

Study Outline Chapter 16

Introduction (p. 440)

- The ability to ward off disease through body defenses is called resistance.
- Lack of resistance is called susceptibility.
- Nonspecific resistance refers to all body defenses that protect the body against any kind of pathogen.
- Specific resistance (immunity) refers to defenses (antibodies) against specific microorganisms.

Skin and Mucous Membranes (pp. 440- 442)

Mechanical Factors (pp. 440- 442)

- The structure of intact skin and the waterproof protein keratin provide resistance to microbial invasion.
- Some pathogens, if present in large numbers, can penetrate mucous membranes.
- The lacrimal apparatus protects the eyes from irritating substances and microorganisms.
- Saliva washes microorganisms from teeth and gums.
- Mucus traps many microorganisms that enter the respiratory and gastrointestinal tracts; in the lower respiratory tract, the ciliary escalator moves mucus up and out.
- The flow of urine moves microorganisms out of the urinary tract, and vaginal secretions move microorganisms out of the vagina.

Chemical Factors (p. 442)

- Sebum contains unsaturated fatty acids, which inhibit the growth of pathogenic bacteria. Some bacteria commonly found on the skin can metabolize sebum and cause the inflammatory response associated with acne.
- Perspiration washes microorganisms off the skin.
- Lysozyme is found in tears, saliva, nasal secretions, and perspiration.
- The high acidity (pH 1.2- 3.0) of gastric juice prevents microbial growth in the stomach.
- Normal microbiota prevent the growth of many pathogens.

Phagocytosis (pp. 443- 448)

- Phagocytosis is the ingestion of microorganisms or particulate matter by a cell.
- Phagocytosis is performed by phagocytes, certain types of white blood cells or their derivatives.

Formed Elements in Blood (pp. 443- 445)

- Blood consists of plasma (fluid) and formed elements (cells and cell fragments).
- Leukocytes (white blood cells) are divided into three categories: granulocytes (neutrophils, basophils, and eosinophils), lymphocytes, and monocytes.
- During many infections, the number of leukocytes increases (leukocytosis); some infections are characterized by leukopenia (decrease in leukocytes).

- Phagocytes are activated by bacterial components (for example, lipid A) and cytokines.

Actions of Phagocytic Cells (pp. 445)

- Among the granulocytes, neutrophils are the most important phagocytes.
- Enlarged monocytes become wandering macrophages and fixed macrophages.
- Fixed macrophages are located in selected tissues and are part of the mononuclear phagocytic system.
- Granulocytes predominate during the early stages of infection, whereas monocytes predominate as the infection subsides.

The Mechanism of Phagocytosis (pp. 445- 448)

- Chemotaxis is the process by which phagocytes are attracted to microorganisms.
- The phagocyte then adheres to the microbial cells; adherence may be facilitated by opsonization, coating the microbe with plasma proteins.
- Pseudopods of phagocytes engulf the microorganism and enclose it in a phagocytic vesicle to complete ingestion.
- Many phagocytized microorganisms are killed by lysosomal enzymes and oxidizing agents.
- Some microbes are not killed by phagocytes and can even reproduce in phagocytes.

Inflammation (pp. 449- 451)

- Inflammation is a bodily response to cell damage; it is characterized by redness, pain, heat, swelling, and sometimes the loss of function.

Vasodilation and Increased Permeability of Blood Vessels (pp. 449)

- The release of histamine, kinins, and prostaglandins causes vasodilation and increased permeability of blood vessels.
- Blood clots can form around an abscess to prevent dissemination of the infection.

Phagocyte Migration and Phagocytosis (pp. 449- 451)

- Phagocytes have the ability to stick to the lining of the blood vessels (margination).
- They also have the ability to squeeze through blood vessels (emigration).
- Pus is the accumulation of damaged tissue and dead microbes, granulocytes, and macrophages.

Tissue Repair (pp. 451)

- A tissue is repaired when the stroma (supporting tissue) or parenchyma (functioning tissue) produces new cells.
- Stromal repair by fibroblasts produces scar tissue.

Fever (pp. 451- 452)

- Fever is an abnormally high body temperature produced in response to a bacterial or viral infection.
- Bacterial endotoxins and interleukin-1 can induce fever.

- A chill indicates a rising body temperature; crisis (sweating) indicates that the body's temperature is falling.

Antimicrobial Substances (pp. 453- 457)

The Complement System (pp. 453- 456)

- The complement system consists of a group of serum proteins that activate one another to destroy invading microorganisms. Serum is the liquid remaining after blood plasma is clotted.
- C1 binds to antigen-antibody complexes to eventually activate C3 protein. Factor B, factor D, factor P, and C3 bind to certain cell wall polysaccharides to activate C3b.
- C3 activation can result in cell lysis, inflammation, and opsonization.
- Complement is deactivated by host-regulatory proteins.
- Complement deficiencies can result in an increased susceptibility to disease.

Interferons (pp. 456-457)

- Interferons (IFNs) are antiviral proteins produced in response to viral infection.
- There are three types of human interferon: Alpha-IFN, Beta-IFN, and Gamma-IFN. Recombinant interferons have also been produced.
- The mode of action of Alpha-IFN and Beta-IFN is to induce uninfected cells to produce antiviral proteins (AVPs) that prevent viral replication.
- Interferons are host-cell-specific but not virus-specific.
- Gamma-IFN activates neutrophils to kill bacteria.