Assessment and Management of Patients With Genetics, Altered Immune Responses, and Transplantation

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Figure 14-1, pp.215
Lymphocyte Origins

1. Stem cells in red bone marrow give rise to undifferentiated lymphocytes.
2. Some undifferentiated lymphocytes are processed in the thymus gland to become T cells.
3. Some undifferentiated lymphocytes are processed, probably within the bone marrow, to become B cells.
4. Both T cells and B cells are transported through the blood to lymphatic organs, such as the lymph nodes, lymphatic ducts, and spleen.
T Cell & B Cell Activation

1. Displayed antigen
2. Activated helper T cell contacting displayed antigen
3. Cytokines

B cells
Antigen receptor
Antigen

B cell combining with antigen
Activated B cell
Activated B cell interacts with T cell and releases cytokines, which activate the B cell
B cell to proliferate

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B Cell Proliferation

- Antigen
- Receptor
- Antigen-receptor combination
- Activated B cell
- Cytokines from helper T cell
- Proliferation
- Clone of B cells
- Proliferation and Differentiation
- Released antibodies
- Plasma cell (antibody-secreting cell)
- Memory cell (dormant cell)
- Endoplasmic reticulum
- Plasma cell (antibody-secreting cell)
- Memory cell (dormant cell)
- Clone of B cells
Organs of the Immune System

Figure 14-5, pp.220
Immunoglobulins and Allergic Response (cont.)

Diagram showing the process:
- Allergen binds to a B cell
- The B cell produces IgE antibodies
- IgE binds to mast cells
- Release of mediators leads to symptoms

SYMPTOMS
Immune Response

1. Initial contact with allergen

2. Plasma cell

3. Mast cell

4. Subsequent contact with allergen

5. Histamine and other chemicals

Diagram showing the immune response process:

- Initial contact with allergen
- Plasma cell releasing IgE antibodies
- Mast cell with IgE receptor
- Allergen binding to IgE receptor
- Release of histamine and other chemicals
Type I Anaphylactic Reaction

Type I. An anaphylactic reaction is characterized by vasodilation, increased capillary permeability, smooth muscle contraction, and eosinophilia. Systemic reactions may involve laryngeal stridor, angioedema, hypotension, and bronchial, GI, or uterine spasm; local reactions are characterized by hives. Examples of type I reactions include extrinsic asthma, allergic rhinitis, systemic anaphylaxis, and reactions to insect stings.
ANAPHYLACTIC REACTION

Causes:
- Insect Stings (bee, wasp, ant)
- Medication Reaction
- Food Allergy
  (peanuts, eggs, shellfish)

- Rapid Onset
- Dyspnea
  - Tight Throat
  - Bronchoospasm
  - Laryngeal Edema
- Feelings of Apprehension
- Tingling and Swelling in Mouth, Face, Throat and Tongue
  - Itching
  - ↓ BP
  - Tachycardia
- Loss Of Consciousness

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Antigen

Antigen-antibody reaction

Release histamine, serotonin, bradykinin, & prostaglandins

Peripheral vascular dilation

↑ capillary permeability

Veins
Arterioles

Extracellular edema
hypovolemic

↓ BP

↓ tissue perfusion
Type II Cytotoxic Reaction

Type II. A cytotoxic reaction, which involves the binding of either the IgG or IgM antibody to a cell-bound antigen, may lead to eventual cell and tissue damage. The reaction is the result of mistaken identity when the system identifies a normal constituent of the body as foreign and activates the complement cascade. Examples of type II reactions are myasthenia gravis, Goodpasture's syndrome, pernicious anemia, hemolytic disease of the newborn, transfusion reaction, and thrombocytopenia.
Type III Immune Complex Reaction

Type III. An immune complex reaction is marked by acute inflammation resulting from formation and deposition of immune complexes. The joints and kidneys are particularly susceptible to this kind of reaction, which is associated with systemic lupus erythematosus, serum sickness, nephritis, and rheumatoid arthritis. Some signs and symptoms include urticaria, joint pain, fever, rash, and adenopathy (swollen glands).
Type III
Immune Complex Reaction (cont)

- Excess antigens cause immune complexes to form in the blood; these circulating complexes usually lodge in small blood vessels (immune complexes reaction).
- Antibody complexes cannot be cleared from body.
- Takes 1-3 hours to develop.
- Usual sites include the kidneys, skin, joints, and small blood vessels.
- Deposited complexes trigger inflammation, resulting in tissue or vessel damage.
- Example:
  - Rheumatoid arthritis reaction, SLE, serum sickness as with PCN, drugs to treat organ transplant rejection.
Type IV
Delayed or Cellular Reaction

Type IV. A delayed, or cellular, reaction occurs 1 to 3 days after exposure to an antigen. The reaction, which results in tissue damage, involves activity by lymphokines, macrophages, and lysozymes. Erythema and itching are common; a few examples include contact dermatitis, graft-versus-host disease, Hashimoto's thyroiditis, and sarcoidosis.
Self-Administration of Epinephrine

1. Carefully uncap the Epipen device, holding it so that the injecting end is upright.
2. Position the device at the middle portion of the thigh.
3. Push the device into the thigh as far as possible. The Epipen device will autoinject a premeasured dose of epinephrine into the subcutaneous tissue.
Organ Transplantation