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Faculty of Pharmacy



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

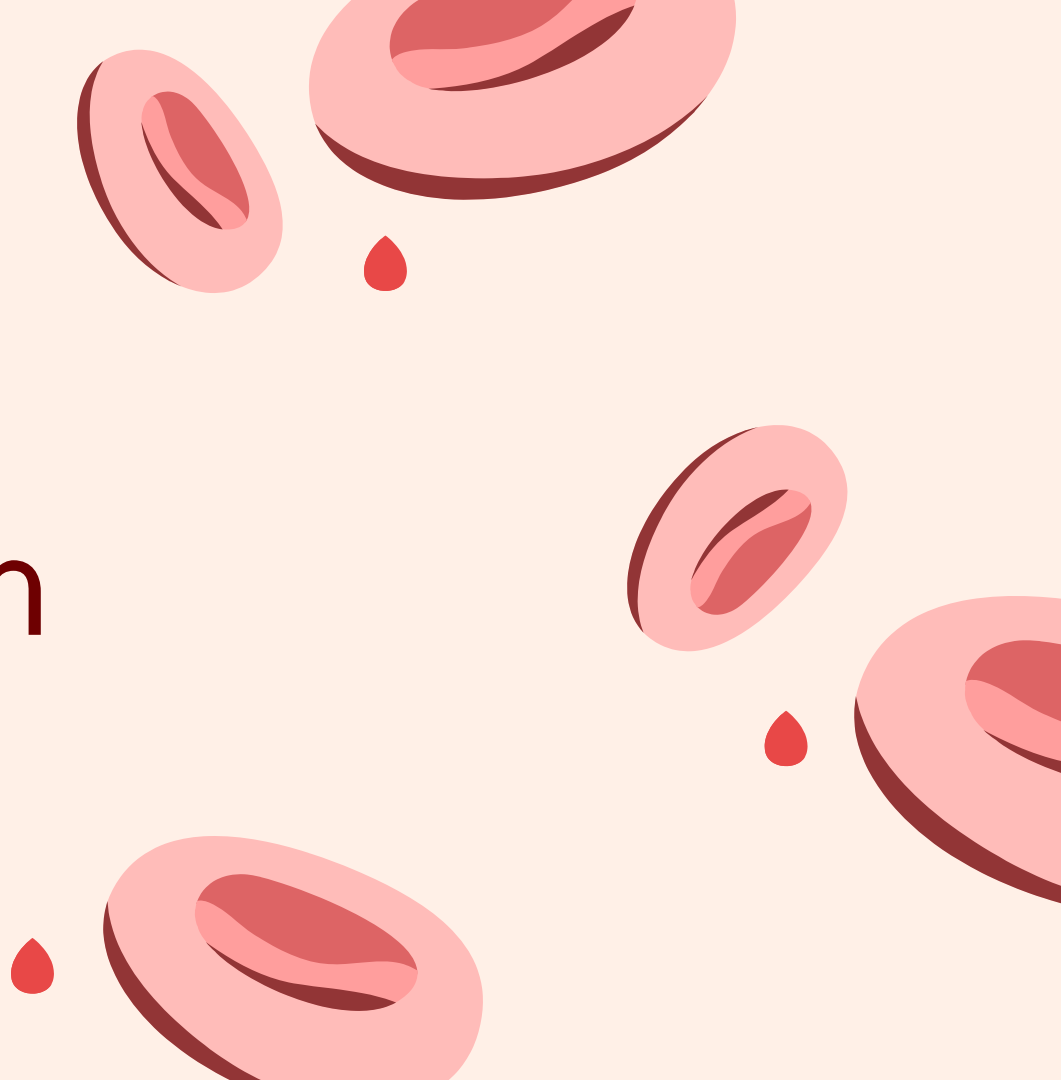


Hemoglobin is a heterotetrameric oxygen transport protein found in red blood cells (erythrocytes), whereas myoglobin is a monomeric protein found mainly in muscle tissue where it serves as an intracellular storage site for oxygen. The oxygen carried by heme proteins such as hemoglobin and myoglobin is 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

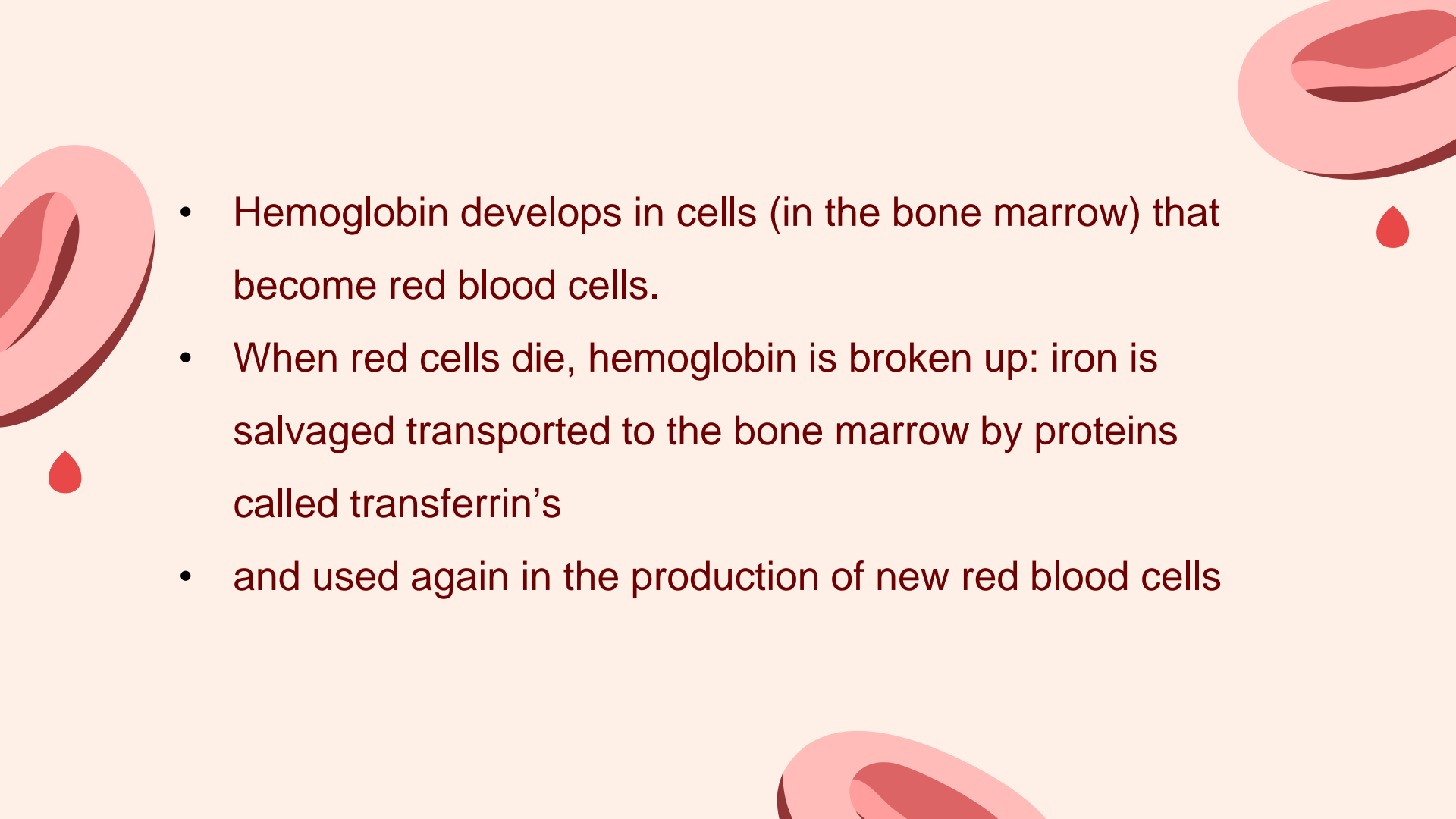


Hemoglobin

- 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



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- The slide features a light pink background with several stylized, 3D-rendered red blood cells. One large cell is on the left, another is at the top right, and a third is at the bottom center. Small red teardrop-shaped drops are scattered around the cells. The text is centered in a dark red, sans-serif font.
- 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

03

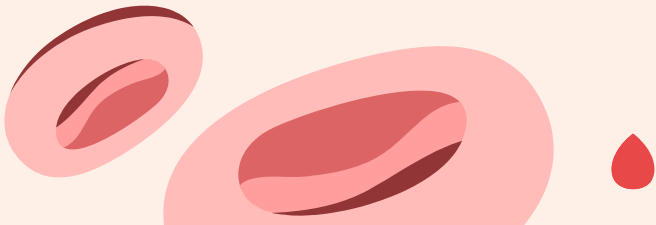
Hemoglobin range

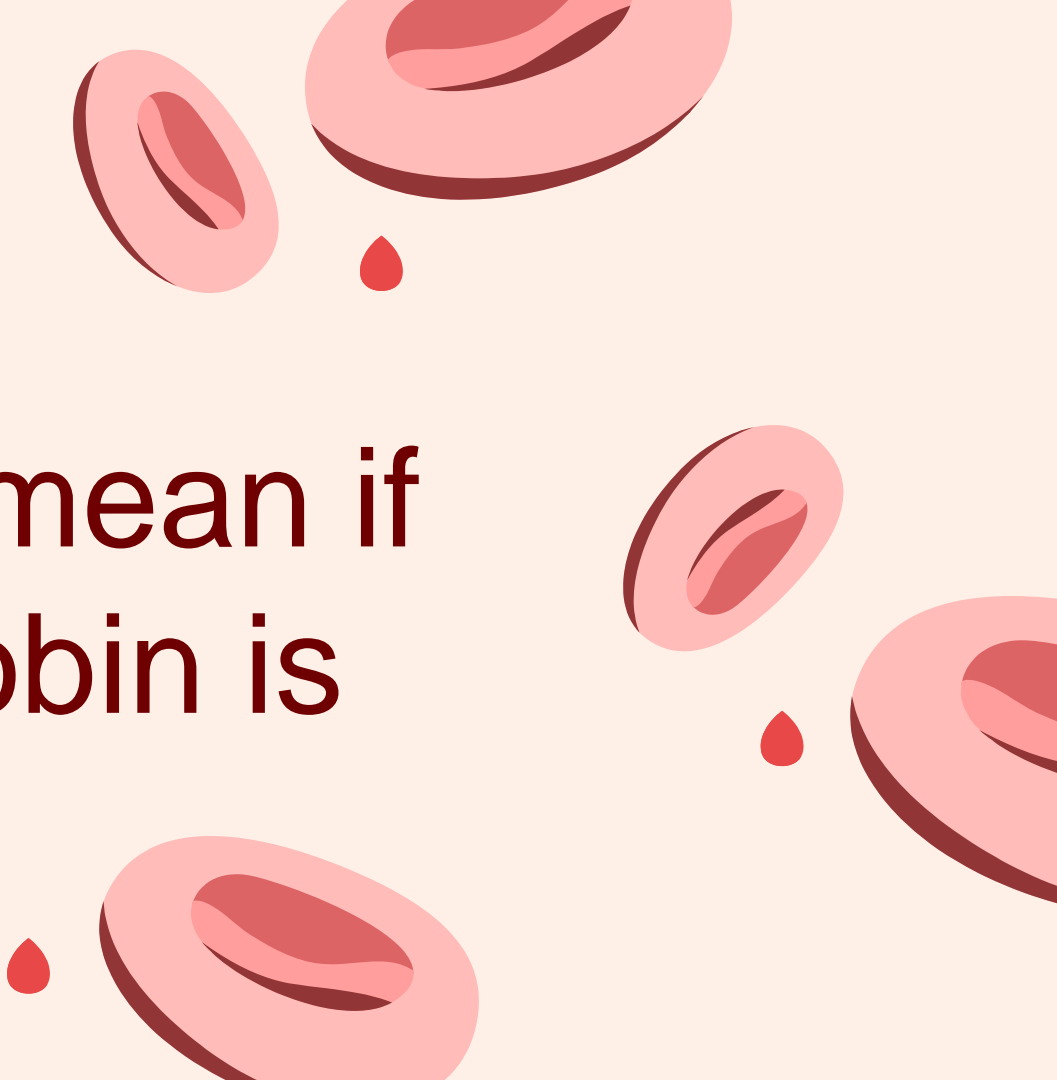




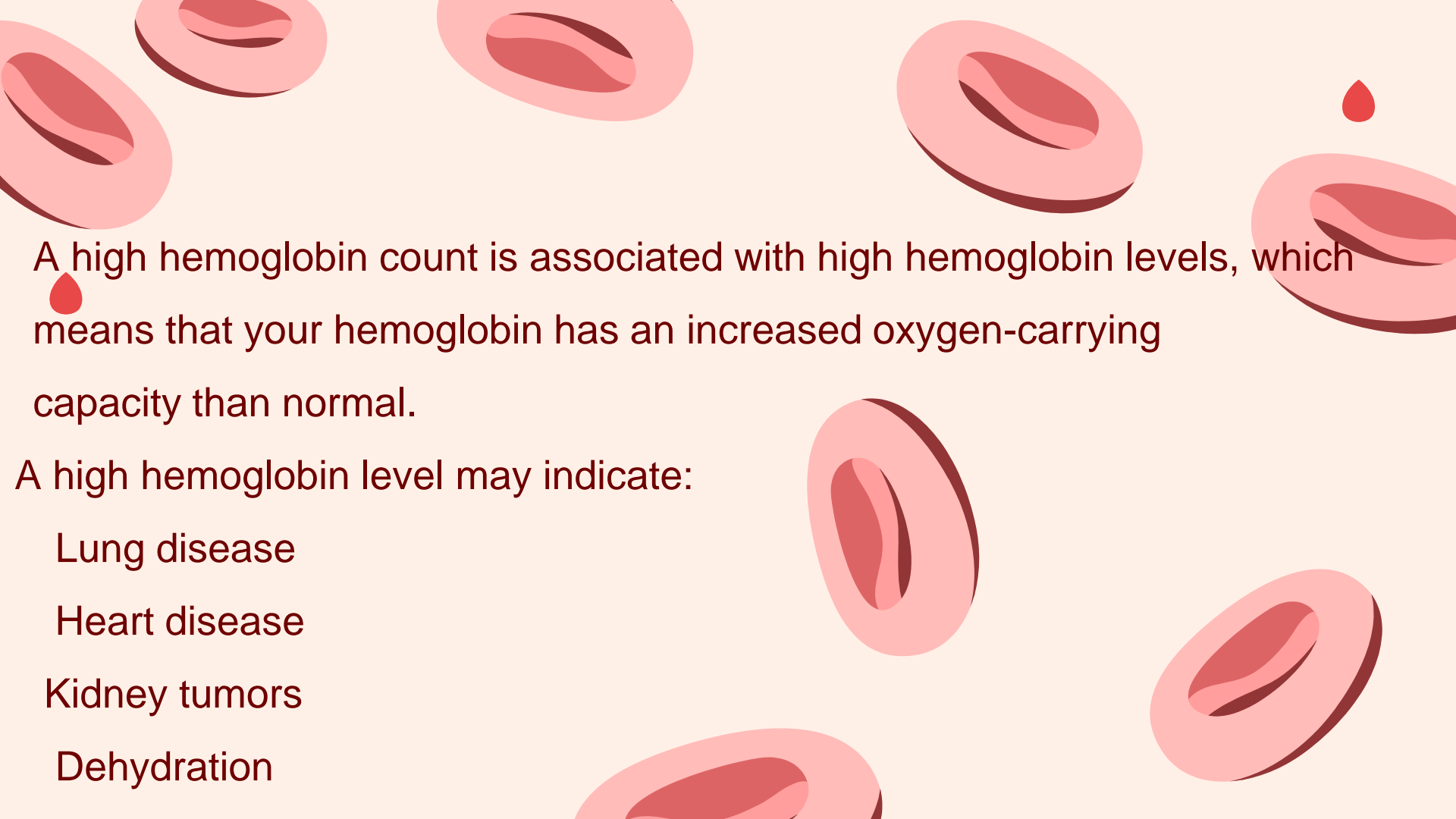
- For males , a normal level ranges between 14 grams per deciliter (g/dL) and 17.5 g/dL.
- For females , a normal level ranges between 12.3 g/dL and 15.3 g/dL.
- A severe low hemoglobin level for men is 13.5 g/dL or lower.
- For women, a severe low hemoglobin level is 12 g/dL

Note it varies from reference to another



The background features several stylized red blood cells, which are biconcave discs, scattered across the frame. Some are shown in profile, while others are slightly angled. A single, small red blood drop is positioned between the top and bottom groups of cells. The overall color palette is a range of reds and pinks against a light cream background.

04
What does it mean if
your Hemoglobin is
high?

The background of the slide features several stylized red blood cells. These cells are depicted as light pink, biconcave discs with a darker pink central indentation, giving them a three-dimensional appearance. They are scattered across the white background, with some appearing larger and more prominent than others. A small, solid red teardrop shape is also visible near the top right of the text area.

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

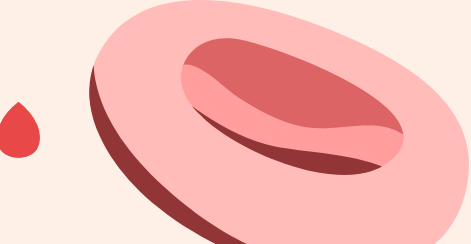

Kidney tumors

Dehydration

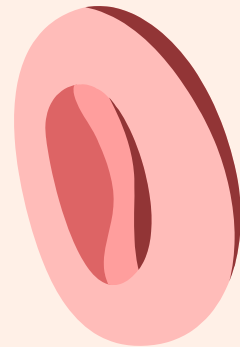
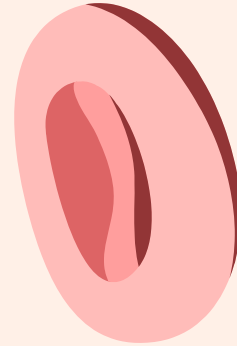


05

What does it mean if
your Hemoglobin is
low?

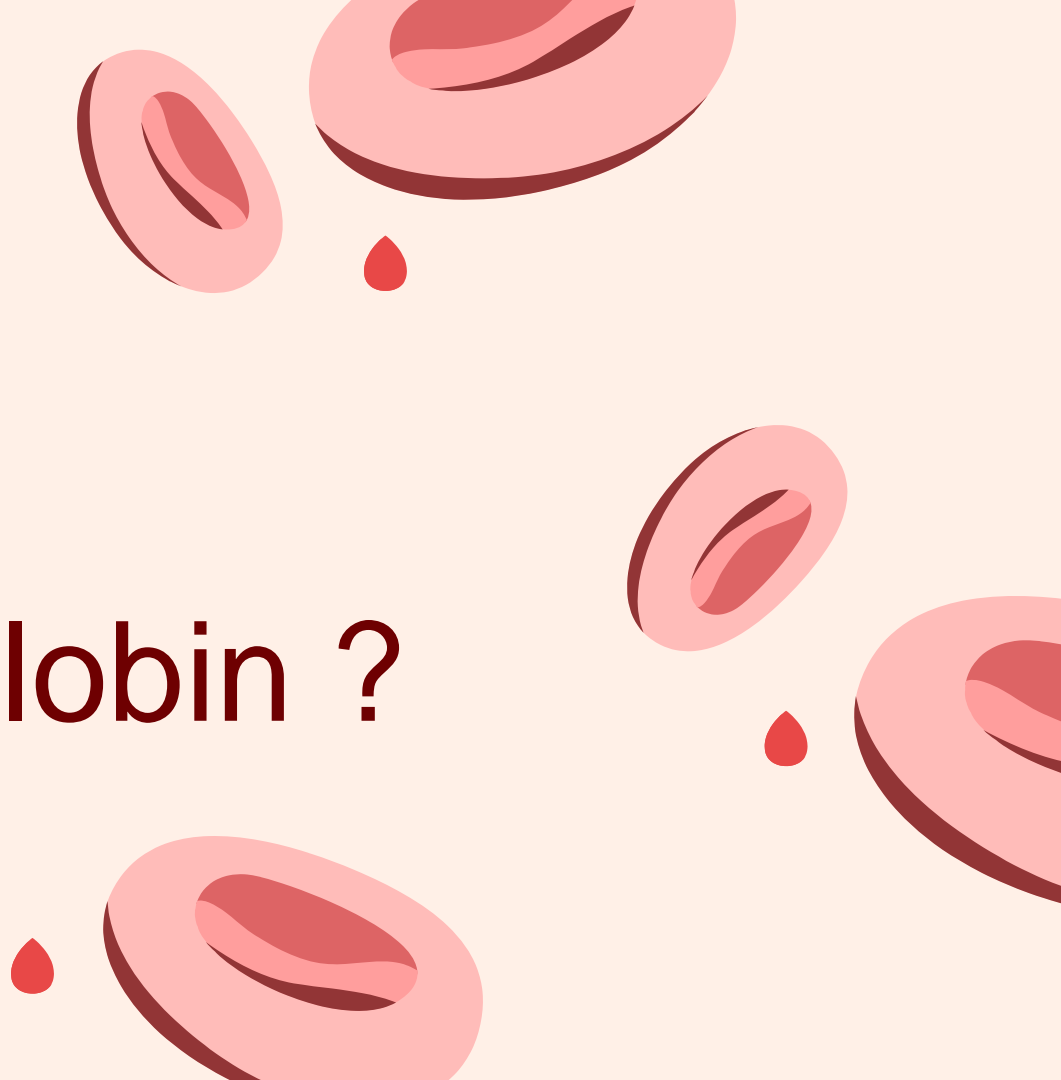


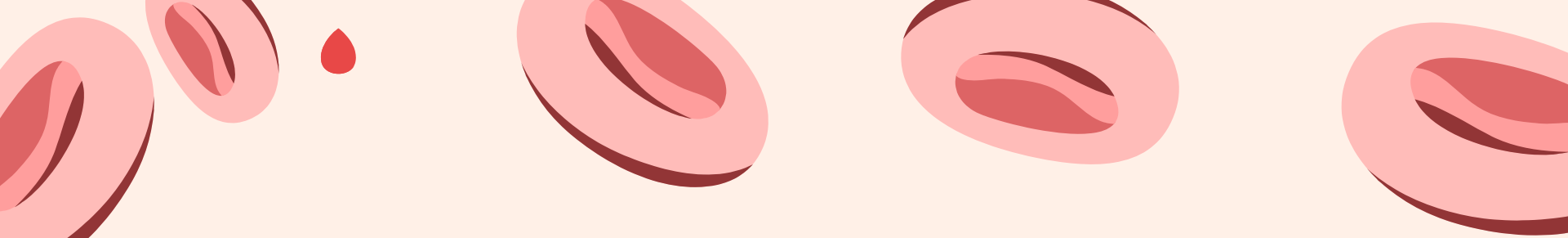
- low hemoglobin count means that the oxygen-carrying capacity of your hemoglobin is reduced.
- low hemoglobin levels can indicate that an individual has certain medical conditions, including:
 - Aplastic anemia
 - Cancer
 - Hypothyroidism
 - Iron deficiency anemia
 - Lead poisoning
 - Leukemia
 - Vitamin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

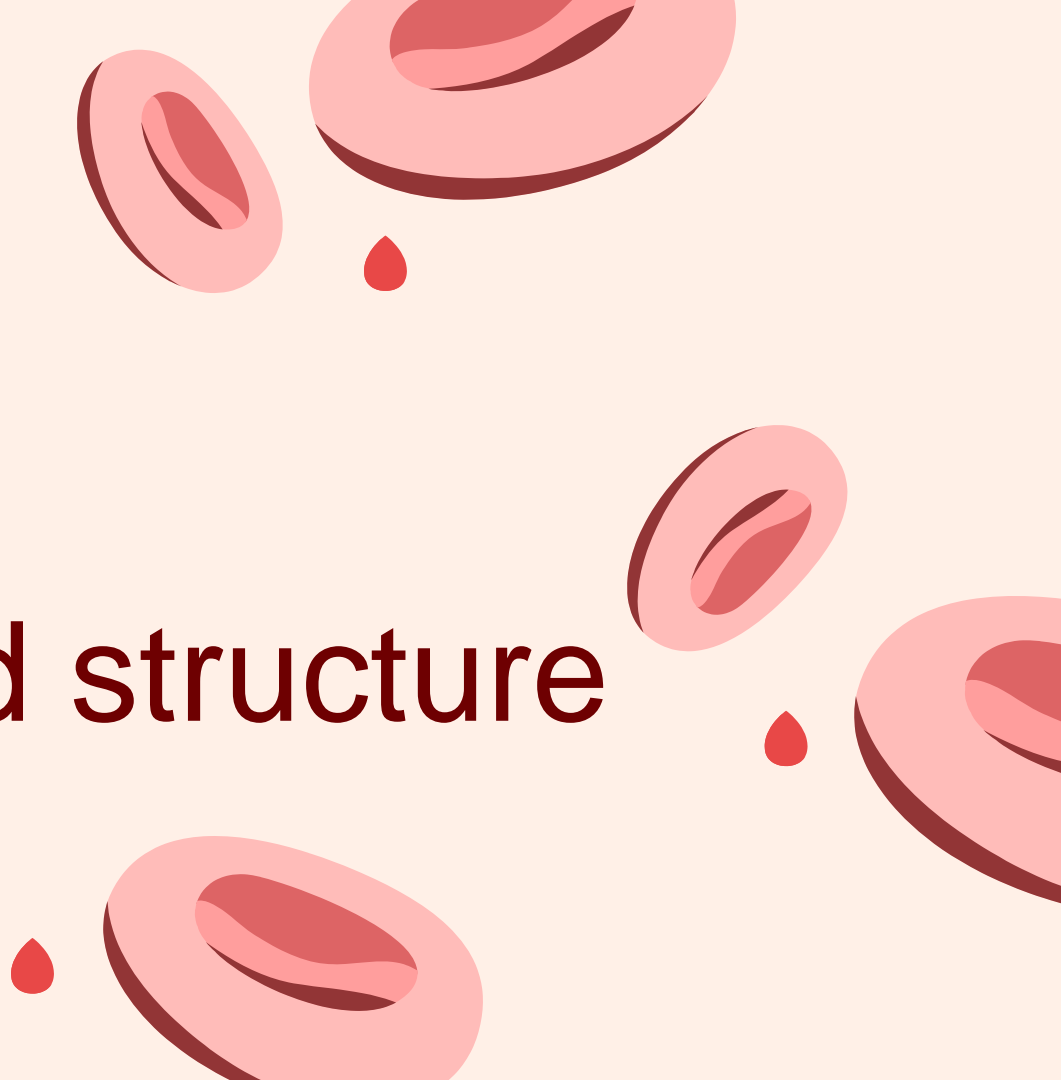
Diving mammals such as seals and whales are able to remain submerged for long periods because they have greater amounts of myoglobin in their muscles than other animals do.

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)

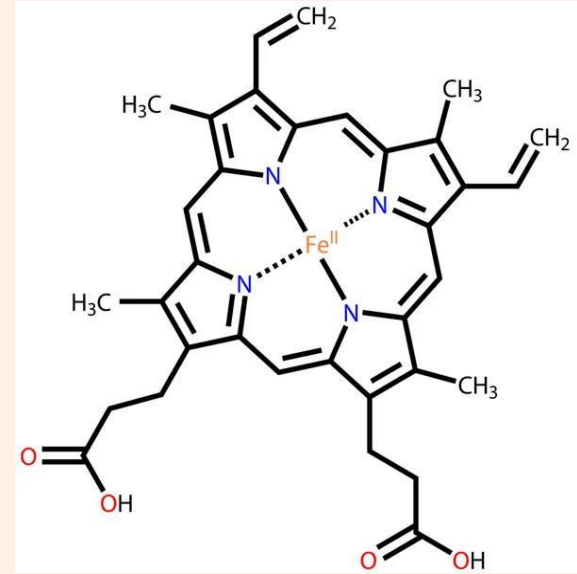


07

Synthesis and structure




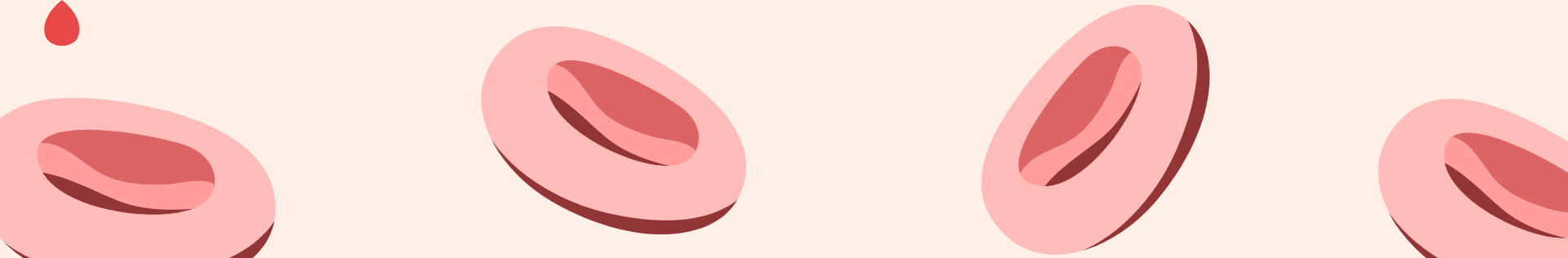
This synthesis of myoglobin accounted for approximately 5–9% of the total soluble protein synthesis demonstrable in this system



08

Myoglobin range

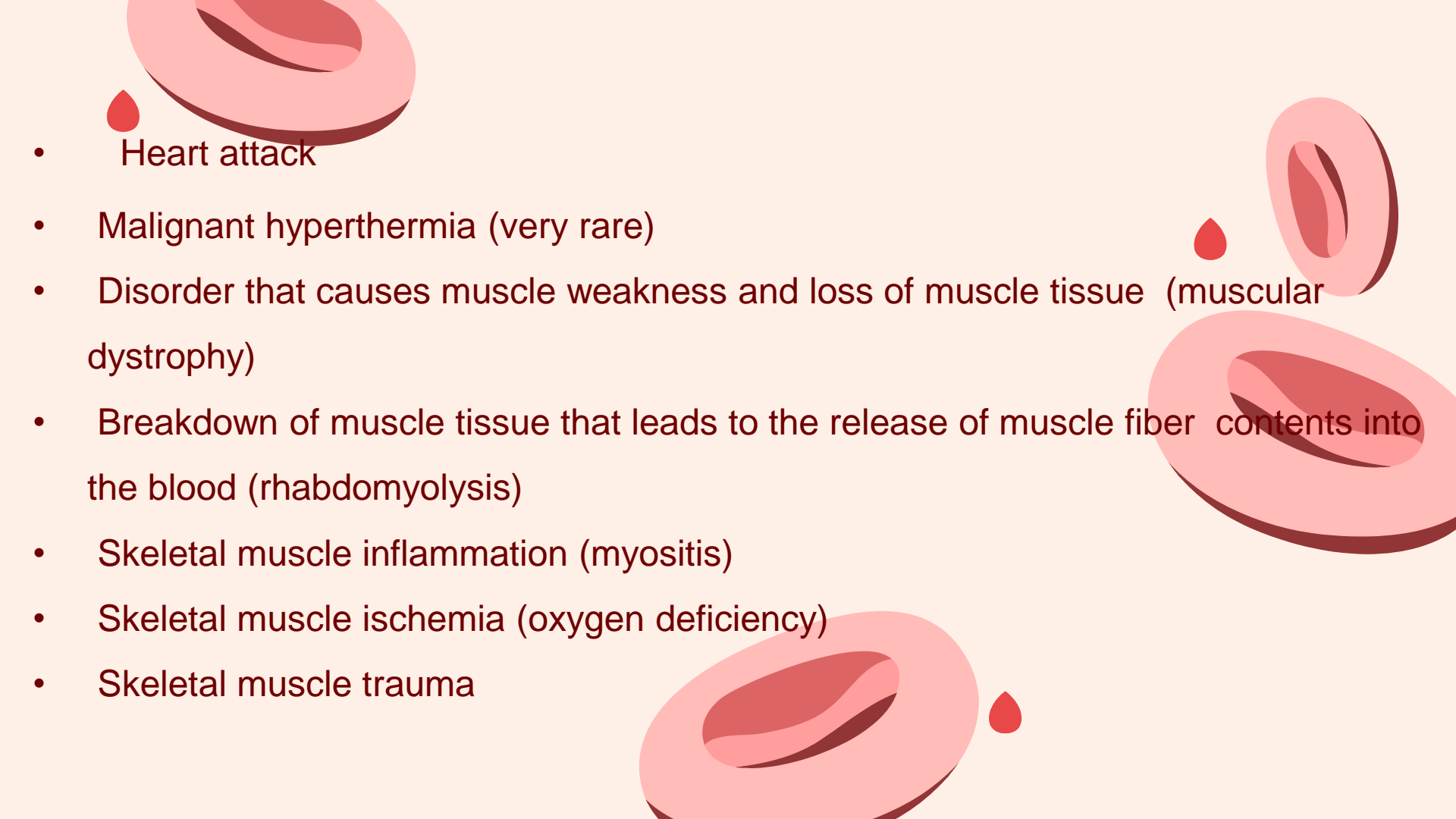


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- The normal range is 25 to 72 ng/mL Normal value ranges may vary slightly among different laboratories.
 - Some labs use different measurements or may test different samples.
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The background features several stylized red blood cells, depicted as pinkish-red biconcave discs with darker red centers, scattered across the white background. Small red droplets are also present, adding to the medical theme.

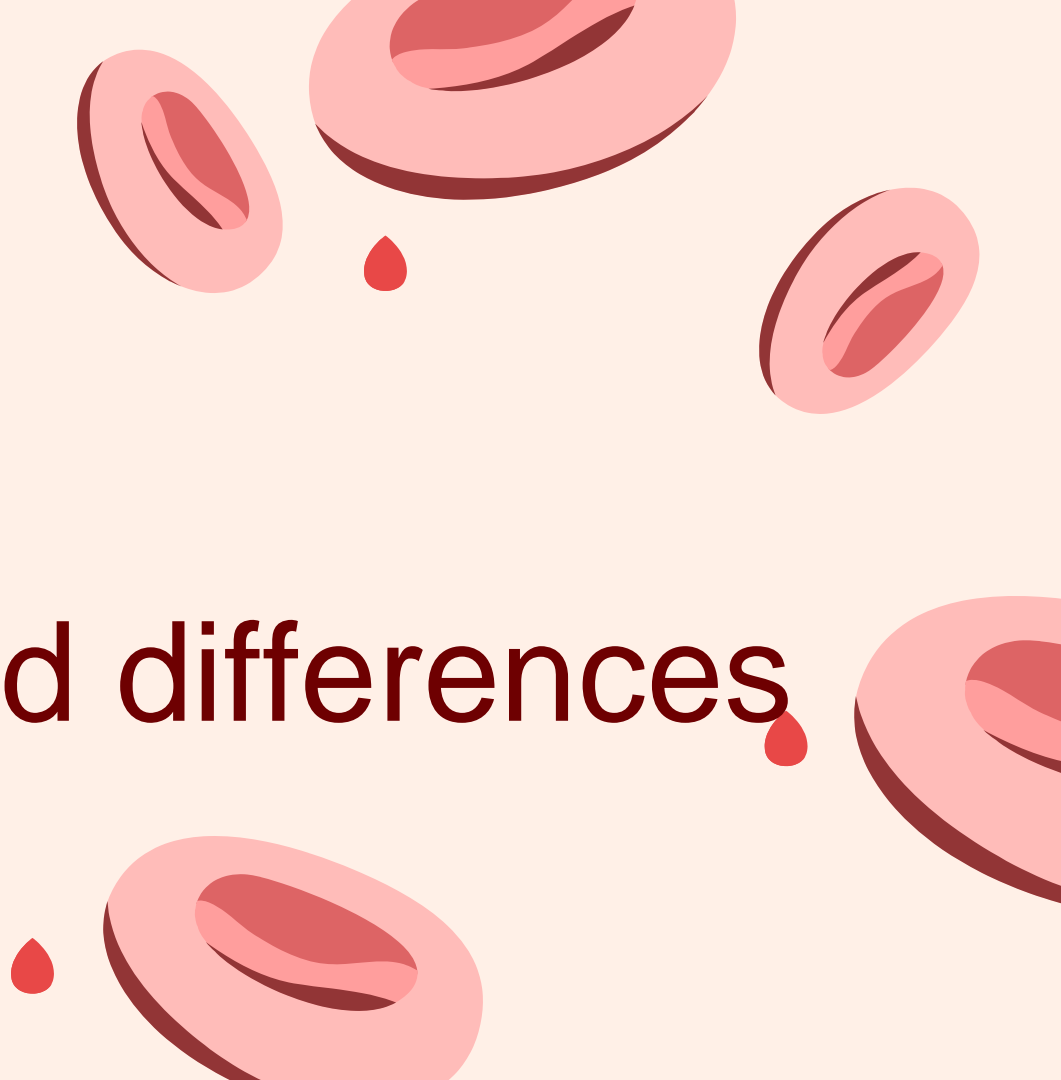
09

An increased level of myoglobin may be due to

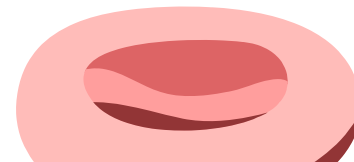
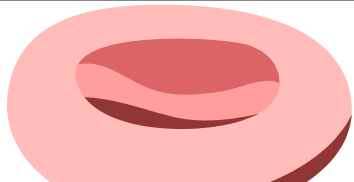
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- Heart attack
 - Malignant hyperthermia (very rare)
 - Disorder that causes muscle weakness and loss of muscle tissue (muscular dystrophy)
 - Breakdown of muscle tissue that leads to the release of muscle fiber contents into the blood (rhabdomyolysis)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

10

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	<ul style="list-style-type: none"> • Heterotetramer. • Quaternary structure • Made up of four polypeptide chains – two alpha and two beta. 	<ul style="list-style-type: none"> • 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 whereas 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 whereas 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.)



References

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<https://www.ucsfhealth.org/medical-tests/myoglobin-blood-test>

The background features four pink, 3D-style rings of varying sizes and orientations, and two small red teardrop shapes. One ring is at the top center, another at the bottom left, one at the bottom right, and a fourth is partially visible on the right edge. The teardrop shapes are located at the top center and bottom right.

Thanks