In the aftermath of "target zero"

by Zdenek Jezeck

In October 1977, health staff working in the small port of Merka, in southern Somalia, diagnosed a case of smallpox in a 23-year-old hospital cook named Ali Maow Maalin. He was isolated, and his friends and co-workers who had been in close contact with him were located, examined and vaccinated. Health teams then fanned out in search of every case of chickenpox and skin rash they could find. No more smallpox was discovered.

Mankind had seen its last case of this endemic disease. Smallpox "target zero" had now indeed been achieved. The ancient scourge, which had killed millions since the dawn of civilization, was finally eradicated. This fact was certified, in a historical session, by the Thirty-third World Health Assembly of the WHO in May 1980.

But the job was not yet finished. It was necessary to convince the world community that the disease had gone forever, to ensure that advantage was rapidly taken of the benefits of this achievement. Despite the overwhelming evidence that the world had been freed from smallpox, measures needed to be taken by the Member States and their Organization to ensure that this situation remained permanent. Recommendations formulated by the Global Commission for the Certification of Smallpox Eradication and the newly-established special WHO Committee on Orthopoxviruses Infections assisted WHO to map out a post-eradication "insurance policy" focusing on the main goal: public safety by maintaining the world permanently free from smallpox.

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Vaccination policy: The modern world had built up an elaborate system of defence against smallpox which included compulsory vaccination and constant checks on international travellers. Already part of that system was being dismantled by 1977, when worldwide eradication became imminent. By that time, routine vaccination, which had been in existence for over 175 years, was no longer required in several countries of North America, Europe and the Western Pacific. Even so, 133 countries were still continuing routine vaccination programmes.

With the certification of the eradication of smallpox in May 1980, the representatives of WHO's Member States endorsed the recommendations that routine vaccination against smallpox was no longer justified and should be discontinued in every country. By the end of 1984, all countries had ceased smallpox vaccination of the general public.

Routine vaccination did not cease instantly, as appropriate instructions were not always transmitted throughout the health services. In some places, smallpox vaccine continued to be made available on request. Health staff in these countries had to explain to anxious parents that the risks posed by vaccination for their children stood against "zero" benefits. There was no disease to be feared. Some physicians had to be persuaded that smallpox vaccination has no value in treating or preventing recurrent herpes infections, warts and so forth, and that, furthermore, misuse of smallpox vaccine for such treat-
ment is associated with the risk of severe complications.

In 1983, WHO contacted governments and vaccine producers and urged them not to distribute vaccine to civilians. Nevertheless, military personnel have continued to be vaccinated in some countries, resulting in the accidental vaccinal infection of their civilian contacts. In 1983, in order to prevent such incidents, the Committee on Orthopoxvirus Infections recommended that “military personnel who have been vaccinated be confined to their bases and prevented from contacting unvaccinated persons for a period of two weeks following vaccination”. And in 1986 the Committee proposed that smallpox vaccination of military personnel be terminated. Smallpox vaccination is now only required for the small number of laboratory workers who handle variola virus or closely related orthopoxviruses in their laboratories. Vast sums taken from scarce health resources and spent on smallpox vaccination in the past are now diverted to other pressing public health problems.

Checks on international travellers: In May 1980, the Member States agreed to withdraw requirements for valid smallpox vaccination certificates for international travellers, and the following year smallpox was formally struck from the International Health Regulations. Despite health administrations withdrawing such requirements, international travellers and crews of ships and aeroplanes were occasionally asked for such certificates at ports and airports, when applying for visas, or simply by travel agencies. WHO cooperated with national health authorities to clarify reports of such incidents, which had virtually ceased by 1986.

Reserve stock of smallpox vaccine: In order to free the world from vaccination regulations, national health authorities had to be absolutely sure that smallpox was gone and that a smallpox vaccine reserve is kept in case of unexpected emergencies. A reserve stock was established by WHO in 1980, and its existence made it much easier for Member States to decide to discontinue both smallpox vaccination and vaccine production. It has been widely publicised that vaccine from this stock can be made available and, in an emergency, could reach any country in the world within 24 hours.

At the end of last year the stock amounted to more than five million ampoules which, with the use of bifurcated needles, would be sufficient to vaccinate about 250 million persons. Considering that nearly ten years had elapsed since the last endemic case of smallpox and that human monkeypox had not proved to be a significant health problem, the Committee on Orthopoxvirus Infections considered in March 1986 that there was no further need for WHO to maintain the global vaccine reserve.

Reports on smallpox prove false: We had no doubt that reports of suspected cases of smallpox would reach WHO for several years after the declaration of its eradication. The thorough and prompt investigation of such reports, backed up by laboratory examination and subsequent disclosure of results, would be a very important element of post-eradication surveillance. Any report of a suspected case is regarded as a public health emergency and has to be promptly investigated. Since 1980, WHO has coordinated the investigation of 131 rumours of suspected cases, recorded in an International Rumour Register. The key role in confirming a correct or incorrect diagnosis lies with two WHO Collaborating Centres, at the Centers for Disease Control, Atlanta, USA, and at the Research Institute for Viral Preparations, Moscow, Soviet Union, who provide laboratory diagnostic services. No single case of smallpox has been proven.

Variola virus after eradication: Once the transmission of endemic smallpox had ended, the only known source of variola virus—and a potential danger for the future—resided in laboratories.
holding stocks of variola virus, who began trying to reduce their number even before smallpox-free status had been reached.

In 1975, WHO officials contacted all those countries and individual laboratories known to have worked with the virus in the past. By the end of 1976, 75 laboratories were identified which held stocks of variola virus.

The following year, the Thirtieth World Health Assembly recommended that stocks be retained only in WHO Collaborating Centres and under conditions assuring the maximum safety. WHO officials sought to persuade the laboratories to destroy the virus held or transfer it to the WHO Collaborating Centres.

Lost or hidden vials with variola virus remained a worldwide concern at that time. There was no way for WHO officials to go through every deep-freeze in the world and look at each vial.

Only 18 laboratories were known to have retained variola virus at the end of 1977. The laboratory associated outbreak of smallpox in Birmingham, United Kingdom, in 1978 and the declaration of the eradication of smallpox in May 1980 provided a strong incentive for them to destroy or transfer their stocks. Since 1984, variola virus has been confined to glass-vials kept under high security in the two WHO Collaborating Centres, neither of which now culturizes the virus.

For centuries, the word “smallpox” brought terror to the civilized world as it killed hundreds of millions of people. Dramatic news it was therefore when the World Health Assembly in May 1980 declared the disease to have been wiped out from the Earth. This was the first disease to be totally conquered by man.

Animal poxviruses—monkeypox: One of the bases on which eradication of smallpox was attempted was the conviction that this specifically human disease had no intermediate host or reservoir of variola virus in animals.

Although a variety of animals suffered from “pox” diseases, man had not been significantly affected by them. But one animal pox-disease known to affect monkeys kept in captivity was looked upon with suspicion.

The suspicion turned into anxiety when in 1970 a nine-month-old child from a village located in a smallpox-free part of Zaire developed a smallpox-like illness. Surprisingly, monkeypox virus was confirmed by laboratory testing to be the causative agent of the child’s illness. Subsequently, similar cases were detected in other countries of western Africa.

It was learned that monkeypox virus, although a distinct species from variola virus, gave rise to an extensive pustular rash, indistinguishable from smallpox. Human monkeypox was not a new disease, but, being rare and so like smallpox, it could never have been recognised until smallpox had been eliminated.

In March 1986 the Committee on Orthopoxvirus Infections took note of the low incidence of human mon-
keypox and the growing conviction that the virus could not sustain itself
by man-to-man transmission, and stated that in its view human mon-
kepox does not pose a significant health problem.

Laboratory investigations and re-
search: Both before and during the
post-eradication period, WHO has
actively helped to maintain suitable
laboratory expertise and laboratory
preparedness for unexpected prob-
lems that might arise with smallpox
but also with other poxvirus dis-
eases of man. Most of the labora-
tory diagnostic work has been
carried out in the two WHO Collabor-
ating Centres in the US and the
Soviet Union. Between 1980 and
1986, these two centres alone
tested about 22,000 human speci-
mens and about 3,000 animal speci-
mens collected in 36 various, mostly
developing, countries. Several un-
solved virological and immunologi-
cal problems relevant to orthopox-
viruses merited further research.
Assisted by WHO in the post-eradica-
tion era, research progressed along
two main lines: analysis of the DNA
of variola and other orthopoxviruses,
and development of reliable sensi-
tive serological tests specific for
various species of orthopoxvirus.

Millions of phials of vaccine were pro-
duced and distributed around the world.

Photo WHO/J. Mohr

Documentation of the smallpox
eradication programme: Since the
eradication of smallpox was a
unique event in the history of man-
kind, it was important to document
the operational and scientific
achievements of the programme, its
experiences and the lessons learned
in various corners of the globe. WHO
published monographs describing
eradication in four priority coun-
tries: Bangladesh, Ethiopia, India
and Somalia. WHO also helped to
prepare a monograph dealing with
management aspects of the largest
national programme, India. A com-
prehensive reference work entitled
"Smallpox and its Eradication",
dealing with all scientific, opera-
tional and administrative aspects,
will be published by WHO in late
1987, about the time of the 10th
anniversary of the occurrence of the
last case of endemic smallpox.

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quered by man. The main target of
post-eradication surveillance, to
provide assurance to the world that
it is permanently free from small-
pox, has been successfully achieved
by WHO and its Member States.

Photo WHO/M. Staszewski

Human monkeypox

Because of its close clinical
resemblance to smallpox, mon-
keypox became an important
disease for post-eradication sur-
veillance. Since 1970, 400 pa-
tients suffering from monkeypox
have been recognised in seven
countries of western and central
Africa; Zaire alone accounted for
95 per cent of them. Most cases
occurred in small, remote vil-
lages close to or in the forest,
where local people have multiple
contacts with a variety of wild
animals and hunting is important
to obtain daily food. Many vic-
tims were young children,
among whom the case-fatality
was similar to that formerly
cased by smallpox.

Ecological studies in recent
years suggest that squirrels are a
significant host or reservoir of
monkeypox virus. Large num-
bers live in the oil-palms which
grow between the village and
the primary rainforest.

Despite intensified surveil-
ance during the last six years,
human monkeypox is viewed
as an infrequent and sporadic
zoonosis, that is, contracted only
by close contact with infected
wild animals. However, there
have been episodes of transmis-
sion from one person to another,
between siblings, children and
parents, playmates, or patients
lying in the same hospital ward.
Generally, the transmission stop-
ped spontaneously at the first
generation of the cases. Despite
waning immunity in the local
population in the absence of
routine smallpox vaccination, the
infrequent nature of human con-
tacts with monkeypox virus and
the low transmissibility of the
virus may be important factors in
limiting its spread.