Body Defenses Against Pathogens

I. Nonspecific Resistance

A. **Surface Barriers:** Physical and Chemical

l**. Intact Skin** -

a. physical - thick, multiple layers of dead keratinized cells

b. chemical - acidity of skin secretions ('acid mantle') inhibit bacterial growth; also contains bacteriocidal chemicals

2. **Mucous Membranes** -line all systems that open to outside of body

a. physical -

i. nasal hairs: trap pathogens

i. mucous: thick, sticky, traps pathogens

ii. cilia: in resp sys move mucous out of system

b. chemical - gastric juices secreted by lining of stomach kill and dissolve most bacteria

3. **Lacrimal Apparatus**

a. physical - continual blinking flushes and wipes away pathogens

b. chemical - lysozyme kills and dissolves some bacteria

4. **Saliva**

a. physical - continual flushing of bacteria

b. chemical - lysozyme kills and dissolves some bacteria

5. **Urine**

a. physical - continual flushing of bacteria entering urethra

b. chemical - acidity inhibits bacterial growth

6. **Vaginal Secretions**

a. physical - flushing and trapping pathogens in mucous

b. chemical - acidity inhibits bacterial growth

B. **Internal Cellular and Chemical Defenses**

1. **Simple Phagocytosis** - mostly neutrophils and macrophytes; engulf and destroy circulating pathogens

2. **Natural Killer Cells** - promote cell lysis of virus infected cells or cancer cells

3. **Inflammatory Response** - larger response that prevents spread of infection from localized area

a. release of chemicals by damaged tissues: histamines, kinins, prostaglandins

b. histamines and others cause vasodilation and increased permeability

c. kinins and others cause phagocyte migration and phagocytosis

d. tissue repair

4. **Fever** - slight increase in temperature inhibits growth of pahtogens while enhancing phagocytosis and repair

5. **Complement Reactions**: foreign substance may trigger cascade which activates complement proteins (complement fixation) to cause:

a. cell lysis - drill hole in bacterial cell killing it

b. opsonization - makes pathogens stickier and easier for the leukocytes to phagocytize

c. enhances infllammatory response

6. **Interferon** - antiviral chemical secreted by infected cells

II. Specific Resistance (The Immune Response)

1. Response to a Specific Antigen (protein or organic molecule, free or attached to bacterial cell or other pathogen)
2. Systemic Response
3. Has Memory

A. **Antibody Mediated Immunity** (AMI; Humoral Immunity)

1. Mediated by B lymphocytes (B-cells)
    a. specific B cells activated by exposure to an antigen
    b. initiate clonal selection and multiplication
    c. differentiation into plasma and memory cells
    d. plasma cells secrete antibodies
    e. antibodies bind to antigens to cause:
        i. **agglutination**
        ii. **precipitation**
        iii. **neutralization**
        iv. **complement fixation**
            -cell lysis
            -opsonization
            -inflammatory enhancement
2. active vs passive immunity
3. natural vs acquired immunity
4. primary vs secondary response

B. **Cell Mediated Immunity** (CMI)

1. Mediated by T lymphocytes (T-cells)
    a. specific T cells activated by exposure to an antigen
    b. initiate clonal selection and multiplication
    c. differentiation into several cell types:
        i. **Helper T-cells**
        ii. **Cytotoxic T- cells**
        iii. **Suppressor T-cells**
        iv. **Delayed Hypersensitivity Cells**
    d. various T-cells secrete immunoactive chemicals = **cytokines** which direct the activities of both B and T cells and phagocytes