



PHYSIOLOGY PRACTICAL revision

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WISH YOU ALL THE BEST!

:)

CBR (COMPLETE BLOOD COUNT)

NORMAL VALUES OF BLOOD CELLS

TYPE OF BLOOD CELLS	NORMAL RANGE
RBC'S	4.7-5.2 MILLION/mm ³
WBC'S	4000-11000 /mm ³
PLATELET	250000 - 500000
HEMATOCRIT (PACKED CELL VOLUME)	45%
HEMOGLOBIN CONC.	14-16 G/DL IN THE BLOOD

THE ERYTHROCYTE INDICES

1. MCV (Mean cell volume) :

Is the volume of average red blood cell measured in cubic micron.

$$MCV = \frac{\text{packed cell volume} \times 10}{RBC \text{ count (millions/mm}^3)}$$

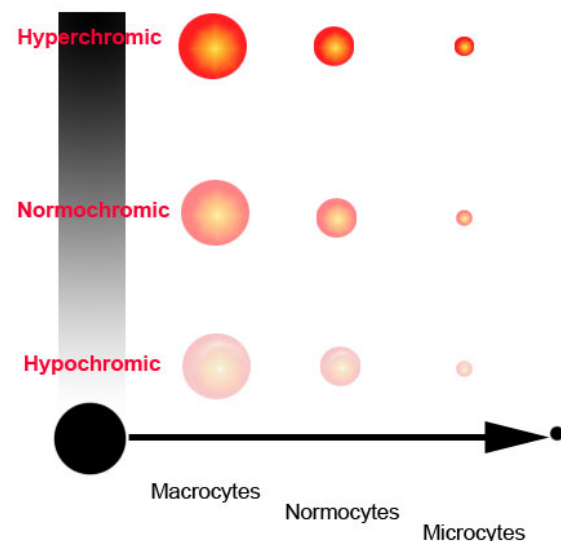
- it is measured in μm^3
- if the MCV above normal then RBCs is called macrocytes RBCs.
- if the MCV less than normal , RBCs is called microcytic RBCs.

2. MCH (mean corpuscular hemoglobin):

It determines the mass of haemoglobin in an average erythrocyte.

$$MCH = \frac{\text{Hemoglobin concentration} \times 10}{RBC \text{ count (millions/mm}^3)}$$

- it is measured in picogram (Pg)
- MCH less than lower limit of normal: hypochromic RBCs
- MCH greater than upper limit of normal: hyperchromic RBCs



3. **MCHC (Mean corpuscular hemoglobin concentration)**

The amount of hemoglobin relative to the size of the cell, and it is measured in percentage or g/dl.

$$\text{MCHC} = \frac{\text{Hb concentration gm/dl} \times 100}{\text{Packed cell volume}}$$

So, if i tell the MCHC is 100% that means the whole RBC is hemoglobin.

NORMAL VALUE OF ERYTHROCYTE INDICES

Indices	Normal value
MCV	85±8 um³
MCH	29±2.5 PICOGRAM
MCHC	30-36% 32-36 G/DL

SOME DISEASES RELATED TO PLATELET, WBCS, RBC'S

- **Anemia** : decrease in the number of Rbcs , or the amount of hemoglobin in the blood.
 - **Polycythemia** : increase in the number of RBcs
 - **Leukocytosis**: increase in the number of WBCs
 - **Leukopenia**: decrease in the number of WBCS
- **Thrombocytosis**: increase in the number of platelet .
- **Thrombocytopenia**: decrease in the number of platelet.

You know these, don't you?
you are genius :)

TYPES OF anemia:

TYPES OF anemia	THE CAUSE
Macrocytic (megaloblastic) anemia	Vitamin B12 deficiency
Pernicious Anemia	<ul style="list-style-type: none">- loss of parietal cell of the stomach- deficiency of intrinsic factor
microcytic hypochromic anaemia	iron deficiency
Aplastic anaemia	bone marrow failure
Hereditary Spherocytosis anemia	excessive destruction of RBCs.
sickle cells anemia	excessive destruction of RBCs.

TLC (TOTAL LEUCOCYTES COUNT)

Types of WBCs	Characteristics of each wbc
NEUTROPHILS	<ul style="list-style-type: none"> - Granular Wbc - 2-5 lobes - 62 % of WBC's - increased in acute inflammation
EOSINOPHILS	<ul style="list-style-type: none"> - granular WBC - 2 lobes - 2.3 % of WBC's - increased in allergic reaction, parasitic infection
BASOPHILS	<ul style="list-style-type: none"> - granular Wbc - 2-3 lobes - 0.4% of WBCs - increased in allergic reaction
MONOCYTES	<ul style="list-style-type: none"> - largest of all Wbc's - kidney-shaped - 5.3% of WBC's
LYMPHOCYTES	<ul style="list-style-type: none"> - smallest of all Wbc's - 30% of WBC's - chronic infection, viral acute inflammation

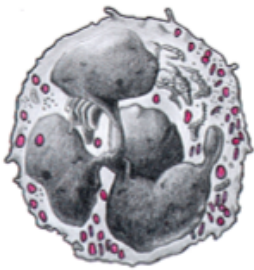


Fig. 8 - Neutrophil

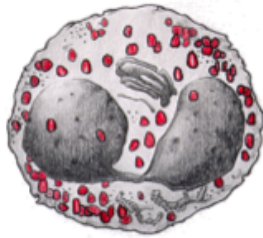


Fig. 9 - Eosinophil

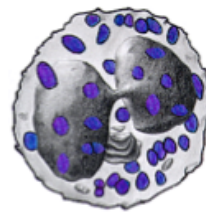


fig. 10 - Basophil



Fig. 12 - Monocyte



Fig. 11 - Lymphocyte

ESR **(ERYTHROCYTE SEDIMENTATION RATE)**

- **Erythrocytes Sedimentation Rate ESR**

1. What is the clinical significance of E.S.R.?

- This is a non-specific indicator of presence of a disease.
- This is a useful prognostic tool.

2. What conditions are associated with an increased E.S.R.?

- Infections
- Connective tissue disorders
- Inflammatory disorders
- Malignancies
- Anemia
- Pregnancy
- Cancer
- TB

- E.S.R has to be reading after 1 hour to measure RBC volume or plasma.
- E.S.R in females is higher than males because they have less RBCs count.
- More RBCs = Less E.S.R.
- ESR for male \approx 10 mm/h is normal.
- ESR for female \approx 15 mm/h is normal.

The name of the tubes is (Westergren Tube)



BLEEDING TIME, CLOTTING TIME

- **Determination of Clotting Time:**

1] Clotting time:

is the time required for the process of coagulation.

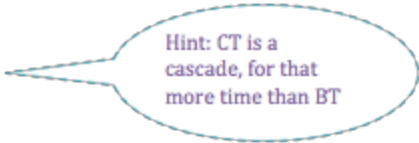
2] What is the normal range of clotting time?

3 - 10 minutes

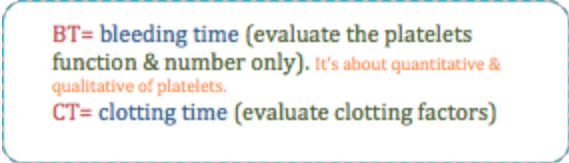
3] What are the clinical conditions in which the clotting time is greater than normal?

If CT increased that's mean that we have problems with the factors.

- Hemophilia A & classical Hemophilia: deficiency of factor 8 (VIII)
- Hemophilia B: deficiency of factor 9 (IX) or Christmas factor.



Hint: CT is a cascade, for that more time than BT



BT= bleeding time (evaluate the platelets function & number only). It's about quantitative & qualitative of platelets.
CT= clotting time (evaluate clotting factors)

- **Determination of the Bleeding Time:**

1] bleeding time:

is the time needed for the aggregation of platelet.

2] What is the normal range of bleeding time?

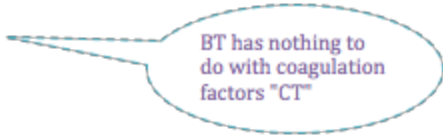
2 - 5 minutes

3] Which blood cells deficiency may prolong the bleeding time?

Platelets

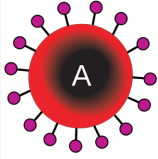
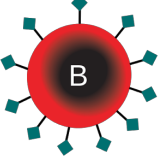
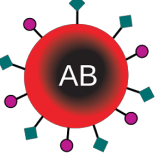



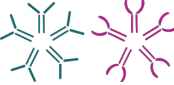



4] Name one condition in which bleeding time is prolonged (increased)?

Thrombocytopenia.







































BT has nothing to do with coagulation factors "CT"

BLOOD GROUP

	Group A	Group B	Group AB	Group O
Red blood cell type				
Antibodies in Plasma	 Anti-B	 Anti-A	None	 Anti-A and Anti-B
Antigens in Red Blood Cell	 A antigen	 B antigen	 A and B antigens	None

HOW TO read THE RESULT OF BLOOD GROUP

HOW TO READ YOUR RESULTS

BLOOD TYPE	ANTI-A	ANTI-B	ANTI-D	CONTROL
O-POSITIVE				
O-NEGATIVE				
A-POSITIVE				
A-NEGATIVE				
B-POSITIVE				
B-NEGATIVE				
AB-POSITIVE				
AB-NEGATIVE				
INVALID				

		DONORS								
RECEIVERS		O-	O+	B-	B+	A-	A+	AB-	AB+	
	AB+	♥	♥	♥	♥	♥	♥	♥	♥	♥
	AB-	♥		♥		♥		♥		
	A+	♥	♥			♥	♥			
	A-	♥				♥				
	B+	♥	♥	♥	♥					
	B-	♥		♥						
	O+	♥	♥							
	O-	♥								

RH INCOMPATIBILITY

Rh incompatibility is a condition that occurs during pregnancy if a woman has Rh-negative blood and her baby has Rh-positive blood.

"Rh-negative" and "Rh-positive" refer to whether your blood has Rh factor. Rh factor is a protein on red blood cells. If you have Rh factor, you're Rh-positive. If you don't have it, you're Rh-negative.

Rh factor is inherited (passed from parents to children through the genes). Most people are Rh-positive.

QUESTIONS :

1. a patient has 100000 platelet, which of these condition is true about this patient:
 - a. increase in the clotting time.
 - b. decrease in the clotting time.
 - c. increase in the bleeding time.
 - d. decrease in the bleeding time.

2. Sample problem: calculate the MCV and the MCHC for a subject with a red blood cell count of 4×10^6 per cubic mm, a hematocrit of 40% and a hemoglobin concentration of 12 g/dl. Describe the subject's red cells, and if he has a problem tell what type of anemia he has and the cause of this problem ...

3. a patient visited a doctor and he ordered a CBC test, and the result was MCV = 70 μm^3 , and MCH = 22 PG . this patient has

4. if you done a total leucocyte count and you find these result:

eosinophil : 450
neutrophil : 6800
basophil: 100
lymphocyte: 3100
monocyte: 580

So, this patient has high chance of having

Answers:

1. C

2. the answer :

$$\text{MCV} = \frac{\text{packed cell volume} \times 10}{\text{RBC count (millions/mm}^3)} = \frac{40 \times 10}{4} = 100 \text{ um}^3$$

$$\text{MCHC} = \frac{\text{Hb concentration gm/dl} \times 100}{\text{Packed cell volume}} = \frac{12 \times 100}{40} = 30 \text{ g/dl}$$

From these value, we can say that this patient has macrocytic anemia, because he doesn't eat food rich with vit B12 :) or because he has deficiency in intrinsic factor , and the color of the red blood cells is normal ..

3. microcytic hypochromic anemia
4. allergic reaction due an increase in basophils and eosinophils