Chapter 55

Care of the Patient with an Immune Disorder

Nature of Immunity

- Functions of the immune system
  - Protect the body's internal environment against invading organisms
  - Maintain homeostasis by removing damaged cells from the circulation
  - Serve as a surveillance network for recognizing and guarding against the development and growth of abnormal cells

Nature of Immunity

- Immunocompetence
  - The immune system responds appropriately to a foreign stimulus
- Immunity
  - The quality of being insusceptible to or unaffected by a particular disease or condition
- Immunology
  - The study of the immune system

Nature of Immunity

- Inappropriate responses of the immune system
  - Hyperactive response against environmental antigens (allergy)
  - Inability to protect the body, as in immunodeficiency disorders (AIDS)
  - Failure to recognize the body as self, as in autoimmune disorders (systemic lupus erythematosus)
  - Attacks on beneficial foreign tissue (organ transplant rejection or transfusion reaction)

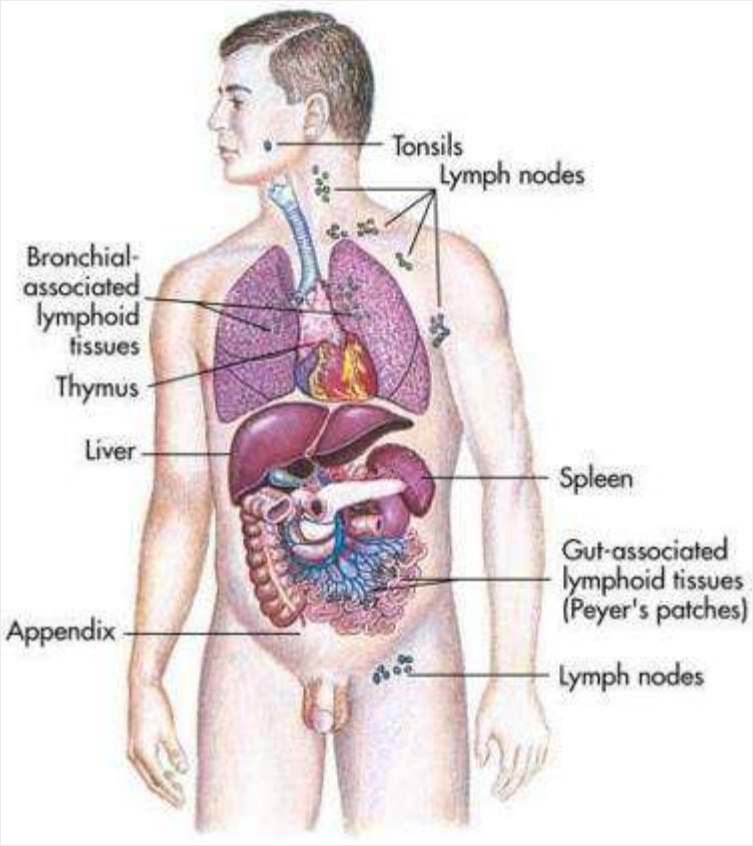
Nature of Immunity

- Innate (natural) immunity
  - First line of defense
  - Provides physical and chemical barriers to invading pathogens and protects against the external environment
  - Composed of the skin, mucous membranes, cilia, stomach acid, tears, saliva, sebaceous glands, and secretions and flora of the intestines and vagina
  - Nonspecific immunity

Nature of Immunity

- Adaptive (acquired) immunity
  - Second line of defense
  - Provides a specific reaction to each invading antigen
  - Protects the internal environment
  - Composed of thymus, spleen, bone marrow, blood, and lymph
  - Produces antibodies in the cells after an infection or vaccination

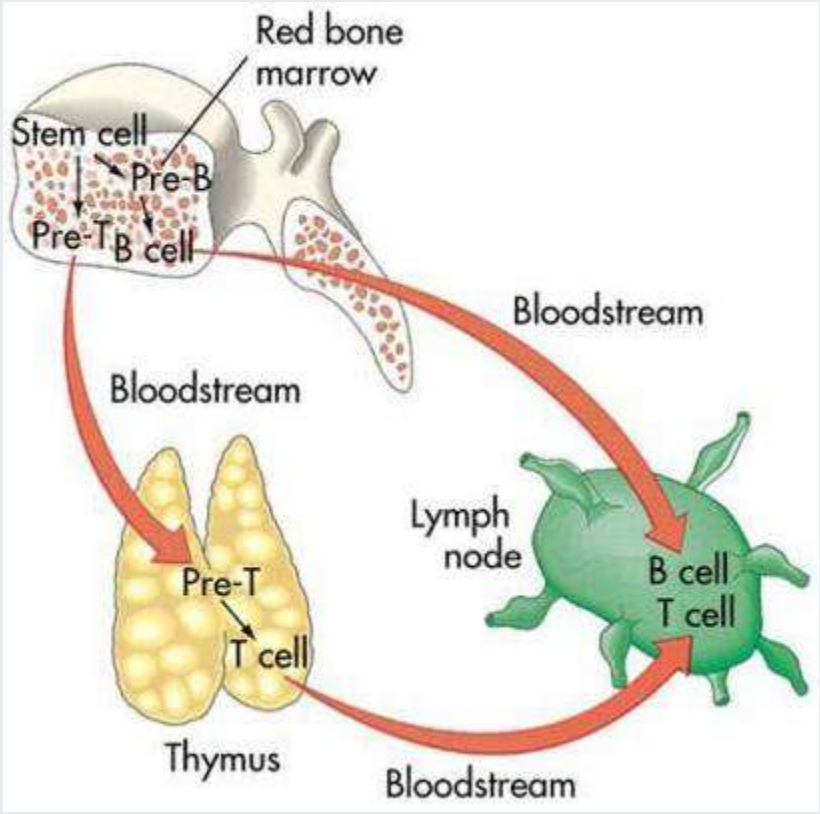
Figure 55-2



(From Grimes, D. [1991]. *Infectious diseases*. St. Louis: Mosby.)

Organization of the immune system.

Figure 55-3



(From Thibodeau, G.A., Patton, K.T. [2007]. *Anatomy and physiology.* [6th ed.]. St. Louis: Mosby.)

Origin and processing of B and T cells.

Nature of Immunity

- Macrophages (phagocytes)
  - Engulf and destroy microorganisms that pass the skin and mucous membrane
  - Carry antigen to the lymphocytes
- Lymphokine
  - One of the chemical factors produced and released by T cells that attracts macrophages to the site of infection or inflammation
- Antigen
  - A substance recognized by the body as foreign that can trigger an immune response

Nature of Immunity

- Humoral immunity
  - Responds to antigens such as bacteria and foreign tissue
  - Result of the development and continuing presence of circulating antibodies in the plasma
  - Active immunity
    - Antibodies are produced by one's own body (vaccines)
  - Passive immunity
    - Antibodies are formed by another in response to a specific antigen and administered to an individual (HBIG)

Nature of Immunity

- Cellular immunity
  - Also called *cell-mediated immunity*
  - Primary importance in:
    - Immunity against pathogens that survive inside cells
    - Fungal infections
    - Rejection of transplanted tissues
    - Contact hypersensitivity
    - Tumor immunity
    - Certain autoimmune diseases

Complement System

- The complement system can destroy the cell membrane of many bacterial species, and this action attracts phagocytes to the area

Genetic Control of Immunity

- There is a genetic link to both well-developed immune systems and poorly developed or compromised immune systems

Effects of Normal Aging on the Immune System

- Aging causes a decline in the immune system
  - Higher incidence of tumors
  - Greater susceptibility to infections
- Aging does not affect the bone marrow

Immune Response

- Immunization
  - A controlled exposure to a disease-producing pathogen that triggers antibody production and prevents disease
  - Provides protection for months to years

Immune Response

- Immunotherapy
  - Treatment of allergic responses that involves administering increasingly large doses of the offending allergens to gradually develop immunity
  - Preseasonal, coseasonal, or perennial
  - Severe side effect: anaphylaxis

Disorders of the Immune System

- Altered immune response
  - Hypersensitivity
    - An abnormal condition characterized by an excessive reaction to a particular stimulus
  - Hypersensitivity reaction
    - An inappropriate and excessive response of the immune system to a sensitizing antigen
  - Hypersensitivity disorders
    - Harmless substances such as pollens, danders, foods, and chemicals are recognized as foreign

Disorders of the Immune System

- Hypersensitivity disorders
  - Etiology/pathophysiology
    - Genetic defect that allows increased production of immunoglobulin E (IgE)
    - Exposures may occur by inhalation, ingestion, injection, or touch

Disorders of the Immune System

- Hypersensitivity disorders *(continued)*
  - Clinical manifestations/assessment
    - Pruritus
    - Nausea
    - Sneezing
    - Excessive nasal secretions and tearing
    - Inflamed nasal membranes
    - Skin rash
    - Diarrhea
    - Cough; wheezes; impaired breathing

Disorders of the Immune System

- Hypersensitivity disorders *(continued)*
  - Diagnostic tests
    - History
    - Physical exam
    - Laboratory studies: CBC, skin testing, total serum IgE levels
  - Medical management/nursing interventions
    - Symptom management: antihistamines
    - Environmental control: avoidance of the allergen
    - Immunotherapy

Disorders of the Immune System

- Anaphylaxis
  - Etiology/pathophysiology
    - System reaction to allergens
      - Venoms
      - Drugs—penicillin
      - Contrast media dyes
      - Insect stings
      - Foods

Disorders of the Immune System

- Anaphylaxis *(continued)*
  - Clinical manifestations/assessment
    - Feelings of uneasiness to impending death
    - Urticaria (hives) and pruritus
    - Cyanosis and pallor
    - Congestion and sneezing
    - Edema of the tongue and larynx with stridor
    - Bronchospasm, wheezing, and dyspnea
    - Nausea and vomiting

Disorders of the Immune System

- Anaphylaxis *(continued)*
  - Clinical manifestations/assessment *(continued)*
    - Diarrhea and involuntary stools
    - Tachycardia and hypotension
    - Coronary insufficiency, vascular collapse, dysrhythmias, shock, cardiac arrest, respiratory failure, and death

Disorders of the Immune System

- Anaphylaxis *(continued)*
  - Medical management/nursing interventions
    - Pharmacological management
      - Epinephrine
      - Benadryl
      - Aminophylline
    - IV access
    - Oxygen
    - Teaching: avoid allergen; use medical alert ID; administration of epinephrine

Disorders of the Immune System

- Latex allergies
  - Allergic reaction when exposed to latex products
  - Type IV allergic contact dermatitis
    - Caused by the chemicals used in the manufacturing process of latex gloves
  - Type I allergic reactions
    - Response to the natural rubber latex proteins

Disorders of the Immune System

- Latex allergies *(continued)*
  - Clinical manifestations/assessment
    - Type IV contact dermatitis
      - Dryness; pruritus; fissuring and cracking of the skin followed by erythema, edema, and crusting
    - Type I allergic reaction
      - Skin erythema, urticaria, rhinitis, conjunctivitis, or asthma to anaphylactic shock

Disorders of the Immune System

- Latex allergies *(continued)*
  - Medical management/nursing interventions
    - Identification of patients and health care workers sensitive to latex is crucial in the prevention of adverse reactions
    - Use nonlatex gloves when possible
    - Use powder-free gloves
    - Do not use oil-based hand creams
    - Know the signs and symptoms of latex allergy
    - Wear a medical alert bracelet and carry an epinephrine pen

Disorders of the Immune System

- Transfusion reactions
  - Etiology/pathophysiology
    - Reactions that occur with mismatched blood
  - Clinical manifestations/assessment
    - Mild
      - Diarrhea
      - Fever and chills
      - Urticaria
      - Cough
      - Orthopnea

Disorders of the Immune System

- Transfusion reactions *(continued)*
  - Clinical manifestations/assessment *(continued)*
    - Moderate
      - Fever and chills
      - Urticaria
      - Wheezing
    - Severe
      - Fever and extreme chills
      - Severe urticaria
      - Anaphylaxis

Disorders of the Immune System

- Transfusion reactions *(continued)*
  - Medical management/nursing interventions
    - Mild
      - Pharmacological management
        - Corticosteroids
        - Diuretics
        - Antihistamines
      - Stop transfusion
      - Administer saline
      - Physician may order transfusion continued at a slower rate

Disorders of the Immune System

- Transfusion reactions *(continued)*
  - Medical management/nursing interventions *(continued)*
    - Moderate
      - Stop transfusion
      - Administer saline
      - Pharmacological management
        - Administer antihistamines and epinephrine

Disorders of the Immune System

- Transfusion reactions *(continued)*
  - Medical management/nursing interventions *(continued)*
    - Severe
      - Stop transfusion
      - Administer saline
      - Pharmacological management
        - Administer antihistamines and epinephrine
      - Return blood or blood product to lab for testing
      - Obtain urine specimen

Disorders of the Immune System

- Delayed hypersensitivity
  - Reaction occurs 24 to 72 hours after exposure
  - Examples include:
    - Poison ivy
    - Tissue transplant rejection

Disorders of the Immune System

- Transplant rejection
  - Types of grafts
    - Autograft
    - Isograft
    - Allograft (homograft)
    - Heterograft
  - Antigenic determinants on the cells lead to graft rejection via the immune process
  - 7 to 10 days after vascularization, lymphocytes appear in sufficient numbers for sloughing to occur

Disorders of the Immune System

- Transplant rejection *(continued)*
  - Immunosuppressive
    - Agents that significantly interfere with the ability of the immune system to respond to antigenic stimulation by inhibiting cellular and humoral immunity

Disorders of the Immune System

- Immunodeficiency
  - An abnormal condition of the immune system in which cellular or humoral immunity is inadequate and resistance to infection is decreased
  - May cause recurrent infections, chronic infections, severe infections, and/or incomplete clearing of infections
  - Can be induced (chemotherapy)

Disorders of the Immune System

- Primary immunodeficiency disorders
  - Phagocytic defects
  - B-cell deficiency
  - T-cell deficiency
  - Combined B-cell and T-cell deficiency

Disorders of the Immune System

- Secondary immunodeficiency disorders
  - Drug-induced immunosuppression
  - Stress
  - Malnutrition
  - Radiation
  - Surgical removal of lymph nodes, thymus, or spleen
  - Hodgkin's disease

Autoimmune Disorders

- Autoimmune
  - The development of an immune response to one's own tissues
  - Body is unable to distinguish "self" protein from "foreign" protein
  - Examples of disorder: pernicious anemia; Guillain-Barré syndrome; scleroderma; systemic lupus erythematosus
  - Plasmapheresis
- Removal of plasma that contains components causing disease
  - Used to treat autoimmune disease