

# Factors influencing Immunogenicity

(M. Pal)

The term **immunogenicity** refers to the ability of a substance to induce cellular and humoral immune response, while **antigenicity** is the ability to be specifically recognized by the antibodies generated as a result of the immune response to the given substance.

Immunogenicity is influenced by:

## 1. Foreignness

- An antigen must be a foreign substance to the animal to elicit an immune response.

## 2. Molecular Size

- The most active immunogens tend to have a molecular mass of 14,000 to 6,00,000 Da.
- Examples: tetanus toxoid, egg albumin, thyroglobulin are highly antigenic.
- Insulin (5700 ) are either non-antigenic or weakly antigenic.

## 3. Chemical Nature and Composition

- In general, the more complex the substance is chemically the more immunogenic it will be.
- Antigens are mainly proteins and some are polysaccharides.
- It is presumed that presence of an aromatic radical is essential for rigidity and antigenicity of a substance.

## 4. Physical Form

- In general particulate antigens are more immunogenic than soluble ones.
- Denatured antigens are more immunogenic than the native form.

## 5. Antigen Specificity

- Antigen Specificity depends on the specific active sites on the antigenic molecules (Antigenic determinants).
- Antigenic determinants or epitopes are the regions of antigen which specifically binds with the antibody molecule.

## 6. Species Specificity

- Tissues of all individuals in a particular species possess, species specific antigen.
- Human Blood proteins can be differentiated from animal protein by specific antigen-antibody reaction.

## 7. Organ Specificity

- Organ specific antigens are confined to particular organ or tissue.
- Certain proteins of brain, kidney, thyroglobulin and lens protein of one species share specificity with that of another species.

## 8. Auto-specificity

- The autologous or self antigens are ordinarily not immunogenic, but under certain circumstances lens protein, thyroglobulin and others may act as **autoantigens**.

## 9. 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.
- They may not have the appropriate genes needed for the APC to present antigen to the helper T cells.

## 10. Age

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

## 11. 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).

## 12. Dose of the antigen

- 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.

## 13. Route of Administration

- 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.
- Antigen administered intravenously is carried first to the spleen, whereas antigen administered subcutaneously moves first to local lymph nodes.

## 14. 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.
- Example: aluminum hydroxide.