- 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

- Figure 55-3

- 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