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Plasma Proteins

Globulins

α1-globulins	α2- globulins	β- globulins	γ-globulins
▪ **α1-antitrypsin** ▪ **α1-fetoprotein** ▪ α1- acid glycoprotein ▪ Retinol binding protein	▪ **Ceruloplasmin** ▪ **Haptoglobin** ▪ **α2-macroglobulin**	▪ **CRP** ▪ Transferrin ▪ Hemopexin ▪ β2-microglobulin	▪ IGG ▪ IGA ▪ IGM ▪ IGD ▪ IGE

α1- antitrypsin

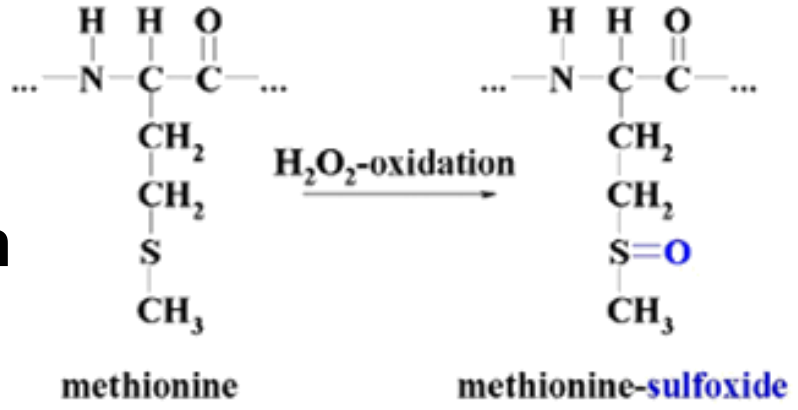
- α1-Antiproteinase (52 kDa)
- Neutralizes trypsin & trypsin-like enzymes (elastase)
- 90% of α1- globulin band
- Many polymorphic forms (at least 75)
- Alleles Pi^M, Pi^S, Pi^Z, Pi^F (MM is the most common)
- Deficiency (genetic): emphysema (ZZ, SZ). MS, MZ usually not affected
- Increased level of α1- antitrypsin (acute phase response)

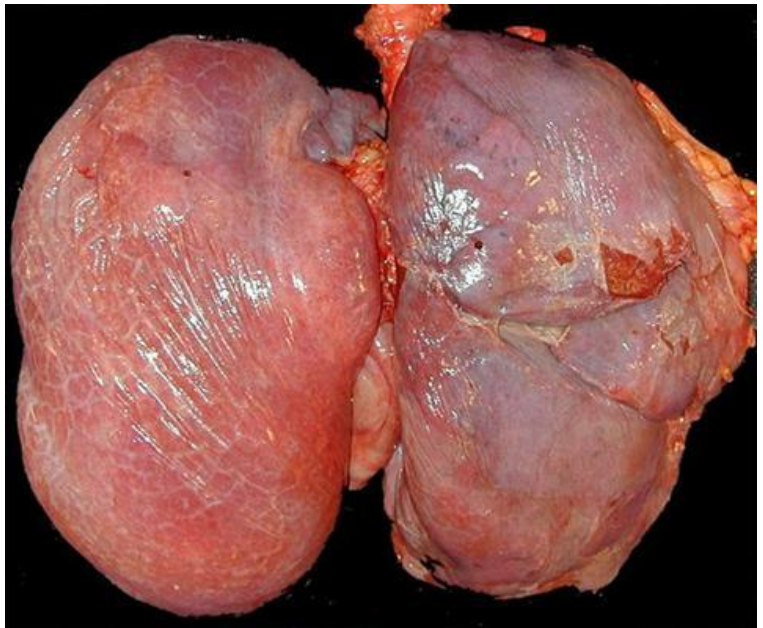
Active elastase + α_1–AT → Inactive elastase: α_1–AT complex → No proteolysis of lung → No tissue damage

Active elastase + ↓ or no α_1–AT → Active elastase → Proteolysis of lung → Tissue damage

Smoking & α1- antitrypsin deficiency

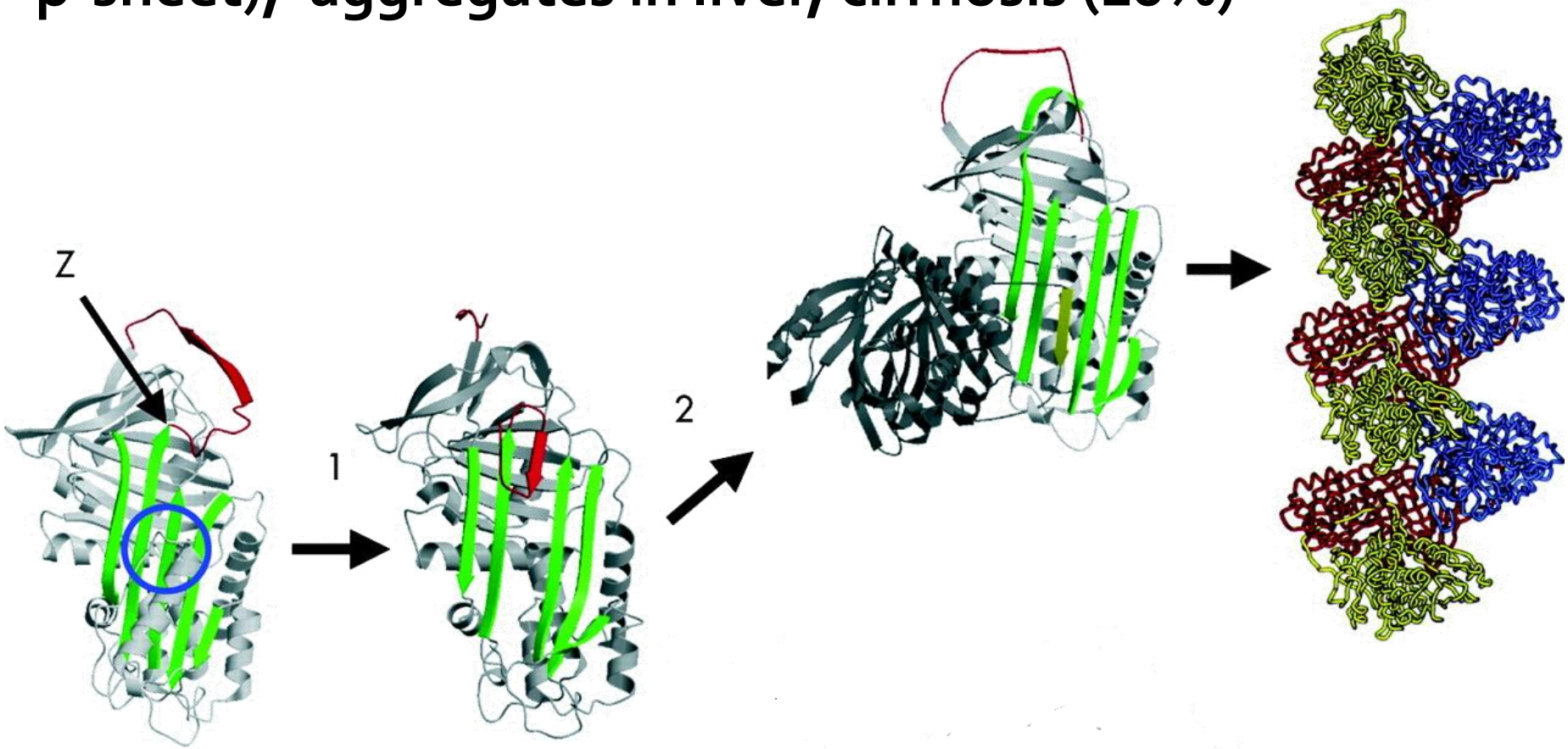
- Chronic inflammation
- Oxidation of Met^{358}
- devastating in patients with Pi^{ZZ}





Liver disease & α1- antitrypsin deficiency

- Liver disease: ZZ phenotype polymerization (loop with β-sheet), aggregates in liver, cirrhosis (10%)



α1- fetoprotein

- Synthesized primarily by the fetal yolk sac and then by liver parenchymal cells
- Very low levels in adult
- Functions of α1-fetoprotein:
  - ✓ Protect the fetus from immunolytic attacks
  - ✓ Modulates the growth of the fetus
  - ✓ Transport compounds e.g. steroids
  - ✓ Low level: increased risk of Down's syndrome
- Level of α1-fetoprotein increases in:
  - ✓ Fetus and pregnant women <u>Normally</u>
  - ✓ Hepatoma & acute hepatitis

Haptoglobin (HP)

- It is an acute phase reactant protein
- α2 glycoprotein (90kDa)
- A tetramer (2α, 2β)
- 3 phenotypes:
  - ✓ Hp 1-1→ α1, α1 + 2β
  - ✓ Hp 2-1→ α1, α2 + 2β
  - ✓ Hp 2-2 → α2, α2 + 2β
- Binds the free hemoglobin (65 kDa); prevents loss of hemoglobin & its iron into urine
- Hb-Hp complex has shorter half-life (90 min) than that of Hp (5 days)
- Decreased level in hemolytic anemia

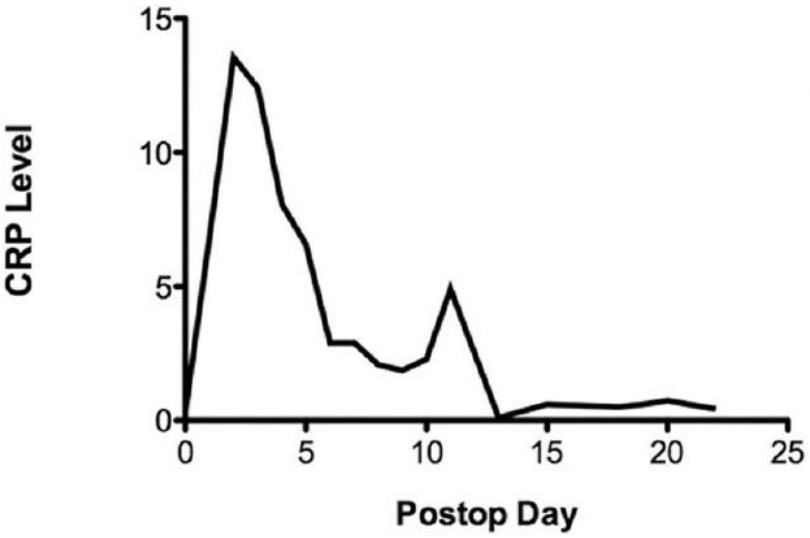
Ceruloplasmin

- Amine oxidase
- Copper-dependent superoxide dismutase
- Cytochrome oxidase
- Tyrosinase

- A copper containing glycoprotein (160 kDa)
- It contains 6 atoms of copper
- Metallothioneins (regulate tissue level of Cu)
- Regulates copper level: contains 90% of serum Cu
- A ferroxidase: oxidizes ferrous to ferric (transferrin)
- Albumin (10%) is more important in transport
- Decreased levels in liver disease (ex. Wilson's, autosomal recessive genetic disease)

C- reactive protein (CRP)

- Able to bind to a polysaccharide (fraction C) in the cell wall of pneumococci
- Help in the defense against bacteria and foreign substances



- Undetectable in healthy individuals, detectable in many inflammatory diseases (Acute rheumatic fever, bacterial infection, gout, etc.) & Tissue damage
- Its level reaches a peak after 48 hours of incident (monitoring marker)