OXGEN-TRANSPORT PROTEINS IN HUMAN BLOOD AND TISSUES

A. Myoglobin
1. Present in red muscle tissues
2. Transports and stores molecular oxygen for the use of muscle cell mitochondria for the aerobic synthesis of ATP.
3. Molecule consists of one single chain (no subunit structure) of 17,000 daltons
4. Active prosthetic group is a heme group containing Fe+++ 

B. Hemoglobin
1. Present in vertebrate erythrocytes
2. Transports molecular oxygen from the lungs to the tissues
3. Transport carbon dioxide and proteons from the tissues to the lungs
4. Molecule consists of a tetramer of four different subunits
   a. Each subunit contains a heme group and will bind oxygen
   b. Binding of oxygen to the four subunits is cooperative
5. Hemoglobin is polymorphic in normal populations, but additionally, several hundred mutant hemoglobins have been identified
   a. Most mutant hemoglobins are benign (function almost normally)
   b. Some mutant hemoglobins cause serious problems

Examples of problematic hemoglobin gene mutations:

Hemoglobin S: Caused by a single mutation (Val replaces Glu) at position-6 of the beta-hemoglobin chain
Mutation causes protein to exhibit a "sticky patch"
Deoxyhemoglobin S will form a long, fibrous precipitate where one molecule binds to the next at this "patch"
These fibrous precipitates cause the "sickling" of RBC as they increase in length and distend the cell
Distended RBC block the capillaries and decrease peripheral circulation

Thalassemias: Caused by inadequate synthesis of either alpha-hemoglobin or beta-hemoglobin
Result is either the absence of one of beta hemoglobins, or the presence of a defective hemoglobin subunit which does not properly function
Hemoglobin tetramer is improperly constructed in these patients; oxygen transport therefore is reduced

ELECTROLYTES, NUTRIENTS, AND METABOLITES OF HUMAN PLASMA

The following are the concentrations of some of the more abundant components present in human plasma:

- free ammonia: 10-110 ug/dL
- bicarbonate ion: 24-28 mequivalents/L (24-28 mM conc)
- cholesterol: 150-280 mg/dL
- glucose: 65-110 mg/dL (fasting or "true" glucose levels)
- iron: 50-175 mg/dL
- inorganic phosphate: 3-45 mg/dL (4-7 mg/dL in children)
- triglycerides: 50-165 mg/dL
- urea: 21-53 mg/dL
- uric acid (females): 2.5-7.5 mg/dL
- uric acid (males): 3-9 mg/dL