PROTEINS OF HUMAN PLASMA

The following are the major proteins present in human plasma:

A. Albumin (4.5 g/dL; MW = 69000; 585 AA)
   1. Major plasma protein, comprising 52-68% of total proteins
   2. Liver synthesizes 12 g/day, which is 25% of its total protein production
   3. Levels are elevated during dehydration and shock
   4. Levels are lowered during malnutrition, nephritis, nephrosis, hepatic insufficiency, cancer, and leukemia
   5. Accounts for 75-80% of the osmotic pressure of human plasma
   6. Binds numerous ligands
      a. endogenous: FFA, Ca++, steroids, bilirubin, Trp, Cu++
      b. exogenous: sulfonamides, penicillins, dicoumarol, aspirin

B. Haptoglobin (abbreviated Hp; 40-180 mg/dL; MW = 90,000; glycoprotein)
   1. Binds extracorpuscular hemoglobin (Hb)
      a. Free Hb has a tendency to precipitate in the kidneys
      b. Hb-Hp complex cannot pass through glomerulus
   2. Plasma half-life of Hp is 5 days; plasma half-life of Hb-Hp complex is 90 min
   3. Hp is one of the acute plasma proteins which are elevated during inflammation

C. Transferrin (abbreviated Tf; 300 mg/dL; MW = 80,000; glycoprotein)
   1. Iron transporter (2 moles Fe+++/mole Tf; iron conc in plasma is 50-175 μg/dl)
   2. Diminishes toxicity of iron by transporting the ion where it is needed
   3. Note that iron deficiency is a common problem during pregnancy, in premenopausal women, and in insufficiently-nourished older adults
   4. Note that Ferritin is an abundant protein in the body which binds iron, but it is considered an iron "store" rather than a transport protein

D. Ceruloplasmin (30 mg/dL; MW = 160,000)
   1. Copper transporter (6 moles Cu+++/mole cerulosplasmin; copper concentration in plasma 100-200 μg/dL
   2. Carries 90% of bound plasma copper; balance is carried by albumin
   3. Copper deficiencies are rare; the total copper in the body is only 100-150 mg (compared to iron, which is present at 2500 mg total in RBC, 300 mg total in myoglobin, 1000 mg total in stores)
   4. Copper can be elevated in pregnancy, cancer, presence of infection, and during the use of oral contraceptives

E. alpha1-Antiproteinase (MW 45,000)
   1. Principle protease inhibitor of human plasma
   2. Inhibits trypsin, elastase, several other proteases
   3. Lack of this protein is associated with emphysema
      a. Note that only 5% of emphysema patients suffer from a genetic condition
      b. Balance of patients have the condition caused by the oxidation of Met-358 in α1-antiproteinase by tobacco smoke, which renders the inhibitor inactive
F. gamma-Globulins (immunoglobulins, antibodies)

1. IgA (90-450 mg/dL)
2. IgG (700-1500 mg/dL)
3. IgM (40-250 mg/dL)
4. IgD (0.3-40 mg/dL)
5. IgE (0.006-0.16 mg/dL)

G. Other plasma proteins include hemoglobin, lipoproteins, proteins of hemostasis, hormones, etc.