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Hemoglobin

Myoglobin

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At the end of this presentation you will be able to

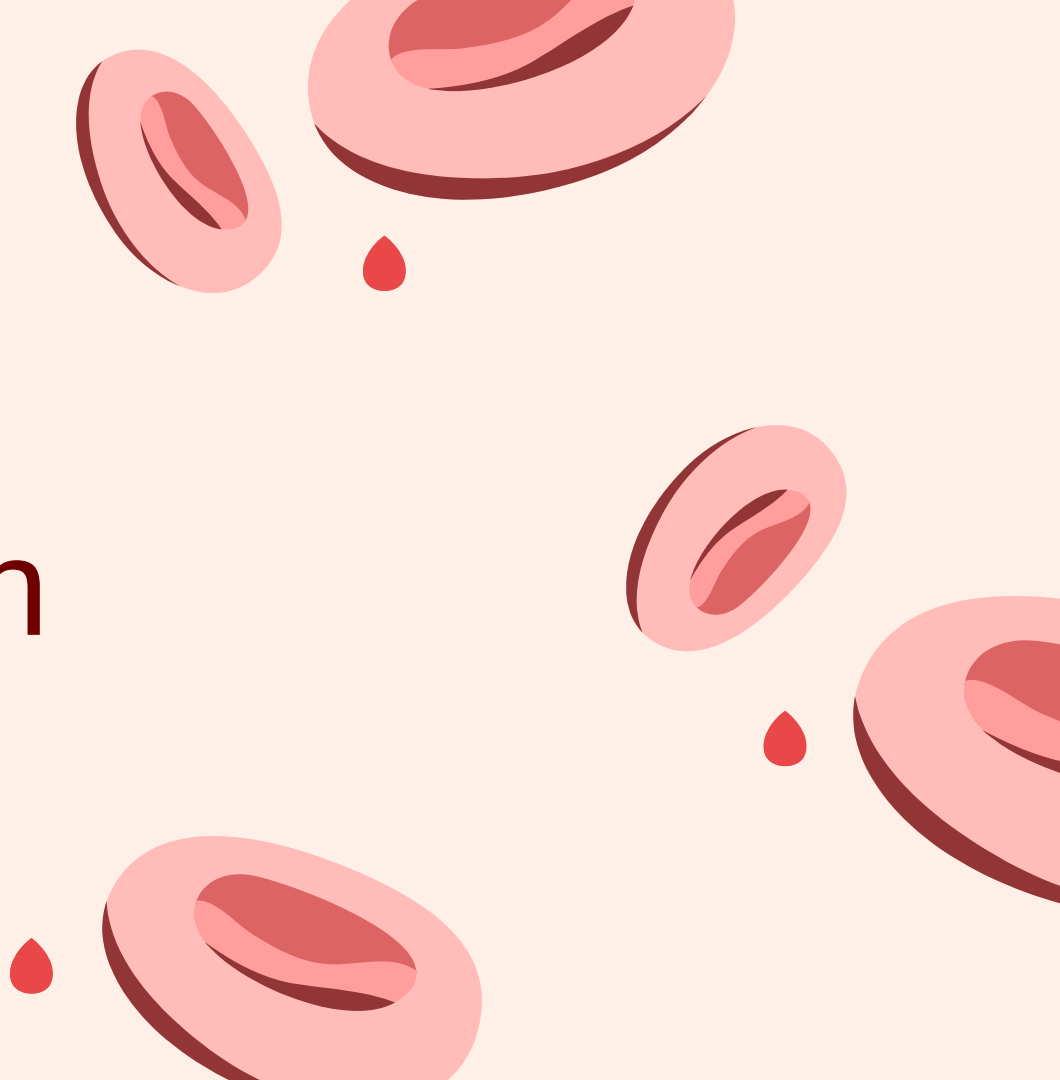
1. Define hemeproteins ?
2. describe Synthesis and structure of hemeprotein .
3. discuss range of hemeproteins ,Affects of increased and decreased levels of hemoproteins .
4. Similarities and Differences .
5. Summary .

Introduction

Hemoglobin is a heterotetrameric oxygen transport protein found in red blood cells (erythrocytes), whereas myoglobin is a monomeric protein found mainly in muscle tissue where it serves as an intracellular storage site for oxygen. The oxygen carried by hemeproteins such as hemoglobin and myoglobin is bound directly to the ferrous iron (Fe^{2+}) atom of the heme prosthetic group. Oxidation of the iron to the ferric (Fe^{3+}) state renders the molecule incapable of normal oxygen binding.

01

Hemoglobin



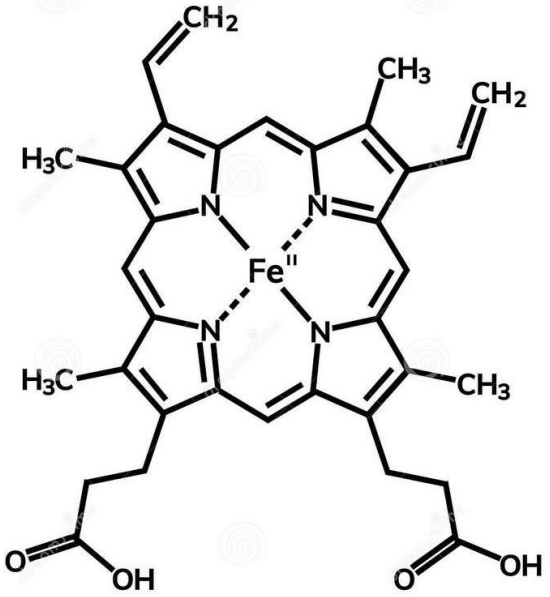
Hemoglobin

- hemoglobin, also spelled haemoglobin,. In the oxygenated state, it is called oxyhemoglobin and is bright red; in the reduced state, it is purplish blue.
- Some types of hemoglobin are; Hemoglobin A (HbA) makes up 95% to of the hemoglobin ,the hemoglobin 2A (HbA2), which represents 2-3% of the hemoglobin and the hemoglobin F (HbF), which is found in up to 2.5 % which is considered the basic hemoglobin of fetuses during pregnancy

02

Synthesis and structure

- Hemoglobin develops in cells (in the bone marrow) that become red blood cells.
- When red cells die, hemoglobin is broken up: iron is salvaged transported to the bone marrow by proteins called transferrin’s
- and used again in the production of new red blood cells



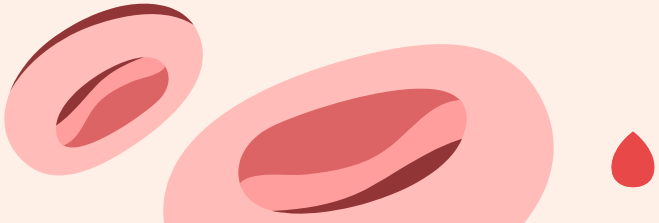
hemoglobin

03

Hemoglobin range

- For males , a normal level ranges between 14 grams per deciliter (g/dL) and 17.5 g/dL.
- For females , a normal level ranges between 12.3 g/dL and 15.3 g/dL.
- A severe low hemoglobin level for men is 13.5 g/dL or lower.
- For women, a severe low hemoglobin level is 12 g/dL

Note it varies from reference to another •



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What does it mean if your Hemoglobin is high?

A high hemoglobin count is associated with high hemoglobin levels, which means that your hemoglobin has an increased oxygen-carrying capacity than normal.

A high hemoglobin level may indicate:

- Lung disease
- Heart disease
- Kidney tumors
- Dehydration

05

What does it mean if your Hemoglobin is low?

- low hemoglobin count means that the oxygen-carrying capacity of your hemoglobin is reduced.
- low hemoglobin levels can indicate that an individual has certain medical conditions, including:
- Aplastic anemia
- Cancer
- Hypothyroidism
- Iron deficiency anemia
- Lead poisoning
- Leukemia
- Vitamin deficiency anemia

06

What is myoglobin ?

- Myoglobin, a protein found in the muscle cells of animals. It functions as an oxygen-storage unit providing oxygen to the working muscles.

Diving mammals such as seals and whales are able to remain submerged for long periods because they have greater amounts of myoglobin in their muscles than other animals do.

Four forms of myoglobin exist in the muscle, depending on the state of the heme group: deoxymyoglobin (purplish red), oxymyoglobin (cherry red), metmyoglobin (brown) and carboxymyoglobin (cherry red)

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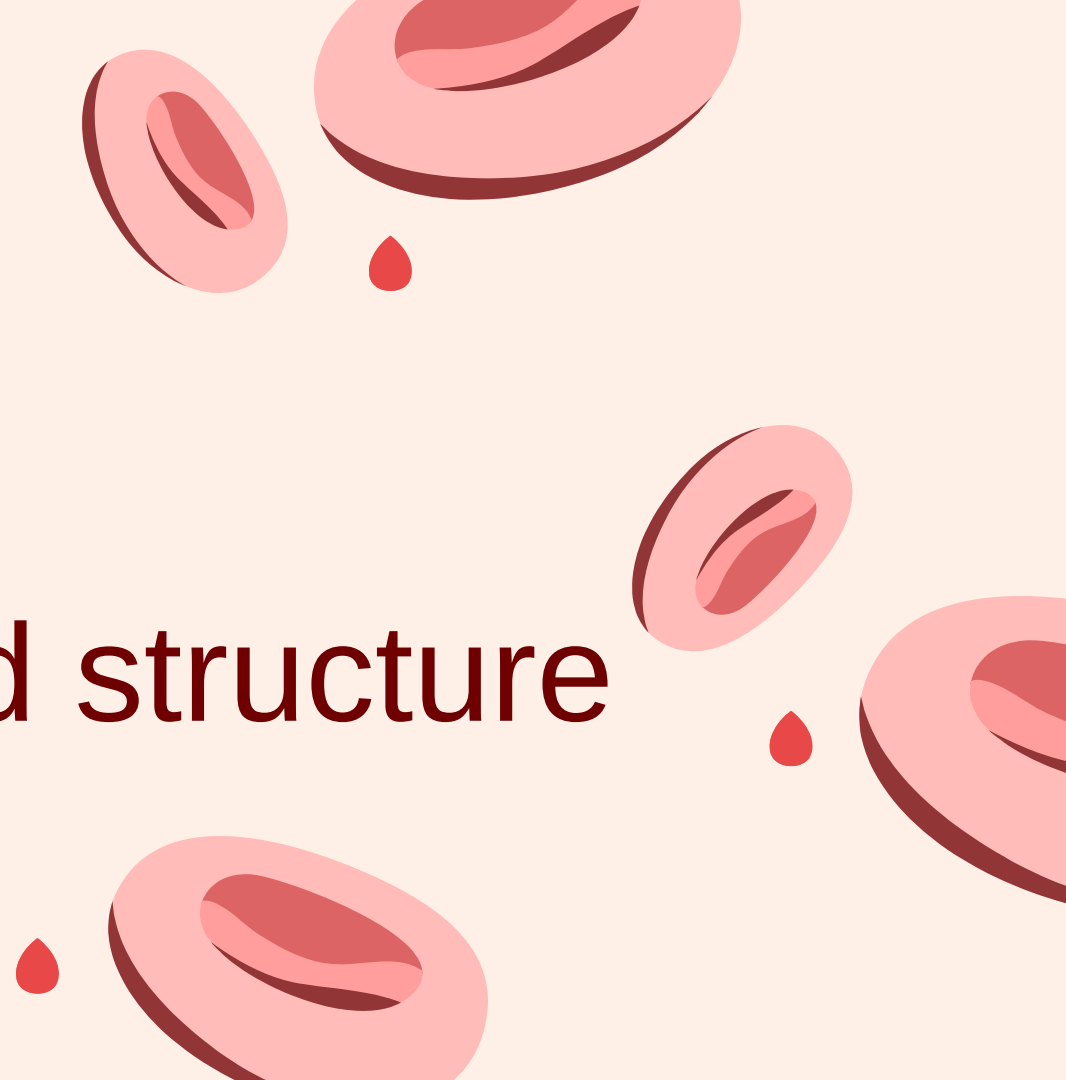
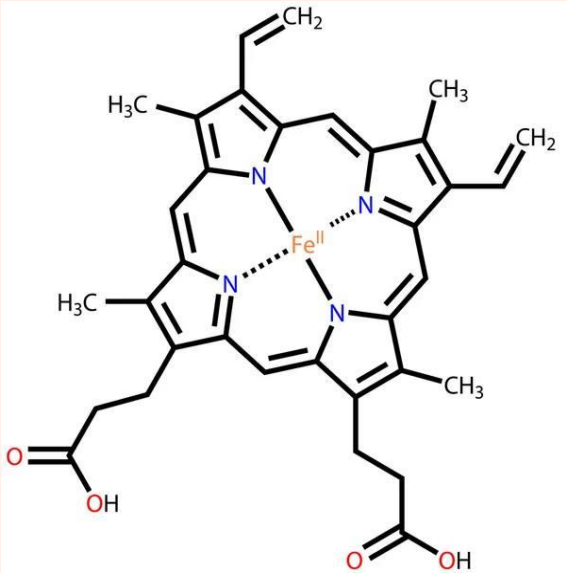
Synthesis and structure



This synthesis of myoglobin accounted for approximately 5–9% of the total soluble protein synthesis demonstrable in this system



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Myoglobin range

- The normal range is 25 to 72 ng/mL Normal value ranges may vary slightly among different laboratories.
- Some labs use different measurements or may test different samples.

09

An increased level of myoglobin may be due to

- Heart attack
- Malignant hyperthermia (very rare)
- Disorder that causes muscle weakness and loss of muscle tissue (muscular dystrophy)
- Breakdown of muscle tissue that leads to the release of muscle fiber contents into the blood (rhabdomyolysis)
- Skeletal muscle inflammation (myositis)
- Skeletal muscle ischemia (oxygen deficiency)
- Skeletal muscle trauma

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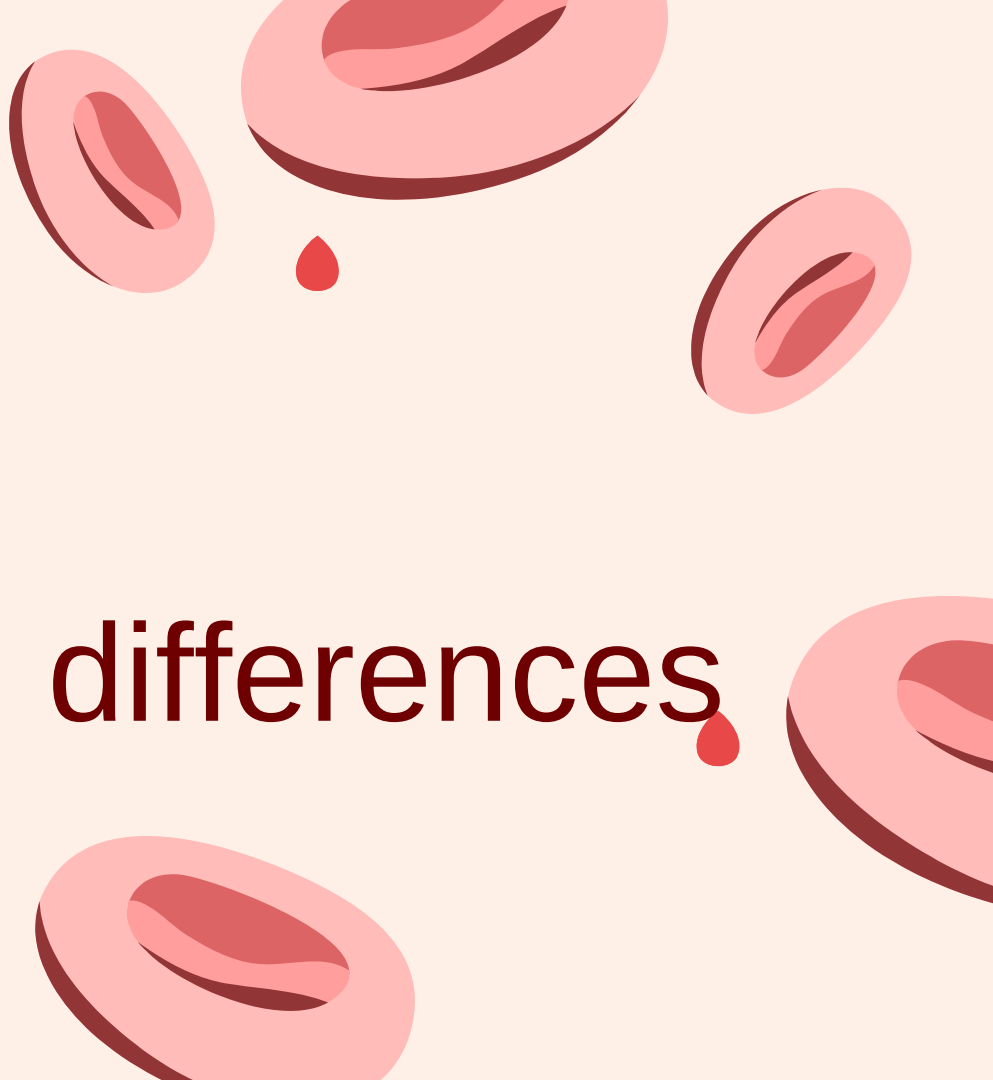
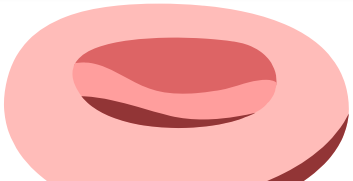
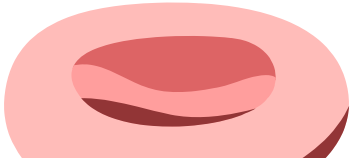
similarities and differences



	Hemoglobin	Myoglobin
Function	It carries oxygen from the lungs to the rest of the body.	It stores oxygen in the muscle cells, which can be utilised as energy.
Structure	• Heterotetramer. • Quaternary structure • Made up of four polypeptide chains – two alpha and two beta.	•Monomer. • Tertiary structure. • Made up of a single polypeptide chain.
Location	Present all over the body	Present only in heart and muscle cells
Abbreviation	Hb	Mb
Concentration in Blood	Higher concentration in blood	Higher concentration in muscles





Summary

Hemeproteins are hemoglobin and myoglobin , hemoglobin is a heterotetrameric protein found in RBCs in all body where as myoglobin is monomeric protein found only in muscles , the normal range of hemoglobin in the human body is 14 to 17.5 gm/dl for male and 12.3 to 15.3 for female where as the myoglobin range is about 25 to 72 ng/ml for both , the change in the hemoglobin range may causes many disease which include (lung disease , heart disease or aplastic anemia , cancer and lead poisoning) while the change in the myoglobin range may causes (skeletal muscle inflammation , skeletal muscle ischemia , skeletal muscle trauma and etc.)

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Thanks