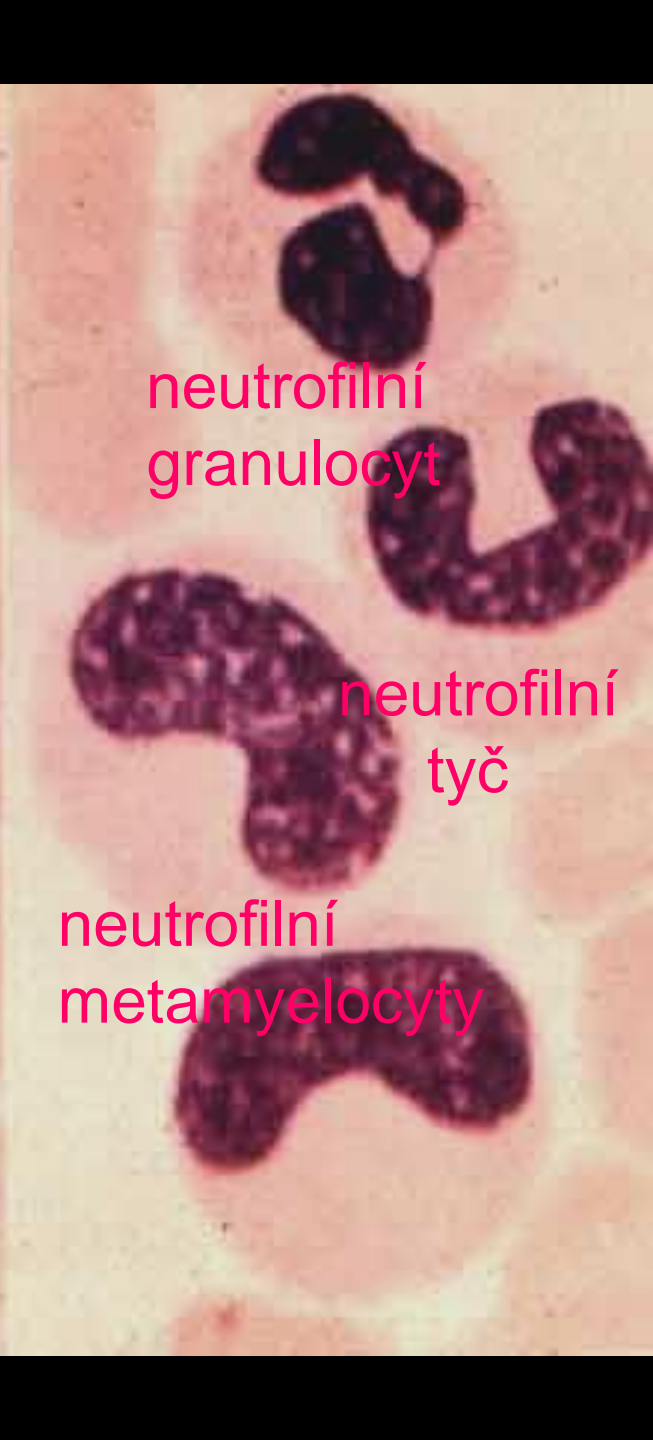
neutrofilní
myelocyt



1 = promyelocyte
2 = neutrophilic myelocyte
4 = neutrophilic metamyelocyte
5,6 = neutrophilic granulocytes

A microscopic view of a blood smear showing several neutrophilic metamyelocytes. These cells are characterized by their large, kidney-shaped nuclei and granules that are densely packed and stain a deep purple. The background shows other cells and a light pinkish-red plasma.

neutrofilní
metamyelocyty

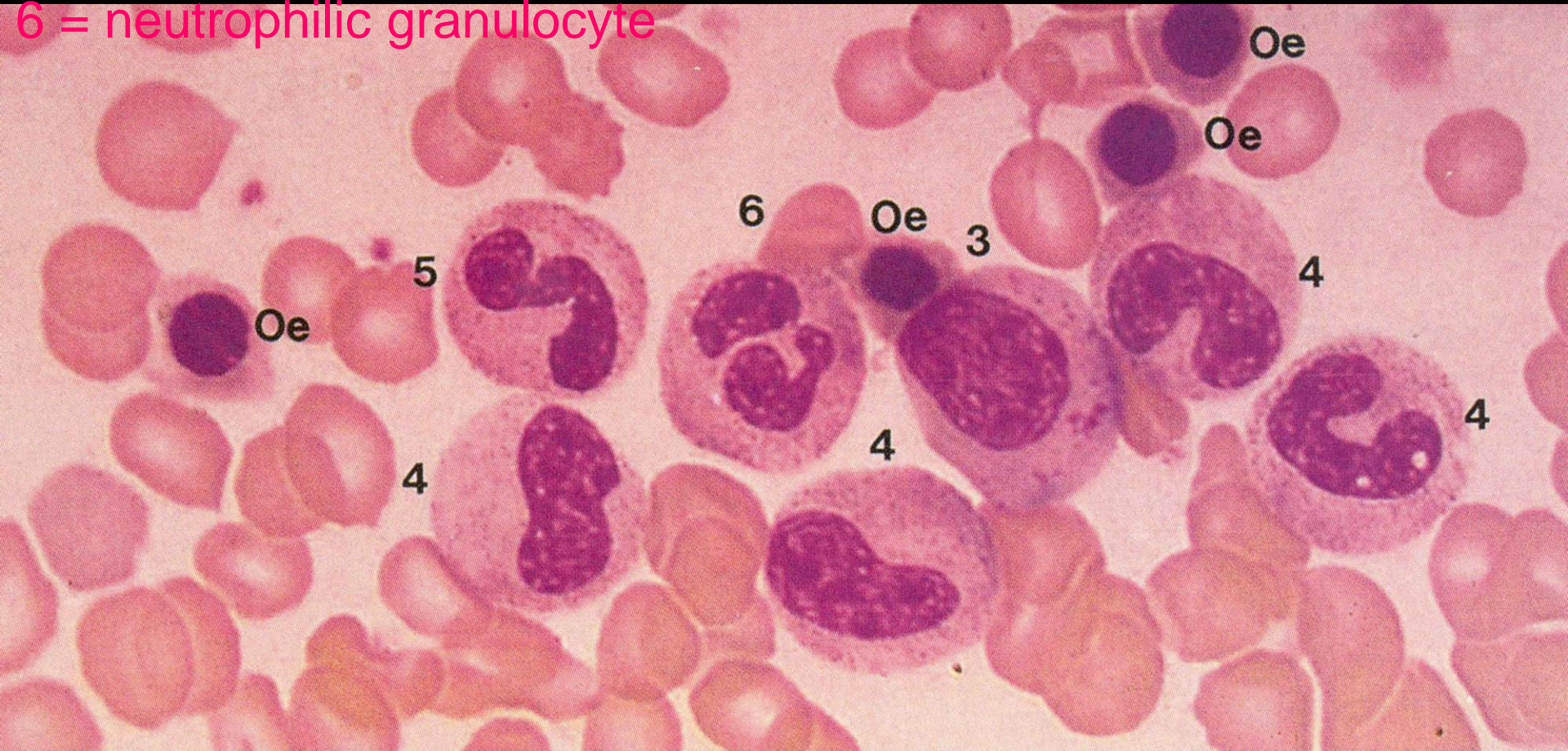
A microscopic view of a blood smear focusing on a single neutrophilic granulocyte. The cell has a multi-lobed nucleus with distinct, dark purple granules. The surrounding plasma is light pinkish-red.

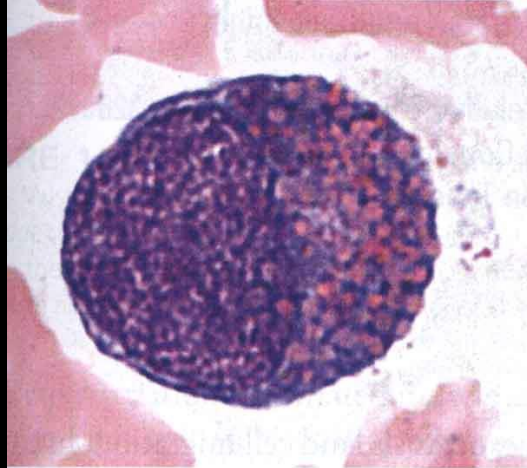
neutrofilní
granulocyt

neutrofilní
tyč

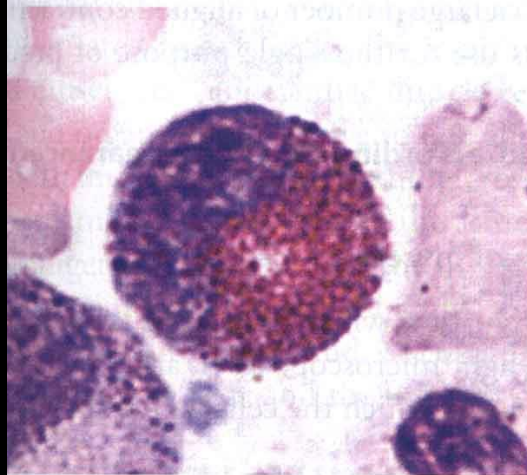
neutrofilní
metamyelocyty

- 3 = neutrophilic myelocyte
- 4 = neutrophilic metamyelocyte
- 5 = neutrophilic band
- 6 = neutrophilic granulocyte

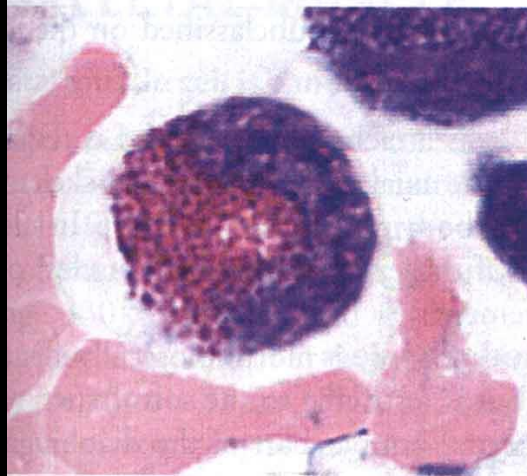




— eosinophilic
myelocyte



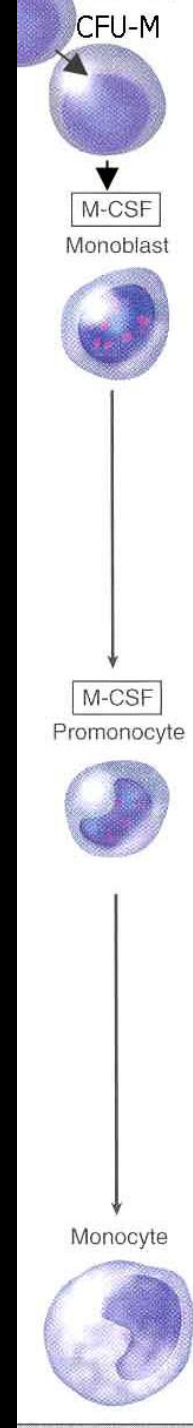
— eosinophilic
metamyelocyte

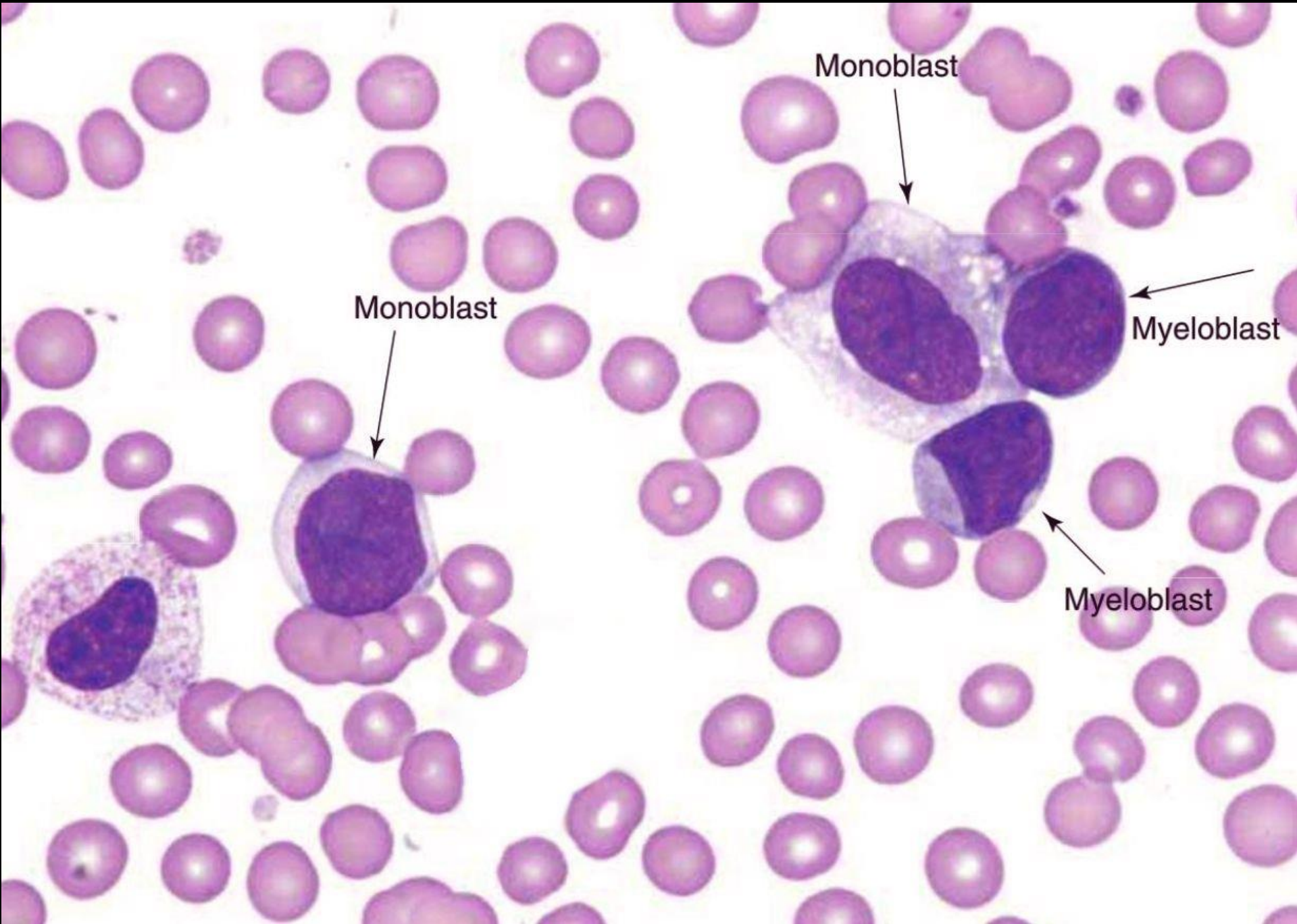


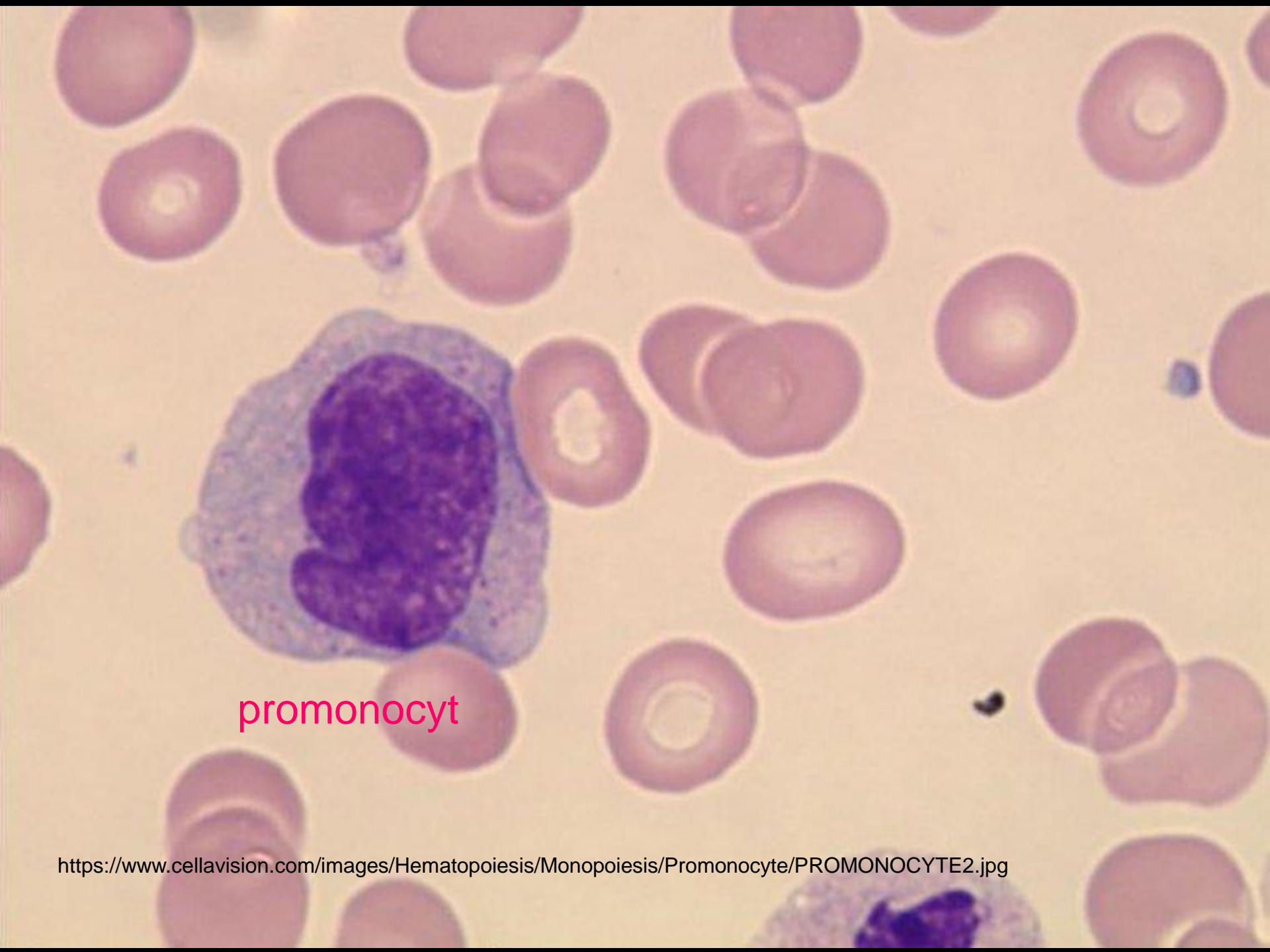
— eosinophilic
band cell



Vývoj monocytů, monopoéza

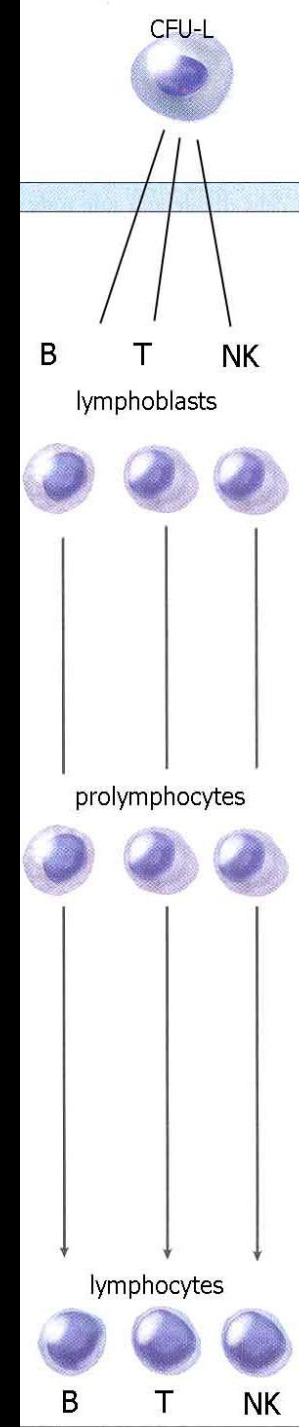


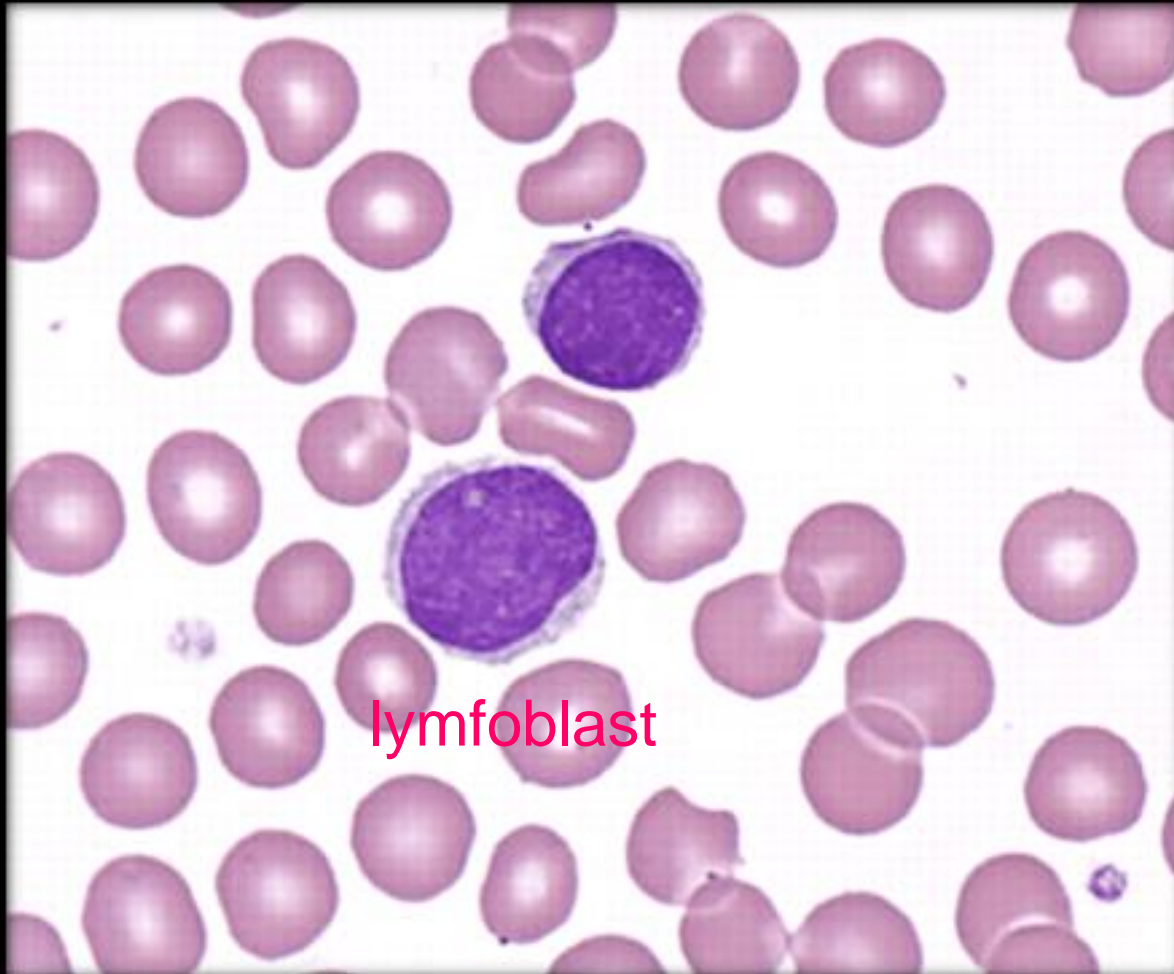




promonocyt

Vývoj lymfocytů, lymfopoéza

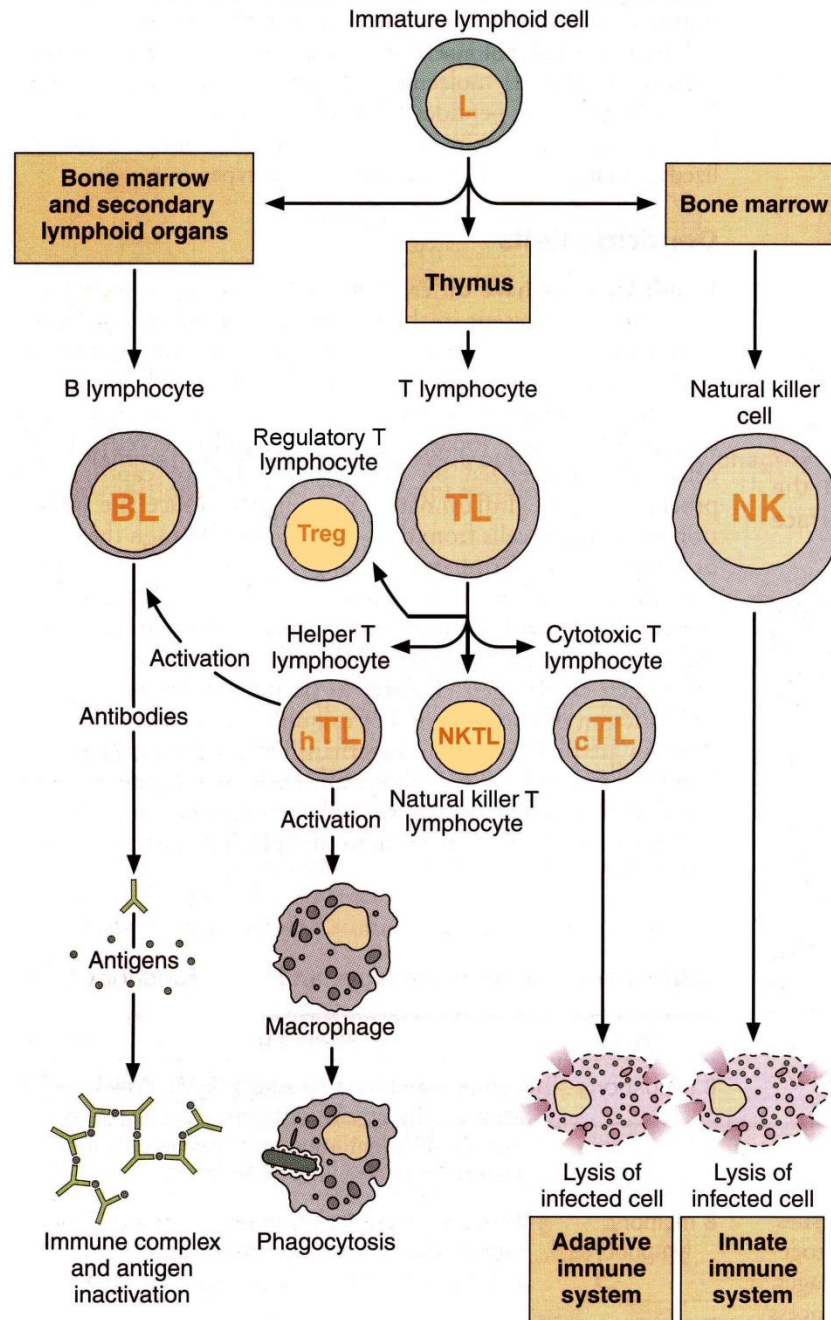




<https://classconnection.s3.amazonaws.com/421/flashcards/940421/png/lymphoblast1321553343200.png>

<http://classconnection.s3.amazonaws.com/801/flashcards/3398801/jpg/prolymphocyte-13FE36EA10E493AEAD5.jpg>

Origin of Main Lymphocyte Types Present in Blood and Their Main Functions Involved in the Immune Responses



POVRCHOVÉ ANTIGENY

všechny B-lymfocyty
 CD20,23,(19) BCR
 MHC II

všechny T-lymfocyty
 CD3 TCR

T_hL CD4

T_cL CD8

T_{reg}L CD4 nebo CD8
 CD25 a FOXP3

NKTL a další
 nekonvenční TL (MAIT)
 CD1d CD16

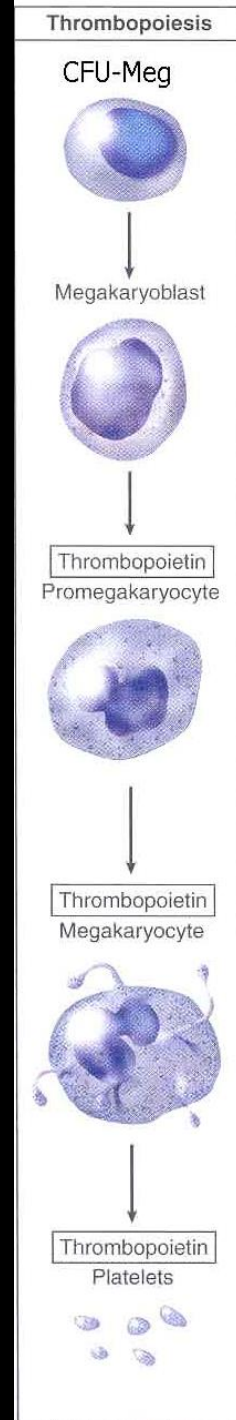
NK-buňky
 CD16 CD56

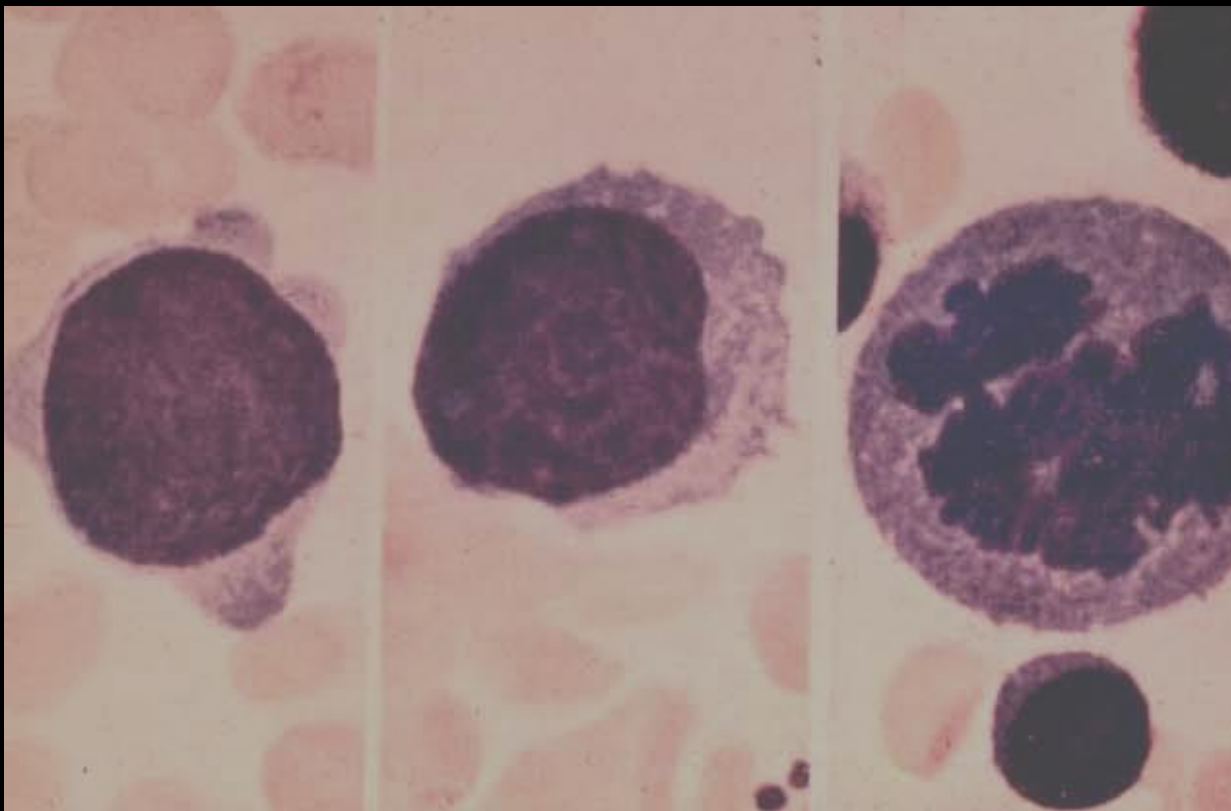
Lymfoblast
 (v kostní dřeni)

Místa zrání
 (získávání
 imunokompetence)

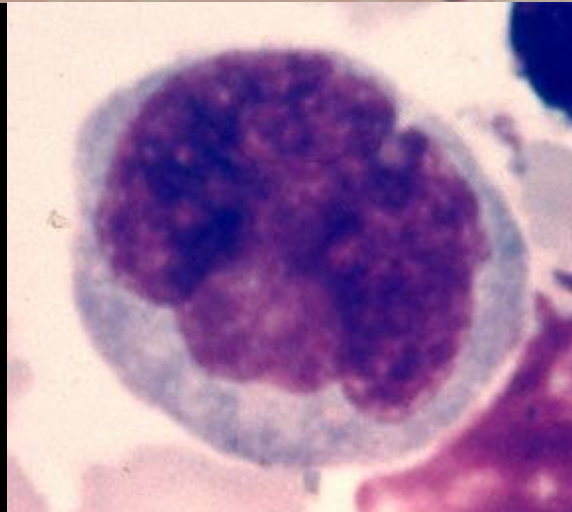
Typy lymfocytů

Vývoj krevních destiček, trombopoéza



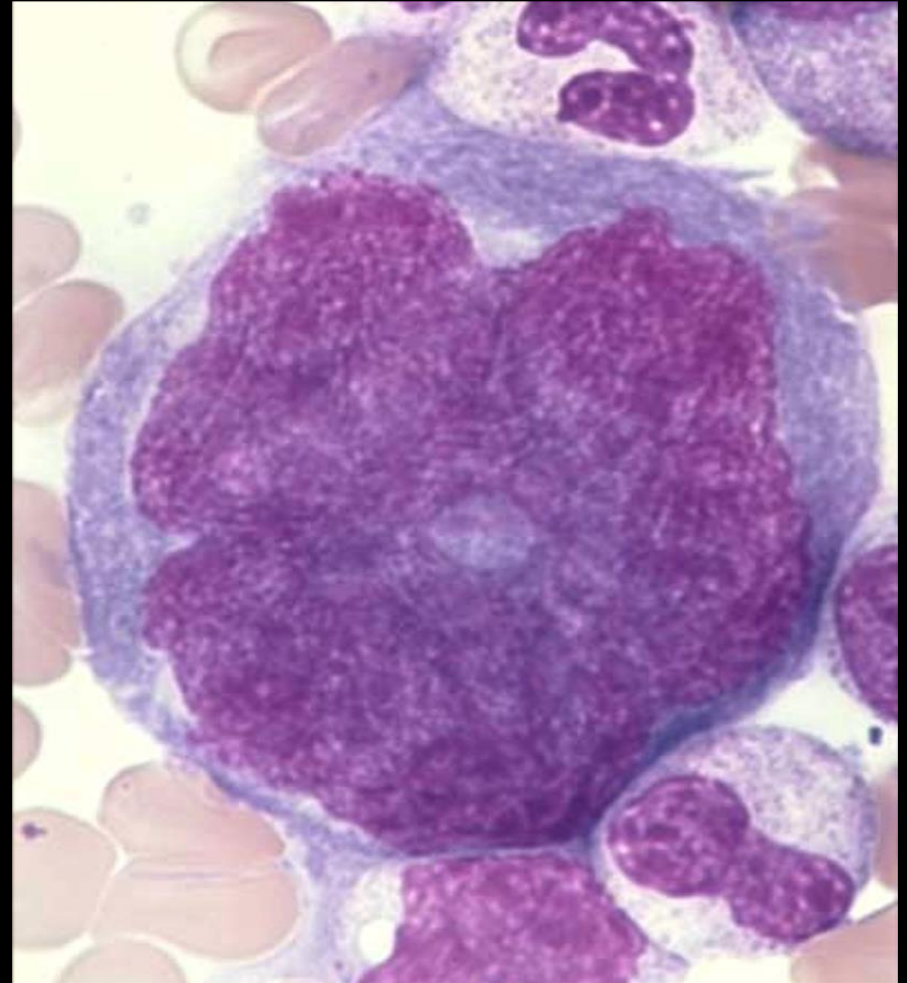
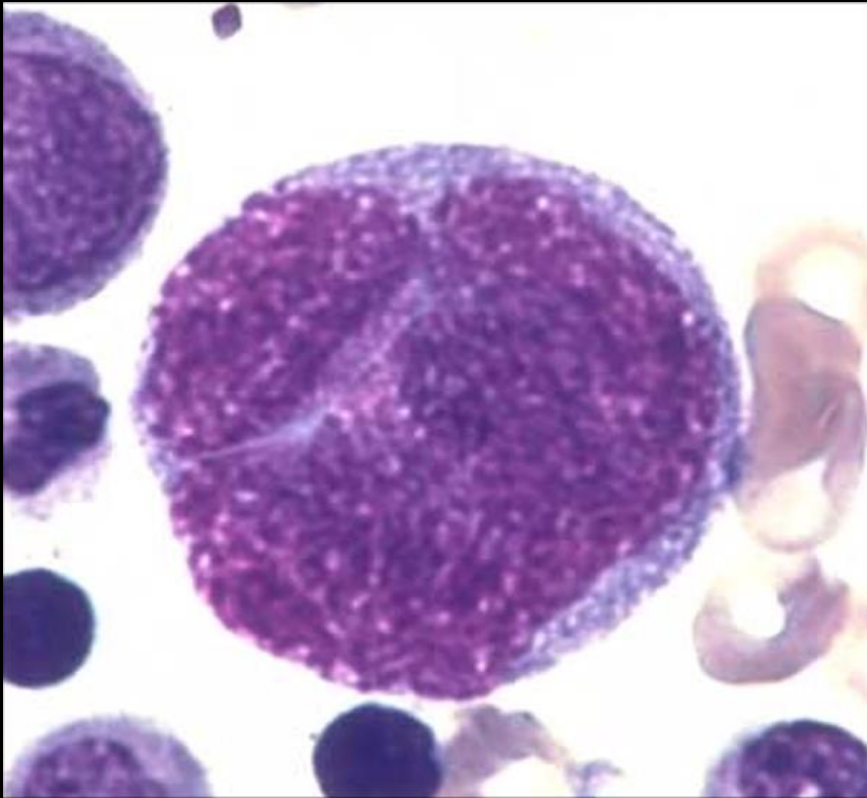


Megakaryoblasty
15 – 35 μm



endomitóza

Promegakaryocyty
30 – 60 μm



pokračující endomitóza

MEGAKARYOCYT 100 – 150 μm

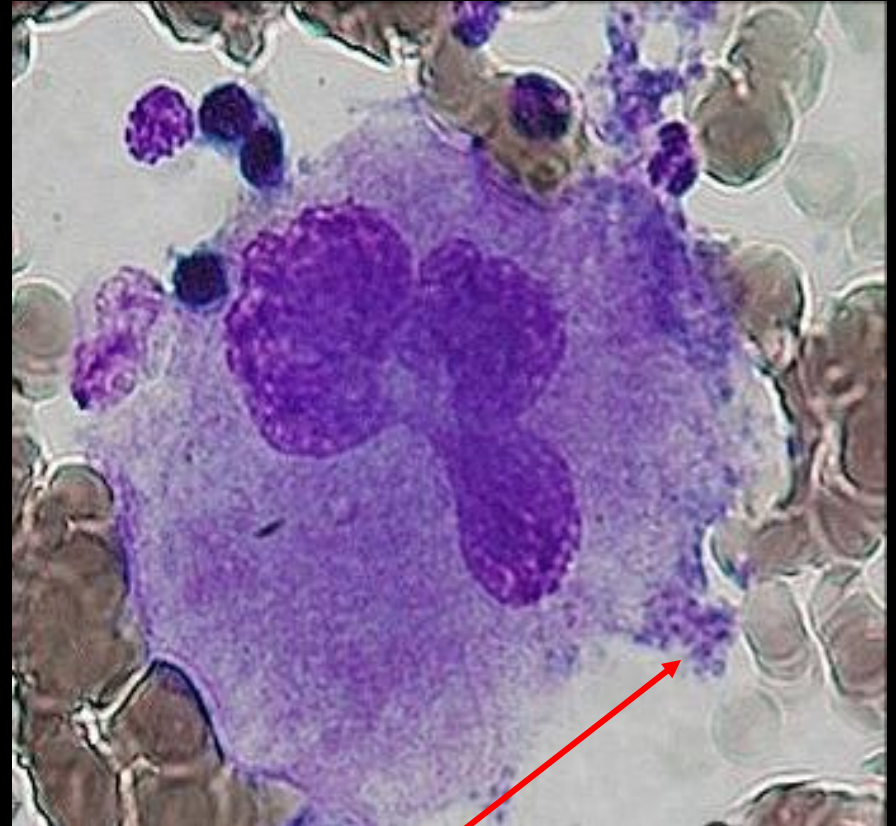
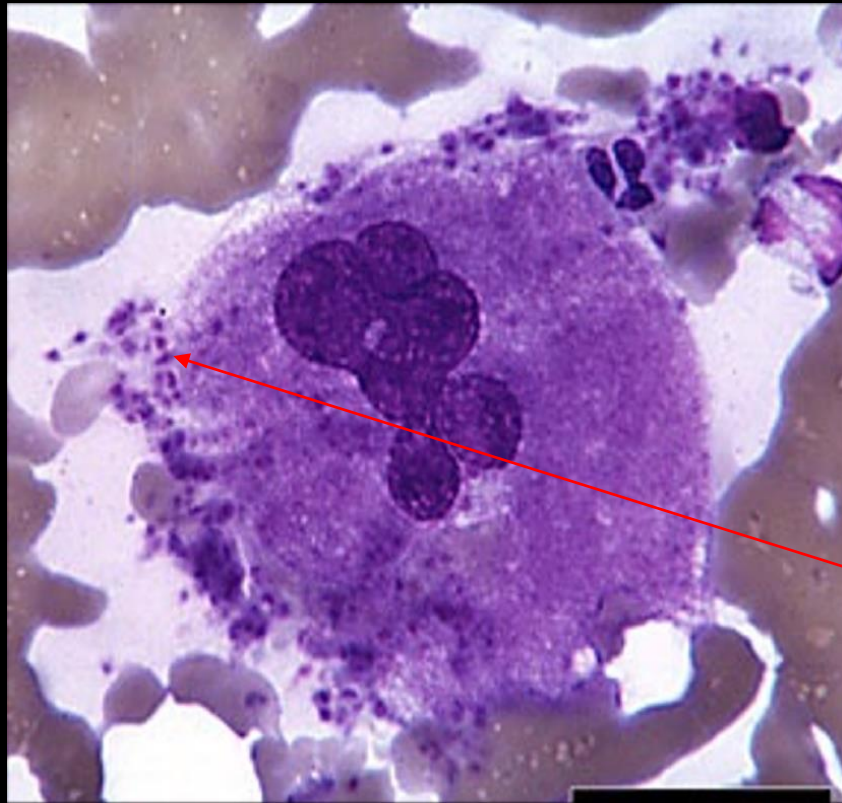
Polyploidní
laločnaté
jádro
(až 64 N)

Azurofilní
granula

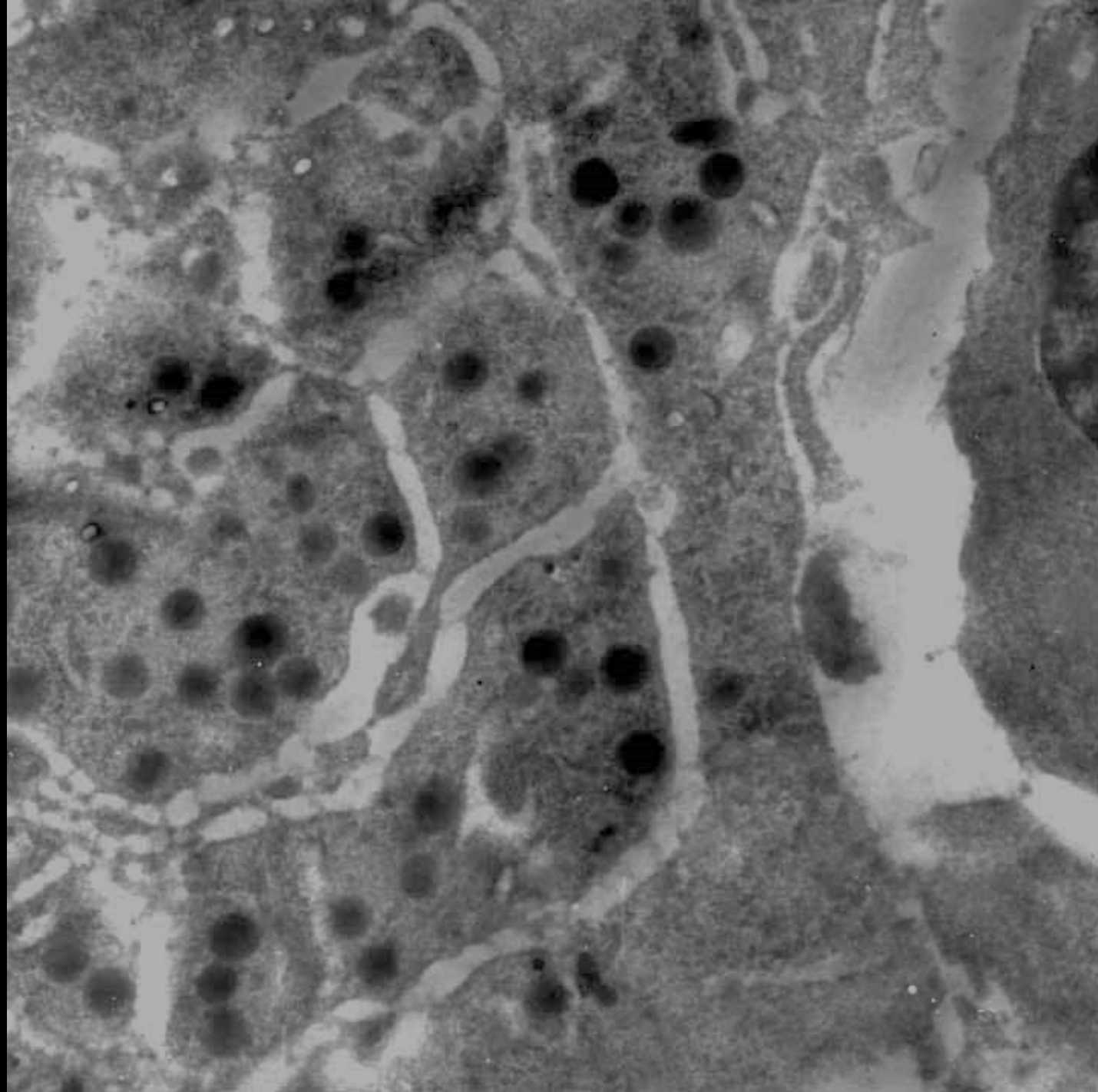
Demarkační linie



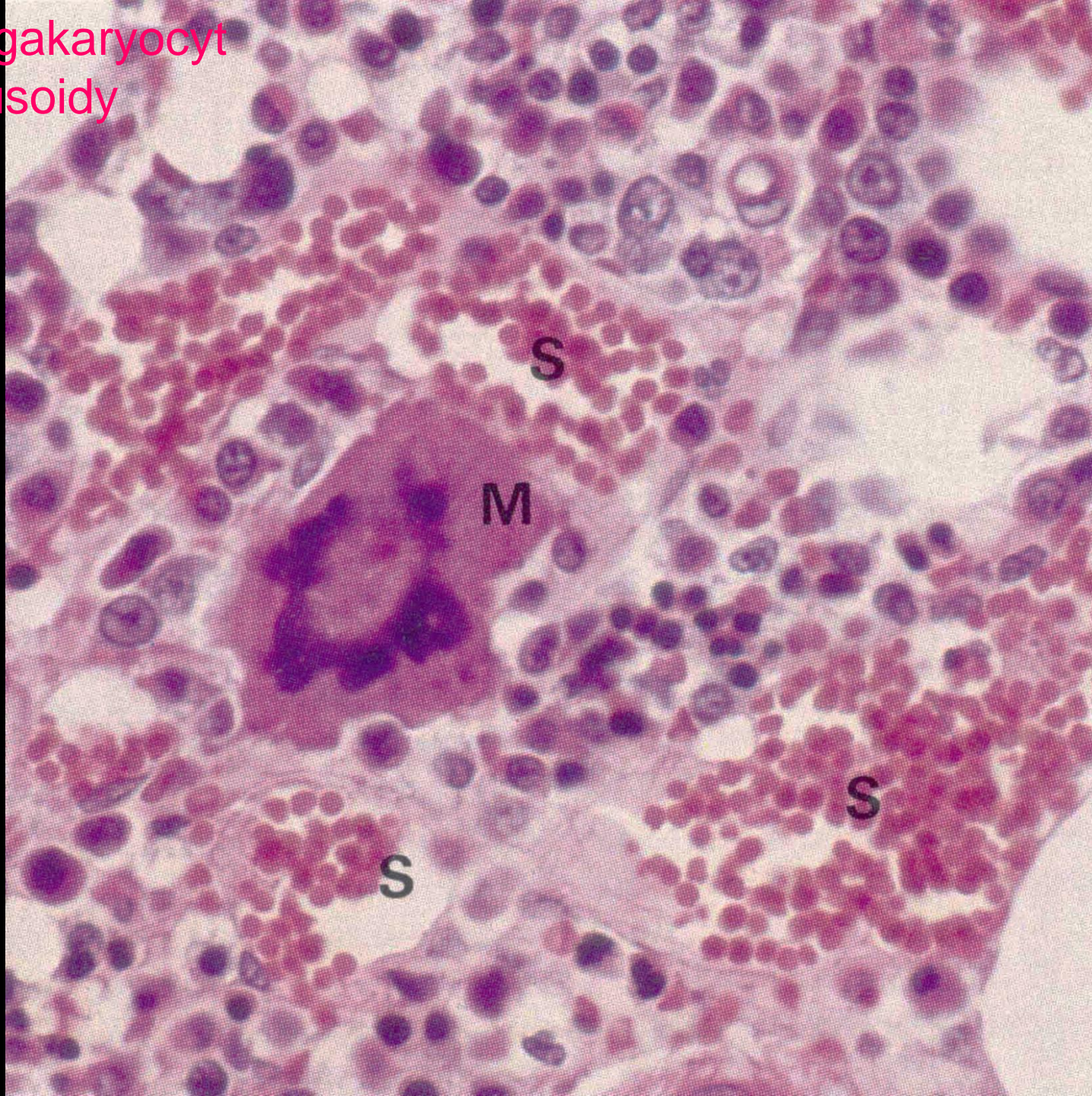
Megakaryocyty



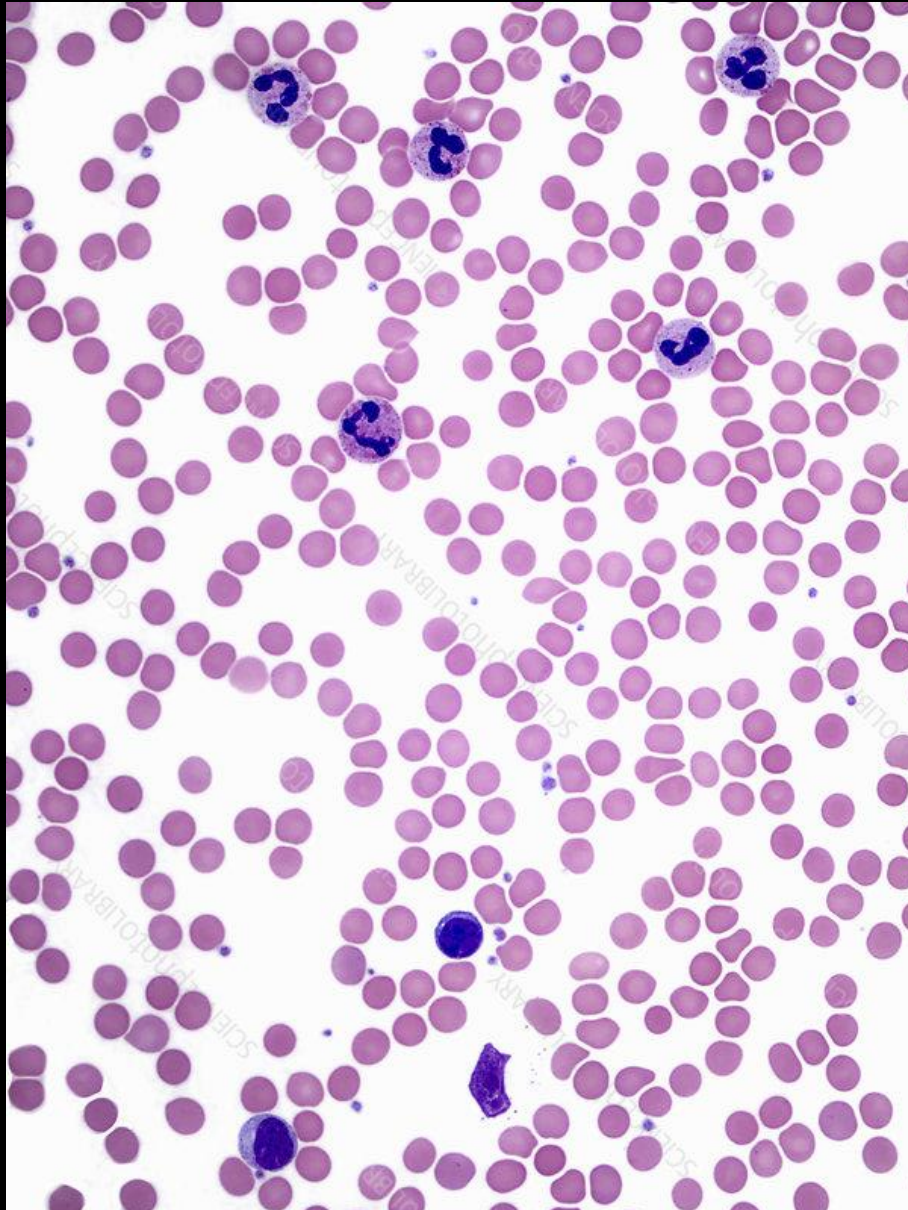
**Fragmentace trombocytů z cytoplasmy
2000 - 4000 trombocytů přímo do sinusoid**



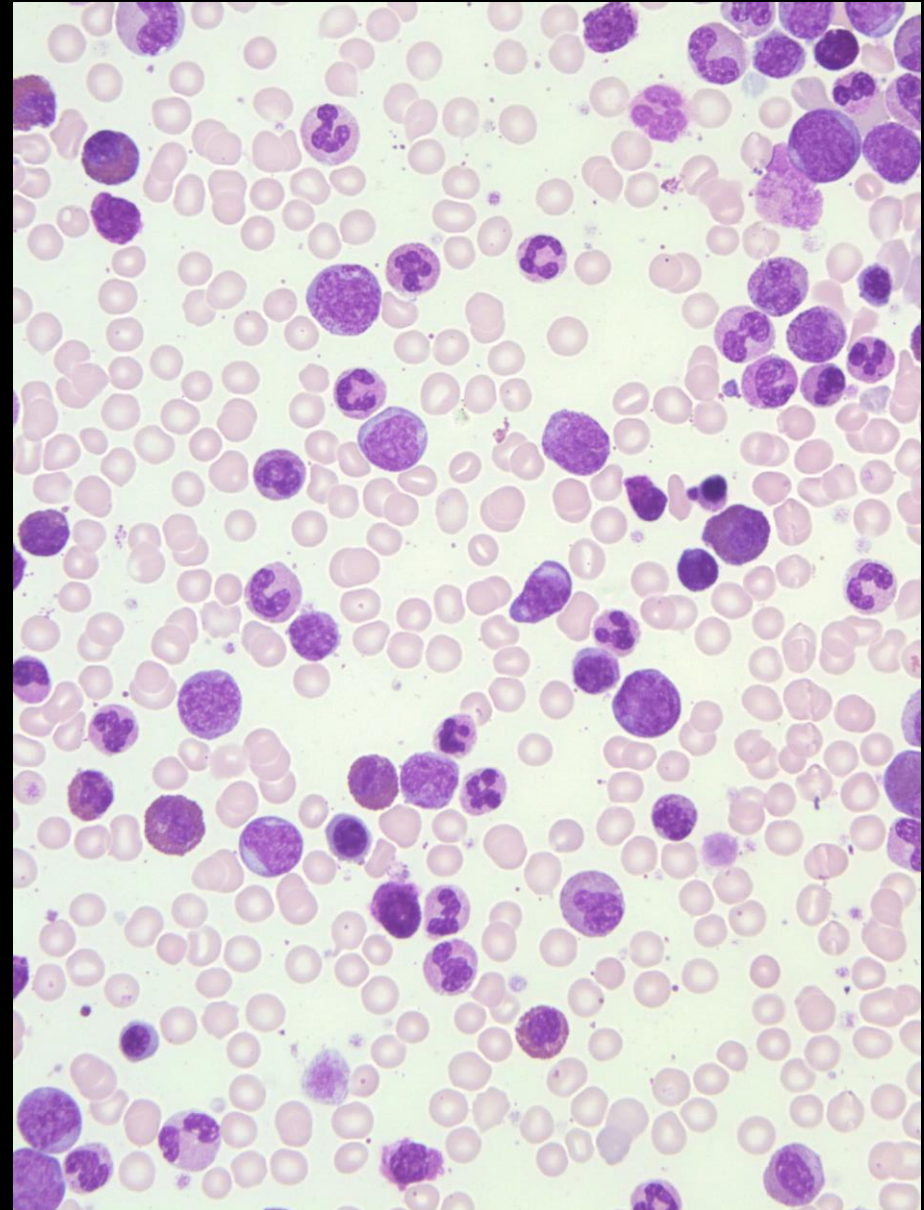
M = megakaryocyt
S = sinusoidy



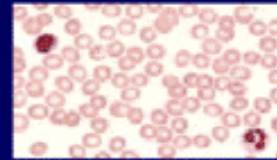
Normální krevní nátěr



Krevní nátěr při leukémii (CML)



Normal Hematopoiesis



transformation

Lymphoma

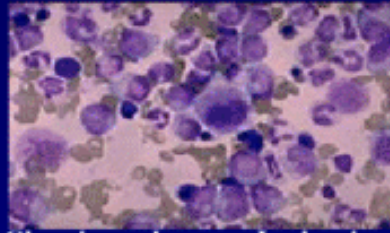
LEUKEMIA

CML

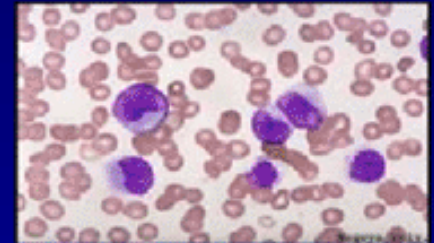
AML

CLL

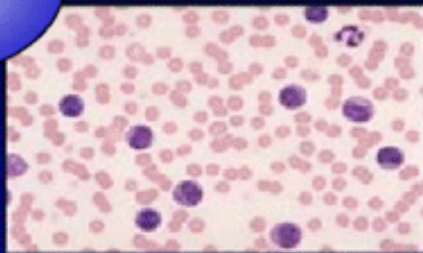
ALL



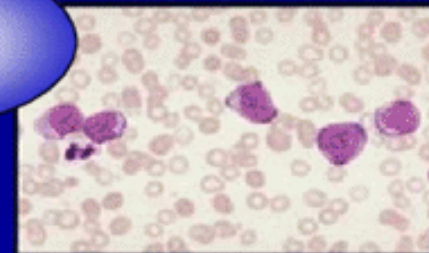
Chronic myelogenous Leukemia



Acute myeloid Leukemia



Chronic Lymphocytic Leukemia



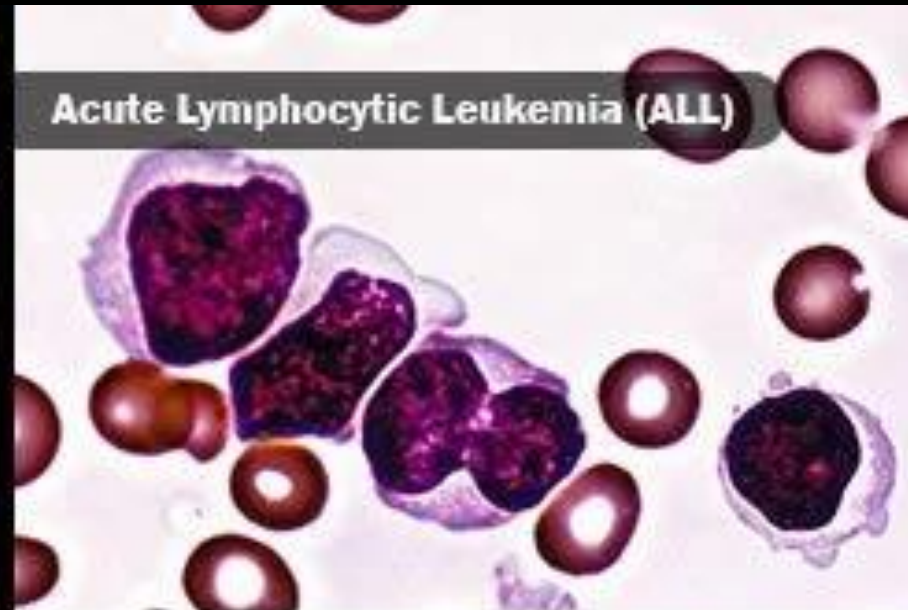
Acute Lymphoblastic Leukemia



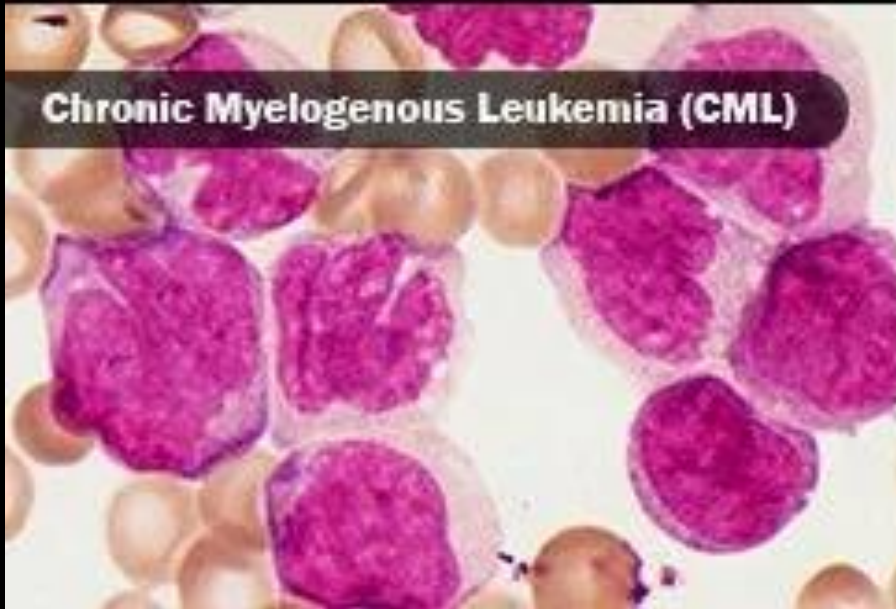
Acute Myelogenous Leukemia (AML)



Acute Lymphocytic Leukemia (ALL)



Chronic Myelogenous Leukemia (CML)



Chronic Lymphocytic Leukemia (CLL)

