World Health Organization Announces Eradication of Smallpox

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The last known case of smallpox was observed in Somalia in late 1977, and two years later, the World Health Organization announced that the virulent disease had been eradicated from the earth.

The Disease
Smallpox is a highly infectious disease that begins with shivers or convulsion, high fever, and intense low back pain, followed by characteristic red spots, pimples, and blisters ("pocks") that erupt with pale yellow liquid all over the body. Known throughout most of recorded human history, the disease seems first to have appeared in the Far East and China. The Egyptian pharaoh Ramses V died of smallpox in 1157 B.C.E.

Before the development of effective vaccination, as many as 80 percent of humans who lived in the Eastern Hemisphere contracted smallpox naturally—mostly in their youth. As many as 25 to 35 percent of those who were infected died from the disease during major epidemics. A large portion of those who contracted smallpox and survived were maimed or disfigured for the rest of their lives.

The smallpox disease agent, also known as Variola virus, is very large in comparison to most infectious viruses. It consists of brick-shaped particles typically ranging from 200 to 400 nanometers in length. The smallpox virus belongs to a large poxvirus family, which includes cowpox, chickenpox, swinepox, and monkeypox viruses. There are two major forms of the smallpox virus, namely Variola major and Variola minor. Variola major is the classic severe form of the virus that is responsible for extremely high case fatality rates, meaning that between 20 percent and 50 percent of those infected die from the disease. Variola minor is a milder form of smallpox virus with less than 2 percent case fatality rate, and it was confined to certain geographical regions.

The Vaccine
The early nineteenth century physician Edward Jenner is credited with revolutionizing the vaccination technique for protecting humans against fatal smallpox virus infections. His work was preceded by marginally successful inoculation techniques that had been developed earlier by Emanuel Timoni and later advocated by Lady Mary Wortley Montagu.

Before Jenner, protection against smallpox was accomplished through a procedure called insertion or variolation, in which healthy persons were exposed to pus exuded from pocks blisters on sick smallpox patients. Threads impregnated with the pus materials were inserted into tiny cuts in the healthy patients' skin to induce immunity. The procedure was controversial because a small but definite fraction of the number of people
who underwent variolation died as a result, and because some inoculated persons propagated smallpox by contagion.

Jenner's work is significant because it greatly reduced the danger of contracting or spreading smallpox through the process of inoculation. His new method, called vaccination (after the Latin word for “cow”), was based on the use of such animal poxviruses such as swinepox and, more notably, cowpox (also known as vaccinia) viruses to induce immunity to human smallpox.

In 1798, Jenner wrote in his landmark first book that cowpox protected the human constitution from the infection of the smallpox. His experiments and anecdotal observations showed that dairy farmers who had been exposed to cowpox were immune to smallpox. Like variolation, however, vaccination was also controversial, although only benign secondary effects accompanied vaccination and it carried no risk of contagion for others. The nature of smallpox vaccines later used for the eventually successful eradication of smallpox disease was of varied origin, including different kinds of cowpox and attenuated smallpox viruses.

Ending the Disease

Between 1798 and 1815, applications of Jenner's vaccination method spread quickly—first throughout Europe, Russia, Japan, and the United States and later to other parts of the world. Italian physicians added the refinement of producing fresh vaccine stock from inoculated heifers. The use of the so-called animal vaccines became widespread because it avoided the side effect of transmission of unrelated disease agents, which had been a concern for the so-called arm-to-arm method of vaccination previously used. After 1837, many countries began to make vaccination obligatory. However, realistic planning for the eradication of smallpox on a global scale were not formalized until the creation of an institutional structure for such programs.

The World Health Organization (WHO) represented such an institution. Frederick Soper, director of the Pan American Sanitary Bureau had overseen a program to eradicate smallpox from the Americas, and in May, 1959, at its Twelfth World Assembly, WHO adopted a global eradication campaign. Viktor M. Zhdanov, the minister of health in the Soviet Union was one of the earliest strong advocates for the global smallpox eradication program, and his country donated most of the vaccine doses required for the effort.

Consequences

Despite these efforts, the global eradication campaign met with limited success until 1967, when many nations renewed their financial commitments, and Donald A. Henderson, on leave from the U.S. Centers for Disease Control, became director of WHO's smallpox eradication program. The eradication campaign was assisted by innovation in the design of the vaccine delivery tool, in the form of a bifurcated needle developed by Wyeth Laboratories, which waived patent fees.

The smallpox eradication campaign was most labor-intensive in India, where more than half of all global smallpox patients resided during the mid-twentieth century. The last case of smallpox observed in India was treated in 1976. The last natural case of smallpox anywhere was that of a man named Ali Maow Maalin, who was diagnosed in October, 1977, in Merca, Somalia. On December 9, 1979, twenty officials of the WHO smallpox eradication commission signed a certificate solemnly declaring that the global eradication of smallpox had been accomplished.

In early 1999, President Bill Clinton announced that the United States would retain its sample of the smallpox virus—which was one of only two samples known to exist in the world. Many scientists and military leaders objected to destroying the last samples of the virus out of concern that samples secretly kept by other nations might be used as agents of bioterrorism—in which case the preserved sample might be used to create antiviral agents or vaccines.

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