



The Importance and Development of Human Vaccines

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Description

Human vaccines have revolutionized the field of medicine, providing an effective means of preventing infectious diseases. This manuscript discusses the importance of vaccines, their history, and the process of their development. We also examine the different types of vaccines, including live attenuated vaccines, inactivated vaccines, subunit vaccines, and mRNA vaccines. Lastly, we highlight the ongoing efforts in vaccine research and development, including the development of new vaccines to combat emerging infectious diseases.

The development of vaccines has played a crucial role in the control and eradication of many infectious diseases. Vaccines work by stimulating the immune system to recognize and destroy specific pathogens, preventing the onset of disease. Since the first vaccine was developed over 200 years ago, vaccines have continued to be an important tool in the prevention of diseases that cause significant morbidity and mortality worldwide.

History of vaccines

The first vaccine was developed in 1796 by Edward Jenner, who produced a vaccine against smallpox. The vaccine was made from cowpox, a similar virus that causes a milder disease than smallpox. By exposing individuals to cowpox, Jenner was able to provide immunity to smallpox. The development of the smallpox vaccine was a major breakthrough in medical history, as smallpox had been responsible for millions of deaths over the centuries.

Since the development of the smallpox vaccine, many other vaccines have been developed, including vaccines against measles, mumps, rubella, polio, and tetanus, among others. These vaccines have had a significant impact on public health, reducing the incidence of these diseases to a fraction of what it was before the introduction of the vaccines.

Types of vaccines: There are several different types of vaccines that are currently in use or under development. These include:

1. **Live attenuate vaccines:** These vaccines contain weakened live viruses that can still replicate and cause an immune response but do not cause disease. Examples of live attenuated vaccines include the Measles, Mumps, and Rubella (MMR) vaccine.
2. **Inactivated vaccines:** These vaccines contain killed viruses or bacteria that cannot replicate or cause disease. Examples of inactivated vaccines include the polio vaccine and the hepatitis A vaccine.
3. **Subunit vaccines:** These vaccines contain only specific proteins or other components of the virus or bacteria. Examples of subunit vaccines include the Human Papillomavirus (HPV) vaccine and the hepatitis B vaccine.
4. **mRNA vaccines:** These vaccines use a small piece of genetic material called mRNA to instruct cells to produce a protein that is unique to the virus or bacteria. Examples of mRNA vaccines include the Pfizer-BioNTech and Moderna COVID-19 vaccines.

Vaccine development: The process of developing a vaccine is complex and can take many years. The first step is to identify the antigen, which is the part of the virus or bacteria that stimulates the immune system. Once the antigen has been identified, researchers must then determine the best method for delivering the antigen to the immune system. This can involve using live attenuated viruses, inactivated viruses or bacteria, subunit proteins, or mRNA.

Conclusion

Clinical trials are then conducted to test the safety and effectiveness of the vaccine. This involves testing the vaccine in small groups of healthy volunteers to determine the optimal dose and to monitor any side effects. If the vaccine is found to be safe and effective, it can then be submitted to regulatory agencies for approval. Emerging diseases and vaccine development in recent years, the emergence of new infectious diseases has highlighted the importance of vaccine development.

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