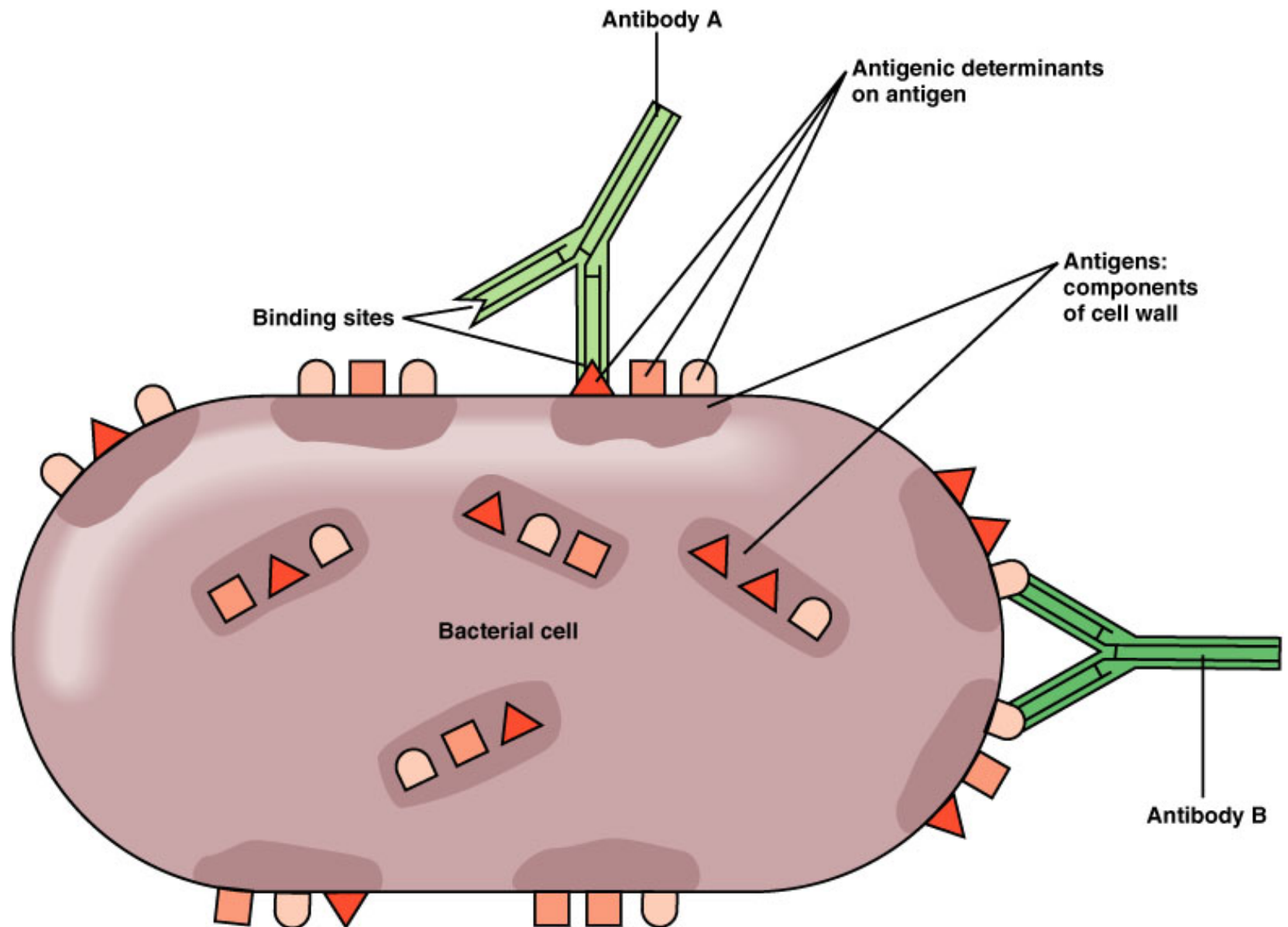


Antigens

Types and factors affecting the immunogenicity

Objectives

1. Able to define:
 - Antigen (Ag), Epitope or Antigenic Determinant and antigenicity
 - Immunogen, immunogenicity.
 - Antibody (Ab)
 - Hapten
2. Able to compare between T-Independent antigen and T dependent antigen
3. Able to compare between superantigen normal antigen



Antigen (Ag):

- Is a foreign substances usually protein and sometimes polysaccharide,
- Generates a specific immune response and induces the formation of a specific antibody or T cells response or both.
- reacts with the products of a specific immune response

Epitope (antigenic determinant)

Active regions of an immunogen (or antigen) that binds to antigen-specific receptors on lymphocytes or to secreted antibodies.

Antigenicity التوليد المضاد:

The ability of antigen to react specifically with a free Ab or membrane coupled antibody (BCR).

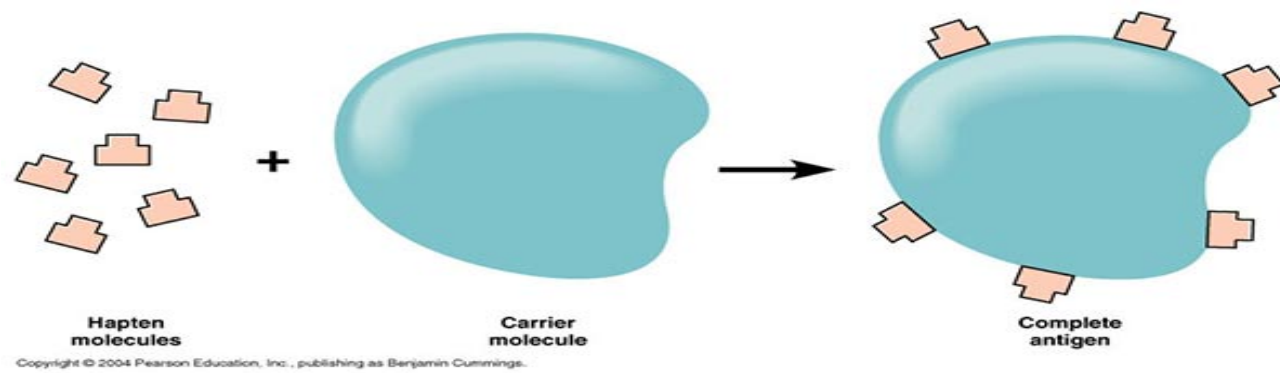
Immunogen: Molecule that stimulate a specific immune response.

Immunogenicity :التوليد المناعي

The ability to induce a humoral or cell mediated immune response.

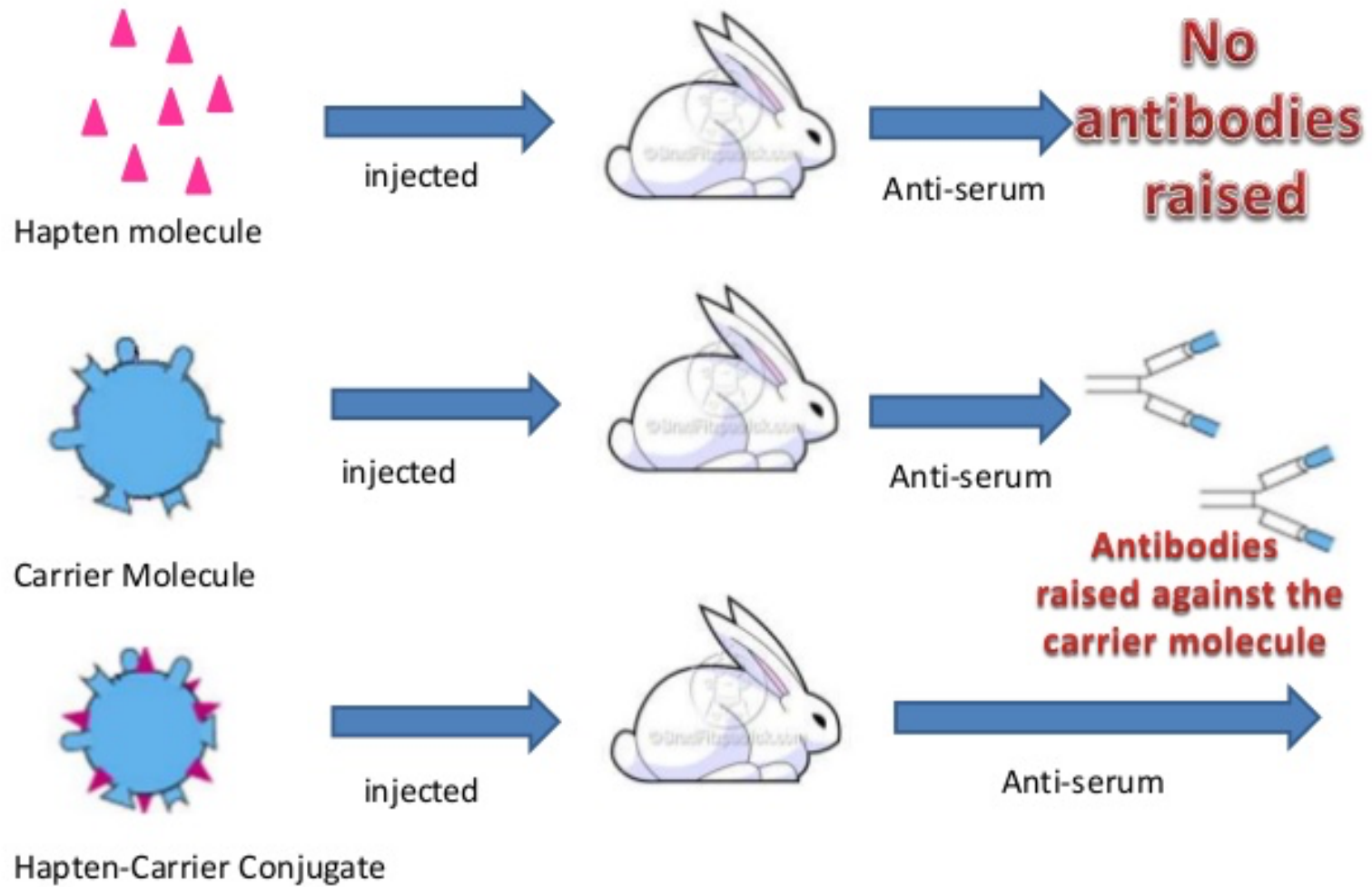
Antibody (Ab): A specific protein that is produced in response to an immunogen and reacts with an antigen

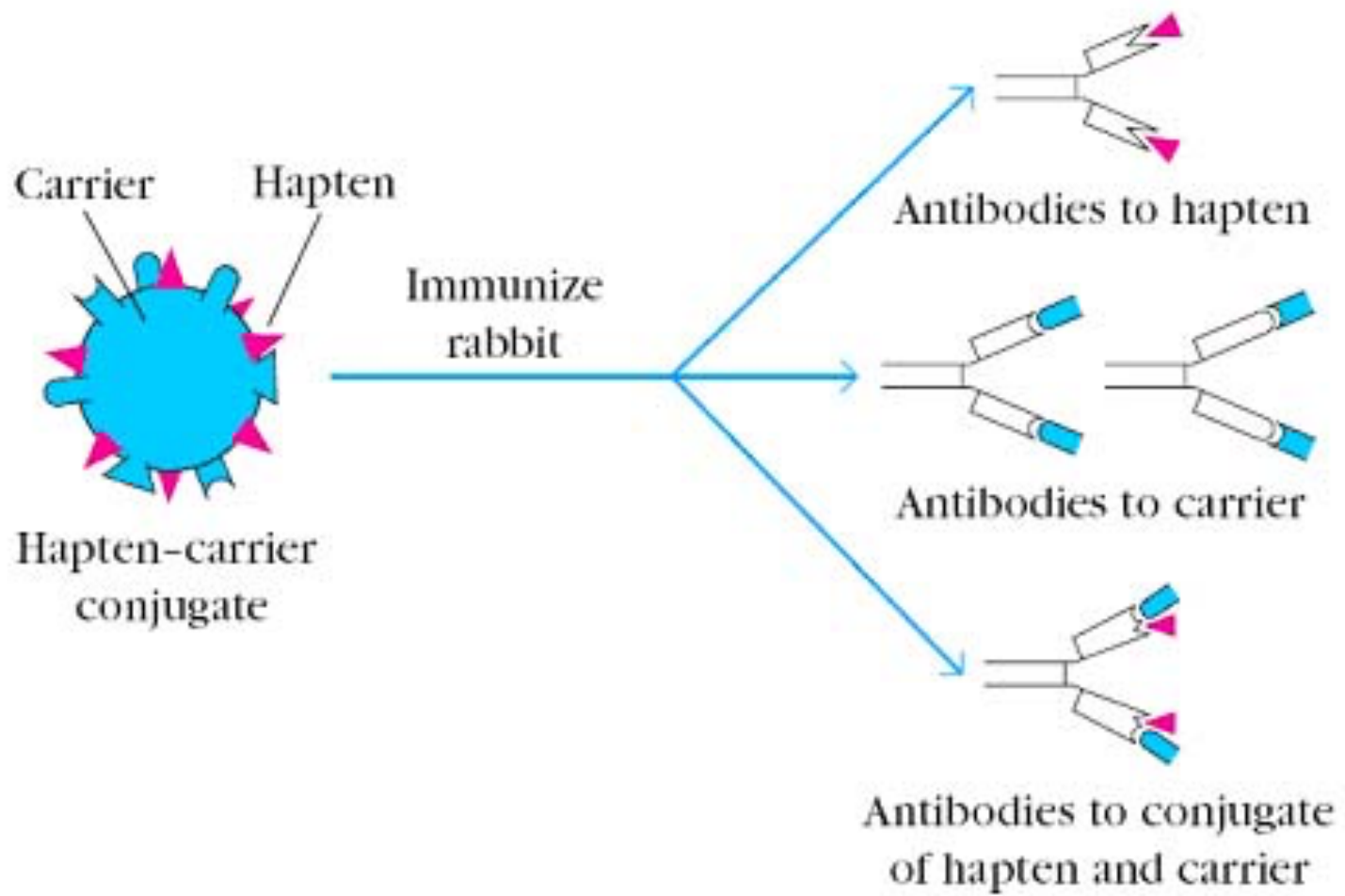
Hapten



- A substance that is non-immunogenic
- But it can react with the products of a specific immune response with no Antibodies formation.
- small molecules with a low Molecular Weight (Less than 10,000) that could never induce an immune response when administered by themselves unless it coupled to a carrier molecule.
- Has the property of antigenicity but not immunogenicity.

Pioneering work of Karl Landsteiner





Factors Influencing Immunogenicity 1

العوامل التي تؤثر على التوليد المناعي

1. Foreignness
2. Size
3. Chemical Composition
4. Physical Form الحالة الفيزيائية
 - Particulate > Soluble
 - Denatured > Native
5. Degradability القدرة على التحلل

Factors Influencing Immunogenicity 2

6. Genetics المحتوى الوراثي

Genotype

– Species

– Individual الأفراد

- Responders vs Non-responders

7. Age

8. Dose of antigen

9. Route of administration: Subcutaneous, Intravenous

10. Adjuvants:

Substances that enhance an immune response to an Ag

طبيعة مولد المناعة الكيميائي

Chemical Nature of Immunogens

- Proteins
- Polysaccharides
- Nucleic Acids
- Lipids

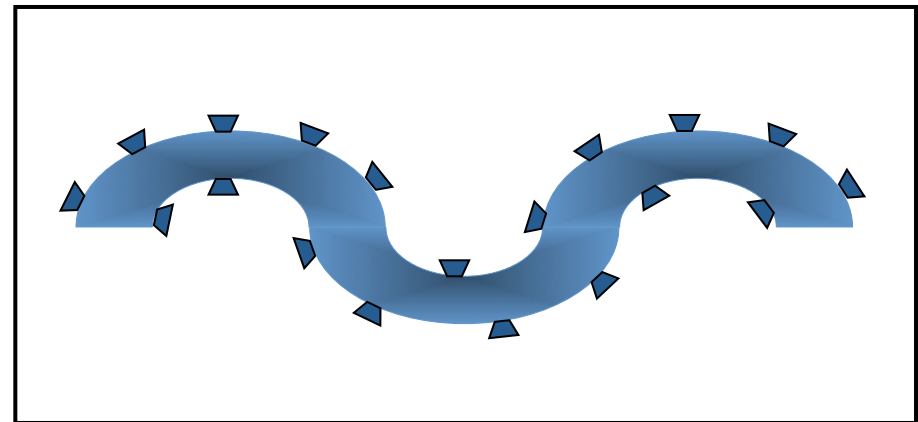
Types of Antigens

1. T-independent antigen

T-independent antigens are antigens which can directly stimulate the B cells to produce antibody without the requirement for T cell help. In general, **polysaccharides** are T-independent antigens.

- Examples

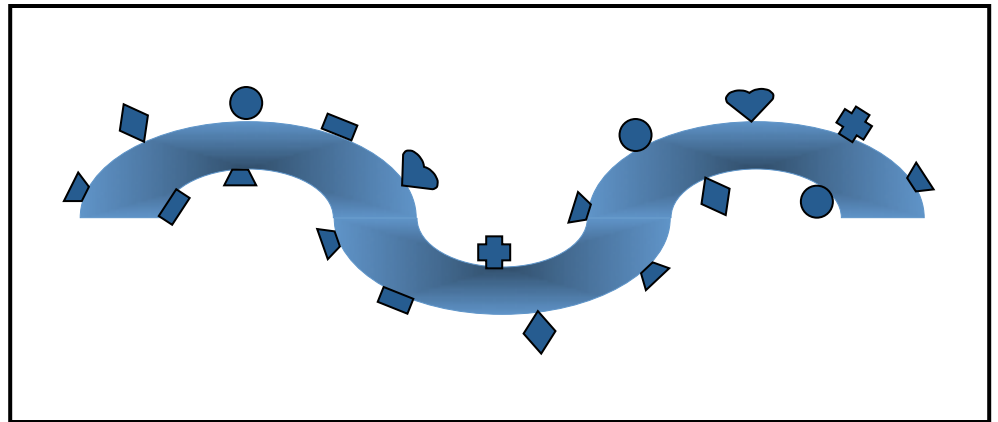
- Pneumococcal polysaccharide, lipopolysaccharide
- Flagella



2- T-dependent antigen:

T-dependent antigens are those that do not directly stimulate the production of antibody without the help of T cells. Proteins are T-dependent antigens.

- Examples
 - Microbial proteins



Superantigens

- Superantigens (SAg) are microbial proteins that can bind to T cells and then activate T cell.
- But the activation of T cells is non-specific polyclonal.
- Bind V β of TCR to α of MHC II.

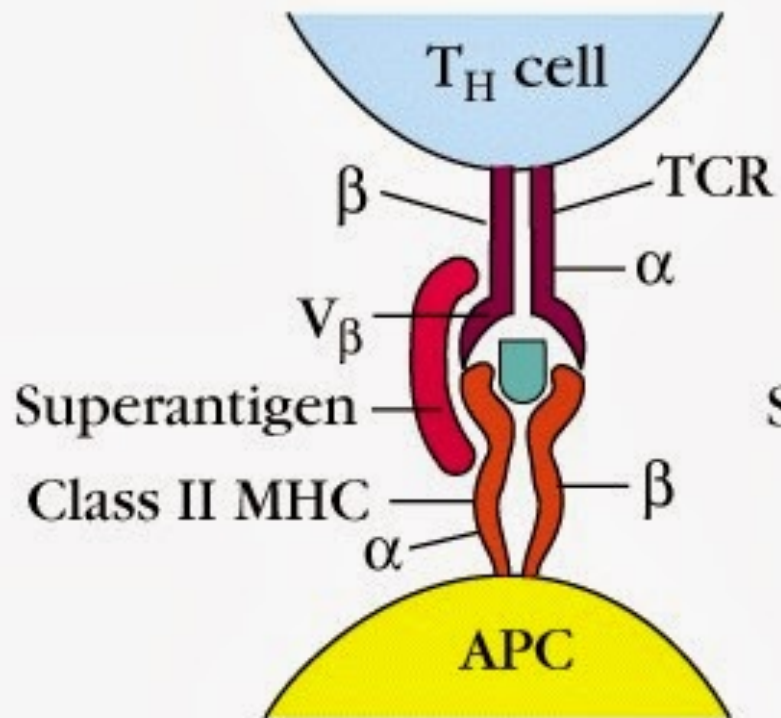
2 Types:

1. Endogenous SAg e.g. virally encoded membrane proteins infected mammalian cells (integrated viruses – retroviruses, EBV) (figure b)
2. Exogenous SAg - exotoxins produced by bacteria such as *Staphylococcus* enterotoxin (figure a)

Superantigens types

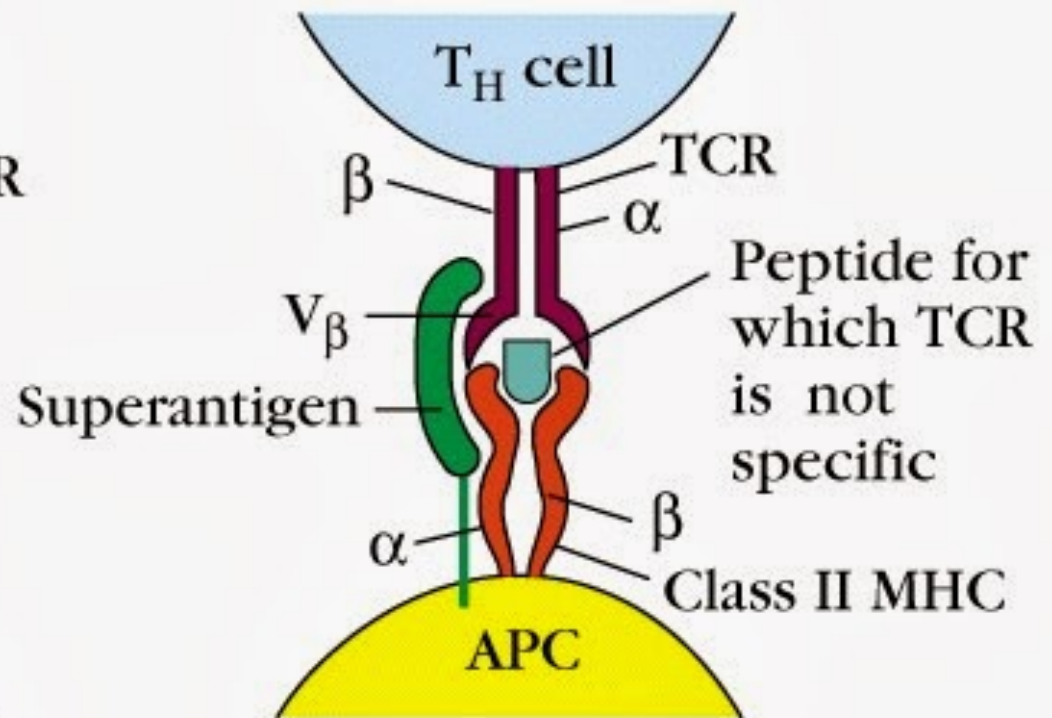
(a)

Exogenous
superantigen



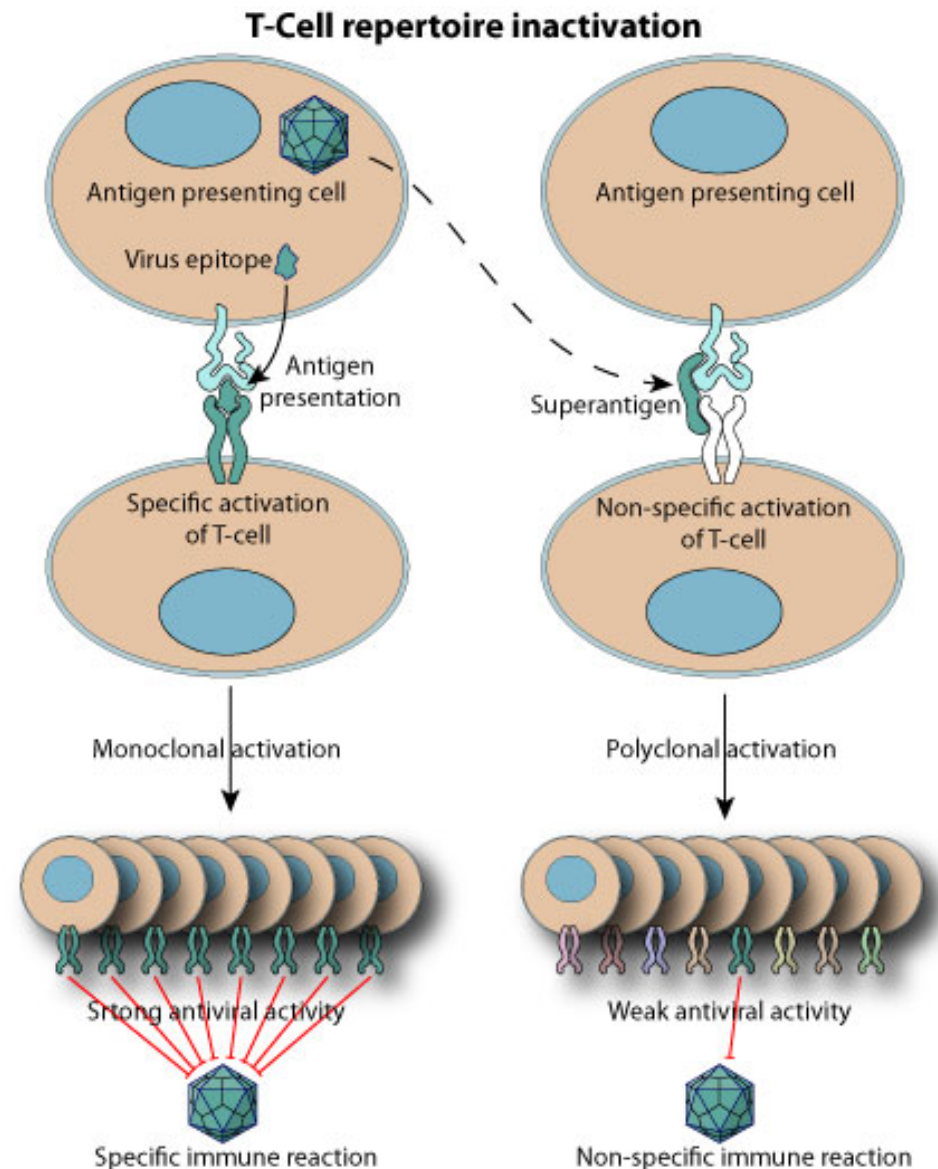
(b)

Endogenous
superantigen



Superantigen binding to T cells

- Bind simultaneously to MHC class II and TCR
- SAg binds outside the TCR antigen-binding region – activation is polyclonal
- Activate 3-20% of T cells.
- Release of massive cytokines



Summary

There are different antigens on the basis of immune response:

1. Complete antigen (immunogenic)
2. Incomplete antigen such as hapten (non-immunogenic)
3. T-Independent and T dependent antigen

By the end you will be able to answer these questions

- Defines different terminologies related to antigen ?
- What are the differences immunogenic and non immunogenic antigen, give examples?
- Compare between T-Independent and T dependent antigen?
- How are superantigens differ from normal antigen?