
# IMMUNOLOGY

Done By: Handout

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# 2

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**Immunogens.**

An immune response is evoked by a foreign agent called antigen or immunogen. The distinction between these two terms is functional, an antigen is a compound that is capable of binding with Ig or T-cell receptor, but does not necessarily evoke an immune response, an immunogen always does. Thus not all antigens are immunogens but the converse is true.

This is apparent with low molecular weight compounds known as haptens, the hapten can bind antibody but does not produce an immune response unless it is conjugated to a high molecular weight compound called carrier. The carrier provides the antigen to be processed and presented to T-cells which will provide help.

**Requirements for immunogenecity :**

1)- Foreigness. Exception auto-immune disease.
2)- High molecular weight : < 1kDa is not.
1-6 kDa may or may not be immunogenic.
> 6kDa are generally immunogenic.
3)- Chemical complexity : polymers of the same unit structure although of high m. w. are usually not immunogenic.

A compound must have all three properties to be immunogenic.

Other factors that affect an immune response are :

1)- The genetic make-up of the animal : responders and non-responders to a particular antigen is controlled by Ir genes which are autosomal dominant ( these in fact are MHC genes).

2)- Method and dose of administration of antigen : I/V, very high and low doses are not efficient. They may even lead to tolerance.

**Adjuvants :**

An adjuvant enhances the immunogenecity of an antigen, importance in immunisation. Distinguish from the carrier of a hapten. It does this through slow release and attraction of cells involved in the immune response e.g. macrophages.

Freund's adjuvant : water in oil emulsion with killed Mycobacteria tuberculosis. The most widely used one in humans is alum precipitate $Al(OH)_3$ suspension on which the antigen is adsorbed, it has an irritant effect which attracts and enhances ingestion by macrophages.

The antigen binding site to the antibody is called an antigen determinant or epitope. This is equivalent to about 5-7 amino-acids.

Epitopes may be linear or conformational.

Modification of an antigen can produce new epitopes, these are called neoantigenic determinants.
An antigen can have several epitopes. These epitopes may be different or identical, when identical the antigen is said to be multivalent.
The corresponding combining site on the antibody is called a paratope.
Epitopes may be exposed on the surface and combine with antibodies. Other epitopes may be buried within the structure of the antigen and may be presented after processing by macrophages, these combine with TcR.
Binding between antigen and antibody is non-covalent, electrostatic and hydrophobic and Van der Waals interactions which are usually weak forces and reversible, the FIT is important in the antigen antibody interaction.

**Cross-reactivity :**

An antibody may bind two different molecules that share the same epitope. This is important in immunisation Toxoids.

**Major classes of antigens :**

1)- Proteins : virtually all are immunogens. Multi-epitopes.
2)- Polysaccharides : potentially but not always. Glycoproteins.
3)- Lipids are usually non-immunogenic unless coupled to proteins.
4)- Nucleic acids : poor immunogens, exception SLE.

Antigens that illicit an immune response usually do so with the help of helper T-cells and thus are called T-dependant antigens. There are also T-independent antigens which trigger B-cells without Helper T-cells, they are usually polysaccharides of repeating units, they result in IgM mainly and there is no memory produced.. The mechanism is not clear.
Superantigens : non-specific polyclonal activation.

Endogenous and exogenous antigens in connection with MHC.

Affinity is a measure of the strength of binding of paratope to epitope.
Avidity is an overall measure of antigen antibody binding, this depends on the total number of epitope paratope binding i.e. multivalent antigen and pentameric antibody would produce high avidity even if the affinity is low. Thus IgM has potentially 10 combining sites which provide great avidity even if the affinity may not be very strong.