

## **Vaccines**

These are substances that contain more than one living weakened , dead bacterium or weakened toxin as antigens that induce the body to form antibodies against it without the bacteria or their toxins having the ability to cause disease. This process is called immunization .

### **\* Ways to weaknesses bacteria for obtaining vaccines :**

- 1- Use of chemicals such as formalin
- 2- Exposing bacteria to high temperatures where their pathogenicity is driven .
- 3- Frequent bacteria culture (frequent subculturing) .
- 4- Drying the bacteria where the virus is less infectious and the paddle can be used as vaccine .

### **\* Features of weakened vaccines**

- 1- Gives strong ,long-acting immunity
- 2- Given in low doses
- 3- Low incidence of allergies occurs

### **\* Characteristics of dead vaccines**

- 1- Has no possibility of developing disease due to so called residual virulence .
- 2- Stable during storage

### **Vaccine's mechanism of action**

- 1- The immune system recognizes the foreign material (antigen) that present in the vaccine.
- 2- By special receptors , the macrophages will recognize the antigens and swallowed , digested then they reappeared on the surface of cells as simple proteins for recognized and treated by the lymphocytes to completes the process of appropriate immune response.

The immune system response against any vaccine is differed between the first and second dose. In the first dose , an initial response has obtained in which the antibodies are produced after a period of several days to two weeks from vaccine administration .Usually , the antibodies are of IgG type and reach their highest level at the fifth week then gradually declined.

At the second dose , a secondary immune response occurs which characterized by the rapid appearance of large amounts of IgG antibodies , during several days of vaccine administration , and remains longer period in the body or may be permanently.

### **Immunological response to vaccine**

A number of factors are affect the amount and quality of immune response to vaccines . These factors can be divided into two main categories :

- 1- The nature of vaccinated person : include several respects
  - a- Age of the vaccinated child (vaccination time)
  - b- Immune ability of the person
  - c- Acquired antibodies against the vaccine

- 2- The vaccine used : include several respects
- a- Nature and dose of the antigen used in the vaccine
  - b- using of immunological Co-factors in vaccine synthesis
  - c- Method of vaccine administration
  - d- Vaccine activity

### **Classification of vaccines**

According to substance prepared from or preparation method, vaccines are classified as follows :

**1- Live attenuated vaccines :** vaccines that contain suspensions of bacteria or viruses that have been weakened by heat or repeated cultivation ( sub-cultivation ) , so they have lost their ability to cause disease , but have retained their ability to provoke the formation of active immunity. The most important of these vaccines are :

\* Viral attenuated vaccines such as Mump , Smallpox , Rubella and Measles .

\* Bacterial attenuated vaccines such as tuberculosis vaccine

**2- Dead (killed) vaccines :** vaccines that contain suspensions of bacteria or viruses that have been killed by heat , chemotherapy , radiation and so on.

\* Viral dead vaccines such as Rabies and Influenza.

\* Bacterial dead vaccines such as Typhoid and Whooping cough.

**3- Vaccines of reduced toxins :** These are external toxins excreted by some bacteria, which have been weakened by heat or chemotherapy (by formalin) so they lost their toxicity and retained their ability to build immunity. The examples of these vaccines are Diphtheria and Tetanus,

this vaccine has been administrated at two doses to form active immunity and may be followed by third booster dose.

**4- Bacterial derivatives vaccines :** these are vaccines in which certain bacterial parts contain bacterium antigens are used , such as bacterial pili that causes Syphilis disease , Meningitis vaccine , and Polio vaccine.

**5- Protozoa and Helminthes vaccines:** the primary and helminthic animals are complex parasites that produce many antigens on their surface as well as through their metabolic products. In addition , different antigens appear during the stages of their development , so it's difficult to make a vaccine against them .

**Vaccine administration methods :**

1- By scratching the skin , such as Smallpox vaccine. \_\_\_\_\_

2- By subcutaneous injection , such as Cholera and Typhoid vaccine.

3- By injection into the skin , such as Tuberculosis vaccine.

4- By oral , such as Polio vaccine.