

Smallpox Fact Sheet

Quick Facts

Agent Type: Virus

Lethality: Moderate to high

Transmission: Highly contagious

Treatment: Vaccination before symptoms emerge

Status: Select Agent; Category A Agent; eradicated

Delivery: Inhalation, ingestion, injection



Man with smallpox (Source: CDC)

Smallpox is caused by the double-stranded DNA orthopoxviruses *Variola major* and *Variola minor*. The virus no longer occurs naturally. Due to an aggressive immunization program by the World Health Organization and its inability to survive for more than a week outside of its only host, humans, *Variola* was declared eradicated in 1980. The two known stock of the virus are at the U.S. Center for Disease Control and Prevention in Atlanta and the State Research Center of Virology and Biotechnology in Koltsovo, Russia. Rumors are that other countries may have retained their stock of smallpox and the Russian stock may have been compromised.

Mechanism: After inhalation and being trapped in mucus lining the lungs, the virus is unsuccessfully "eaten" by macrophages. Taken to the lymph nodes, the virus manufactures more viruses while inside the macrophage. Entering the bloodstream 3-4 days after initial infection, *Variola* spreads throughout the body and incubates in the bone marrow, spleen, and other organs. The virus enters the bloodstream 5-6 days later triggering the first symptoms and targeting blood vessels near the skin. The tongue, inside the mouth, and skin develop flat, red lesions that rise into blisters before becoming pus-filled pimples.

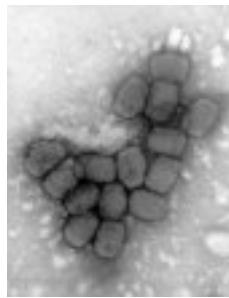
Effects: Flu-like symptoms, including headache, fever, and fatigue, usually first occur 12 days after exposure. The infected person is also contagious at this stage. Within the next 4 days, the initial lesions containing *Variola* appear and spread to the arms, torso, and legs. Over the next two weeks, the virus continues to damage the body, particularly the immune and circulatory systems. When the last rash has scabbed over and

Delivery: The smallpox virus can infect humans through inhalation, ingestion, or injection. A smallpox attack would likely rely on victims inhaling *Variola* via an aerosol or through an infectious individual deliberately infected with the virus. Clothing, blankets, and other such material can harbor the virus for up to a week. Infection with *Variola* could be accomplished with as little as 10-100 viral particles.

Production: Two noted production methods include incubation inside the embryos of chicken eggs and culturing the virus with cells susceptible to infection.

Ideally, *Variola* exists only in secure Biosafety Level-4 labs of the two facilities mentioned above.

Historic Use: Some health experts believe that smallpox is responsible for more deaths than all other infectious diseases combined. Beginning in the 1600s, the Native American population of North and South America was exposed to *Variola*, carried by Europeans. Infections carried a 50% mortality rate. Researchers in the Soviet Union from 1980 until the mid 1990s reportedly developed a strain of *Variola* as a potent bioweapon, capable of causing illness within two days instead of the average 12 days.



Smallpox viruses (Transmission electron micrograph) (Source: CDC)

fallen off, the person is no longer contagious. Permanent scars, blindness, and arthritis can result from the infection. Smallpox is fatal in 30% of infections.

In 2% to 6% of smallpox infections, lesions are classified as hemorrhagic, characterized by bleeding sores, or flat; where the lesions are soft and flat. The mortality rates for those types of infections are over 95%.

Treatment: The vaccine used to eradicate *Variola*, routinely used in the U.S. until 1972, prevents infections for an undetermined amount of time. It can also prevent or lessen smallpox if administered within four days of exposure. Mild to life-threatening risks are associated with the vaccine. No antivirals are available for unvaccinated individuals who contract the virus. After the symptoms develop, medications and intravenous fluid can be administered to make the patient more comfortable. Antibiotics can reduce potential secondary bacterial infections.

(Sources: CDC, U.S. Army, WHO)