Types of immunity:

*Natural passive immunity*

- Antibodies made in one individual are passed into another individual of the same species.
- This *is temporary protection*, for, as the antibodies do their job, or are broken down by the body's natural processes, their number diminishes and protection is slowly lost.
- For example, antibodies from a mother can cross the placenta and enter her fetus. In this way they provide protection for the baby until its own immune system is fully functional.
- Passive immunity may also be conferred by *colostrum* (the mother’s first milk), from which antibodies are absorbed from the intestines of the baby.
Acquired passive immunity

• Antibodies which have been made in one individual are extracted and then injected into the blood of another individual which may, or may not, be of the same species.

• For example, specific antibodies used for combating tetanus and hepatitis B are cultured in horses and later injected into humans. They act to prevent tetanus and hepatitis respectively.

• This type of immunity is again short-lived – a matter of weeks only.
Natural active immunity

- The body manufactures its own antibodies when exposed to an infectious agent.
- Memory cells produced on exposure to the first infection are able to stimulate the production of massive quantities of antibody, when exposed to the same antigen again.
- This type of immunity is most effective and generally persists for a long time - sometimes even for life.
- When a bacterial infection occurs and an antigen is presented for the first time, time is taken for the B and T cells to proliferate. Once the B cells have differentiated into plasma cells, specific antibodies can be secreted. This primary response lasts several days or weeks and then the concentration of antibody decreases as the plasma cells stops secreting them. Once the infection is eradicated, plasma cells die, but B memory cells are left in the body.
• If another infection of the same pathogen occurs, then the same antigen is reintroduced. There is a more rapid response, called the **secondary response**. This is much faster because there are many more memory B-cells that can produce many plasma cells and the appropriate antibody.

• These destroy the pathogen before it has the chance to cause any symptoms to occur.

• Memory cells are the basis for immunological memory – they last for many years, often a lifetime.

• It is possible for suffer repeated infections from a single pathogen because pathogens occur in different form, each having minor changes in the shape of the antigen, due to a possible mutation, and therefore requiring a primary response.
**Acquired active immunity**

- This is achieved by injecting small amounts of antigen - the vaccine - into the body of an individual.
- The whole process is called **vaccination** or **immunization**.
- The small dose of antigen is usually safe because the pathogen is either killed or attenuated (= crippled). This ensures that the individual does not contract the disease itself, but is stimulated to manufacture antibodies against the antigen.
- Often a second, booster, injection is given and this stimulates a much quicker production of antibody which is long lasting and which protects the individual from the disease for a considerable time.
Vaccinations

Currently vaccines come in three forms:

Living attenuated microbes:

- These are mutants of microbes that have lost the ability, either naturally or by treatment in the laboratory, to produce the dangerous, clinical disease.
- Some examples are the cowpox virus, measles, mumps and rubella (MMR vaccine) and polio vaccine virus.
- A vaccination consists of infecting you with a living microbe which then produces a limited infection.
- Because these attenuated strains are weak the immune system of normal healthy people quickly kill and eliminate them from the body.
- During this process the infection elicits a vigorous immune response that protects the host from infection by the related virulent, disease-producing form of the pathogen.
- Live vaccines produce the best immunization because they closely imitate the real thing.
- Immunity lasts for life.
Dead Microbes:

- These vaccines consist of growing up cultures of the virulent, disease-producing microbial strains and killing them in such a way that they retain their ability to stimulate the body to produce an immunological response to the live form.
- Examples include anthrax and rabies vaccine.
- Immunity lasts several years.

Virulence of Components of Pathogens:

- These vaccines consists of substances isolated from the virulent strains, such as polysaccharide material or proteins components.
- No whole organisms, living or dead are present in these vaccines.
- Examples include the toxins of diphtheria, tetanus and botulinum and the polysaccharide from virulent pneumococci.
Vaccinations by eating:

• Experiments are underway to deliver vaccines through common foods like potatoes and bananas.
• Genes that make an antigen effective against a microbe are cloned into a common food.
• The food is eaten by the "patient" and the cloned-antigen stimulates the immune system.

• DNA Vaccines:
• Vaccines consisting of DNA fragments that can be transformed into host tissue.
• Once in the host tissue, the DNA is transcribed and translated and the protein produced is seen by the specific immune system as foreign material and an immune response is induced.