

HISTOLOGY SHEET

Doctor 2021 -mercy- | medicine | MU

DONE BY:

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Corrected by

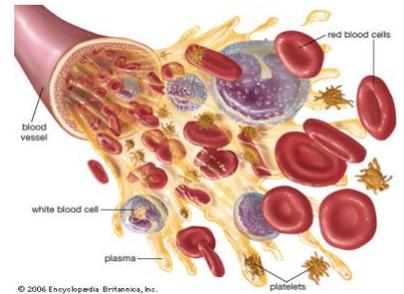
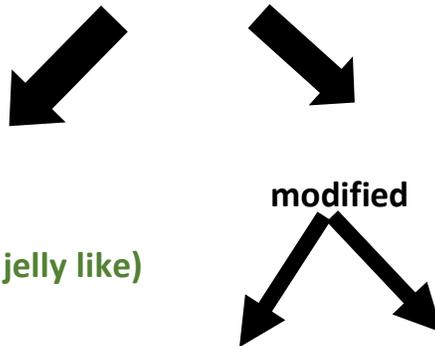
Areen Abunawas

DOCTOR

Dr. Ferdous star

Blood

Connective Tissue



C.T. proper

Ground substance (jelly like)

1. Loose C.T.

2. Adipose C.T.

3. Reticular C.T.

4. Dense C.T.

5. Elastic C.T.

6. Mucoïd C.T.

In blood there is not fiber, there is dissolved protein fiber like fibrinogen {normal condition} —> dissolved in plasma of blood

In the cases of injury the fibrinogen convert to fiber thread to stop bleeding

Blood (Modified type of CT)

Mesodermal in origin When we distinguish between CT and epithelium (epithelium derived from Exoderm, Endoderm and mesoderm) when CT derived from mesoderm

Considered **modified connective tissue** because it contains:

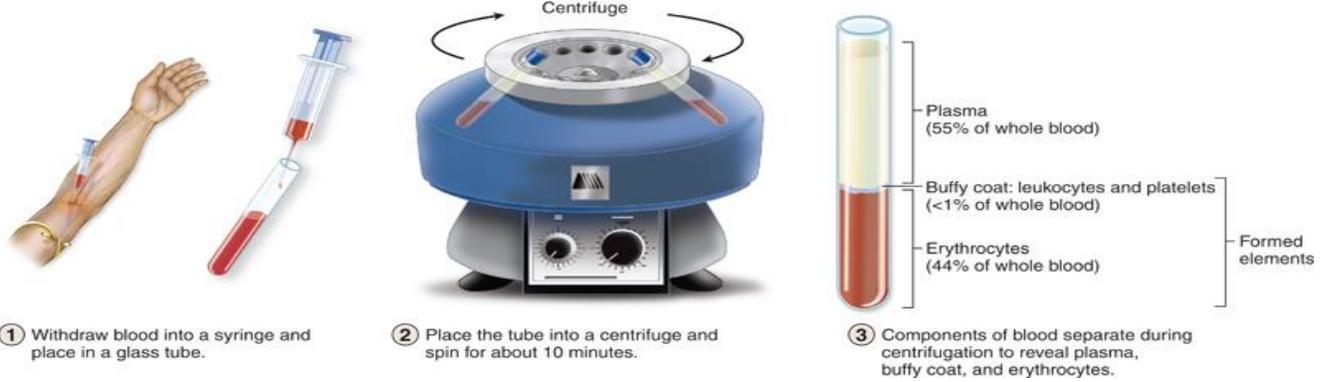
- **cells**
- **a liquid ground substance** (called plasma)
- **dissolved protein fibers.**

Adult has ~ 5.5 -6 L (7-8% of body volume)

- ❖ Circulate in CVS (**closed circulation**)
- ❖ Blood formation = hematopoiesis (**blood formation process**)

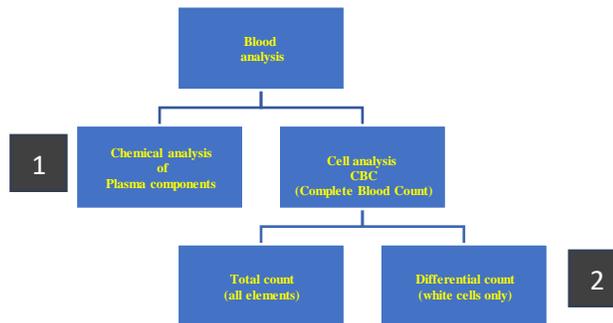
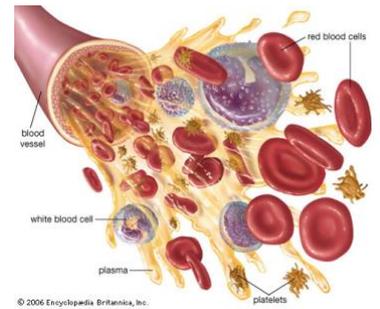
Consists of **liquid** and **cellular** components by a machine called a **centrifuge**.

In centrifuge we took the sample from peripheral blood



Blood

- 1- Formed blood elements
- Cells : 45%
- Originate in the red bone marrow
- The red bone marrow is the site of hematopoiesis
- (99% RBC, 1%WBC)
- 2- Plasma : 55%
- 3- No aberrant fibers (fibers : dissolved protein in normal condition-)



1. Hormon, enzyme, meneral
2. It has sub- type and each one has different percent
3. Just WBC have sub type

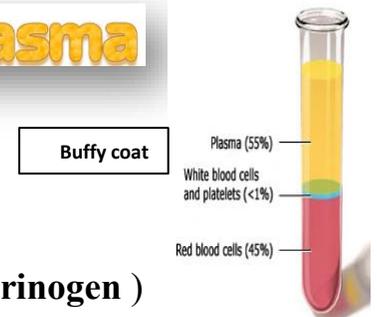
55% of blood volume:

- **Water 92%.**
- **organic substances:7 %**
 - plasma proteins

(albumin, globulin, prothrombin (helps blood to clot) and fibrinogen)

- **Hormones & enzymes.**
- **inorganic salts 1%**

Plasma



(NaCl, Bicarbonates HCO_3^- , phosphates & calcium)

The Blood Film= Smear

Preparation of blood for laboratory study

Blood elements =blood cell

- Why do we do a blood film ?

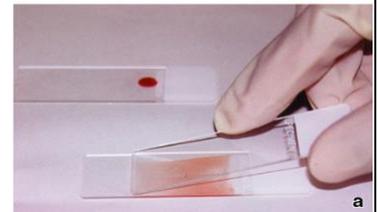
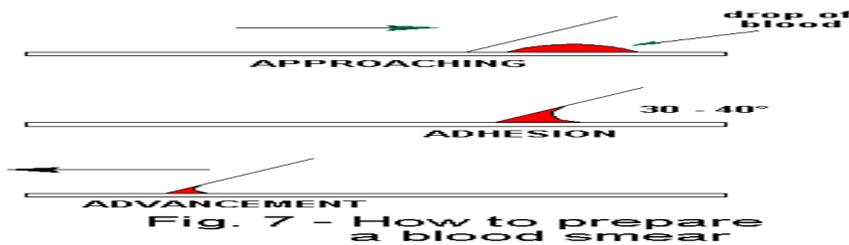
1.To study blood elements.

2.To make differential leucocytic count.

Steps :

- Put a small drop of blood peripheral blood
- Spread into a thin film
- Stain with Leishman or Giemsa stain

(methylene blue +eosin) the H&E stain with hematoxylin + eosin



Blood film

- Why do we do a blood film ?

1.To study blood elements.

2.To make differential leucocytic count.

Steps :

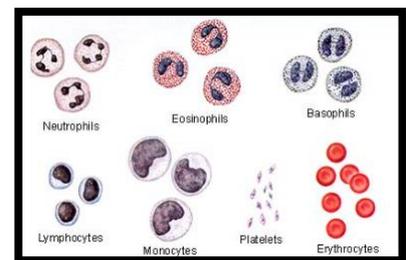
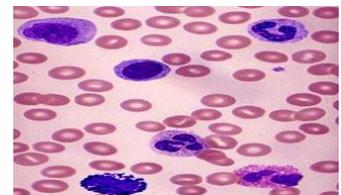
- Put a small drop of blood
- Spread into a thin film
- Stain with Leishman or Giemsa stain
(methylene blue +eosin) as we take the toluidene blue for the mast cell

- Stains of blood film

- Giemsa's / Leishman's (نفس الصبغه بس الاختلاف في نسب المواد المكونه لها)

- = methylene blue + eosin

- ► basophilic (violet)
- ► eosinophilic (pink)
- ► azurophilic (red purple)



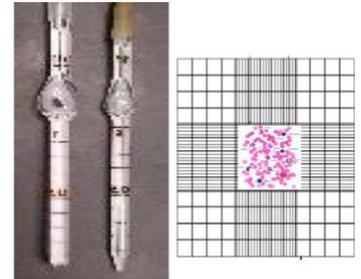
Complete blood count (CBC)

I-Total count :

It is the total number of blood elements (RBCs, WBCs, or Platelets) per cubic millimeter

Cubic millimeter=micro liter

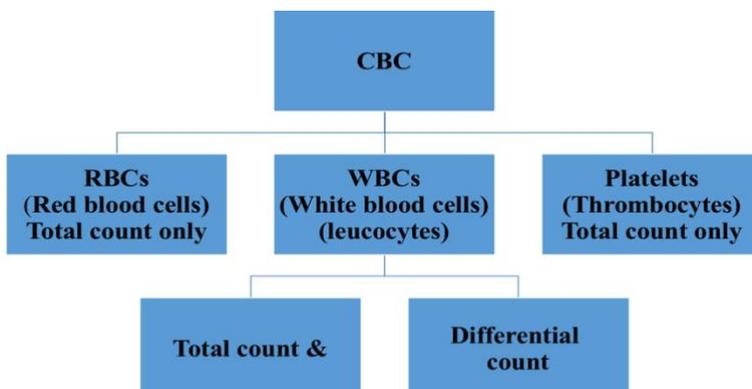
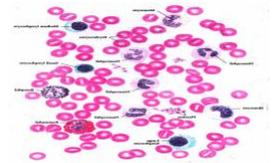
Measured by Hemocytometer Or automatic counter



II-Differential leucocytic count

- the percentage of each type of leucocytes to the total count of **white blood cell**
 - Done by blood film. Or automatic counter

Three type of blood cells : white blood cell, red blood cell , platelets



Thrombocytes :
pieces of vary large cells in
bone marrow called
megakaryocytes

Blood cell count=**CBC**

- **Manual method= Conventional** =hemocytometer= counting chamber.
- **Electronic method** = automated hematology analyzer.
- **WBC have total and differential count**

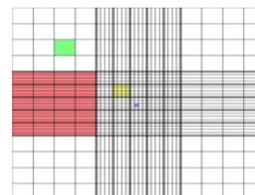


RBC count 4.5-5 million/mm³ in female

Total leukocytic count 4,000-11,000/mm³

Platelet count 250,000- 350,000/mm³

- **Differential leukocytic count**
=Examination of blood film



Red Blood corpuscles =Erythro/cytes

Corpuscles: bag filled with hemoglobin has no nucleus and no organelle

- Blood cell

1. Total or Differential count all the cell has total except WBC has differential and total
2. Shape & size
3. Structure (nucleus + granules)
4. Function
5. Life span
6. Abnormalities

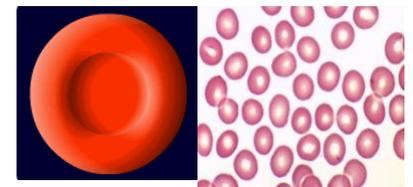


,,, Life span of the cell depends on its function

...All cells have at least one nucleus but there are some cells [Binucleated,,, liver] and multi nucleated,,, muscle] except RBC [don't have nucleus]

Normal RBCs total count:

- In males † 5- 5.5 millions / mm³ blood
- in females † 4.5-5 millions / mm³ blood



LM of RBCs:

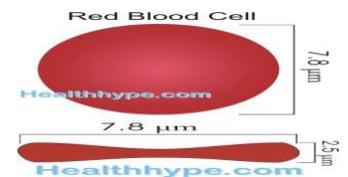
- ❖ Shape: - Biconcave discs. Rounded in origin (larger surface)

Mature RBCs are membrane- bound corpuscle.

Difference between mature and immature

Immature has organelles and nucleus

Mature has no organelles and no nucleus except few mitochondria



- ❖ Size:

- -Diameter 7.5 μm
- -Thickness 1 μm)
- In any blood film you must see RBC
HB concentrated in periphery

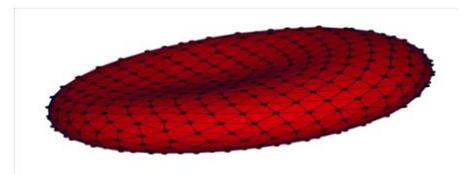
- ❖ Nucleus: Anucleate.

- ❖ Cytoplasm 33% of the corpuscular volume is Hemoglobin ■ heme

“Fe”+ Globin ‘protein’

النواه بتطلع عشان توفر مساحه لدخول HB

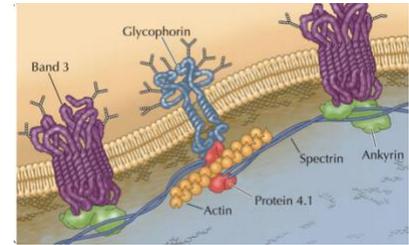
There is no measuring unit in RBC except micron



EM picture of RBCs:

- No nucleus, No typical organelles. Only few mitochondria

subplasmalemmal **cytoskeleton (actin, spectrin & ankyrin)** responsible for the flexibility of RBCs. To pass through capillary (in capillary RBC 3 micron)

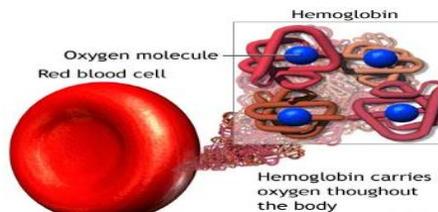
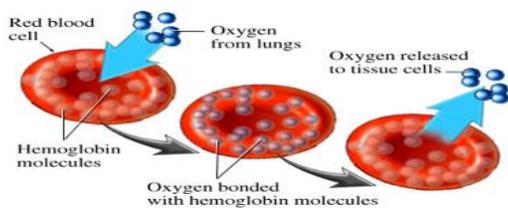


Glycocalyx (cell coat) responsible for the ABO/ Rh blood group.

Function of RBCs Carry O₂ & CO₂ (hemoglobin)

*For increasing surface area the cell extrusion the nucleus and organelles,

*The carbonic anhydrase doing dissociation of CO₂ and O₂



O-	A-	B-	AB-
O+	A+	B+	AB+

2- life span:

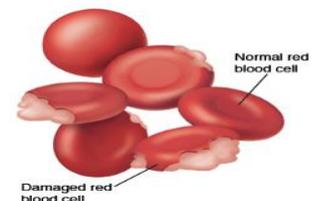
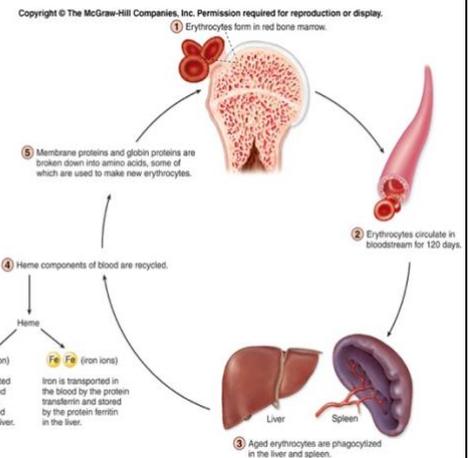
- **100-120 days**
- Then removed by **Macrophages (doing phagocytosis)** of spleen and liver sinusoids. Numerous macrophages in liver and spleen
- When RBC removed the Heme storage to make HB

Adaptation to function

- 1- ▲ surface area. **Biconcave shape**
- 2- ▲ amount of HB
(no nucleus/ organelles)
- 3- ▲ ▲ HB at the periphery carry O₂, CO₂
selective permeability
- 5- carbonic anhydrase **dissociation for gases**
- 6- ▲ flexibility to squeeze without damage

Subplasmalemmal cytoskeleton

7- **Glycocalyx**



Abnormalities of RBCs

- **Abnormalities of RBCs in number**

- **Anaemia:** decrease in the total number of RBCs.
- **Polycythaemia:** increase in the total number of RBCs.



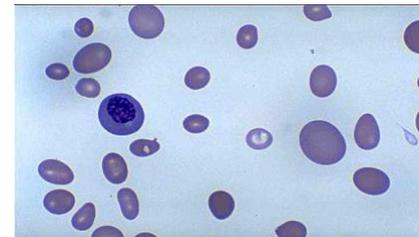
Causes: (decreased oxygen tension)

Physiological: newborns, high altitude

Pathological: chronic lung and heart diseases.

- **Abnormalities of RBCs in size normal 7.5 Mm**

- **Microcytosis:** diameter of RBCs is less than $6\mu\text{m}$. (Microcytic anaemia)
- **Macrocytosis:** diameter of RBCs is more than $9\mu\text{m}$. (Macrocytic anaemia)
- **Anisocytosis?? Variable size**

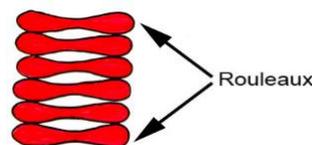


Anisocytosis : Medical term for having red blood cells that are unequal in size

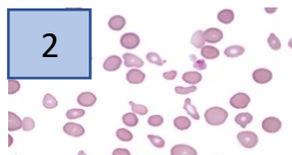
Abnormalities of RBCs in shape

1- Rouleaux formation In slow circulation

Rouleaux are stacks or aggregation of red blood cells (slow circulation ,,in varicose veins condition)

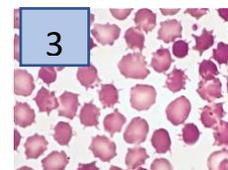


2- Poikilocytosis ► Variable in shape



3- In hypertonic solution

► **echinocytes(crenation)**
shrinking



4- In hypotonic solution ► Ghosts



In hypotonic solution the cell been swelling and

Sickle Cell Anemia (abnormal Hemoglobin)

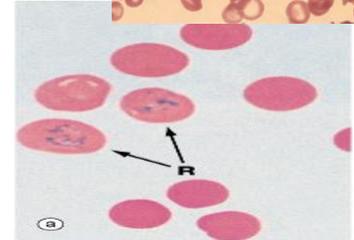
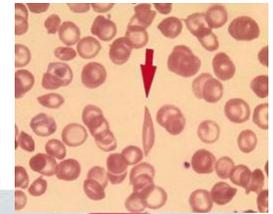
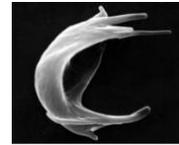
Reticulocytes immature RBCs

Reticulocytes represent 1% of all RBCs in normal blood film.

- Nucleated

differ than mature RBCs

- slightly larger (8 μ m).
- Cytoplasm contains remnants of ribosomes.
- On staining with **cresyl blue** form a reticulate pattern.



Clinical significance:

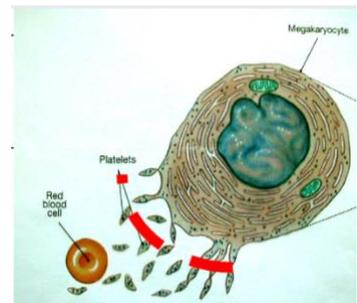
An increase in this percentage indicates an

- accelerated rate of erythropoiesis.
- compensate for anemia or hemorrhage.

BLOOD PLATELETS

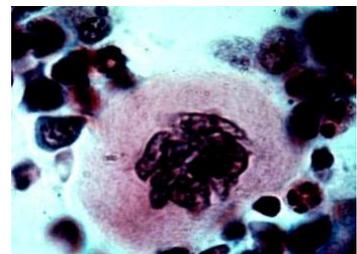
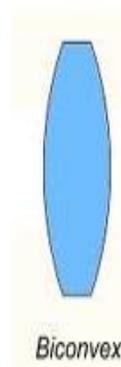
Origin: from (fragmentation not rapture of) megakaryocyte in the bone marrow.

Normal Platelet (total) Count 250,000-350,000/ mm³
200-400,000



Structure (L. M) :

- Non-nucleated bodies,
- 2-4microns, central granular portion (granulomere) & peripheral clear zone (hyalomere)
- cell fragment of megakaryocyte
- Thrombocytes
- Thromboplastids



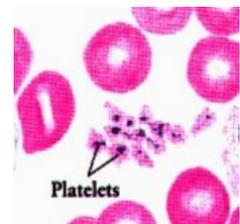
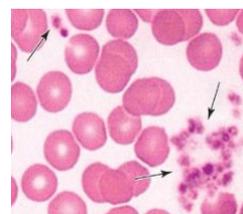
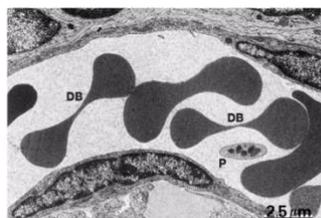
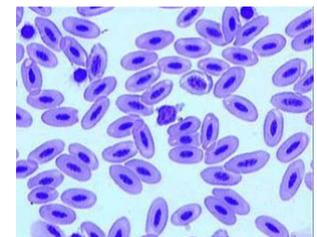
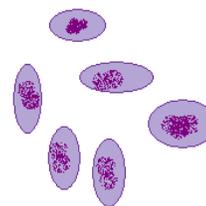
LM picture

Shape: Anucleate, biconvex discs.

Be careful not biconcave

Diameter : 2-3 μ m.

- Granulomere, granular central region
- Hyalomere at the periphery, there is a pale basophilic zone



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EM:

Shape:

- Irregular.
- Pseudopodia. To move

Platelet membrane:

▲ ▲ glycoprotein coat for: to form thrombose

- Adhesion
- Aggregation
- Hyalomere & granulomere

➤ Platelet granulomere
few mitochondria & ribosomes.

➤ scattered glycogen particles.

➤ 3 types of granules:

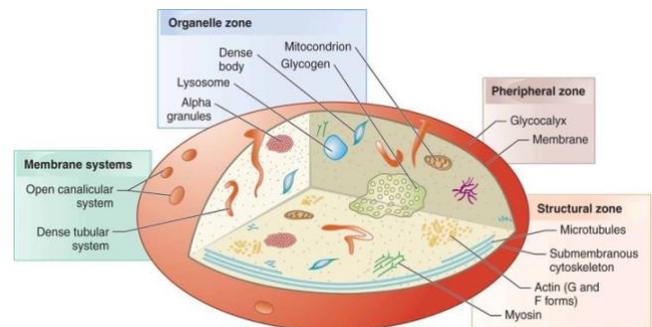
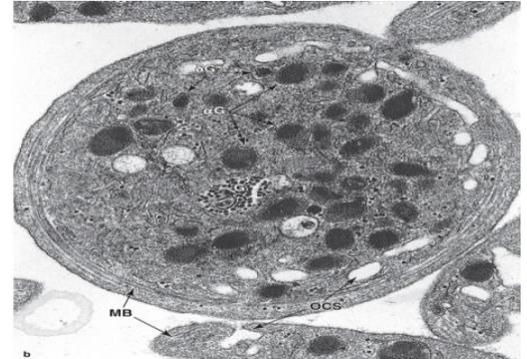
➤ **Alpha (α) granules:**

- Large.
- Abundant. most numerous
- PD-GF, coagulation factors.

➤ **Delta granules:**

- Medium (size, no.)
- ATP, ADP, serotonin.

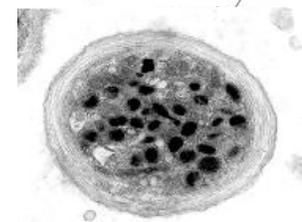
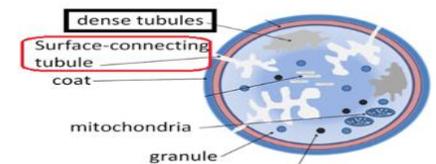
➤ **Lambda (λ) granules:** hydrolytic enzymes.



Platelet hyalomere

- Electron- lucent.
- Lacks organelles.
- It contains:
 - circumferential bundle of 10-15 microtubules ► ► discoid shape
 - Actin & myosin ► ► motility + clot retraction
 - Canalicular system + tubular system.
 - Alpha granules ,,,, secretion

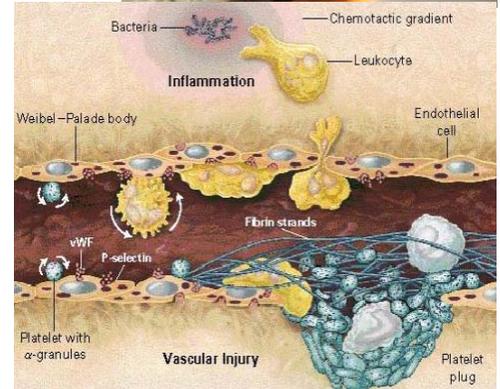
Life span : two week to month



PLATELET FUNCTION

At sites of injury of BVs:

- Platelet adhesion
- Platelet aggregation
- Thrombus formation
- Clot retraction **get smaller**
- Clot removal
- Functions of platelets
- Platelet aggregation → white thrombus
- Local blood coagulation → red thrombus
- Serotonin → Vaso-constriction
- Clot retraction → by microfilaments
 - Clot removal → by proteolytic enzymes



PLATELET ABNORMALITY

❖ **Thrombocytopenia** ▼ ▼ ▼

Thrombocytopenia (purpura)

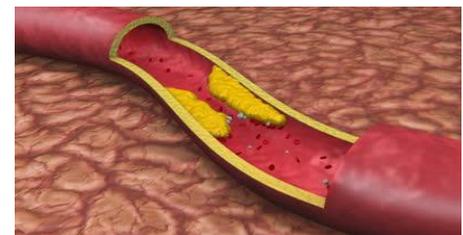
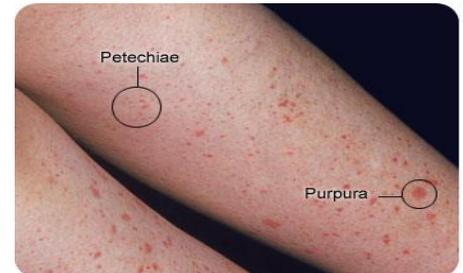
Thrombocytopenia occurs when your blood platelet count is slow

❖ **Thrombocythemia** ▲ ▲ ▲

❖ **Thrombasthenia** disease in which your bone marrow makes too many platelets

One of symptoms of there's a lack or decreased in the number platelet cells :

- 1- purpura
- 2- anything touches the skin causes the converting the color of skin to blue in a specific region But the increase of the number of platelet cell's symptoms :-thrombasthenia : frequent thrombosis



RBCs

Red blood corpuscle
Erythrocytes – Greek: "Red"

Platelets

Thrombocytes
Thromboplastides

Number	<u>males</u> is 5 - 5.5 millions / mm ³ <u>females</u> it is 4.5-5 millions / mm ³ blood.	250,000-350,000/mm ³
Size	7.5-8.5 um Macrocytes > 9 um, Microcytes < 6 um Anisocytosis = variation in si	3um 2-5 um diameter
Shape	biconcave disc	Biconvex
Structure	no nuclei & other organelles Bag of Haemoglobin	Fragments of megakaryocyte Non-nucleated
Life span	100-120 days..	Life span 10 days in blood
Function	Carry O2 & Co2	- the process of thrombus formation (blood clotting) in response to any vascular endothelial injury to prevent excessive blood loss. - clot retraction and removal of the blood clot after healing of the vessel wall to re-establish the flow of the blood.
Abnormality	Polycythaemia: i.e. increase in the total number of R.B.Cs. Anaemia: i.e. decrease in the total number of R.B.Cs. Sickle Cell Anemia	INCREASE → Thrombosis Decrease → Bleeding

2-

يقول الشافعي رحمه الله تعالى :

"لَيْسَ الْعِلْمُ مَا حُفِظَ، إِنَّمَا الْعِلْمُ مَا نَفَع"

فكن صبوراً على نفسك و تجرّع العلم رويداً رويداً، و ابدل من جهدك ما استطعت .

حتى وإن كان طريق الحلم صعباً .. لا تستسلم، لا تقف، لا تياس، فالذي خلق الطريق الصعب، خلق فيك القوة على اجتيازه .