

Dual nature of the Immune System

I. Humoral (Antibody-Mediated) Immunity

- Involves production of antibodies against foreign antigens.
- Antibodies are produced by a subset of lymphocytes called **B cells**.
- B cells that are stimulated will actively secrete antibodies and are called *plasma cells*.
- Antibodies are found in **extracellular fluids** (blood plasma, lymph, mucus, etc.) and the surface of B cells.
- Defense against bacteria, bacterial toxins, and viruses that circulate freely in body fluids, *before* they enter cells.
- Also cause certain reactions against transplanted tissue.

II. Cell Mediated Immunity

Involves specialized set of lymphocytes called **T cells** that recognize foreign antigens on the surface of cells, organisms, or tissues:

Helper T cells, Cytotoxic T cells

T cells **regulate** proliferation and activity of other cells of the immune system: B cells, macrophages, neutrophils, etc.

Defense against:

Bacteria and viruses that are inside host cells and are inaccessible to antibodies.

Fungi, protozoa, and helminths, Cancer cell, Transplanted tissue

Antigens

◆ Most are proteins or large polysaccharides from a foreign organism.

Microbes: Capsules, cell walls, toxins, viral capsids, flagella, etc.

Nonmicrobes: Pollen, egg white, red blood cell surface molecules, serum proteins, and surface molecules from transplanted tissue.

◆ Lipids and nucleic acids are only antigenic when combined with proteins or polysaccharides.

Hapten: Small foreign molecule that is not antigenic. Must be coupled to a **carrier** molecule to be antigenic. Once antibodies are formed they will recognize hapten.

Epitope:

◆ Small part of an antigen that interacts with an antibody.

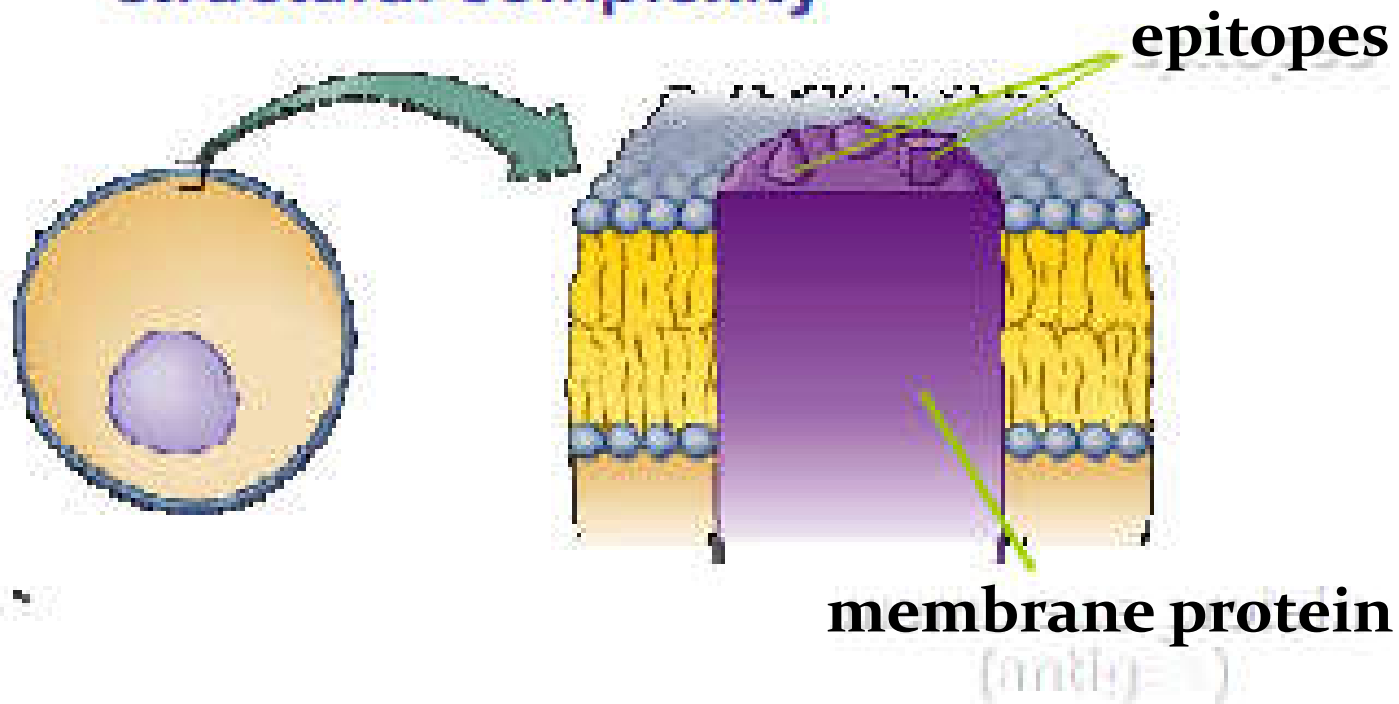
◆ Any given antigen may have several epitopes.

◆ May be **Linear** or **Conformational**

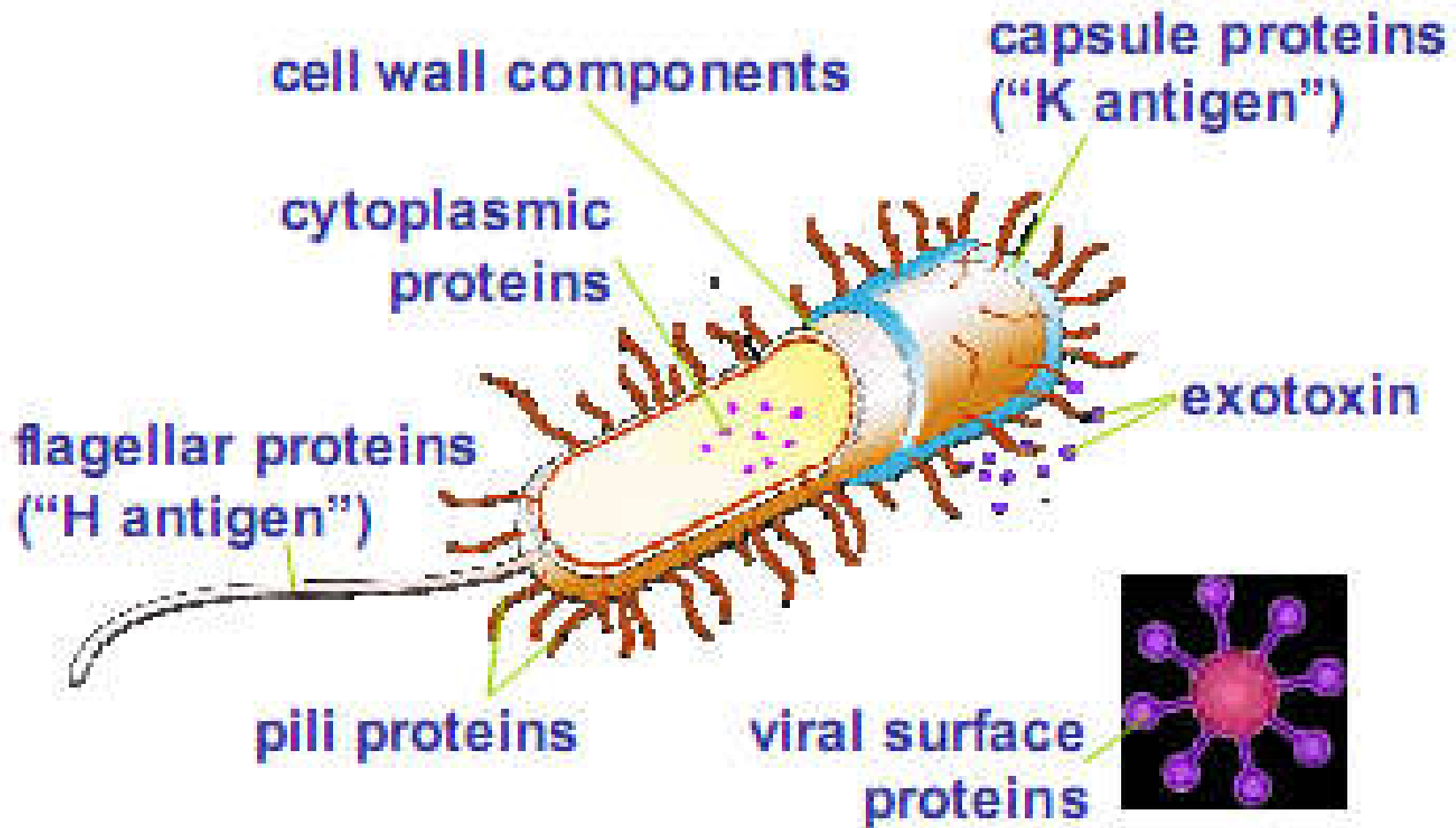
◆ Each epitope is recognized by a different antibody.

Antigens/Epitopes

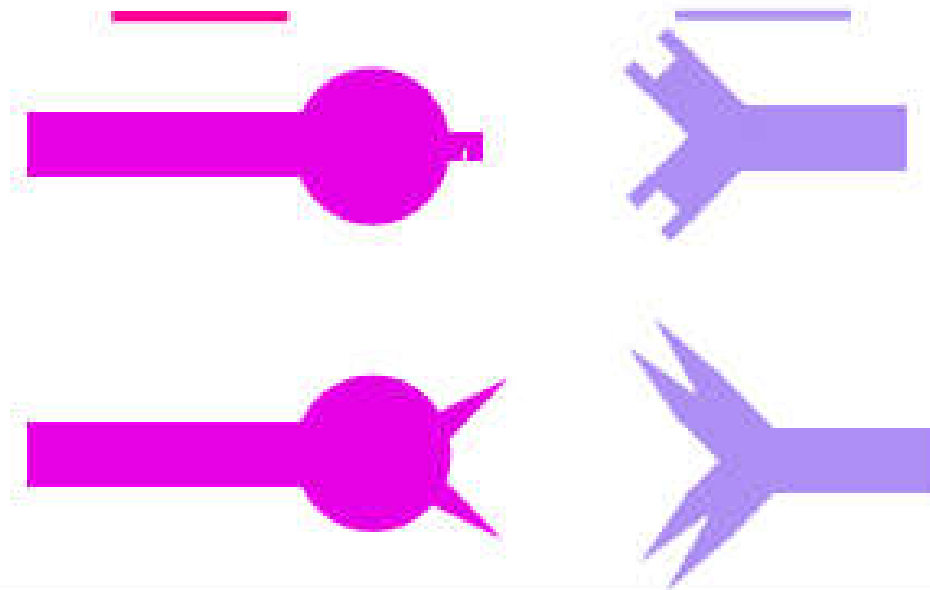
surface molecules of sufficient size,
structural complexity



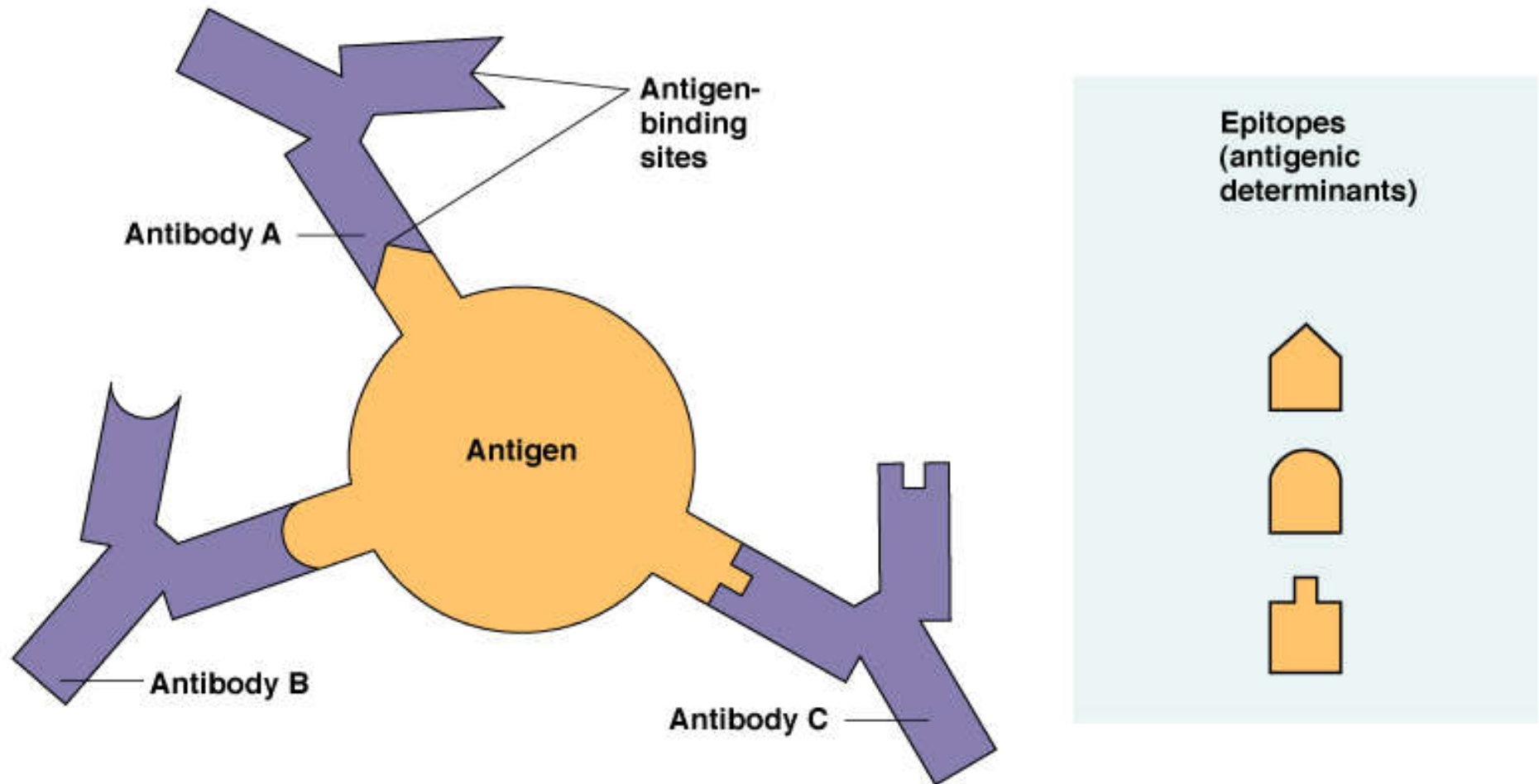
Microbial antigens/epitopes



Response to antigens



Epitopes: Antigen Regions that Interact with Antibodies



Features that determine immunogenicity

- ❖ Foreignness
- ❖ Molecular size
- ❖ Complexity of structure
- ❖ Antigenic determinants
- ❖ Others, eg. dosage, route, genetic constitution