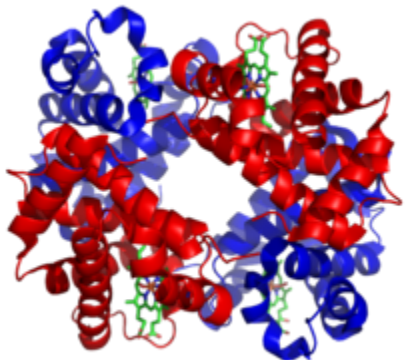


Hemoglobin

Hemoglobin (**haemoglobin** BrE) (from the Greek word αἷμα, *haîma* 'blood' + Latin *globus* 'ball, sphere' + *-in*) (/ˈhiːməˈɡloʊbɪn, ˈhɛmoʊ-/^[1]^[2]), abbreviated **Hb** or **Hgb**, is the iron-containing oxygen-transport metalloprotein present in red blood cells (erythrocytes) of almost all vertebrates^[3] (the exception being the fish family Channichthyidae)^[4] as well as the tissues of some invertebrates. Hemoglobin in blood carries oxygen from the respiratory organs (e.g. lungs or gills) to the rest of the body (*i.e.* tissues). There it releases the oxygen to permit aerobic respiration to provide energy to power functions of an organism in the process called metabolism. A healthy individual human has 12 to 20 grams of hemoglobin in every 100 mL of blood.

Hemoglobin		
(heterotetramer, $(\alpha\beta)_2$)		
 <p>Structure of human hemoglobin. α and β subunits are in red and blue, respectively, and the iron-containing heme groups in green. From PDB: 1GZX (https://www.rcsb.org/structure/1GZX) <i>Proteopedia Hemoglobin</i> (http://www.proteopedia.org/wiki/index.php/Hemoglobin)</p>		
Protein type	metalloprotein, globulin	
Function	oxygen-transport	
Cofactor(s)	heme (4)	
Subunit name	Gene	Chromosomal locus
Hb- α 1	HBA1	Chr. 16 p13.3 (https://www.ncbi.nlm.nih.gov/Omim/getmap.cgi?chromosome=16p13.3)
Hb- α 2	HBA2	Chr. 16 p13.3 (https://www.ncbi.nlm.nih.gov/Omim/getmap.cgi?chromosome=16p13.3)
Hb- β	HBB	Chr. 11 p15.5 (https://www.ncbi.nlm.nih.gov/Omim/getmap.cgi?chromosome=11p15.5)

In [mammals](#), the [chromoprotein](#) makes up about 96% of the red blood cells' dry content (by weight), and around 35% of the total content (including water).^[5] Hemoglobin has an oxygen-binding capacity of 1.34 mL O₂ per gram,^[6] which increases the total [blood oxygen capacity](#) seventy-fold compared to dissolved oxygen in blood. The mammalian hemoglobin molecule can bind (carry) up to four oxygen molecules.^[7]

Hemoglobin is involved in the transport of other gases: It carries some of the body's respiratory [carbon dioxide](#) (about 20–25% of the total)^[8] as [carbaminohemoglobin](#), in which CO₂ is bound to the [heme protein](#). The molecule also carries the important regulatory molecule [nitric oxide](#) bound to a [thiol](#) group in the globin protein, releasing it at the same time as oxygen.^[9]

Hemoglobin is also found outside red blood cells and their progenitor lines. Other cells that contain hemoglobin include the [A9 dopaminergic neurons](#) in the [substantia nigra](#), [macrophages](#), [alveolar cells](#), lungs, retinal pigment epithelium, hepatocytes, [mesangial cells](#) in the kidney, endometrial cells, cervical cells and vaginal epithelial cells.^[10] In these tissues, hemoglobin has a non-oxygen-carrying function as an [antioxidant](#) and a regulator of [iron metabolism](#).^[11]

Excessive glucose in one's blood can attach to hemoglobin and raise the level of hemoglobin A1c.^[12]

Hemoglobin and hemoglobin-like molecules are also found in many invertebrates, fungi, and plants.^[13] In these organisms, hemoglobins may carry oxygen, or they may act to transport and regulate other small molecules and ions such as carbon dioxide, nitric oxide, hydrogen sulfide and sulfide. A variant of the molecule, called [leghemoglobin](#), is used to scavenge oxygen away from [anaerobic](#) systems, such as the nitrogen-fixing nodules of [leguminous](#) plants, lest the oxygen poison (deactivate) the system.

[Hemoglobinemia](#) is a medical condition in which there is an excess of hemoglobin in the [blood plasma](#). This is an effect of [intravascular hemolysis](#), in which hemoglobin separates from red blood cells, a form of [anemia](#).

Research history

Genetics

Synthesis

Structure of heme

Evolution of vertebrate hemoglobin

Iron's oxidation state in oxyhemoglobin

Cooperativity

Binding for ligands other than oxygen

Types in humans

Degradation in vertebrate animals

Diseases related to hemoglobin

Diagnostic uses

Athletic tracking and self tracking uses

Analogues in non-vertebrate organisms

Other oxygen-binding proteins

Presence in nonerythroid cells

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References

Further reading

External links

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