

BHARATHIDASAN UNIVERSITY

**Tiruchirappalli – 620 024,
Tamil Nadu, India**

Programme: M.Sc., Biotechnology (Marine)

Course Title : Immunology

Course Code : 21 CC7

**Unit : II
Terminology & Definition**

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Professor

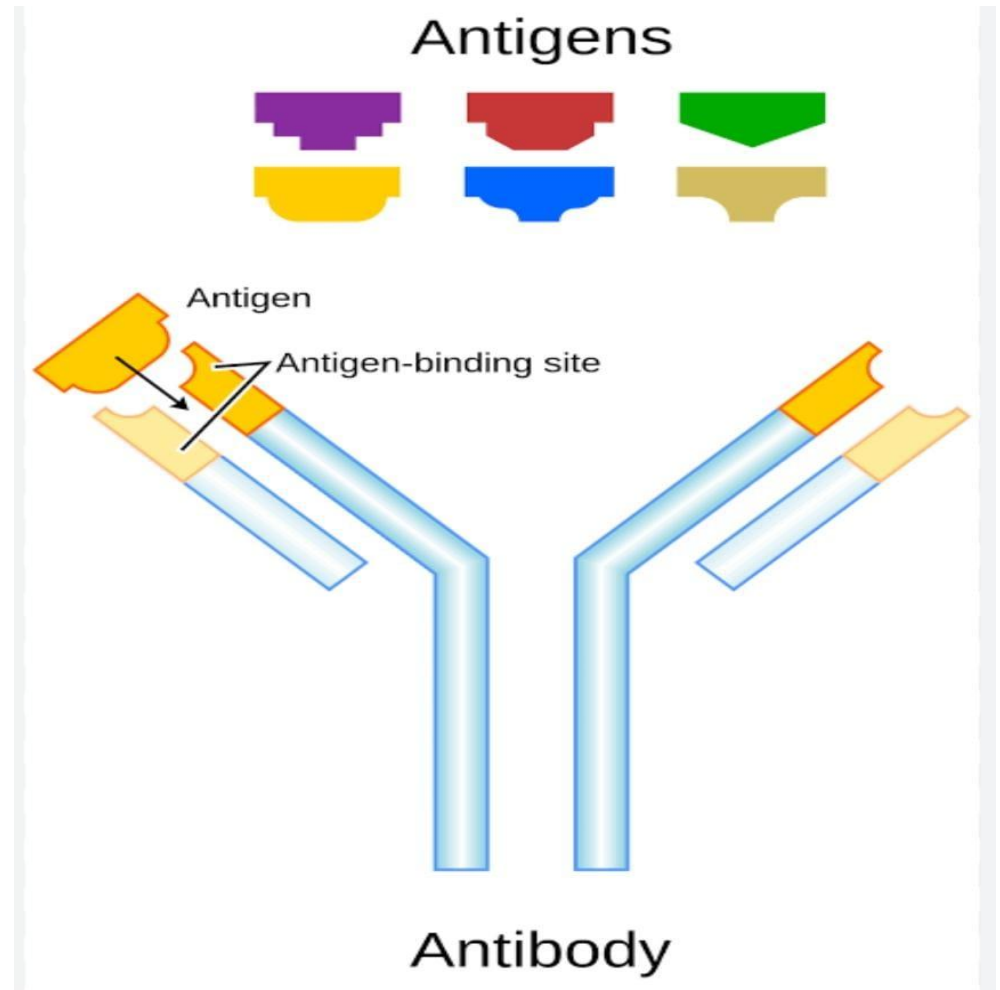
Department of Marine Biotechnology

Terminology

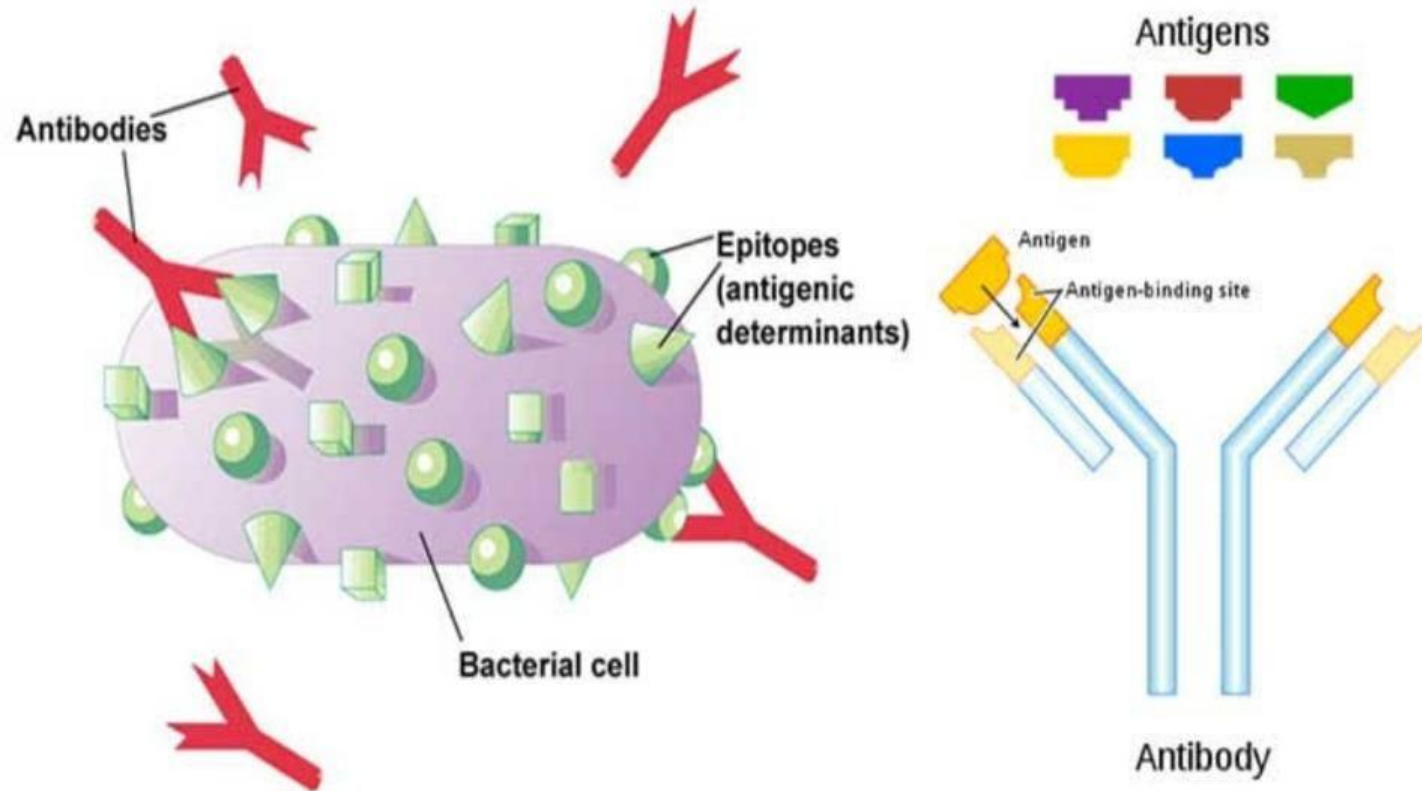
Terminology is a group of specialized words and respective meanings in a particular field, and also the study of such terms and their use; the latter meaning is also known as terminology science.

Antigen -

- **Definition and Function:** Antigens are substances that trigger an immune response by activating lymphocytes, the white blood cells responsible for fighting infections.
- **Composition and Sources:** They can be proteins, polysaccharides, or other molecules, typically found on pathogens like bacteria, viruses, or allergens.
- **Immune Activation:** Antigens are recognized by lymphocyte receptors, initiating antibody production and immune defense mechanisms.

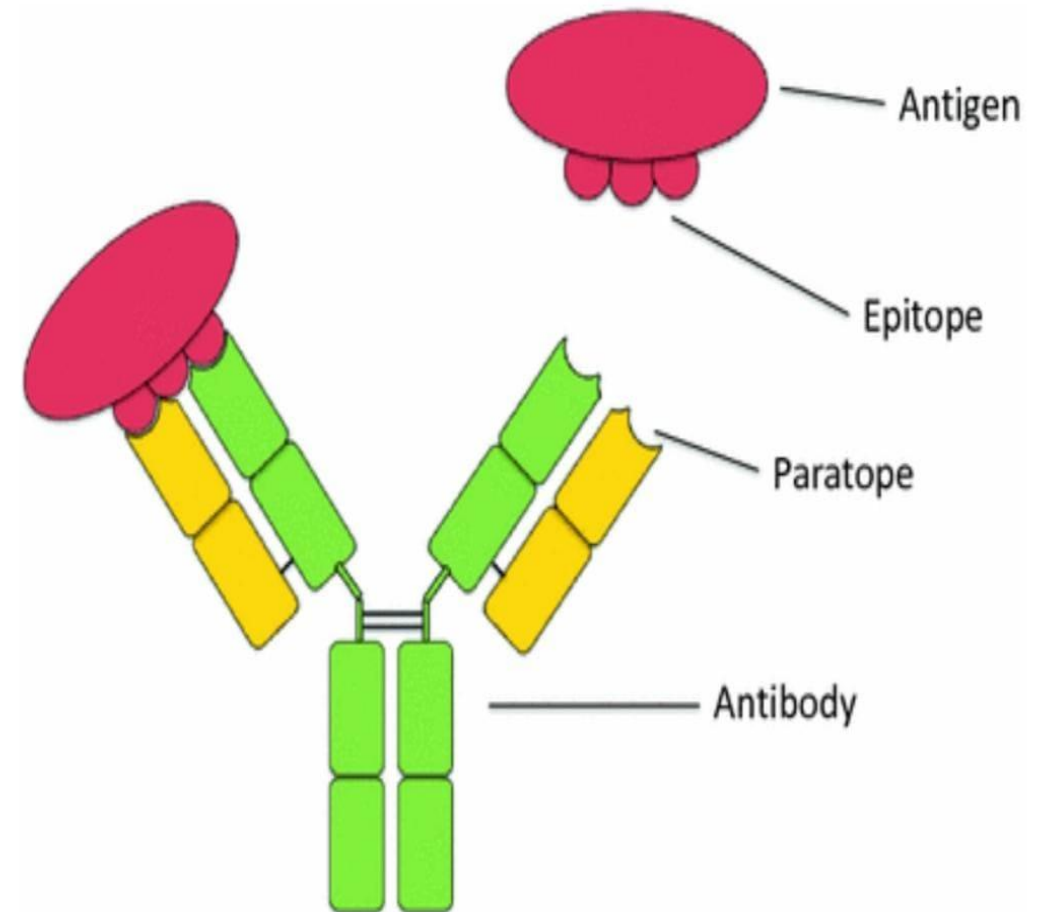


- For example: When a common cold virus enters the body, it causes the body to produce antibodies to prevent from getting sick.



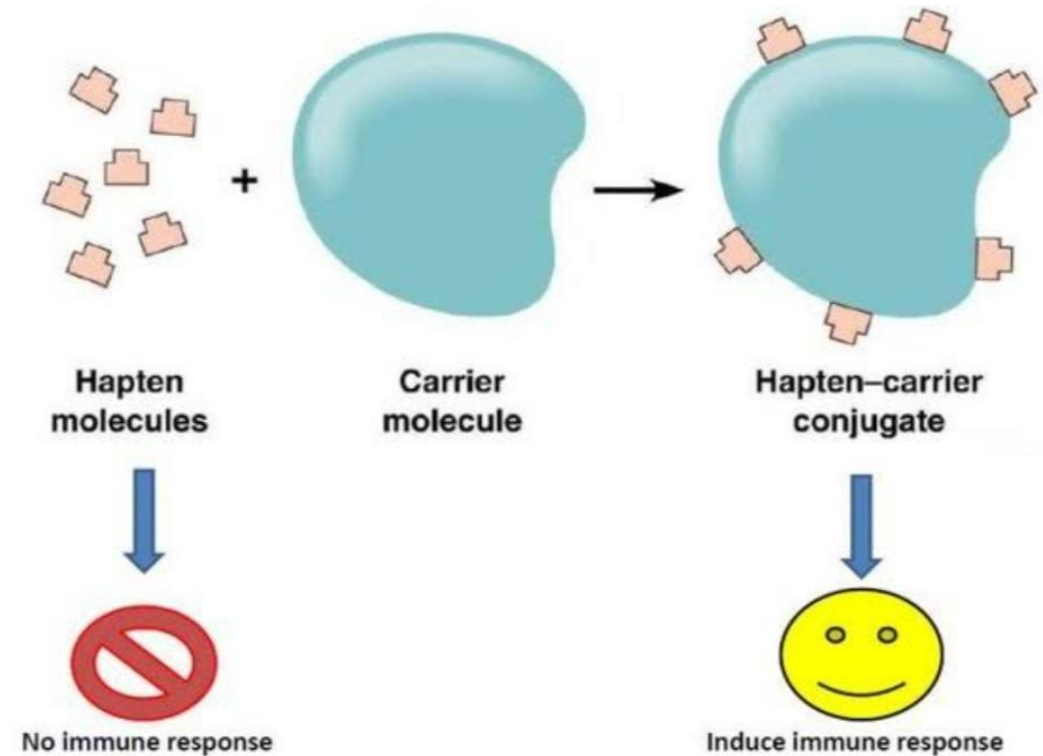
Epitope-

- **Definition:** A molecular region on the surface of an antigen, known as an epitope or antigenic determinant, is capable of eliciting an immune response.
- **Function:** This region interacts specifically with antibodies or immune receptors, triggering a targeted immune defense.
- **Role in Immunity:** The epitope binds to the antibody produced as a result of the immune response, ensuring precise recognition and neutralization of the antigen.



Hapten-

- A small separable part of an antigen, known as a hapten, reacts specifically with an antibody but cannot independently stimulate antibody production.
- For a hapten to trigger an immune response, it must be attached to a larger carrier protein molecule, which provides the necessary immunogenicity.
- Once the hapten-carrier complex is formed, the immune system can recognize and produce antibodies specific to the hapten.



Carrier protein-

- Carrier proteins make small, non-immunogenic antigens immunogenic by attaching to them, forming a hapten-carrier complex.
- By themselves, carrier proteins are easily recognized as antigens, and the immune system quickly generates antibodies against them.
- The antibodies produced target the carrier protein and the attached hapten, enabling macrophages to identify and eliminate the complex as a foreign particle.

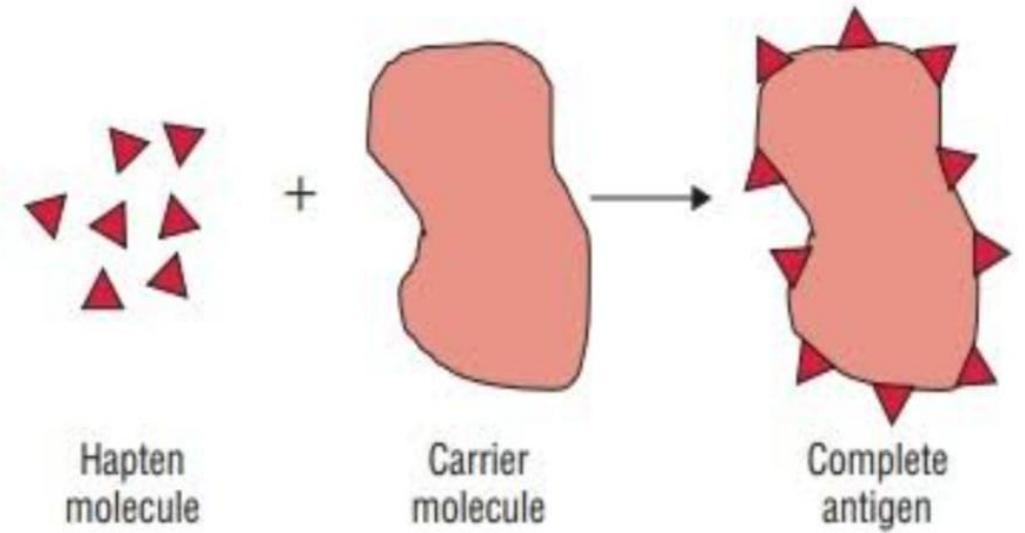
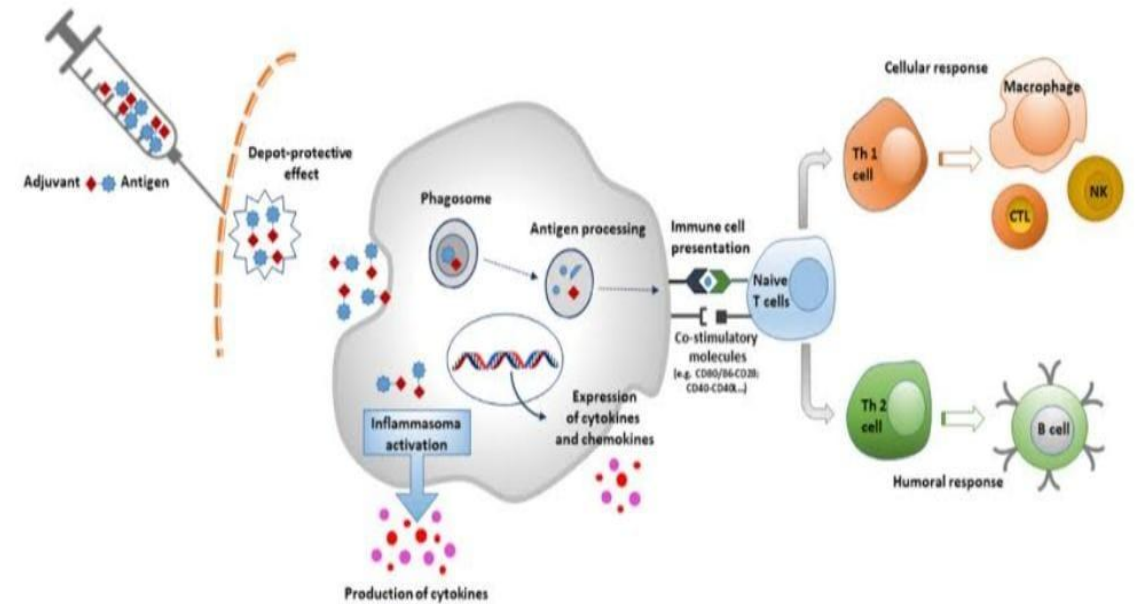


FIG. 12-1. Hapten-carrier conjugate.

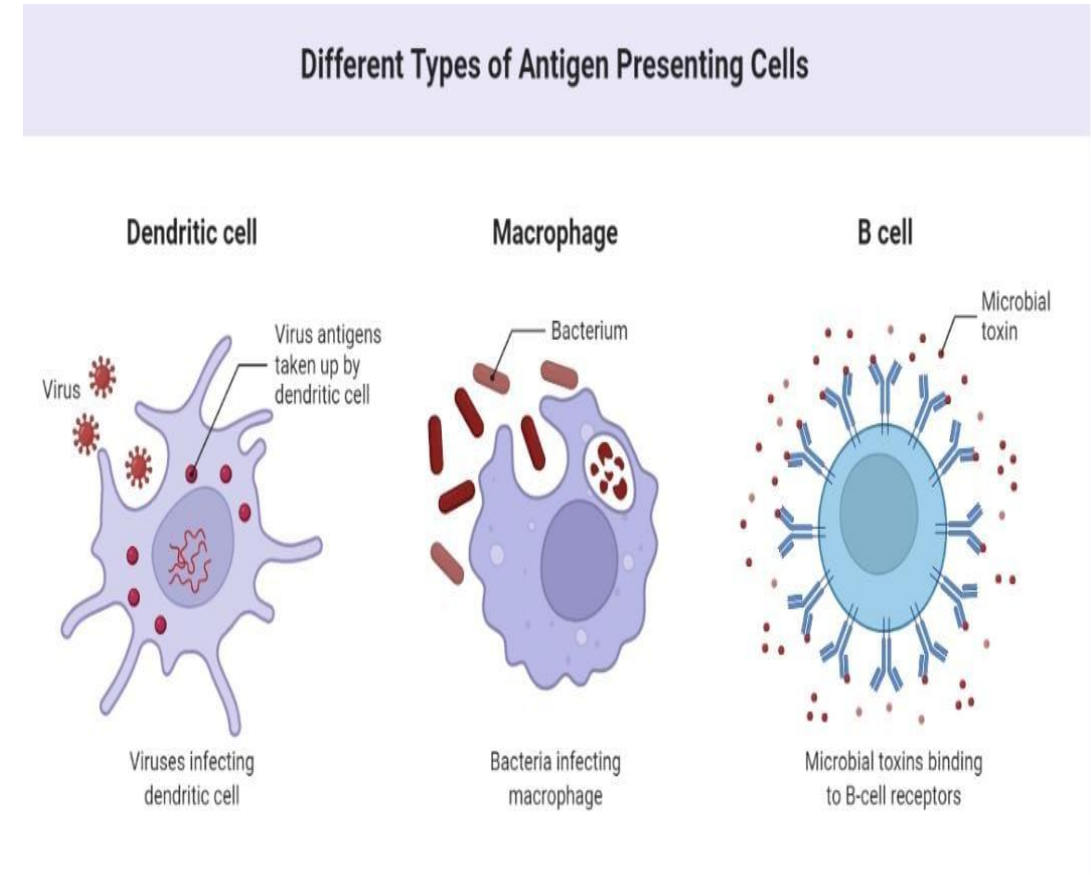
Adjuvant -

- Definition: An adjuvant is a substance that boosts the immune system's response to an antigen, enhancing its effectiveness.
- Use in Vaccines: Adjuvants are often co-administered with antigens in vaccines to improve the generation of antibodies and ensure a stronger, longer-lasting immune response.
- Mechanism: By stimulating the immune system, adjuvants amplify antigen recognition, promoting more efficient antibody production and immune memory formation.



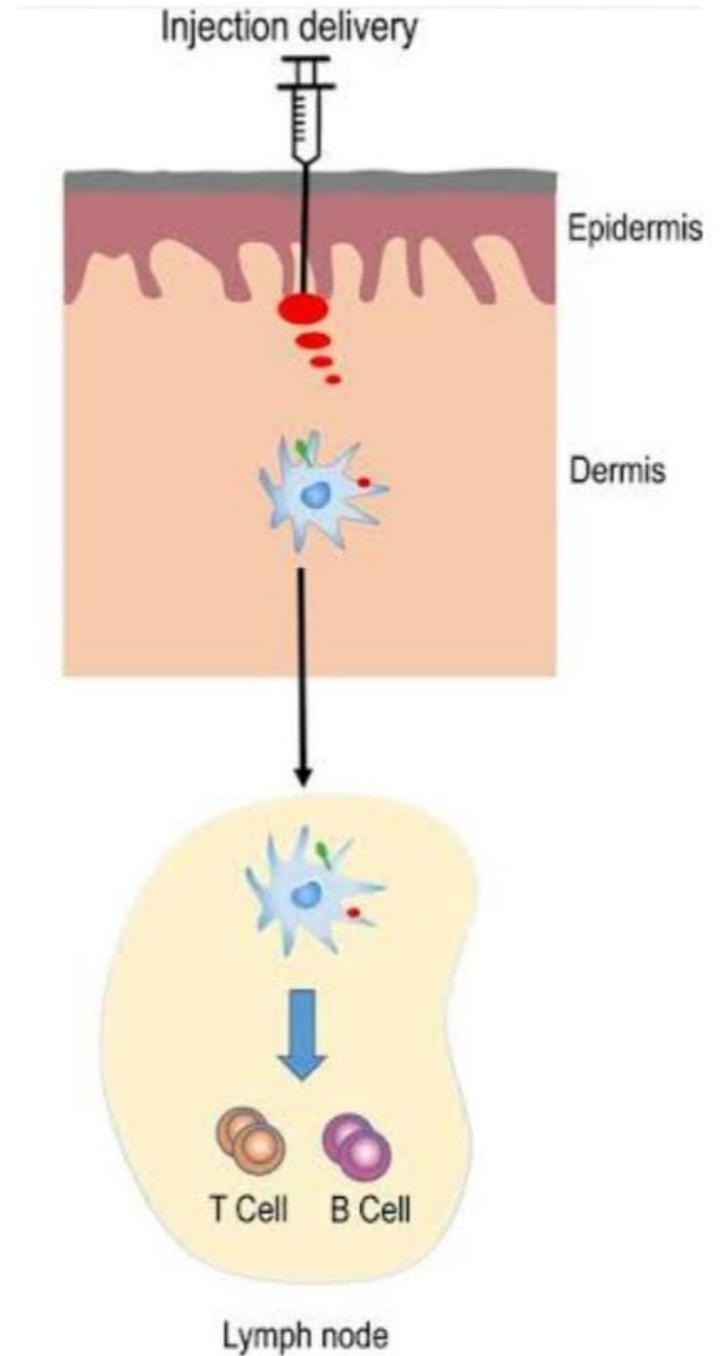
Antigen presenting cells-

- Antigen presenting cells (APCs) are a diverse group of cells that play a crucial role in initiating the cellular immune response by processing antigens.
- These cells process the antigen into fragments and display it on their surface in a form that is recognizable by T cells.
- The process of antigen presentation allows T cells to recognize and respond to the antigen, triggering the immune response necessary for combating pathogens or foreign substances.



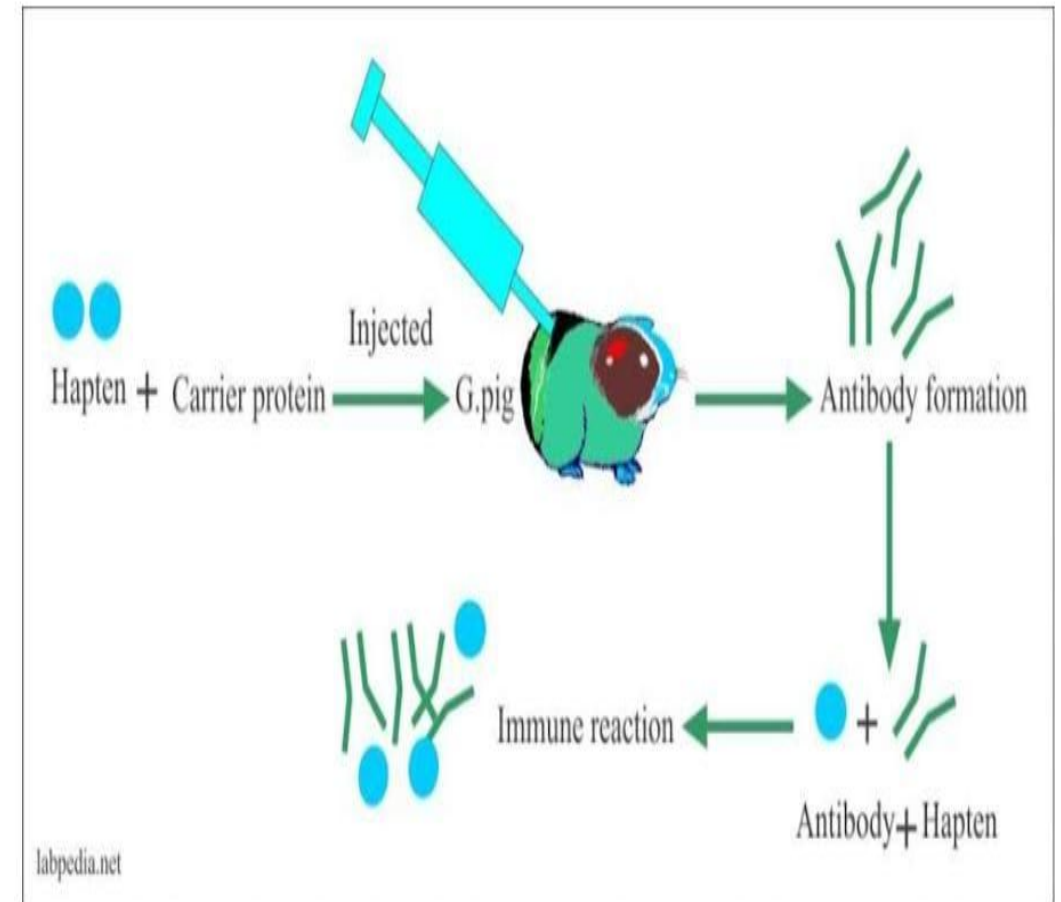
Immunogenicity -

- Immunogenicity is the ability of a foreign substance to enter a person's body and cause an immune response.
- A great example of immunogenicity is a vaccination.
- When a person gets vaccinated, they are injected with a very tiny amount of a specific disease.



Immunogen-

- Definition: An immunogen is a molecule capable of eliciting an immune response by activating an organism's immune system.
- Immunogen vs. Antigen: While all immunogens are antigens (recognized by the immune system), not all antigens are immunogens, as some antigens may lack the ability to trigger an immune response independently.
- Key Distinction: Immunogens possess both antigenicity (recognition by the immune system) and immunogenicity (ability to induce a response), whereas some antigens only have antigenicity.

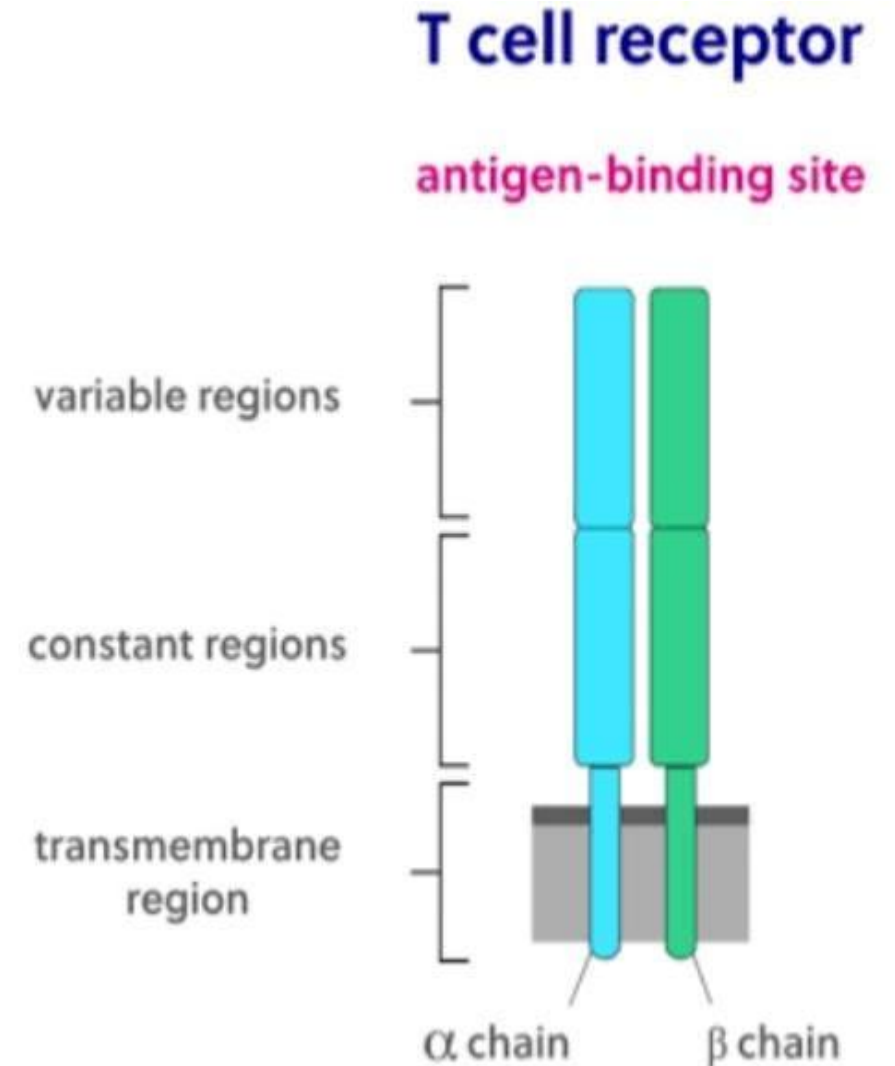


Antigenicity-

- Antigenicity: Antigenicity is the ability of a substance to be specifically recognized by antibodies that are produced as a result of an immune response.
- Immunogenic vs. Antigenic: Immunogenic substances can elicit an immune response, while antigenic substances are recognized by the immune system but may not independently trigger a response.
- Relationship: All immunogenic substances are antigenic, but not all antigenic substances are immunogenic, as they may lack the capability to initiate an immune response on their own.

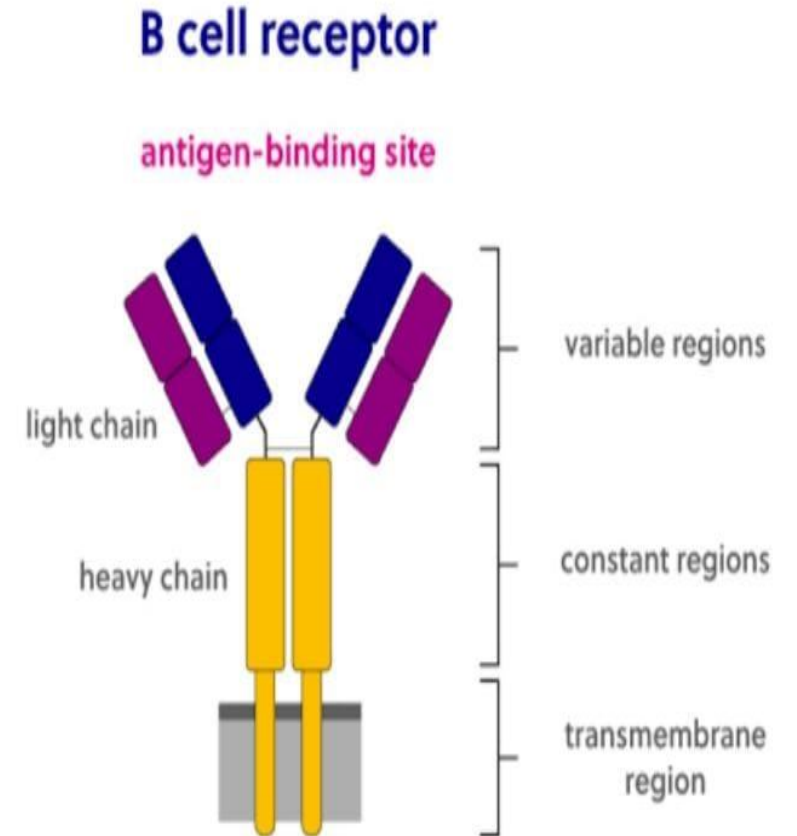
T-cell receptor -

- A group of proteins found on T cells (a type of immune cell that recognizes and binds to foreign substances).
- T-cell receptors bind to certain antigens (proteins) found on abnormal cells, cancer cells, cells from other organisms, and cells infected with a virus or another microorganism.
- This interaction causes the T cells to attack these cells and helps the body fight infection, cancer, or other diseases. Also called TCR.



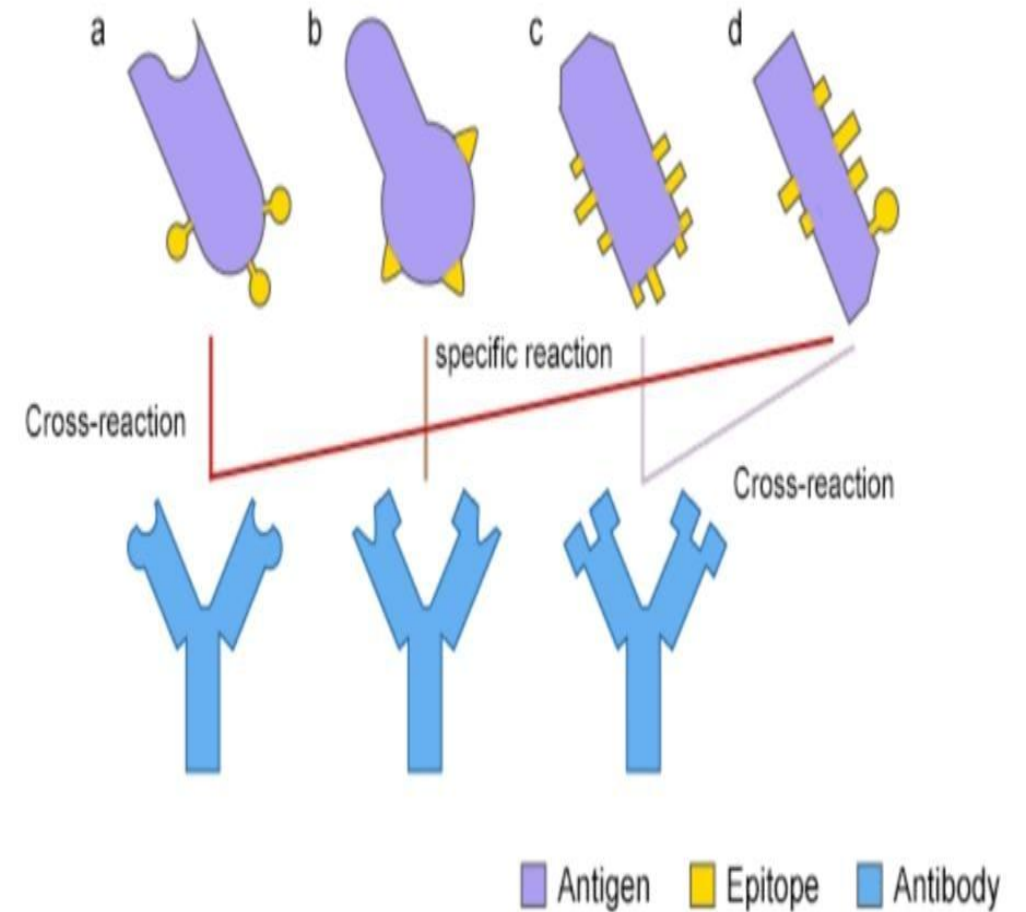
B -cell receptor -

- The B-cell receptor (BCR) is a transmembrane protein on the surface of a B cell.
- A B-cell receptor is composed of a membrane-bound immunoglobulin molecule and a signal transduction moiety.
- The former forms a type 1 transmembrane receptor protein, and is typically located on the outer surface of these lymphocyte cells.



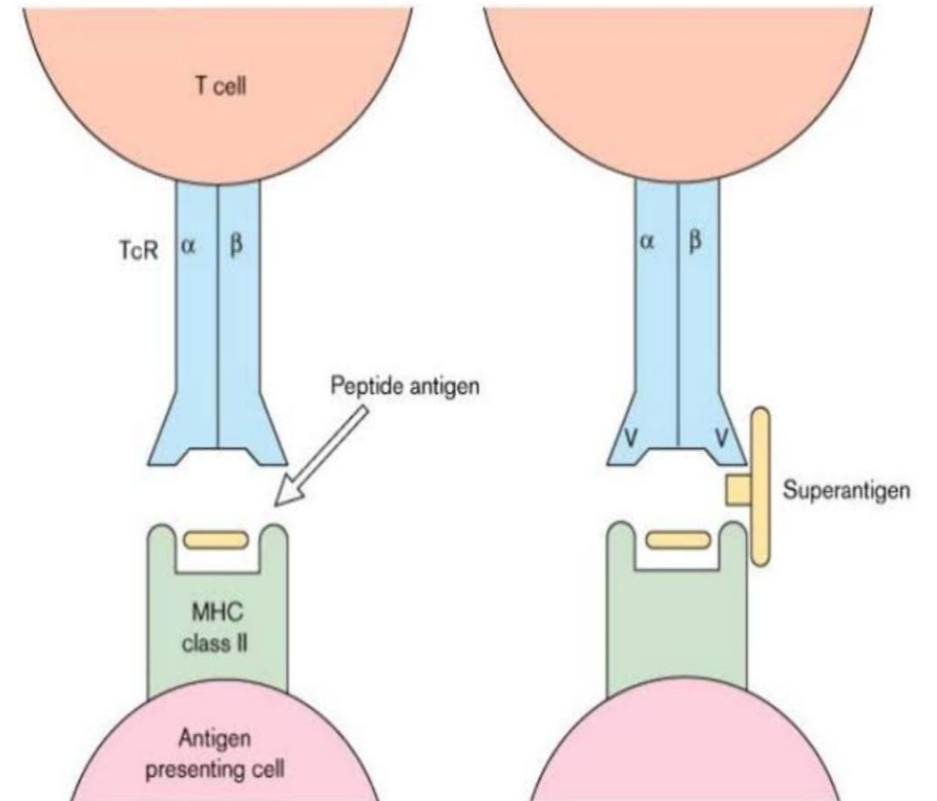
Cross reactivity -

- Cross-reactivity measures the extent to which different antigens appear similar to the immune system.
- The molecular determinants of specificity and cross-reactivity define the nature of antigenic variation and the selective processes that shape the distribution of variants in populations.



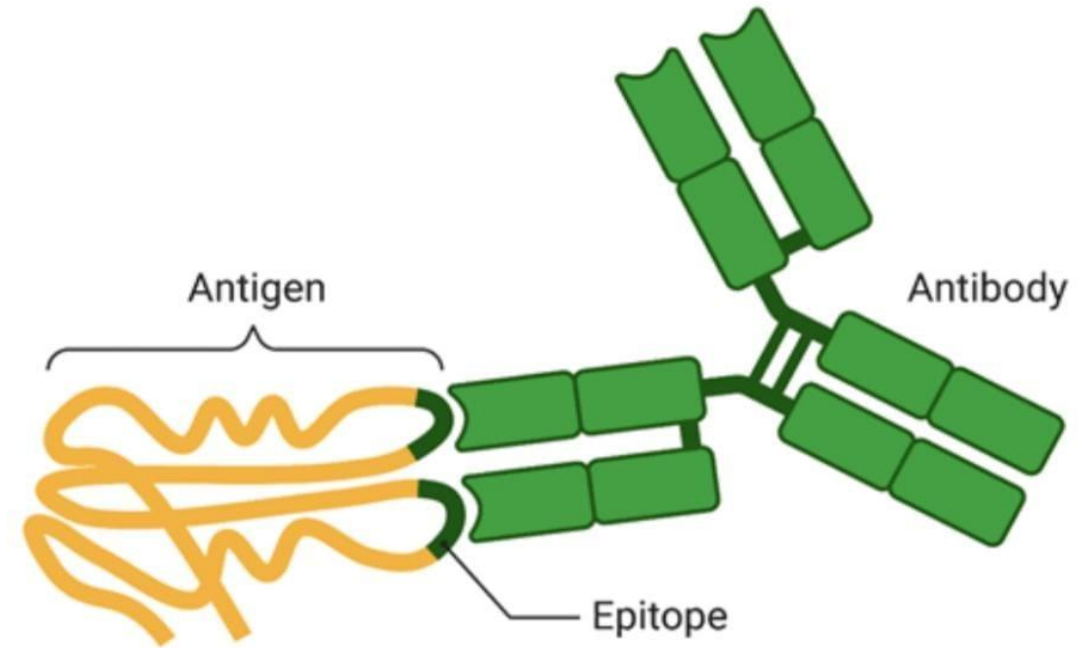
Superantigen-

- Superantigens (SAgs) are a class of antigens that result in excessive activation of the immune system.
- Specifically they cause non-specific activation of T-cells resulting in polyclonal T cell activation and massive cytokine release.



Immunogen-

- Definition: An immunogen is a molecule that can elicit an immune response when introduced into an animal.
- Immunogen vs. Antigen: While all immunogens are antigens, not all antigens are immunogens. Both have multiple binding sites, known as epitopes, for antibody interaction.
- Binding Sites: These epitopes allow antibodies to bind at various specific regions, enabling a targeted immune response against the immunogen or antigen.



Hapten-

- Definition: A hapten is a small molecule that can bind to a specific antibody but cannot independently trigger an immune response.
- Antigenicity Limitation: Haptens lack the ability to elicit an immune response unless attached to a larger carrier molecule, which provides the necessary immunogenicity.
- Role in Immunity: Once combined with a carrier, the hapten-carrier complex can stimulate an immune response, leading to antibody production specific to the hapten.

