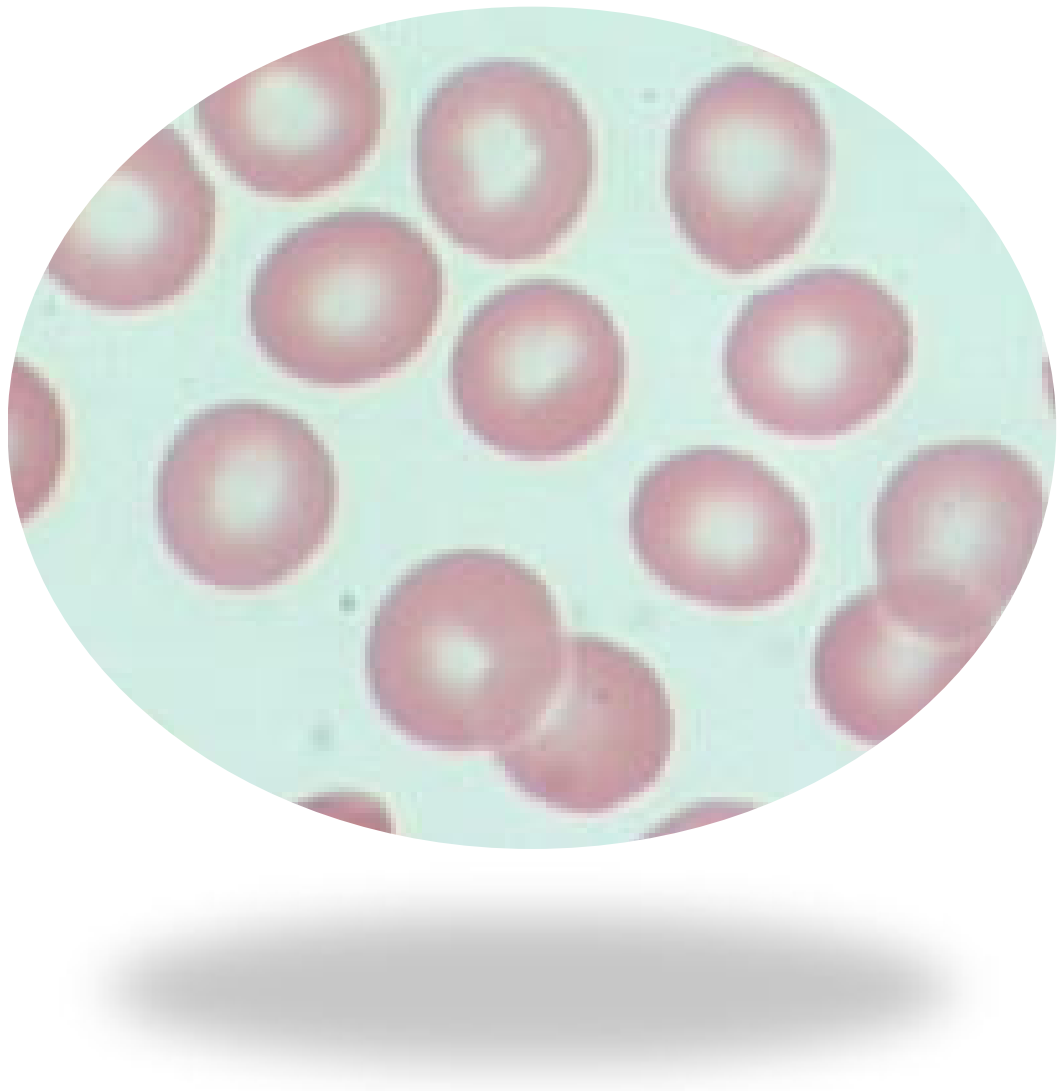
Red Blood Cell Physiology



Learning Objectives

Morphological Features of RBCs
Functions of the RBCs
Hematological Indices

Red Blood Cells

RBC are also known as erythrocytes or red blood corpuscles as it contains haemoglobin which turns red on binding with oxygen.

It also carries carbon dioxide away from tissues to lungs.

It contains certain antigens on its surface membrane that determine blood groups and makes basis of whole blood transfusion physiology.

Red Blood Cells

Clinical Application :

Since RBC uses glucose constantly from plasma,

whenever blood glucose level is to be tested, the sample is taken in the fluoride vial

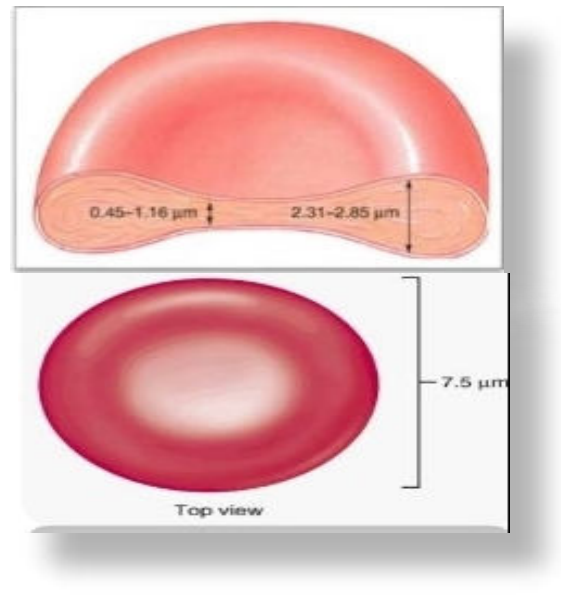
Red Blood Cells- Morphology-Size

RBCs are anucleated discs

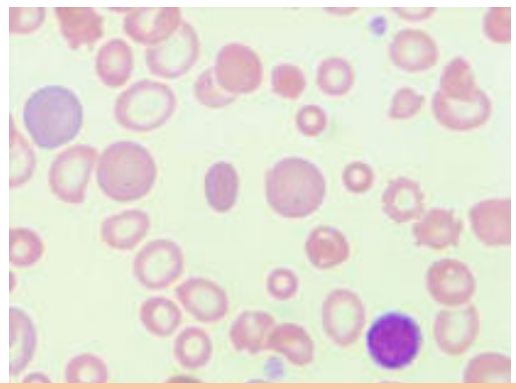
RBC count : 4-6 million/mm^3,

Life span - 120 days.

Central pallor is seen due to presence of less haemoglobin molecule in the centre.



Size – Diameter: 7-7.8 µm,
Thickness at the periphery-2.2 µm and
Centre - 1 µm

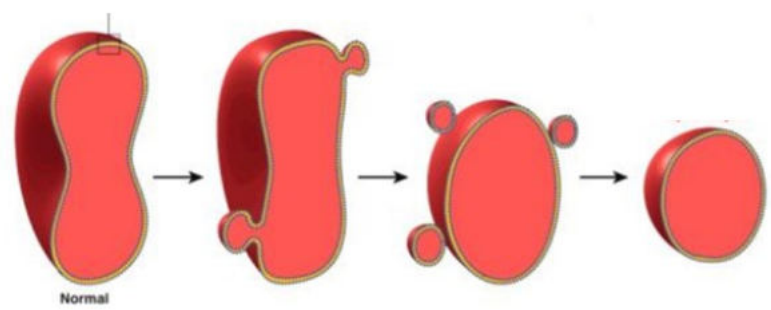


Red Blood Cells- Shape

Shape - Normal biconcave disc

Biconcave shape has many advantages :

1 .Flexibility RBCs
2 .Greater surface area/volume ratio



Red Blood Cells- Normal values

RBCs Count-4-6 million/mm ^{3}
Hb content-14-16 gm/dl
O_2 carrying Capacity of blood-1 gm Hb binds to 1.34 ml of O_2
PCV=45±2 ml/100 ml of blood

Hematological Indices

Red blood cell indices are blood tests that provide information about the average volume or size (MCV) and hemoglobin content (MCH, MCHC) of red blood cell.

Mean Corpuscular Volume (MCV)

Mean corpuscular volume (MCV) is the average volume of a single rbc.

We need values of:
- RBC count
- PCV

$$= \frac{\text{PCV X 10}}{\text{RBCs}}\ \mu^3$$

$$= 80\text{-}100\ \mu^3$$

Mean Corpuscular Hemoglobin (MCH)

Mean corpuscular hemoglobin (MCH) is the average amount of hemoglobin of a single rbc.

We need values of:
- RBC count
- Hb

$$= \frac{\text{Hb X 10}}{\text{RBCs}}\ \text{pg}$$

$$= 27\text{-}32\ \text{pg}$$

Mean Corpuscular Hemoglobin Conc. (MCHC)

Mean corpuscular hemoglobin Concentration (MCHC) is the average concentration of hemoglobin per unit volume of red blood cells.

We need values of:

- PCV
- Hb

$$= \frac{\text{Hb X 100}}{\text{PCV}} \text{ g}$$

32-36 %

Self Asessment

What is normal RBC Count-
a. 4000-6000/mm3
b. 4lac-6 lac/mm3
c. 4 million to 6 million/mm3
d. 4 billion to 6 billion/mm3

What is the life span of RBCs-
a. 1 month
b. 2 months
c. 3 months
d. 4 months

What is the term used to describe a cell of normal color?
•A.-Normochromic
•B. Hypochromic
•C. Polychromic
•D Euchromic

Self Asessment

What are the formula and normal value of MCV----------
What are the formula and normal value of MCH----------
What are the formula and normal value of MCHC----------
What are the causes of Normocytic normochromic anemia----------
What are the causes of Microcytic hypochromic anemia----------
What are the causes of Macrocytic anemia----------

Thank you