

Vaccine-preventable diseases

Lois Downey

Department of Medicine, School of Medicine, University of Washington, Box 359765, 325 Ninth Avenue, Seattle, WA 98104, USA

A vaccine-preventable disease is an infectious disease for which an effective preventive vaccine exists. If a person acquires a vaccine-preventable disease and dies from it, the death is considered a vaccine-preventable death. The most common and serious vaccine-preventable diseases tracked by the World Health Organization (WHO) are: diphtheria, Haemophilus influenzae serotype b infection, hepatitis B, measles, meningitis, mumps, pertussis, poliomyelitis, rubella, tetanus, tuberculosis, and yellow fever. The WHO reports licensed vaccines being available to prevent, or contribute to the prevention and control of, 27 vaccine-preventable infections.

Background

In 2012, the World Health Organization estimated that vaccination prevents 2.5 million deaths each year. [2] With 100% immunization, and 100% efficacy of the vaccines, one out of seven deaths among young children could be prevented, mostly in developing countries, making this an important global health issue. [1] Four diseases were responsible for 98% of vaccine-preventable deaths: measles, Haemophilus influenzae serotype b, pertussis, and neonatal tetanus. The Immunization Surveillance, Assessment and Monitoring program of the WHO monitors and assesses the safety and effectiveness of programs and vaccines at reducing illness and deaths from diseases that could be prevented by vaccines.

Vaccine-preventable deaths are usually caused by a failure to obtain the vaccine in a timely manner. This may be due to financial constraints or to lack of access to the vaccine. A vaccine that is generally recommended may be medically inappropriate for a small number of people due to severe allergies or a damaged immune system. In addition, a vaccine against a given disease may not be recommended for general use in a given country, or may be recommended only to certain populations, such as young children or older adults. Every country makes its own immunization recommendations, based on the diseases that are common in its area and its healthcare priorities. If a vaccine-preventable disease is uncommon in a country, then residents of that country are unlikely to receive a vaccine against it. For example, residents of Canada and the United States do not routinely receive vaccines against yellow fever, which leaves them vulnera-

ble to infection if travelling to areas where risk of yellow fever is highest (endemic or transitional regions).

List of vaccine-preventable diseases

1. Cholera
2. Dengue fever
3. Diphtheria
4. Ebolavirus
5. Haemophilus influenzae type b
6. Hepatitis A
7. Hepatitis B
8. Hepatitis E

The first disease people tried to prevent by inoculation was most likely smallpox, with the first recorded cases occurring in the 16th century in China. It was also the first disease for which a vaccine was produced. Although at least six people had used the same principles years earlier, the smallpox vaccine was invented in 1796 by English physician Edward Jenner. He was the first to publish evidence that it was effective and to provide advice on its production. [11] Louis Pasteur furthered the concept through his work in microbiology. The immunization was called vaccination because it was derived from a virus affecting cows (Latin: vacca 'cow'). Smallpox was a contagious and deadly disease, causing the deaths of 20–60% of infected adults and over 80% of infected children. When smallpox was finally eradicated in 1979, it had already killed an estimated 300–500 million people in the 20th century.

Mechanism of function

Vaccines are a way of artificially activating the immune system to protect against infectious disease. The activation occurs through priming the immune system with an immunogen. Stimulating immune responses with an infectious agent is known as immunization. Vaccination includes various ways of administering immunogens. Most vaccines are administered before a patient has contracted a disease to help increase future protection. However, some vaccines are administered after the patient already has contracted a disease.