Vaccines

A vaccine is a biological preparation that provides active acquired immunity to a particular infectious disease. It contains an agent that resembles a disease-causing microorganism and is often made from weakened or killed forms of the microbe, its toxins, or one of its surface proteins. The agent stimulates the body's immune system to recognize the agent as a threat, destroy it, and to further recognize and destroy any of the microorganisms associated with that agent that it may encounter in the future. Vaccines can be prophylactic and therapeutic.

The administration of vaccines is called vaccination. This is the most effective method of preventing infectious diseases. Because the widespread immunity is due to the vaccination and is largely responsible for the worldwide eradication of smallpox and the restriction of diseases such as polio, measles and tetanus. The effectiveness of vaccination has been widely studied and verified. The World Health Organization reports that vaccines are currently available for 25 different preventable infections.

The terms vaccine and vaccination are derived from *Variolae vaccinae.* This term is devised by Edward Jenner to denote cowpox. He used it in 1798 in the long title of his Inquiry into the *Variolae vaccinae known as the Cow Pox.* There he describes the protective effect of cowpox against smallpox. In 1881 Louis Pasteur proposed that the term should be extended to cover the new protective inoculations then being developed. There is overwhelming scientific consensus that vaccines are very safe and effective way to fight and eradicate infectious diseases. Limitations to their effectiveness, nevertheless, exist. Sometimes, protection fails because of vaccine-related failure such as failures in vaccine attenuation, vaccination regimes or administration or host-related failure due to host's immune system simply does not respond adequately or at all. Lack of response commonly results from genetics, immune status, age, health or nutritional status.

The efficacy of the vaccine is dependent on a number of factors:

-the disease itself (for some diseases vaccination performs better than others)

-the strain of vaccine (some vaccines are specific to, or at least most effective against, particular strains of the disease)

-whether the vaccination schedule has been properly observed

-idiosyncratic response to vaccination; some individuals are “non-responders” to certain vaccines, meaning that they do not generate antibodies even after being vaccinated correctly

-assorted factors such as ethnicity, age, or genetic predisposition.

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Adverse effects

Vaccination given during childhood is generally safe. Adverse effects are generally mild. The rate of side effects depends on the vaccine in question. Some common side effects include fever, pain around the injection site, and muscle aches. Additionally, some individuals may be allergic to ingredients in the vaccine. MMR vaccine is rarely associated with febrile seizures. Severe side effects are extremely rare. Varicella vaccine is rarely associated with complications in immunodeficient individuals and rotavirus vaccines are moderately associated with intussusception.

Types

There are several different types of vaccines. Each type is designed to teach the immune system of the person how to fight off certain kinds of germs – and the serious diseases they cause.

When scientists create vaccines, they consider:

- How the immune system of a person responds to the germ
- Who needs to be vaccinated against the germ
- The best technology or approach to create the vaccine

Based on a number of these factors, scientists decide which type of vaccine they will make. There are 4 main types of vaccines:

- Live-attenuated vaccines;
- Inactivated vaccines;
- Subunit, recombinant, polysaccharide, and conjugate vaccines;
- Toxoid vaccines.

Live-attenuated vaccines

Live vaccines use a weakened (or attenuated) form of the germ that causes a disease. Because these vaccines are so similar to the natural infection that they

help prevent, they create a strong and long-lasting immune response. Just 1 or 2 doses of most live vaccines can give a person a lifetime of protection against a germ and the disease it causes. But live vaccines also have some limitations. For example:

- Because they contain a small amount of the weakened live virus, some people should talk to their health care provider before receiving them, such as people with weakened immune systems, long-term health problems, or people who have had an organ transplant.
- They need to be kept cool, so they do not travel well. That means they can't be used in countries with limited access to refrigerators.

Live vaccines are used to protect against:

- Measles, mumps, rubella;
- Rotavirus;
- Smallpox;
- Chickenpox;
- Yellow fever.

Inactivated vaccines

Inactivated vaccines use the killed version of the germ that causes a disease. They usually do not provide immunity (protection) that's as strong as live vaccines. So a person may need several doses over time (booster shots) in order to get ongoing immunity against diseases.

Inactivated vaccines are used to protect against:

- Hepatitis A;
- Flu;
- Polio;
- Rabies.

Subunit, recombinant, polysaccharide, and conjugate vaccines

Subunit, recombinant, polysaccharide, and conjugate vaccines use specific pieces of the germ – like its protein, sugar, or capsid (a casing around the germ). Because these vaccines use only specific pieces of the germ, they give a very strong immune response that's targeted to key parts of the germ. They can also be used on almost everyone who needs them, including people with weakened immune systems and long-term health problems. One limitation of these

vaccines is that the person may need booster shots to get ongoing protection against diseases.

These vaccines are used to protect against:

- HIB (Haemophilus influenzae type b) disease;
- Hepatitis B;
- HPV (Human papillomavirus);
- Whooping cough (part of the DTaP combined vaccine);
- Pneumococcal disease;
- Meningococcal disease;
- Shingles.

Toxoid vaccines

Toxoid vaccines use a toxin made by the germ that causes a disease. They create immunity to the parts of the germ that cause a disease instead of the germ itself. That means the immune response is targeted to the toxin instead of the whole germ. Like some other types of vaccines, the person may need booster shots to get ongoing protection against diseases.

Toxoid vaccines are used to protect against:

- Diphtheria;
- Tetanus.

Developing immunity

The immune system recognizes vaccine agents as foreign, destroys them, and "remembers" them. When the virulent version of an agent is encountered, the body recognizes the protein coat on the virus, and thus is prepared to respond, by neutralizing the target agent before it can enter cells, and recognizing and destroying infected cells before that agent can multiply to vast numbers. When two or more vaccines are mixed together in the same formulation, the two vaccines can interfere. This most frequently occurs with live attenuated vaccines, where one of the vaccine components is more robust than the others and suppresses the growth and immune response to the other components.

Schedule

In order to provide the best protection, children are recommended to receive vaccinations as soon as their immune systems are sufficiently developed to respond to particular vaccines, with additional "booster" shots often required to

achieve “full immunity”. This has led to the development of complex vaccination schedules.

Answer the questions:

1.Give a definition of the term vaccine.

2.Which are the factors for the efficacy of the vaccines?

3.What are the adverse effects of the vaccination?

4.What are the types of the vaccines?

5.Describe the Live-attenuated vaccines.

6. Describe the Inactivated vaccines.

7.Describe the Subunit, recombinant, polysaccharide, and conjugate vaccines.

8.Describe the Toxoid vaccines.

9.Describe the developing immunity as a result of the vaccination.

10.What is the vaccination schedule?

What is your opinion about the vaccines. Use between 60 - 80 words.