

Blood Cells

- Connective tissue

Cells

Fibers

ground substance

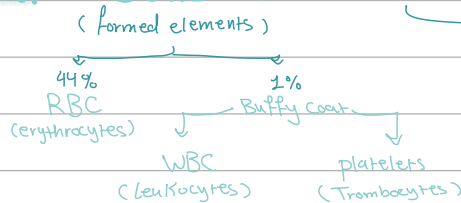
Collagen Reticulum elastic

water

stabilizing micromolecule

- Blood \rightsquigarrow origin: mesenchyme

component: Cells + Plasma \rightsquigarrow Lacks Fibers



- Hematocrit \rightsquigarrow Ratio of RBC volume to whole Blood

Male = 40% - 53%

Female = 36% - 48%

- Plasma proteins

Albumins

Fibrinogen

Globulins

• secreted by liver

• secreted by liver

α, β

γ

• Transports steroid hormones + F.A

• Clot Formation

• secreted by liver

• secreted by plasma cell

• Transports Fat-Sol vitamins

- Lipids
- Iron

- Blood stain \rightsquigarrow Leishman's stain

Eosin

Methylene Blue

Methyl Alcohol

Azure Dye

acidic dye

basic dye

Fixative

pink-red

blue-purple

- Erythrocytes \rightsquigarrow Male = 4.5 - 5.5 mil/mm³

Female = 4 - 5 mil/mm³

* Live for 120 day then destroyed by Macrophages of liver, spleen, bone marrow

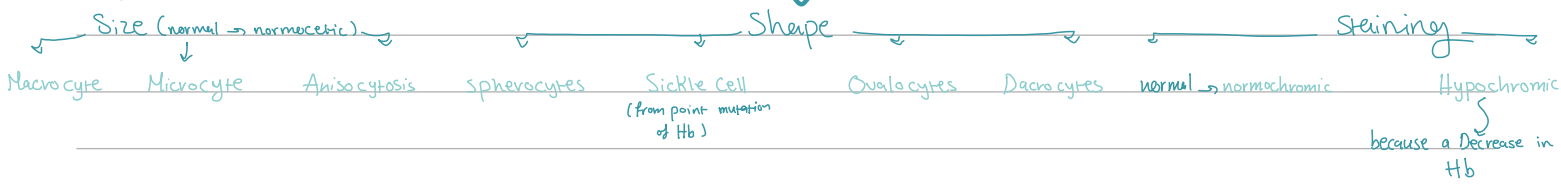
* Biconcave shape \rightsquigarrow central pale area 1/3 of cell \rightsquigarrow normochromic RBC (if no central pale area \rightsquigarrow spherocytosis)

* Plasma membrane \rightsquigarrow to prevent fragmentation \rightsquigarrow cytoskeleton of (Spectrin + Ankyrin)

* Diameter \rightsquigarrow 7.5 μ m

* in low/slow circulation or \downarrow fluid \rightsquigarrow Rouleaux - reversible

Abnormalities of Erythrocyte

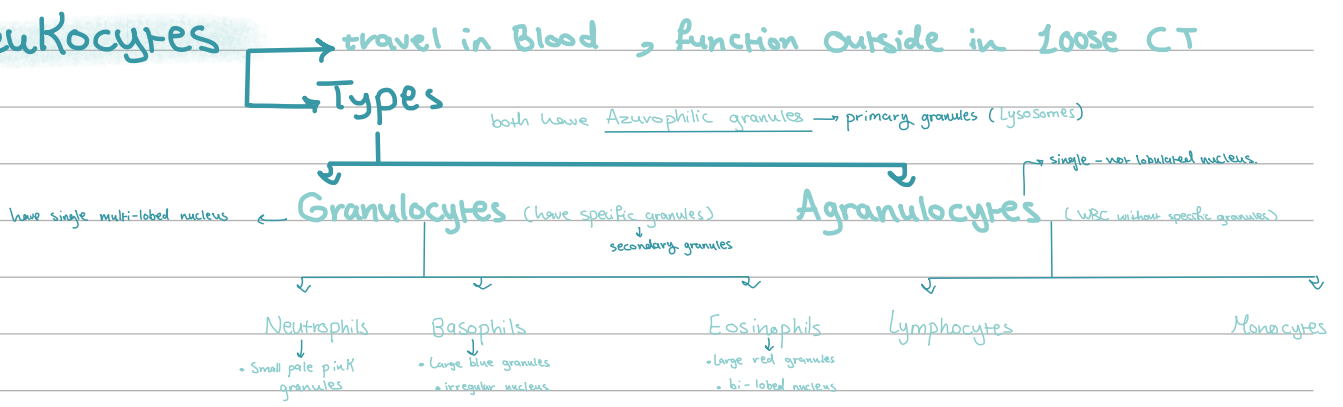


loss of RBC → Hypoxia → is detected by Kidneys → produce Erythropoietin → stimulate Erythropoiesis from bone marrow

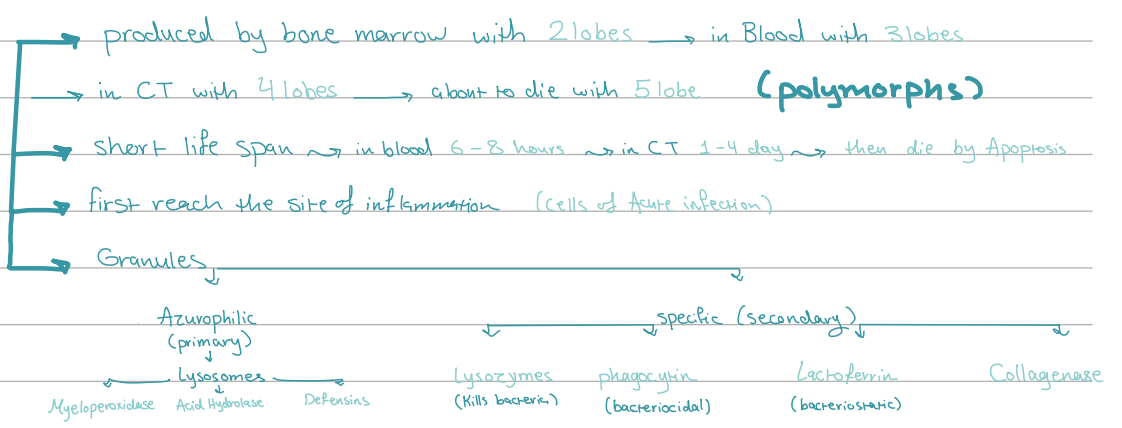
↓ in RBC #n.
Anemia

↑ in RBC #n.
Polycythemia

Leukocytes



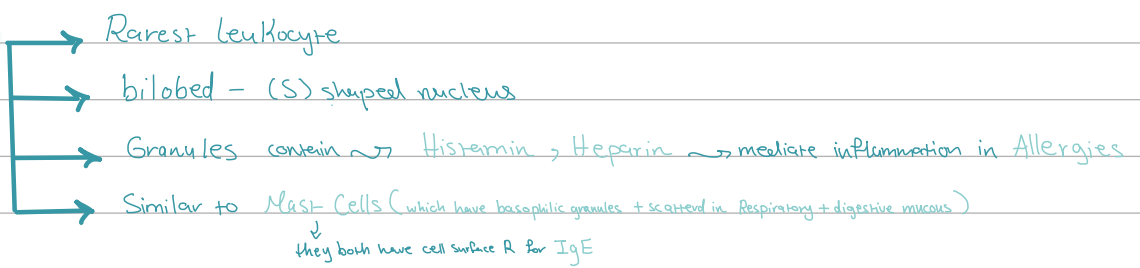
Neutrophils



*pyrogenic → bacterial infection producing Pus

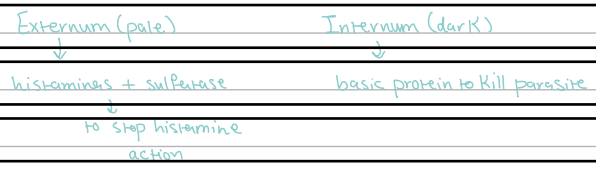
*pyrogenic → bacterial infection producing Heat

Basophils



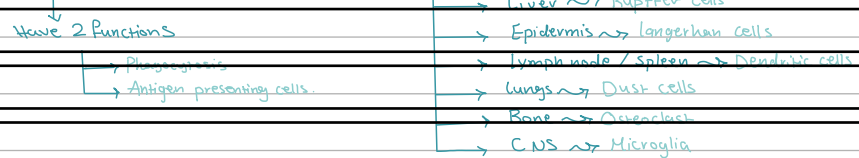
Eosinophils

- usually bi-lobed nuclei
- red granules
- help in ending Allergic rxn + fighting parasitic infections
- Specific granules (Crystalloid granules)



Monocyte

- Largest leukocytes
- Bluish (unclear) cytoplasm due to lysosomes (Azurophilic granules)
- mononuclear phagocyte system



Lymphocytes

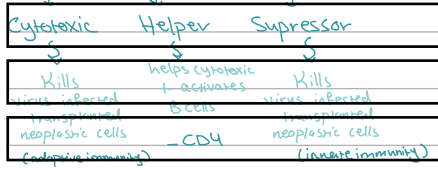
- Smallest leukocyte
- Large rounded nucleus (takes most of cell) → cytoplasm → large + light → active
- Adaptive immunity

T Cells

B Cells

NK Cells

- Cell mediated immunity
- Humoral immunity
- Always active
- once activated
- memory cells
- plasma cells
- Antibodies
- detect cells that does not express MHC molecule.



- IgM, IgD - BCR

CD8

TCR

binds Free Antigen

TCR (specific to certain antigen)

endocytosis + fragmentation

restricted to MHC bound antigen

present it on MHC-2

MHC-1

MHC-2

- on all nucleated cell surface
- present a cell derived peptide

- on APC surface
- present a injected peptide

when T-helper cell binds it → activate B cell proliferation + activation

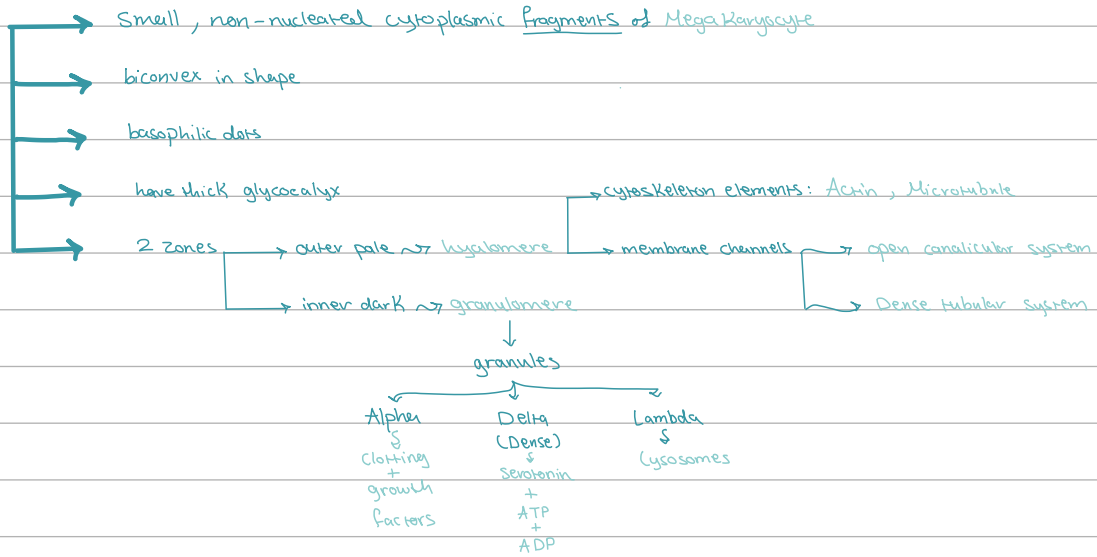
- Cytotoxic T cells → recognize Ag on MHC-1



- T Helper cells → recognize Ag on MHC-2 on APC → dendritic cell → B cell



Platelets (Thrombocytes)



Hematopoiesis

Hematopoiesis → Blood Cell Formation

Sites of hematopoiesis

1. yolk sac

2. Liver + Spleen

3. bone marrow

(extramedullary hemopoiesis)

(medullary hemopoiesis)

Red bone marrow

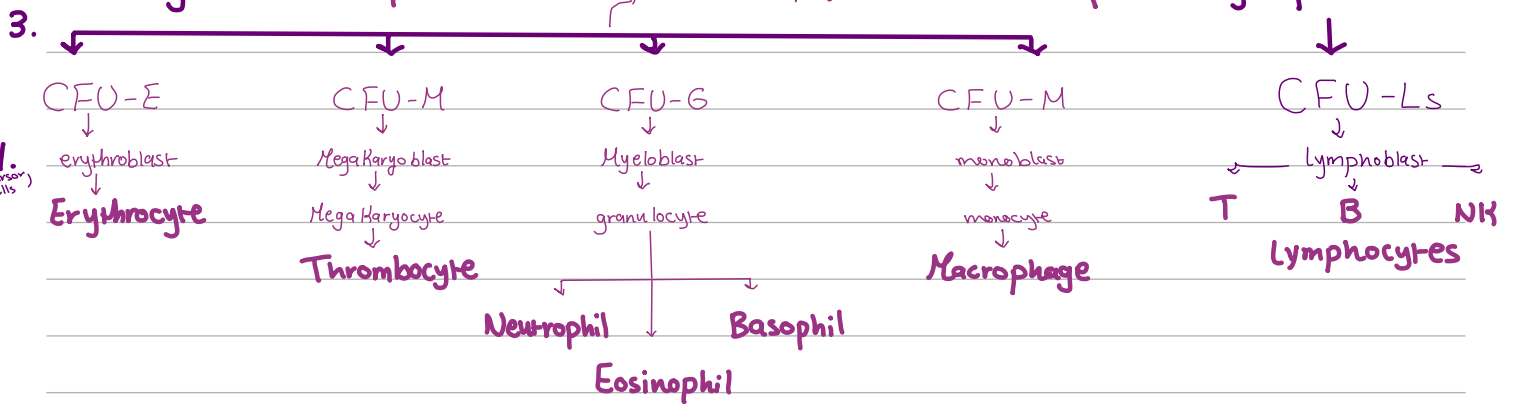
- Hematopoietic Stem cells
- Macrophages
- Sinusoidal capillaries → discontinuous basement membrane
- reticular tissue for support. (stroma)
- small number of adipocytes

1. Hematopoietic Stem Cells (HSC) (pluripotent)

have self renewal capacity + slow rate of division

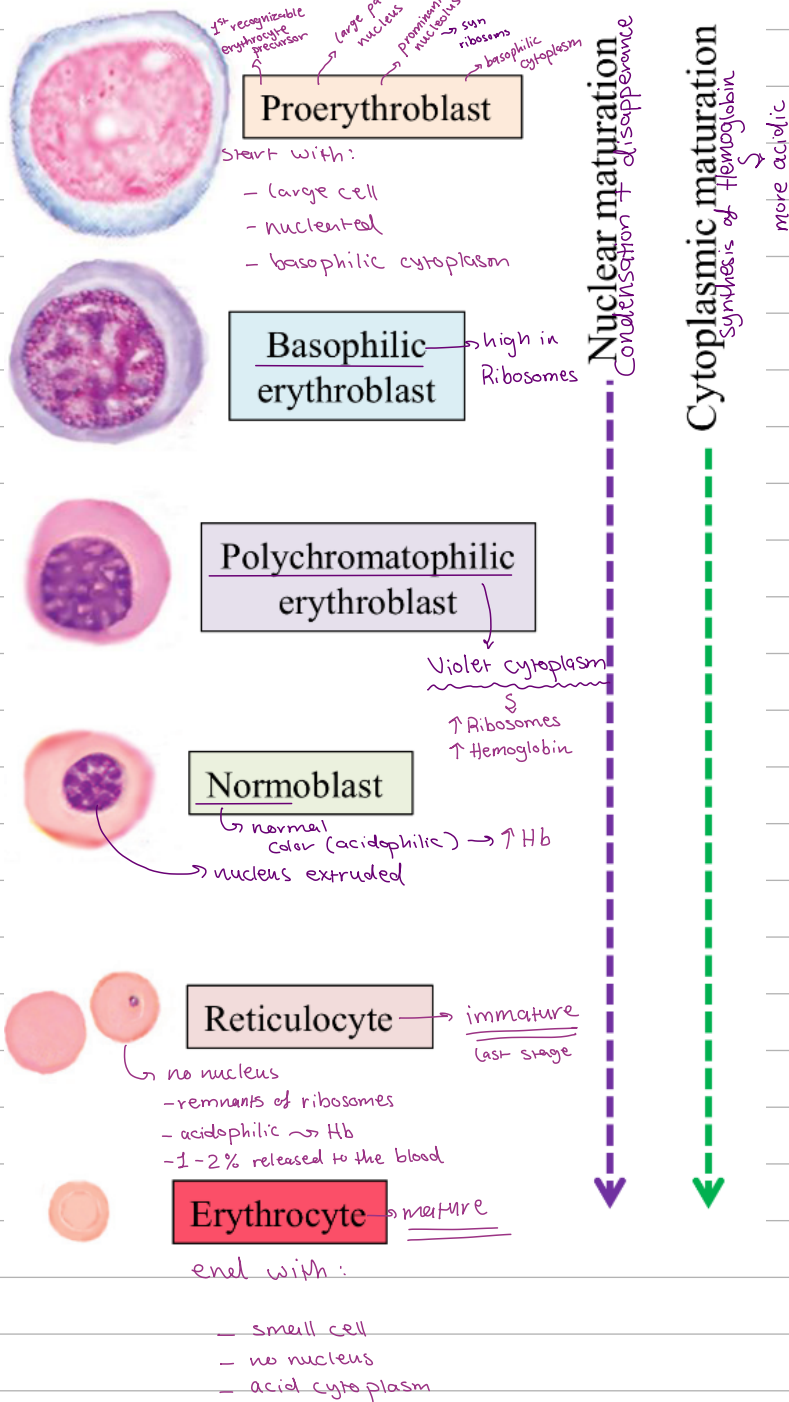
2. Myeloid (multipotent) (progenitor cells) (multipotent) Lymphoid

have self renewal capacity + fast division



1. Erythropoiesis

- takes about 1 week
- rate is controlled by erythropoietin, and availability of iron, B12, folic acid, precursor proteins
- steps

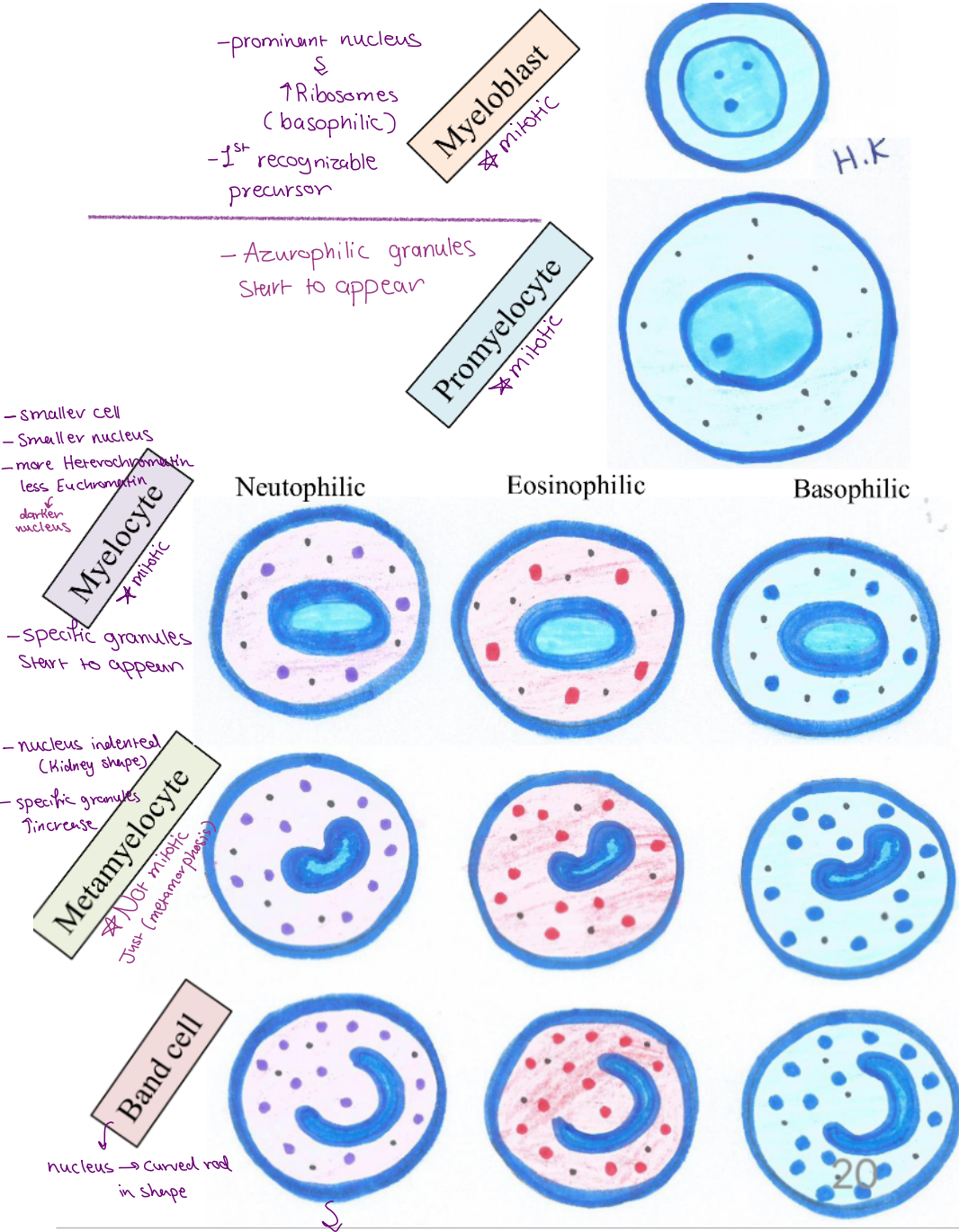


2. Granulopoiesis

- takes about 2 weeks

- **Stages**

→ Cytoplasmic changes ~ synthesis of granules ↳ specific
↳ non specific / Azurophilic
 → Nuclear changes ~ Condensation + segmentation of the nucleus (lobulation)



neutrophil Band Cells

- should not exceed 5% in blood

immature neutrophil Band Cell, can indicate Bacterial infection

- After Condensation + Segmentation of nucleus of Band Cells

↳ Mature Lymphocytes

3. Thrombopoiesis



4. Monocytopoiesis



5. Lymphopoiesis

