

SMALLPOX

Bioterrorism Agent Profiles for Health Care Workers

Causative Agent: Smallpox is an acute viral illness caused by variola, one of the orthopox viruses. There are two different strains of the virus, variola major and variola minor. Variola major causes a more severe illness. No cases of smallpox have been observed in the world since 1978. The World Health Organization declared the world free smallpox free in 1980.

Routes of Exposure: Inhalation or contact with skin lesions or secretions

Infective Dose: The infectious dose is unknown, but it is believed to be 10-100 virions.

Incubation Period: The incubation period ranges from 7-17 days, with an average of 12 days.

Clinical Effects: The illness begins with a prodrome lasting 2-3 days, with generalized severe malaise, fever, rigors, headache, and backache. Abdominal pain and delirium are sometimes present. These symptoms are followed by a rash that progresses over 7 to 10 days. Lesions develop at the same stage, starting first as macules, and then changing to papules, then to vesicles, then to pustules and finally to scabs. The lesions are most concentrated on the face and extremities, and they are least dense on the trunk. The lesions are firm and deep-seated.

Approximately 10% of cases will have an atypical type of rash described as either flat smallpox or hemorrhagic smallpox. These patients also have a prostrating febrile prodrome. In the flat form, the skin lesions never fully organize; instead they remain soft, flattened and velvety to the touch. In the hemorrhagic form there is bleeding under the skin and overwhelming DIC without the development of characteristic pox lesions.

Lethality: The mortality rate of smallpox is 20-50% in unvaccinated individuals. Hemorrhagic and malignant cases are 95-100% fatal.

Transmissibility: Smallpox is not contagious during the incubation period. Persons with smallpox become infectious at the onset of the rash, and remain infectious until all of the scabs have fallen off. Person-to-person transmission occurs by droplet exposure to oropharyngeal secretions, and by contact with skin lesions. Close, face-to-face contact is usually required for transmission, although airborne transmission in a hospital may have occurred in one outbreak.

Primary contamination & Methods of Dissemination: Any case of smallpox would be considered an act of terrorism. Smallpox virus could be delivered via aerosol, or by means of an intentionally infected individual.

Secondary Transmission & Persistence of organism: Humans are the only host for smallpox. People have been infected by contact with smallpox patients' linen, presumably by fomite transmission. However, smallpox has only been found to spread when there is an identifiable patient with active infection.

Decontamination & Isolation:

Patients – Airborne and contact precautions should be observed in addition to standard precautions. *Equipment, clothing & other objects* – Contaminated clothing and bed linens can spread the virus. Laundry should be bagged with minimal agitation to prevent contamination of air, surfaces, or people. Only immunized workers using proper PPE should handle contaminated laundry. Laundering should be done using hot water to which bleach has been added. Disinfectants that are used for standard hospital control, such as hypochlorite or quaternary ammonia, are effective for cleaning surfaces possibly contaminated with virus. Waste should be placed in biohazard bags and discarded according to medical waste regulations.

Outbreak control: Control of smallpox is based upon vaccination with the vaccinia virus and isolation of cases. A suspect case of smallpox should be considered a public health emergency. Local, tribal and state health departments should be notified immediately. As soon as the diagnosis of smallpox is made, all suspected smallpox cases should be isolated. Additionally, all household and face-to-face contacts should be vaccinated as soon as possible. The smallpox vaccine does not confer lifelong immunity.

Laboratory testing: Smallpox virus can be found in vesicular or pustular fluid by PCR or by culture. Electron microscopy can identify an orthopox virus, but cannot differentiate between variola, vaccinia, or monkeypox. Smallpox virus testing is currently only available through the CDC.

Local and state health departments should be contacted immediately if smallpox is a consideration.

People who collect samples to test for smallpox should wear proper personal protective equipment and have received a recent smallpox vaccine. Smallpox evaluation is done by sampling skin lesions, drawing blood, and doing throat swabs for testing by culture, EM, PCR, and serology.

Therapeutic Treatment: There is no proven effective anti-viral treatment for smallpox. Cidofovir has *in vitro* activity against smallpox and could be available by an investigational new drug protocol.

Prophylactic Treatment: A highly effective smallpox vaccine exists using vaccinia virus, another orthopox virus. It is being used by the military and for public health preparedness. It is not being offered to the general public since as of July 2004 there is no one in the world with smallpox infection. There is enough vaccine available to vaccinate everyone in the United States, if there were a smallpox outbreak. Vaccination within 3 days of exposure will prevent or significantly modify smallpox in the vast majority of persons. Vaccination 4 to 7 days protects against death, but will not prevent infection.

Differential Diagnosis: The differential diagnosis of a generalized vesicular rash should include varicella (chickenpox) and monkey pox. The lesions of varicella arise in crops, are superficial, and are almost never found on the palms or soles. In contrast, the rash associated with smallpox does not appear in crops: all lesions on one part of the body will be at the same stage of development. Smallpox lesions are deep and firm, and are most concentrated on the face and extremities, including palms and soles. Monkey pox, a naturally occurring relative of smallpox, occurs in Africa. The lesions are clinically indistinguishable from smallpox, they are fewer in number and the patients are less toxic. Smallpox cases that present in the hemorrhagic form can be misdiagnosed as meningococemia or severe acute leukemia. The CDC website has an algorithm to assess the risk of a rash for smallpox: <http://www.bt.cdc.gov/agent/smallpox/diagnosis/riskalgorithm/index.asp>

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For more information call (602) 364-3289

Frequently Asked Questions About Smallpox

What should I know about smallpox?

Smallpox is an acute, contagious, and sometimes fatal disease caused by the variola virus (an orthopoxvirus), and marked by fever and a distinctive progressive skin rash. In 1980, the disease was declared eradicated following worldwide vaccination programs. However, in the aftermath of the events of September and October, 2001, plans are in place to deal with a bioterrorist attack using smallpox as a weapon.

If I am concerned about a smallpox attack, can I go to my doctor and get the smallpox vaccine?

At the moment, the smallpox vaccine is not available for members of the general public. In the event of a smallpox outbreak, however, there is enough smallpox vaccine to vaccinate everyone who would need it.

What are the symptoms of smallpox?

The symptoms of smallpox begin with high fever, head and body aches, and sometimes vomiting. A rash follows that spreads and progresses to raised bumps and pus-filled blisters that crust, scab, and fall off after about three weeks, leaving pitted scars.

If someone comes in contact with smallpox, how long does it take to show symptoms?

After exposure, it takes between 7 and 17 days for symptoms of smallpox to appear (average incubation time is 12 to 14 days). During this time, the infected person feels fine and is not contagious.

Is smallpox fatal?

The majority of patients with smallpox recover, but death may occur in up to 30% of cases. Many smallpox survivors have permanent scars over large areas of their body, especially their face. Some are left blind.

How is smallpox spread?

Smallpox normally spreads from contact with infected persons. Generally, direct and fairly prolonged face-to-face contact is required to spread smallpox from one person to another. Smallpox also can be spread through direct contact with infected bodily fluids or contaminated objects such as bedding or clothing. Indirect spread is less common. Rarely, smallpox has been spread by virus carried in the air in enclosed settings such as buildings, buses, and trains. Smallpox is not spread by insects or animals.

If smallpox is released in aerosol form, how long does the virus survive?

The smallpox virus is fragile. In laboratory experiments, 90% of aerosolized smallpox virus dies within 24 hours. In the presence of ultraviolet (UV) light, this percentage is even greater. Therefore, if an aerosol release of smallpox were to occur, most of the smallpox virus matter would be inactivated or dissipated within 24 hours.

How many people would have to get smallpox before it is considered an outbreak?

One confirmed case of smallpox is considered a public health emergency.

Is smallpox contagious before the smallpox symptoms show?

A person with smallpox will have a fever and be quite ill for several days before the rash appears. A person is not contagious until the rash begins. The infected person is contagious until the last smallpox scab falls off.

Is there any treatment for smallpox?

Smallpox can be prevented through use of the smallpox vaccine. There is no proven treatment for smallpox, but research to evaluate new antiviral agents is ongoing. Early results from laboratory studies suggest that the drug cidofovir may fight against the smallpox virus; currently, studies with animals are being done to better understand the drug's ability to treat smallpox disease. Patients with smallpox can benefit from supportive therapy (e.g., intravenous fluids, medicine to control fever or pain) and antibiotics for any secondary bacterial infections that may occur.

What is the smallpox vaccine?

The smallpox vaccine is the only way to prevent smallpox. The vaccine is made from a virus called *vaccinia*, which is another "pox"-type virus related to smallpox. The vaccine cannot cause smallpox. The vaccine helps the body develop immunity to smallpox. It was successfully used to eradicate smallpox from the human population.

Should I get vaccinated against smallpox?

The smallpox vaccine is not available to the public at this time.

Many vaccinations are required. Why don't people have to get the smallpox vaccine?

The last case of smallpox in the United States was in 1949. The last naturally occurring case in the world was in Somalia in 1977. After the disease was eliminated from the world, routine vaccination against smallpox among the general public was stopped because it was no longer necessary for prevention.

If someone is exposed to smallpox, is it too late to get a vaccination?

Vaccination within 3 days of exposure will completely prevent or significantly modify smallpox in the vast majority of persons. Vaccination 4 to 7 days after exposure likely offers some protection from disease or may modify the severity of disease.

How long does a smallpox vaccination last?

Past experience indicates that the first dose of the vaccine offers protection from smallpox for 3 to 5 years, with decreasing immunity thereafter. If a person is vaccinated again later, immunity lasts longer.

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