Foundation Block

Physiology team 441

OSPE

Team Leaders

★ Alanoud albawardi

★ Nawaf alshehri

MED441
KING SAUD UNIVERSITY

physiology
441

Abdulaziz & Bahammam
Faye Wael Sendi

Editing File

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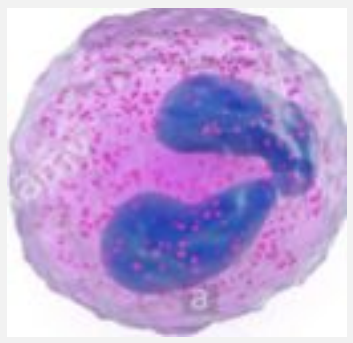
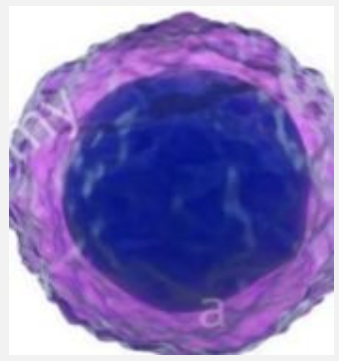
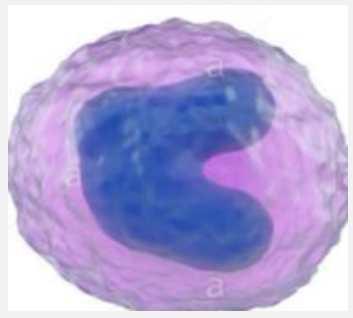
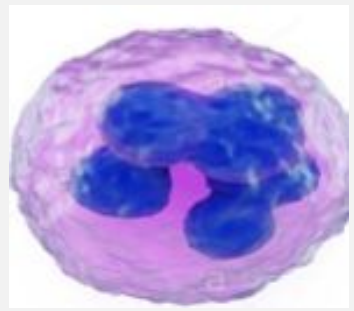
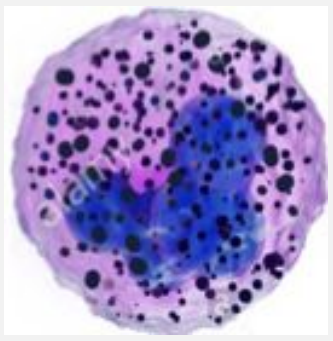
White blood cells (WBC)

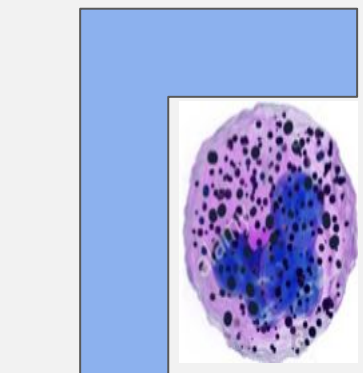






Objectives :

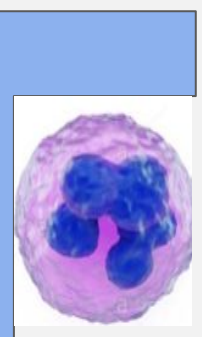
- 1- To be able to identify the different types of leukocytes under the microscope.
- 2- To know the normal values expected for the differential white cells count .
- 3 - To practice the procedure for differential leucocyte.
- 4-To understand the clinical relevance of the differential white cell count in the diagnosis of disease.

WBC

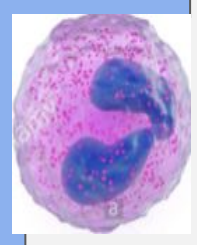
Granulocytes



Basophils

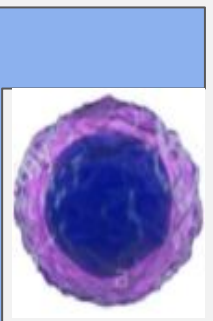


Neutrophils

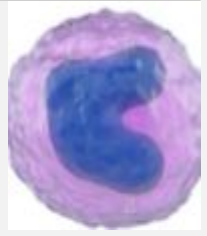


Eosinophils

Agranulocytes

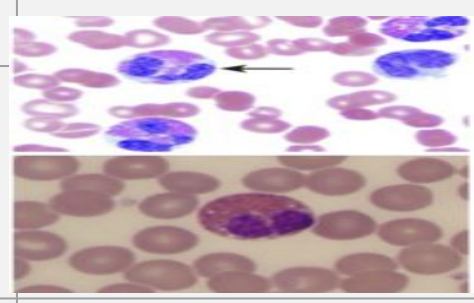
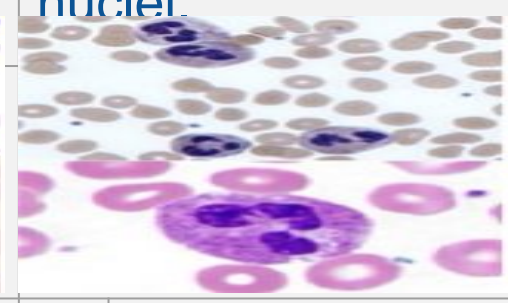
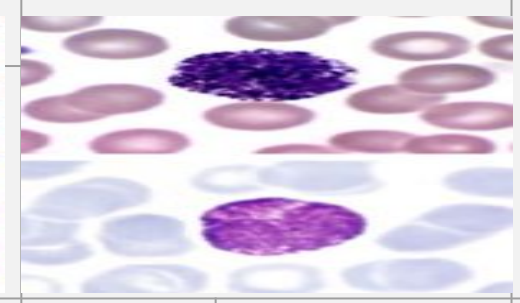


Lymphocytes

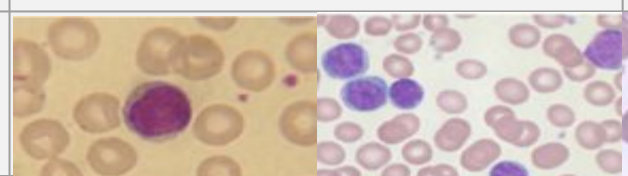


Monocytes

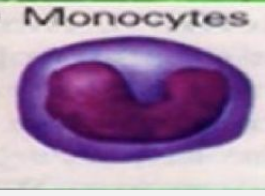
Granulocytes

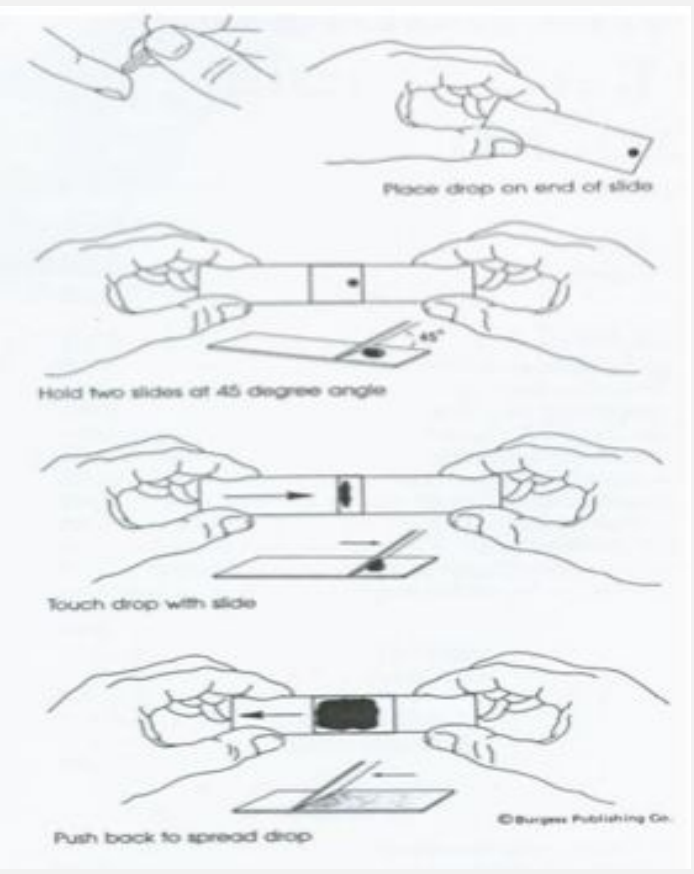
Types:	Eosinophils	Neutrophils (segmented and band)	Basophils
Amount in the blood:	Less common (1%-3%).	Most common (50%-70%).	The rarest of the blood cells (0.4%-1%).
Describe the shape of cell/nucleus and the granule colors:	Dumbbell- shaped nucleus and large , prominent red , orange granules (eosinophilic) .	Small **violet pink or purple** granules with various stains such as Wright's stain (have small cytoplasmic granules and complex).	Large cell granular with densely packed dark violet/**blue** granules (basophilic). Large granules—->contain heparin and histamine.
Number of the lobes and type its:	Bi-lobed nuclei , 2-3 lobes.	Multilobed nucleus,2-6 lobes. Usually thin filaments present connecting the nuclei.	Small non-segmented nucleus but often hardly visible amongst the dark granules.
Pictures:			

Agranulocytes

Types:	Lymphocytes	Monocytes
Amount in the blood:	25%-35%	4%-6%
Describe the shape of nucleus /cytoplasm and the granule colors:	Agranular cytoplasm Small spherical cells with **large, round , blue / violet stained** nucleus which covers a large part of the cytoplasm (Ring) ' leaving only thin rim of cytoplasm around it .	Largest of blood cells no granules in the cytoplasm (but some practicals may be seen like ; **small red dust.** Kidney shaped or horse shaped nucleus.
Pictures:		

In the boy's slides :

Cell type	Function
Leukocytes (white blood cells, or WBCs)	
Granulocytes	
• Neutrophils 	Active phagocytes; number increases rapidly during short-term or acute infections
• Eosinophils 	Kill parasitic worms; increase during allergy attacks; might phagocytize antigen-antibody complexes and inactivate some inflammatory chemicals
• Basophils 	Granules contain histamine (vasodilator chemical), which is discharged at sites of inflammation
Agranulocytes	
• Lymphocytes 	Part of immune system; one group (B lymphocytes) produces antibodies; other group (T lymphocytes) involved in graft rejection, fighting tumors and viruses, and activating B lymphocytes
• Monocytes 	Active phagocytes that become macrophages in the tissues; long-term "clean-up team"; increase in number during chronic infections such as tuberculosis



In girl's slides:

Reagents and apparatus:

- A microscope with an oil immersion objectives .
- Mineral or cedar oil .
- Various dyes for staining blood films(e.g. wright's and leishman's stain).

Procedure:

1. Prepare blood film and stain it with wright's stain .
2. Examine it under the oil immersion objective lens (count about 100 cells of different leukocytes).

Clinical application:
Differential count provides clues about certain illnesses.

Viral infections (infectious mononucleosis)	Chronic infection	In allergy and malignancy	Allergy and parasitic infection	Pyogenic illness (bacterial and fungal infection)
Lymphocytosis	Monocytosis	Basophilia	Eosinophilia	Neutrophilia

In girls slides

Eosinophilia:

Allergy and parasitic infection

Blood element	% of leukocytes	Size µ	Cytoplasmic staining	Nucleus morphology
Erythrocyte	-	7-8	pink, no granules	none
Neutrophil	50-70	10-12	salmon-colored small granules	Segmented,-2-5 lobed
Lymphocyte	25-35	7-8	Light blue, scant amount, no granules	Single large Oval purple
Monocyte	4-6	16-18	Basophilic, no granules	Large, kidney shaped
Eosinophil	1-3	13-14	Bright red coarse granules	bilobed purplish
Basophil	0-4-1	14-15	Large, basophilic granules	Bilobed bluish black

In boys slides :

Conditions associated with increased counts

CELL COUNT	TERMINOLOGY	CONDITION
Increase Neutrophils Count	Neutrophilia	Acute Bacterial Infection
Increase Eosinophils Count	Eosinophilia	Allergy Acute Parasitic infection
Increase Basophils Count	Basophilia	Allergy Malignancy
Increase Monocytes Count	Monocytosis	Chronic Bacterial/Viral Infection
Increase Lymphocytes Count	Lymphocytosis	Acute Viral Infection Chronic Infection

Normal ranges

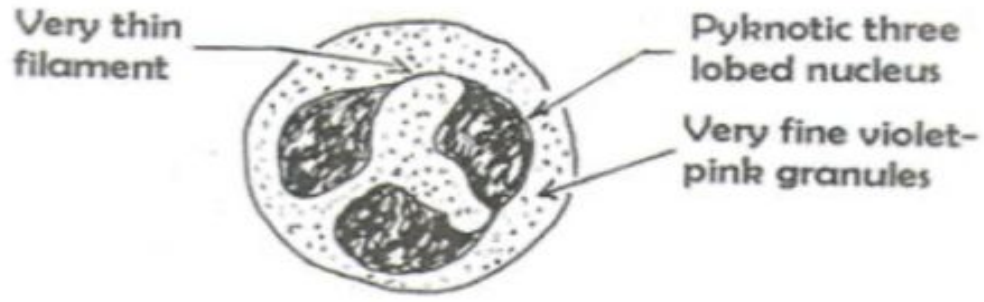
Blood Parameters	Normal Ranges
RBC Count	Males: 4.7 – 5.2 x 10^6 / µL Females: 3.8 – 4.8 x 10^6 / µL
WBC Count	4 – 11 x 10^3 / µL
Platelets Count	150 – 400 x 10^3 / µL
Hemoglobin Concentration (Hgb)	Males: 13 – 18 g/dl Females: 11 – 16 g/dl
Hematocrit (Hct)	35 – 55 %
Neutrophils %	40 – 70 %
Eosinophils %	1 – 6 %
Basophils %	0 – 1 %
Monocytes %	5 – 10 %
Lymphocytes %	20 – 40 %

nular

Granular

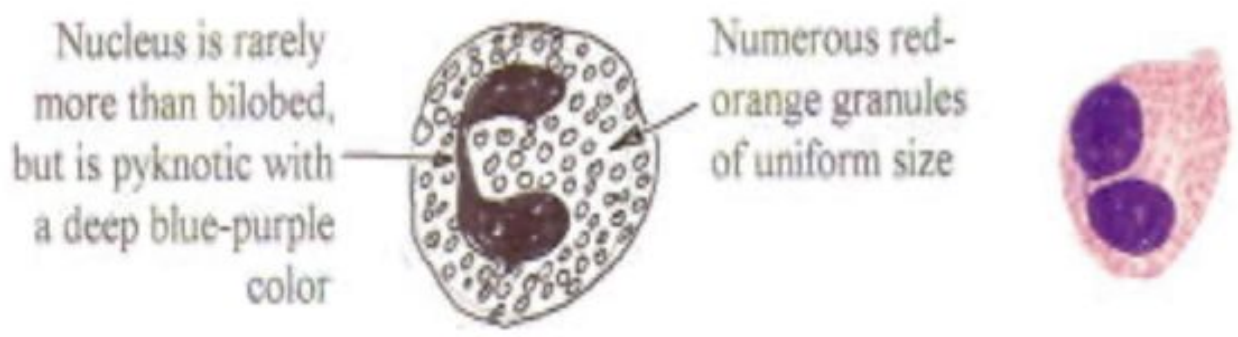
Agranular

Neutrophil



Basophil

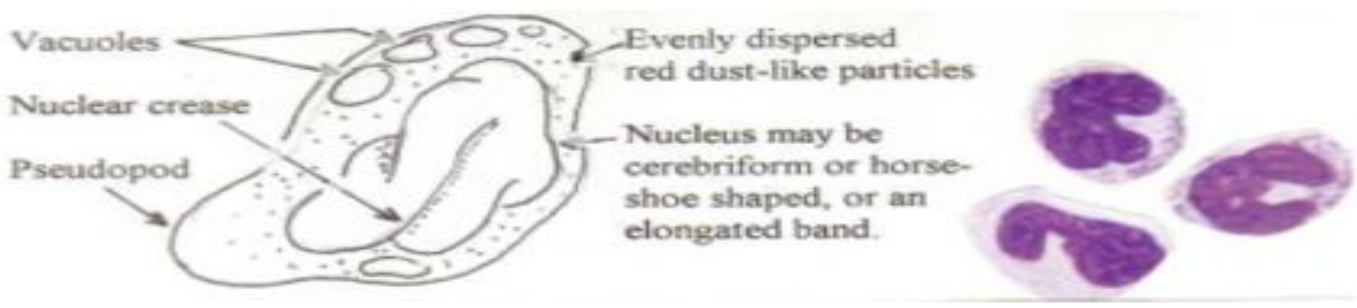
Eosinophil



Large Lymphocyte

Small lymphocyte

Monocyte



CBC & ESR

CBC
&
ESR

Objectives :

1-The procedure used for taking both capillary and venous blood
2- The normal value recorded when taking these measurements
3 - The methods used to measure the ESR and hematocrit
4-The methods used to get CBC and assess RBCs indices including Mean corpuscular volume, Mean corpuscular hemoglobin, and Mean corpuscular hemoglobin concentration

★ Complete Blood Count (CBC)

It is a **test panel** requested by a doctor or other medical professional that **gives information about the cells in a patient's blood.**

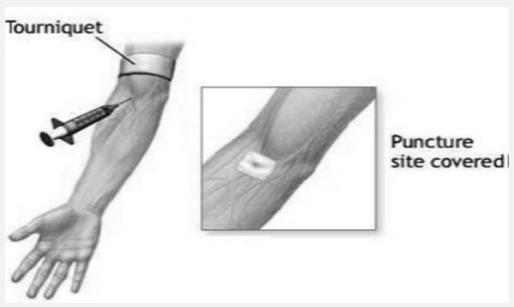
TESTS	RESULT	FLAG	UNITS	REFERENCE INTERVAL	LAB
CBC With Differential/Platelet					
WBC	5.7		x10E3/uL	4.0-10.5	01
RBC	5.27		x10E6/uL	4.10-5.60	01
Hemoglobin	15.4		g/dL	12.5-17.0	01
Hematocrit	44.1		%	36.0-50.0	01
MCV	84		fL	80-98	01
MCH	29.2		pg	27.0-34.0	01
MCHC	34.9		g/dL	32.0-36.0	01
RDW	13.7		%	11.7-15.0	01
Platelets	268		x10E3/uL	140-415	01
Neutrophils	47		%	40-74	01
Lymphs	46		%	14-46	01
Monocytes	6		%	4-13	01
Eos	1		%	0-7	01
Basos	0		%	0-3	01
Neutrophils (Absolute)	2.6		x10E3/uL	1.8-7.8	01
Lymphs (Absolute)	2.6		x10E3/uL	0.7-4.5	01
Monocytes(Absolute)	0.4		x10E3/uL	0.1-1.0	01
Eos (Absolute)	0.1		x10E3/uL	0.0-0.4	01
Baso (Absolute)	0.0		x10E3/uL	0.0-0.2	01
Immature Granulocytes	0		%	0-1	01
Immature Grans (Abs)	0.0		x10E3/uL	0.0-0.1	01

★ Coulter Counter Principle

1. It counts and measures the **size of the cells**. ***How?*** by **detecting and measuring electrical resistance when a liquid pass through aperture**.
2. While passing the aperture (Hole), the cells impedes (block) the current(التيّار) and causes a measurable pulse.
3. Number of pulses → Number of particles
4. Height obf pulses → Volume of particles.

★ RBC, WBC cell count, HB

Puncute
a small hole in a tire resulting in an escape of blood.



Tourniquet
Used to stop blood flow through a vein or artery, usually by compressing the limb with a cord or an airtight bandage.

★ Normal Values

01

RBC

M = 4.5 - 6.5×10^6/µl

F= 3.8 - 5.8×10^6/µl

Avg= 4.7 -6.5 ×10^6/µl

02

WBC

M = 4 - 11×10^3/µl

F= 4 - 11×10^3/µl

Avg= 4 - 11×10^3/µl

03

HB

M = 13-18 g/dl

F= 11.5 - 16.5 g/dl

Avg= 13-18 g/dl

02

Platelet

M = 150-400 ×10^3/µl

F=150-400 ×10^3/µl

Avg=150-400 ×10^3/µl

★ Clinical Terms

Low RBC	**Anemia**
High RBC	**Polycythemia**
Low WBC	**Leucopenia**
High WBC	**Leukocytosis**
Low platelets	**Thrombocytopenia**
High platelets	**Thrombocytosis**

★ Clinical Application

Low RBC	Low WBC	Thrombocytopenia (Low Platelets)
-Blood loss when: ➔ Hemorrhage ➔ Anemia (Various type)	-Presence of cytotoxic substance	Thrombocytopenia, possible results: -Aplastic anemia, -Chemotherapy
-Bone marrow failure,causes: ➔ Radiation ➔ Fibrosis ➔ Toxin ➔ Tumor	-Bone marrow failure, causes: ➔ Infection ➔ Fibrosis ➔ Tumor	
-Erythropoietin deficiency results: ➔ Secondary to renal disease	-Autoimmune/collagen-vascular disease, such as: ➔ Lupus erythematosus	
-Hemolysis (RBC destruction)	-Disease of the liver spleen. -Radiation exposure.	

High RBC	High WBC	Thrombocytosis (High Platelets)
-Low oxygen tension in the blood ➔ Congenital heart disease ➔ Cor pulmonale ➔ Pulmonary fibrosis	-Infectious diseases	-Chronic myeloid leukaemia.
-Polycythemia rubra vera.	-Inflammatory disease (such as rheumatoid arthritis or allergy).	
-Dehydration (such as from severe diarrhea).	-Leukemia	
-Renal (kidney) disease with high erythropoietin production.	-Severe emotional or physical stress. -Tissue damage (burns).	

★ Etiological (Causes) Classification of Anemia:

We classify anemia depending on the causes of anemia

01 **Hemorrhagic Anemia**
Blood loss

02 **Aplastic Anemia**
Bone marrow suppression by drugs or radiation

03 **Nutritional Anemia**
Deficiency of:
Iron, Folic Acid, Vit B12

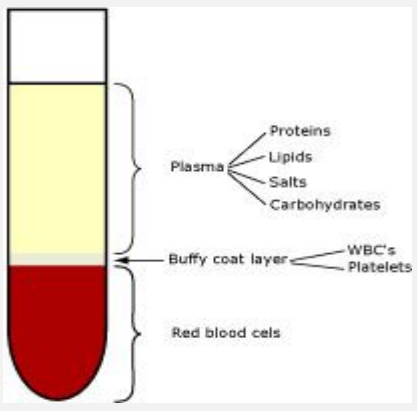
04 **Hemolytic Anemia**
Increased destruction of RBCs such as sickle cell anemia

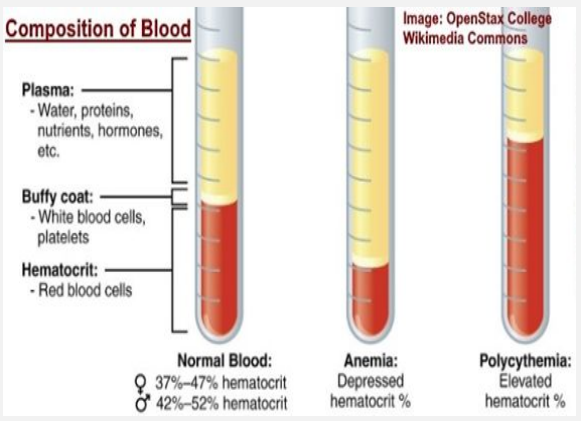
★ Hematocrit: Packed Cell Volume (PCV)

The ratio of $\frac{\text{Volume of RBCs}}{\text{Volume of blood (plasma)}}$

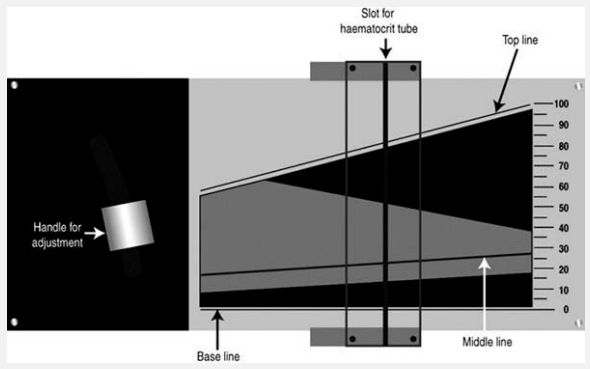
Normal Values of PCV:
M = 40 -54 %
F= 35- 47%
Avg= 35 - 54 %

Blood Composition





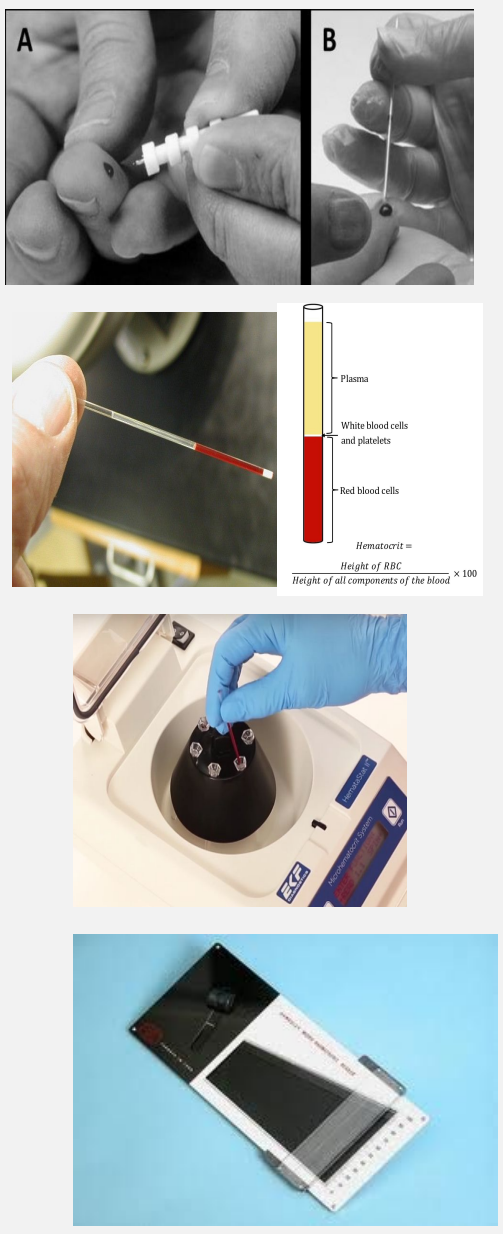
Haematocrit Reader



★ Procedure of finding PCV

1. Capillary blood obtained from pricking finger tip after cleaning it with alcohol
2. Fill a heparinized capillary tube, then seal(سد)one end by plasticine

   (قطعة مثل الصلصال). "Add heparin to a container of blood to prevent it from coagulation"
3. Centrifuge for 5 mins to packed the cells at one end of the tube leaving a clear plasma on the top
4. Use the hemocritic reader to find the (PCV)



Clinical Applications

High Hematocrit indicates:

Elevated RBCs count, causes:

- ↓ O_2 Tension
  - ★ Smoking
  - ★ Congenital heart disease
  - ★ Living at high Altitude
- Polycythemia Rubra vera
- Dehydration
  - ★ Burns
  - ★ Diarrhea

Low Hematocrit indicates:

A person with low hematocrit referred to as being anemic, causes :

- Bone Marrow failure
  - ★ Radiation
  - ★ Fibrosis
  - ★ Tumor
  - ★ Toxin
- Blood loss
- Hemolysis
  - ★ RBCs destruction (related to transfusion reaction)
- Hemorrhage
- Anemia or Leukemia

★ Boxes= Causes
★ Under each box there are details related to it

★ The Calculation of Red Blood Indices

Mean Cell **V**olume (MCV)

The average volume of red blood cell measured by femtoliters (fl)

★ a value that describes the average size of red blood cells (erythrocytes) in a blood sample.

★ ↓ MCV → Microcytes
★ ↑ MCV → Macrocytes

$$MCV\ (fl) = \frac{PCV}{RBC} \times 10$$

AVG= 78 - 98 μm^3 (fl)

Mean Cell **H**emoglobin (MCH)

The average weight of red Hb in a single RBC measured by picogram (pg)

★ A value refers to the average quantity of hemoglobin present in a single red blood cell.

★ ↓ MCH → Hypochromic
★ ↑ MCH → Hyperchromic

$$MCH\ (pg) = \frac{Hb}{RBC} \times 10$$

AVG= 27 - 32 pg

Mean Cell Hb Concentration (MCHC)

Concentration of Hb per 100 ml of RBC measured in g/dl

★ Measure of the concentration of Hb in a given value of packed RBC *100 المعطى لنا هنا*

$$MCHC\ (\%) = \frac{Hb\ (100mg\ blood)}{PCV} \times 100$$

AVG= 30 - 35 g/bl

★ Types of Anemia

	Case A	Case B
RBC	LOW	LOW
Hb	LOW	LOW
PCV	LOW	LOW
MCV	LOW	High
MCH	LOW	N/High
MCHC	LOW	N/LOW
Type of Anemia	Microcytic - Hypochromic	Macrocytic - Megaloblastic
Causes	Iron Deficiency	Vit B12 or Folic acid deficiency

★ **Macrocytic megaloblastic anemia means that RBCs aren't produced properly so you have anemia =RBC are low.**

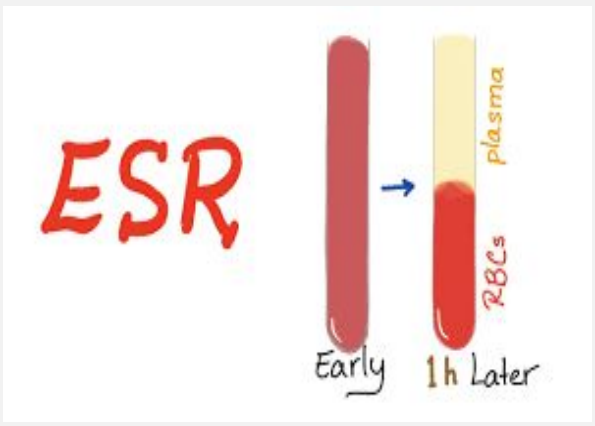
★ **The size of RBCs are large = macrocytic magaloblastic . MCHC is low due to low hemaglobin**

★ A- Erythrocyte Sedimentation Rate

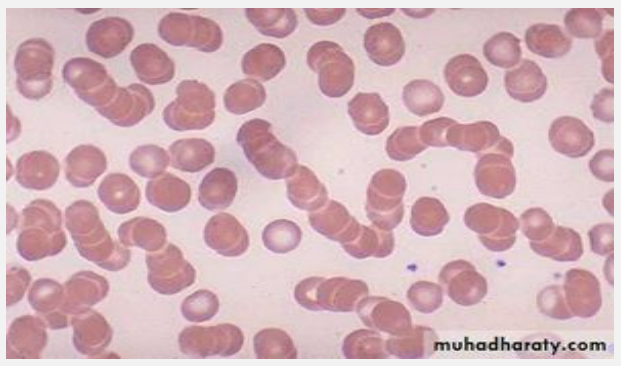
1. Is the rate at which RBCs sediment (precipitate) in a period of 1 hour.
2. ESR is a non-specific measure of inflammation. A faster-than-normal rate may indicate inflammation in the body.

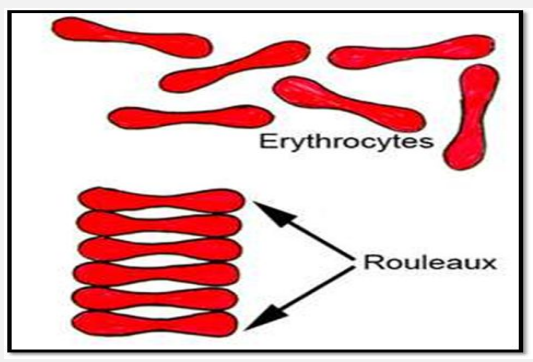
★ B- RBCs Sedimentation

1. **Normal RBCs** have -Ve charges → they repel each other
   Plasma proteins (fibrinogen) have +Ve charges → promoting aggregation.
2. In inflammation, the high fibrinogen level causes RBCs to stick to each other. (Fibrinogen: is a clotting factor) **Why that happens?** due to aggregation to form stacks (rouleaux), which settle (sperate) faster.



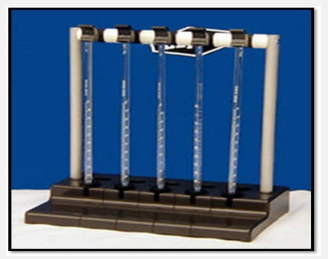
Formation of rouleaux →





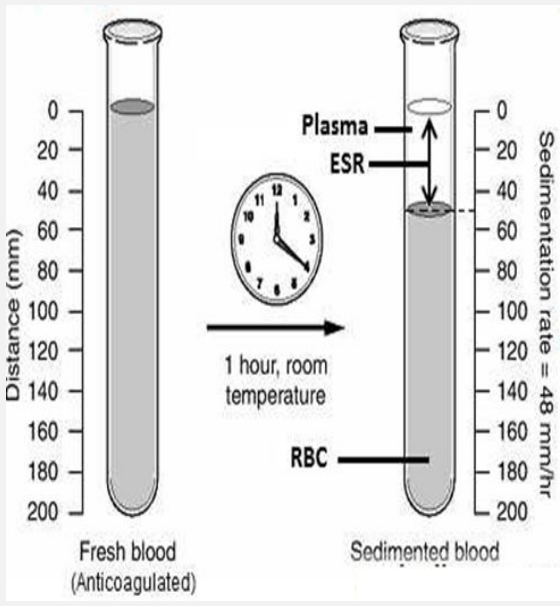
★ What do we need?Materials are:

1. Westergren's sedimentation apparatus
2. Anticoagulant (EDTA)
3. Disposable sterile syringes and needle



★ Procedure:

1. Using a sterile syringe draw 1.6ml of blood from a suitable vein.
2. Transfer it to a test tube (containing EDTA) and then draw up blood into a Westergren tube exactly to the zero mark.
3. Place the tube upright in the stand and leave undisturbed.
4. The height of the column of clear plasma at the top of the tube is noted at the end of an hour, this will be ESR reading.



★ ESR Results

Male

0mm - 7mm

Normal Value ESR

Slightly higher than male

Female

★ Due to less number of RBCs

Pregnancy

infections

inflammation

Moderately elevated ESR occurs

Anemia

Malignancies

Old age

Multiple myoloma

A very high ESR associated with

Temporal arteritis

Polymyalagia Rheumatic

★ Clinical application of ESR

- Nonspecific test
- Prognostic not diagnostic
- Monitor disease activity and response to therapy.
- -ESR is nonspecific marker of inflammation
  -It's affected by other factors.
  -ESR results must be used along with other clinical findings

★ C-reactive protein & ESR

- C-reactive protein: is an acute phase protein produced by the liver during an inflammatory reaction.
- Since C-reactive protein levels in the blood rise more quickly after the inflammatory or infective process begins, ESR is often replaced with C-reactive protein measurement.

Test yourself

Q1: What is the clinical importance of knowing the red blood cells indices?

RBC indices are part of the complete blood count (CBC) test. They are used to help diagnose the cause of anemia. **The indices include:**
Average RBC volume (MCV),
Hemoglobin amount per RBC (MCH),
The concentration of Hb per 100 ml of RBC (MCHC)

Q2: Discuss briefly the etiology classification of anemia?

Hemorrhagic Anemia → Blood loss
Aplastic Anemia → Bone marrow suppression by drugs or radiation.
Nutritional Anemia → Iron, Folic acid, Vit B12 deficiency
Hemolytic Anemia → Increased destruction of RBCs such as sickle cell anemia

Q3: What is meant by rouleaux formation? Why does rapid rouleaux formation increase the ESR?

Stacks or aggregations of red blood cells (RBCs) due to high fibrinogen level.

Q4: What is the clinical significance of ERS?

It considered as non-specific measure of inflammation

Q5: What conditions are associated with an increased ESR?

Multiple myeloma, polymyalgia Rheumatic, temporal arteritis.

Q6: Peripheral blood parameters of two adult males (Subject A and Subject B) are shown in the table below. Using the information shown in the table answer the questions a & b.

Laboratory parameter	Subject A	Subject B
RBC Count	3.6×10^6 /mm^3	2.4×10^6/mm^3
Hb concentration	7.2 g/dl	8 g/dl
Hct	25%	25%

a. **Calculate MCV, MCH, and MCHC for each of these subjects.**
b. **What are the RBC abnormalities seen in these men. List possible causes for each of these abnormalities?**

Blood Groups

★ Blood groups and Rhesus blood group

01 Group A
antigen A on RBC membrane anti B in plasma.

02 Group AB
Antigen A and B on RBC membrane NO antibodies in plasma.

03 Group O
NO antigen on RBC membrane both Anti A and Anti B in plasma.

04 Group B
Antigen B on RBC membrane Anti A in plasma.

05 Rh +ve
Antigen D on RBC (96-98%).

06 Rh-ve
NO Antigen D on RBC (2-4%).

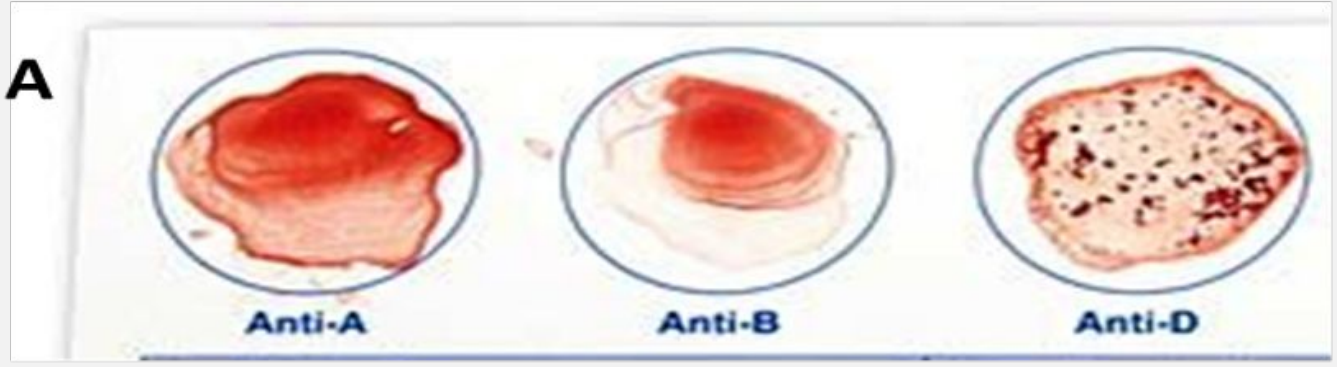
★ Materials

1. High titer anti-A, anti-B and anti-D sera.
2. A microscope.
3. Tooth picks.
4. Microscope slides.
5. Alcohol swabs.
6. Lancet.

★ Procedure

1. Take 3 microscope slides and label them clearly as “A”, “B” and “D”.
2. Sterilize the fingertip with an alcohol swab.
3. Prick the finger using a lancet and place one drop of blood in each of the 3 microscope slides.
4. Quickly add a drop of anti-A, anti-B and anti-D sera to slides labeled as “A”, “B” and “D” respectively.
5. Stir the mixture on each slide with the help of different pieces of tooth picks for a minute or two.
6. Examine the mixtures carefully for the signs of red blood cell agglutination. When red blood cells clump together (agglutination), they have a speckled or peppered appearance. If there is a doubt, examine the slides using the low power of a microscope.

Sample A: O+ blood type



Sample B : B+ blood type

Sample C : A+ blood type

Blood Group	Antigens	Antibodies	Can give blood to	Can receive blood from
AB^+	A ,B, Rh	None	AB^+	All blood groups
AB^-	A, B	Anti-Rh	AB^-, AB^+	AB^-, A^-, B^-, 0^-
A^+	A, Rh	Anti B	A^+, AB^+	A^+, A^-, 0^+, 0^-
A^-	A	Anti B, Anti Rh	A^-, A^+, AB^-, AB^+	A^-, 0^-
B^+	B, Rh	Anti A	B^+, AB^+	B^+, B^-, 0^+, 0^-
B^-	B	Anti A, Anti Rh	B^-, B^+, AB^-, AB^+	B^-, 0^-
0^+	Rh	Anti A, Anti B	0^+, A^+, B^+, AB^+	0^+, 0^-
0^-	None	Anti A, Anti B, Anti Rh	All blood group	0^-

★ Rh (D) antigen

- Of next importance is the Rh type.
  >Term "Rh" is a misnomer.
  > Rh is a blood group system with many antigens, one of which is "D".
- Rh refers to the presence or absence of the D antigen on the red blood cell. The presence of the antibody to the "D" antigen however requires previous exposure to the antigen.

Production of antibody to D requires exposure to the antigen.

The D antigen is immunogenic, i.e. individuals exposed to it will very likely make an antibody to it.

For this reason all individuals are typed for D, if -ve must receive Rh (D) -ve blood

The most important patient population to consider is females of child-bearing age.

If immunized to Rh (D) antigen the antibody can cross the placenta and destroy Rh (D) positive fetal cells resulting in death.

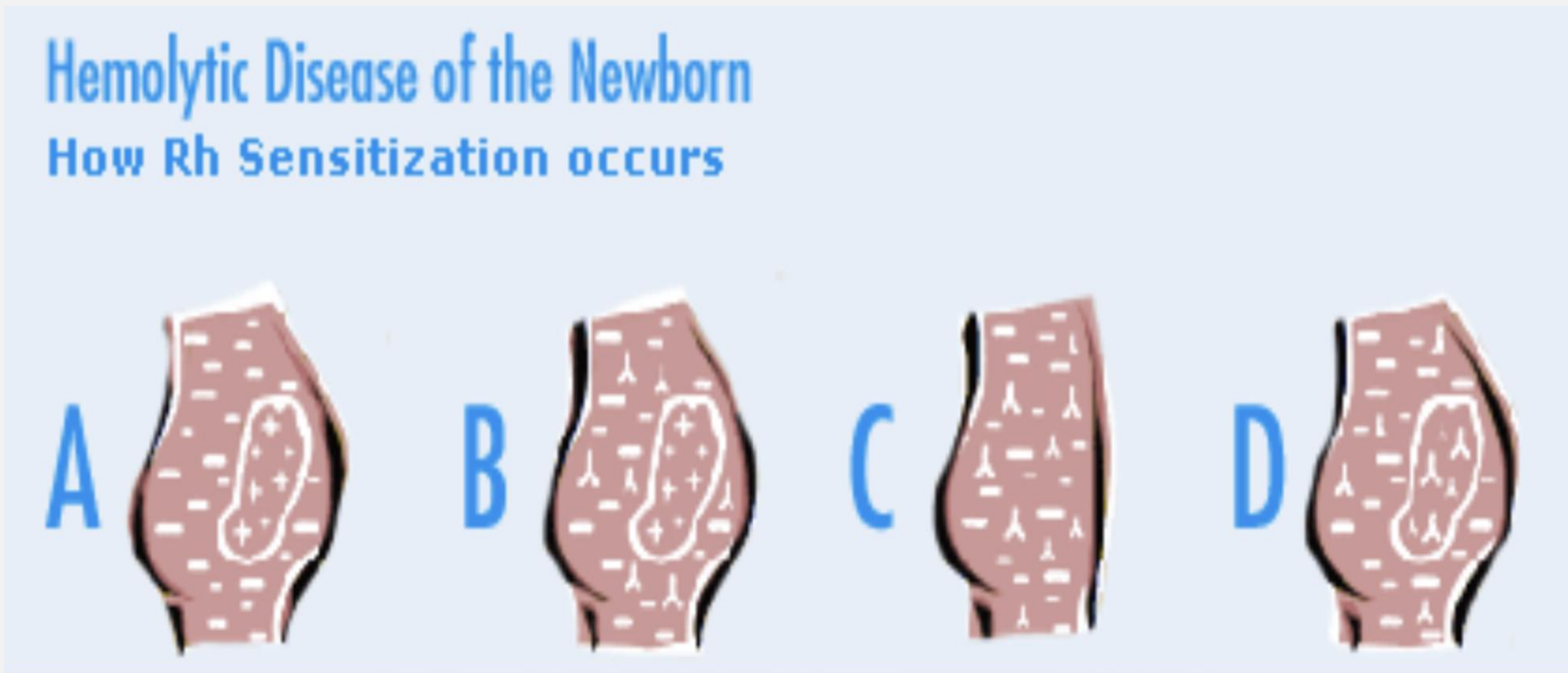
This is why Rh negative women are given (Rhogam) after birth of Rh positive baby

★ Clinical applications

1. Blood transfusion
2. Hemolytic disease of newborn (HDN) Explained in detail in the upcoming slide
3. Blood products

2. Hemolytic disease of newborn (HDN) (Erythroblastosis Fetalis)

- If a child is Rh positive.
- Then during pregnancy fetal Rh positive RBC's escape into maternal circulation
- Mother produces antibodies to Rh (D) antigen.
- Second or subsequent pregnancies with Rh (D) positive child results in destruction of fetal D positive RBCs.



Interpretation of Slide Typing Testing with **Anti-B** Anti-Serum

- If an RBC contains the **"B"** antigen the red blood cells will be agglutinated by **anti-B**, (a positive reaction).
- If an RBC does not have the B antigen there will be **no clumping by anti-B**, (a negative reaction).

Interpretation of Slide Typing Testing with **Anti-A** Anti-Serum

- if an RBC contains the **"A"** antigen the red blood cells will be agglutinated by **anti-A**, (a positive reaction).
- If an RBC does not have the A antigen there will be **no clumping**, (a negative reaction).

Clotting Time

★ Clotting time

The time required for blood to form a clot.

1. The normal coagulation time in glass tubes is 3 to 10 minutes.
   5 to 15 min in boys slides
2. The whole blood clotting time is a rough measure of all intrinsic clotting factors in the absence of tissue factors.
3. Used in diagnosis of hemophilia (bleeding disorder)
4. Its chief application is in monitoring anticoagulant therapy.

★ Materials

1. Capillary tubes of uniform size (non heparinized)
2. A petri-dish.
3. Alcohol swabs.
4. Cotton wool.
5. Plasticine.
6. A water bath set at 37°C.
7. A watch

★ Procedure

1. Prick a finger of the subject observing the usual precautions and note the time at which the prick is made.
2. Wipe away the first drop of blood.
3. Then while the blood is still freely flowing, place one end of the capillary tube on it and let the tube fill with it by the capillary action.
4. Close both ends of this filled capillary tube with the plasticine.
5. Place this capillary tube in the water bath.
6. Repeat all the above steps with many capillary tubes.
7. Two minutes after making the prick, break a capillary tube and separate the two halves slowly and look for a thread like clot between the two broken halves of the tube.
8. Repeat step 7 at 30 seconds interval with the remaining tubes until you see a thread-like clot between the broken halves of one of the capillary tubes.
9. Note the time. The time from pricking the finger to the appearance of the clot is the clotting time.

★ Results

Prolong clotting time seen in deficiencies in the intrinsic coagulation pathway.

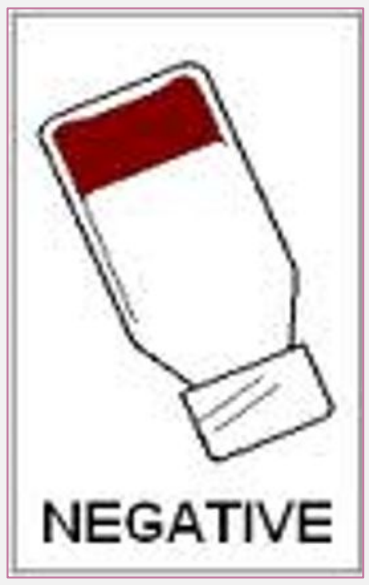
Usually the clotting time measured by this method is in the range 3-10 minutes.

Example: Hemophilia due to deficiency of Factor VIII (8).

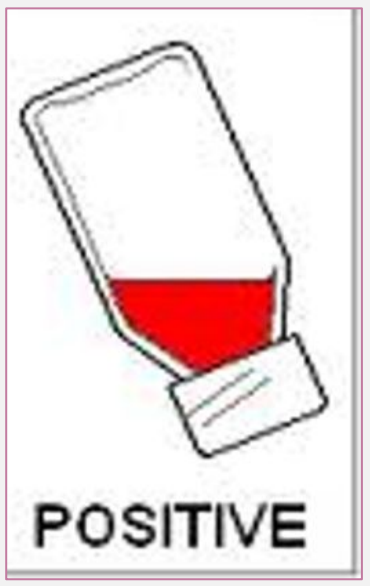
★ Clotting Time using Test Tube Method

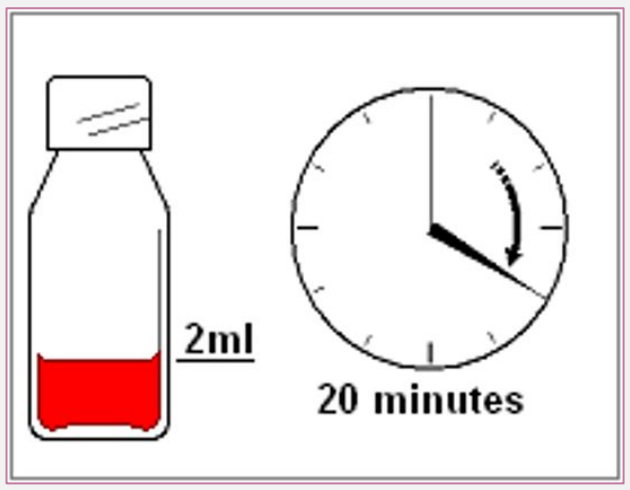
1. Place 2 ml blood into non heparinized test tube incubated in water bath.
2. Every 30 second invert gentle to check for clot formation.
3. Time from pricking finger to clot formation is clotting time.
4. Normally 6-10 min by this method
5. Time from pricking finger to clot formation is clotting time.
6. Normally 6-10 min by this method

Clot formed



NO Clotting





Bleeding Time

★ Bleeding time

1. The time taking for bleeding to stop (time for a platelet plug to form).
2. Bleeding time is a test of platelet function.
3. Bleeding time is prolonged in cases of thrombocytopenia

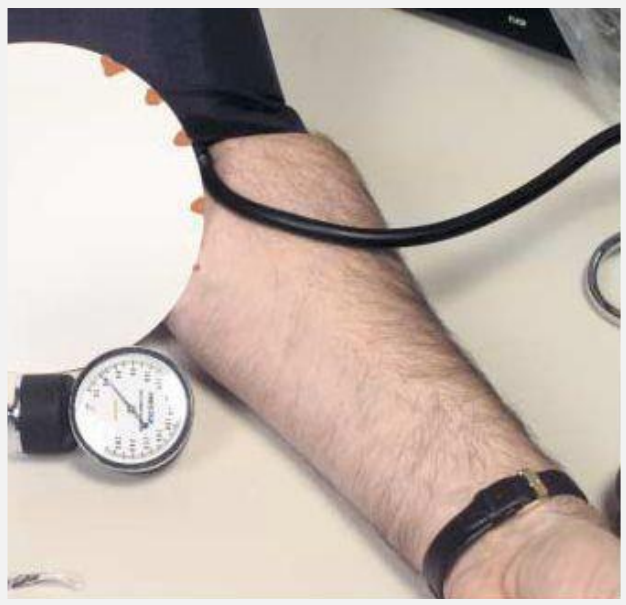
★ Materials

a. Blotting paper.
b. Stop watch.
c. Alcohol swabs.
d. Lancets.

★ Procedure

1. Prick a finger of the subject observing the usual precautions and note the time at which the prick is made. (The pricked skin should not be touched until the experiment is over.)
2. Apply a piece of filter paper (blotting paper) to the emerging drop of blood from the pricked skin every 30 seconds until the bleeding stops.
3. Note the time when the bleeding stops. The time from pricking the finger to the stop of bleeding is the bleeding time.

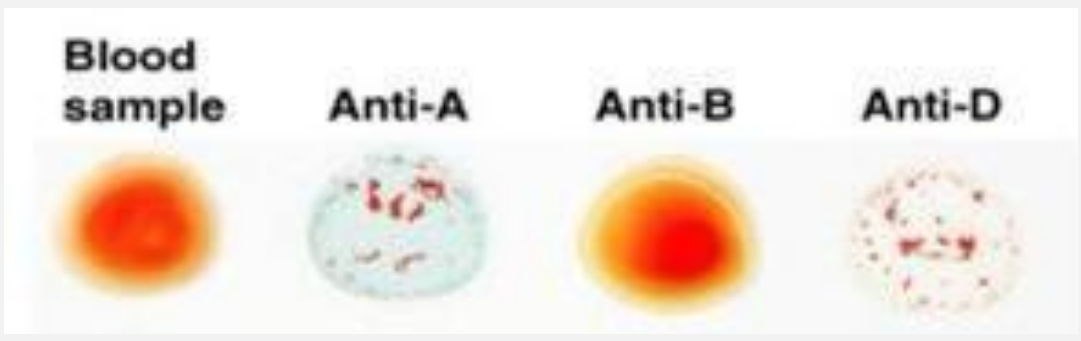
★ The standardized template method



1. A sphygmomanometer cuff is applied to the subject's arm and inflated to 40mmHg.
2. The volar surface is cleaned with 70% alcohol.
3. A sterile metal template with a linear slit (11mm long) is pressed firmly against the skin.
4. A scalpel blade, with a guard, is carefully introduced so that it protrudes 1mm through the template slit. An incision, 1mm deep and 9mm long can then be made.
5. Blood is gently, but completely removed with filter paper at 15 second intervals until the bleeding stops.
6. Normal bleeding times determined with this method are in the range 2.5-9.5 minutes.

Test yourself

1. What is the blood type seen in this sample?



2. You did a bleeding test to a patient, it took 17min to form a clot, is normal?

1) A+ , it contain A antigens, it contain D+
2) The normal range it is from 3-10 min, we suspect haemophilia

MED441
KING SAUD UNIVERSITY

physiology 441

Foundation Block

Physiology team 441

Male Members

Abdulaziz Alassaf
Muan Almoajil
Feras Alzahrani
Meshal Alqahtani
Faisal Bin Moammar
Ahmed Bin Radi
Mansour Aldhalaan
Rayan Ali
Saad Alghadir
Naif Al-Hasan
Fahad Alkhattabi
Abdulaziz Alqusiyer
Naif Alfahed
Faisal Alshuaibi
Bader Alshahrani
Bader Rajeh

Female Members

Lama Bin Salamh
Munira Alsharif
Shimah Alsalhi
Albandry Bin Habda
Raaoum Jabor
Arwa Alenzi
Ayah Sayed
Lama Aleyadhy
Lujain Alkhalaf
Layan Almasri
Deema Almuhaimel
Ghadah Alarify
Asma Eidah
Reema Alrashedi
Sara Alhomaidhi
Raneem Alanazi
Jumana Alqahtani
Sahar Alhakami
Waad Alhowti
Maha Aljarbaa

Team Leaders

- ★ Alanoud albawardi
- ★ Nawaf alshehri

Edited by :

Physiology.team441@gmail.com