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Vaccines –a tool for Health

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I. Introduction:

The word "vaccine" originates from the Latin Variable vaccine (cowpox), which Edward Jenner demonstrated in 1798 could prevent smallpox in humans. Today the term 'vaccine' applies to all biological preparations, produced from living organisms, that enhance immunity against disease and either prevent (prophylactic vaccines) or, in some cases, treat disease(therapeutic vaccines). Vaccines are administered in liquid form, either by injection, Boral, or by intranasal routes. Vaccines are composed of either the entire disease-causing microorganism or some of its components. They may be constructed in several ways.

- From living organisms that have been weakened, usually from cultivation under sub-optimal conditions (also called attenuation), or from genetic modification, which has the effect of reducing their ability to cause disease;
- From whole organisms that have been inactivated by chemical, thermal or other means;
- From components of the disease-causing organism, such as specific proteins and polysaccharides, or nucleic acids;
- From inactivated toxins of toxin-producing bacteria;
- From the linkage (conjugation) of polysaccharides to proteins (this increases the effectiveness of polysaccharide vaccines in young children)

The practice of immunization dates back hundreds of years. Buddhist monks drank snake venom to confer immunity to snake bite and variolation (smearing of a skin tear with cowpox to confer immunity to smallpox) was practiced in 17th century China. Edward Jenner is considered the founder of vaccinology in the West in 1796, after he inoculated a 13 year-old-boy with vaccine virus (cowpox), and demonstrated immunity to smallpox. In1798, the first smallpox vaccine was developed. Over the 18th and 19thcenturies, systematic implementation of mass smallpox immunisationculminated in its global eradication in 1979.

Louis Pasteur's experiments spearheaded the development of live attenuated cholera vaccine and inactivated anthrax vaccine in humans (1897 and 1904, respectively). Plague vaccine was also invented in the late19th Century. Between 1890 and 1950, bacterial vaccine development proliferated, including the Bacilli's-Chalmette-Guerin (BCG) vaccination, whichis still in use today.

In 1923, Alexander Glenny perfected a method to inactivate tetanus toxin with formaldehyde. The same method was used to develop a vaccine against diphtheria in 1926. Pertussis vaccine development took considerably longer, with a whole cell vaccine first licensed for use in the US in 1948.Viral tissue culture methods developed from 1950-1985, and led to the advent of the Salk (inactivated) polio vaccine and the

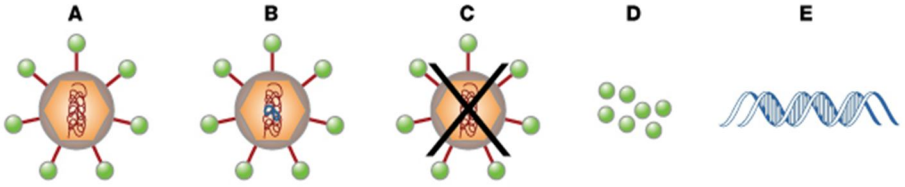
Sabin (live attenuated oral) polio vaccine. Mass polio immunization has now eradicated the disease from many regions around the world.

II.Types of Vaccines:

There are several basic types of vaccines. Some vaccines are describedhere.

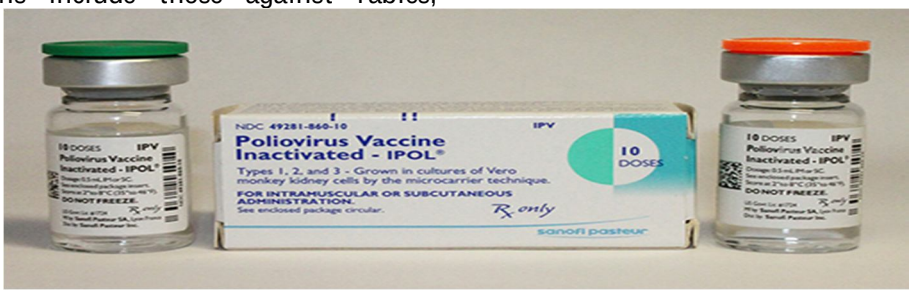
1. Attenuated:

whole-agent vaccines use living but attenuated (weakened)microbes. Examples of attenuated vaccines are the Sabin polio vaccine and those used against measles, mumps and rubella(MMR).The widely used vaccine against the tuberculosis bacillus sand certain of the newly introduced, orally administered typhoid vaccine contain attenuated bacteria.



2. Inactivated:

Whole-agent vaccines use microbes that have been killed. Inactivated virus vaccines used in humans include those against rabies, influenza and polio (the Salk polio vaccine). Inactivated bacterial vaccines include those for pneumococcal pneumonia, cholera, pertussis (whoopingcough)andtyphoid.

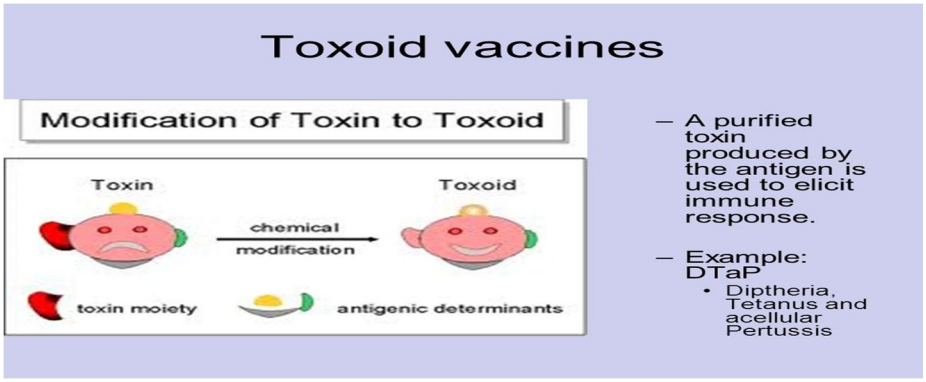


3. Toxoids:

which are inactivated toxins, are vaccines directed at the toxins produced by a pathogen. Examples.Vaccin eagainst tetanus and diphtheria

4. Subunit vaccines:

Use only those antigenic fragments of a microorganism that best stimulate an immune response. Subunit vaccines that are produced by genetic modification techniques, meaning that other microbes are programmed to produce the desired antigenic fraction, are called recombinant vaccines. For example, the vaccine against the hepatitis virus consists of a portion of the viral protein coat that is produced by genetically modified yeast.



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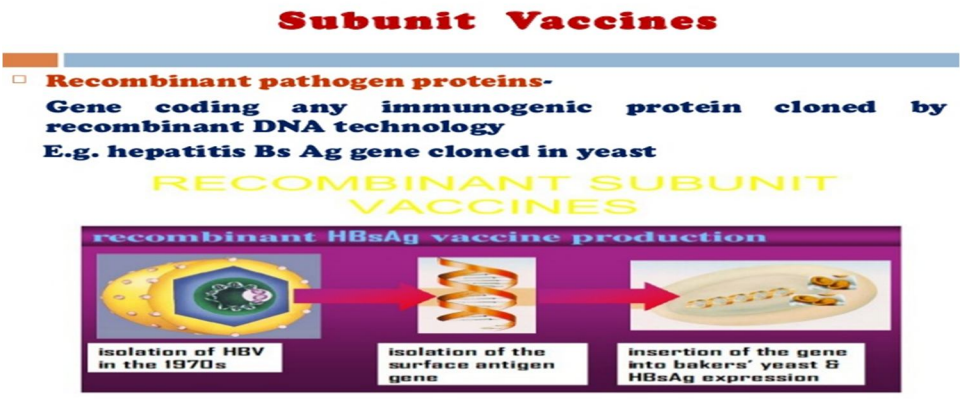
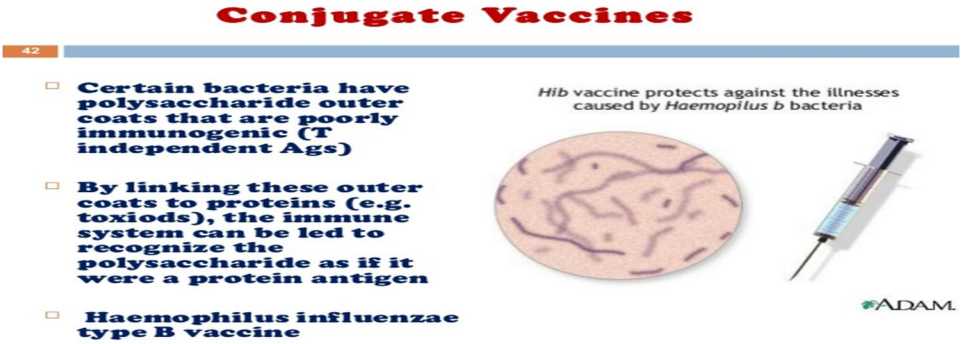
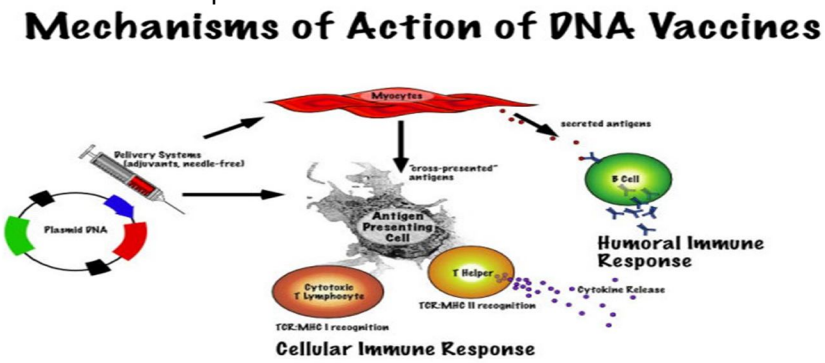


5. Conjugated vaccines:

Have been developed in recent years to deal with the poor immune response of children. The polysaccharides are combined with proteins such as diphtheria taxied. This approach has led to the very successful vaccine for hemophilic influenza type b, which gives significant protection.



6. Nucleic acid vaccines or DNA vaccines: Are among the newest and most promising vaccines, although they have not yet resulted in any commercial vaccine for humans. Experiments with animals show that plasmids of "naked" DNA injected into muscle results in the production of the protein encoded in the DNA.



VACCINES ARE ALSO CLASSIFIED AS FOLLOWS

1. First generation vaccines:

These are produced by conventional methods, e.g., small pox vaccine,

Salk's polio vaccine.

2. Second generation vaccines:

These are prepared with the help of genetic engineering technique, e.g.,

Vaccines against Hepatitis B and Herpes virus.

3. Third generation vaccines:

These are synthetic vaccines which are under trial.

Vaccines under study:

Vaccines against Malaria, Leprosy, Herpes, Hepatitis C, AIDS, Dental caries,etc. are under study.

III.MECHANISM

How do vaccines work?

When inactivated or weakened disease-causing microorganisms enter the body, they initiate an immune response. This response mimics the body's natural response to infection. But unlike disease-causing organisms, vaccines are made of components that have limited ability, or are completely unable, to cause disease. The components of the disease-causing organisms or the vaccine components that trigger the immune response are known as "antigens". These antigens trigger the production of "antibodies" by the immune system. Antibodies bind to corresponding antigens and induce their destruction by other immune cells The induced immune response to either a disease-causing organism or to vaccines configure the body's immune cells to be capable of quickly recognizing, reacting to, and subduing the relevant disease-causing organism. When the body's immune system issub sequently exposed to same disease-causing organism, the immune system will contain and eliminate the infection before it can cause harm to the body. The effectiveness and the duration of the protective effect of a vaccine depend both on the nature of the vaccine constituents and on the manner in which they are processed by the immune system (See Section 1.3). Some

disease-causing organisms, such as influenza, change from year to year, requiring annual immunization against new circulating strains. In very young children, the immune system is immature and less capable of developing memory. In this age group, duration of protection can be very short-lived for polysaccharide antigens.

IV.EFFECTS OF VACCINES:-

A vaccine side effect can be defined as an "adverse reaction" to a vaccine. Most vaccines have some "local" side effects such as pain, redness, swelling, or a small lump at the site
of injection. These side effects usually re solve in a few days, although lumps may take
weeks or longer to resolve.

V.CONCLUSION

Vaccination is highly important, because it provides protection not only for
vaccinated individuals but for those who cannot be vaccinated due to biological/genetic reasons and for young babies who cannot be vaccinated due to theirage. Vaccination is important for the whole society, and the effect of vaccination is not limited by one country only, because people all over the world are nowadays traveling more, and exposure to viruses combined with low vaccination can easily cause an outbreak in other countries, especially if they are using different scheme of vaccination or have lower rate of vaccinated people. Thus, in my opinion, the government should make vaccination compulsory, and introduce punitive sanctions for those who refuse to vaccinate their children. At the same time, the process of vaccination should be more open for parents and other involved people, and they should be able to control the procedure and be aware of the minimization of risk for the kids. The idea to make multiple vaccines at a time should also be reconsidered, because this might pose too significant threat for the kids' immunity. Although these procedures might be more costly, it would be better to apply to vaccines one at a time. TV and other mass media should also interact with the government and deliver scientifically reliable information to the people, because in the absence of information the public can easily

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