

Smallpox

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Tasks in the wake of smallpox eradication

The last case of endemic smallpox occurred a decade ago but not everybody was convinced that eradication had been achieved. It was essential to investigate rigorously all reported instances of suspected smallpox and to make known the findings so that public confidence would be built up. Laboratory stocks of variola virus have been reduced and the destruction of the final ones is now in prospect. Vaccination against the disease is virtually a thing of the past; in 1986 the World Health Organization's Committee on Orthopoxvirus Infections suggested that it should be terminated even for military personnel. Vigilance continues in respect of animal poxviruses that might conceivably become important in humans.

In October 1977, health staff in the Somalian port of Merka diagnosed smallpox in a 23-year-old hospital cook. He was isolated and his contacts were examined and vaccinated. A rigorous search revealed no more smallpox in the area. The last case of endemic smallpox had been found. The scourge that had killed millions was finally eradicated. However, certain tasks connected with it remained to be tackled. The world community had to be convinced that smallpox had gone for ever, and full advantage had to be taken of the new situation. Surveillance had to be maintained for suspected cases of smallpox; research on orthopoxviruses was needed; smallpox

vaccination of the general public had to be ended; vaccine reserves had to be maintained for unexpected emergencies; and the significance of variola virus stocks in laboratories had to be considered.

Phasing out vaccination

The elaborate system of defence against smallpox included the compulsory vaccination of the general public and constant checks on international travellers. By 1977, when worldwide eradication was imminent, routine vaccination was no longer required in 16 countries of North America, Europe and the Western Pacific. At the end of 1984 all countries had ceased smallpox vaccination of the general public.

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A small number of laboratory workers handling variola virus or closely related orthopoxviruses continued to be vaccinated. It thus became possible to divert the vast

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sums that had been spent on smallpox vaccination to other areas of public health.

The only large category of people that continues to be vaccinated consists of military personnel. Complications caused by their vaccination have been reported from several countries, mainly among recently vaccinated military personnel and their civilian contacts infected through person-to-person spread of vaccinia virus. Thus in Canada an 18-year-old female National Defence recruit went on leave after being vaccinated. Six of her relatives and friends subsequently acquired the vaccinia virus. Other episodes were reported from the USA in 1981 and 1985. The affected persons recovered but the possibility of serious or fatal complications would have been much greater if the subjects had been suffering from eczema or immunological deficiency. In 1986 the World Health Organization's Committee on Orthopoxvirus Infections suggested that smallpox vaccination of military personnel should be terminated so as to remove the risk of such incidents.

False reports

Experience gained in many countries indicated that reports of suspected cases of

smallpox could be expected for several years after the declaration of its eradication. Their thorough and prompt investigation, backed up by laboratory examination and subsequent disclosure of results, was regarded as very important in maintaining public confidence that the disease had been eradicated. Such reports are regarded as public health emergencies and are promptly investigated.

Rumours of smallpox, especially those generated by the media, could rapidly spread and cause international concern (1). In 1980, smallpox was wrongly reported in Iran by a radio station with a large audience; Nigerian newspapers described a supposed outbreak of 17 cases in 1982; and the Indian daily papers announced in 1983 that smallpox had struck again in Patna. In 1985, 250 delegates at an international health seminar in Mexico were advised to consult their doctors on returning home because a delegate had been diagnosed by a hotel physician as having smallpox. Word of this spread rapidly abroad before a diagnosis of chickenpox was confirmed by electron microscopic examination of skin specimens taken from the person in question.

Since 1980, epidemiologists and medical researchers have investigated and rejected 131 rumours of suspected cases of smallpox reported to the World Health Organization and entered in the International Rumour Register. A greater number of reports have been promptly dealt with at country level. For example, between 1980 and 1985, 68 suspected cases of smallpox were examined in Bangladesh and 86 in India. Most reports reaching the World Health Organization come from tourists, the general public, and the mass media, rather than from public health services and medical service networks.

Responsibility for confirming diagnoses lies with the Centers for Disease Control, Atlanta, USA, and the Research Institute for Viral Preparations, Moscow, USSR.

Laboratory hazard

After the interruption of transmission of endemic smallpox, the only known source of variola virus was in certain laboratories.

Dangerous organisms rarely escape from virological laboratories, but in London in 1973 two persons died from the disease after being infected by a laboratory worker who had contracted smallpox. A similar event occurred in the summer of 1978, leaving no doubt about the danger. After almost a year during which no cases were suspected, a medical photographer at the University of Birmingham, England, who worked one floor above a laboratory where the variola virus was being studied, became ill.

Thinking she had influenza, she stayed at home but a rash appeared and her symptoms worsened. Smallpox was diagnosed and she was moved to an isolation hospital, where she died. Three days later her mother was diagnosed as having smallpox and was placed in isolation; she eventually recovered.

Since 1984, variola virus has been confined to glass vials kept under high security at the Centers for Disease Control in Atlanta and the Research Institute for Viral Preparations in Moscow. The culture of variola virus ceased in both these laboratories in 1986.

The question arises as to whether stocks of the variola virus should be retained. Some virologists believe that they should, whereas people formerly engaged in fighting smallpox in the field but not directly involved in virus research have advocated the eventual destruction of the stocks. In March 1986 the WHO Committee on

Orthopoxvirus Infections concluded that cloned DNA could provide sufficient reference material to resolve any future diagnostic problems involving suspected smallpox, that research studies of variola requiring culture of the virus were no longer justified, and that there was no need to retain stocks of viable variola virus any longer. The destruction of the virus will be the final step in ending the fear of smallpox.

Animal poxviruses

One of the animal pox diseases known to affect captive monkeys was looked upon with suspicion from the very beginning of the intensified global eradication campaign. In 1970 a nine-month-old child from a village in Zaire developed a smallpox-like illness and monkeypox virus was identified as the causative agent. Subsequently, similar cases were detected in three other African countries. It was learned that monkeypox virus, although a distinct species from variola virus, gave rise to an extensive pustular rash, indistinguishable from that of smallpox. Human monkeypox was not a new

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disease, but, being rare and very like smallpox, had never been recognized until smallpox had been eliminated.

Since 1970, over 400 patients suffering from monkeypox have been recognized in seven countries of western and central Africa;

Zaire has accounted for 95% of them. The patients have been predominantly in small, remote villages close to or in the forest where the people have many contacts with wild animals and hunting is important as a means of subsistence. Most victims have been young children, among whom the case-fatality rate has been similar to that caused previously by smallpox. Intensified surveillance during the last six years suggests that human monkeypox is an infrequent and sporadic zoonosis. It appears that humans can contract monkeypox by close contact with infected wild animals. However, there have been episodes of person-to-person transmission, most of which have been stopped spontaneously in the first generation of cases. Most patients contracting the disease from wild life have failed to give rise to even one infection by contact. Infrequent contact with monkeypox virus and the low transmissibility of the virus may be important factors limiting its spread among people living in enzootic areas. Human monkeypox therefore does not pose a significant health problem.

The cessation of smallpox vaccination and the gradual loss of immunity in the population will require vigilance with

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respect to other poxviruses and assessment of their potential epidemiological importance. Few researchers have expressed concern that some poxviruses might somehow be altered and become more virulent in humans, and the molecular and

epidemiological evidence suggests no such risk.

In camel-raising countries, camelpox is of great economic importance. In Somalia in 1977-79 a number of camels were discovered with severe, frequently fatal, exanthematous disease and camelpox virus was identified as the causative agent. However, there was no evidence of camelpox virus infection in the nomadic peoples living in close contact with these camels. Experience suggests that camelpox is rare or nonexistent in humans.

Reports of human cowpox have been rare in recent years and in fact it is strongly doubted whether cattle are the reservoir of the virus concerned. It is possible that both cattle and humans are only incidental hosts that become infected from an unknown reservoir. The occurrence of sporadic cowpox infections in persons who had no contact with cattle supports this view. Cowpox virus or closely related viruses have been isolated in various exotic animals, particularly Felidae, in zoos. Recently, attention has been focused on cowpox infections in domestic cats. A virus similar to cowpox virus was isolated from wild rodents captured in Turkmenistan, USSR, suggesting that the natural reservoir of the cowpox virus and some other poxviruses might be in small wild rodents.

At present there is no fear that these and related viruses could establish themselves in non-immunized populations. However, the number of poxviruses known to be derived from animals is growing and vigilance should be maintained in case they become important in man. □

Reference

1. Khodakevich, L. & Arita, I. Investigating rumours of smallpox. *World health forum*, 6: 171-173 (1985).