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HAEMOGLOBIN

Haemoglobin was discovered by Hunefeld in 1840. The role of haemoglobin was in the blood was elucidated by physiologist Clude Bernard. The name haemoglobin is derived from the words haeme and globin, The ~~unit~~ subunit of haemoglobin is a globular protein with an embedded haeme group. Each haeme group contains one iron atom, that can bind one oxygen molecule through ion-induced dipole forces. The most common type of haemoglobin in mammals contains four such subunits. Haemoglobin is involved in the transport of other gases. it carries some of the body respiratory carbon dioxide (about 10% of the total) as carbaminohaemoglobin, in which CO_2 is bound to the globin protein. The molecule also carries the important regulatory molecule nitric oxide bound to a globin protein thiol group, releasing it at the same time as oxygen.

STRUCTURE:— Haemoglobin has a quaternary structure of many multi-subunit globular proteins. most of the amino acids in haemo-globin form alpha helices, connected by short non-helical segments. Hydrogen bonds stabilize the helical sections inside this protein. The molecule folding each polypeptide chain into a specific shape. Haemoglobin's quaternary structure comes from its four subunits in roughly a tetrahedral arrangment.

In most vertebrates the haemoglobin molecule is an assembly of four globular protein subunits. Each subunit is composed of a protein chain tightly associated with

a non-protein haeme group.

Each protein chain arranges into a set of alpha-helix structure segments, connected together in a globin fold arrangement, so called because this arrangement is the same folding motif used in other haeme-globin proteins such as myoglobin. The folding pattern, contains a pocket that strongly bind the haeme group.

A haeme group consists of an iron (Fe) ion (charged atom) held in a heterocyclic ring, known as a porphyrin. This porphyrin ring consists of four pyrrole molecules, cyclically linked together (by methene bridges) with the iron ion bound in the centre. The iron ion, which is the site of oxygen binding, coordinates with the four nitrogens in the centre of the ring, which all lie in one plane. The iron is bond strongly (covalently) to the globular protein via the imidazole ring of the F8 histidine (also known as the proximal histidine). below the porphyrin ring. A sixth position can reversibly bind oxygen by a coordinate covalent bond, completing the octahedral group of six ligands. oxygen binds in an 'end-on-bent' geometry, where one oxygen atom bind Fe bound a very weakly bounded water molecule fills the site, seeming a distorted octahedron.

In adult humans, the most common haemoglobin type is a tetramer (which contain 4 subunit protein) called haemoglobin A, consisting of two α and two β sub-units non-covalently bound, each made of 141 and 146 amino acid residues, respectively.