

Smallpox Overview

The Disease

Smallpox is a serious, contagious, and sometimes fatal infectious disease. There is no specific treatment for smallpox disease, and the only prevention is vaccination. 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. There are two clinical forms of smallpox. Variola major is the severe and most common form of smallpox, with a more extensive rash and higher fever. There are four types of variola major smallpox: ordinary (the most frequent type, accounting for 90% or more of cases); modified (mild and occurring in previously vaccinated persons); flat; and hemorrhagic (both rare and very severe). Historically, variola major has an overall fatality rate of about 30%; however, flat and hemorrhagic smallpox usually are fatal. Variola minor is a less common presentation of smallpox, and a much less severe disease, with death rates historically of 1% or less. Smallpox outbreaks have occurred from time to time for thousands of years, but the disease is now eradicated after a successful worldwide vaccination program. 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.

Where Smallpox Comes From

Smallpox is caused by the variola virus that emerged in human populations thousands of years ago. Except for laboratory stockpiles, the variola virus has been eliminated. 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.

Transmission

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. Rarely, smallpox has been spread by virus carried in the air in enclosed settings such as buildings, buses, and trains. Humans are the only natural hosts of variola. Smallpox is not known to be transmitted by insects or animals. A person with smallpox is sometimes contagious with onset of fever (prodrome phase), but the person becomes most contagious with the onset of rash. At this stage the infected person is usually very sick and not able to move around in the community. The infected person is contagious until the last smallpox scab falls off.

Vaccine Overview

The Smallpox Vaccine

The smallpox vaccine helps the body develop immunity to smallpox. The vaccine is made from a virus called *vaccinia* which is a “pox”-type virus related to smallpox. The smallpox vaccine contains the “live” vaccinia virus—not dead virus like many other vaccines. For that reason, the vaccination site must be cared for carefully to prevent the virus from spreading. Also, the vaccine can have side effects (see below). The vaccine does not contain the smallpox virus and cannot give you smallpox. Currently, the United States has a big enough stockpile of smallpox vaccine to vaccinate everyone in the country who might need it in the event of an emergency. Production of new vaccine is underway.

Length of Protection

Smallpox vaccination provides high level immunity for 3 to 5 years and decreasing immunity thereafter. If a person is vaccinated again later, immunity lasts even longer. Historically, the vaccine has been effective in preventing smallpox infection in 95% of those vaccinated. In addition, the vaccine was proven to prevent or substantially lessen infection when given within a few days of exposure. It is important to note, however, that at the time when the smallpox vaccine was used to eradicate the disease, testing was not as advanced or precise as it is today, so there may still be things to learn about the vaccine and its effectiveness and length of protection.

Receiving the Vaccine

The smallpox vaccine is not given with a hypodermic needle. It is not a shot as most people have experienced. 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 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 droplets of blood to form. The vaccine usually is given in the upper arm. If the vaccination is successful, a red and itchy bump develops at the vaccine site in three or four days. In the first week, 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. People who are being vaccinated for the first time have a stronger reaction than those who are being revaccinated.

Post-Vaccination Care

After vaccination, it is important to follow care instructions for the site of the vaccine. Because the virus is live, it can spread by touching a vaccination site before it has healed or by touching bandages, clothing, or other material contaminated with live virus from the vaccination site and then touching another part of the body or touching someone else. The vaccinia virus (the live virus in the smallpox vaccine) may cause rash, fever, and head and body aches. In certain groups of people (see the section "Smallpox Vaccine Safety" in this fact sheet), complications from the vaccinia virus can be severe.

Benefit of Vaccine Following Exposure

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

Smallpox Vaccine Safety

The smallpox vaccine is the best protection you can get if you are exposed to the smallpox virus. Anyone directly exposed to smallpox, regardless of health status, would be offered the smallpox vaccine because the risks associated with smallpox disease are far greater than those posed by the vaccine. There are side effects and risks associated with the smallpox vaccine. Most people experience normal, usually mild reactions that include a sore arm, fever, and body aches. However, other people experience reactions ranging from serious to life-threatening. People most likely to have serious side effects are: people who have had, even once, skin conditions (especially eczema or atopic dermatitis) and people with weakened immune systems, such as those who have received a transplant, are HIV positive, are receiving treatment for cancer, or are currently taking medications (like steroids) that suppress the immune system. In addition, pregnant women should not get the vaccine because of the risk it poses to the fetus. Women who are breastfeeding should not get the vaccine. Children younger than 12 months of age should not get the vaccine. Also, the Advisory Committee on Immunization Practices (ACIP) advises against nonemergency use of smallpox vaccine in children younger than 18 years of age. In addition, those allergic to the vaccine or any of its components should not receive the vaccine. 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 included a toxic or allergic reaction at the site of the vaccination (erythema multiforme), spread of the vaccinia virus to other parts of the body and to other individuals (inadvertent inoculation), and spread of the vaccinia virus to other parts of the body through the blood (generalized vaccinia). These types of reactions may require medical attention. In the past, between 14 and 52 people out of every 1 million people vaccinated for the first time experienced potentially life-threatening reactions to the vaccine. Based on past experience, it is estimated that 1 or 2 people in 1 million who receive the vaccine may die as a result. Careful screening of potential vaccine recipients is essential to ensure that those at increased risk do not receive the vaccine.

All the above information is contained within smallpox fact sheets from the U.S. Centers for Disease Control (CDC). For further information, visit <http://www.cdc.gov/smallpox>, or call the CDC public response hotline at (888) 246-2675 (English), (888) 246-2857 (Español), or (866) 874-2646 (TTY)