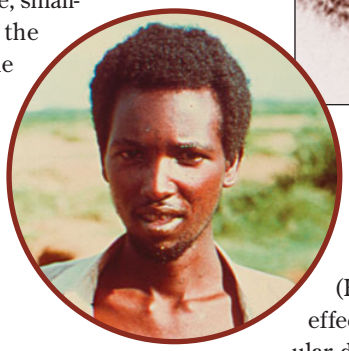
Smallpox

BY FELICIA M. WILLIS

There has not been a naturally occurring case of smallpox since the 1970s, and in 1980, the World Health Organization declared that smallpox had been eliminated entirely through vaccinations. But smallpox has come into the forefront of news headlines because of its potential to be used as an agent in biological warfare. With its extremely high fatality rate, smallpox represents a serious danger to the civilian population. Feared as one of the most devastating of all the infectious diseases, smallpox—also called variola—is caused by the poxvirus variola and is highly contagious, disfiguring, and often lethal.



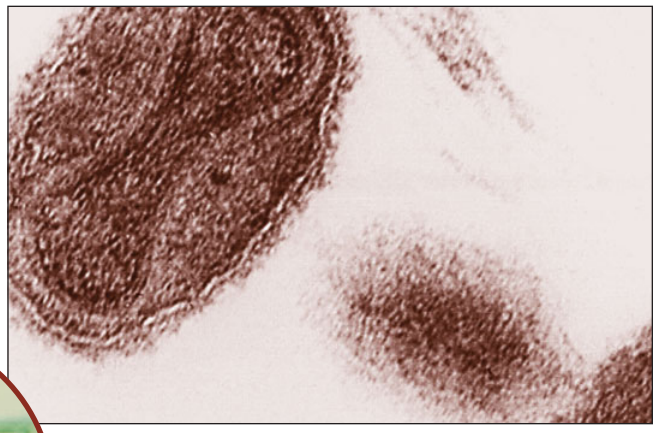
Ali Maow Maalin, a Somalian, had the last known case of endemic smallpox in 1977.

There are three forms of variola—major, minor, and varioloid. Variola major (classic smallpox) is the most severe form of the disease and kills 30% of people who are unvaccinated, become infected, and do not receive treatment; 3% of those who are vaccinated die. Variola minor is considered a milder form of the disease and kills 1–2% of people who are unvaccinated and become infected. Varioloid is also a mild variant of smallpox and occurs in previously vaccinated people who have only partial immunity. According to the book *Princes and Peasants: Smallpox in History* by Donald R. Hopkins, the first recorded smallpox epidemic occurred in 1350 B.C. during the Egyptian–Hittite war.

Smallpox has the potential to spread quickly. Unlike anthrax, which cannot be transmitted from person to person, a smallpox epidemic could plausibly start from an infected individual. It can be spread through direct contact or contaminated bed linen and clothing. Particles containing the virus are released into the air when an infected person coughs, sneezes, or talks by droplet nuclei expelled from the oropharynx. Inhaling a single particle may be enough to cause infection. Natural infection occurs following implantation of the virus on the oropharyngeal (the part of the throat just behind the mouth) or respiratory mucosa.

Once a person is infected, the average incubation period is 12–14 days. After the incubation period, the patient generally experiences high fever, depression, and exhaustion, usually accompanied by headache and backache. A rash of lesions then emerges, first on the mucosa of the mouth and pharynx, face and forearms, then spreading to the chest and legs. Within one or two days, the rash becomes pustules. Around the eighth or ninth day, crusts begin to form, and when the scabs fall off, pitted scars form.

The Centers for Disease Control and Prevention (CDC) says it has a stockpile of 15.4 million doses of vaccine. Also, antiviral drugs that have been developed since smallpox was eradicated, such as hexadecyloxypropyl-cidofivir (HDP-CDV), are now being tested to see whether they are effective against the smallpox virus. These drugs carry molecular disguises that allow them to be absorbed in the intestine so that they can be given orally. A team at the U.S. Army Medical Research Institute of Infectious Diseases conducted studies with HDP-CDV and found that just five oral doses given to cowpox-virus-infected mice prevented their death, while untreated mice died in nine days. Many scientists argue that antiviral drugs may save lives and possibly lessen transmission; however, unlike vaccines, antiviral drugs do not give immunity to the disease, which limits treatment of smallpox to supportive therapy and antibiotics as needed for secondary bacterial infections. There are no proven antiviral agents effective in treating smallpox.



Micrograph of the smallpox virus, poxvirus variola.

IMAGES: CENTERS FOR DISEASE CONTROL AND PREVENTION

Further reading

CDC website; www.cdc.gov/nip/smallpox.
Medicine Plus; www.nlm.nih.gov/medlineplus/smallpox.html.
WHO website; www.who.int/emc/diseases/smallpox/factsheet.html. ■

Vaccine varieties

There is no known cure for smallpox, but the vaccine helps protect against the disease. The smallpox vaccine that is currently in stock in the United States, Dryvax, is different from most vaccines in that it is a "live-virus" vaccine that is made from the live vaccinia virus—not a weakened or dead virus. This vaccine does not contain the actual smallpox virus but is developed from calves, sheep, and water buffalo and can protect people from other similar types of viruses. The new vaccine being developed will be made from a tissue cell culture, which is now commonly used in making other vaccines such as tetanus.

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