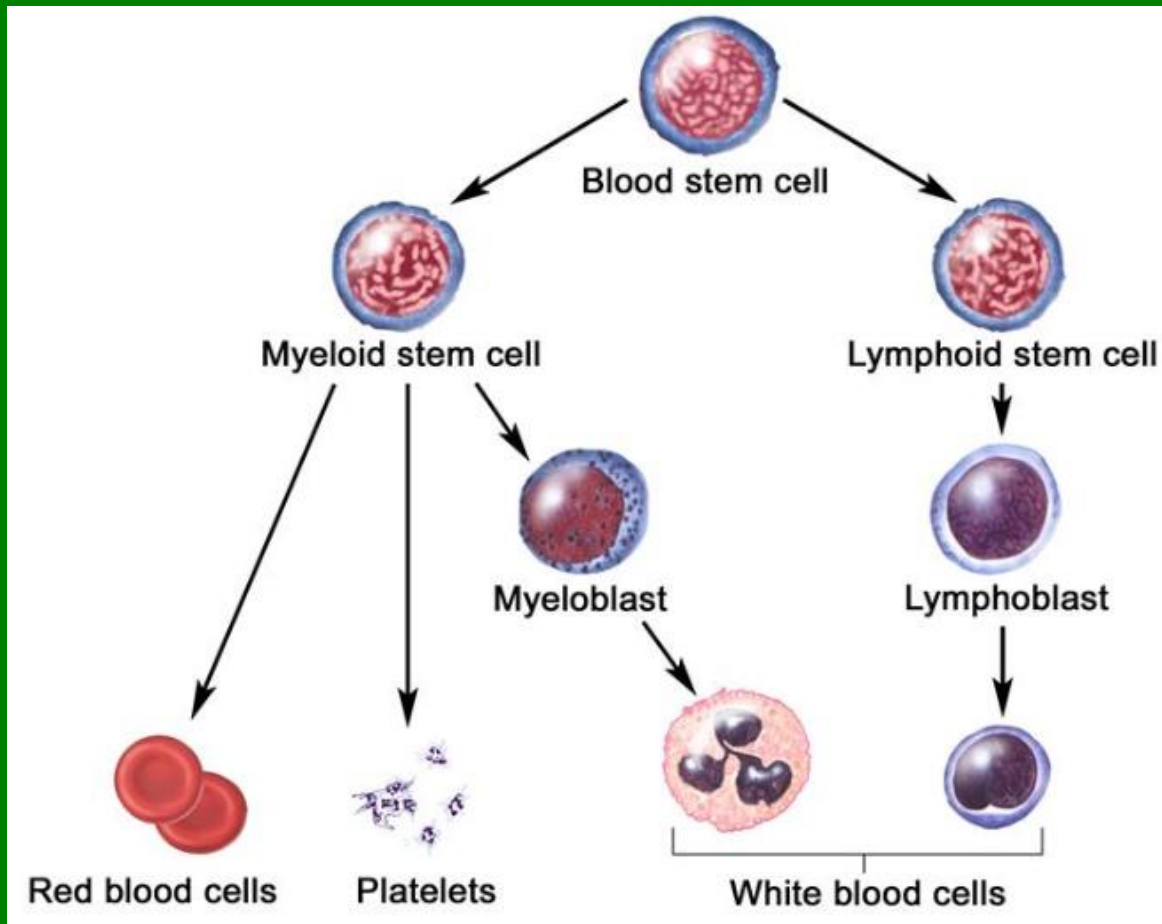


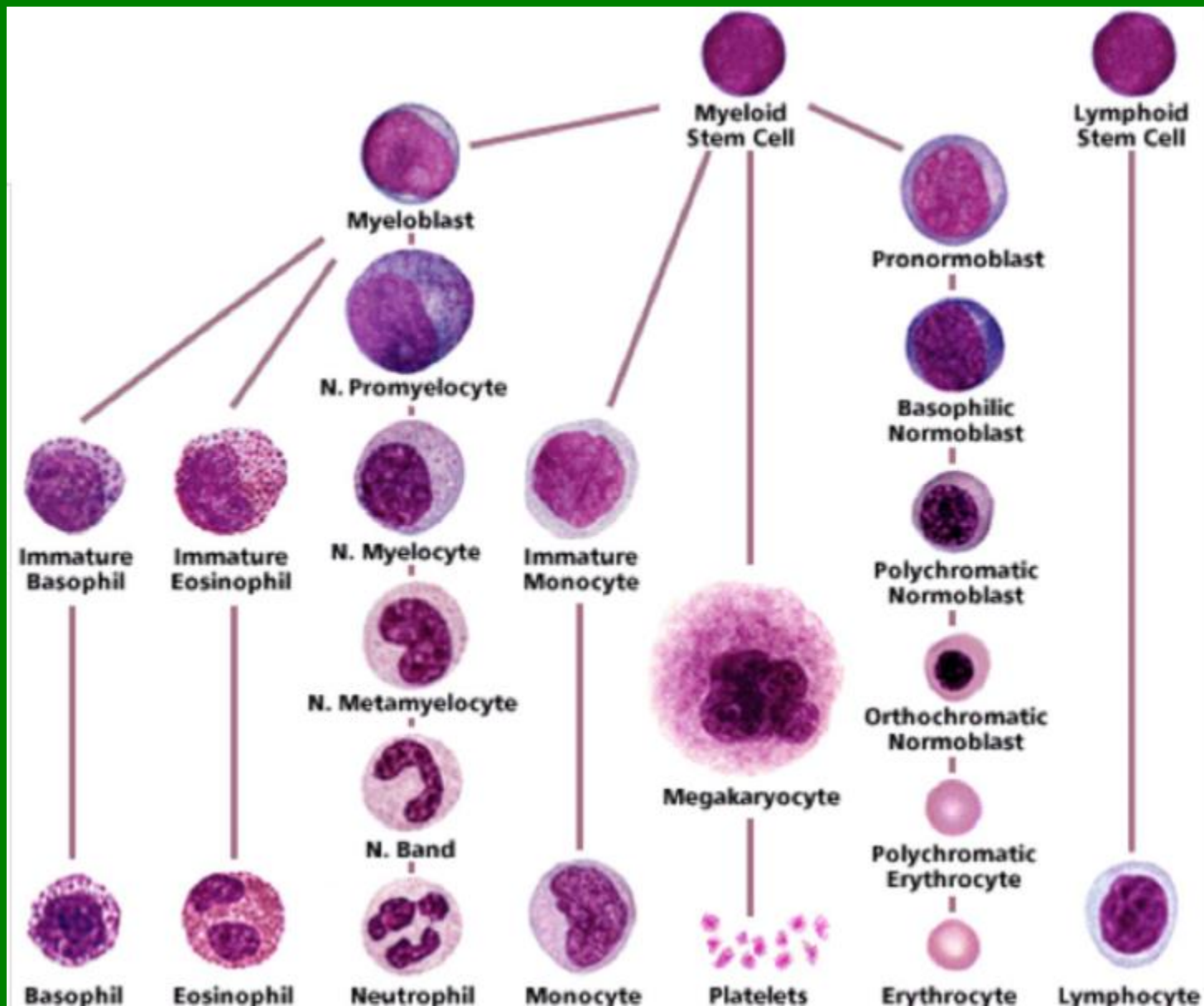
Hematopoéza

Bourková L., OKH FN Brno

- bílé krvinky – leukocyty – WBC (*White Blood Cells*)
- červené krvinky – erytrocyty – RBC (*Red Blood Cells*)
- krevní destičky – trombocyty – PLT (*Platelets*)

Kmenové buňky hematopoézy



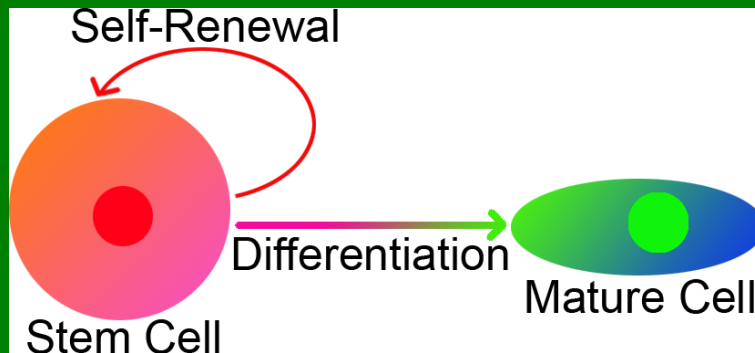


Hematopoiesis

Proliferative potential

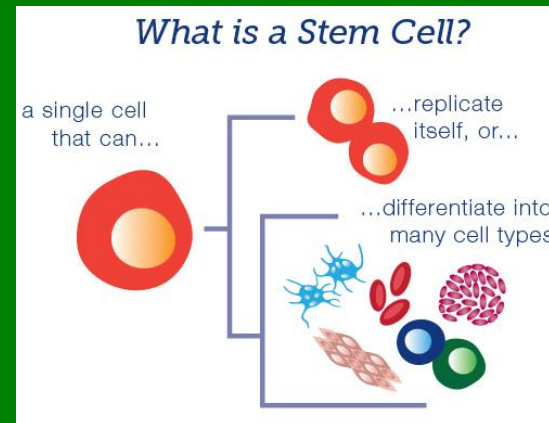


differentiation



Hematopoetické kmenové buňky

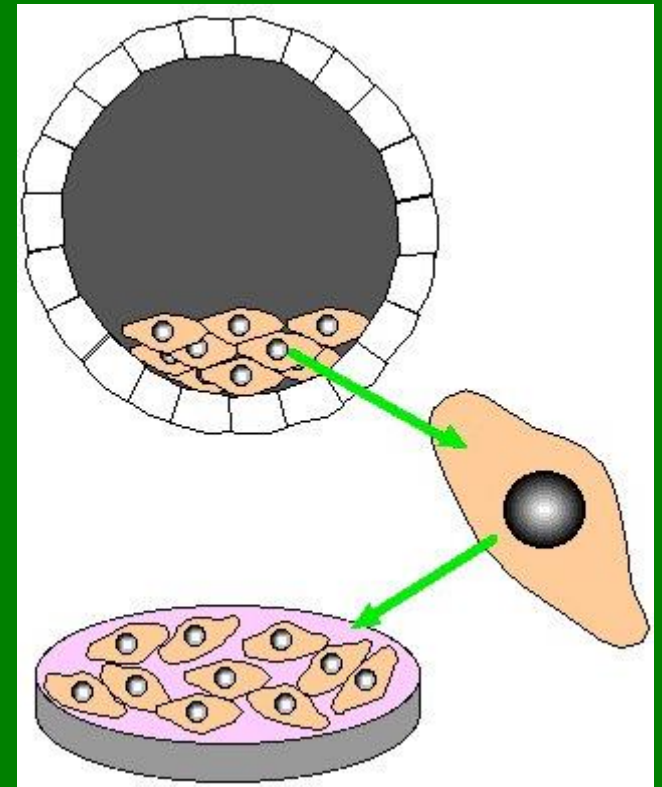
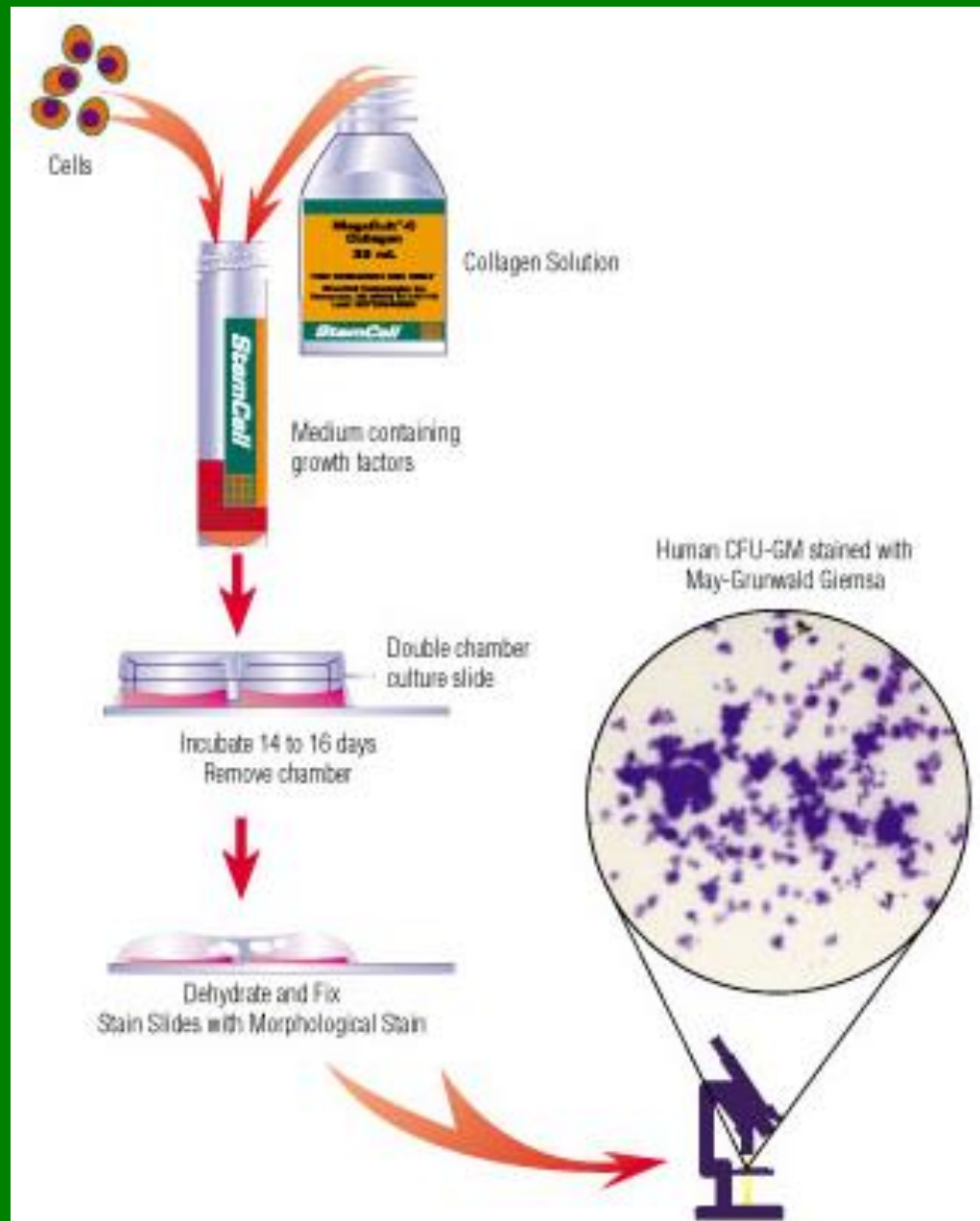
- ❑ v kostní dřeni i periferní krvi ve velmi nízké koncentraci
- ❑ pro svoji podobnost s lymfocyty se nedají morfologicky rozpoznat.
- ❑ morfologicky jsou rozpoznatelné až jejich další vývojová stádia - myeloblast, proerytoblast, megakaryoblast.....
- ❑ kmenové buňky se stanovují např. imunologicky pomocí povrchových antigenů a nebo **funkčními testy**, na základě proliferační aktivity
 - ❑ sebeobnova
 - ❑ diferenciace



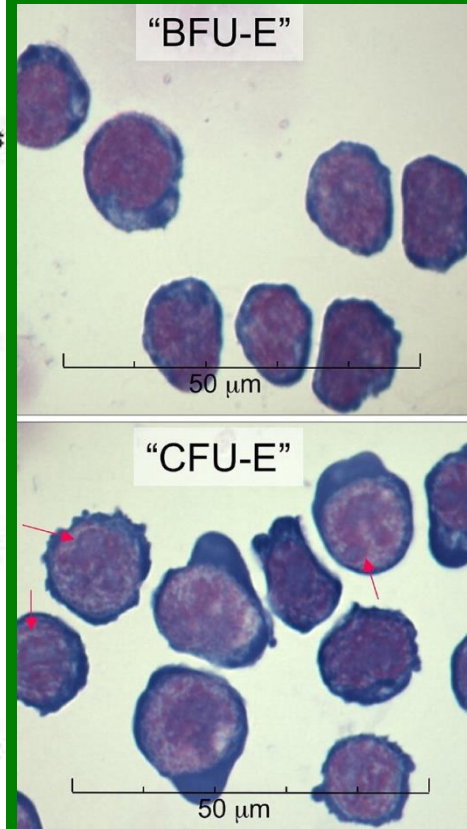
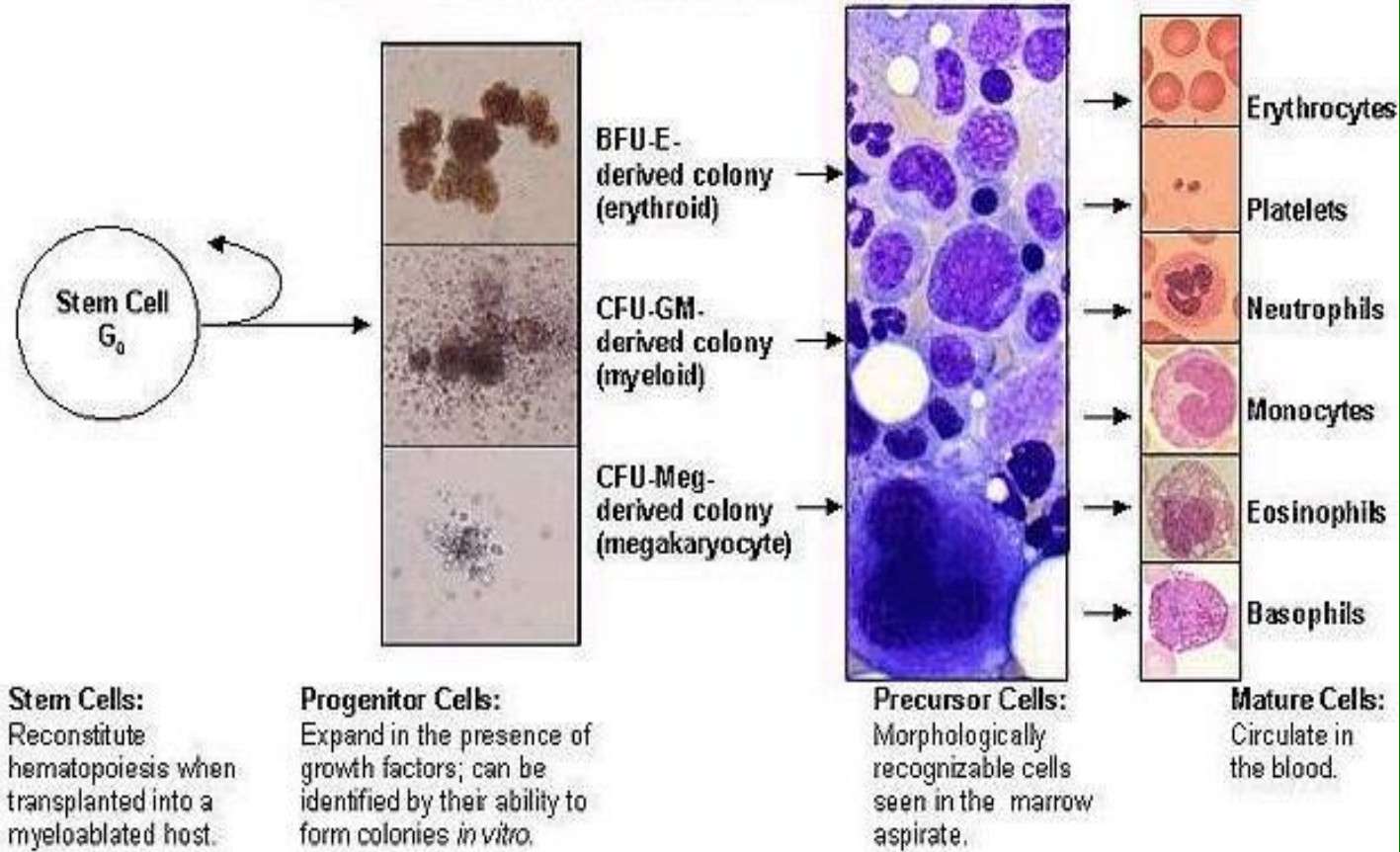
Pracovní prostředí



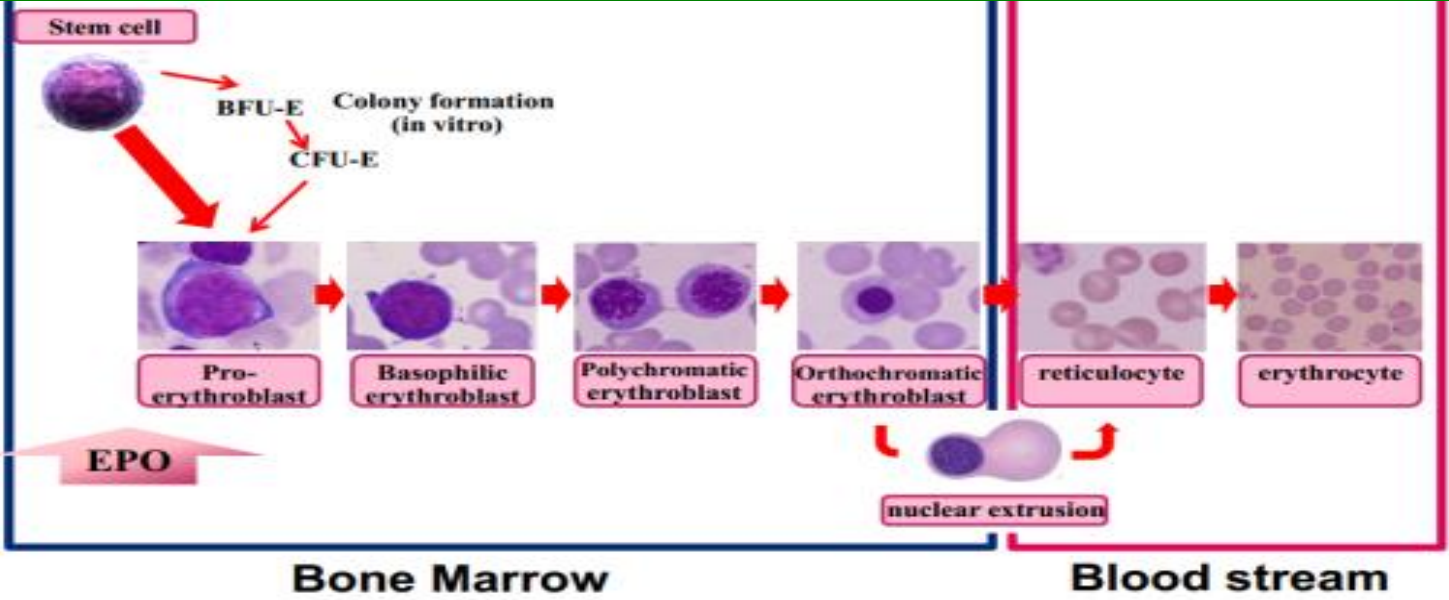
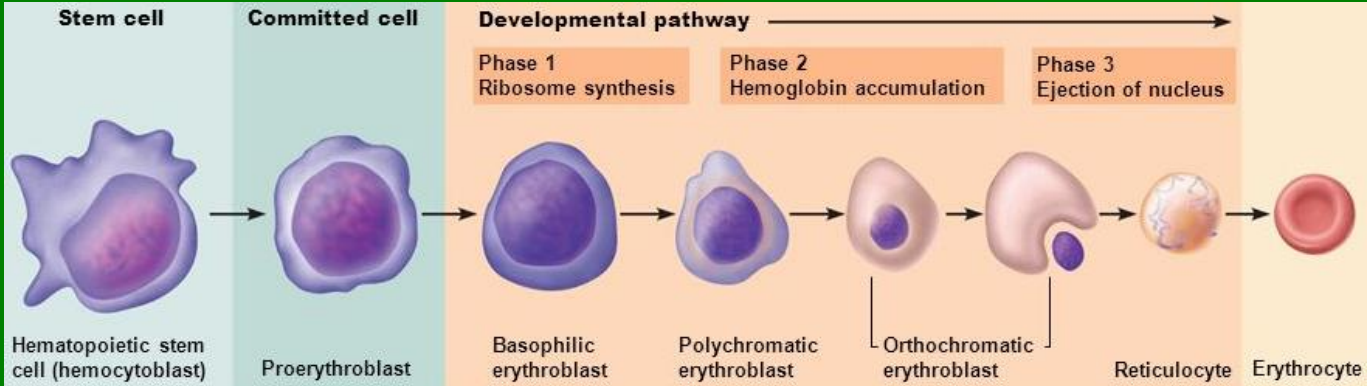
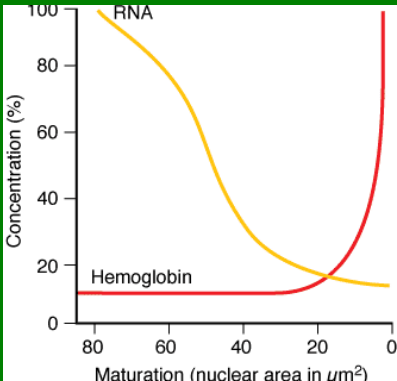
Tkáňové kultivace



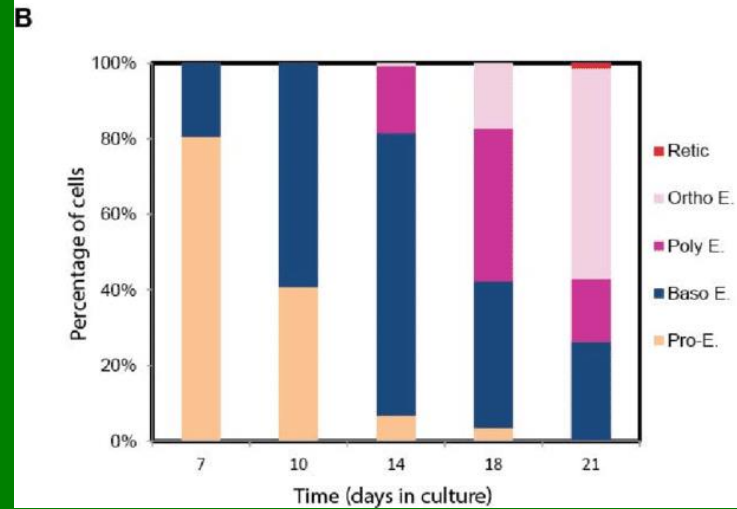
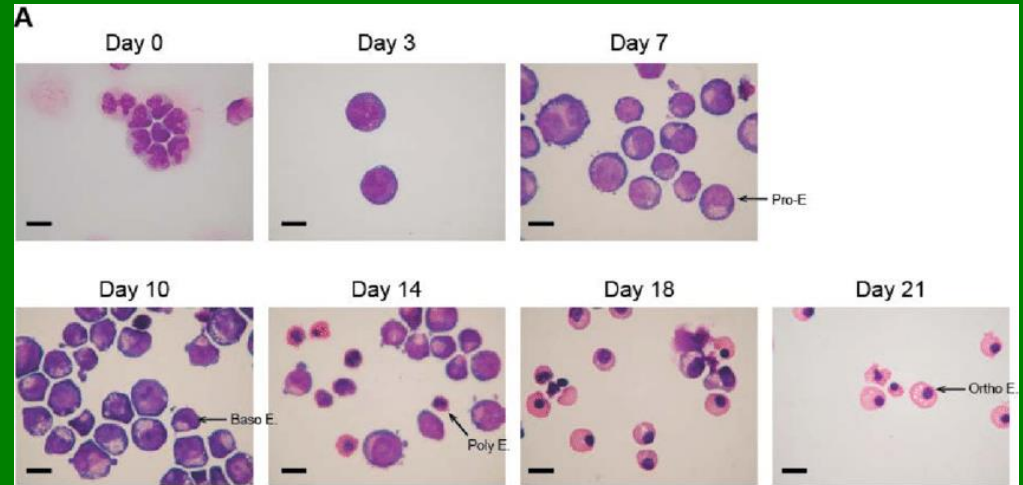
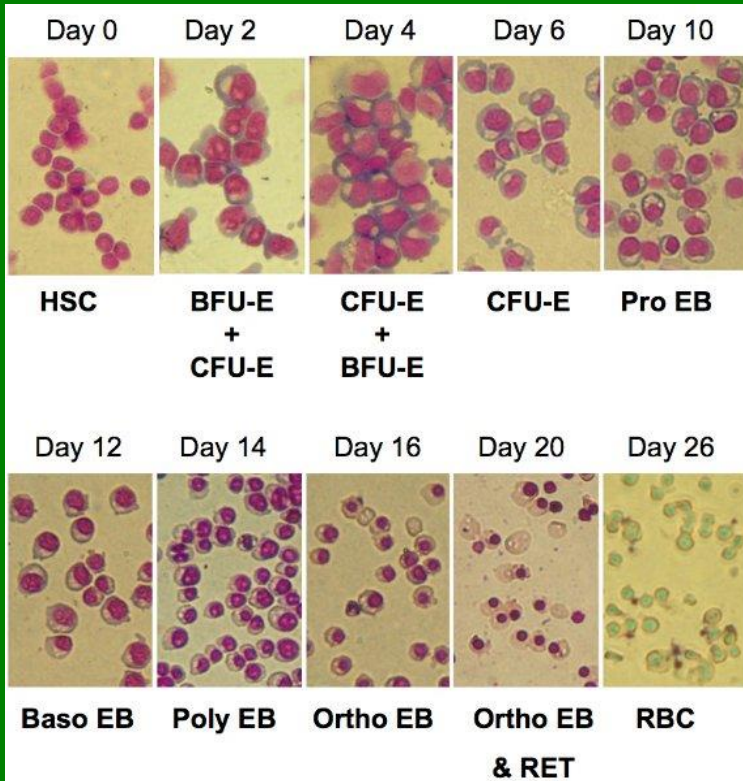
STEM CELL MODEL OF HEMATOPOIESIS



Erythropoéza



Erythropoéza



Granulopoéza

myeloblast



promyelocyte



myelocyte



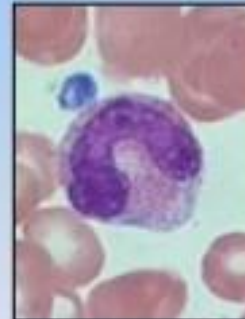
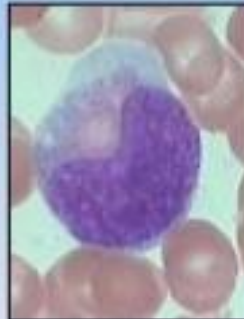
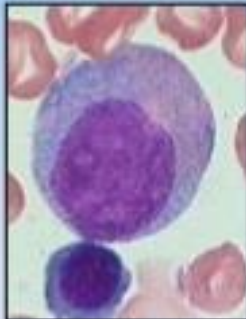
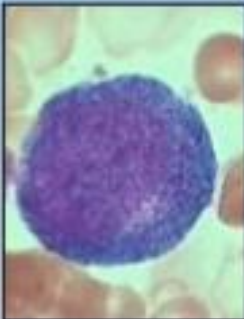
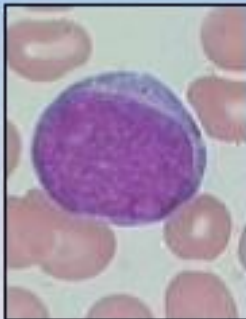
metamyelocyte

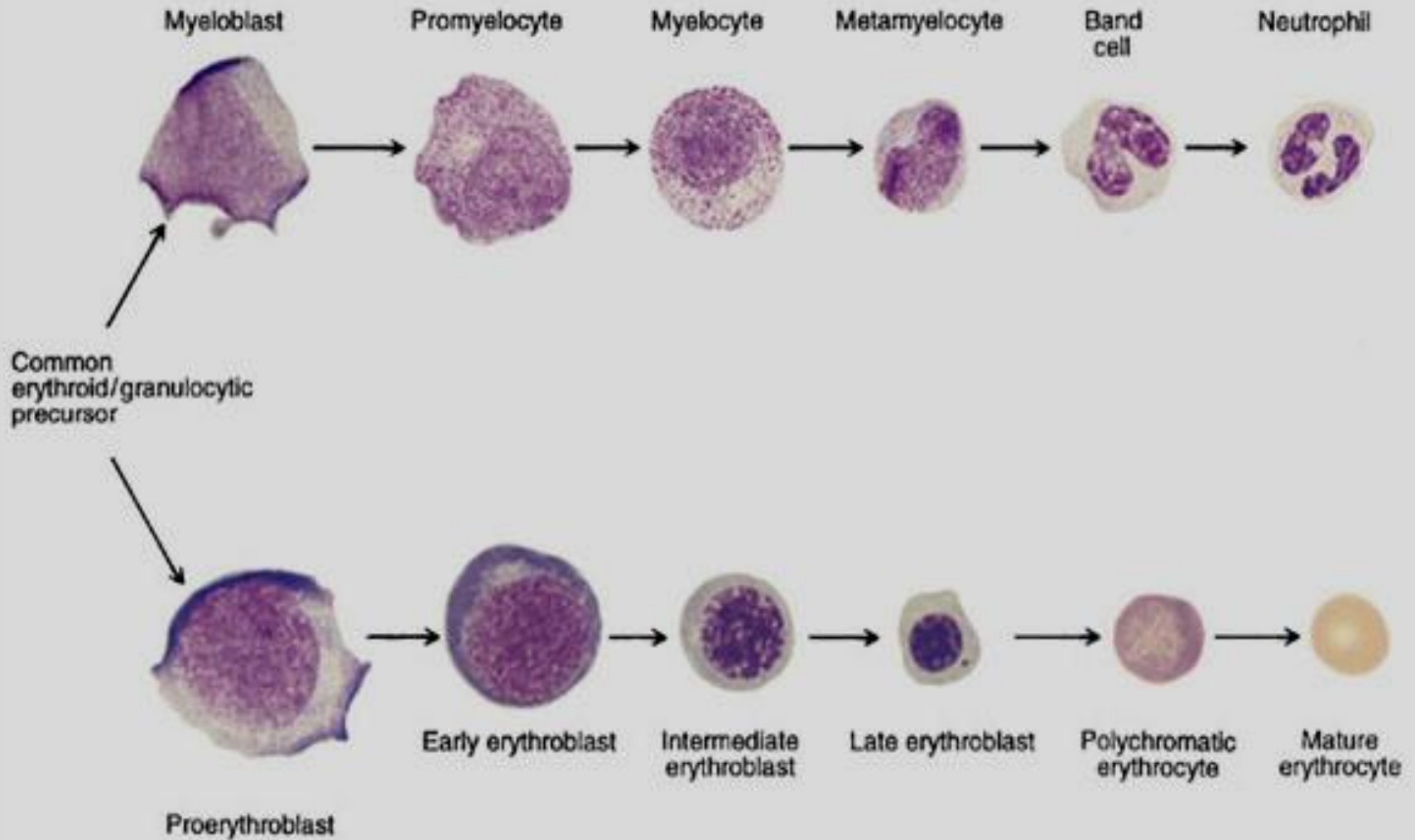


band

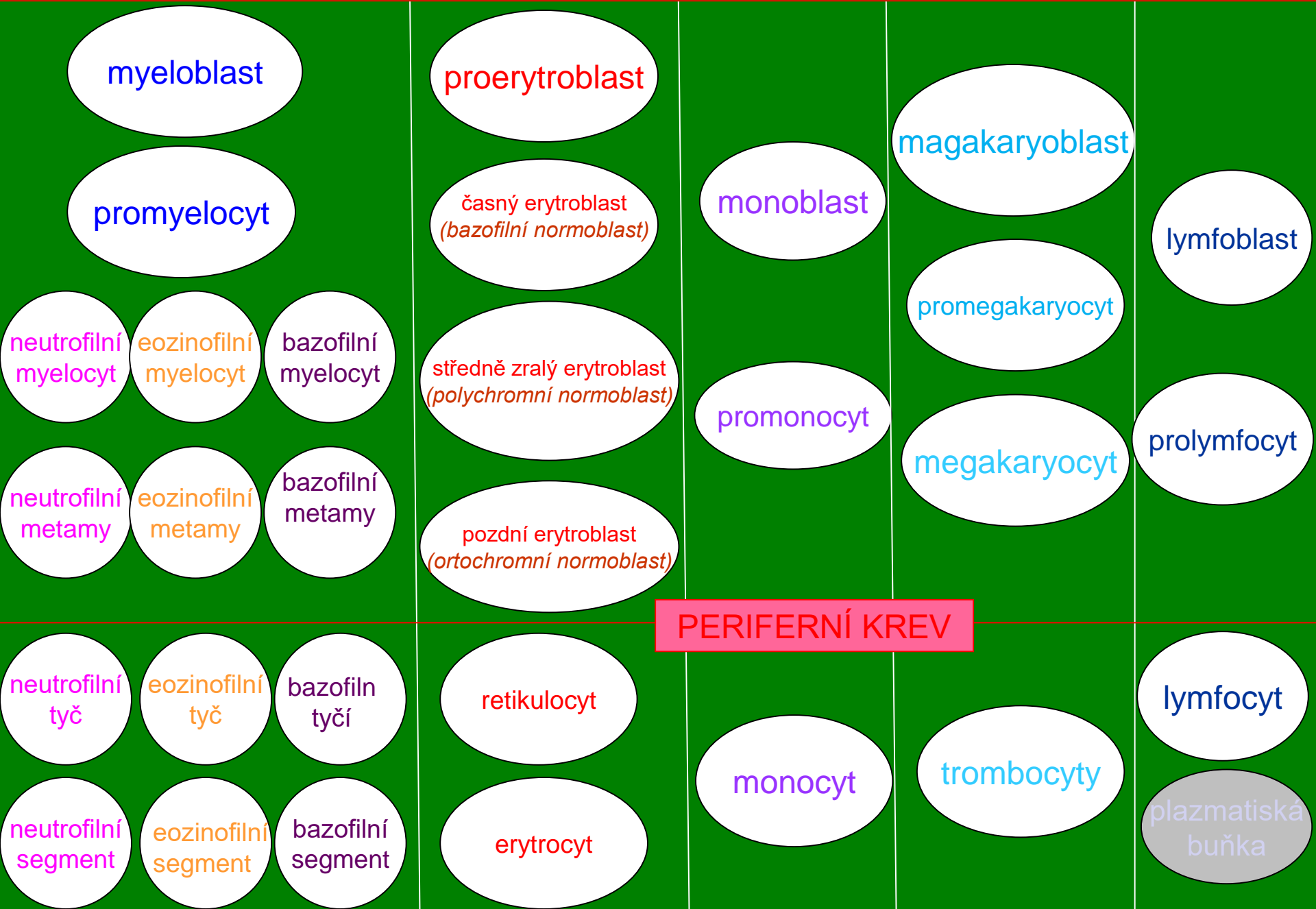


neutrophil





VÝVOJOVÁ STÁDIA HEMATOPOETICKÝCH BUNĚK



Poznámka

Granulocytární elementy (segmentované leukocyty):

- *primární granulace (nespecifická):*
 - *od promyelocytu*
 - *azurofilní*
- *sekundární granulace (specifická):*
 - *od myelocytu až po segment*
 - *neutrofily*
 - *eozinofily*
 - *bazofily*

rozdíl velikostí leukocytů

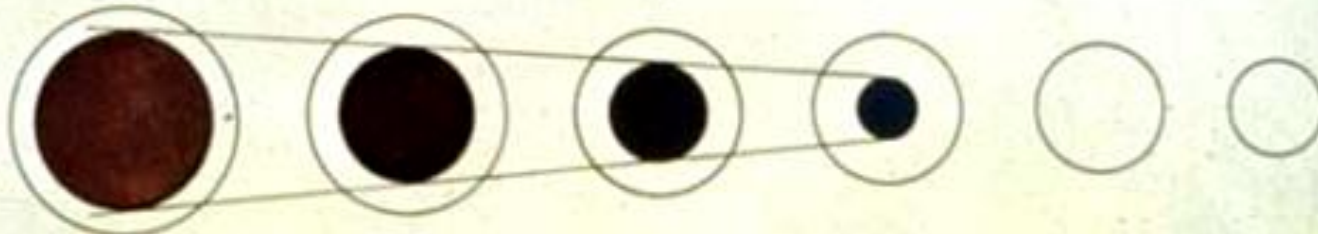


Sledování buněčných morfologických změn



A Cell size and cytoplasm color

zbarvení, obsah
cytoplazmy



B Nuclear size and color

velikost, tvar
jádra



C Nuclear chromatin structure

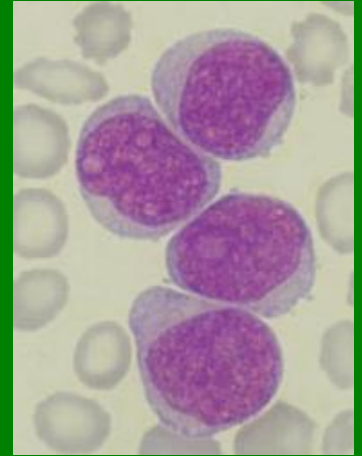
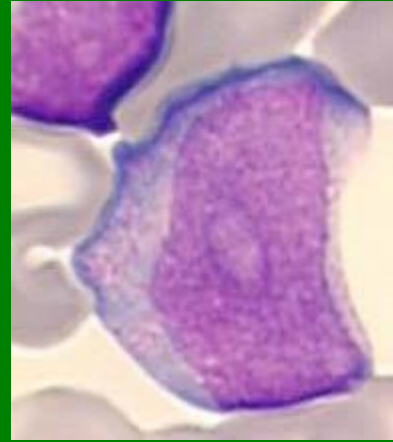
struktura chromatinu,
jadérka



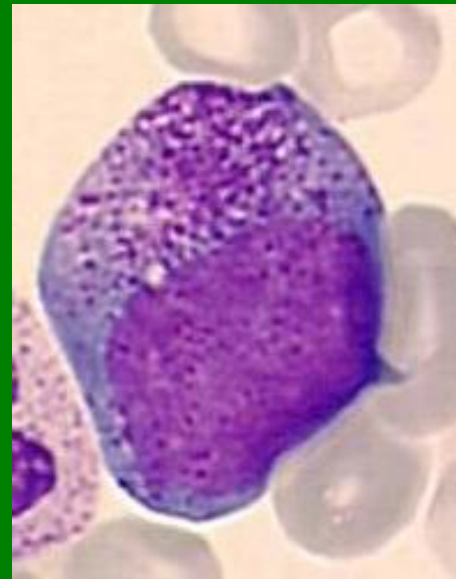
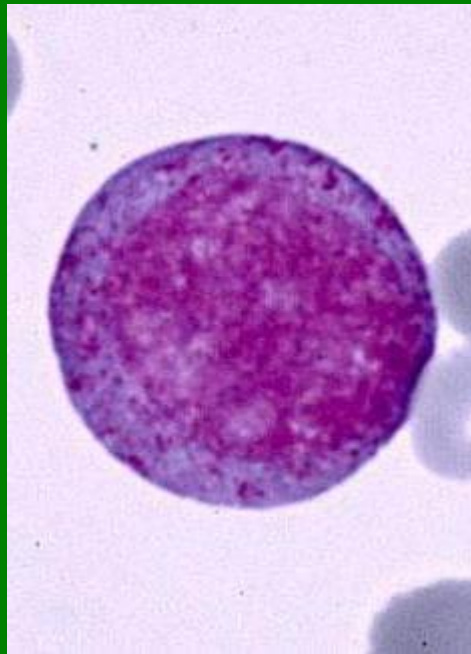
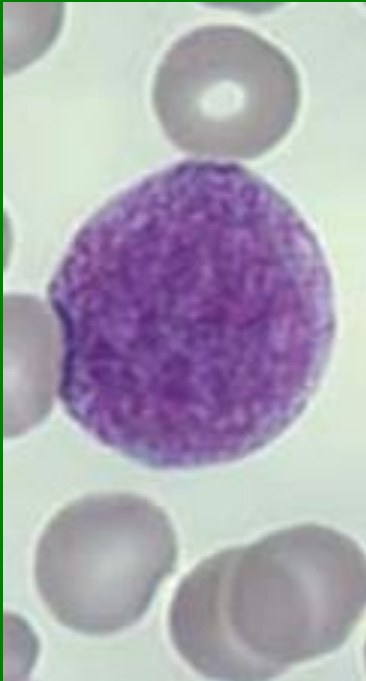
D Composite (Left to right: Rubriblast, Proerythrocyte, Rubricyte, Metarubricyte, Diffusely basophilic erythrocyte, Erythrocyte)

komplexní hodnocení

Myeloblasty

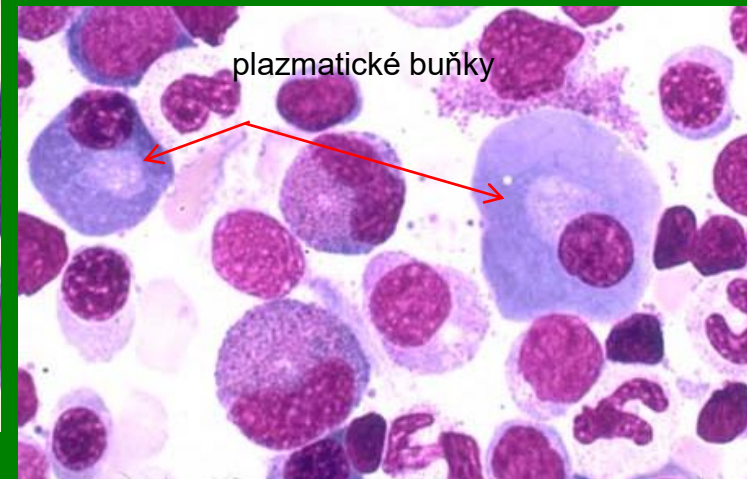
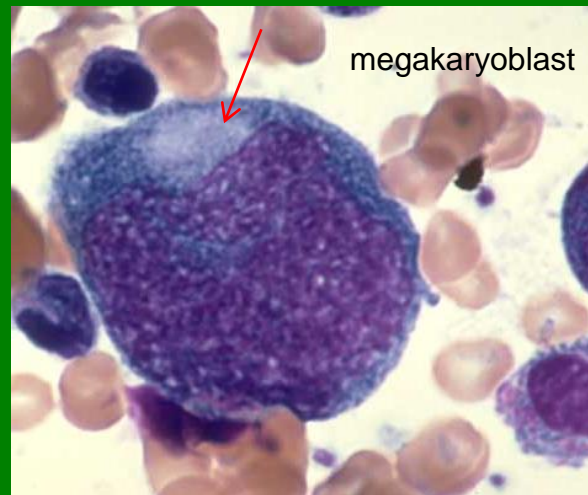
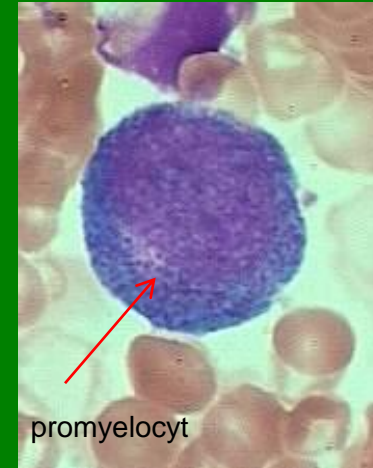
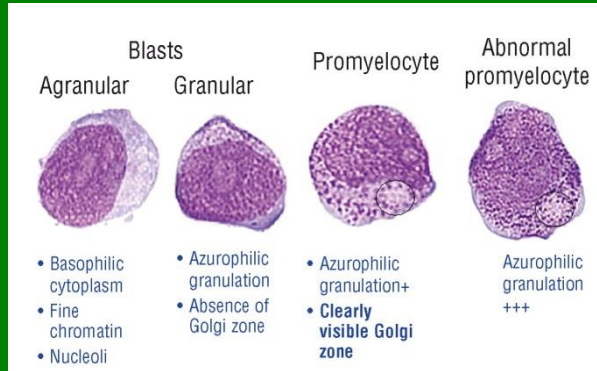


Promyelocyty

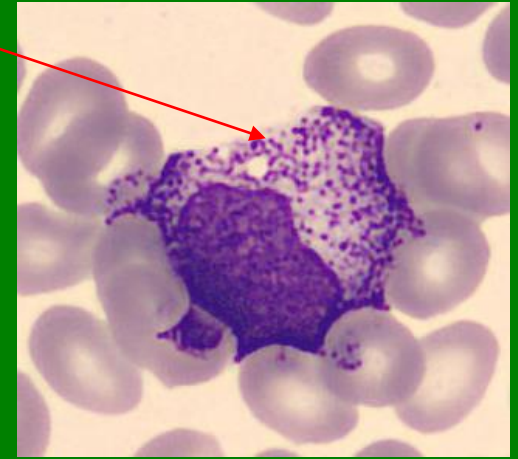
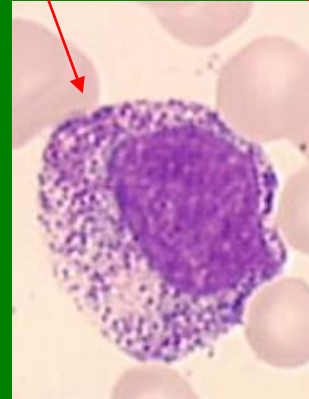
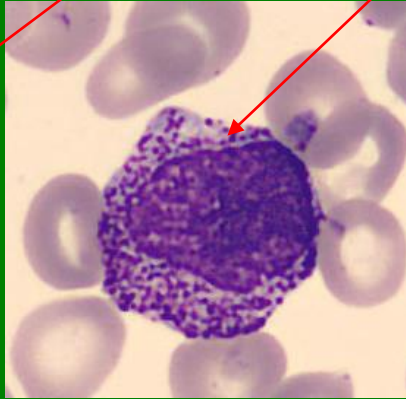
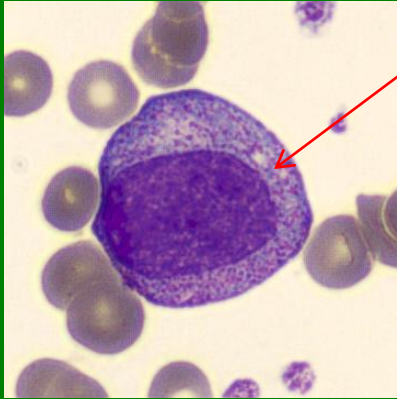


Perinukleární projasnění

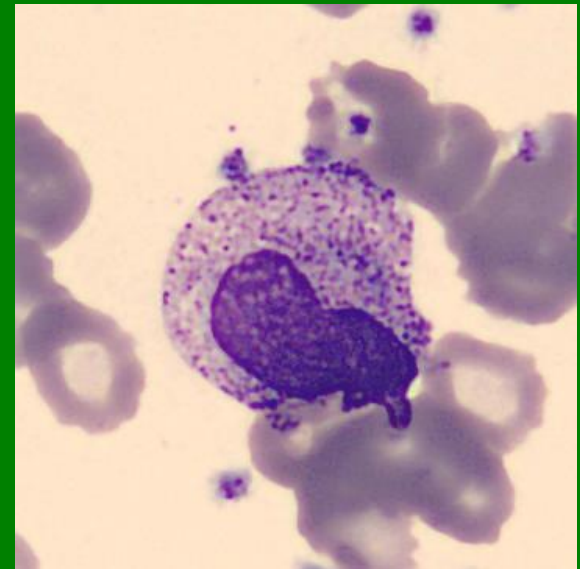
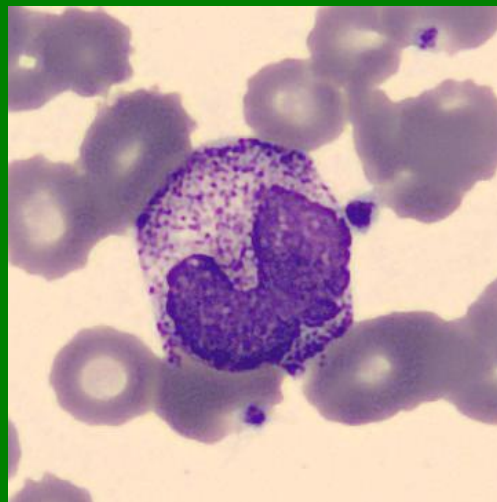
Golgiho zóna (návaznost na jádro přes endoplazmatické retikulum)



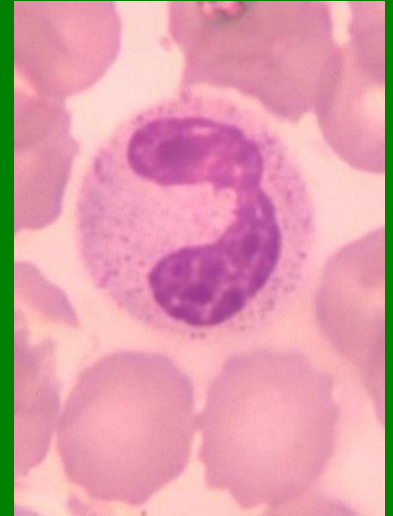
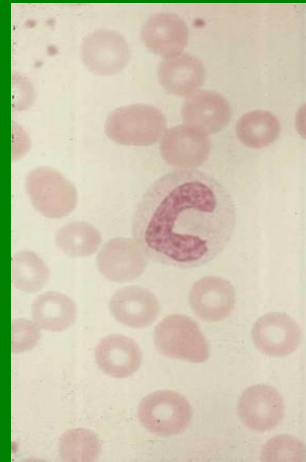
Myelocyty – Ne (*nezralé* - jadérko, *zralé* – bez jadérka)



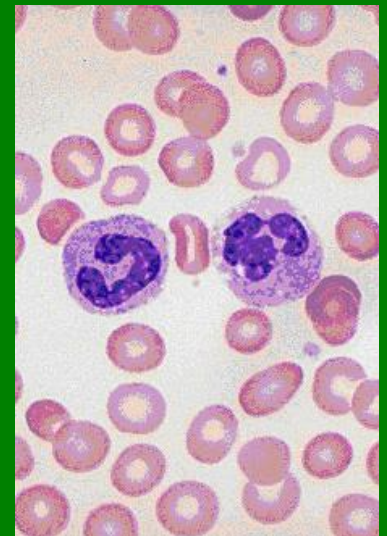
Metamyelocyty - Ne



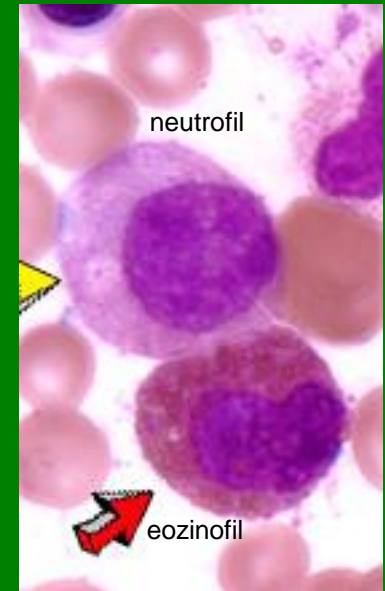
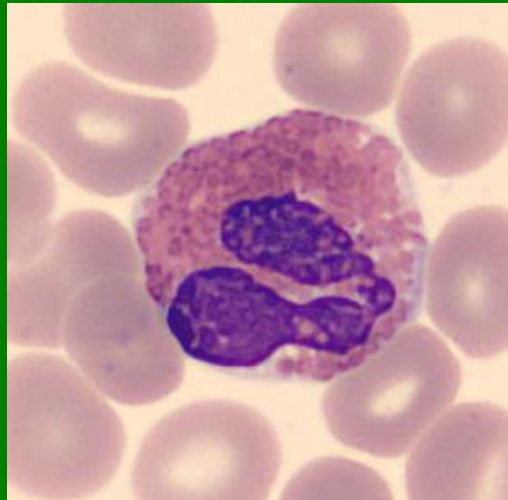
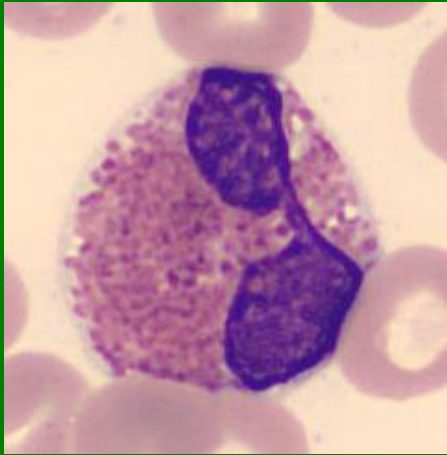
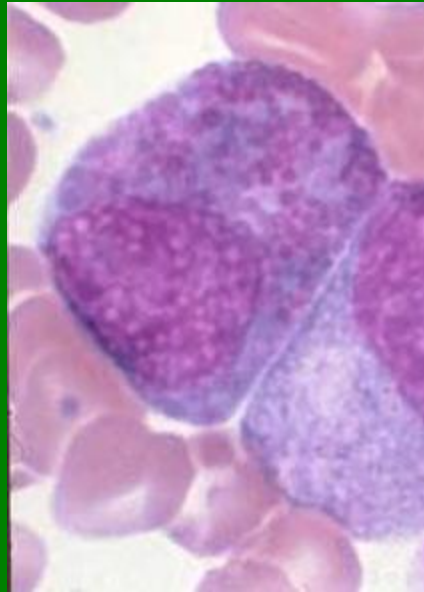
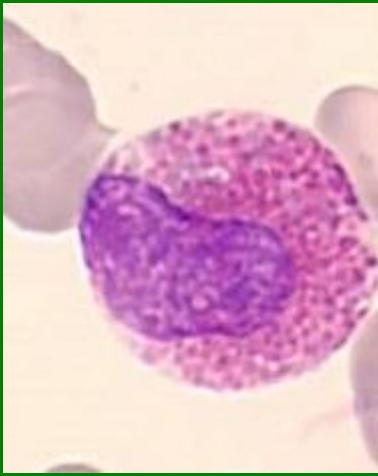
Tyč – Ne (rozdíl mezi nejširším a nejužším tvarem jádra je $1/3$ až $1/2$)



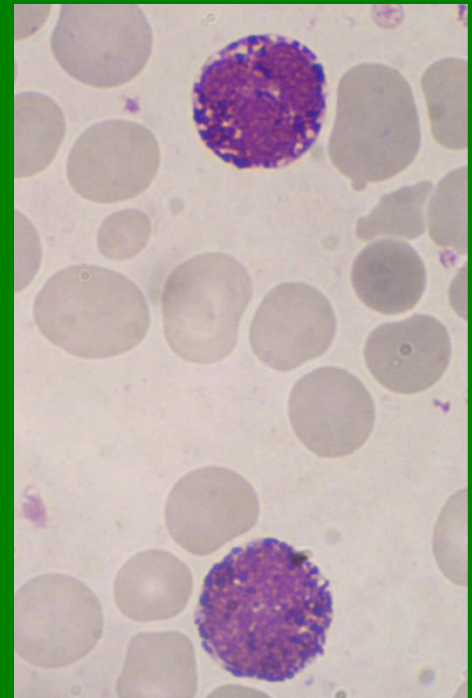
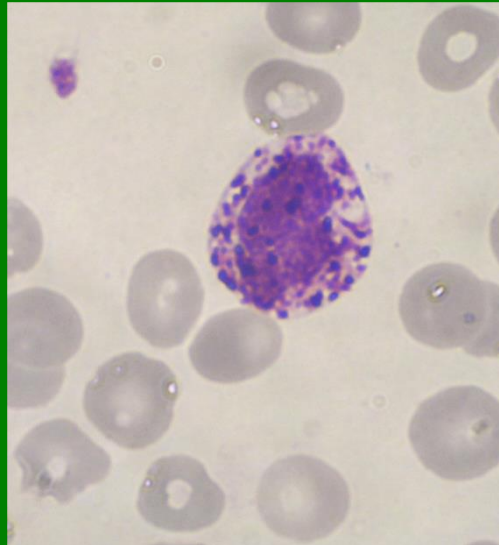
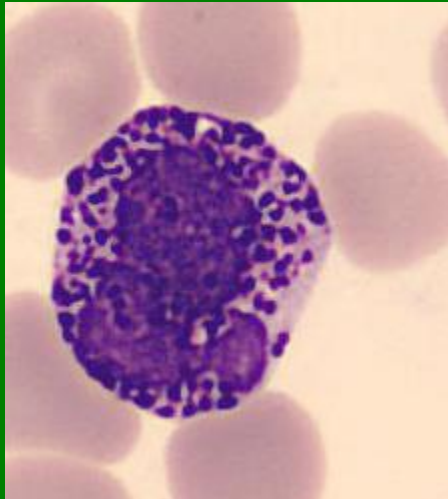
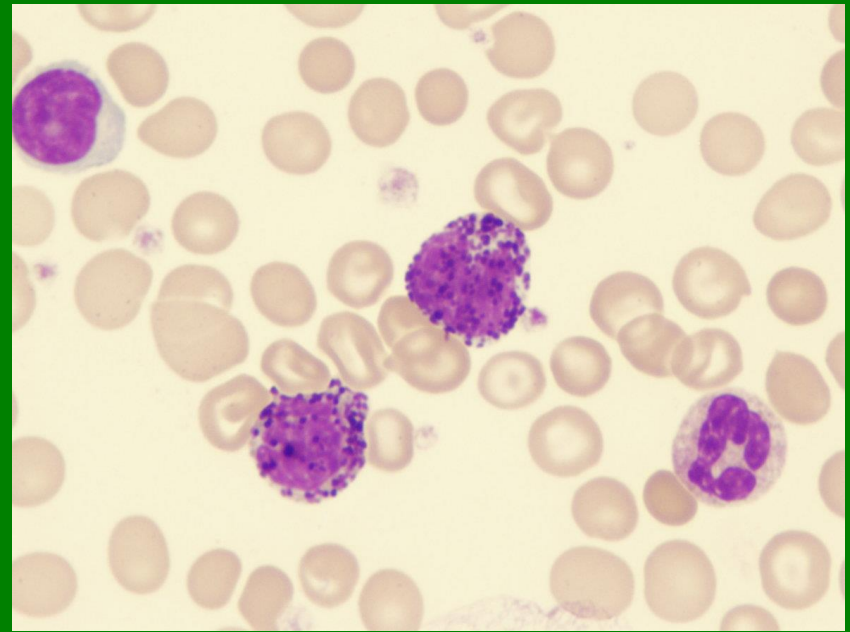
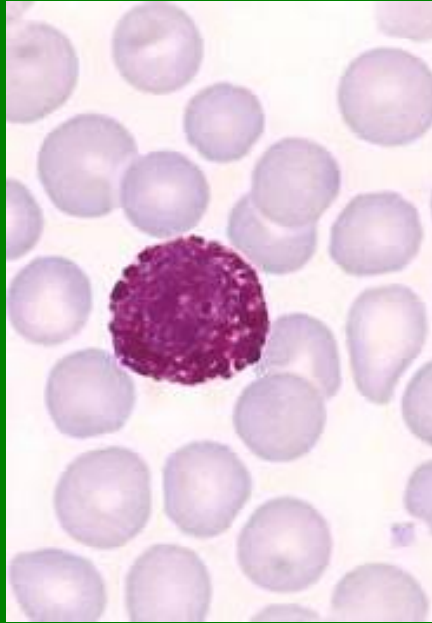
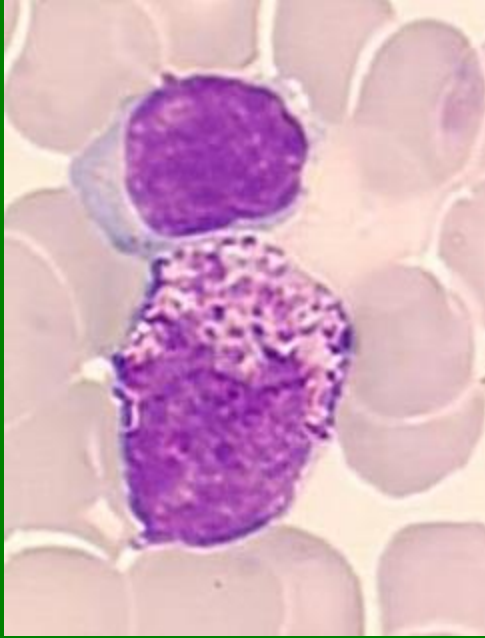
Segment - Ne



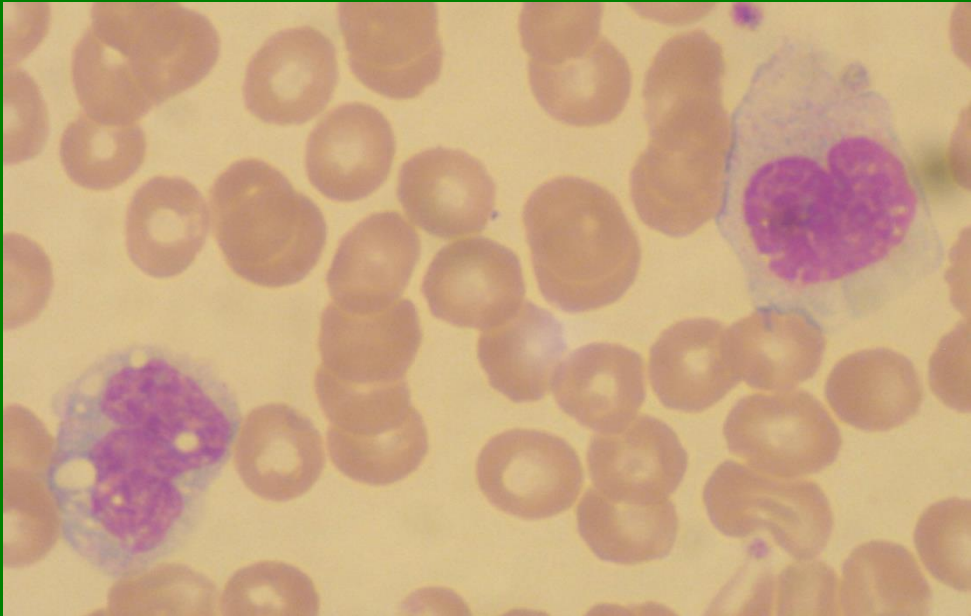
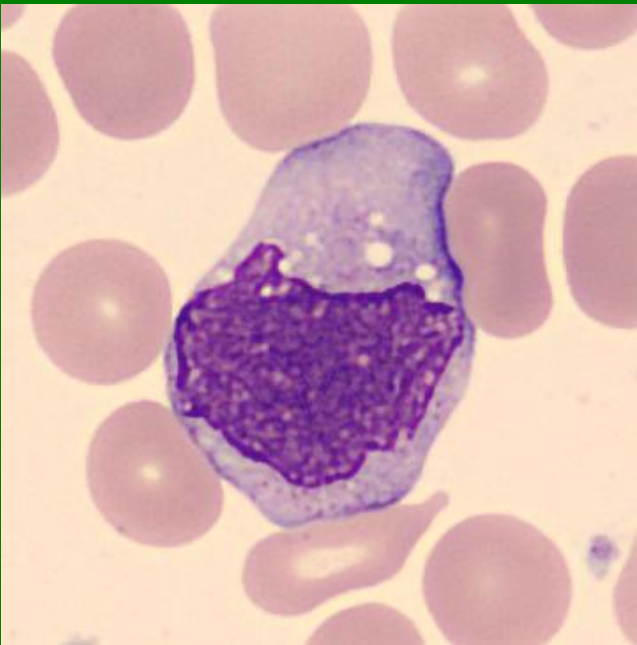
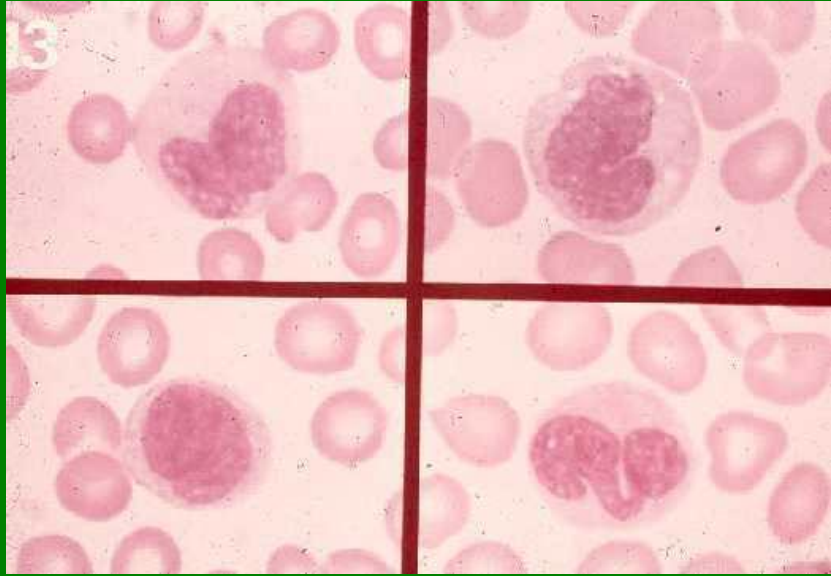
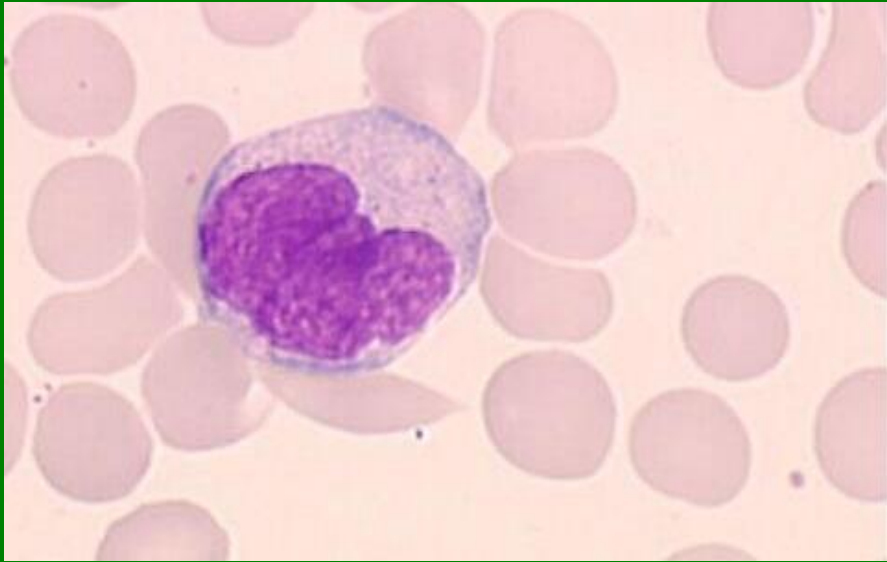
Eozinofily



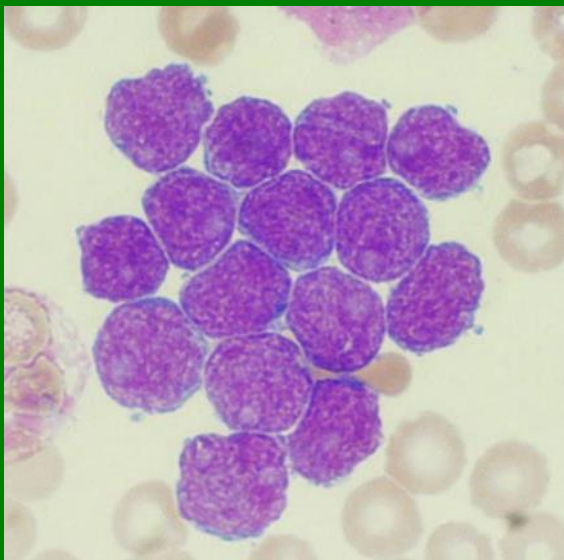
Bazofily



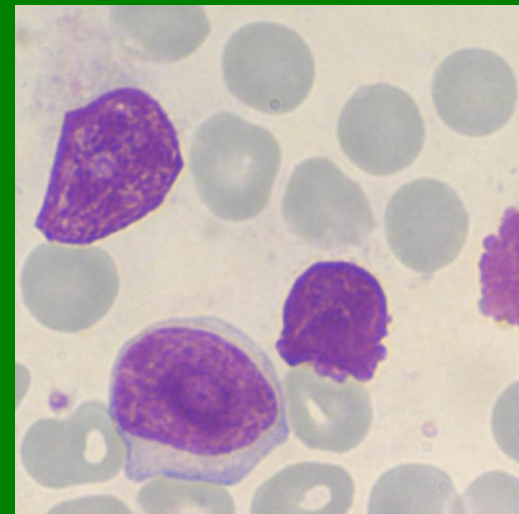
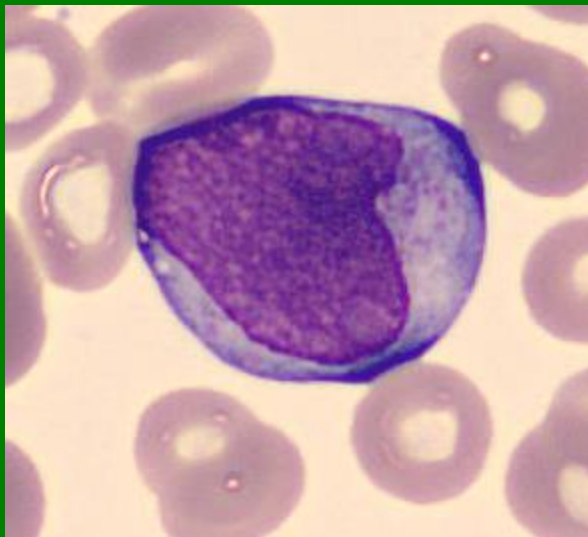
Monocyty



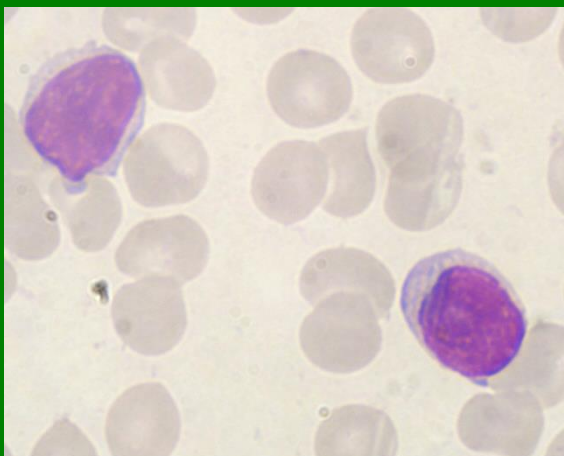
Lymfoblasty



Prolymfocyt



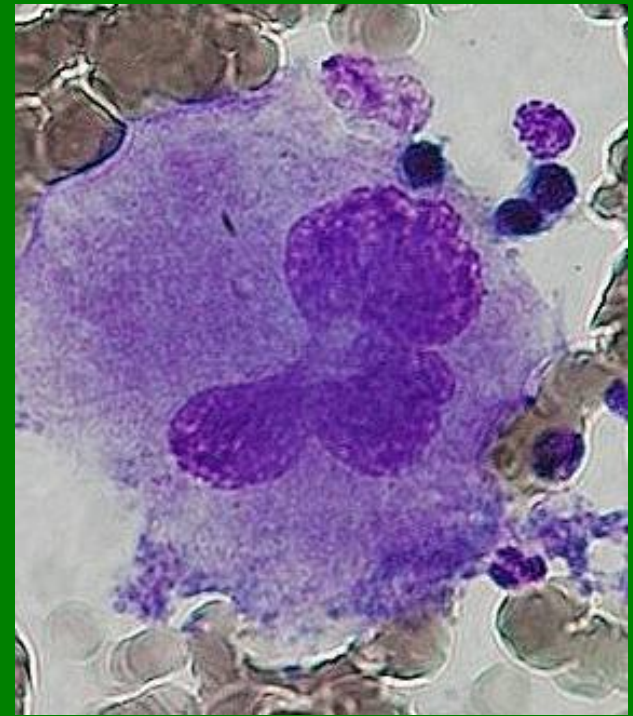
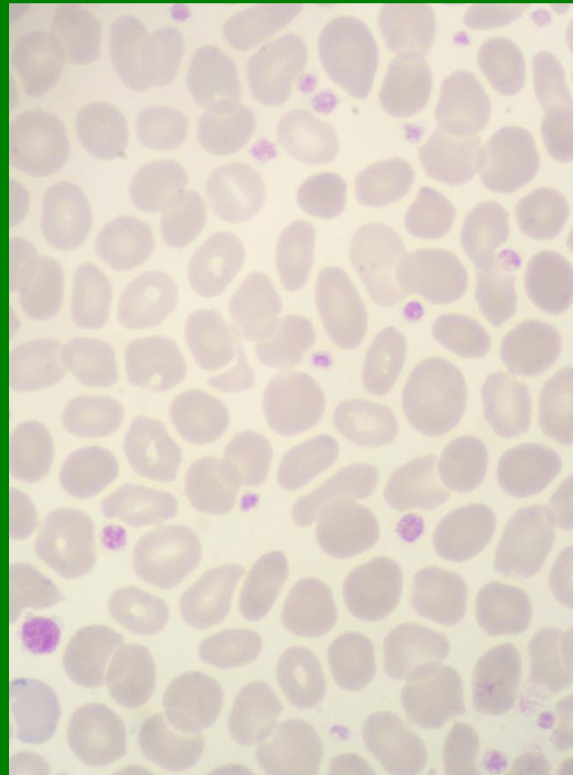
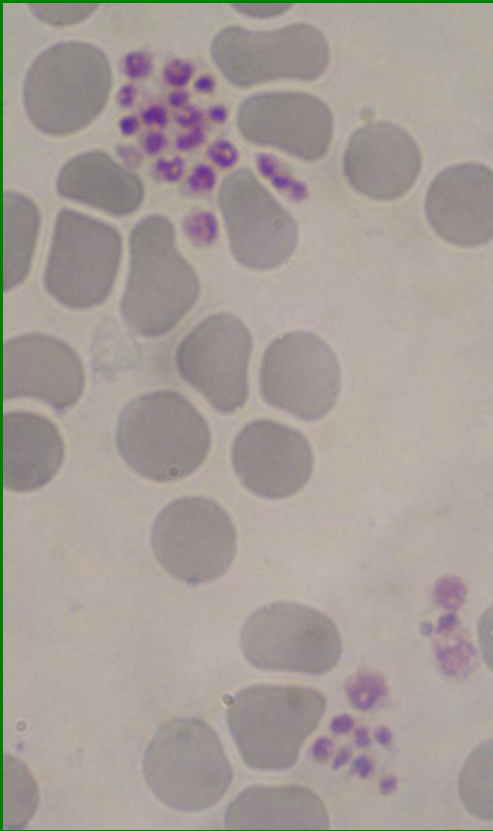
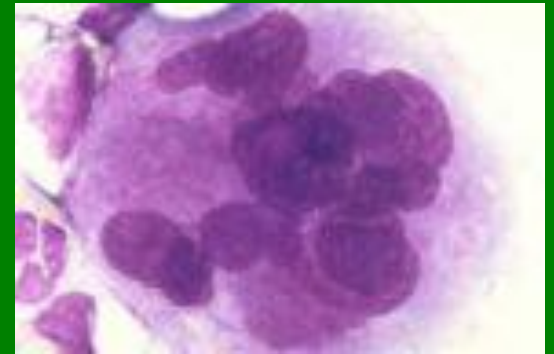
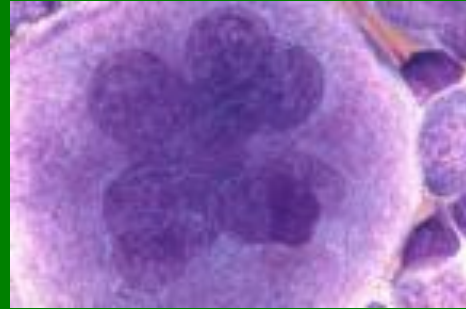
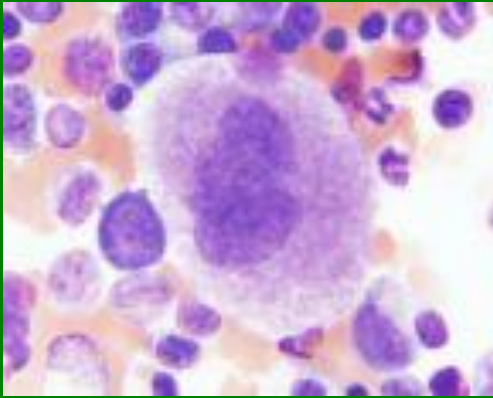
Lymfocyty



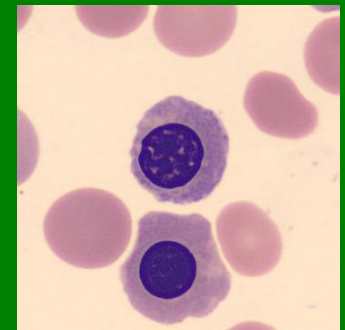
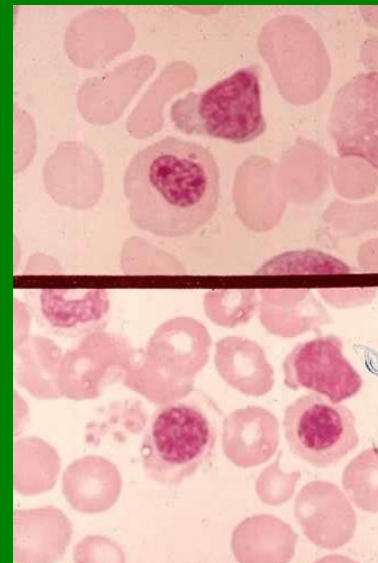
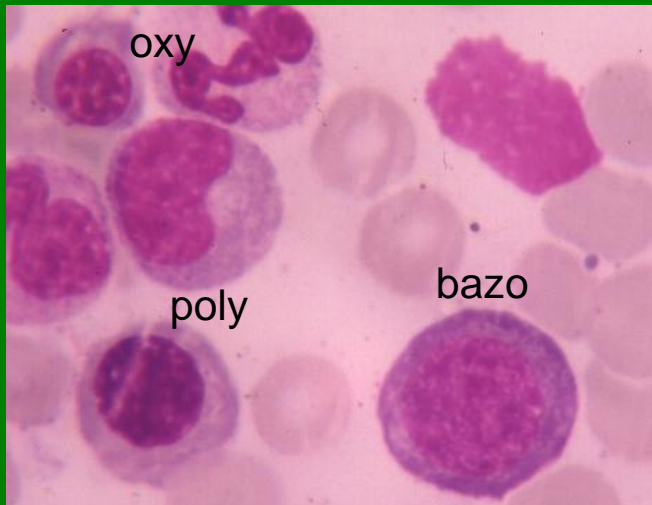
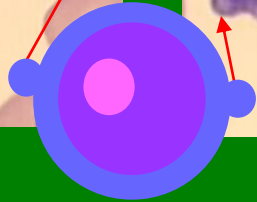
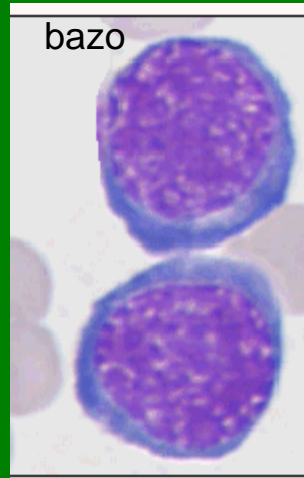
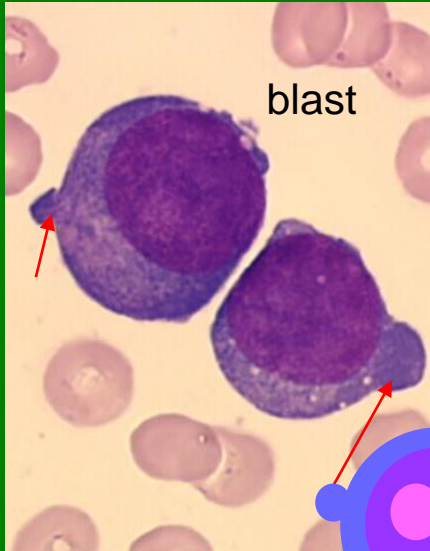
Plazmatická buňka



Megakaryocyty, PLT

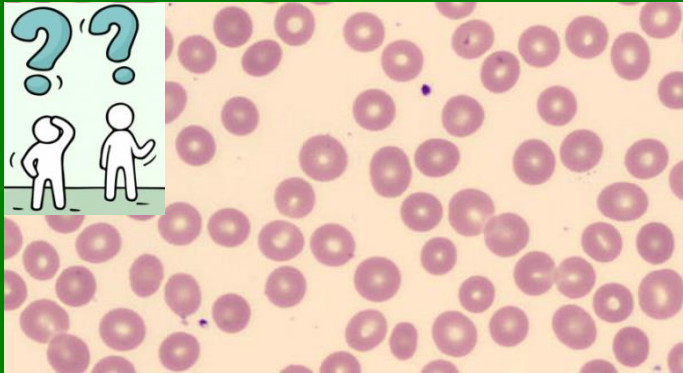


NRBC

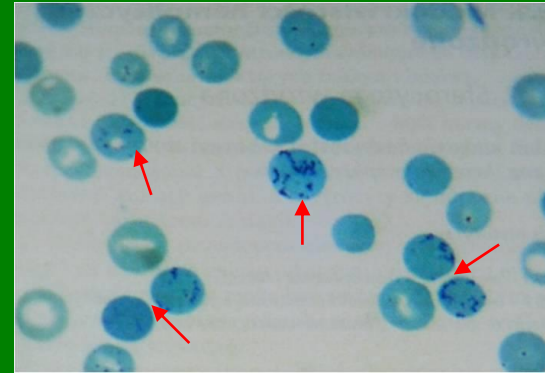


Retikulocyty

RBC/Retic?



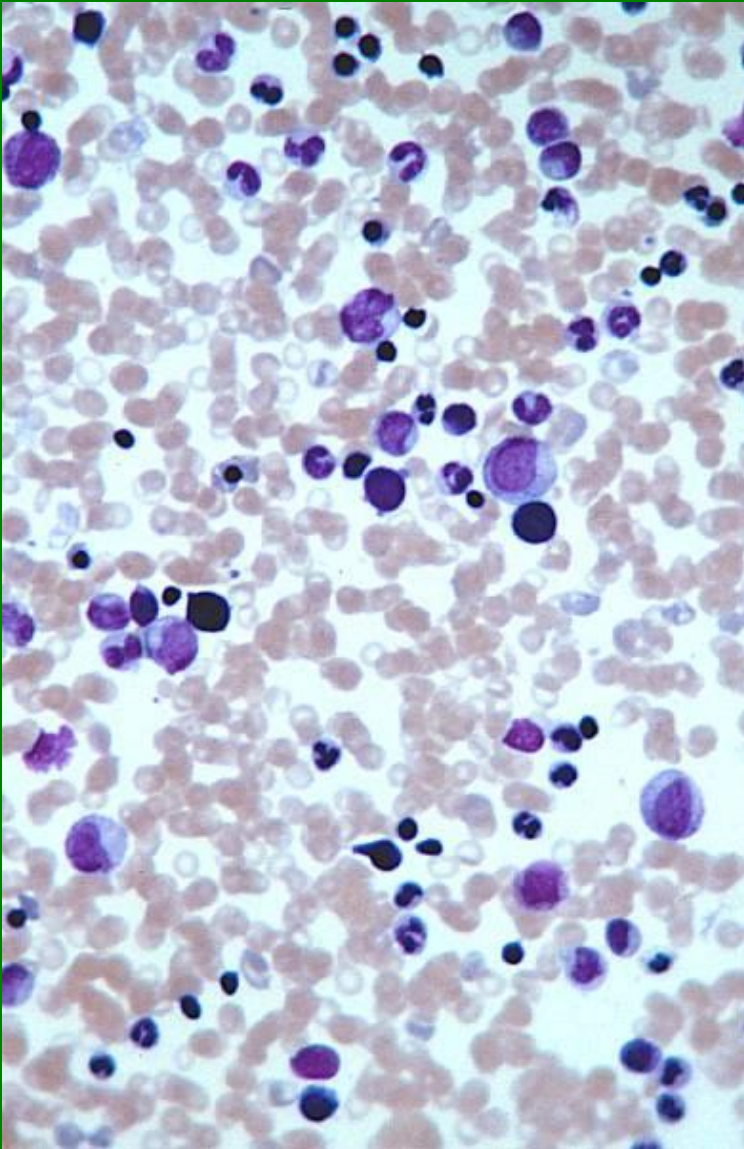
Retic



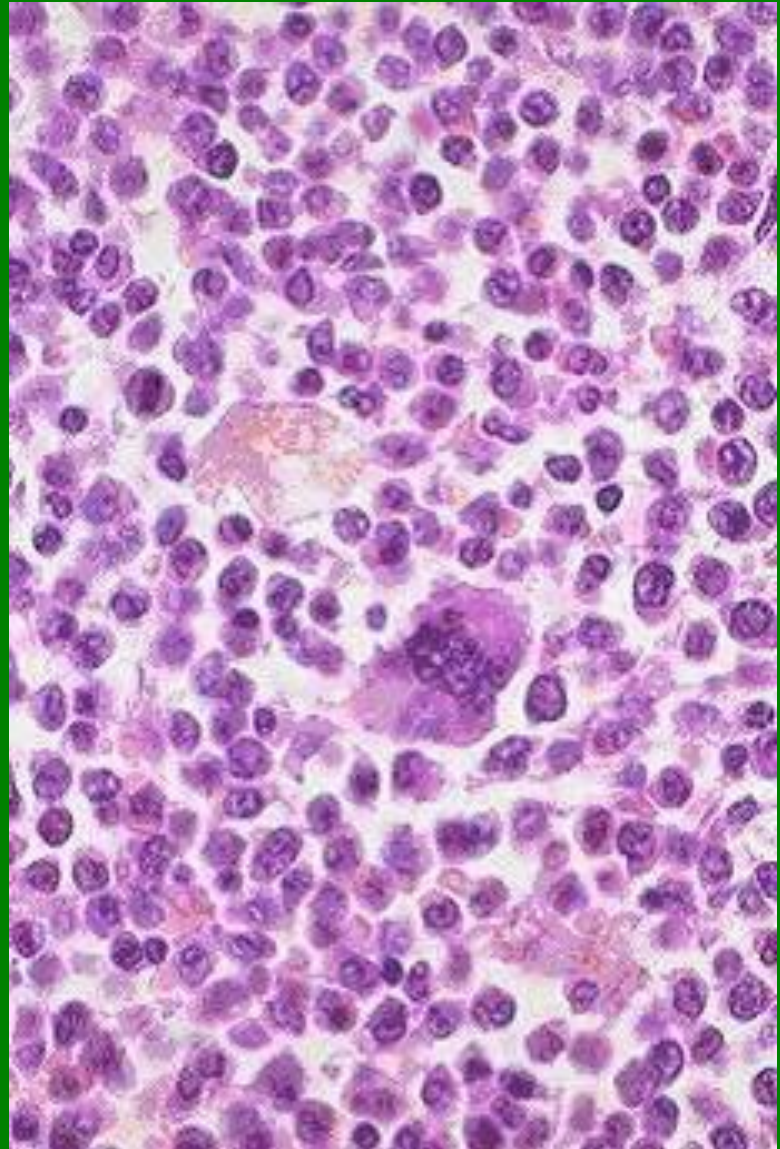
- větší než normocyty
- obsahují zbytky RNA v buněčných organelách (ribozomy, endoplazmatické retikulum)
- proto ještě může docházet k syntéze hemoglobinu
- průkaz speciálním barvením
(nelze prokázat běžným panoptickým barvením)

Kostní dřeň – buněčnost

normální



vysoká



Fyziologické zastoupení jaderných buněk

❑ kostní dřeň

- Proerytroblast: 0 - 2%
- Erytroblast bazofilní: 1 – 3%
- Erytroblast polychromní: 2 – 20%
- Erytroblast ortochromní: 2 – 15%
- ❖ Červená řada – celkem: 15 – 38%
- Myeloblast: 0 – 3%
- Promyelocyt: 0 – 7%
- Myelocyt neutrofilní: 5 – 20%
- Metamyelocyt neurofilní: 5 – 20%
- Tyč neutrofilní: 5 – 25%
- Segment neutrofilní: 5 – 25%
- Eozinofily celkem: 0 – 5%
- Bazofily: 0 – 1%
- ❖ Granulocytární řada celkem: 50 – 70%
- Žírná buňka: 0 – 0,2%
- Lymfocyt: 5 – 20%
- Plazmatická buňka: 0 – 3%
- Monocyt: 0 – 3%

Poměr: (Granulocyty + Monocyty) : Erytrocyty
1,5 : 1 – 5 : 1 (ženy); 1,5 : 1 – 4,2 : 1 (muži)

✓ periferní krev - leukocyty

- Neutrofilní segmenty: 47 – 70%
- Neutrofilní tyče: 0 – 4%
- Lymfocyty: 20 – 45%
- Monocyty: 2 – 10%
- Eozinofily: 0 – 5%
- Bazofily: 0 – 1%

Referenční meze:

<https://labsekce.hematology.cz/referencni-meze/>