

# *Vaccines & immunization*

Vaccines: are immuno-biological substance that are used to elicit immune response ( I<sub>r</sub> ) to prevent or minimize disease produced by infectious agents

Type of vaccines: Vaccines are classified as follow:

1-Toxoids: bacterial toxins treated with formaldehyde to render them nontoxic with out effecting their antigenic properties.

Eg : tetanus & diphtheria

2-Inactivated (kill) vaccines: the microbes have been killed by various means.

Eg : cholera, polio (salk), pertusis, influenza, rabies, hepatitis A & B vaccines.

3-Live (attenuated) vaccines: the microbes have weakened by various means but still immunogenic, so they cause symptom-less infection that result in strong protection.

Eg: polio (sabin), BCG, MMR vaccines

4-coniugate vaccines: involve the conjugation of bacterial capsular polysaccharides to protein carriers e.g to tetanus toxiod or diphtheria toxoid.

Such polysaccharide conjugation vaccine induce a protective I<sub>r</sub>.

These are used against H. influenzae type b (cause bacterial meningitis in children)

5-Subunit vaccines: new generation of vaccines prepared using antigenic portions of pathogens rather than using the whole pathogen.

These antigenic portions are capable of inducing a protective I<sub>r</sub>.

Eg: purified Hepatitis B surface antigen (HBsAg) against hepatitis B virus.

6-Synthetic antigen vaccines: uses synthetic peptides that correspond to antigenic determinants on pathogen. These peptides are capable of inducing a protective Ir. Such peptides can be used as vaccines

7-DNA vaccines: the gene coding for immunogenic protein from a pathogen is inserted into plasmid & the plasmid is then injected into skin or muscle tissue.

Inside the host cell the gene direct the synthesis of particular protein (Ag), the body then produces antibodies directed against the protein these antibodies protect the person from infection with the pathogen

How do vaccines induce immunity:

vaccines act as antigens & stimulate the production of protective antibodies

The protective antibodies &/or memory cells produced in response to the vaccine remain in the recipient body to protect against a particular pathogen if that pathogen enter the recipient body in the future

The protective effects of antibodies include :

- 1- Neutralization of viruses
- 2- Initiation of complement mediated lysis of bacteria
- 3- Initiation of phagocytosis (opsonization)
- 4- Neutralization of bacterial exotoxins
- 5- prevention of bacterial adhesion to musosal surface (function of secretory IgA)

Characteristics of effective vaccines:

- 1- Safety (No disease caused by the vaccine it self)
- 2- Long-lasting immunity (protection must be long-lasting i.e induce T & B - memory cells)
- 3- Cheap (in expensive)
- 4- Promotes effective immunity
- 5- Easily administered
- 6- produce few side effects

Route of administration:

This depend on the nature of vaccine:

1-Injection:

- A-Intramusclar (MMR vaccine)
- B-subcutaneous (Hepatitis B vaccine)
- C- Intradermal (BCG)

2-oral (polio vaccine = sabin)

Contra-indication to vaccination:

- 1- Immunodeficiency disorder.
- 2- previous adverse reaction to vaccine
- 3- pregnancy
- 4- febrile child.

Types of vaccines used to prevent important infectious disease of humans :

Disease	Type of vaccine used
1- Diphtheria, tetanus & pertusis	→ Toxoid
2- Bacterial.pneumonia	→ purified polysaccharide
3- H.influenzae meningitis	→ conjugated vaccine
4- Measles,mumps & rubella	→ attenuated virus vaccine
5- Poliomyelitis	→ Inactivated virus
6- Influenza	→ Inactivated virus
7- Hepatitis B	→ Recombinant DNA vaccine or Inactivated virus

