

The Role and Importance of Viral Vaccines and their Contributions in Preventing Viral Diseases

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DESCRIPTION

Viral vaccines have emerged as a beacon of hope in the ongoing battle against infectious diseases. These vaccines have played a pivotal role in curbing the spread of various viral illnesses, preventing millions of deaths, and improving the overall quality of life for people. In this article, we will discuss about viral vaccines, their history, mechanisms, types, and their significant contributions to public health.

A historical perspective

The concept of vaccination dates back centuries, with early attempts involving the use of substances from infected individuals to provide immunity against diseases like smallpox. The breakthrough moment in vaccine history came in 1796 when Edward Jenner successfully inoculated a boy with cowpox to protect against smallpox. This pioneering work laid the foundation for modern vaccinology.

Viral vaccines

Viral vaccines work by mimicking the presence of a virus in the body without causing the disease itself. They stimulate the immune system to recognize and mount a defense against specific viral pathogens. This process is achieved through two primary types of viral vaccines: live attenuated vaccines and inactivated (killed) vaccines.

Live attenuated vaccines: These vaccines use weakened forms of the virus that have lost their ability to cause illness while retaining their ability to activate an immune response. Examples include the Measles, Mumps, and Rubella (MMR) vaccine and the Oral Polio Vaccine (OPV).

Inactivated vaccines: Inactivated vaccines consist of viruses that have been killed or inactivated through physical or chemical methods. They cannot replicate in the body but can still stimulate an immune response. Common examples include the Polio Vaccine (IPV) and the hepatitis A vaccine.

Types of viral vaccines

Viral vaccines come in various forms, depending on the nature of the virus and the desired immune response. Some of the main types include:

Subunit vaccines: These vaccines contain only specific portions of the virus, such as proteins or surface antigens. The hepatitis B vaccine is an example of a subunit vaccine.

Vector vaccines: Vector vaccines use a harmless virus or bacterium as a delivery system to introduce genetic material from the target virus into the body. The COVID-19 vaccines developed by AstraZeneca and Johnson and Johnson use adenovirus vectors.

mRNA vaccines: The COVID-19 vaccines developed by Pfizer-BioNTech and Moderna are revolutionary examples of mRNA vaccines. They work by introducing a small piece of viral genetic material (mRNA) into cells to trigger an immune response.

DNA vaccines: These vaccines involve the insertion of a small piece of viral DNA into the body, which instructs cells to produce viral proteins and induce an immune response. DNA vaccines are still under development for various viruses.

Contributions to public health

Viral vaccines have made remarkable contributions to public health in several ways:

Disease eradication: Through widespread vaccination campaigns, some viral diseases have been completely eradicated or brought under control. Smallpox, for example, was officially declared eradicated in 1980 due to a successful global vaccination effort.

Prevention of severe illness: Vaccines have prevented countless cases of severe illness and death. Diseases like measles, polio, and influenza have seen a significant reduction in mortality rates due to vaccination.

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Herd immunity: Vaccination not only protects individuals but also contributes to herd immunity, reducing the overall spread of disease within communities. This is especially crucial for those who cannot receive vaccines for medical reasons.

Pandemic response: The rapid development and deployment of COVID-19 vaccines showcased the incredible potential of viral vaccine technology to respond to emerging infectious diseases.

Challenges and concerns

While viral vaccines have undoubtedly been a public health triumph, challenges and concerns persist. These include vaccine hesitancy, distribution inequities, and the potential for vaccine-resistant strains to emerge. Addressing these issues requires ongoing research, education, and international cooperation.

CONCLUSION

Viral vaccines represent a shining example of human ingenuity and scientific progress. They have saved countless lives, prevented untold suffering, and brought hope in times of crisis. As we continue to face new viral threats, it is essential to support vaccine research, ensure equitable access, and promote public understanding of the critical role that vaccines play in safeguarding our global health.