Al-Rasheed University College Pharmacy Department

2nd Stage / 1st Semester

2021-2022

Determination of packed cell volume

Physiology lab #4

Done by:

Assis. Lecturer Mohammed Akram Al-Mahdawi

Introduction

- **Blood** consist of two portions:

1-Liquid plasma

2-Solid cellular portion.

Solid portion consist of red blood cells, white blood cells and platelets.

PCV or HCT is defined as the volume of packed RBCs per unit volume of the whole blood after centrifugation

Introduction

- PCV is the percentage of the number of packed RBCs in the whole blood.

- Example #1:

If a 100ml of blood sample contains a 50% PCV >>

it demonstrates that 100ml of blood have 50ml of packed RBC!

Question: 100ml of blood sample contains 40% of PCV

What is the volume (ml) of PCV?

Clinical implications

- PCV is affected by the shape, number of the RBC and plasma volume.

High PCV either indicates:

(Increase in number of circulating RBCs) OR (Decrease in plasma volume) (e.g. cholera due to loss of water in the stool).

Low PCV either indicates:

A low PCV indicates either **decrease in RBC or increase in plasma volume**

Lower number of PCV may indicates:

- An insufficient supply of healthy red blood cells (anemia).
- Acute kidney disease (lower Erythropoietin production lead to less RBCs production by the bone marrow).
- Pregnancy may lead to women having additional fluid in blood. This could potentially lead to a small drop in haematocrit level.

Higher number of PCV may indicates:

- Abnormal increase in RBC (erythrocytosis)

- A disorder, such as polycythaemia vera causes the body to produce RBCs excessively.

- At higher altitudes ➔ lower oxygen supply in the air ➔ haematocrit levels may increase over time.

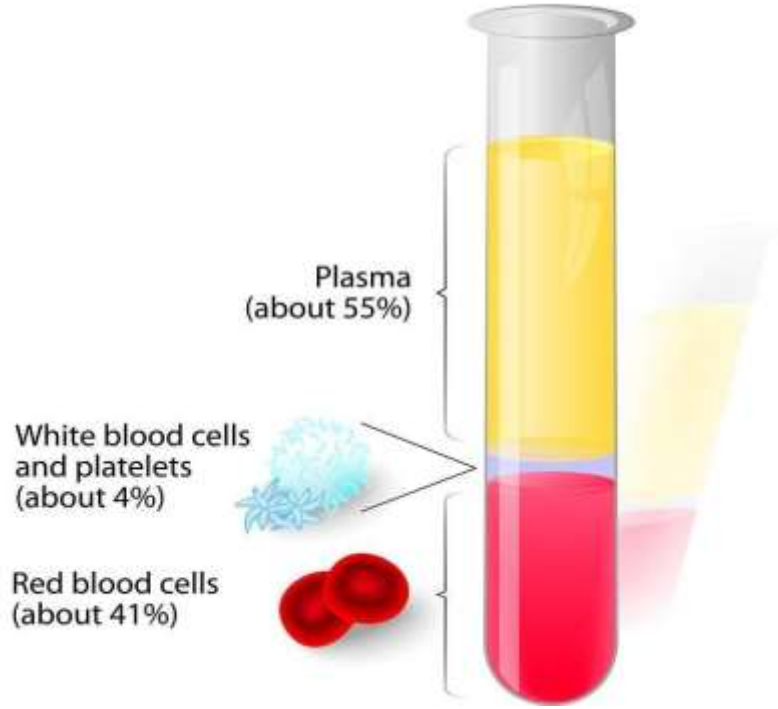
- Lung or heart disease, if the body senses low oxygen levels, it will make more RBCs in an effort to increase the amount of oxygen in the blood

Aim of Experiment

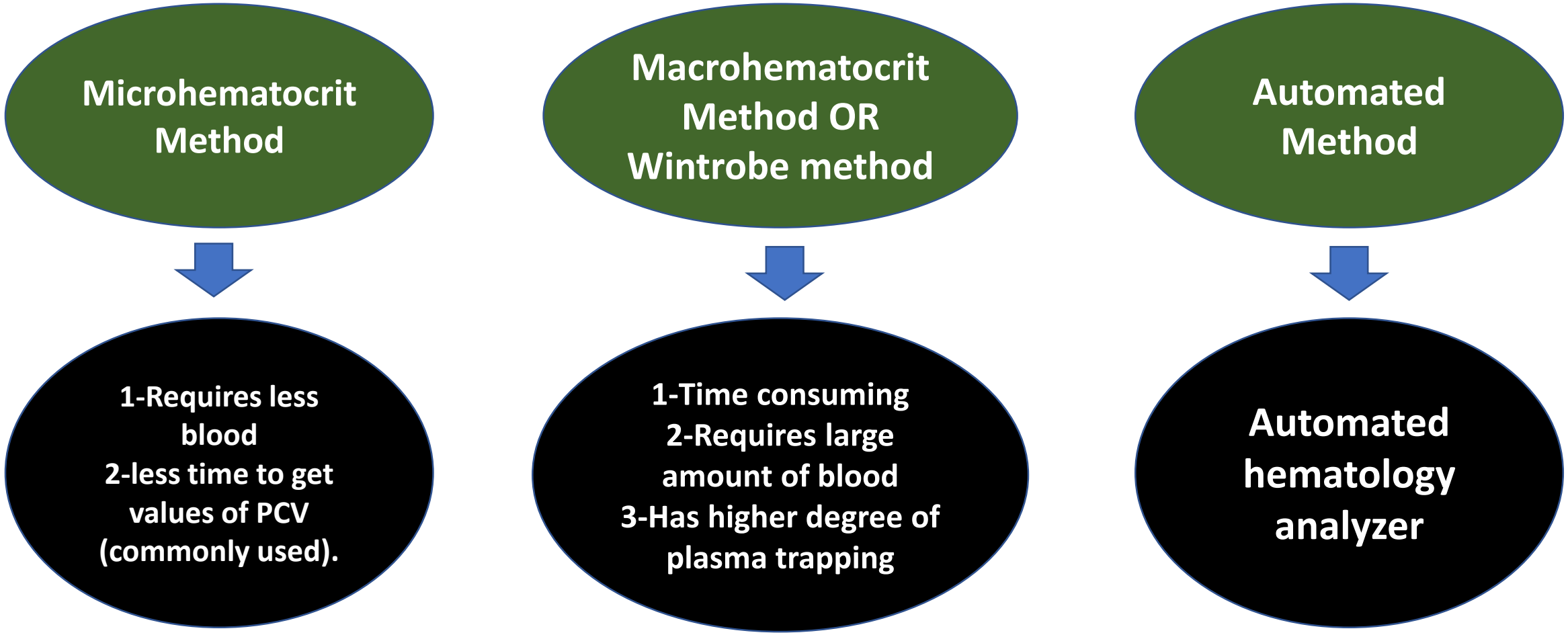
- 1- To assess PCV values, methods for determination PCV value and clinical importance of PCV.
- 2-To determine the volume or the amount of RBCs in 100 ml of blood
- 3-To assess whether there is a sufficient number of circulating RBCs to transport the required amount of oxygen throughout the body.

Principle of the experiment

- Hematocrit is derived from Greek words (Haima = blood) and (krites =separate).
- “Hematocrit” means separation of blood where blood cells and plasma are separated by centrifugation.
- When a known volume of blood is centrifuged ➔ Cells being **heavier** will **settle down** leaving a **clear column of plasma above.**



PCV determination methods



Materials and instruments

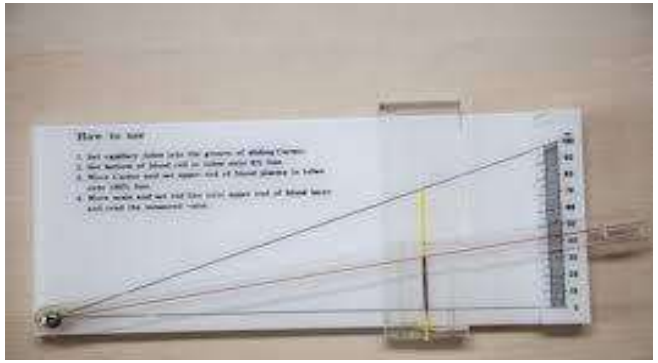
1-Microhematocrit tube (Red capillary tube).

2-Microhematocrit centrifuge device.

3-Plastic seal to seal one end of the capillary tube.

4-Microhematocrit reader.

5-Lancet, Alcohol 70%, and Cotton.



Procedure

- 1- Clean your finger with 70% alcohol and let it dry for 20-30 sec
- 2-Blood is drawn into the tube by capillary phenomenon.
- 3-Seal the dry end of the tube by plastic seal
- 4-The sealed tube then is placed in the radial grooves of the Microhematocrit centrifuge for 5 min at 10,000 RPM.
- 5-Balance the tubes in the centrifuge with the clay ends facing the outside away from the centre (place the tubes opposite each other in the centrifuge)

Observation

A tall upper layer of clear plasma - slightly yellow coloured.

Disclaimer It shouldn't be pink or red which would indicate hemolysis

A greyish-white (buffy layer) thin layer (about 1 mm) in thickness consisting of platelets and WBCs.

A tall bottom layer of RBCs which have been closely packed together.

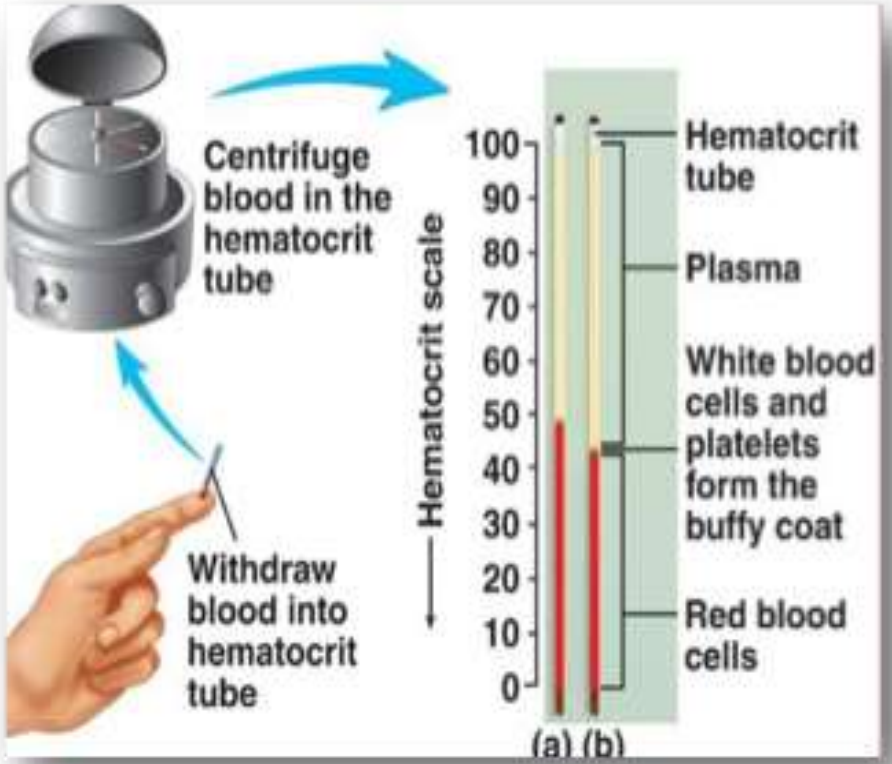
Reading PCV Values

- The capillary tube should be parallel to graduation and you should do the following:

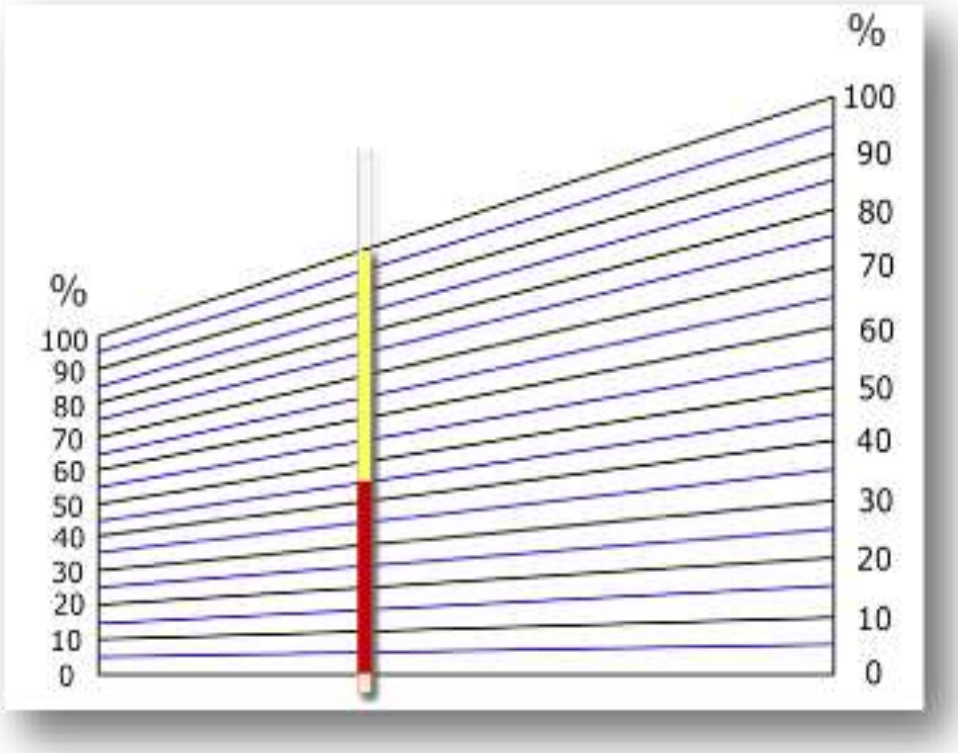
- **lower level of the scale (packed RBCs) on zero line of the scale.**

- **Upper level of the scale (plasma) on 100% line of the scale**

- **Do not** include the buffy coat (WBCs and platelets) when reading PCV value.



Procedure of PCV experiment



Reading of PCV value

Sources of errors

- 1-Improper sealing of the capillary tube
- 2-Time and speed of centrifugation.
- 3-The buffy coat of the specimen should not be included in the PCV reading, because its inclusion would falsely elevate the result.
- 4-Decrease or increase in the readings may be seen if the micro- hematocrit reader is not used properly.
- 5-The microhematocrit centrifuge should never be forced to stop by applying pressure to the metal cover plate!

This will cause ➔ RBCs layer to “sling” forward ➔ falsely elevated value.


IT'S OVER
IT'S FINALLY OVER
quickmeme.com