

جامعة الانبار
كلية العلوم
قسم التقنيات الأحيائية

اسم المادة: المناعة
Antigen : عنوان المحاضرة :
الاستاذ المساعد الدكتور صفاء عبد لطيف المعيني

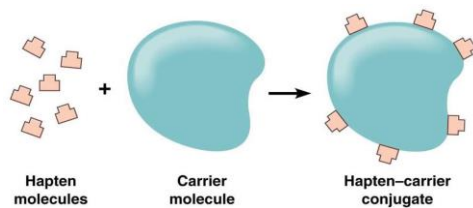
ANTIGENS

DEFINITIONS

Immunogen : A substance that induces a specific immune response.

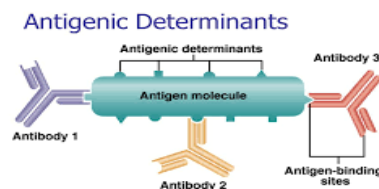
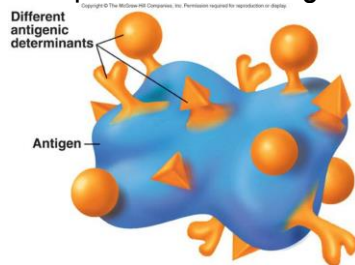
Antigen (Ag): A substance that reacts with the products of a specific immune response.

Hapten: A substance that is non-immunogenic but which can react with the products of a specific immune response. Haptens are small molecules which could never induce an immune response when administered by themselves but which can when coupled to a carrier molecule. Free haptens, however, can react with products of the immune response after such products have been elicited. Haptens have the property of antigenicity but not immunogenicity.



Epitope or Antigenic Determinant

That portion of an antigen that combines with the products of a specific immune response.



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

FACTORS INFLUENCING IMMUNOGENICITY

1- Contribution of the Immunogen

Foreignness

The immune system normally discriminates between self and non-self such that only foreign molecules are immunogenic.

Size

There is not absolute size above which a substance will be immunogenic. However, in general, the larger the molecule the more immunogenic it is likely to be.

Chemical Composition

In general, the more complex the substance is chemically the more immunogenic it will be. The antigenic determinants are created by the primary sequence of residues in the polymer and/or by the secondary, tertiary or quaternary structure of the molecule.

Physical form

In general particulate antigens are more immunogenic than soluble ones and denatured antigens more immunogenic than the native form.

Degradability

Antigens that are easily phagocytosed are generally more immunogenic. This is because for most antigens (T-dependant antigens) the development of an immune response requires that the antigen be phagocytosed, processed and presented to helper T cells by an antigen presenting cell (APC).

2- Contribution of the Biological System

Genetic Factors

Some substances are immunogenic in one species but not in another. Similarly, some substances are immunogenic in one individual but not in others (*i.e.* responders and non-responders). The species or individuals may **lack** or **have** altered genes that code for the receptors for antigen on B cells and T cells or they may not have the appropriate genes needed for the APC to present antigen to the helper T cells.

Age

Age can also influence immunogenicity. Usually the very young and the very old have a diminished ability to mount an immune response in response to an immunogen.

3- Method of Administration

Dose

The dose of administration of an immunogen can influence its immunogenicity. There is a dose of antigen above or below which the immune response will not be optimal.

Route

Generally the subcutaneous route is better than the intravenous or intragastric routes. The route of antigen administration can also alter the nature of the response

Adjuvants

Substances that can enhance the immune response to an immunogen are called adjuvants. The use of adjuvants, however, is often hampered by undesirable side effects such as fever and inflammation

CHEMICAL NATURE OF IMMUNOGENS

Proteins

The vast majority of immunogens are proteins. These may be pure proteins or they may be glycoproteins or lipoproteins. In general, proteins are usually very good immunogens.

Polysaccharides

Pure polysaccharides and lipopolysaccharides are good immunogens.

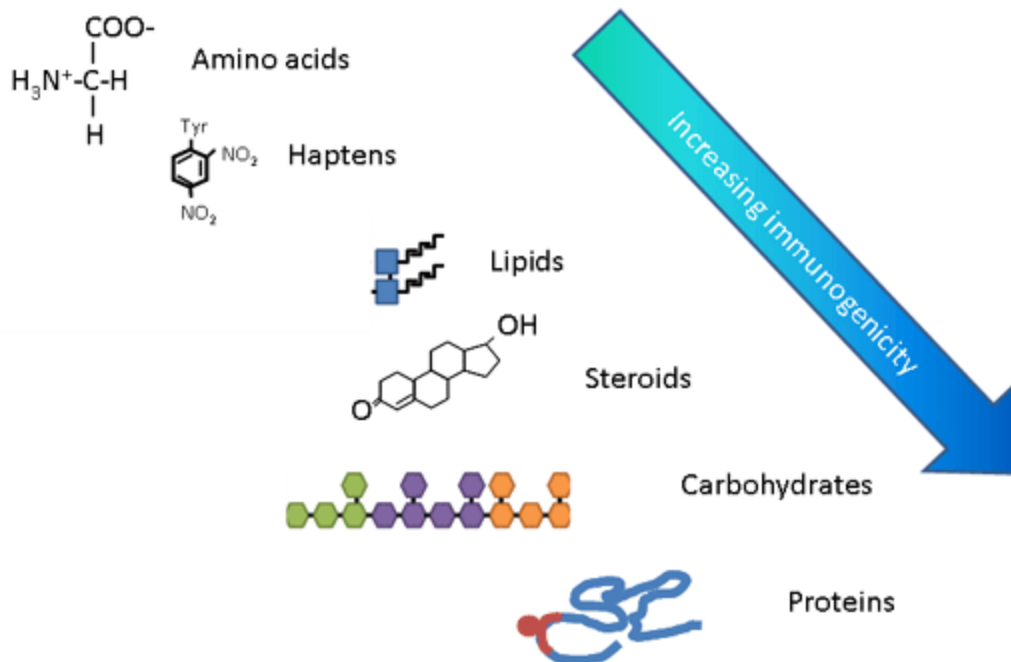
Nucleic Acids

Nucleic acids are usually poorly immunogenic. However, they may become immunogenic when single stranded or when complexed with proteins.

Lipids

In general lipids are non-immunogenic, although they may be haptens.

Immunogenicity



TYPES OF ANTIGENS

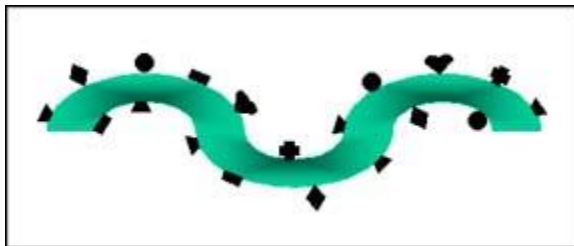
T-independent Antigens

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.



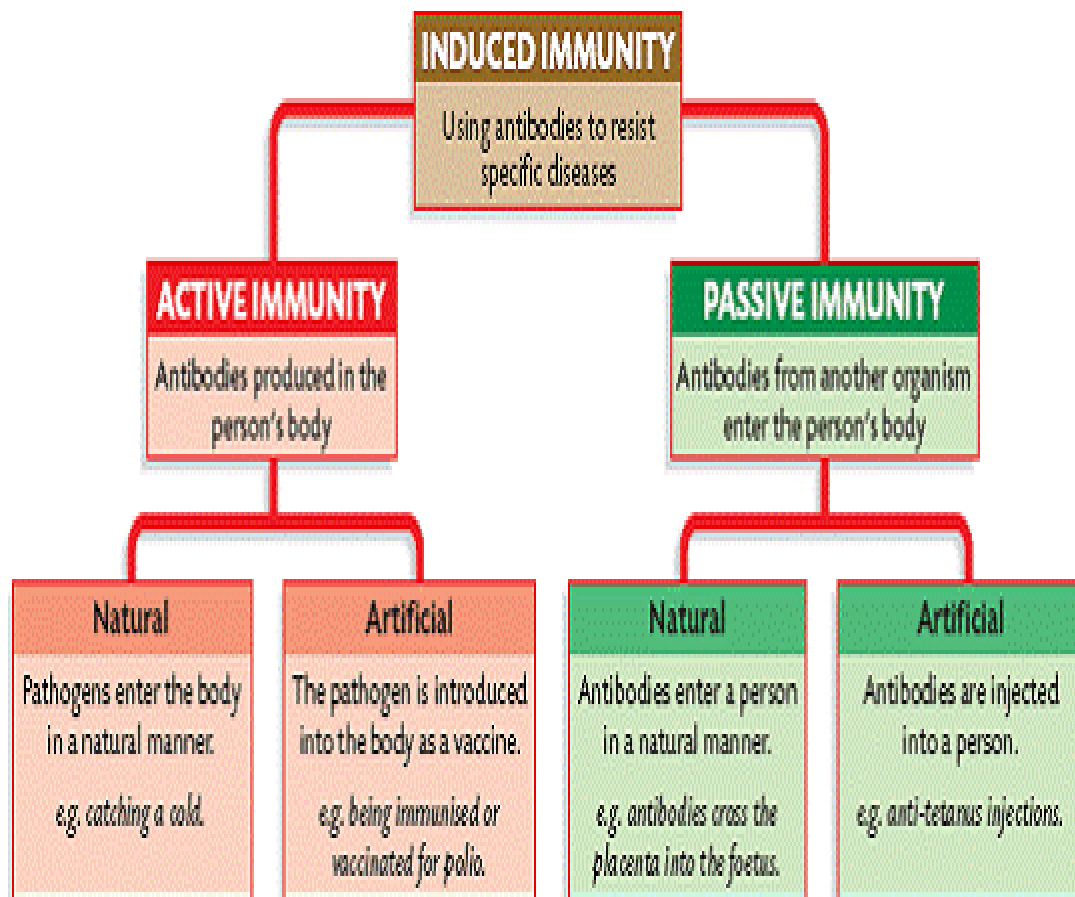
T-dependent Antigens

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.



SUPERANTIGENS

There are some antigens which polyclonally activate a large fraction of the T cells (up to 25%). These antigens are called superantigens. Examples of superantigens include: Staphylococcal enterotoxins (food poisoning) and Streptococcal pyrogenic exotoxins (shock).



References:-

- 1- Richard Coioco and Geoffery Sunshine (2014). Immunology. Seventh edition. Wiley Blackwell.