



## *X-Plain™* *Smallpox*

### **Reference Summary**

Smallpox is a serious, contagious, and sometimes fatal infectious disease. It is caused by the variola virus. There is no specific treatment for smallpox, and the only prevention is vaccination.

Except for laboratory stockpiles, the variola virus has been eradicated. However, in the aftermath of the events of September and October, 2001, there is heightened concern that the variola virus might be used as an agent of bioterrorism. For this reason, the U.S. government is taking precautions for dealing with a smallpox outbreak.

This reference summary explains what smallpox is and discusses the benefits and risks of vaccination.

#### **What is Smallpox**

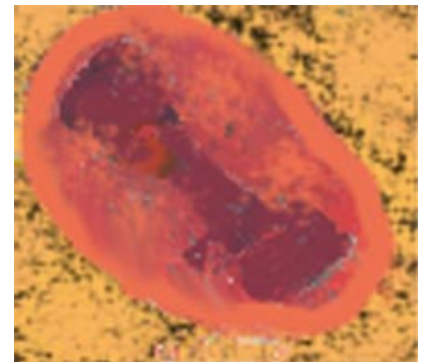
Smallpox is a contagious disease that can sometimes be fatal. It is caused by a virus called the variola virus.

Smallpox emerged in human populations thousands of years ago. However, it was declared eradicated in 1980. Samples of the virus still exist in laboratory stockpiles.

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 can also 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 known to be transmitted by insects or animals.



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## Symptoms

The name smallpox is derived from the Latin word for “spotted” and refers to the raised bumps that appear on the face and body of an infected person.

The symptoms of smallpox change as the disease goes through the following stages:

- Incubation period
- Initial symptom or Prodrome phase
- Early rash
- Pustular rash
- Pustules and Scabs
- Resolving Scabs
- Resolved Scabs

The next section describes these stages.

### **1. Incubation Period**

Exposure to the virus is followed by an incubation period during which people do not have any symptoms and may feel fine. The incubation period averages about 12 to 14 days but can range from 7 to 17 days. During this time, people are not contagious.

### **2. Initial Symptoms**

The first symptoms of smallpox include fever, malaise, head and body aches, and sometimes vomiting. The fever is usually high, in the range of 101 to 104 degrees Fahrenheit. At this time, people are usually too sick to carry on their normal activities. This is called the prodrome phase and may last for 2 to 4 days. During this stage, people are sometime contagious.

### **3. Early rash**

A rash emerges first as small red spots on the tongue and in the mouth. These spots develop into sores that break open and spread large amounts of the virus into the mouth and throat. At this time, the person becomes most contagious.

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Around the time the sores in the mouth break down, a rash appears on the skin, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours. As the rash appears, the fever usually falls and the person may start to feel better.

By the third day of the rash, the rash becomes raised bumps. By the fourth day, the bumps fill with a thick, opaque fluid and often have a depression in the center that looks like a bellybutton. This is a major distinguishing characteristic of smallpox. Fever often will rise again at this time and remain high until scabs form over the bumps.

#### **4. Pustular Rash**

The bumps become pustules—sharply raised, usually round and firm to the touch as if there's a small round object under the skin. People often say the bumps feel like BB pellets embedded in the skin. This stage lasts about 4 days.

#### **5. Pustules and Scabs**

The pustules begin to form a crust and then scab. This stage lasts about 5 days. By the end of the second week after the rash appears, most of the sores have scabbed over.

#### **6. Resolving Scabs**

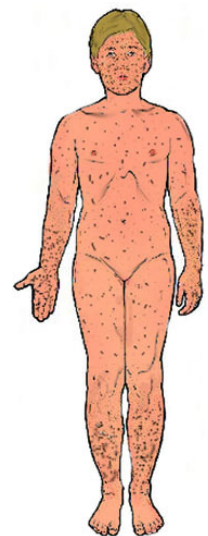
The scabs begin to fall off, leaving marks on the skin that eventually become pitted scars. Most scabs will have fallen off three weeks after the rash appears.

Scabs resolved The person is contagious to others until all of the scabs have fallen off.

### **Treatment & Vaccination**

There is no proven treatment for smallpox, but research to evaluate new antiviral agents is ongoing.

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.



Smallpox can be prevented through the use of the smallpox vaccine. The smallpox vaccine is the only way to prevent smallpox. The vaccine helps the body develop

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immunity to smallpox. It was successfully used to eradicate smallpox from the human population.

The vaccine is made from a "live virus" called vaccinia, which is another "pox"-type virus. Vaccinia is related to smallpox but cannot cause smallpox.

For most people, smallpox vaccination is safe and effective. Most people experience mild reactions to the vaccine, which indicate that it is beginning to work. Some people may experience reactions that require medical attention.

These risks and complications are discussed in the next sections.

The smallpox vaccine is not given with a hypodermic needle. It is not a "shot," like many vaccinations. The vaccine is given using a bifurcated (two-pronged) needle that is dipped into the vaccine solution. When removed, the needle retains a droplet of the vaccine.

The needle is then used to prick the skin a number of times in a few seconds. The pricking is not deep, but it will cause a sore spot and one or two drops of blood to form. The vaccine is usually given in the upper arm.

Healthcare workers should cover the gauze with a semipermeable dressing as an additional barrier. A semipermeable dressing is one that allows for the passage of air but does not allow for the passage of fluids.

If the vaccination is successful, a red and itchy bump develops at the vaccination site in three or four days. In the first week after vaccination, the bump becomes a large blister, fills with pus, and begins to drain.

During the second week, the blister begins to dry up and a scab forms. The scab falls off in the third week, leaving a small scar.

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.

## **Vaccination Plan**

Routine vaccination of the American public against smallpox stopped in 1972 after the disease was eradicated in the United States. Until recently, the U.S. government

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provided the smallpox vaccine only to a few hundred scientists and medical professionals who work with smallpox and similar viruses in a research setting.

After the events of September and October 2001, the U.S. government is taking precautions to be ready to deal with bioterrorist attacks using smallpox as a weapon.

For smallpox, the plan includes

- Ordering enough smallpox vaccine to immunize the American public in the event of a smallpox outbreak.
- The creation of smallpox healthcare teams that would respond to a smallpox emergency.
- Vaccination of certain military and civilian personnel who are or may be deployed in high threat areas.

There is now sufficient vaccine available to immunize everyone who might need it in the event of an emergency.

In addition, members of the smallpox healthcare teams are being vaccinated against smallpox. By vaccinating groups of health care workers and emergency responders, smallpox response teams would be available to vaccinate others and provide critical services in the days following an attack.

As of the date of the last update of this module, 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.

### **Vaccination Side Effects & Risks**

After vaccination, most people experience normal, usually mild reactions. These reactions usually go away without treatment.

Normal mild reactions include:

- The arm receiving the vaccination may be sore and red where the vaccine was given.
- The glands in the armpits may become large and sore.

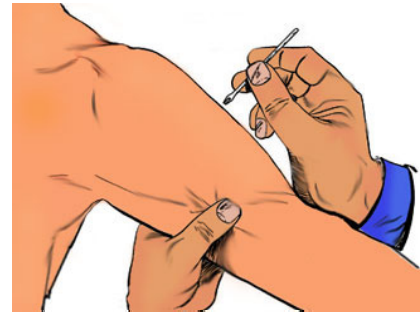
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- The vaccinated person may run a low fever.

One out of 3 people may feel bad enough to miss work, school, or recreational activity or have trouble sleeping .

In the past , about 1,000 people for every 1 million people vaccinated for the first time experienced reactions that, while not life-threatening, were serious. These reactions may require medical attention.



A vaccinia rash is one such serious reaction. It is an outbreak of sores limited to one area. This is an accidental spreading of the vaccinia virus caused by touching the vaccination site and then touching another part of the body or another person.

Vaccinia rash usually occurs on the genitals or face, including the eyes, where it can damage sight and lead to blindness. Washing hands with soap and water after touching the vaccine site will help prevent this.

A widespread vaccinia rash can also occur. The vaccinia virus spreads from the vaccination site through the blood. Sores break out on parts of the body away from the vaccination site.

Rarely, a toxic or allergic rash can develop in response to the vaccine.

Rarely, people have had very bad reactions to the vaccine. In the past, between 14 and 52 people per 1 million people vaccinated for the first time experienced potentially life-threatening reactions. These reactions require immediate medical attention.

Life-threatening reactions include:

- Ongoing infection of skin with tissue destruction frequently leading to death. This is known as progressive vaccinia.
- Inflammation of the brain, or postvaccinal encephalitis.

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Based on past experience, it is estimated that between 1 and 2 people out of every 1 million people vaccinated may die as a result of life-threatening reactions to the vaccine.

People with certain skin conditions, such as eczema or atopic dermatitis, can develop serious skin rashes caused by widespread infection of the skin. The next section discusses who should not be vaccinated.

## **Who Should Not Be Vaccinated**

Some people with certain medical conditions are at greater risk for serious side effects from the smallpox vaccine. These people should not get the smallpox vaccine unless they have been exposed to the smallpox virus. This section discusses these medical conditions

Individuals who have eczema or atopic dermatitis, or live with someone who does, should NOT get the smallpox vaccine unless they have been exposed to the smallpox virus. This is true even if the condition is not currently active, mild or experienced as a child.

People with any of these skin conditions should not get the vaccine until they have completely healed:

- burns,
- chickenpox,
- shingles,
- impetigo,
- herpes,
- severe acne, or
- psoriasis.

People with weakened immune systems should not be vaccinated. In addition to illnesses that weaken the immune system, such as HIV/AIDS, the immune system is weakened:

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- After cancer treatment,
- After an organ transplant,
- When taking medications to treat autoimmune disorders

A Woman should not get the smallpox vaccine if she is pregnant or plans to become pregnant within one month of vaccination. Women who are currently breastfeeding should also not take the smallpox vaccine. If a person has a moderate or short-term illness, he or she should wait until complete recovery to get the smallpox vaccine.

A person who is allergic to the smallpox vaccine or any of its ingredients should not get vaccinated.

The smallpox vaccine is not given to infants who are younger than 12 months of age. However, the Advisory Committee on Immunization Practices advises against non-emergency use of smallpox vaccine in children younger than 18 years of age.



Linda is in the smallpox healthcare response team and she is scheduled to take the smallpox vaccine today. She has been planning on becoming pregnant. In one week, she will be able to have a pregnancy test to determine if she is pregnant.

### **Self-Care After Vaccination**

After vaccination, the vaccinia virus is present at the vaccine site and can be spread to other parts of the body or to other individuals through contact.

The vaccination site must be cared for carefully until the scab that forms after vaccination falls off on its own in 2 to 3 weeks. The following section lists important instructions to avoid spreading the vaccinia virus.

Cover the vaccination site loosely with a gauze bandage, using first aid adhesive tape to keep it in place. Change the bandage every 1 to 3 days. Keep the site covered until the scab falls off on its own. Wear a shirt that covers the vaccination site as an extra precaution to prevent spread of the vaccinia virus. This is particularly important in situations of close physical contact.

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Wash hands with soap and warm water after direct contact with the vaccination site or any other material that might have become contaminated, such as the bandage, clothes, or towels.

Keep a separate laundry hamper for clothing, towels, bedding or other items that may have come in direct contact with the vaccine site or drainage from the site. Wash with hot water, detergent and bleach.

Keep the vaccination site dry. Cover the vaccination site with a waterproof bandage when you bathe. Remember to change back to the loose gauze bandage after bathing.

Don't put salves or ointments on the vaccination site.

Don't scratch or pick at the scab.

Put the contaminated bandages in a sealed plastic bag and throw them away in the trash.

When the scab falls off, throw it away in a sealed plastic bag then wash your hands.

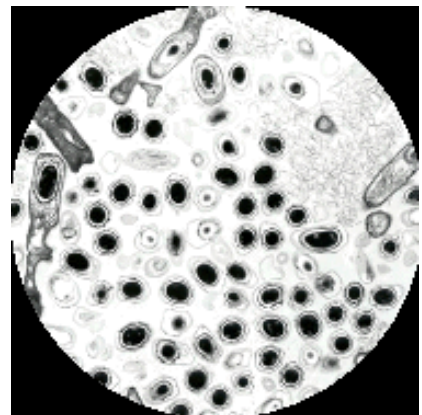
## **Conclusion**

Smallpox is a serious, contagious, and sometimes fatal infectious disease. There is no specific treatment for smallpox, and the only prevention is vaccination.

There is heightened concern that the variola virus might be used as an agent of bioterrorism. For this reason, the U.S. government is taking precautions for dealing with a smallpox outbreak.

For most people, smallpox vaccination is safe and effective. Most people experience normal, typically mild reactions to the vaccine, which indicate that it is beginning to work. Some people may experience reactions that may require medical attention.

Medical experts believe that with careful screening, monitoring and early intervention, the number of serious adverse reactions to smallpox vaccination can be minimized.



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For additional information about smallpox, check the smallpox website of the Center for Disease Control and Prevention at

- <http://www.bt.cdc.gov/agent/smallpox/index.asp>.

The CDC public response hotlines are:

- English: (888) 246-2675
- Español: (888) 246-2857
- TTY: (866) 874-2646

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