Mechanisms and Manifestations of Disease Lecture 2

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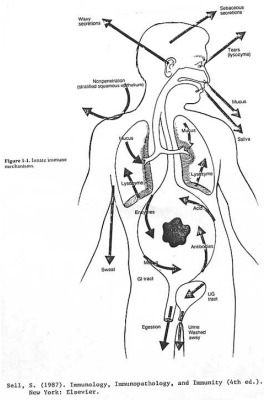
Part 2

Introduction to the Immune System

Mechanisms of Immunity

- Innate resistance-defense mechanisms against foreign invaders e.g. mechanical barriers like skin and mucosa-secreted products like GI enzymes
  - ***Always present*** in healthy persons
  - No distinction between organisms-***non-specific***
  - ***Intensity is not altered*** upon re-exposure



Sell, S. (1987). Immunology, Immunopathology, and Immunity (4th ed.). New York: Elsevier.

Innate Resistance

Mechanisms of Immunity (cont.)

- Adaptive resistance-Quiescent until specifically stimulated, requires an immunizing event
  - Distinguishes between organisms
  - Alters intensity and response with re-exposure

Functional Abilities of the Adaptive Immune System

- ***Specific*** recognition of different invaders
- ***Rapid synthesis*** of immune products
- ***Quick delivery*** of immune products to infection site

Functional Abilities (cont'd)

- ***Diversity*** of effector defenses
- **Direction** of specific defenses
- ***Deactivation*** of the system

White Blood Cells

- Divided into two major populations based upon the form of their nuclei:
  - Single nuclei-mononuclear or round cells
  - Segmented nuclei-polymorphonuclear cells

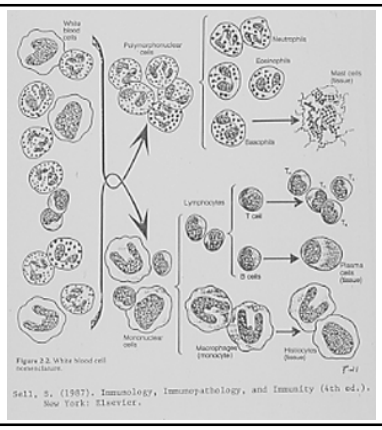


Figure 2.2 White blood cell nomenclature.

Sell, S. (1987). Immunology, Immunopathology, and Immunity (4th ed.). New York: Elsevier.

Polymorphonuclear (PMN) Leukocytes

- Class of white blood cells subdivided based upon staining properties
  - Neutrophils
  - Eosinophils
  - Basophils

Neutrophils

- Cellular Composition
  - Granules composed of hydrolytic enzymes
- Cellular Presence
  - Characteristic of acute inflammation (6-12 hours in tissues)
  - Neutrophil role is taken over by macrophage in chronic inflammation

Eosinophils

- Location-Found in body around:
  - Antigen-antibody complexes
  - Parasitic infections
- Role
  - Appears to be to limit or modulate inflammation

Eosinophils (cont.)

- Cellular Composition
  - Eosinophilic granules composed of hydrolytic enzymes with high peroxidase content
- Cellular Migration
  - Chemotactic response similar to neutrophils

Basophils

- Location
  - Found in blood, solid tissue (mast cells), and in loose connective tissue
- Cellular Composition
  - Granules contain heparin, histamine, serotonin, prostaglandin-like substances, leukotrienes, hydrolytic enzymes
- Role
  - Mediate anaphylactic reactions

Mononuclear cells

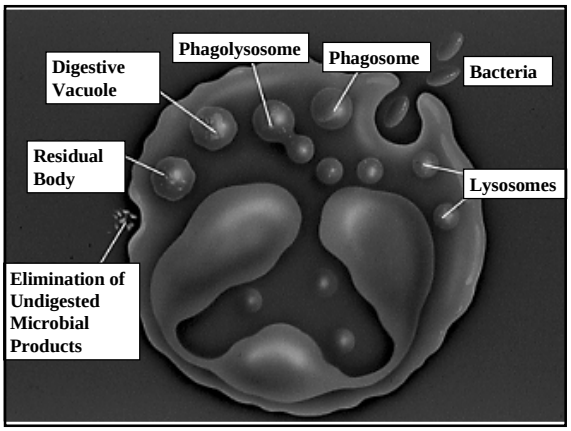
- Large cells-macrophages or monocytes
- Small cells-lymphocytes

Macrophages

- Types
  - Monocytes
    - Found in peripheral blood
  - Histiocytes
    - Found in tissue (e.g. Kupffer cells in liver)

Macrophages (cont.)

- Role
  - Antigen uptake-first step in antigen-antibody response
  - Nonspecific antigen uptake and ***incomplete degradation***
  - ***Presentation of partially degraded antigen*** on surface in conjunction with histocompatibility markers
  - Plays prominent role in later stages of inflammatory response



Lymphocytes

- T cells - Distinguished phenotypically
- B cells
- Null cells - No phenotypic markers

Null Cells

- Natural killer cells
  - cytotoxic (kill)
  - Not antibody dependent
- Killer cells
  - Become armed by passive antibody absorption
  - Antibody dependent cytoxicity (ADCC)

Natural Killer cells (NK cells)

- Cytotoxic lymphocytes present in non-immunized individuals
- NK cells share some properties of T cells, B cells, and macrophages
- Differ from T killer cells because they can lyse a variety of tumor cells without prior sensitization

Natural Killer cells (cont.)

- Not histocompatibility restricted
- Activity is increased by infections and IL2
- Cytotoxic for viruses and cancer cells

Killer cells (K cells)

- Lyphocytes that mediate antibody-dependent cell-mediated cytotoxicity (ADCC)
- Dependent on immunizing event, memory