Chapter 4
Inflammation and Infection

Defense Mechanisms
• Three lines of defense protect the body against foreign invasion:
  – Physical or surface barriers
  – Inflammation
  – Immune response

Inflammation
• Non-specific cellular and vascular reaction to tissue
• Repels and destroys invader; cleans up debris to promote healing
• Requires blood supply

Inflammatory Process
• Signs and symptoms:
  – Redness
  – Heat
  – Edema
  – Pain

Chronic Inflammation
• Last two weeks or longer
• Acute inflammation lasts less than 10 days
Inflammatory Exudates

- Appearance and amount of exudate (blood fluid) reveals acute or chronic condition
- Serous exudate is clear serum-like fluid
  - Acute state of inflammation
  - Skin blisters and cold sores

Inflammatory Exudates

- Fibrinous exudate
  - Indicates larger injury with severe inflammation
  - Commonly called scab
  - Strep throat or bacterial pneumonia forming a mesh-like lesion

Inflammatory Exudates

- Purulent exudate called “pus”
- Collection of pus is an abscess
- Accumulation of pus in body cavity is empyema

Inflammatory Lesions

- Due to physical or pathologic injury
- Inflammatory lesions include:
  - Abscesses
  - Ulcers
  - Cellulitis

Tissue Repair and Healing

- Ongoing process
- Tissue repair:
  - Regeneration
  - Fibrous connective tissue repair
  - Scar formation
Tissue Healing

• Primary Union (First Intention)
  – Involves approximating edges of wound
  – Steps of primary healing:
    • Forms scab
    • 1 to 2 days, new capillaries begin to bridge gap between wound edges

• Secondary Union (Secondary Intention)
  – Larger, deeper wounds with more inflammation than primary union
  – Need more capillaries, fibroblasts, and collagen

• Secondary Union (Secondary Intention)
  – After a week, new soft red tissue called granulation tissue is produced
  – Scar tissue is formed
  – Healing time is dependent on size of wound

Delayed Wound Healing

• Debridement (washing or cutting away necrotic tissue and foreign material) may be necessary

• Factors affecting healing time:
  – Age
  – Size of wound
  – Location
  – Nutrition
Delayed Wound Healing

- Factors affecting healing time:
  - Circulation
  - Organism virulence
  - Steroids

Complications of Wound Healing

- Poor or excessive scar formation
- Dehiscence - separation of tissue margins
- Keloid - hard, raised scar
- Adhesions - fibrous bands of tissue that attach to surfaces of adjacent organs as scar tissue develops

Infection

- Invasion of microorganisms causing cell or tissue injury
- Pathogenic - microorganisms causing disease
- Opportunistic - normal flora become pathogenic under certain conditions

Infection

- Conditions for flora to become pathogenic
  - Microorganisms gain access to body through portal of entry
  - Pathogen is resistant to defenses of host
  - Number of invading microorganisms
  - Condition of individual or host

Frequency and Type of Infection

- Infectious diseases leading cause of death in the world
- Identifying and tracking infectious diseases is crucial

Frequency and Type of Infection

- CDC - Centers for Disease Control and Prevention provide these services in the United States
Frequency and Types of Infections

**Bacteria**
- Primary or secondary disease
- Staphylococcus is a bacterium on skin
- Streptococcus live on skin and in throat
- Escherichia coli, Klebsiella, Pseudomonas, Shigella, and Salmonella are common enteric bacteria

**Viruses**
- Smallest infective organism
- Must be visualized by electron microscope
- Cannot reproduce or live outside a cell
- Viral infections are not easily treated
- Antibiotics do not kill a virus but help prevent secondary infections

**Fungi**
- Microscopic plant-like organisms larger than bacteria
- Only few are pathogenic
- Types of infections:
  - Tinea - skin
  - Candida - superficial infection of skin and mucous membranes

**Rickettsiae**
- Microscopic organisms that are intermediate between bacteria and viruses
- Must live in a host cell like a virus
- Spread by fleas, ticks, mites, and lice
- Most common infection: Rocky Mountain Spotted Fever
Frequency and Types of Infections

• Protozoa
  – Single-celled microscopic organisms
  – Found in soil; live on dead or decaying material
  – Infection through bite of infected insect or ingestion of spores
  – Malaria is most common disease

Frequency and Types of Infections

• Helminths
  – Roundworms or flatworms
  – Pinworms and tapeworms are most common
  – Pinworms cause anal itching
  – Tapeworms cause intestinal disease due to inadequately cooked meat