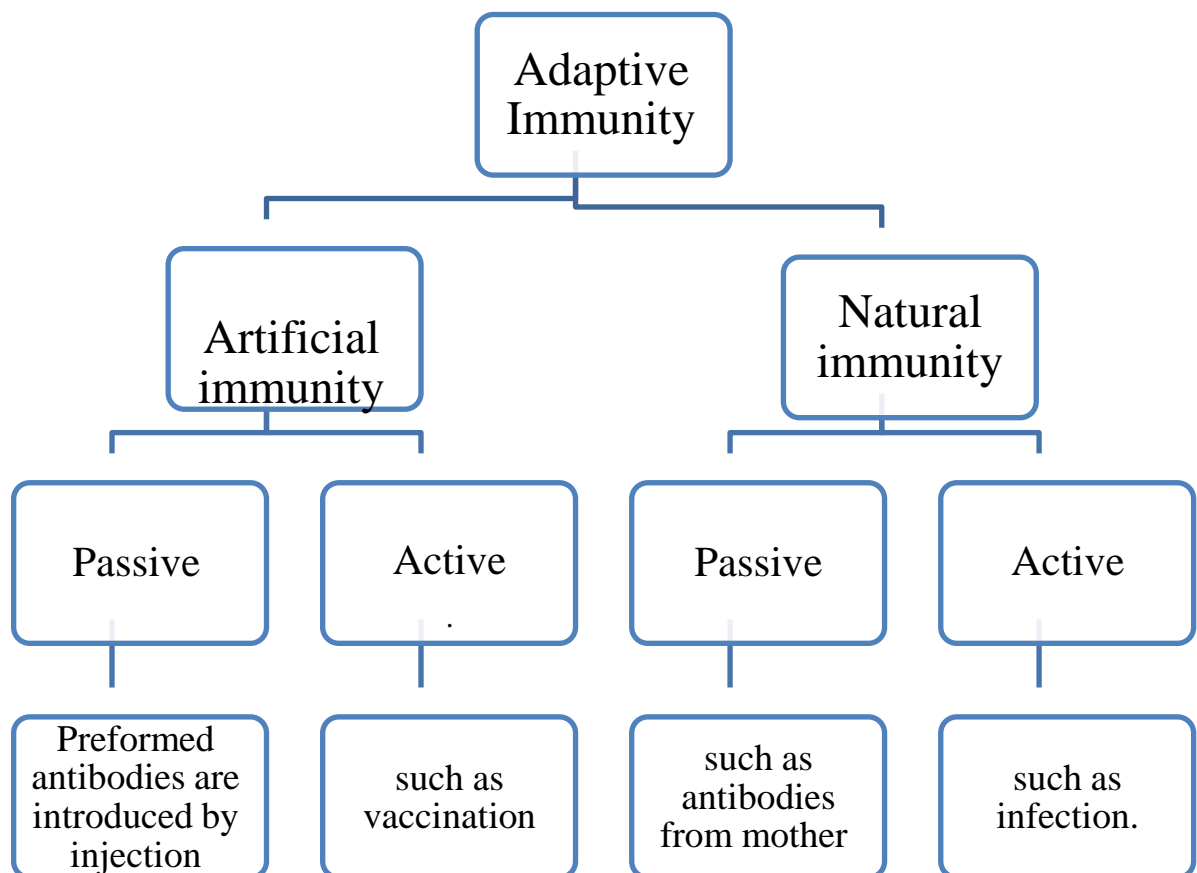


Adaptive Immunity: Specific Defenses of the Host

❖ Characters:

- Highly specific for the invading antigen.
- Can differentiate between self and non self antigens. The response occurs only to non self antigen.
- Diversity: responds to millions of different antigens.
- Immunological memory due to presence of memory cells.

❖ Types of acquired immunity:



❖ Mechanisms of acquired immunity:

- Humoral immunity:
 - *Mediated by antibodies secreted from B lymphocytes.*
- Cell mediated immunity:
 - *Mediated by T lymphocytes, NK cells and macrophages.*

Antigens and Antibodies

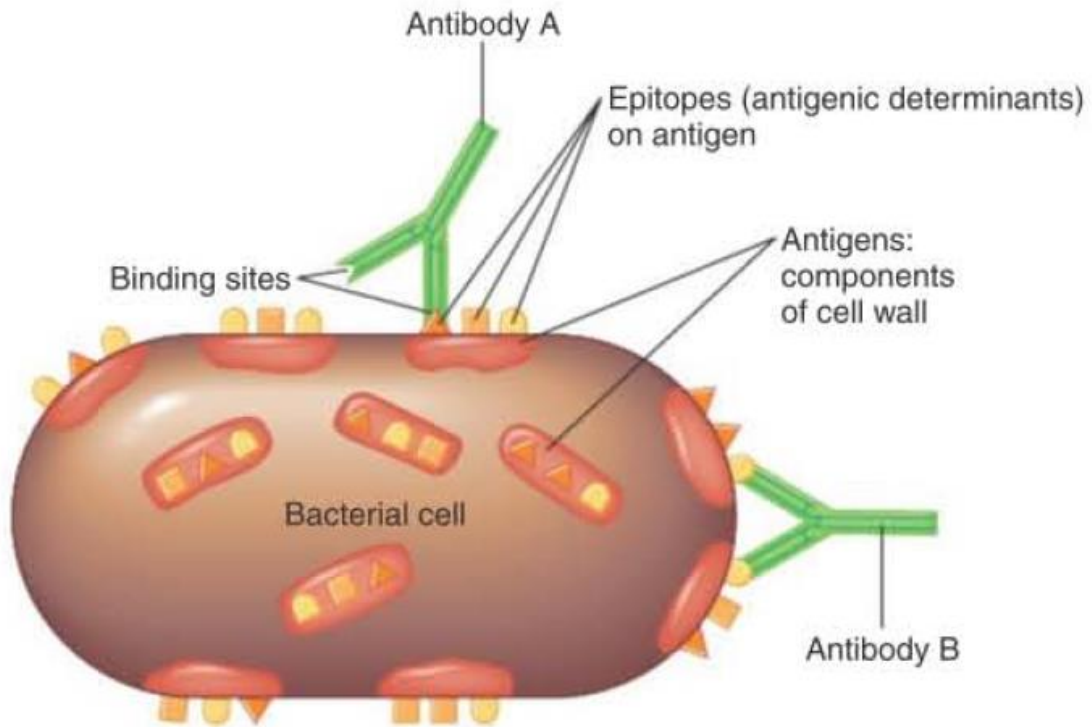
Antigens that cause a response are known as immunogens.

The Nature of Antigens

Most antigens are either proteins or large polysaccharides. Lipids and nucleic acids are usually antigenic only when combined with proteins and polysaccharides. Antigenic compounds are often components of invading microbes, such as capsules, cell walls, flagella, fimbriae, and toxins of bacteria; the coats of viruses; or the surfaces of other types of microbes.

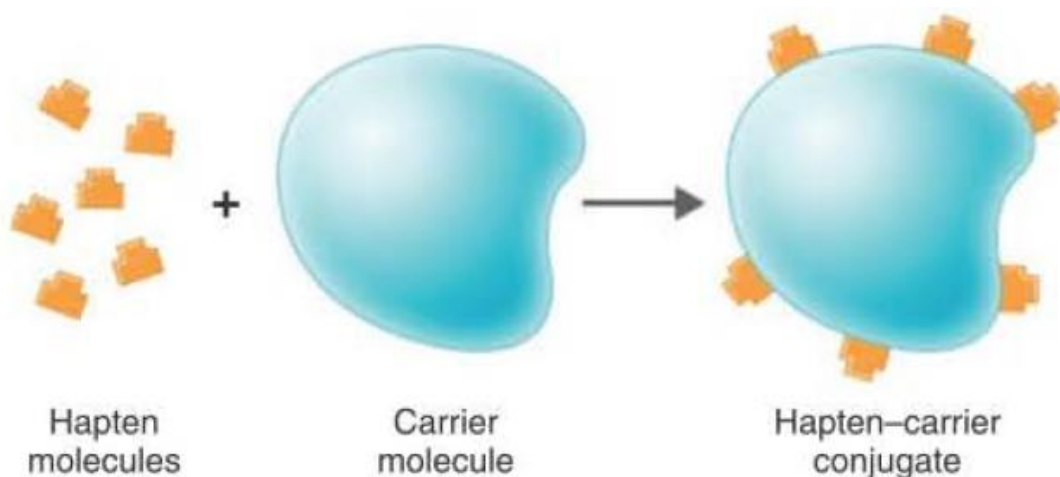
Non microbial antigens include pollen, egg white, blood cell surface molecules, serum proteins from other individuals or species, and surface molecules of transplanted tissues and organs.

Generally, antibodies recognize and interact with specific regions on antigens called epitopes or antigenic determinants (Figure below).



The nature of this interaction depends on the size, shape, and chemical structure of the binding site on the antibody molecule. Most antigens have a molecular weight of 10,000 or higher.

A foreign substance that has a low molecular weight is often not antigenic unless it is attached to a carrier molecule. These low molecular weight compounds are called **haptens**



Penicillin is a good example of a hapten. This drug is not antigenic by itself, but some people develop an allergic reaction to it. (Allergic reactions are a type of immune response). In these people, when penicillin combines with host proteins, the resulting combined molecule initiates an Immune response.

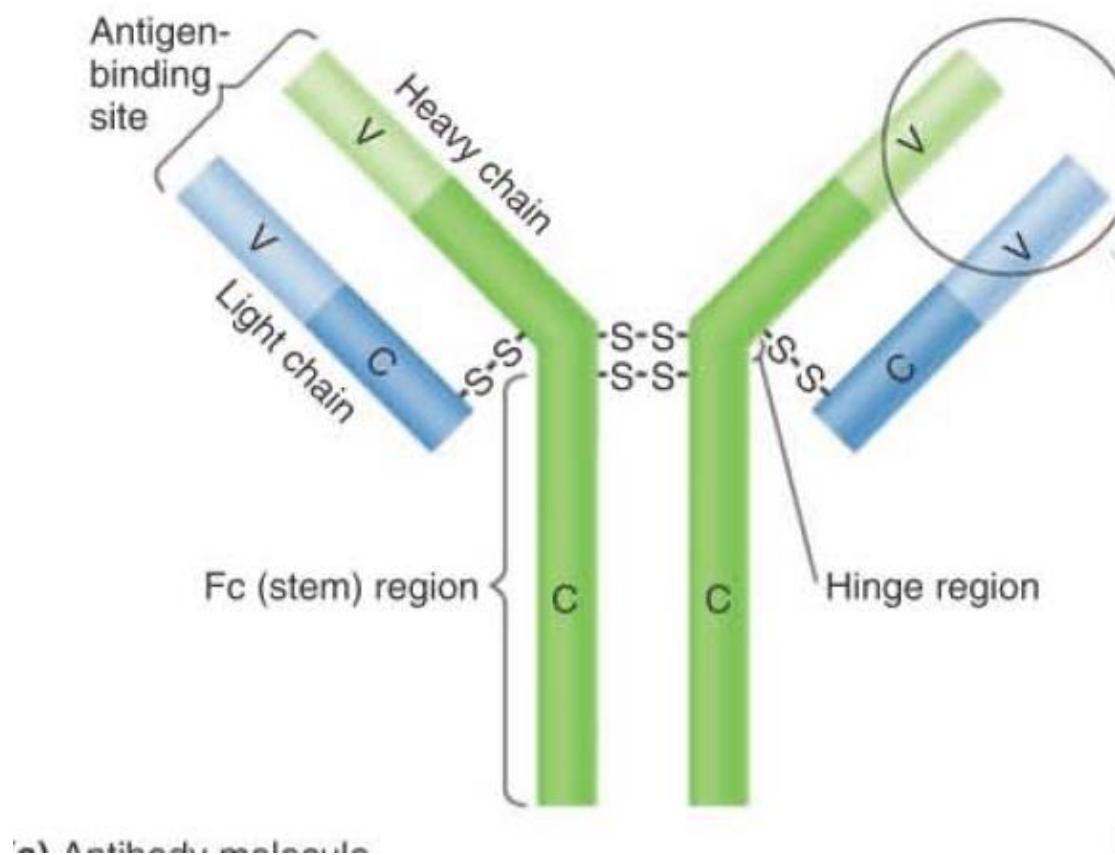
The Nature of Antibodies

Antibodies are globulin proteins therefore, we have come to use the term immunoglobulins (Ig) for antibodies. Globulin proteins are relatively soluble. Antibodies are made in response to an antigen and can recognize and bind to the antigen.


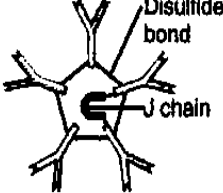



Each antibody has at least two identical sites that bind to epitopes. These sites are known as antigen-binding sites.

Antibody Structure

Because a bivalent antibody has the simplest molecular structure, it is called a monomer. A typical antibody monomer has four protein chains: two identical light chains and two identical heavy chain. The chains are joined by disulfide links and other bonds to form a Y-shaped molecule. The Y-shaped molecule is flexible and can assume a T shape (notice the hinge region in).



Immunoglobulin Classes

Characteristics	IgG	IgM	IgA	IgD	IgE
Structure					
Percentage of Total Serum	80%	5- 10%	10- 15%'	0.2%	0.002%
Location	Blood. lymph. intestine	Blood, lymph, B cell surface (as monomer)	Secretions (tears. saliva. mucus. intestine. milk). blood. lymph	B cell surface. blood, lymph	Bound to mast and basophil cells throughout body. blood
Half-life in Serum	23 days	5 days	6 days	3 days	2 days
Complement Fixation	yes	yes	No	No	No
placental Transfer	yes	No	No	No	No

