

ESR & CBC

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ADVICE: Cut Down On Salt

- ✓ To maintain healthy blood pressure, avoid using salt at the table and try adding less to your cooking.

"الفرق بين عدد السلايدات والمعلومات جدًا كبيرة فعشان كذا السلايد اللي كان موجود عند البنات والاولاد راح نحط فوقه اللي ما كتب عليها يعني البنات فقط

This slide was found in girls and boys slides"

Objectives

- Recognize the method used to measure the different hematological values, and compare it with the normal values.
- Do the calculation of indices, their normal values and their importance in diagnosis of different types of anemia.
- To know how to measure the erythrocyte sedimentation rate.
- To recognize what is the clinical value of these measurements.

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.

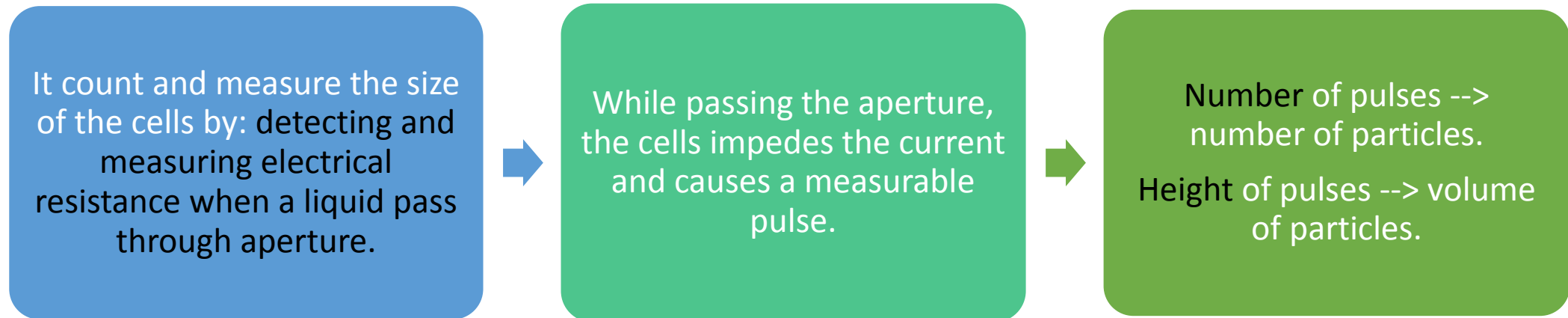
TESTS	RESULT	FLAG	UNITS	REFERENCE INTERVAL	LAB
CBC With Differential/Platelet					
WBC	5.7		x10E3/uL	4.0-10.5	01
RBC	5.27		x10E6/uL	4.10-5.60	01
Hemoglobin	15.4		g/dL	12.5-17.0	01
Hematocrit	44.1		%	36.0-50.0	01
MCV	84		fL	80-98	01
MCH	29.2		pg	27.0-34.0	01
MCHC	34.9		g/dL	32.0-36.0	01
RDW	13.7		%	11.7-15.0	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



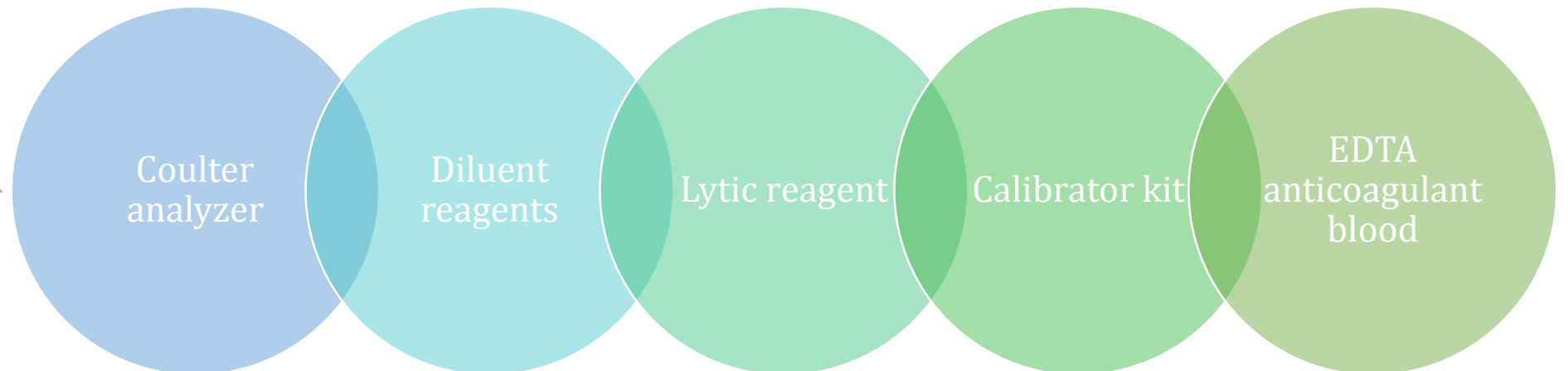
The machine that do CBC
Called : Coulter
Counter

Coulter Counter:

Principle:



Materials & methods:



^More details in next slide

Coulter Counter:

Make every single cell completely isolated

Diluent –Reagent :

Is an isotonic electrolyte solution that:

- Dilute the whole blood sample
- Stabilize cell membrane for accurate counting and size
- Conduct aperture current
- Rinse instrument components between analysis
- Prevent duplicate cell counts

We should put anticoagulant with the blood to prevent clotting

Lytic reagent:

Lysis RBCs for WBCs count and hemoglobin measurements.

Calibrator Kit:

Is an alternative to the whole blood reference method for calibration.

RBC, WBC cell count & HB:

- 5ml of venous blood will be drawn in EDTA anticoagulant tube.
- Diluted by the reagent I and used to count RBC.
- Lysing RBC using reagent II and used for counting WBC and Hb.

Normal values

	Male	Female	Average
RBC	4.5-6.5 $\times 10^6 / \mu\text{l}$	3.8-5.8 $\times 10^6 / \mu\text{l}$	4.7-6.5 $\times 10^6 / \mu\text{l}$
WBC	4 – 11 $\times 10^3$ $/\mu\text{l}$	4 – 11 $\times 10^3$ $/\mu\text{l}$	4 – 11 $\times 10^3$ $/\mu\text{l}$
HB	13-18 g/dl	11.5-16.5 g/dl	13 –18 g/dl
Platelet	150- 400 $\times 10^3 / \mu\text{l}$	150- 400 $\times 10^3 / \mu\text{l}$	150- 400 $\times 10^3 / \mu\text{l}$

You MUST memorize the normal values

Clinical Terms:

1. ↓ RBC = anemia
2. ↑ RBC = polycythemia
3. ↓ WBC = leucopenia
4. ↑ WBC = leucocytosis
5. ↓ Platelets = thrombocytopenia
6. ↑ Platelets = thrombocytosis

Anemia

Low numbers of RBCs may indicate:

Blood loss:
Anemia (various types).
Hemorrhage.

Bone marrow failure:
(for example, from radiation, toxin, fibrosis, tumor).

Erythropoietin deficiency
(secondary to renal disease).

A hormone produced by the kidney

Hemolysis (RBC destruction).
تكسر الدم

Clinical Terms: cont...

polycythemia

High numbers of RBCs may indicate:

Low oxygen tension in the blood:
-Congenital heart disease
-Cor pulmonale
-Pulmonary fibrosis

Polycythemia vera.

Dehydration (such as from severe diarrhea).

Renal (kidney) disease with high erythropoietin production.

Leucocytosis

High numbers of WBCs may indicate:

Infectious diseases.

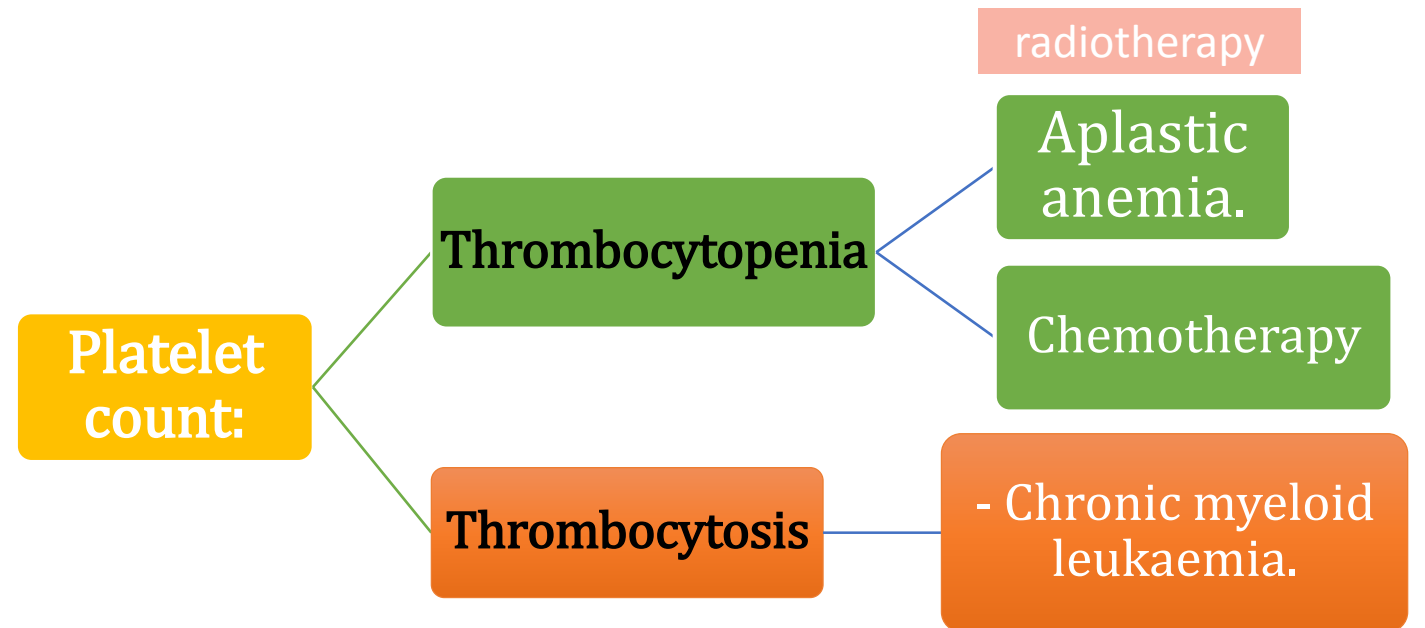
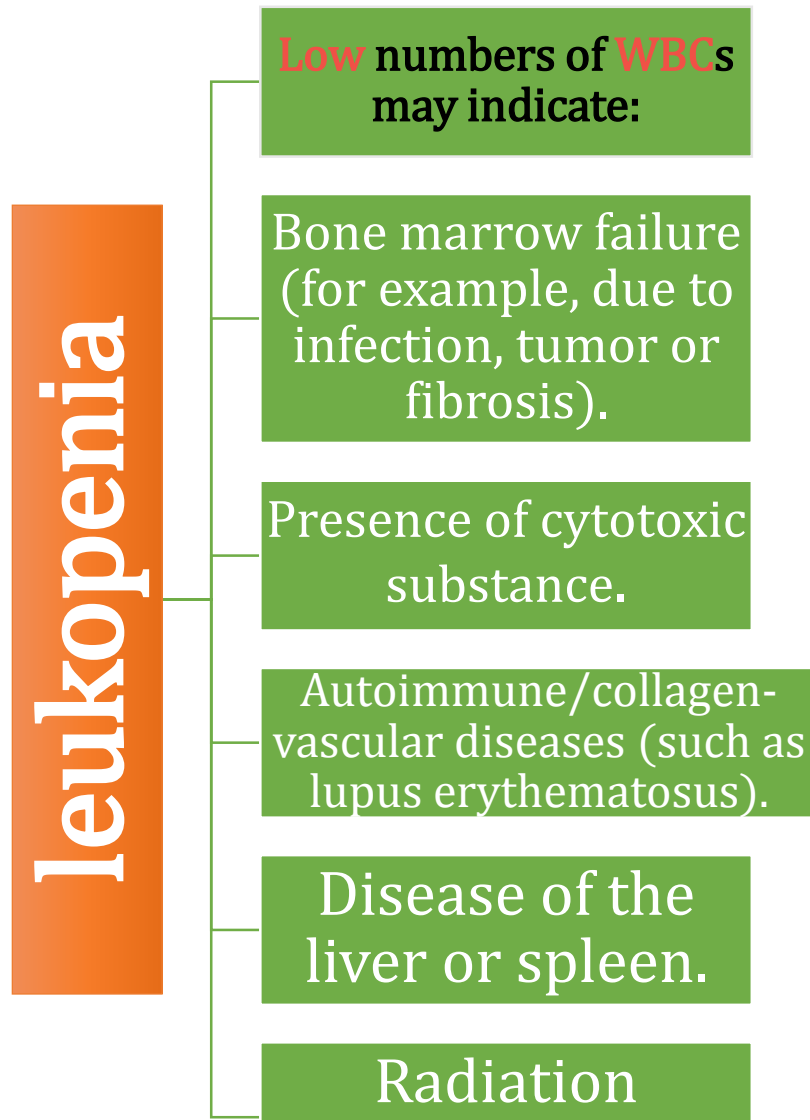
Inflammatory disease (such as rheumatoid arthritis or allergy).

Leukemia.

Severe emotional or physical stress.

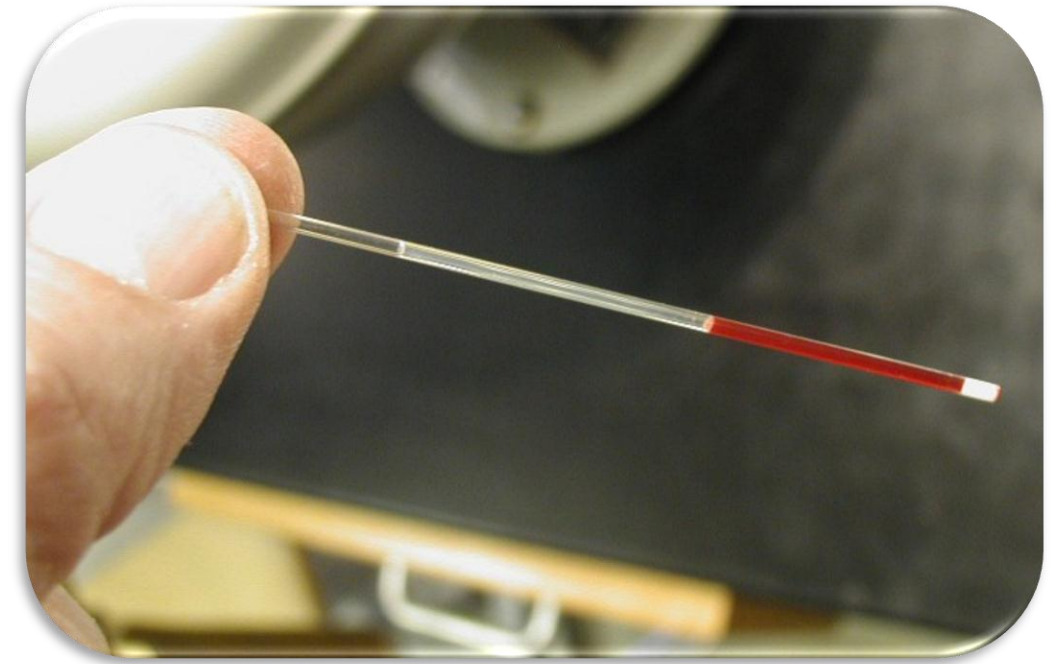
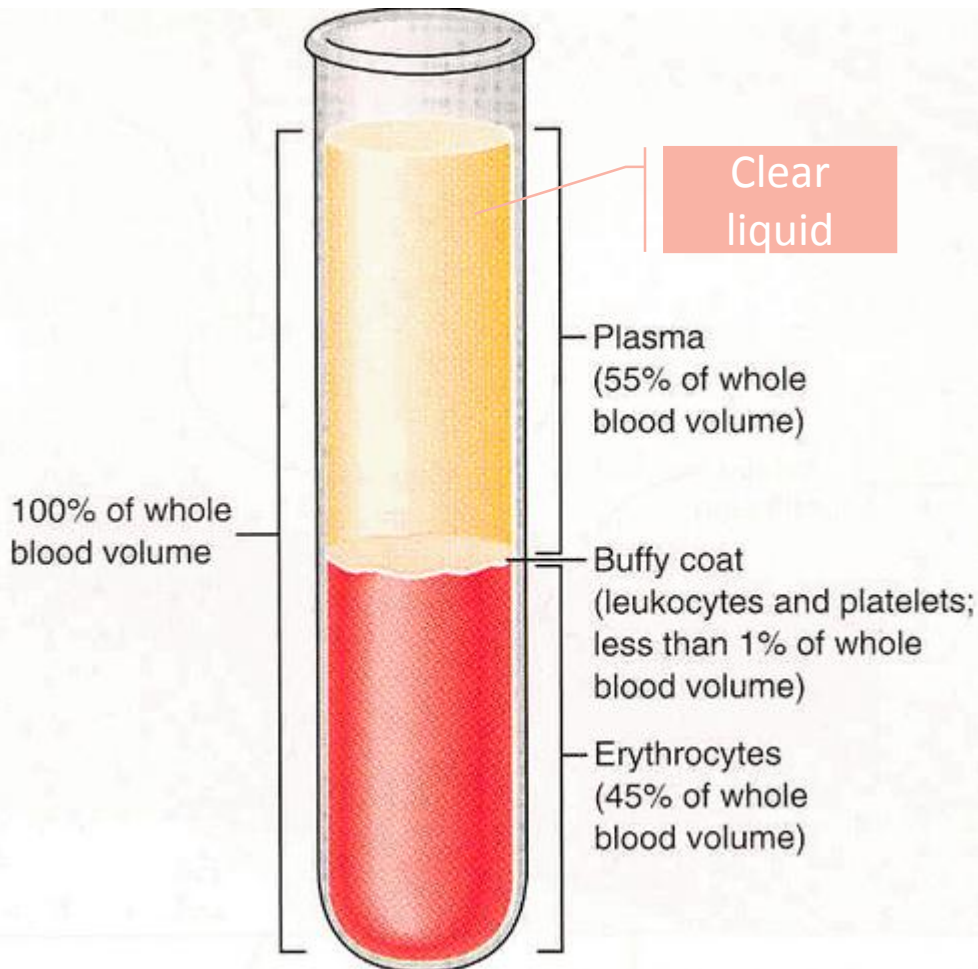
Tissue damage (burns).

Clinical Terms: cont...



Packed Cell Volume (PCV)= Hematocrit

- It is the ratio of packed blood cells volume to plasma.



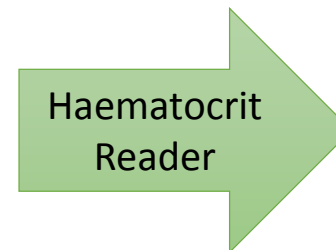
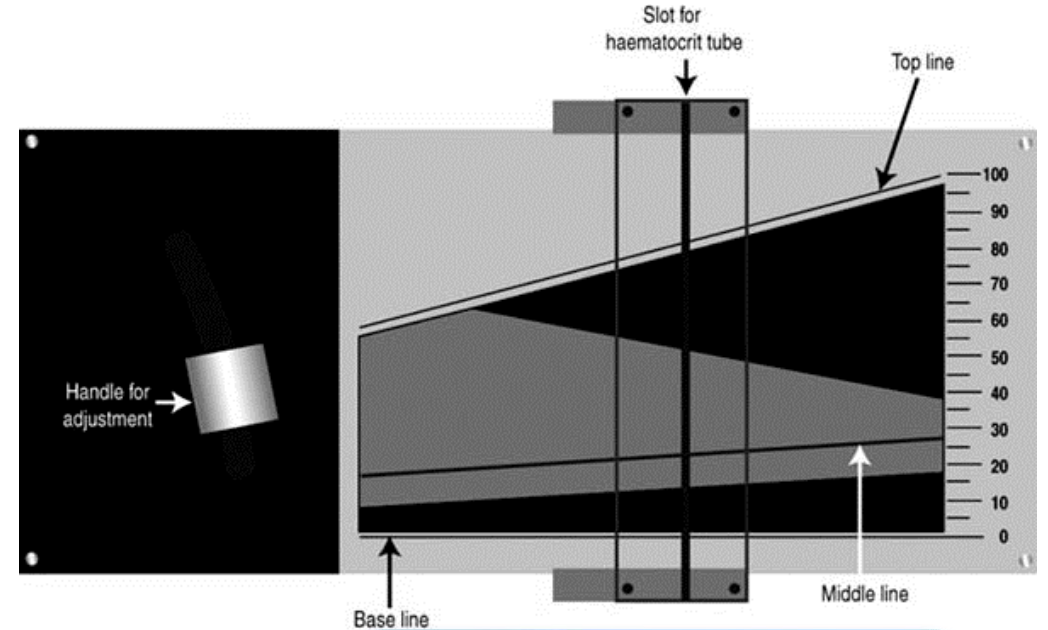
Normal value PCV::

	Male	Female	Average
PCV	40%-54%	35%-47%	35%-54%

Packed Cell Volume (PCV)= Hematocrit

Procedure:

- Capillary blood obtained from pricking finger tip after cleaning it with alcohol
- Fill a heparinised capillary tube, then seal one end by plasticine.
- Centrifuge for 5 minutes to packed the cells at one end of the tube leaving a clear plasma on top.
- Use the hematocrit reader to find the packed cell volume.



Clinical application

High hematocrit

Low hematocrit

Dehydration

Polycythemia vera

Low oxygen tension

Burns

Diarrhea

- Smoking,
- congenital heart disease,
- living at high altitudes

Anemia

Blood loss

hemorrhage

Leukemia

Hemolysis

(RBC destruction)
related to transfusion
reaction.

Bone marrow failure

Due to ::

- Radiation
- Fibrosis
- Toxin
- Tumor

Mean cell volume (MCV)

Mean cell hemoglobin (MCH)

Mean cell Hb concentration (MCHC)

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

The average weight of Hb in red cells measured by picogram (pg)

Concentration of Hb per 100 ml of RBC

$$MCV = \frac{PCV \times 10}{RBC \text{ count}}$$

$$MCH = \frac{Hb \times 10}{RBC \text{ count.}}$$

$$MCHC = \frac{Hb \times 100}{PCV}$$

↓ MCV : **microcytes**

↑ MCV : **macrocytes**

↓ MCH : **hypochromic**

↑ MCH : **hyperchromic**

[Click here for examples](#)

MCV : 78-98 fL

MCH : 27-32 pg

MCHC : 30-35 g/ dl

Types of anemia

	Case A	Case B
RBC	Low	Low
HB	Low	Low
PVC	Low	Low
MCV	Low	High
MCH	Low	N / high
MCHC	Low	N / low
Type of anemia	Microcytic hypochromic	Macrocytic megaloblastic
Cause	Iron deficiency	Vit B12 or folic deficiency

Erythrocyte Sedimentation Rate (ESR)

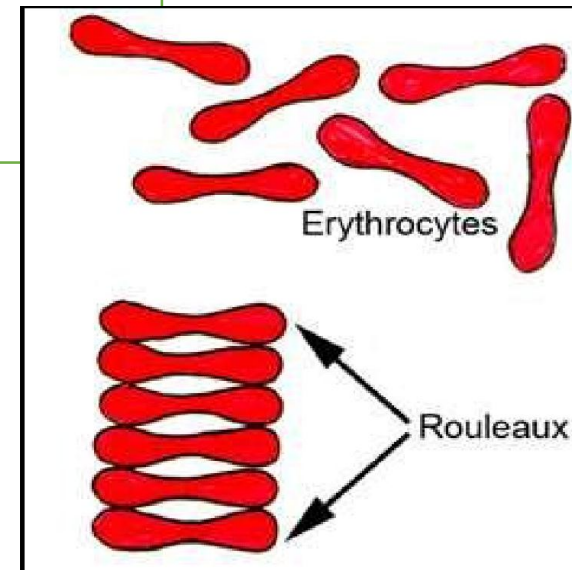
سرعة ترسيب الدم

Is the rate at which red blood cells sediment in a period of 1 hour

non-specific measure of inflammation

Is controlled by the balance between plasma protein (fibrinogen), and the negative charge of the erythrocytes.

In inflammatory the high fibrinogen level causes RBCs to stick to each other to form stacks (rouleaux), which settle faster.



Material and methods

Westergren's sedimentation apparatus

Anticoagulant (EDTA).

Disposable sterile syringes and needles.

1- Using a sterile syringe draw 1.6ml of blood from a suitable vein

2- Transfer it to a test tube containing EDTA

3- draw up blood into a Westergren tube exactly to the zero mark

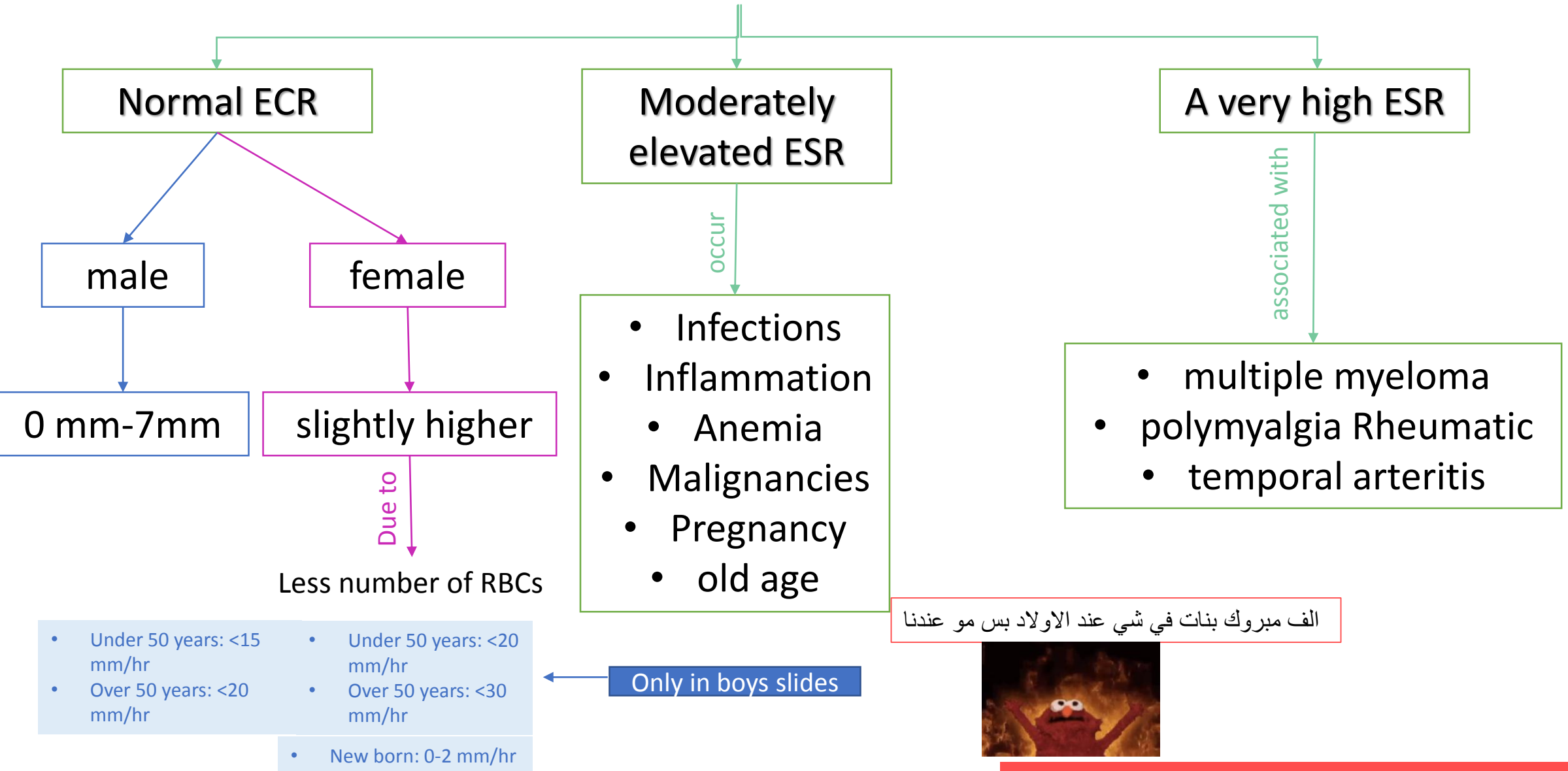
4- Place the tube upright in the stand and leave undisturbed

5- The height of the column of clear plasma at the top of the tube is noted at the end of an hour

6- Note it again at the end of 2nd hours



ESR result



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Clinical application of ESR

Nonspecific
test.

Prognostic not
diagnostic

Monitor
disease
activity and
response to
therapy

ESR is a
nonspecific
marker of
inflammation

is affected by
other factors

ESR results must be used along with other clinical findings

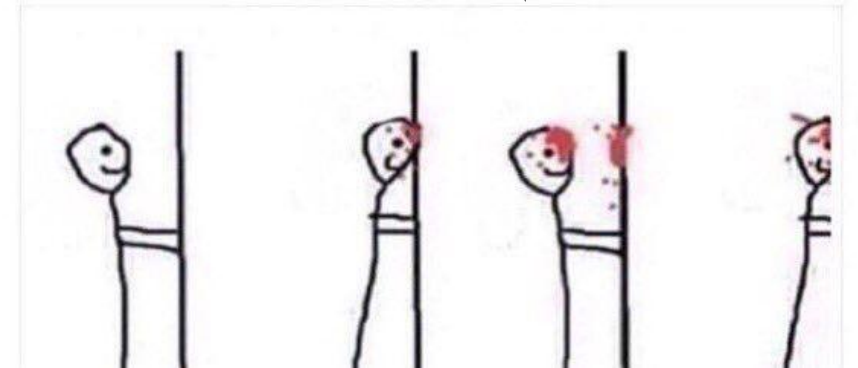
C-reactive protein & ESR

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



هنا يقول طلع مافي فايده من كل اللي درسناه وبكل بساطه ممكن نستخدم هذا الاختبار ونسحب على ذاك





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وانت شخص جديد"

PHYS OLOGY

438 practical team



Team members

GOOD LUCK

Team members



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- Mohammed Alhamad
- Zyad Aldosari
- Omar Aldosari
- Faisal alqifari
- Abdullah Basamh

- Tarfah Alkaltham
- Jude alkhalifah
- May Babaeer
- Arwa Al Emam
- Deema AlMaziad
- Noura Almazrou
- Njoud alali
- Joud Alotaibi
- Renad Almutawa
- Reema Almutawa
- Raghad Almubarak

Boys TEAM LEADER

Omar Alshenawy



Girls TEAM LEADER

Elaf Almusahel

