**Immune System Function**

Antigen enters body – B lymphocytes become plasma cells

**Plasma Cells** – produce antibodies

Antigen – Antibody response

T Cell lymphocytes react to destroy antigens directly

Antigens destroyed indirectly by recruiting other lymphocytes or macrophages

Effective against bacteria, fungi, virus, cancer, transplanted cells

Numbers (consult text) – normal values:
- **WBC x (10^3)**: 4.5 to 11.0
- **RBC x (10^6)**: 3.5 to 5.5
- **Hemoglobin**: Female 12 to 16 g/100mL; Male 14 to 18 g/100mL
- **Hematocrit**: Female 36 to 48 mL/100mL; Male 40 to 54 mL/100mL
- **Mean Cell Volume**: 80-100
- **Mean Cell Hemoglobin**: 26 to 34
- **Hemoglobin Content**: 31 to 37
- **Platelet Count x (10^3)**: 150-450

**WBC Differential**
- SEGs: 50-60%
- Bands: 3-8%
- Lymphocytes: 25-40%
- Monocytes: 2-4
- Eosinophils: 1-4
- Basophils: 0-1
- Neutrophils: 100

Neutrophil count is extremely important, reduced numbers can lead to severe infection. Below 1000/mm^3 the neutrophils are neutropenic. Cancer patients have special problems with neutropenia.

**Blood Plasma**

A. Components:
- 1. water 91.5%
- 2. inorganic salts 1.5%
- 3. plasma proteins 7.0%
B. Plasma proteins:
1. Albumin 60%
2. Globulin 36% (alpha, beta, gamma)
3. Fibrinogen 4%

C. Plasma nutrients and gasses:
1. amino acids, sugars and lipids
2. sugars: glucose, glycogen
3. lipids: triglycerides, phospholipids, cholesterol
   - These are usually combined with protein (lipoprotein)
   - Very low density (VLDL), low density (LDL), high density (HDL)
   - Fats are less dense than protein
   - As fat content decreases, density increases
   - Apoproteins are molecules that can attach to receptors

Process:
- VLDL carry fats from liver that were formed from carbs
- VLDL are converted to LDL at adipose tissue
- LDL molecules have high cholesterol content
- Liver cells have receptors that remove LDL
- Chylomicrons are converted to HDL

D. Non-protein nitrogen:
1. Amino acids, urea, uric acid, creatine, creatinine
2. Creatine is stored as creatine phosphate – high density
3. A rise in NpN may be a symptom of renal failure, infection or excessive protein
   Metabolism

E. Blood Coagulation:
1. Blood clots maintain homeostasis
2. Clotting depends on:
   - Factors that enhance clotting
   - Factors that inhibit clotting
3. Process is as follows:
   - Tissue damaged – release thromboplastin
   - Blood vessel spasms
   - Platelet plug formation
   - Extrinsic clot formation
   - Prothrombin activator
   - Prothrombin + Ca converted to thrombin
   - Fibrinogen goes to fibrin
   - Blood clot formation
4. Intrinsic blood clot
   - Blood contacts foreign surface
   - Hageman factor activation
- Series of reactions
- Prothrombin activator
- Thrombin – fibrinogen – fibrin – blood clots