Plasma proteins

	Prealbumin (Transthyretin)	Albumin
Overview	— **Migrates faster than albumin in electrophoresis** — **Short half-life (2 days)**	— **Most abundant plasma protein (~40 g/L) in normal adult** — **Synthesized in the liver as preproalbumin and secreted as albumin** — **Half-life in plasma: 20 days**
Function	**A transport protein for:** — **Thyroid hormones** — **Retinol (vitamin A)** (Transthyretin)	— Maintains oncotic pressure (80%) — **Useful in treatment of liver diseases, hemorrhage, shock and burns** — **A non-specific carrier of hormones, calcium, free fatty acids, drugs, etc.** — **Tissue cells can take up albumin by pinocytosis where it is hydrolyzed to amino acids**
Levels	**Lower levels found in:** — liver disease, — nephrotic syndrome, — acute phase inflammatory response, — malnutrition	**Hypoalbuminemia: Decreases rapidly in injury, infection and surgery** • **Causes** – Decreased albumin synthesis (liver cirrhosis, malnutrition) – Increased losses of albumin: • Increased catabolism in infections • Excessive excretion by the kidneys (nephrotic syndrome) • Excessive loss in bowel (bleeding) • Severe burns (plasma loss in the absence of skin barrier) • Effects of **Hypoalbuminemia** – Edema – Reduced transport of **hormones, calcium, free fatty acids, drugs…** – Reduced protein-bound **calcium** (not ionized calcium) **Hyperalbuminemia** • Dehydration
	Negative Acute Phase Protein	**Negative Acute Phase Protein**

	α_1-Globulins	
	α_1-Antitrypsin	α-fetoprotein
Overview	— **Synthesized by the liver and macrophages** — **Over 30 types are known, The most common is M type**	— **Synthesized in the developing embryo and fetus by the parenchymal cells of the liver** — **AFP levels decrease gradually during intra-uterine life and reach adult levels at birth.**
Function	— **inhibits proteases** e.g. trypsin.	— **Function is unknown but it may protect fetus from immunologic attack by the mother** — **No known physiological function in adults.**
Levels	**Genetic deficiency of α_1-Antitrypsin = α_1-Antitrypsin accumulates in hepatocytes and is deficient in plasma.** • **Neonatal jaundice with evidence of cholestasis** • **Childhood liver cirrhosis** • **Pulmonary emphysema in young adults**	— **Elevated maternal AFP levels are associated with: Neural tube defect, anencephaly** — **Decreased maternal AFP levels are associated with: Increased risk of Down's syndrome** (AFP levels are down) — **AFP is a tumor marker for: Hepatoma and testicular cancer**
Laboratory Diagnosis	• **Lack of α_1-globulin band in electrophoresis** • **Quantitative measurement of α_1-Antitrypsin by: Radial immunodiffusion, isoelectric focusing or nephelometry**	
	Positive Acute Phase Protein	

	α_2-Globulins	
	Ceruloplasmin	Haptoglobin
Overview	— **Synthesized by the liver** — **Contains >90% of serum copper**	— **Synthesized by the liver**
Function	— **An oxidoreductase that inactivates ROS** — **Important for iron absorption from the intestine**	— **Binds to free hemoglobin to form complexes that are metabolized in the RES** (reticuloendothelial system) — **Limits iron losses by preventing Hb loss from kidneys**
Levels	**Wilson's disease: Due to low plasma levels of ceruloplasmin, Copper is accumulated in the liver and brain.**	**Plasma level decreases during hemolysis**
	Positive Acute Phase Protein	**Positive Acute Phase Protein**

	β-Globulins		
	C-Reactive Protein (CRP)	Transferrin	β_2–Microglobulin
Overview	— **synthesized by the liver**	— **A major iron-transport protein in plasma (30% saturated with iron)** — **Iron deficiency results in increased of its hepatic synthesis**	— **A component of human leukocyte antigen (HLA)** — **Present on the surface of lymphocytes and most nucleated cells**
Function	— **Important for phagocytosis**		
Levels	— **High plasma levels are found in many inflammatory conditions such as rheumatoid arthritis** — **A marker for ischemic heart disease**	**Plasma level drops in:** — **Malnutrition,** — **liver disease,** — **inflammation,** — **malignancy**	— **Elevated serum levels are due to Overproduction in disease** — **May be a tumor marker for:** **Leukemia, lymphomas, multiple myeloma**
	Positive Acute Phase Protein	**A negative acute phase protein**	

	γ- Globulins	
	Monoclonal Hypergammaglobulinemia:	Polyclonal hypergammaglobulinemia:
Mechanism	Proliferation of a Single B-cell clone produces a single type of Ig	Stimulation of many clones of B cells produce a wide range of antibodies
electophoresis	Appears as a Separate dense band **(paraprotein or M band)**.	γ-globulin band appears large
Clinical conditions	Paraproteins are characteristic of **malignant B-cell proliferation**: — multiple myeloma	— acute and chronic infections, — **autoimmune diseases,** — **chronic** liver diseases

بالتوفيق للجميع

لولوه الصغير -