





B cells and Humoral Immunity

- Bone marrow gives rise to B cells.
- Mature B cells migrate to lymph organs.
- Clonal Selection: Specific response of mature B cells to an antigen's epitopes.
 - Immature
 - Naïve
 - Activated
 - Effector/ plasma cells
 - Memory

Clonal Selection

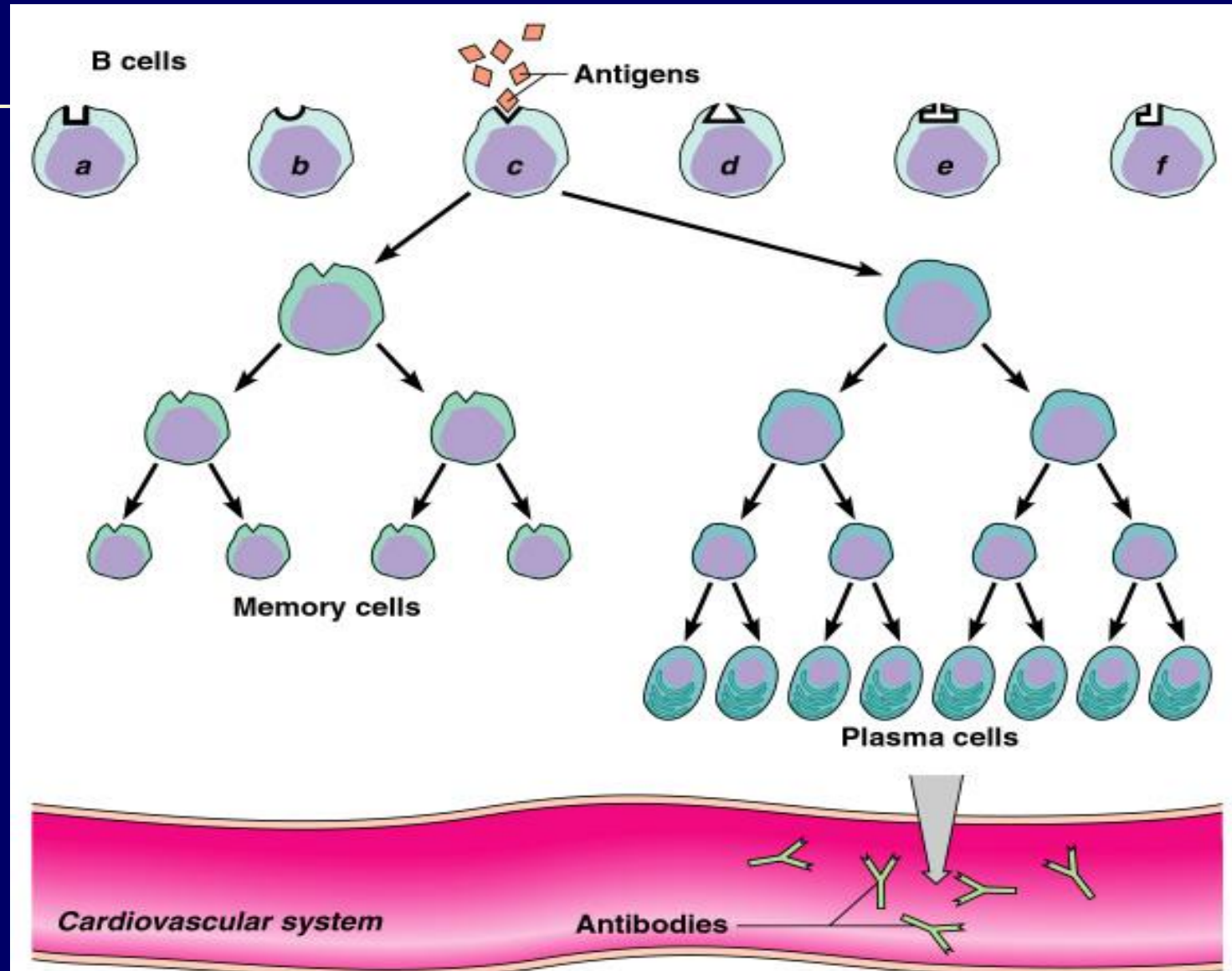
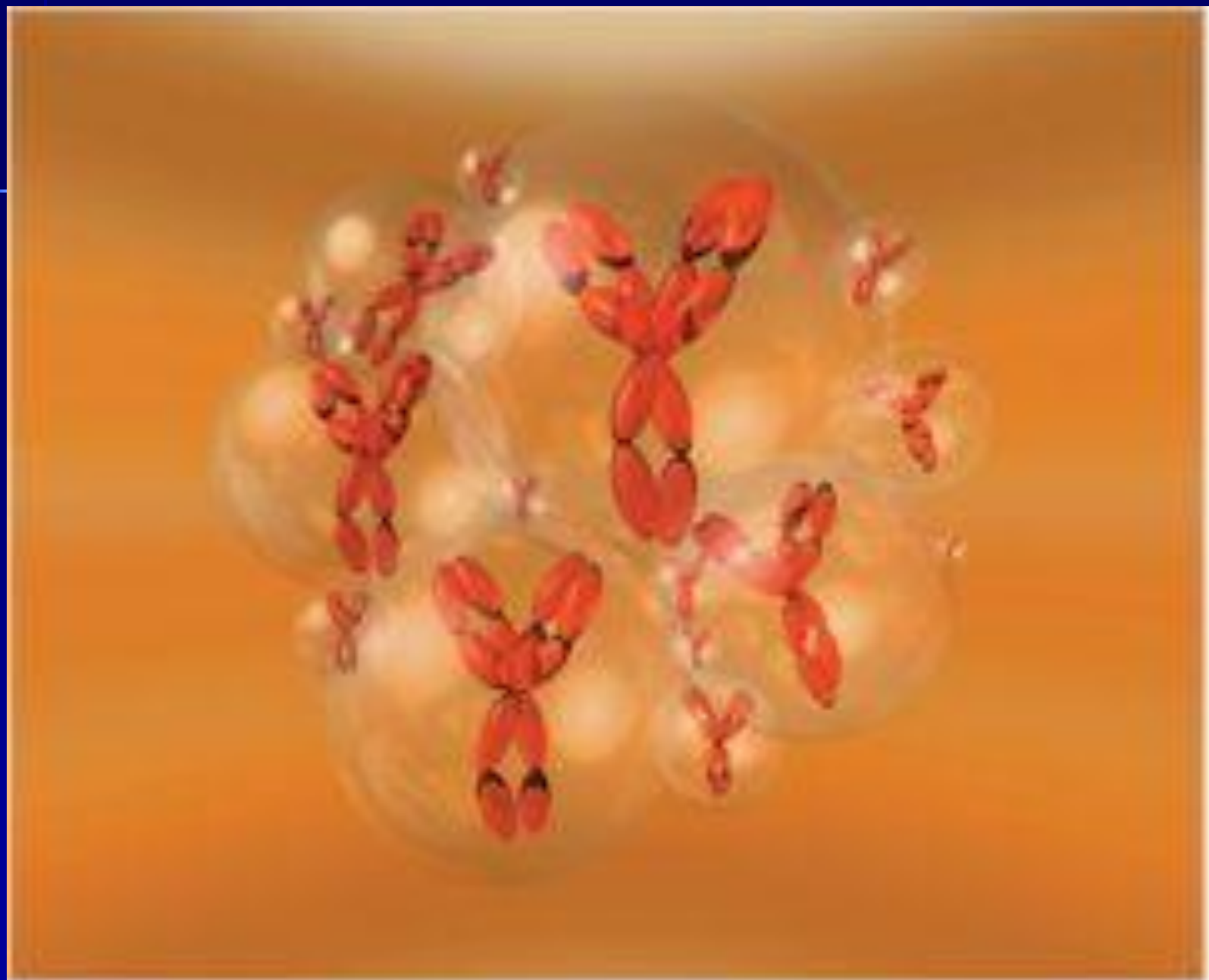
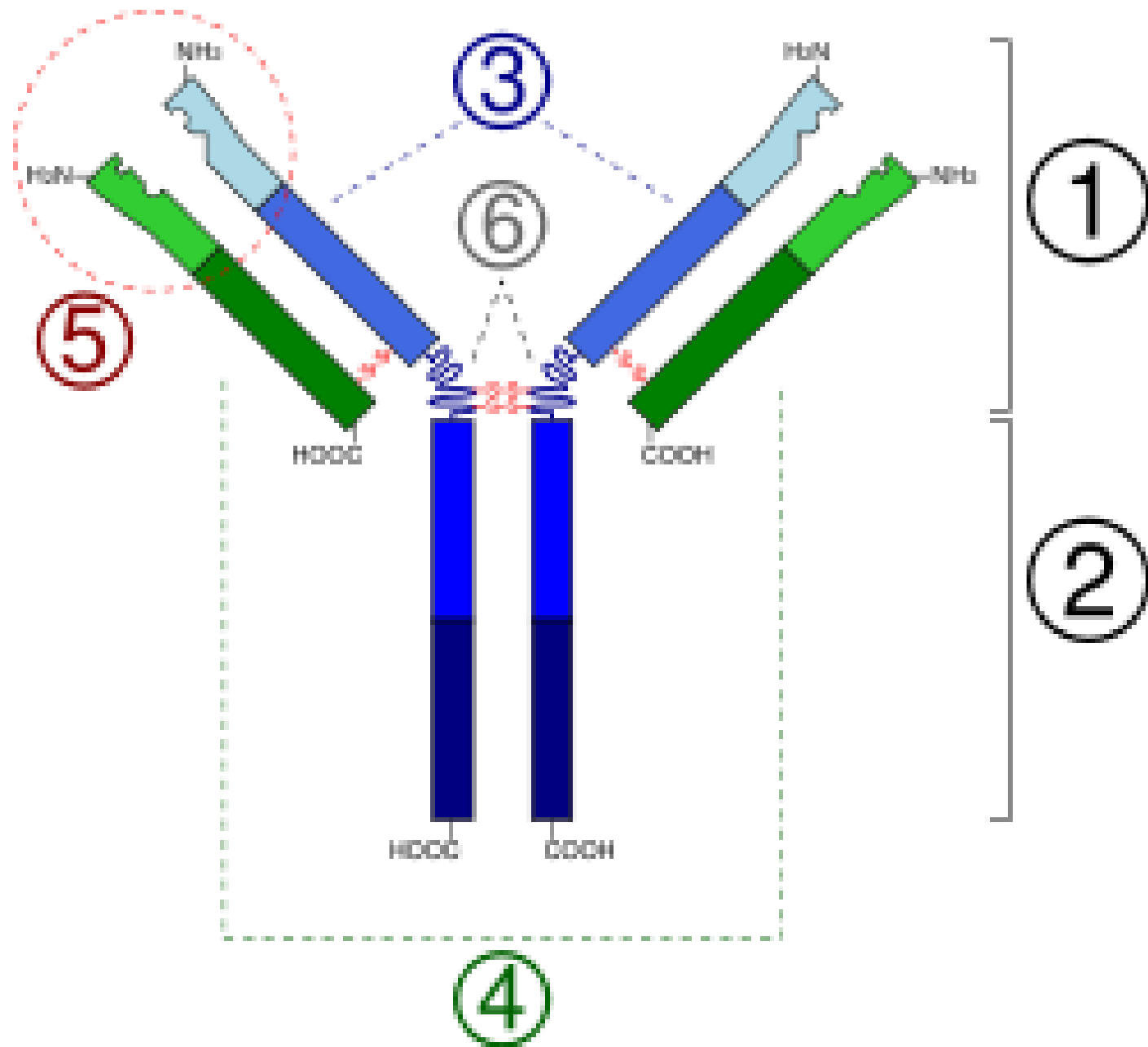
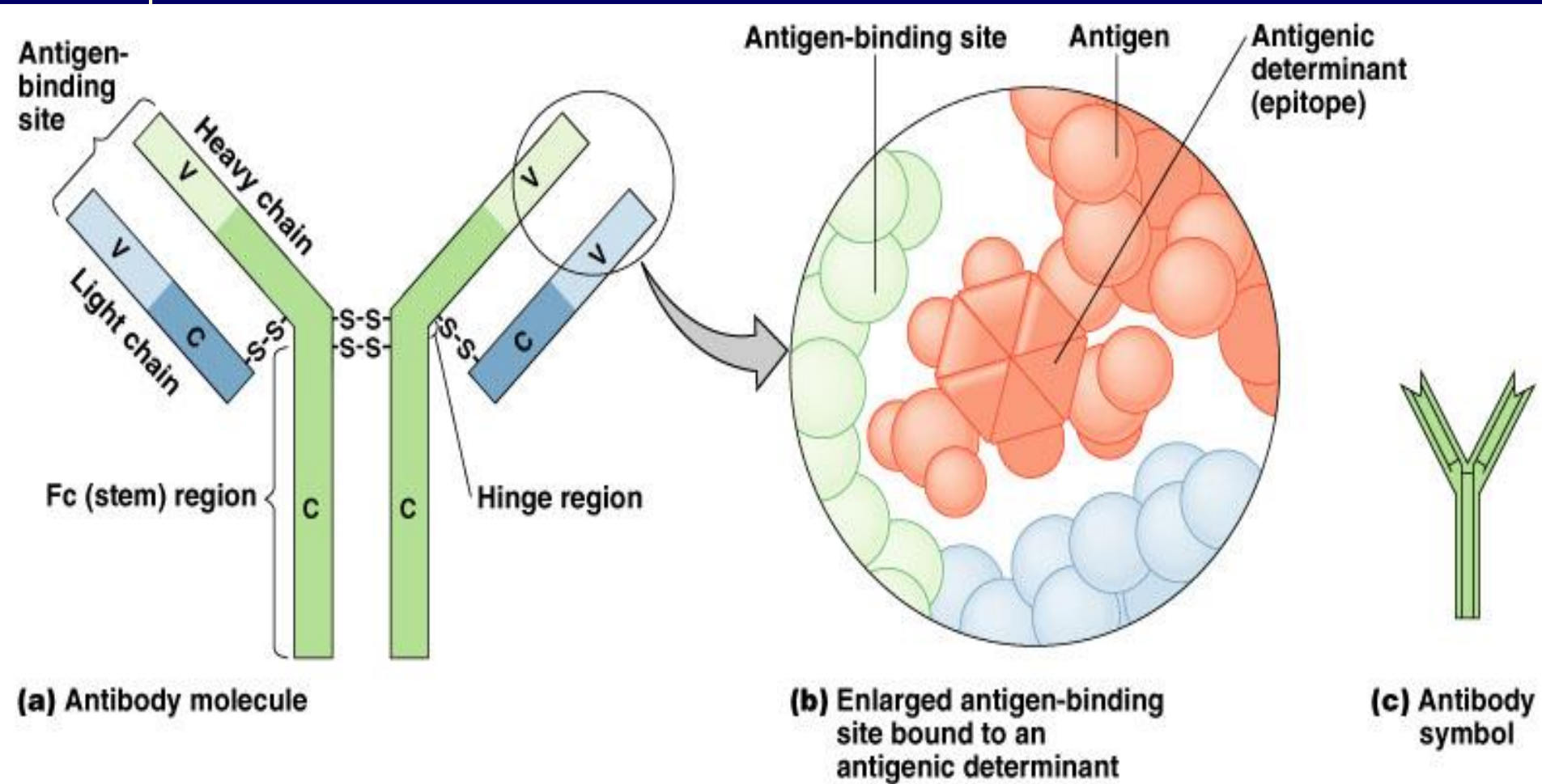


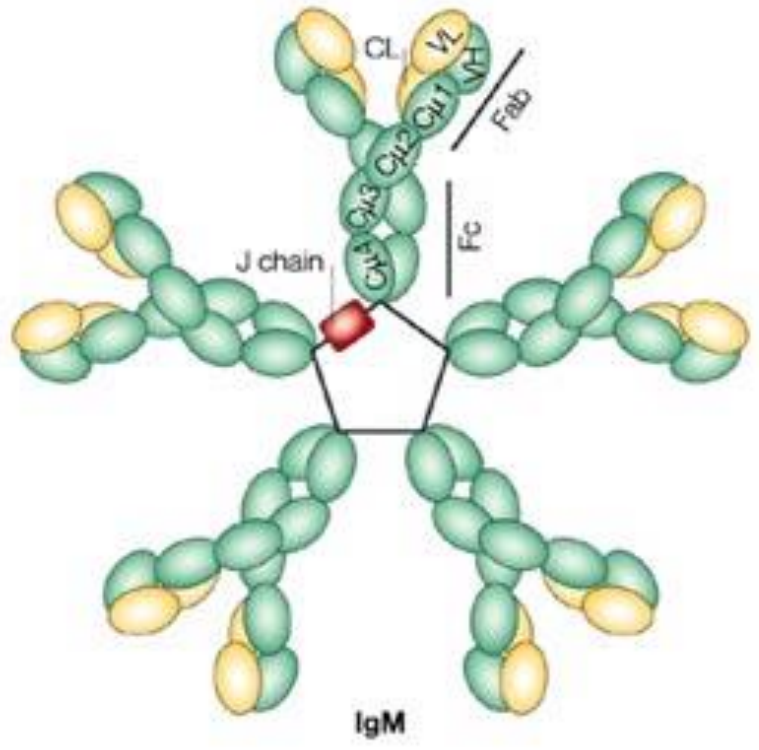
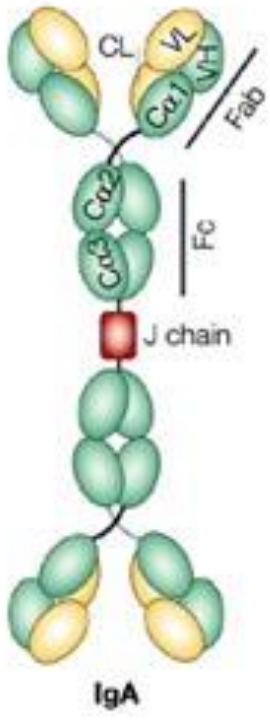
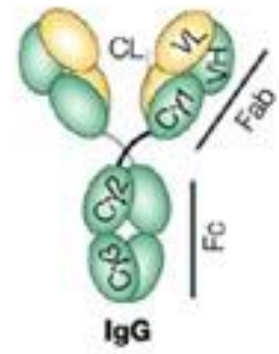
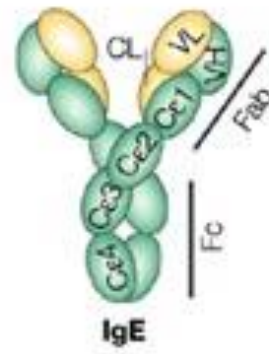
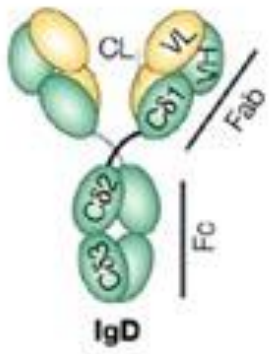
Figure 17.8



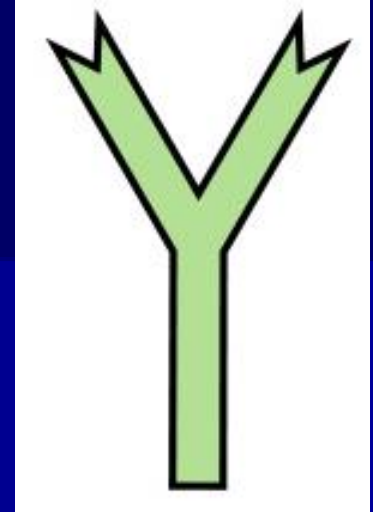


Antibody structure



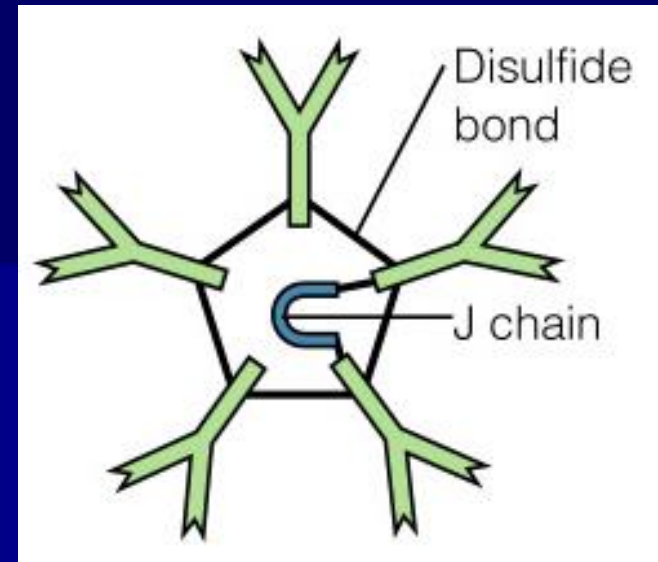


IgG antibodies



- Monomer
- 80% of serum antibodies
- Fix complement
- In blood, lymph, intestine
- Cross placenta
- Enhance phagocytosis; neutralize toxins & viruses; protects fetus & newborn
- Half-life = 23 days

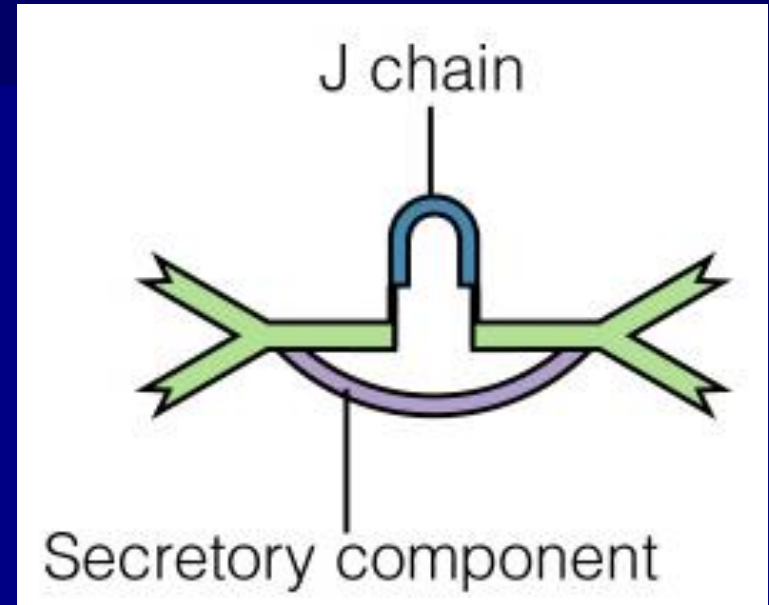
IgM antibodies



- Pentamer
- 5-10% of serum antibodies
- Fix complement
- In blood, lymph, on B cells
- Agglutinates microbes; first Ab produced in response to infection
- Half-life = 5 days

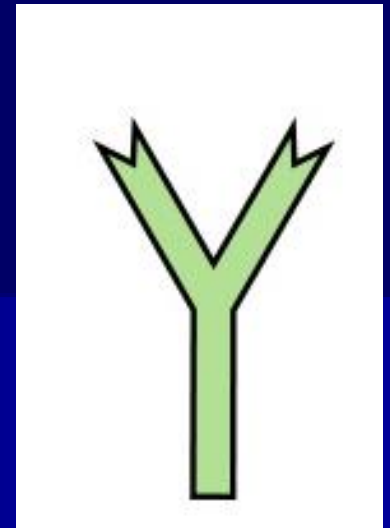
IgA antibodies

- Dimer
- 10-15% of serum antibodies
- In secretions
- Mucosal protection
- Half-life = 6 days



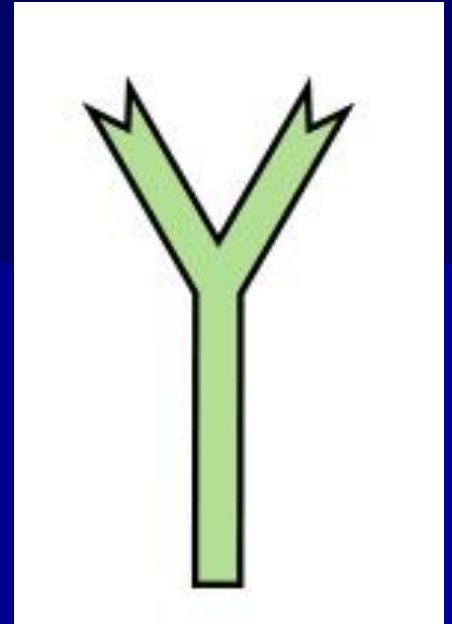
IgD antibodies

- Monomer
- 0.2% of serum antibodies
- In blood, lymph, on B cells
- On B cells, initiate immune response
- Half-life = 3 days



IgE antibodies

- Monomer
- 0.002% of serum antibodies
- On mast cells and basophils, in blood
- Allergic reactions; lysis of parasitic worms
- Half-life = 2 days



Self-tolerance

- Body doesn't make Ab against self
- Clonal deletion
 - The process of destroying B and T cells that react to self antigens

The Results of Ag-Ab Binding

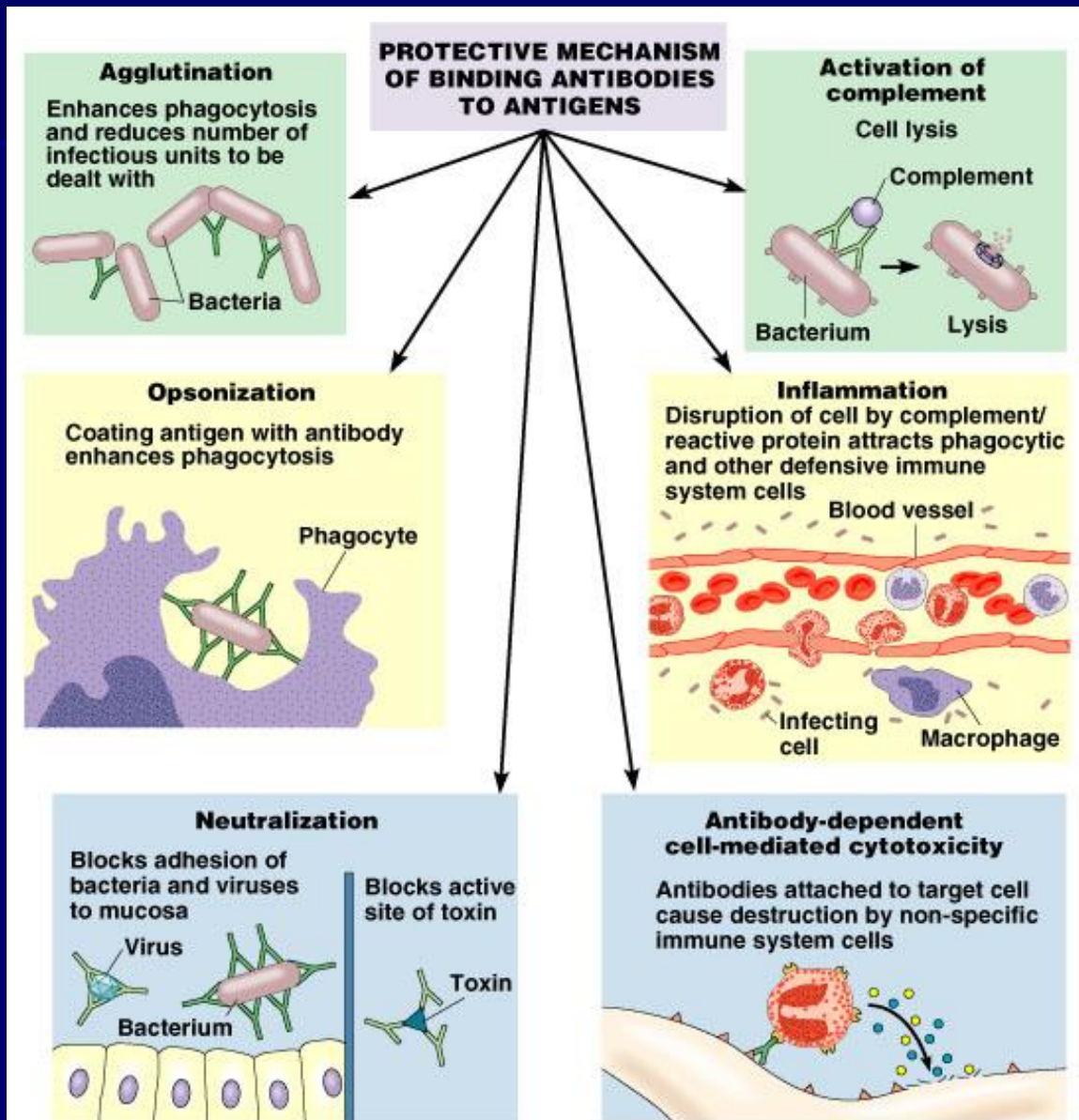


Figure 17.9

Monoclonal Antibodies

- Hybridomas are produced by fusing a cancer cell with an Ab-secreting plasma cells
- The hybridoma cell culture is immortal and produces monoclonal Abs (Mabs)
- Immunotoxins: Mabs conjugated with a toxin to target cancer cells
- Chimeric Mabs: Genetically modified mice that produce Ab with a human constant region
- Humanized Mabs: Mabs that are mostly human, except for mouse antigen-binding

Monoclonal Antibodies

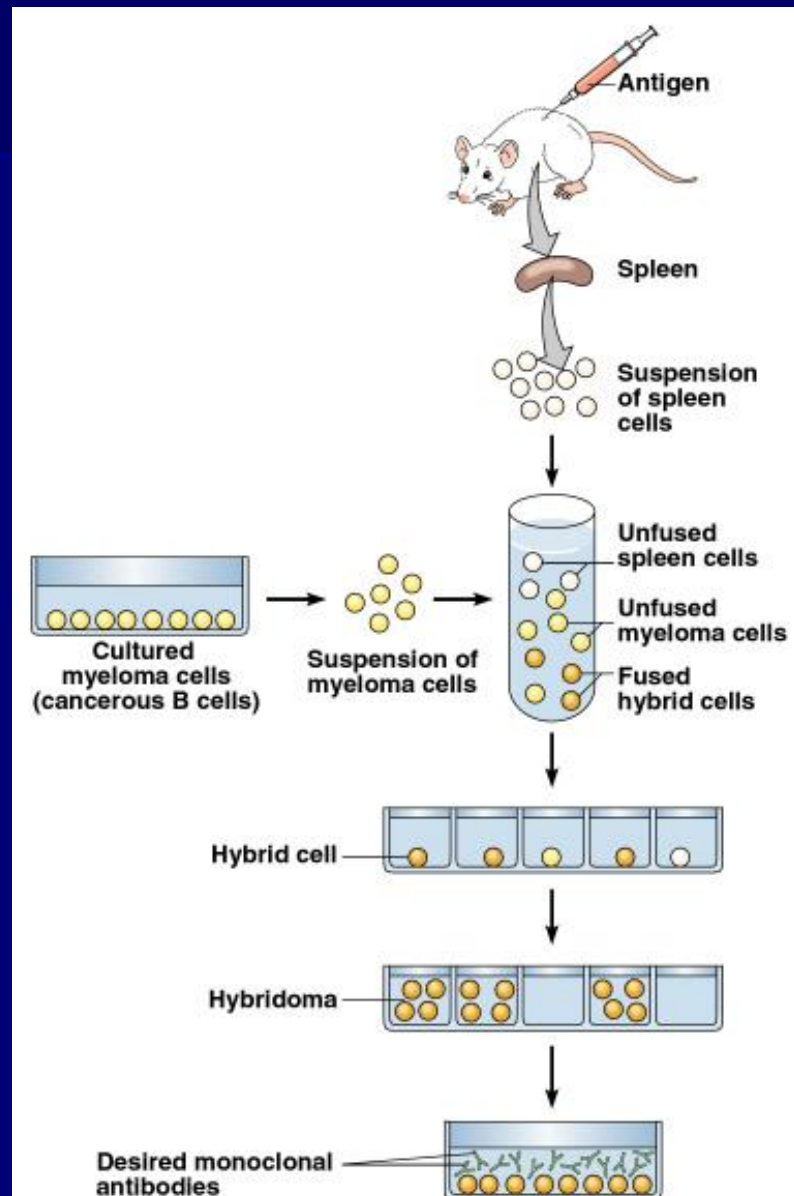


Figure 17.11

Antigens

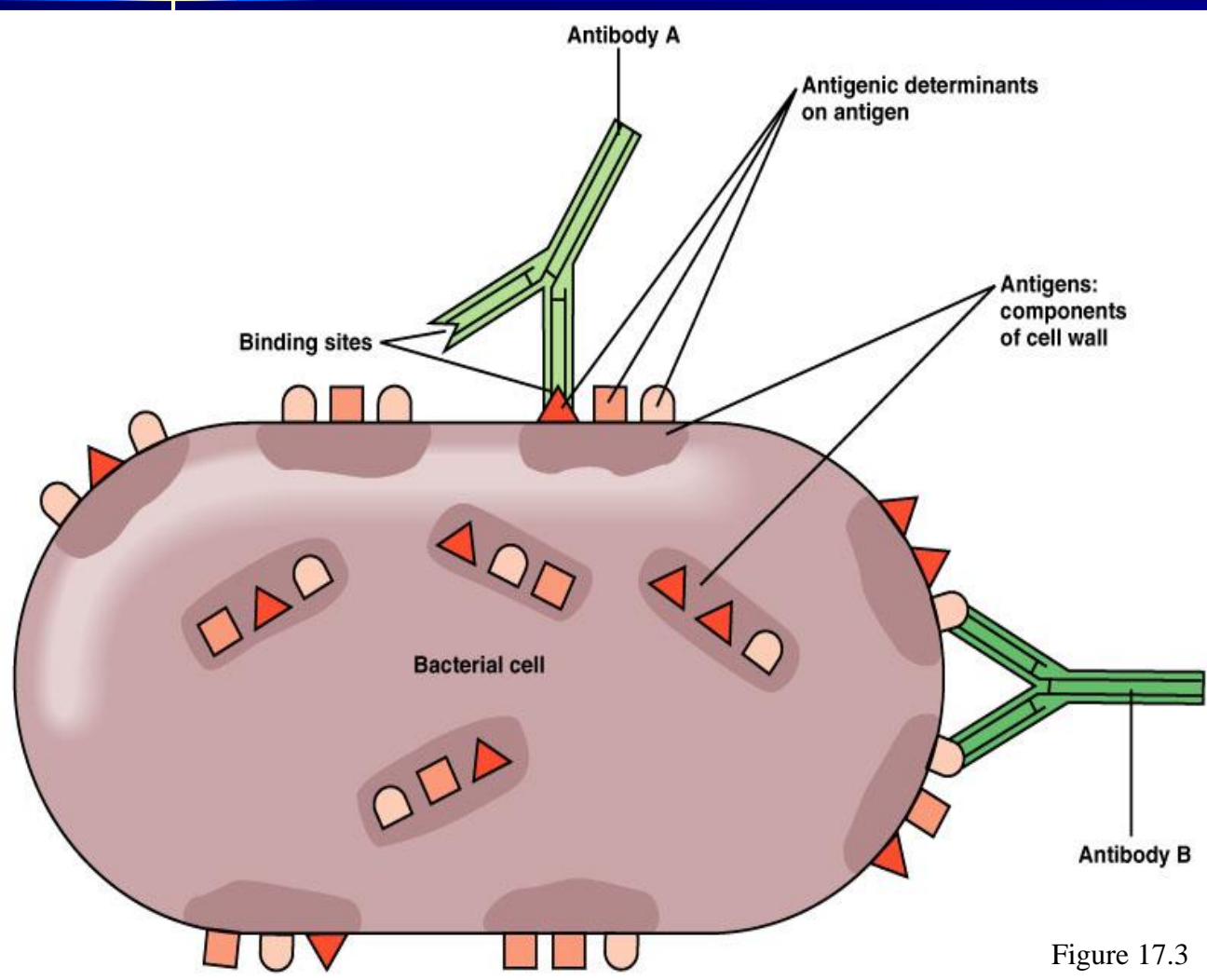


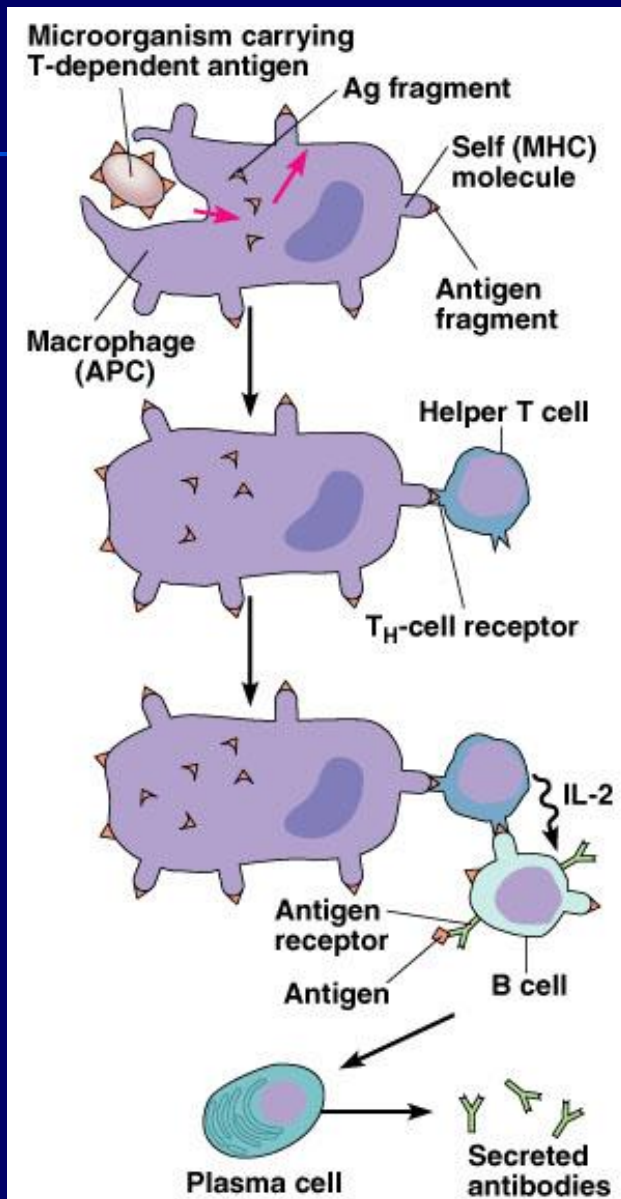
Figure 17.3

- Immunogen/antigen – a molecule that specifically interacts with an antibody or lymphocyte
- Antigenic determinants (epitopes)

Cell-mediated and Humoral Immunity

- **T-dependent Antigens**
- **T-independent Antigens**
- **Antibody-Dependent Cell-Mediated Cytotoxicity (ADCC)**

T-dependent Antigens



- Ag ingested and digested by APC
- T_H cell specific to Ag reacts with MHC-Ag Complex
- T_H cell produces IL-2 to activate B cell
- B cell differentiates into plasma cell that secretes Ab

Figure 17.16

T-independent Antigens

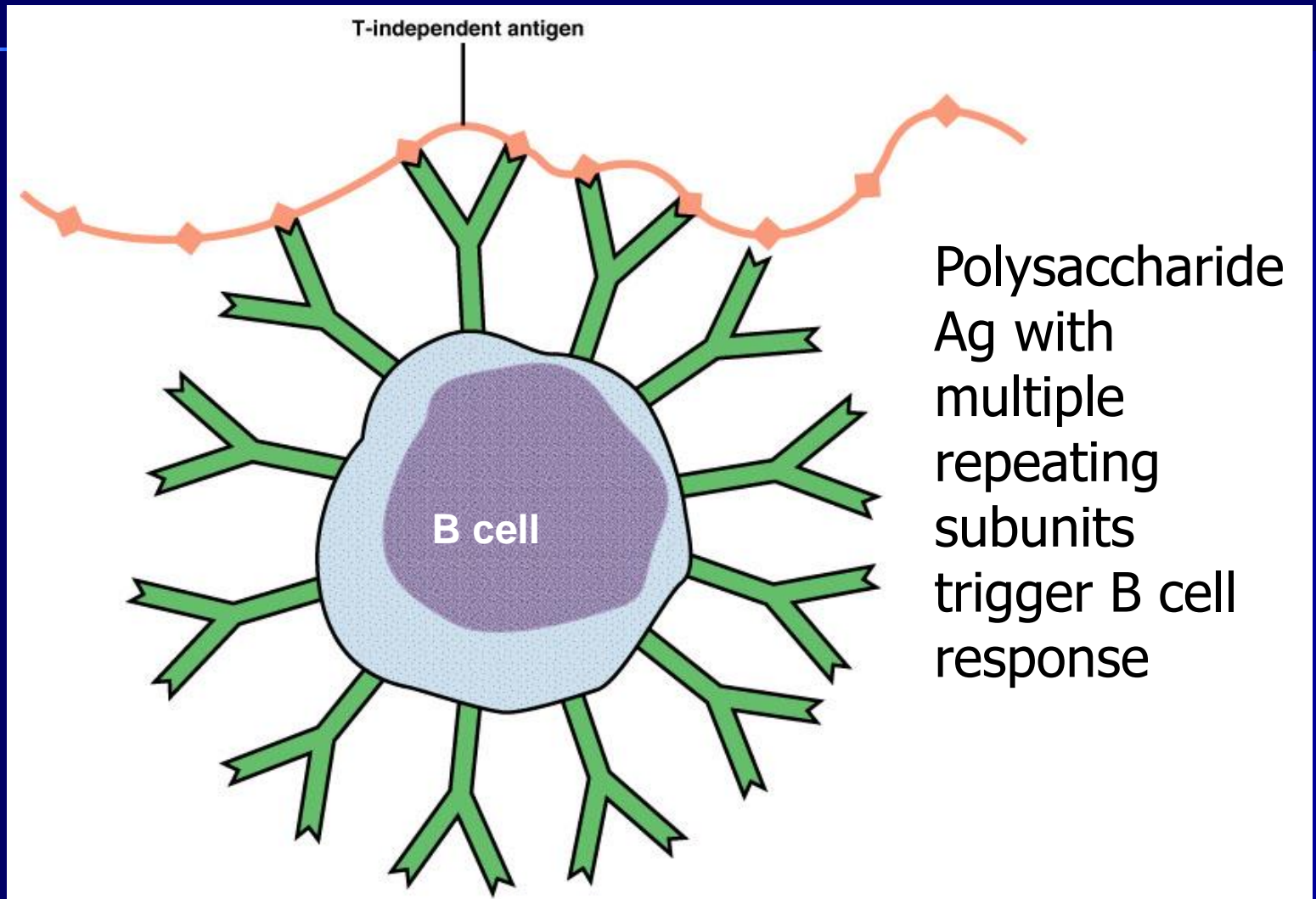
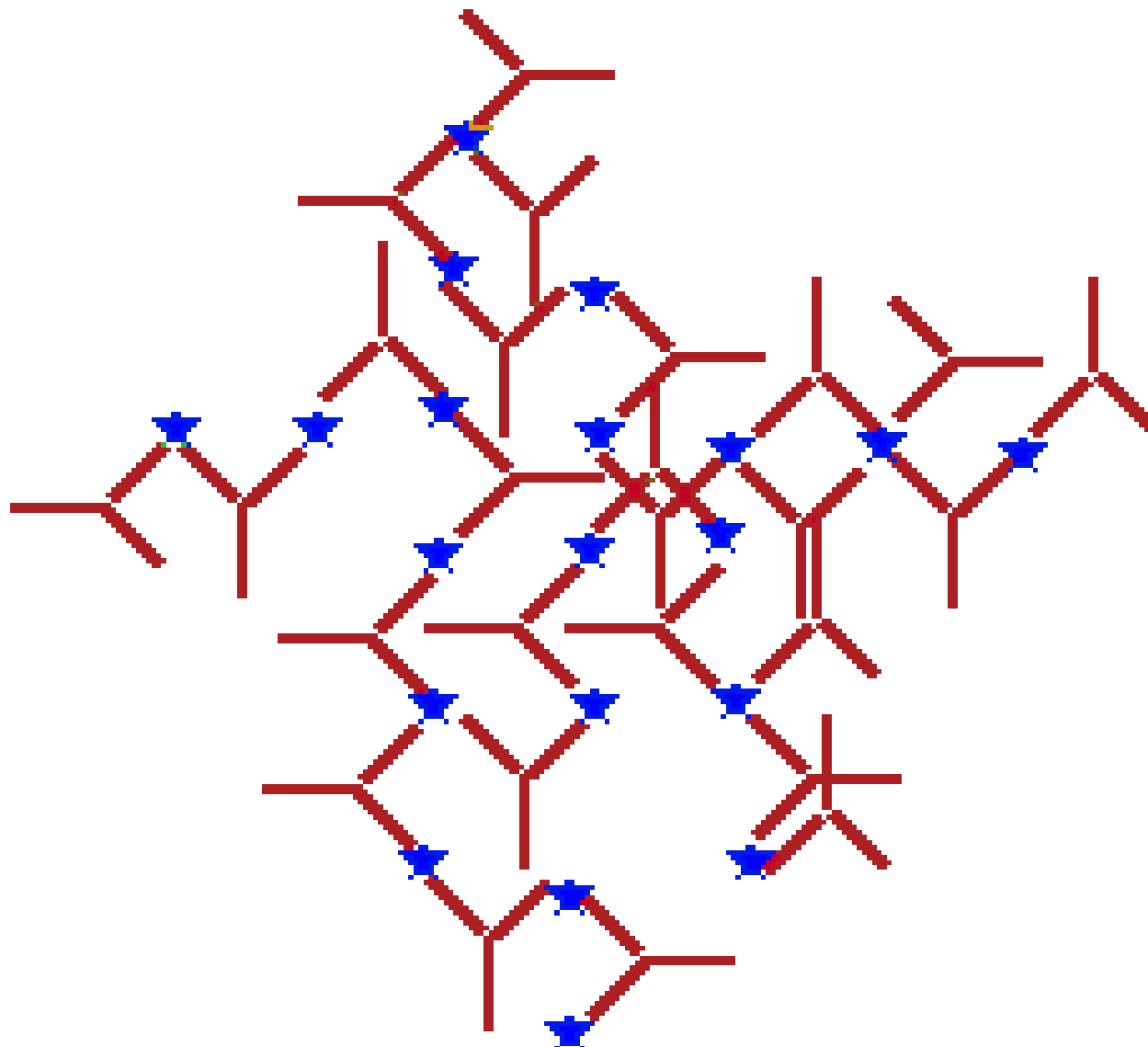
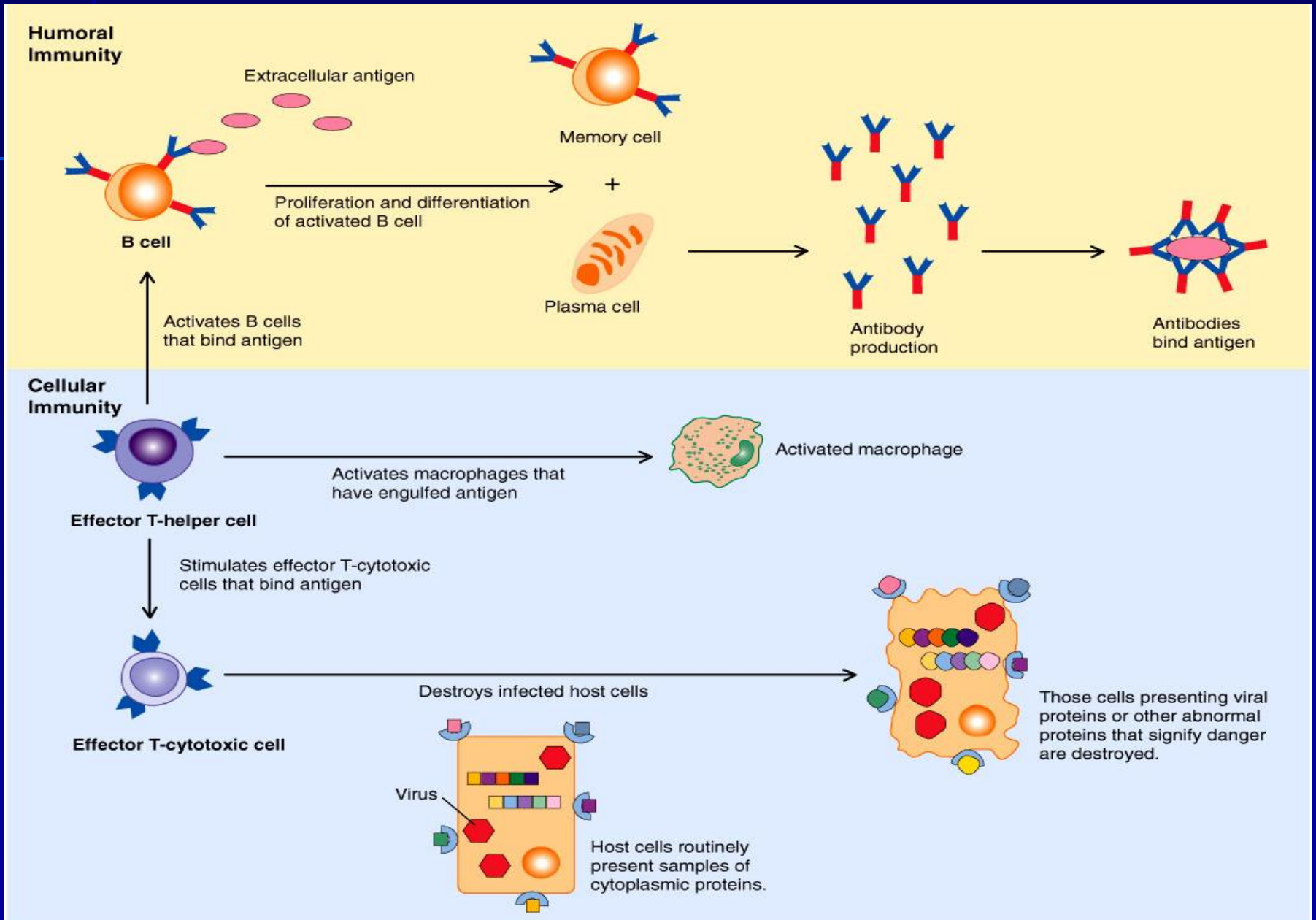


Figure 17.17



★ SOLUBLE ANTIGEN

Cell-mediated and Humoral Immunity



Summary of immune system

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