

Immunization:

- Two Artificial Methods of Immunity

1- Active immunization: Administration of antigens so patient actively mounts a protective immune response.

2- Passive immunization: Individual acquires immunity through the transfer of antibodies formed by immune individual or animal.

Brief History of Immunization

- Chinese noticed children who recovered from smallpox did not contract the disease again.
- They infected children with material from a smallpox scab to induce immunity .
- 1796 – Edward Jenner discovered process of vaccination
- 1879 – Louis Pasteur developed a vaccine against *Pasteurella multocida*.
- Antibody transfer developed when it was discovered vaccines protected through the action of antibodies.

Vaccine: are suspension of microorganism or their products to induce immunity in man against infectious microorganism..

Vaccines are the most effective means of controlling infectious diseases. They not only work to protect individuals who get them, they also protect others.

The vaccines are broadly classified into three types namely:

- 1- Live vaccines - attenuated vaccines.
- 2- Killed vaccines.
- 3- Toxoid vaccines.

Live vaccines - attenuated vaccines:

Live microorganism are attenuated by different methods.

Attenuation results in the loss of pathogenicity without the loss of antigenicity of microorganisms.

How Do Vaccines Work?

When a person is sick, the immune system makes antibodies that have the ability to remember the pathogen. With subsequent exposure to the pathogen, the immune system quickly responds by producing white blood cells to fight the infection, which results in no or only minor symptoms of disease.

This adaptive immune system response occurs because the immune system is capable of immunologic memory.

Vaccines work the same way except they cause immunity to a pathogen without causing the symptoms and complications of disease.

Types of vaccines

There are four basic types of vaccine in use today

- **Killed vaccines:** These are preparations of the normal (wild type) infectious, pathogenic virus that has been rendered non-pathogenic, usually by chemical treatment such as with formalin that cross-links viral proteins.
- **Attenuated vaccines:** These are live virus particles that grow in the vaccine recipient but do not cause disease because the vaccine virus has been altered (mutated) to a non-pathogenic form; for example, its tropism has been altered so that it no longer grows at a site that can cause disease.
- **Sub-unit vaccines:** These are purified components of the virus, such as a surface antigen.
- **DNA vaccines:** These are usually harmless viruses into which a gene for a (supposedly) protective antigen has been spliced. The protective antigen is then made in the vaccine recipient to elicit an immune response

Characteristics of Live and Killed Viral Vaccines.

No	Characteristic	Live Vaccine	Killed Vaccine
1	Duration of immunity	Longer	Shorter
2	Effectiveness of protection	Greater	Lower
3	Immunoglobulins produced	IgA and IgG	IgG
4	Cell-mediated immunity produced	Yes	Weakly or none
5	Interruption of transmission of virulent virus	More effective	Less effective
6	Reversion to virulence	Possible	No
7	Stability at room temperature	Low	High

In general, live viral vaccines are preferable to killed vaccines for three reasons:

- (1) they induce a higher titer of antibody and hence longer-lasting protection.
- (2) they induce a broader range of antibody, e.g., both IgA and IgG, not just IgG.
- (3) they activate cytotoxic T cells, which kill virus-infected cells.

There are some potential problems with live viral vaccines, the most important of which is reversion to virulence. Transmission of the vaccine virus to others who may be immunocompromised is another concern. Also there may be a second, unwanted virus in the vaccine that was present in the cells used to make the vaccine virus. This second virus may cause adverse effects.

The MMR vaccine is a live vaccine that gives protection against viral infection. It has attenuated strains of rubella, measles and mumps viruses but they are at such low levels they do not cause the disease. The vaccine is used so that the immune system can develop antibodies against the disease, which the immune system can then store as lymphocytes in the lymph nodes so that if any of the viruses enter the body again the immune system will already have the antibodies to destroy them. The MMR vaccine also causes another form of protection know as 'herd immunity' which prevents quick and large scale spread of the disease (Mark Harmon et al. 2003).



