

Blood



Blood:



Is a viscous fluid which circulates through a closed system of blood vessels.

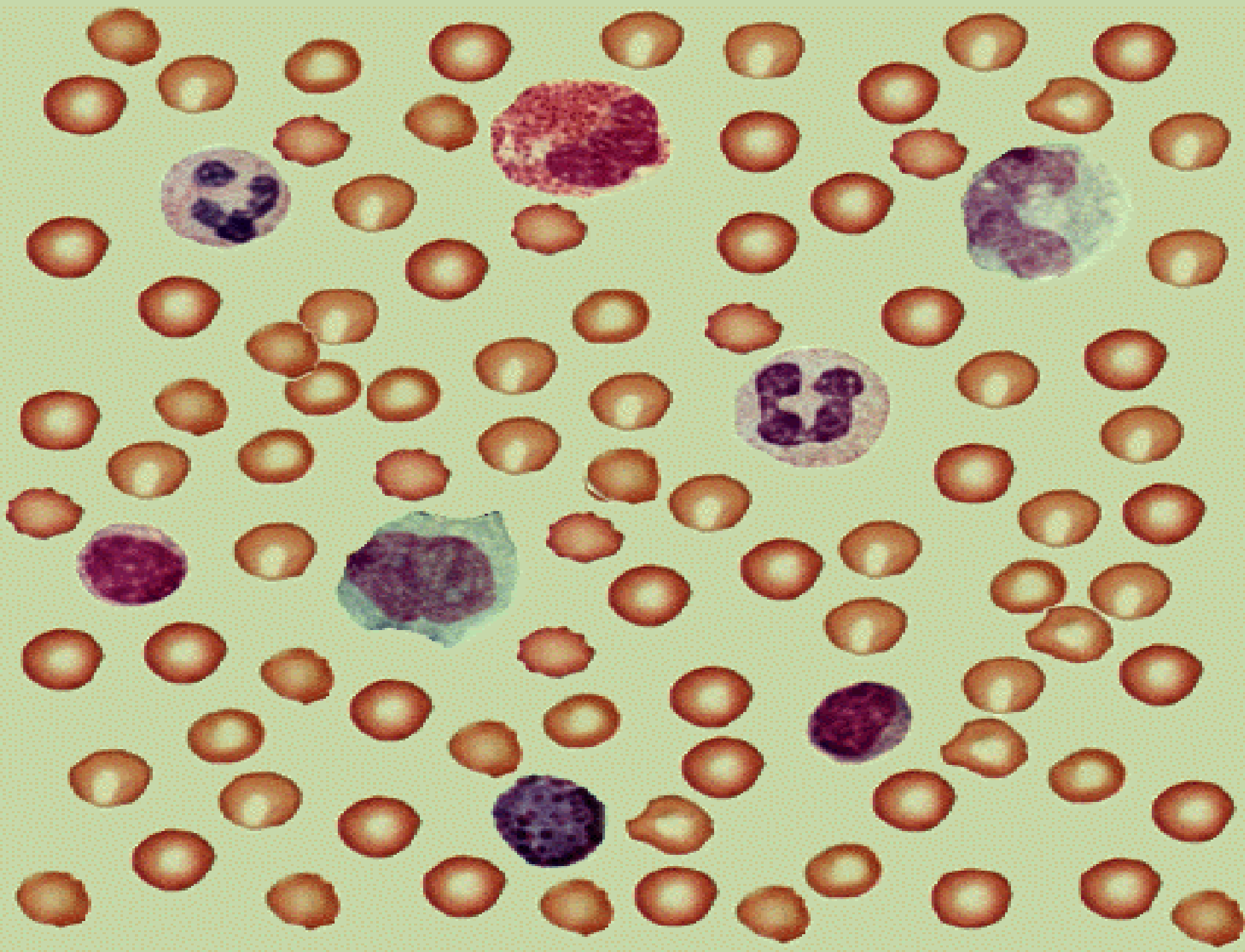
Composition of blood



∞ Fluid portionplasma

∞ Cellular element which included :

- Red blood cell (Erythrocytes)
- White blood cell (Leukocytes)
- Platelets (Thrombocytes)



plasma



It contains protein, organic and inorganic substances of blood

There are three types of protein in plasma

- **Albumin .**

- Concentration of 4.5 gm/dl

- Its function to cause osmotic pressure at capillary membrane.



- **Globulin.**

- Concentration of 2.5 gm/dl
- Are divided to α , β and γ
- Its function transporting substances.



- **Fibrinogen.**
- Concentration of 0.3 gm/ dl
- Its basic importance in blood clotting

Red blood cell (Erythrocytes)



Number, shape and size

- In men, the average 5.2 millions
- In women ,the average 4.7 millions
- Biconcave discs , diameter about 7.8 micrometer and average volume 90-95 μm^3



Function

- Transport hemoglobin which carries the O_2 and CO_2

Concentration of Hb in RBC

- Is about 34%

Genesis of R.B.C.



R.B.C. are derived from the cell known as **Hemocytoblast** which is formed from **stem cells** located in bone marrow.

polycythemia



∞ The increase of R.B.C. count under normal value

∞ There are two types of polycythemia .

- **Physiological**

- Too little oxygen in atmosphere
- Failure of delivery of oxygen to tissue
- The blood count 6-7 million/mm³



- **Pathological**

- Pathological condition such as cancer
- The blood count 7-8 million/mm³

Anemia



- ❧ Deficiency of R.B.C., which can be caused either by too rapid loss or by too slow production of R.B.C

- ❧ There are different types of anemia .
 - **Blood loss anemia**
 - Plasma replaced quickly
 - R.B.C. take few weeks



- **Bone marrow aplasia**
 - Mean loss of bone marrow function
 - Due to drug poisoning or irradiation



- **Hemolysis of R.B.C.**

- Due to

1. drug poisoning
2. Hereditary diseases
3. Erythroblastosis fetalis



- **Thalasemia**
 - Due to deficiency of globulin
- **Maturation failure (pernicious anemia)**
 - Due to lack of vitamin B12 or folic acid

Destruction of R.B.C.



∞ R.B.C are delivered from the bone marrow into the circulatory system an average of 120 days.

Blood functions



1. Transport gases O_2 and CO_2
2. Delivery the nutrients
3. Distribution of heat
4. Regulation of ions concentration and PH
5. Protective function



White blood cells



- ∞ Are involved in the body defense mechanism against micro -organisms and other foreign body.
- ∞ The W.B.C. count is form (4000 - 11000) cells/mm³

Classification of W.B.C.



1-Granular leukocytes :

∞ Neutrophils.

-(2-5)lobes depend on age

-Percent is 65 %



☞ Eosinophils.

- Bilobed

- Percent 1-3 %

☞ Basophils.

- S shape nucleus

1-Agranular leukocytes :

☞ Monocytes.

- Nucleus is kidney shape
- Percent 7 %

☞ Lymphocytes.

- Size depend on age
- Percent 30 %



Lymphocyte



Monocyte



Eosinophil





Basophil



Neutrophil

Genesis of leukocytes



- Granulocytes and monocytes  bone marrow
- Lymphocytes and plasma cell  lymphogenes organs

Life span of W.B.C.



❧ Granulocytes

- Normally 4-8 hours in the blood and 4-5 days in tissue

❧ Monocytes

- 10-20 hours in the blood and months and years in the tissue
- lymphocytes
- Weeks , months or years depends on body need

phagocytosis



Mean cellular ingestion of the offending agent

inflammation



Characterized by

- Vasodilation of the local blood vessels
- Increased permeability of capillaries
- Migration of granulocytes and monocytes
- Swelling of the tissue cells

leukemia



- ∞ Uncontrolled production of W.B.C. is caused by cancerous mutation myelogenous and lymphogenous cell
- ∞ Divided to
 - Lymphogenous leukemia
 - Myelogenous leukemia

leukopenia



☞ Occurs when the bone marrow stops producing of W.B.C.

☞ Caused by

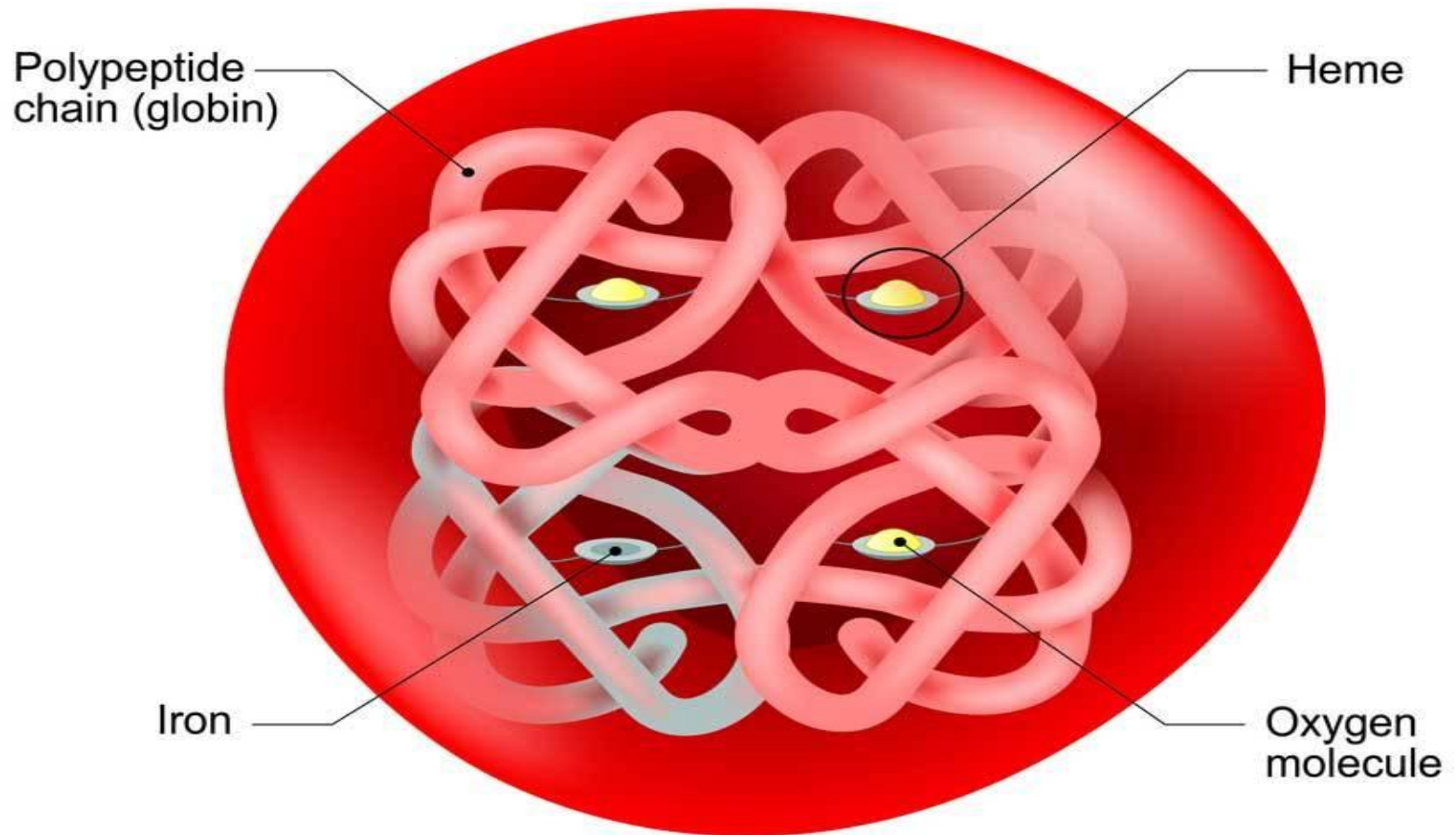
- Irradiation of the body
- Exposure to drugs and chemical

Haemoglobin

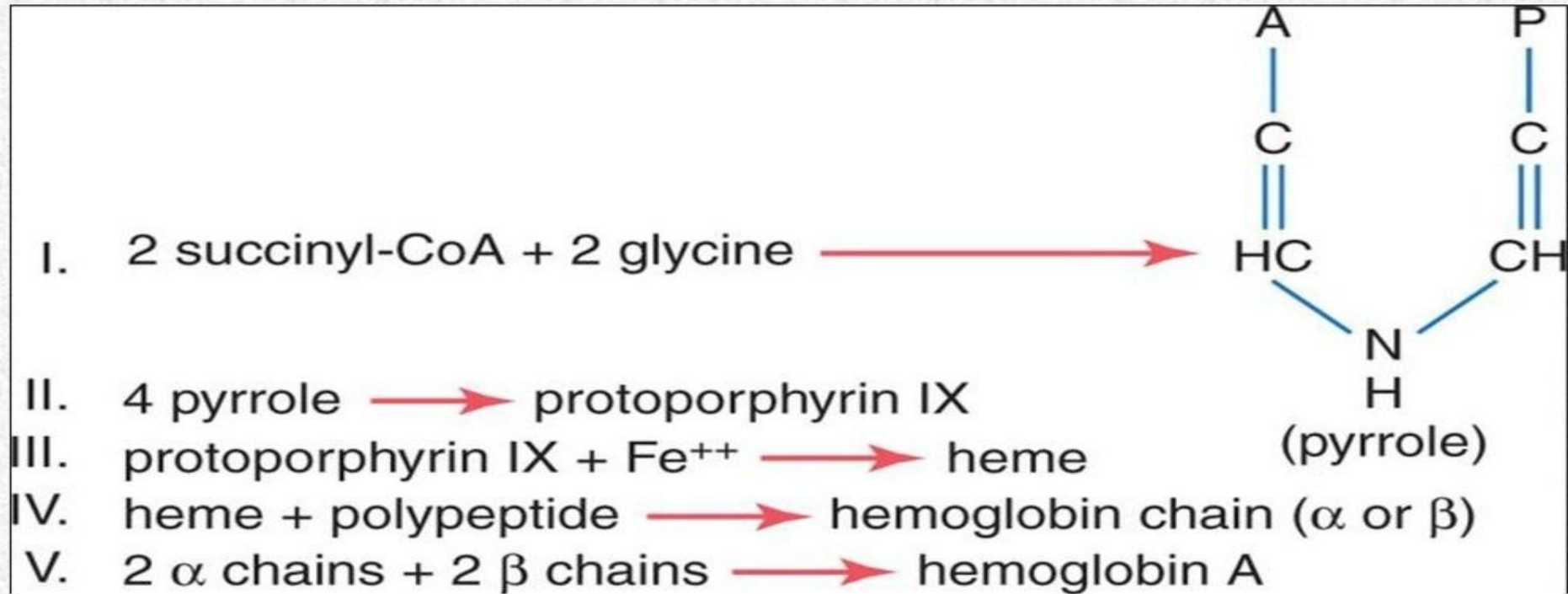


- ☞ Is the pigment in R.B.C
- ☞ The normal value is 14-16 gm/100ml blood
- ☞ Every 1 gm of Hb can combine with 1.39 ml O₂

HEMOGLOBIN



Hemoglobin formation



Types of hemoglobin

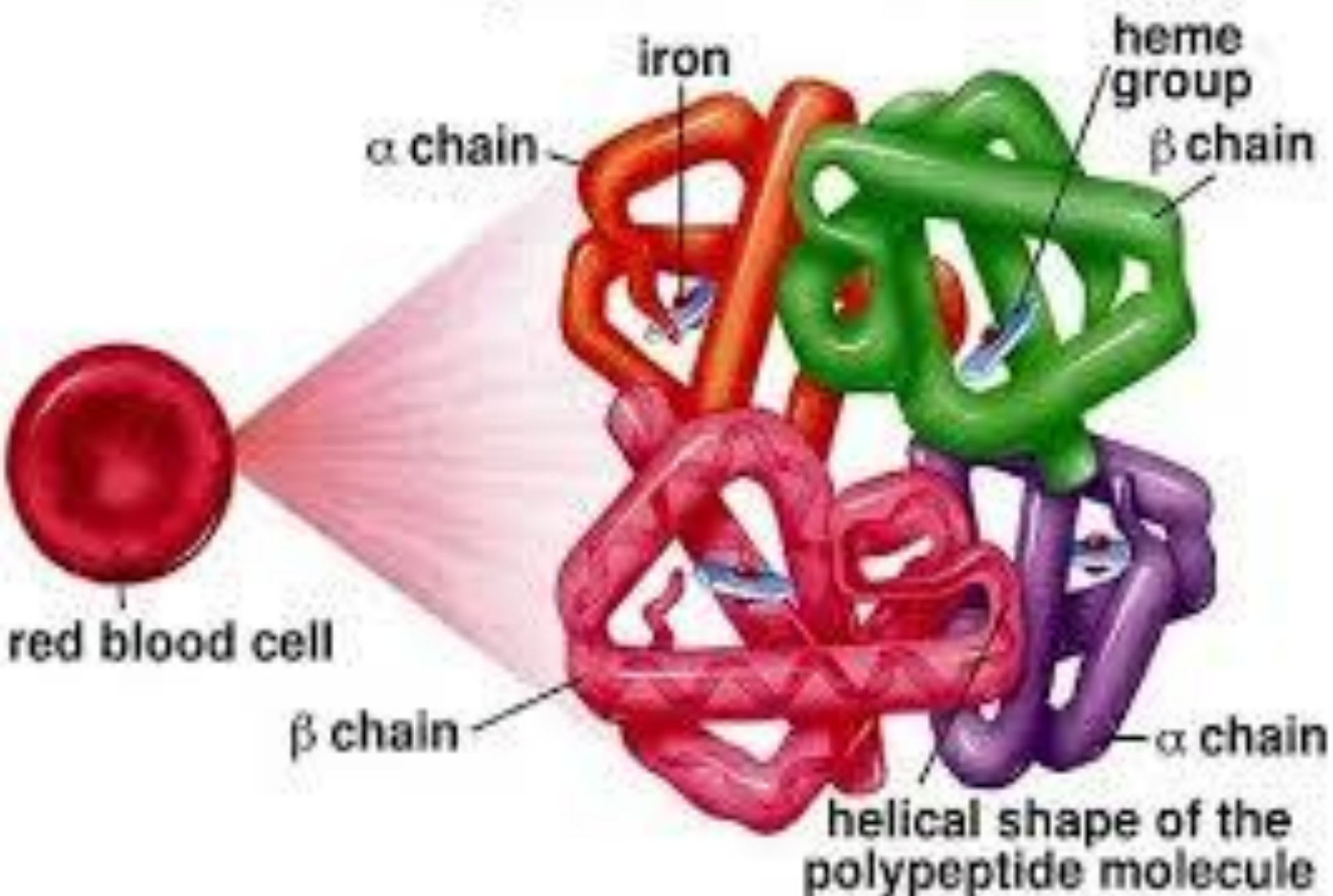


☞ HbA about 97 %

☞ HbA2 about 2.5 %

☞ HbF about 0.5 %

Hemoglobin Molecule



Iron metabolism



- ∞ The total quantity of iron in the body 4-5 gm
- ∞ 65 % of which is in the form of Hb
- ∞ 4 % of which is in the form myoglobin
- ∞ 1 % of which is in the form the various heme compounds that promote intracellular oxidation



- ∞ **0.1 % is combined with the protein transferrin in blood plasma**
- ∞ **15 -30 % is stored in the reticuloendothelial system and liver**

Hemoglobin compounds



❖ Oxyhemoglobin :

Result from combination of O₂ with Hb

❖ Carboxy Hb :

Result from combination of Co gas with Hb



❖ **Sulfa Hb :**

Result from combination of sulphur compounds with Hb

❖ **Carbamino Hb :**

Result from combination of CO₂ with Hb

❖ **Methemoglobin:**

Destruction of hemoglobin



- ❑ Hb released from cells when the phagocytosed by macrophages (spleen, bone marrow and liver)
- ❑ After few hours , the iron from hemoglobin release back in to blood to be carried by transferrin to bone marrow for production of new R.B.C.
- ❑ Or to liver to storage in the form of ferritin

