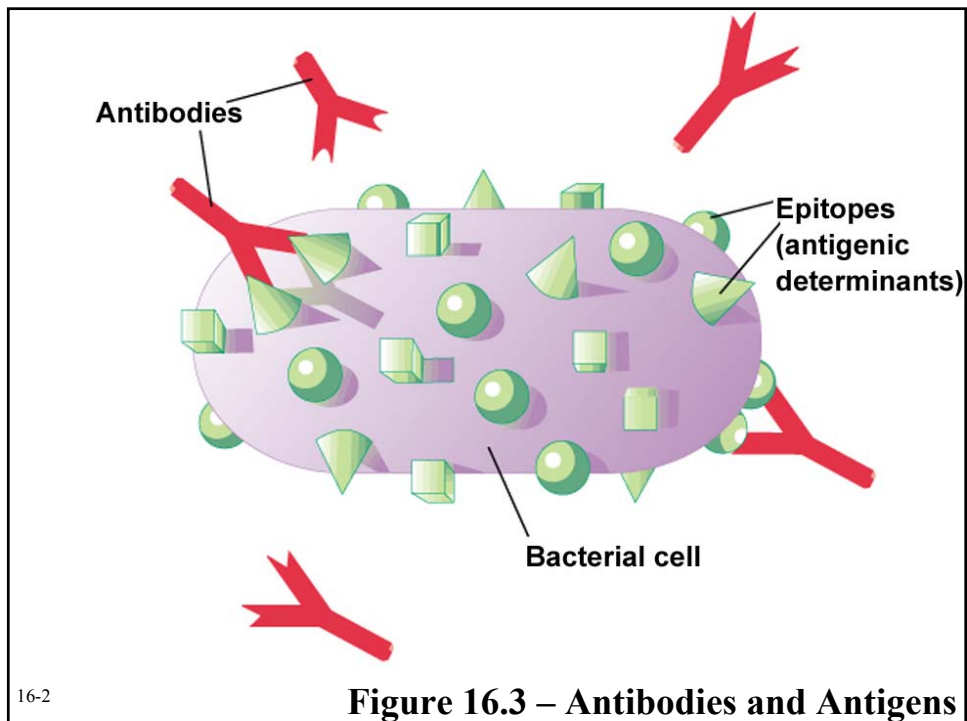


Antigens

- **Immunogen** – a molecule that specifically interacts with an antibody or lymphocyte and elicits an immune response
- **Antigenic determinants (epitopes)**

16-1



16-2

Figure 16.3 – Antibodies and Antigens

Antibodies

- **Structure**
- **Protective outcomes**
- **Immunoglobulin classes**

16-3

Structure

- **Antigen – binding (Fab) site**
- **Fc region**
- **Heavy chains and light chains**
- **Variable region (Fab)**
- **Constant region (Fc)**

16-4

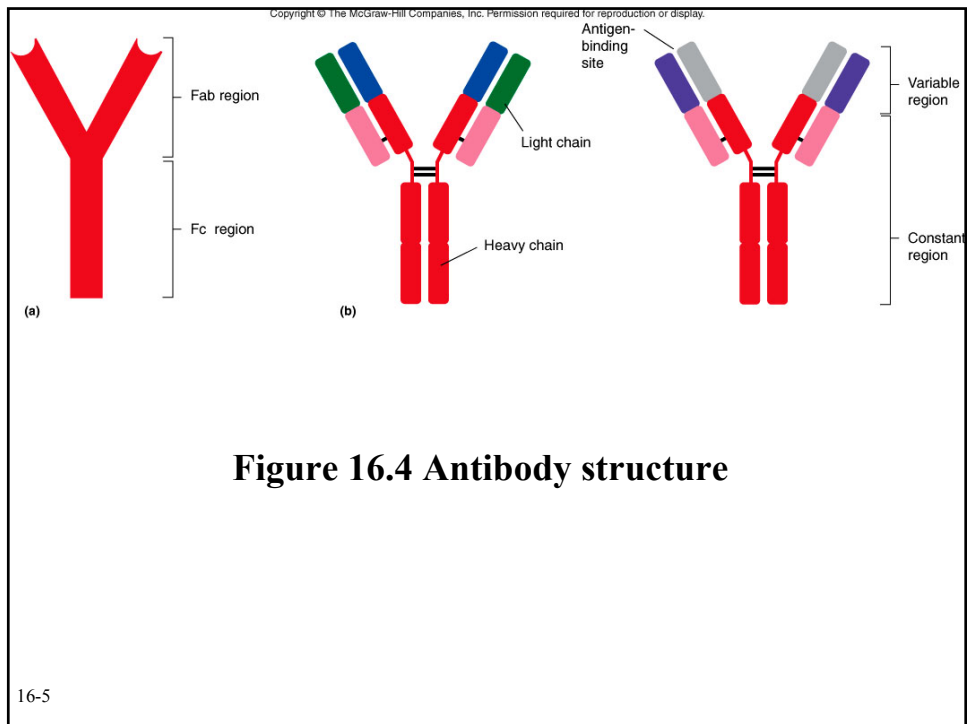
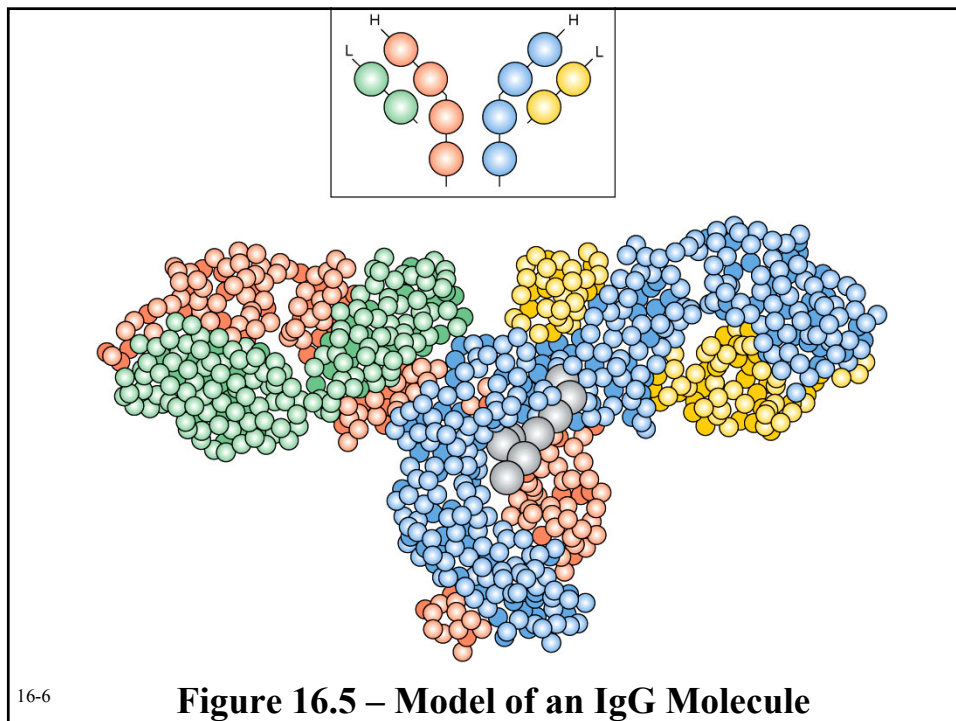


Figure 16.4 Antibody structure

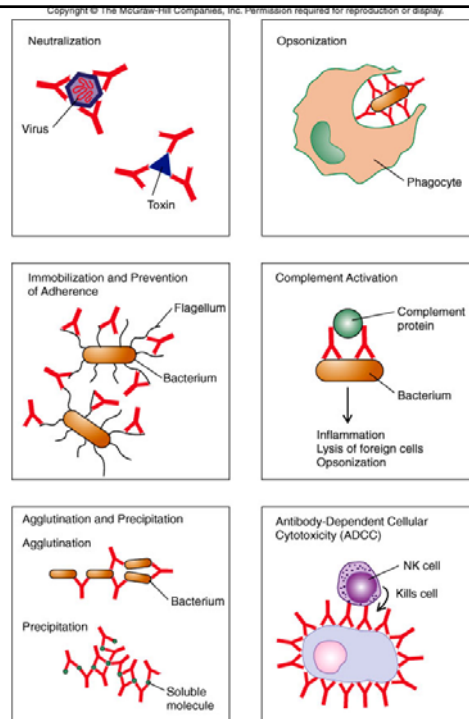


Protective outcomes

- Neutralization
- Immobilization and prevention of adherence
- Agglutination and precipitation
- Opsonization
- Complement activation
- Antibody – dependent cellular cytotoxicity (ADCC)

16-7

Figure 16.6
Protective outcomes
of Ab-Ag binding



16-8






Immunoglobulin classes

- **IgM (pentamer)** – first class produced
- **IgG (monomer)** – 80-85% total serum Ig; secondary response
- **IgA (dimer in secretions)** – secreted Ab; mucosal immunity
- **IgD (monomer)** – minor Ab involved in development
- **IgE (monomer)** – bound to basophils and mast cells, important in elimination of parasites, allergies

16-9

Copyright © The McGraw-Hill Companies, Inc. Permission required for reproduction or display.

Table 16.1 Characteristics of the Various Classes of Human Immunoglobulins

Class and Molecular Weight (daltons)	Structure	Percent of Total Serum Immunoglobulin (Half-life in serum)	Properties	Functions
IgG 146,000	 Monomer	80%–85% (21 days)	Specific attachment to phagocytes; complement fixation; ability to cross placenta	Agglutination; precipitation; opsonization; ADCC; complement activation
IgM 970,000	 Pentamer	5%–13% (10 days)	Complement fixation; first antibody produced during the primary immune response; only class produced in response to T-independent antigens	Agglutination; precipitation; complement activation
IgA monomer 160,000; secretory IgA 390,000	 Dimer in secretions	10%–13% (6 days)	Secreted into saliva, milk, mucus, and other secretions; secretory form resists enzymatic degradation	Protection of mucous membranes by preventing attachment of organisms (mucosal immunity)
IgD 184,000	 Monomer	<1% (3 days)		Involved with development and maturation of the antibody response; functions have not been clearly described
IgE 188,000	 Monomer	<0.01% (2 days)	Attaches to mast cells and basophils; cell-bound IgE that binds antigen causes the cell to release its granule contents	Involved in many allergic reactions; functions in ADCC; helps to expel parasites

16-10

Table 16.1 Classes of immunoglobulins

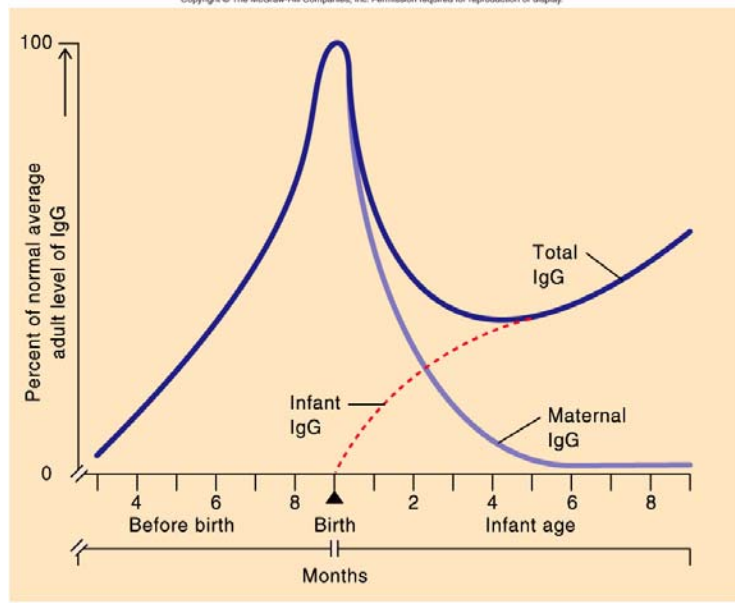


Figure 16.7 – Immunoglobulin G Levels in the Fetus and Infant

16-11

Names for antibodies based on protective outcome:

agglutinin – IgG antibody that agglutinates antigen

precipitin – IgG antibody that precipitates antigen

opsonin – IgG that coats antigen to promote phagocytosis

complement fixing antibody – leads to complement lysis

antitoxin – neutralizes antigen

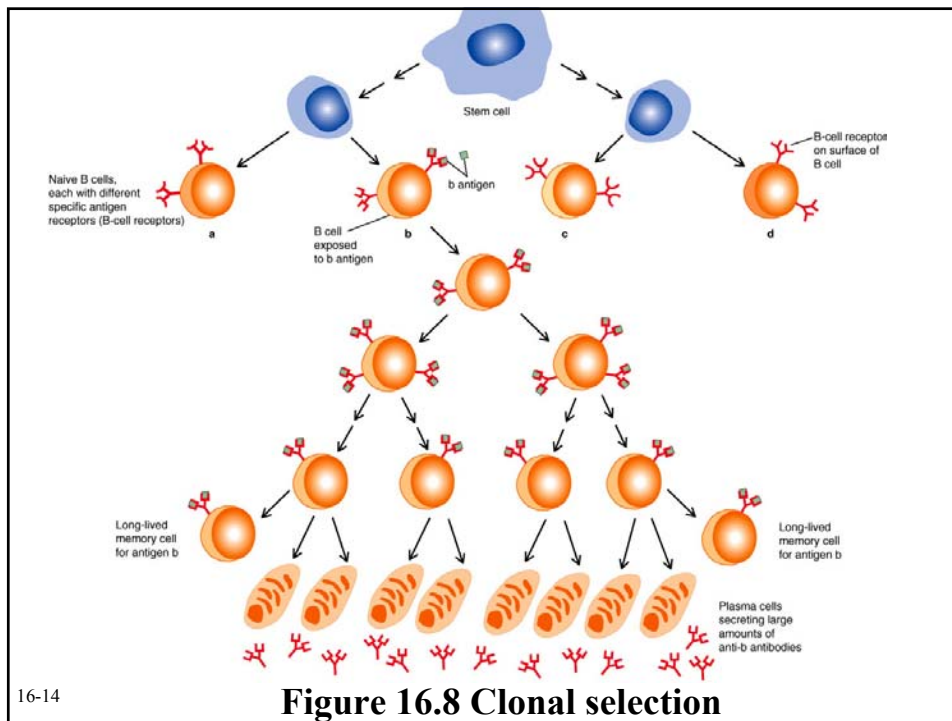
neutralizing antibody – neutralizes ability of virus to infect

16-12

Clonal selection

- Specific response of a lymphocyte to an antigen
- Lymphocytes
 - Immature
 - Naïve
 - Activated
 - Effector
 - Memory

16-13



16-14

Figure 16.8 Clonal selection

B - lymphocytes

- **Response to T – dependent antigens**
- **Response to T – independent antigens**

16-15

Response to T – dependent antigens

- **B cells present antigen (usually protein) to effector T cells**
- **B cell clonal expansion – affinity maturation, class switching and memory**
- **Primary and secondary response**

16-16

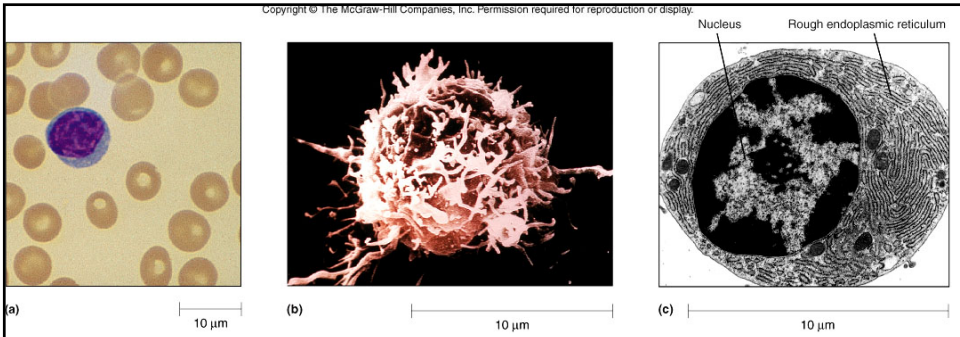
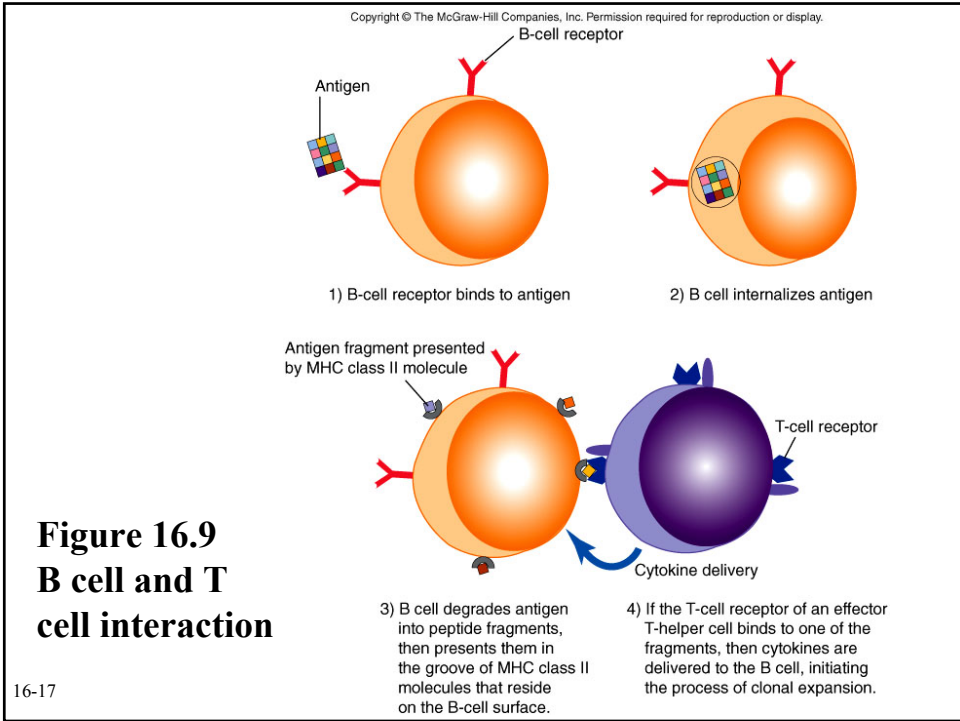


Figure 16.12
Affinity maturation
in B cells

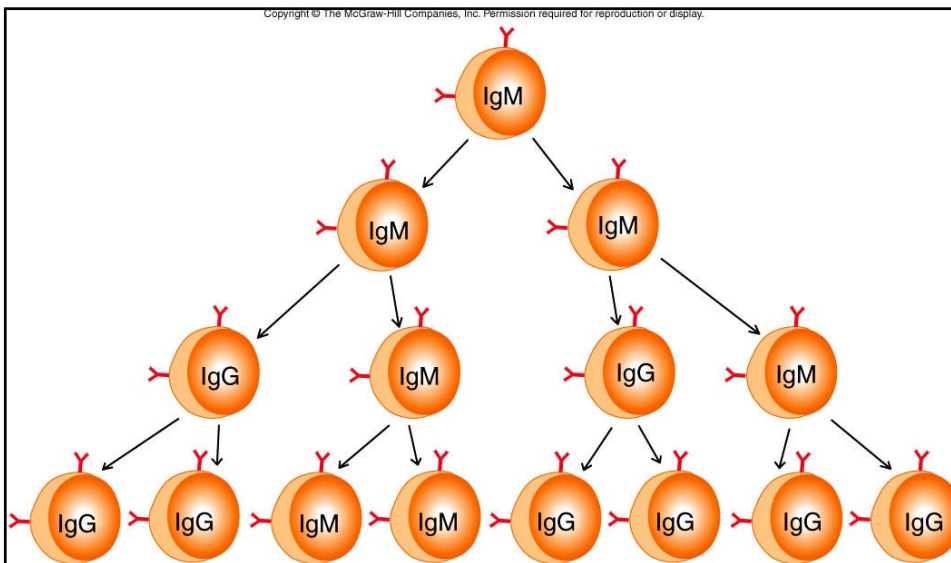
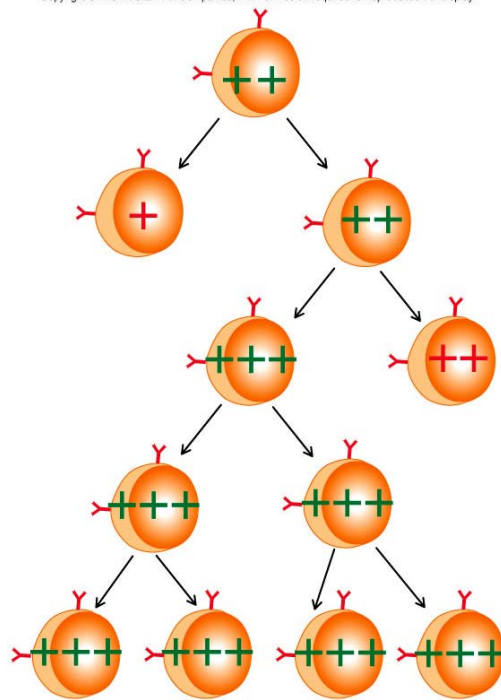
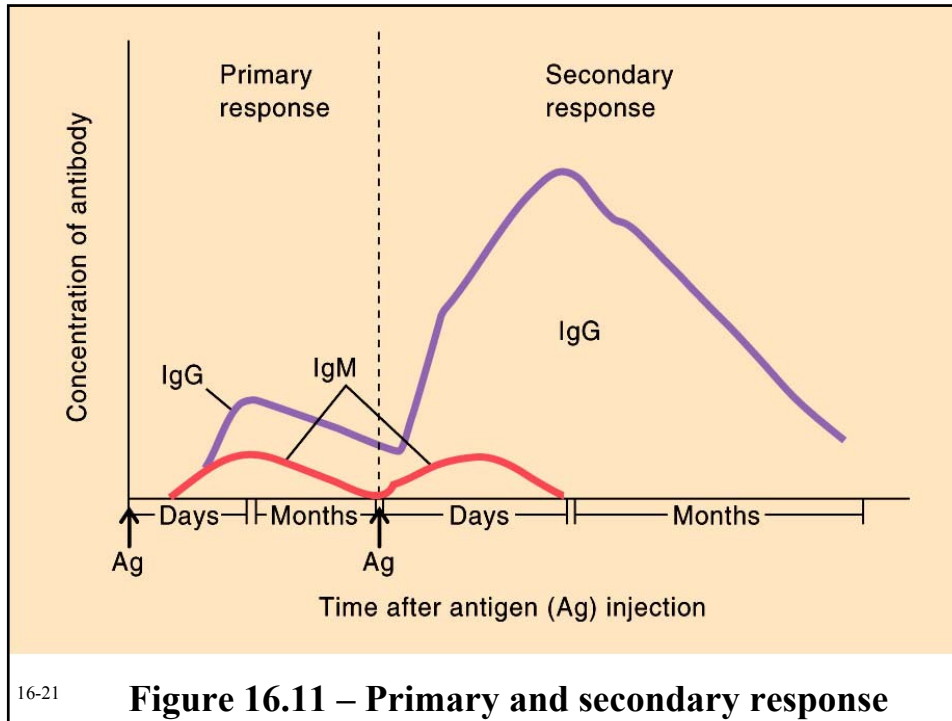


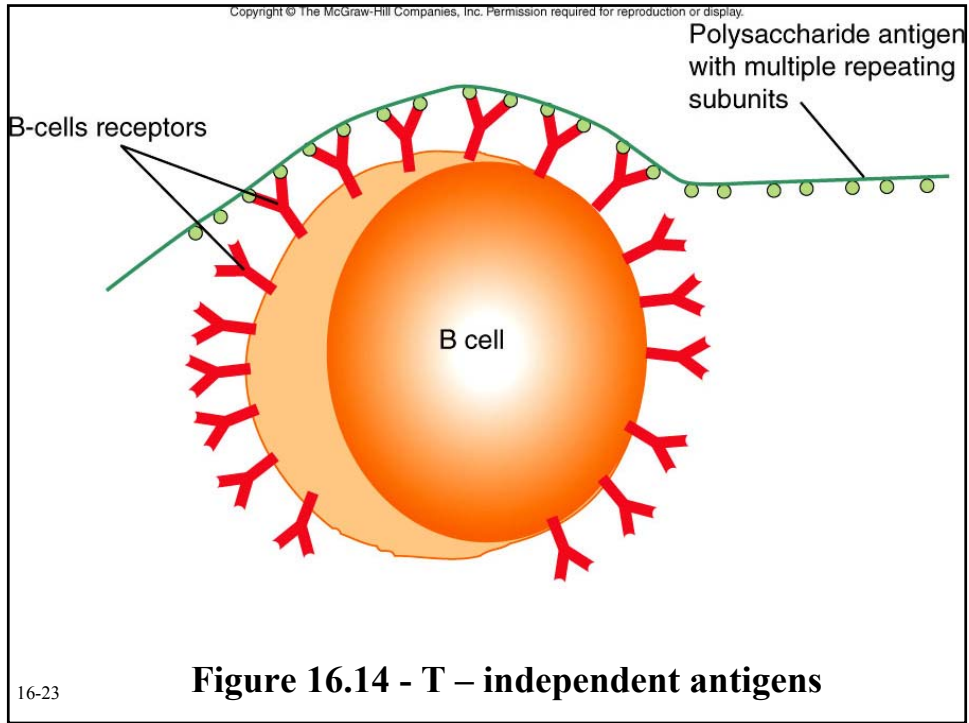
Figure 16.13 – Class switching in B cells and plasma cells



Response to T – independent antigens

- Polysaccharides – trigger B cell response
- No T – helper cells are involved

16-22



16-23

Figure 16.14 - T – independent antigens