BLOOD PRACTICAL

RBC, WBC, HB & PCV

Aims of the Practical

1. Counting Red blood cells
2. Counting White blood cells
3. Determination of hemoglobin concentration
4. Determination of packed cell volume (PCV) hematocriet
5. Calculation of red blood cell indices

Objectives

1. At the end of this lesson the student should be able to
2. Recognize the methods used to measure the different hematological values, and compare it with the normal values.
3. Do the calculation of indices, their normal values and their importance in diagnosis of different types of anemia.
4. To be familiar with the procedure of taking both venous and capillary blood.

Material and methods

- Coulter analyzer
- Diluent reagents
- Lytic reagent
- Calibrator kit
- EDTA anticoagulant blood

Coulter Counter

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 $x10^6/\mu l$	3.8-5.8 $x10^6/\mu l$	4.7–6.5 $x10^6/\mu l$
WBC	4 – 11 $x10^3/\mu l$	4 – 11 $x10^3/\mu l$	4 – 11 $x10^3/\mu l$
HB	13-18 g/dl	11.5-16.5 g/dl	13 –18 g/dl
Platelet	150-400 $x10^3/\mu l$	150-400 $x10^3/\mu l$	150-400 $x10^3/\mu l$

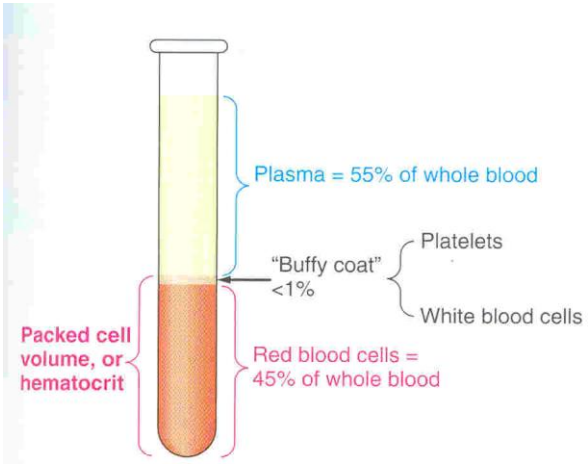
Clinical application

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

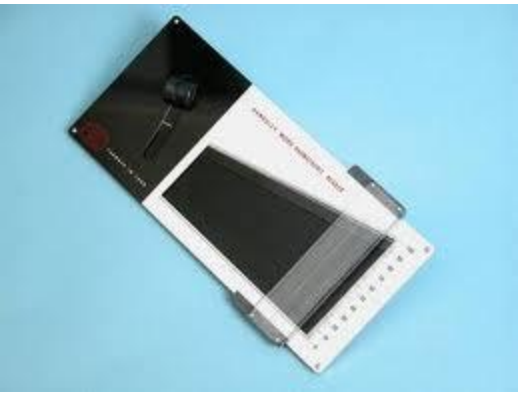
The packed cell volume (PCV) hematocrit

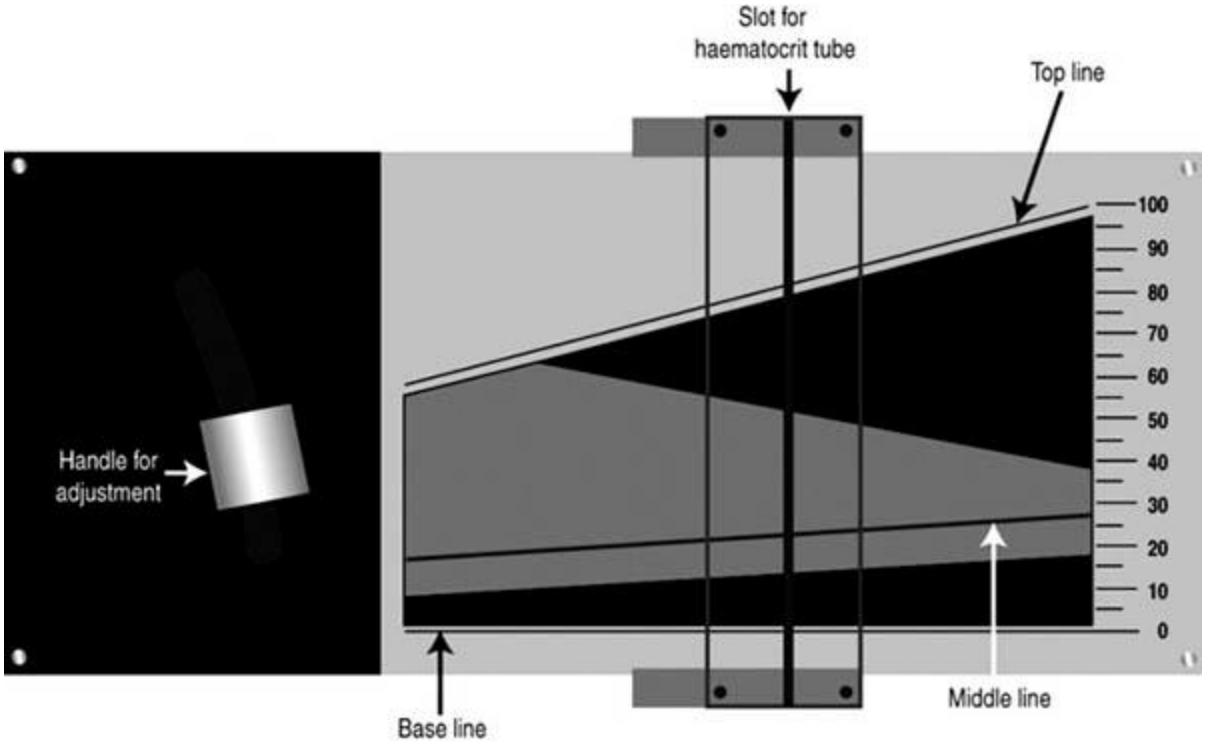
- The ratio of packed blood cells volume to plasma
- Capillary blood obtained from pricking finger tip after cleaning it with alcohol
- Fill a non-heparinised capillary tube, then seal one end by plasticine
- Centrifuge for 15 minutes to packed the cells at one end of the tube leaving a clear plasma on top
- Use the hematocrit reader to find the packed cell volume

Packed Cell Volume



Haematocrit Reader





Packed Cell Volume

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

Clinical application

- **↑ PCV:**
  - **↑ RBC (polycythemia) ;**
  - **↓ plasma volume (hemo-concentration, dehydration)**
- **↓ PCV:**
  - **↓ RBC (anemia),**
  - **↑ plasma volume (hem-dilution)**

The calculation of Red Blood Indices

1. **Mean cell volume (MCV)**
   - The average volume of red blood cell
   - $MCV = \frac{PCV \times 10}{RBC\ count} = 85 \pm 8\ \mu m^3$
2. **Mean cell hemoglobin (MCH)**
   - The average weight of Hb in red cells
   - $MCH = \frac{Hb \times 10}{RBC\ count.} = 29.5 \pm 2.5\ pg$
3. **Mean cell Hb concentration (MCHC)**
   - Concentration of Hb per 100 ml of RBC
   - $MCHC = \frac{Hb \times 100}{PCV} = 33 \pm 3\ g/dl$

Normal values

	Average
MCV	**78-98 μm3**
MCH	**27-32 pg**
MCHC	**30-35 g/dl**

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
cause	Iron deficiency	Vit B12 or Folic deficiency