Building on success

The world’s last case of smallpox was recorded in Somalia in 1977. Ali Maalin suffered only a mild form of the disease and quickly recovered. Later, when his little sister died of measles, he trained as a health worker and devoted himself to the immunization of children. Photo WHO/J. Wickett

The story of the eradication of smallpox and WHO’s continuing fight against preventable diseases

Twenty years after winning the battle against smallpox, WHO is still fighting the war against disease. Are the lessons learnt from the smallpox eradication campaign still relevant today?

Smallpox is dead

Ali Maalin of Merka town, Somalia, is the last recorded case of smallpox in the world. The onset of his rash on 26 October 1977 led to a veritable military operation - tracing contacts, quarantine and vaccination. National staff and WHO officers combined forces to make sure that the variola virus - the virus that causes smallpox - did not escape.

Then came a time for everyone to hold their breath and hope. Would smallpox spring up somewhere else? It is easy enough to identify the virus, but much more difficult to prove that it does not exist anywhere. WHO offered a reward of US$ 1000 to anyone who could identify a case of smallpox. Claim after claim was made. All were thoroughly investigated. None were smallpox.

On 9 December 1979, the members of the Global Commission for the Certification of Smallpox Eradication solemnly affixed their signatures to the statement that "smallpox has been eradicated from the world".

Battle campaign

The only way to eradicate smallpox was to make sure that every single case was found and isolated. Otherwise, the virus could spread. There is no treatment for smallpox. A method for preventing smallpox has been known from ancient times. In this method, called variolation, a healthy person is deliberately scratched with substance taken from an infected scab. A person who survives variolation is immune, but use of the live virus can spread the disease.

The breakthrough came in 1796 when Edward Jenner took material from a cowpox sore on the hand of a milkmaid and inoculated it into the arm of an eight-year-old boy. When he tried to inoculate the boy with smallpox two months later, the infection did not take. The findings were announced in 1798 and thousands of people were subsequently vaccinated. In 1801, Jenner predicted the annihilation of smallpox.

Why did it take so long to achieve that goal? With hindsight, the answer is clear. While some populations were protected by vaccination because the knowledge and means were available to provide the necessary public health care, other populations remained at risk. The smallpox virus can only survive in a human host. If one person in the whole world has smallpox, the disease can spread, and anyone who has not been vaccinated is at risk.

The problem of smallpox was raised at the very first meeting of the World Health Assembly in 1948. Ten years later, at the instigation of the Soviet delegation, the Assembly decided to step up efforts to eradicate smallpox. Mass vaccination campaigns were launched in many countries, but the goal of eradication remained elusive. Millions were still dying from the disease.

In 1967, a unit set up at WHO headquarters in Geneva started to work with WHO Regional Office teams and national programmes in an intensified effort to eradicate smallpox. By 1971, endemic smallpox had been cleared from South America...
following a huge programme of mass vaccination and case searching, in particular covering the vast Amazon basin. In Asia, the campaign strategy was refined to include improved case investigation and the containment of outbreaks, and the last case was seen in 1975—a three-year-old girl in Bangladesh. The final stage of the campaign was in the Horn of Africa, the last remaining foothold of the disease.

The total cost of the smallpox eradication campaign was some US$ 330 million. In economic terms, its benefit has been around US$ 1000 million annually. But the human benefit of averting needless suffering, disfigurement, blindness and death is immeasurable.

Know-how and expertise

The smallpox eradication campaign brought governments, health workers and ordinary people throughout the world face to face with a successful health intervention. A heat-stabilized vaccine was developed. Cold chains were set up to bring the vaccine safely to remote areas. The inoculation technique was simplified—bifurcated needles replaced syringes. Alongside these technical advances, success enhanced the credibility of preventive health care. As the Director-General of WHO said at the time: “Victory over smallpox ... reasserts our ability to change the world around us for the better.”

Has WHO capitalized on its success? Do the specifics of smallpox—absence of asymptomatic carriers, no animal reservoir, ease of identifying former cases because of characteristic scarring—make the eradication of smallpox a unique event?

Smallpox eradication created a demand for immunization. Governments could see that it was cost-effective and people could see that it worked. In 1974, before the goal of the eradication of smallpox had been reached, and at a time when fewer than 5% of infants in developing countries were protected against the vaccine-preventable diseases of childhood, WHO established a programme to expand its immunization efforts. Today, some 80% of children throughout the world are immunized against diphtheria, pertussis (whooping cough), tetanus, tuberculosis, poliomyelitis and measles. Work continues on vaccine development, and the Health Assembly has set goals for the eradication of polio and the control of other diseases.

What next?

Following the certification of the eradication of smallpox, the World Health Assembly in 1981 struck smallpox from the International Health Regulations. The disease has gone, but the virus still exists—in two carefully guarded laboratories at the Centers for Disease Control and Prevention, Atlanta, Georgia, USA, and the Russian State Research Centre of Virology and Biotechnology, Koltsovo, Novosibirsk Region, Russian Federation.

In 1996, the Health Assembly recommended that all stocks of variola virus should be destroyed. The escape of the virus would be a serious risk, because of the proportion of the population lacking immunity to smallpox. Extensive studies have been made of the virus. Sequence information on the genome of several virus strains and cloned DNA fragments of genome allow for further research, as well as for the diagnosis of suspected smallpox.

It is reassuring to know that the destruction of the virus stocks would not affect the capacity to produce smallpox vaccine, which—as in the time of Jenner—is still derived from cowpox. Nor would it prevent the reintroduction of vaccination in response to the recent change in the pattern of monkeypox infection in humans, with greater person-to-person transmission than previously. (Vaccination against smallpox also protects against monkeypox.) The smallpox vaccine seed virus (vaccinia virus strain Lister Elstrea) will be maintained at the WHO Collaborating Centre on Smallpox Vaccine at the National Institute of Public Health and Environmental Protection, Bilthoven, Netherlands.

The little sister of Ali Maalin was not as lucky as her brother: she died of measles. Shocked, Ali Maalin trained as a health worker so that he could help to protect other children against that disease.

WHO, through its Global Programme on Vaccines and Immunization, is striving to protect humanity against preventable diseases. As the story of smallpox shows, an international strategy is needed to vanquish these diseases. Who better to lead it than WHO?