Chapter 19 Disorders of the Immune System

Hypersensitivity Reactions

- Response to antigens (allergens) leading to damage
- Require sensitizing dose(s); primary exposure
- When exposed again→dangerous reaction

Type I (Anaphylactic) Reactions

- Involve IgE antibodies
- Localized: Hives or asthma contact or inhaled antigens
- Systemic: Shock from ingested or injected antigens

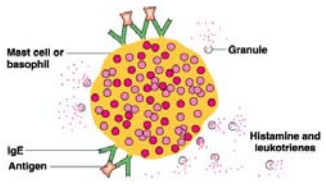

Figure 19.1a

Type II (Cytotoxic) Reactions

- Involve IgG or IgM antibodies and complement
- Complement activation causes cell lysis or damage by macrophages
- 5-8 hours after exposure

ABO Blood Group System

Blood Group	Erythrocyte or Red Blood Cell Antigens	Illustration	Plasma Antibodies
AB	A and B		Neither anti-A nor anti-B antibodies
B	B		Anti-A
A	A		Anti-B
O	None		Anti-A and Anti-B

Table 19.2

Hemolytic Disease of the Newborn

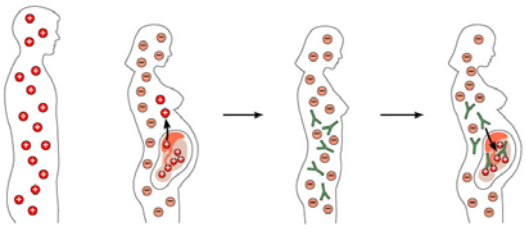

Figure 19.4

- Drug-Induced
- Thrombocyto-penia purpura

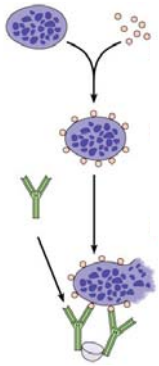

Figure 19.5

Type III (Immune Complex) Reactions

- IgG antibodies and antigens form complexes that lodge in basement membranes.

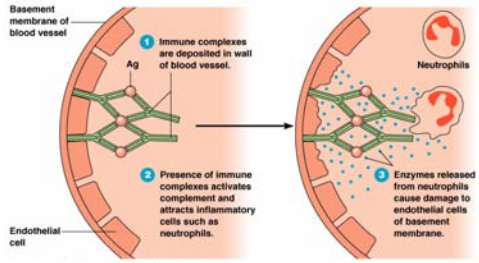

Figure 19.6

Type IV (Cell-Mediated Rxns)

- Delayed-type hypersensitivities due to T_D cells
- Cytokines attract macrophages and initiate tissue damage

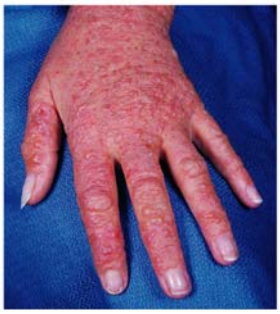

Figure 19.8

Autoimmune Diseases

- Clonal deletion during fetal development ensures self-tolerance
- Autoimmunity is loss of self-tolerance
- 75% of cases in women

Autoimmune Diseases

- Type I — Due to antibodies against pathogens (viruses); Hep C
- Type II — Antibodies react with cell-surface antigens; Graves
- Type III (Immune Complex) — IgM, IgG, complement immune complexes deposit in tissues; Lupus, RA
- Type IV — Mediated by T cells; MS (suspect Epstein-Barr virus)

Human Leukocyte Antigen (HLA) Complex

- Histocompatibility antigens: Self antigens on cell surfaces
- Major histocompatibility complex (MHC): Genes encoding histocompatibility antigens
- Human leukocyte antigen (HLA) complex: MHC genes in humans

HLA Typing

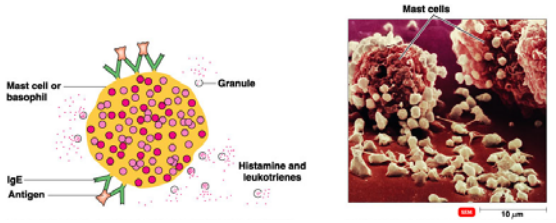

Figure 19.1

Reactions to Transplantation

- Transplants may be attacked by T cells, macrophages, and complement-fixing antibodies.
- Transplants to privileged sites do not cause an immune response; cornea
- Stem cells may allow therapeutic cloning to avoid rejection.

Grafts

- Autograft: Use of one's own tissue
- Isograft: Use of identical twin's tissue
- Allograft: Use of tissue from another person
- Xenotransplantation product: Use of non-human tissue
- Graft-versus-host disease can result from transplanted bone marrow that contains immunocompetent cells

Immunosuppression

- Cyclosporine suppresses IL-2
- Mycophenolate mofetil inhibits T cell and B cell reproduction
- Sirolimus blocks IL-2

Immune Deficiencies

- Congenital: Due to defective or missing genes
  - Selective IgA immunodeficiency
  - Severe combined immunodeficiency: no B or T
  - Agammaglobulinemia; few or no Abs
  - Di George: no thymus so no T cells
- Acquired: Develop during an individual's life, due to drugs, cancers, infections
  - Multiple Myeloma: single plasma cell
  - Macroglobulinemia: overproduce IgM

Immune System and Cancer

- Cancer cells possess tumor-specific antigens; Tc cells recognize and lyse
- Cancer cells may lack tumor Ags/ kill T_C cells

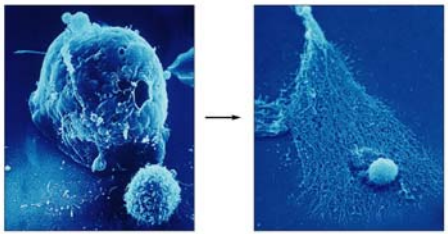

Figure 19.11

Immunotherapy

- Treatment of cancer using immunologic methods
- Tumor necrosis factor, IL-2, and interferons may kill cancer cells
- Immunotoxins link poisons with an monoclonal antibody directed at a tumor antigen
- Vaccines contain tumor-specific antigens

Chapter 18

Types of Vaccines

- **Inactivated whole agent**
  - Killed organism (formulin or phenol)
- Rabies, Influenza, Strep pneumo, cholera, Salk (polio)

Types of Vaccines

- **Attenuated whole agent**: living but weakened organism
  - Closely mimics infection
  - May be life long and 95% effective
  - Can mutate to more virulent strain; not if immunosuppressed
- MMR, TB, Thypoid, Sabin polio

Types of Vaccines

- **Toxoids**: inactivated toxins from bacteria
- Tetanus, Diphtheria

- **Subunit:** Antigenic fragments of organism that best stimulates response
  - safer
- Hep B

- **Conjugated**: combine capsular polysaccaride with protein; deals with children's poor response to capular Ags (not respond until 15-24 months)
- Haemophilus influenzae B (can protect at 2 months)

- Nucleic Acid vaccines:
  - Newest
  - Plasmids of naked DNA injected into muscle
- Adjuvants: chemical added to improve effectiveness of Ags for vaccines
  - Alum; increases effectiveness

Principal Vaccines in US

- DtaP
  - Diphtheria: Purified diphtheria toxoid
  - Pertussis: Acellular fragments of *B. pertussis*
  - Tetanus: Purified tetanus toxoid
- Meningococcal meningitis: Purified polysaccharide from *N. meningitidis*
- *Haemophilus influenzae* type b meningitis: Polysaccharides conjugated with protein
- Pneumococcal conjugate vaccine: *S. pneumoniae* antigens with protein