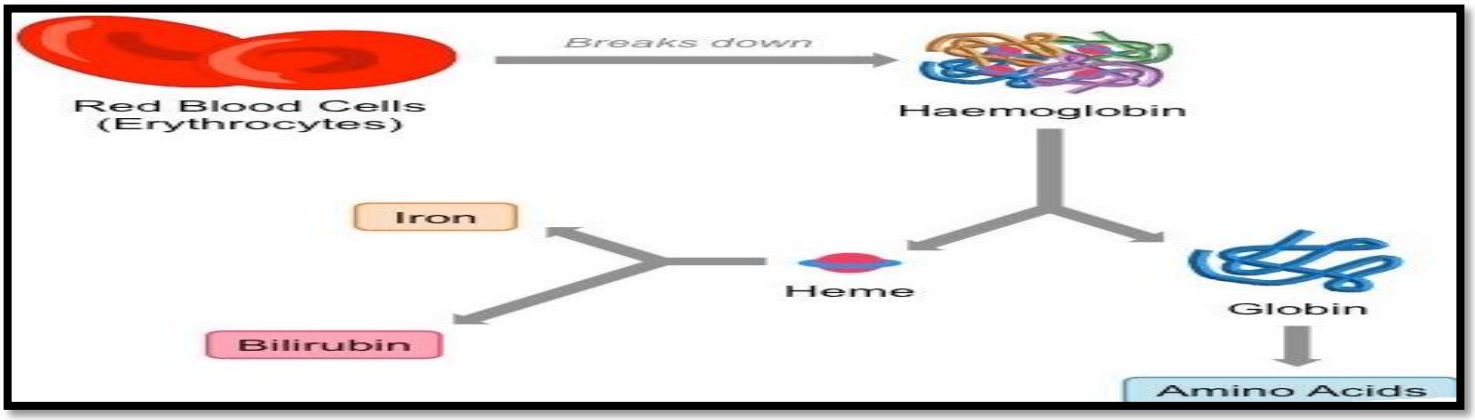
Breakdown hemoglobin: (catabolism Hb)

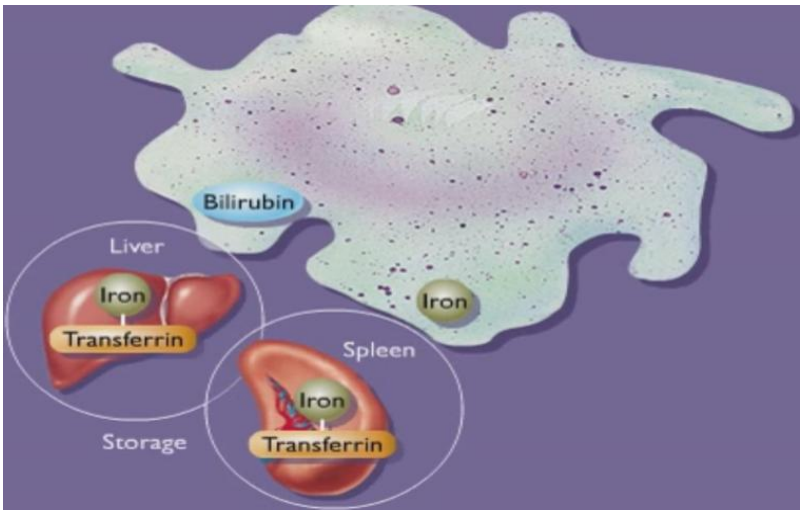
RBCs reach the end of their life (life span in circulation =120 days) due to aging or defects, RBCs will rupture and released Hb, Free hemoglobin are removed from the circulation by the phagocytic activity of macrophages in the spleen or the liver & bone marrow .

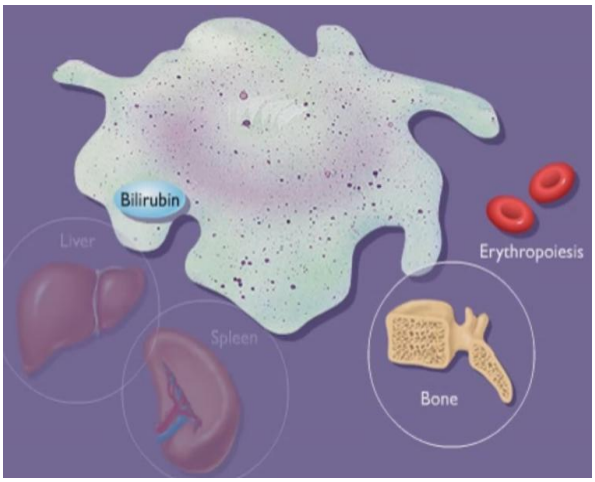
Hb is broken in to its component:

- Globin--- polypeptide---- amino acid { recycled or reused for synthesis protein }
- Heme ----- iron { stored in liver and spleen or reused in synthesis RBCs in stem cells of bone marrow}

  ------ Porphyrin ring is converted to the bile pigment **bilirubin** {secreted}







Hemoglobin deficiency: (low amount of Hb) associated with diseases and conditions that can be caused a decreased amount of red blood cells.

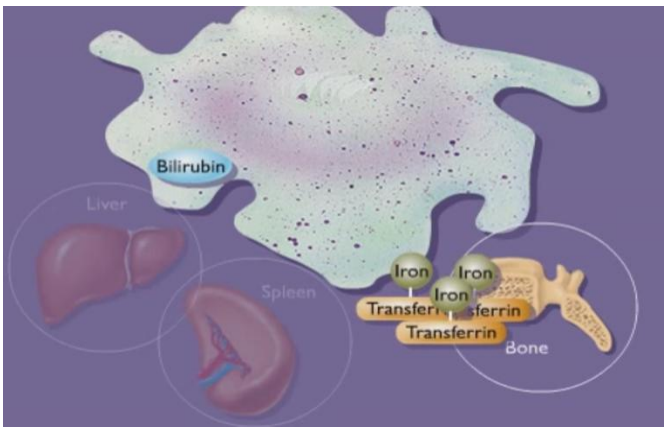
Diseases and conditions include:

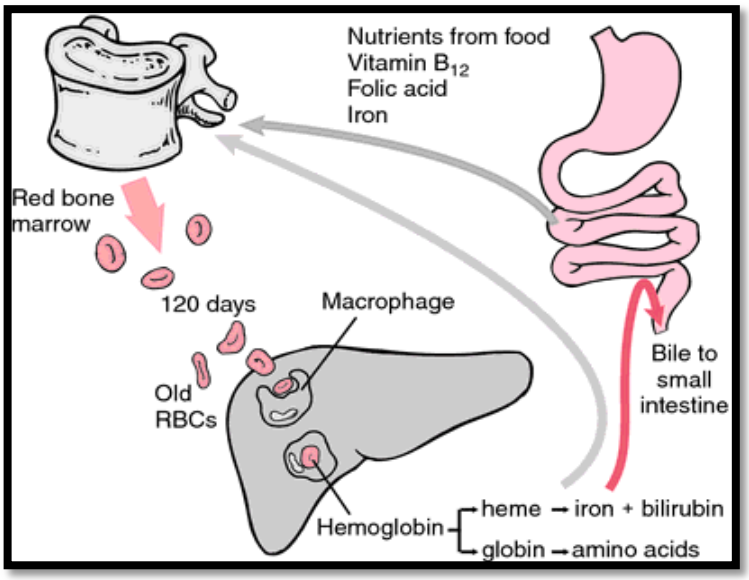
- ❖ Anemia [Aplastic, Vitamin deficiency, Iron deficiency]
- ❖ Cirrhosis
- ❖ Cancer [Hodgkin's lymphoma, Leukemia, Multiple myeloma]
- ❖ Hypothyroidism (a thyroid disorder)

- Lead poisoning.
- Enlarged spleen
- Hemoglobin defect ((Sickle cell &Thalassemia))
- Bleeding from a wound
- Bleeding in your digestive or urinary tract.
- Frequent blood donation
- Heavy menstrual periods
- Nosebleeds

Treated : by taking **supplements** to undergoing medical procedures.

By eating **a healthy, varied diet**.





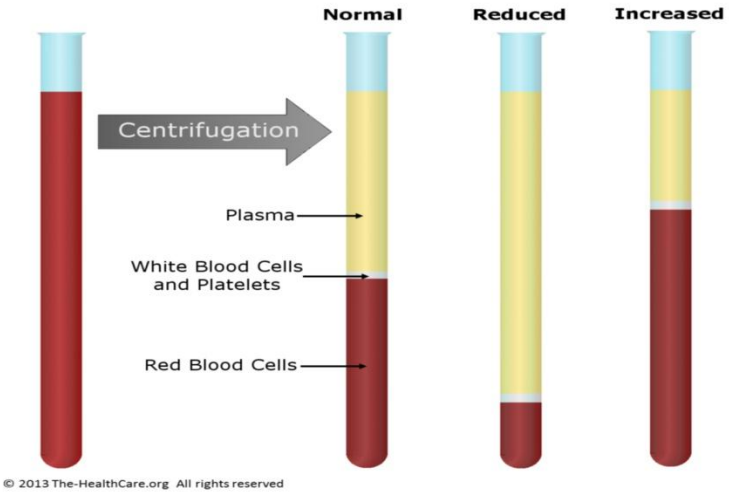
High hemoglobin (Erythrocytosis)

Specific disorders or other factors that may cause a high hemoglobin count include:

- Geographical factor:

High altitude where oxygen levels are low thus stimulates your body to produce more red blood cells ((which have the hemoglobin)) ,, Red blood cell production is governed by a hormone called erythropoietin that is secreted by the kidney.

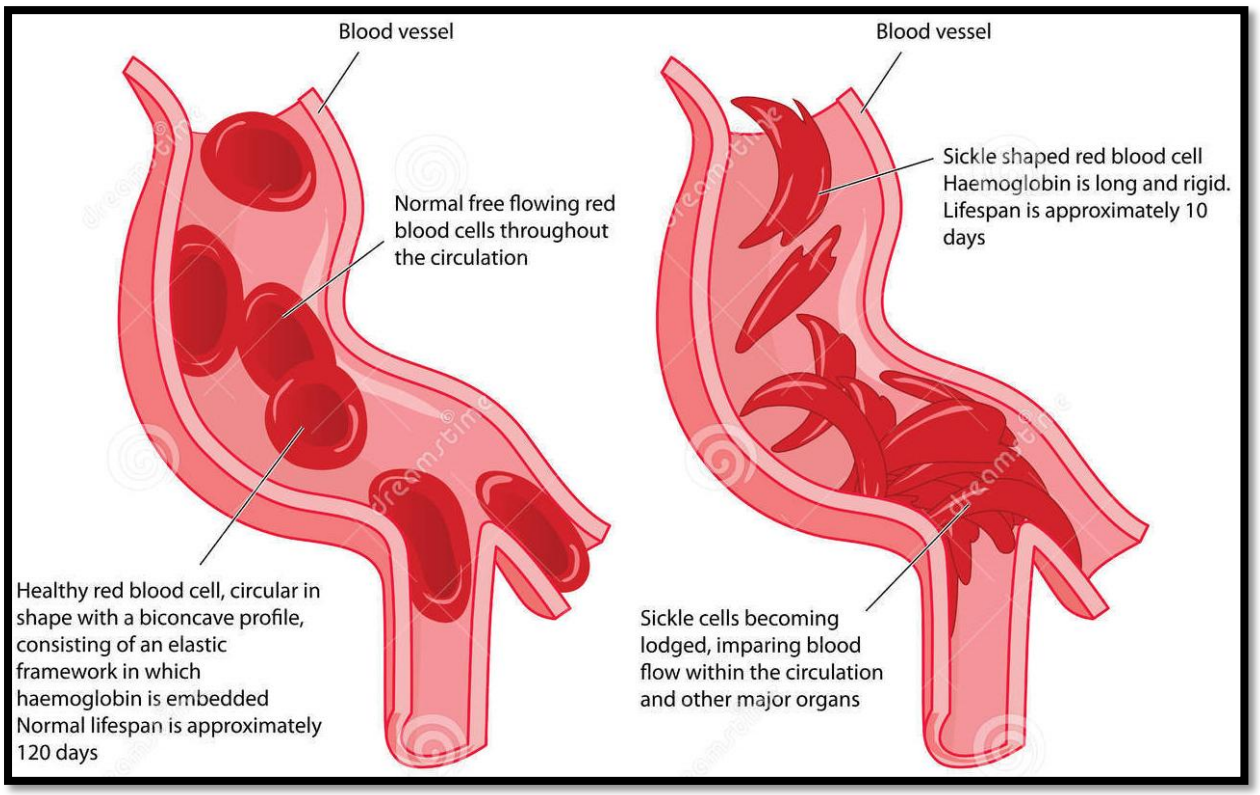
- polycythemia
- continual exposure to carbon monoxide (heavy smoking)
- various diseases (heart , chronic lung disease ,**kidney disease**).



treated with frequent phlebotomy (draining blood from the body)

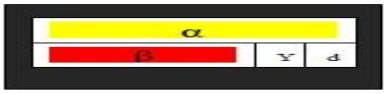
Hemoglobin qualitative defects : (Hemoglobinopathies)

Sickle cell disease is a genetic condition in which the quality of hemoglobin is defective. This condition can cause abnormal hemoglobin which, in turn, can result in abnormally shaped (sickled) red blood cells. These abnormal red blood cells cannot easily pass through small blood vessels and, therefore, could deprive the body organs of adequate oxygen. This rapid turnover may-result in inadequate time to replace the red blood cells and may result in anemia.



Hemoglobin quantitative defects :

Thalassemia : the hemoglobin and chains must have the proper structure and be synthesized in a 1:1 ratio . A Large excess of one subunit over results in the class of diseases. It is reduced synthesis of one or more Hb chains.

Normal genes	Thalassemia	Abnormal hemoglobin
		
Normal hemoglobin Normal production	Lower production of hemoglobin	Structurally abnormal