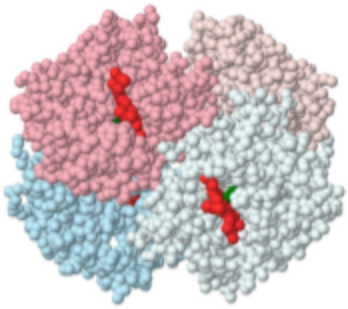
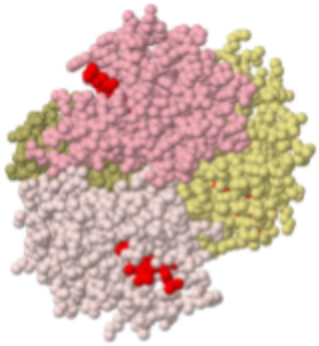
Two Important Carriers of Oxygen: Adult and Fetal Hemoglobin



1HHO HbA
Alpha globin- Pink
Beta globin- Light blue
Heme Groups- Red
Oxygen-Green



4MQJ HbF
Alpha globin- Pink
Gamma Globin- Khaki
Heme groups-Red

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Shaanan, B. (1983). Structure of human oxyhaemoglobin at 2.1 A resolution. *J.Mol.Biol.*, *171*, 31-59. Retrieved from http://www.rcsb.org/pdb/explore/explore.do?structureId=1HHO

PDB Files: 1HHO (HbA), 4MQJ (HbF)

Adult hemoglobin is a structure made up of four monomers. Two of which are alpha globin, and two which are beta globin. This is different compared to the the four monomers found in fetal hemoglobin which has two alpha and two gamma. The difference is significant because gamma chains have a higher affinity for oxygen then do the beta chains. This is important in understanding why some RBC diseases such as sickle cell anemia and beta thalassemia can not be diagnosed until the fetal hemoglobin production ceases and adult hemoglobin is produced at around 6 months.

Alpha globin is present in both fetal and adult hemoglobin. The important contrasting factor is between the beta and gamma chains. The amino acid residue specifically residue 143 is imperative in understanding the effects of a single acid. In the beta chain 143 is comprised of histidine which is negative while in the gamma chain 143 is the positive serine. This affects the nature of adult and fetal hemoglobin because 2,3 BPG can disrupt the histidine much more effectively than it can with serine. This is a finding that could possibly lead to further development and be the key to finding more efficient cures for RBC related diseases.