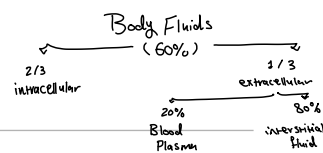


Physiology lec. 1 - introduction



- 3L of water part of Hematology
- protein in extracellular fluid \rightarrow more in Blood than interstitial fluid
 \hookrightarrow Cause of membrane is impermeable
- the volume is stable.
- 10, -9 \rightarrow this diff will be in interstitial fluid \rightarrow go to lymph
- it's important to know numbers, But do not memorize.
- more viscous than water \rightarrow many cellular component.

Blood components:

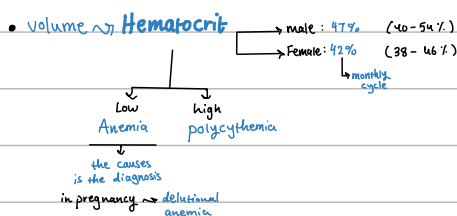
1. RBC \rightarrow concave in shape
2. WBC
3. platelet
4. plasma

Centrifuge \rightarrow separation depend on density. \rightarrow after Blood test \rightarrow packed cell volume - PCV -

• Plasma

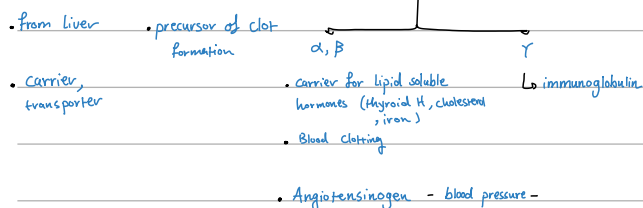
- mainly water
- +1% other substance
- + Plasma protein \rightarrow maintain osmotic pressure act as buffer

• RBCs



• Buffy coat.

Albumin Fibrinogen Globulins



• Blood function:

1. Transportation
2. Regulation
3. Protection

• Hematopoiesis:

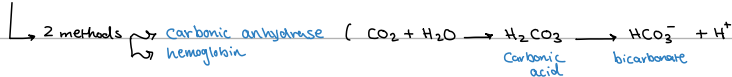
- * mainly in bone marrow - Red bone marrow -
- * early in life \rightarrow Liver, spleen, thymus, lymph nodes
- * once in circulation \rightarrow can't divide, except lymphocytes
- * interleukin 3 \rightarrow stimulate production
- + other growth factors

Physiology 2 lec - Erythrocytes

* production = destruction \leadsto in balance
in bone marrow in spleen

* Function:

- $O_2 + CO_2$ transport



- Buffering

* Hemoglobin

- 2 α chain, 2 β chain
- each have heme
- CO is competitor to O_2

- male: 15.5 g/dl
- female: 14 g/dl

* Erythropoiesis:

\rightarrow named from histology appearance

1. proerythroblast \leadsto 2. Reticulocyte \leadsto 3. Erythrocyte

- | | | |
|---|--|--|
| <ul style="list-style-type: none">• nucleus• shape - not concave-• low hemoglobin content• bone marrow | <ul style="list-style-type: none">• bone marrow
- we can see it in circulation -
not more than 2% \leftarrow• able to carry O_2• Reticulocyte count
\rightarrow $\frac{R}{RBC} \times 100$
Low \rightarrow Aplastic Anemia
High \rightarrow Hemolytic Anemia | <ul style="list-style-type: none">• no nucleus• concave• color (high hemoglobin content)• circulation |
|---|--|--|

• Vitamins:

B_{12} + Folic Acid \rightarrow For DNA synthesis

- deficiency \leadsto maturation failure, larger cells (macrocytes)
- leading to \leadsto Anemia

• Regulation \leadsto Negative Feedback

- erythropoietin production in \leadsto kidney to bone marrow stimulate production proerythrocyte
 \rightarrow stimulated by Hypoxia
- patient with Renal failure may have Anemia treated by erythropoietin supplement.

Physiology Lec 3 - RBC - parameters

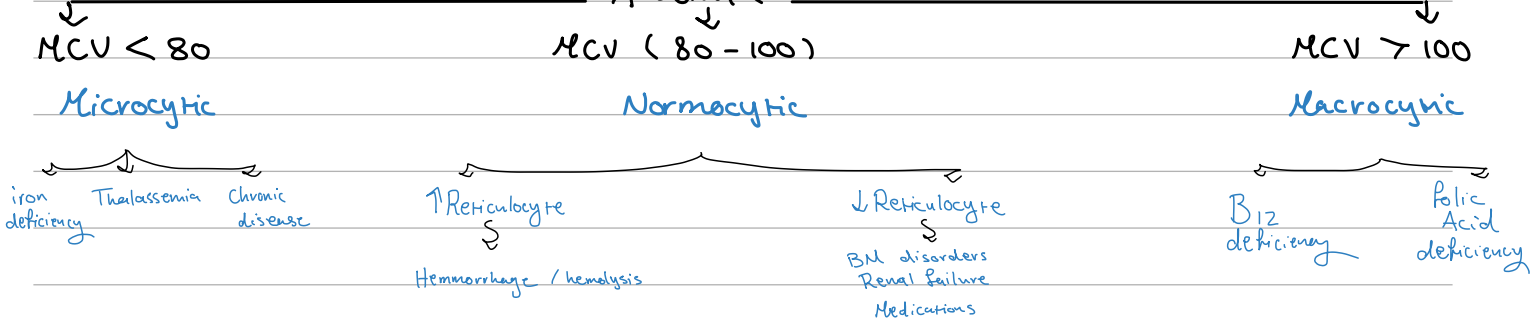
RBC Parameters

RBC count ($10^6/\mu\text{L}$)	Hematocrit (%)	Hemoglobin (g/dl)	MCV (fl/cell)	MCH (pg/cell)	MCHC (g/dl)	RDW (%)
male: $4.5 \times 10^6/\mu\text{L}$ Female: $4 \times 10^6/\mu\text{L}$	male: 45% Female: 40%	male: 15.5 g/dl Female: 14 g/dl	90 fl/cell	30 pg/cell	35 g/dl	normal $\rightarrow 11.4\% - 13.5\%$
			$\text{MCV} = \frac{\text{Hct} \times 10}{\text{RBC count } (10^6/\mu\text{L})}$	$\text{MCH} = \frac{\text{Hemoglobin} \times 10}{\text{RBC count } (10^6/\mu\text{L})}$	$\text{MCHC} = \frac{\text{Hb} \times 100}{\text{Hct}(\%)}$	$\text{RDW} = \frac{\text{standard deviation}}{\text{MCV}} \times 100$
			normocytic: 80-100 macrocytic: >100 microcytic: <80	normochromic: 30-34 hypochromic: <30 \downarrow iron deficiency Anemia		\uparrow RDW \rightarrow Anisocytosis

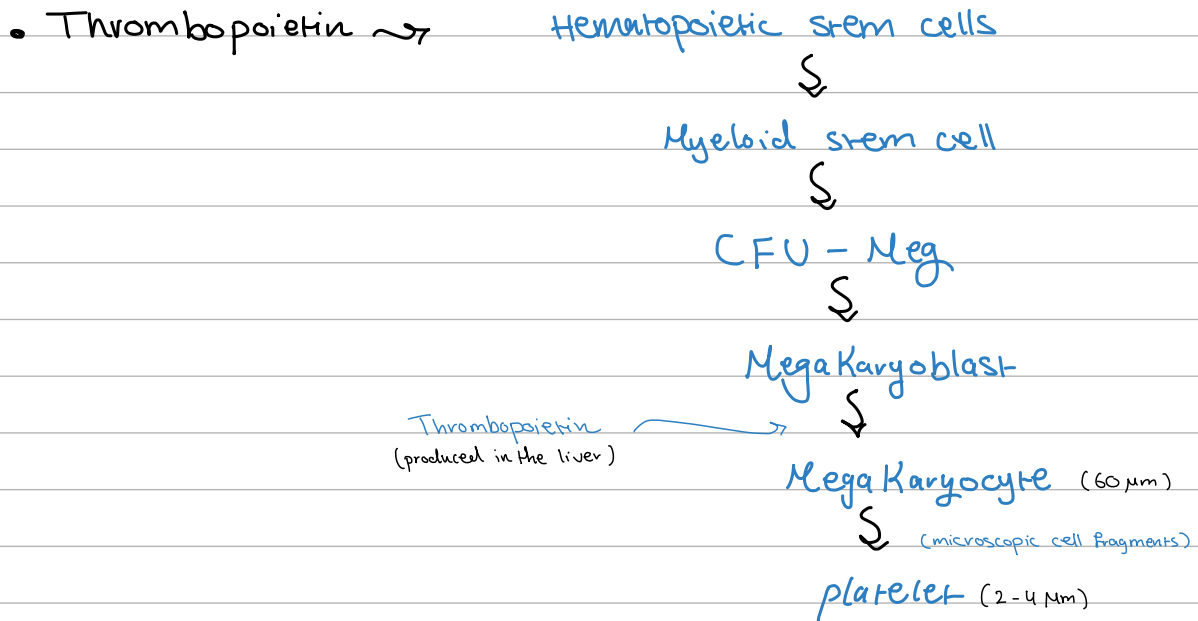
Anemia



Anemia



Physiology lec 4 - Thrombocytes + Hemostasis



- Thrombocytes \rightarrow normal: 150 000 - 450 000 / ML
 - \rightarrow they contain Contractile proteins \rightarrow Actin, Myosin, thrombostenin
 - \rightarrow they contain Fibrin stabilizing factor (factor 13)
 - \rightarrow they contain Growth factors
 - \rightarrow Vascular endothelial Cells
 - \rightarrow Vascular Smooth muscle Cells
 - \rightarrow Fibroblast.

- Thrombocytopenia \rightarrow \downarrow platelet count. ($< 100 000$ / ML)

petechiae increase bleeding time Bleeding

• Hemostasis:

1. Vascular Constriction
2. Platelet Plug
3. Blood Clot (Coagulation)
4. Growth of Fibrous tissue.

• 1. Vascular Constriction

\rightarrow Contraction of Smooth muscles to reduce blood flow

• 2. Platelet Plug Formation:

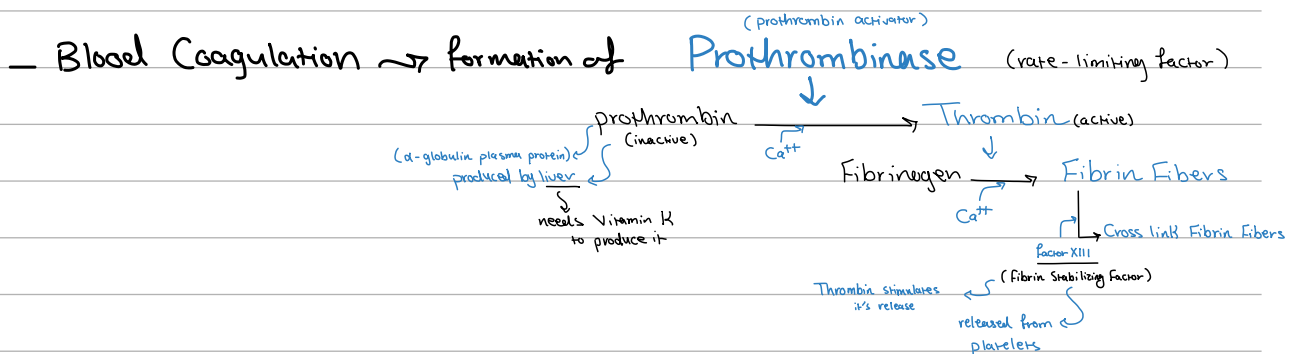
- A. Adhesion \rightsquigarrow Adhesion to subendothelial matrix (by vWF)
- B. Secretion \rightsquigarrow of ADP + thromboxane A_2 to activate nearby platelets
- C. Aggregation

ADP + TX A_2 \rightsquigarrow stimulate normal endothelium to secrete \rightarrow Prostacyclin + nitric oxide (NO)
 That \rightsquigarrow inhibit platelet Aggregation

Physiology Lec 5 - Hemostasis

• 3. Blood Clot Formation:

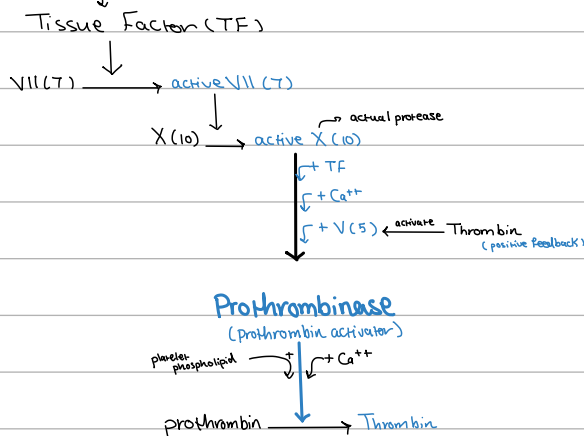
- Several rxns ends in \rightarrow formation of Fibrin Threads
- Blood Clot \rightsquigarrow meshwork of Fibrin fibers, trapped RBC + platelets + plasma
 \hookrightarrow they adhere to endothelium to prevent blood loss



Blood Coagulation

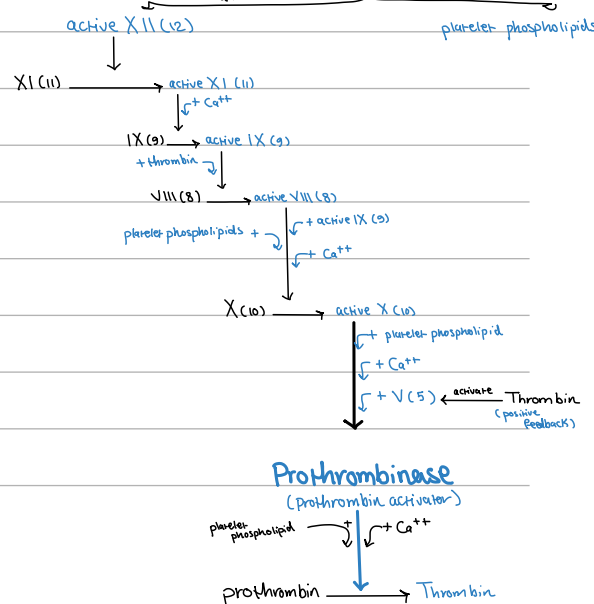
Extrinsic pathway (faster, fewer steps)

Start with \rightsquigarrow trauma to vascular tissue



(Slower) Intrinsic pathway

Start with \rightsquigarrow blood itself / collagen exposure



- Hemophilia → X-linked disorder (more in men)

- Hemophilia A → deficiency in Factor VIII (8)
- Hemophilia B → deficiency in Factor IX (9)

Physiology Lec 6 - Hemostasis

• 4. Growth of Fibrous tissue:

