Immunology

Saddam Ansari

Tbilisi State Medical University

What is immunology?

- Immune (Latin- "immunus")
  - To be free
  - People survived calamity of epidemic diseases when faced with the same disease again
- The study of physiological mechanisms that humans and other animals use to defend their bodies from invading organisms
  - Bacteria - Viruses
  - Fungi - Parasites - Toxins

Immunology Buzzword

Antigen

- Any molecule that binds to immunoglobulin or T cell receptor

Pathogen

- Microorganism that can cause disease

Antibody (Ab)

- Secreted immunoglobulin

Continued…

- **Immunoglobulin (Ig)**
  - Antigen binding molecules of B cells
- **Vaccination**
  - Deliberate induction of protective immunity to a pathogen
- **Immunization**
  - The ability to resist infection

Types of Immunity

Innate Immunity

- Host defense mechanisms that act from the start of an infection but do not adapt to a particular pathogen

Adaptive Immunity

- Response of an antigen specific B and T lymphocytes to an antigen
- Immunological memory

Types of Immunity

Humoral immunity

- Immunity that is mediated by antibodies
- Can be transferred by to a non-immune recipient by serum

Cell Mediated Immunity

- Immune response in which antigen specific T cells dominate

Immunology cell histology

Polymorphonuclear

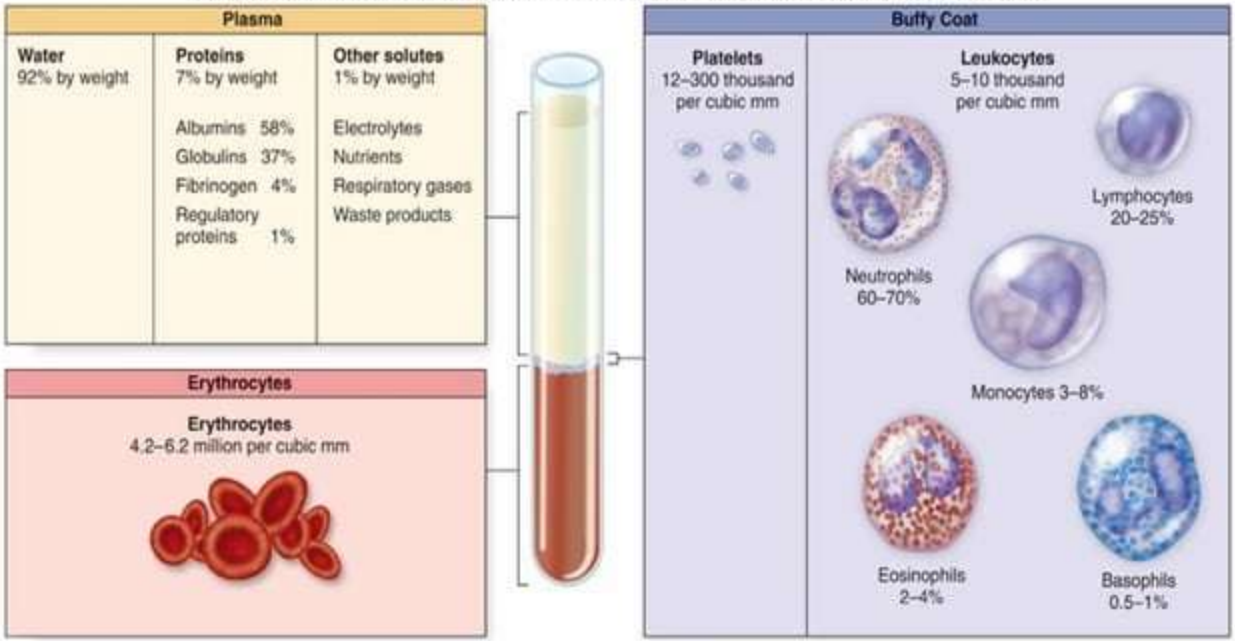
- Lobed nucleus

Mononuclear

- Non-lobed nucleus

Granulocyte

- Many granules seen in cytoplasm



Continued...

Neutral

- Does not stain to acidic or basic compounds

Acidic (red-pink)

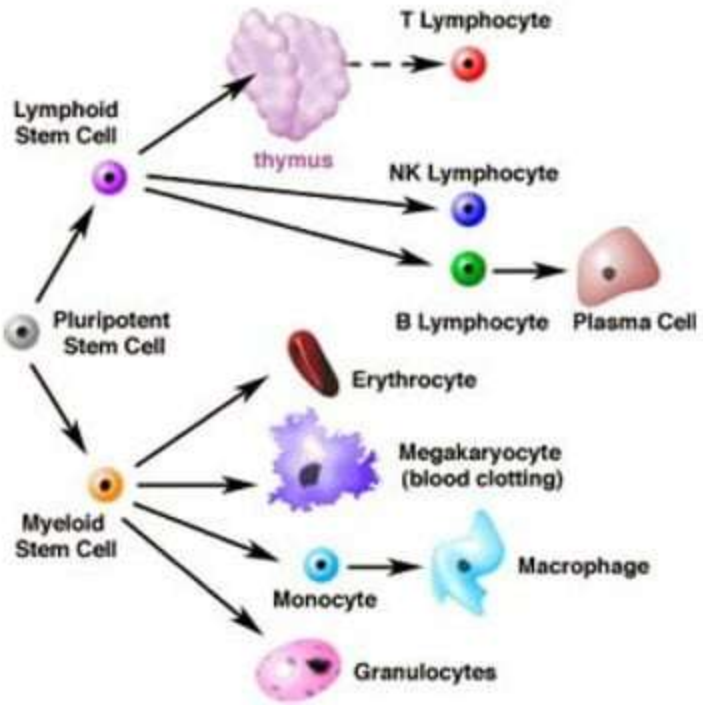
- Stains to acidic compounds (Eosin)

Basic (blue-purple)

- Stains to basic compounds

Cells of the Immune system

- Many cells of the immune system derived from the bone marrow
- Hematopoetic stem cell differentiation



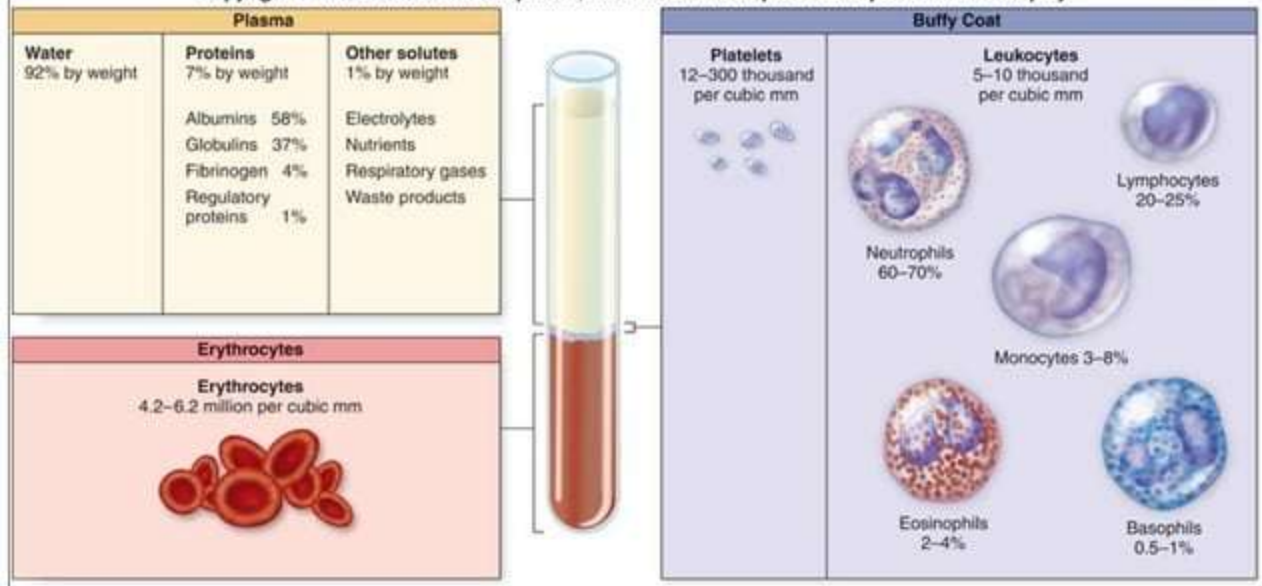
Components of blood

Serum vs. Plasma

- Serum: cell-free liquid, minus the clotting factors

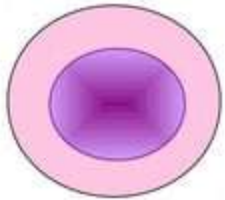
- Plasma: cell-free liquid with clotting factors in solution (must use an anticoagulant)

Components of blood

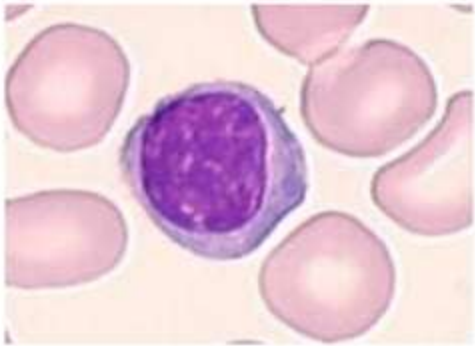


Lymphocytes

Many types: Important in both humoral and cell-mediated immunity



- B-cells produce antibodies
- T- cells
  - Cytotoxic T cells
  - Helper T cells
- Memory cells



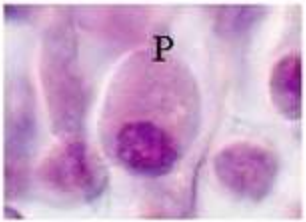
Lymphocytes

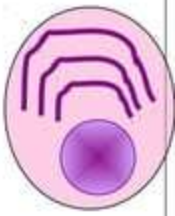
Plasma Cell (in tissue)

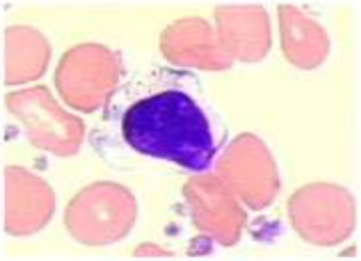
- Fully differentiaited B cells, secretes Ab

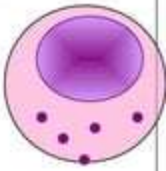
Natural Killer cells

- Kills cells infected with certain viruses
- Both innate and adaptive
- Antigen presentation



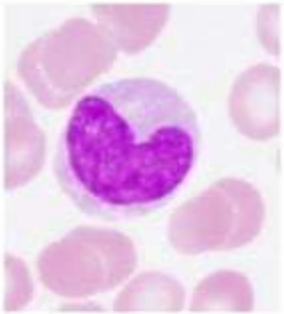


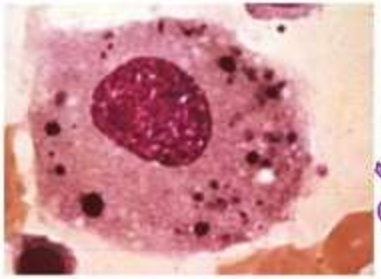


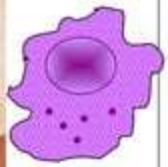


Monocytes/Macrophage

- Phagocytosis and killing of microorganisms
  - Activation of T cells and initation of immune response
- Monocyte is a young macrophage in blood
- There are tissue-specific macrophages
- Antigen Presentation

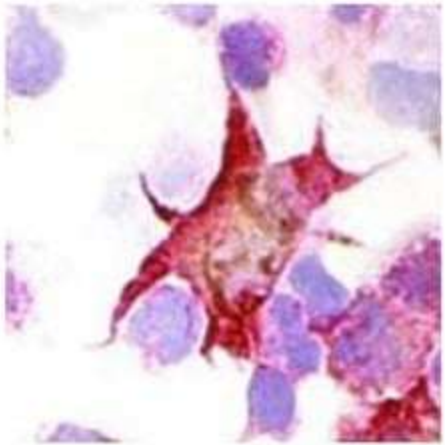


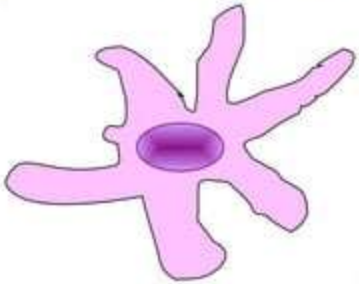




Dendritic Cells

- Activation of T cells and initiate adaptive immunity
- Found mainly in lymphoid tissue
- Function as antigen presenting cells (APC)
- Most potent stimulator of T-cell response



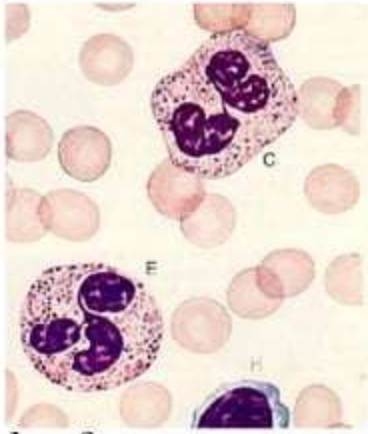


Mast Cells

- Expulsion of parasites through release of granules
- Histamine, leukotrienes, chemokines, cytokines
- Also involved in allergic responses

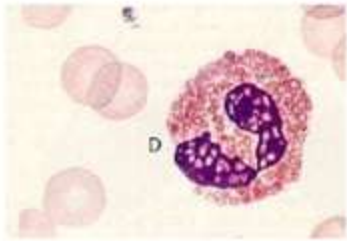
Neutrophil

- Granulocyte
  - Cytoplasmic granules
- Polymorphonuclear
- Phagocytosis
- Short life span (hours)
- Very important at "clearing" bacterial infections
- Innate Immunity



Eosinophils

- Kills Ab-coated parasites through degranulation
- Involved in allergic inflammation
- A granulocyte
- Double Lobed nucleus
- Orange granules contain toxic compounds

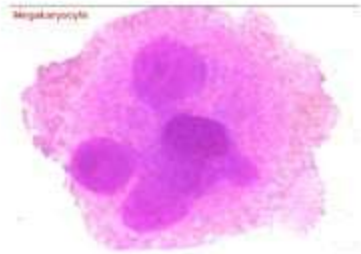


Basophils

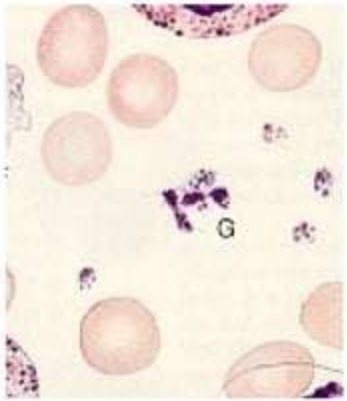
- Might be "blood Mast cells'
- A cell-killing cells
  - Blue granules contain toxic and inflammatory compounds
- Important in allergic reactions

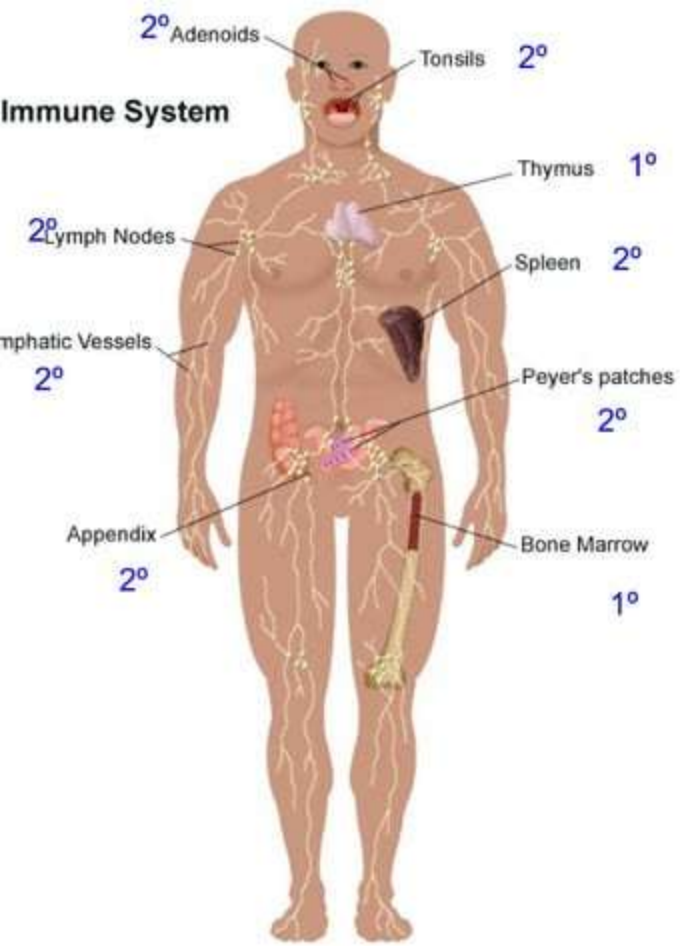
Other Blood Cells

- Megakaryocyte
  - Platelet formation
  - Wound repair



- Erythrocyte
  - Oxygen transport





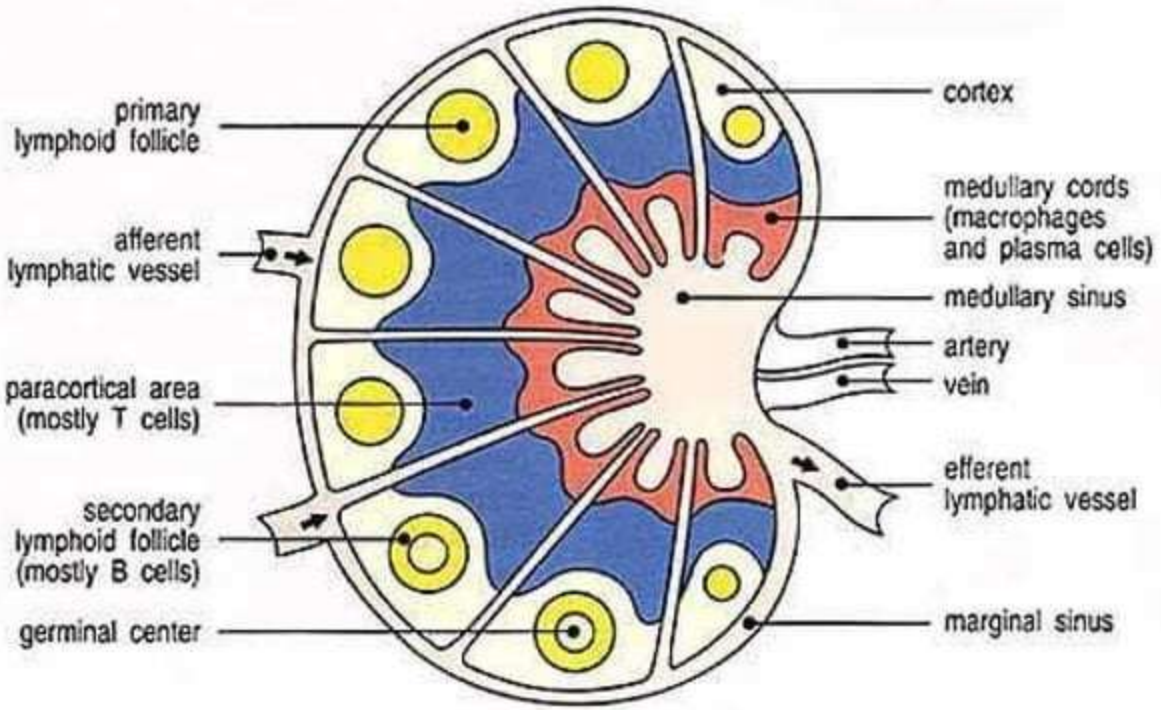
Major Tissues

Primary Lymph tissues

- Cells originate or mature

Secondary Lymph Tissues

The lymph node




Thank You