

Smallpox: how serious is the threat?



As we can see in the chart on the right, the majority of Americans older than 35 were vaccinated before 1972. Are they still protected?

| Age (in 2004) | Percentage vaccinated |
|---------------|-----------------------|
| < 34 | 14% |
| 34-37 | 62% |
| 38-52 | 94% |
| 53-97 | 91% |
| >98 | 74% |

Source: United States Immunization Survey, 1972

In August 2003, the prestigious scientific journal, [Nature Medicine](#), published a study by OHSU/ONPRC scientists reporting that smallpox vaccine protection lasts decades longer than previously thought. Nearly every one of the people tested, including those vaccinated as long as 75 years ago, showed at least some immunity to the deadly virus.

To defend against a possible bioterrorist attack and to help discourage it, the United States has embarked on a vaccination campaign. 40,000 health care and emergency workers have been vaccinated, so they will be ready to vaccinate others in case of attack. The military has vaccinated 500,000 people and is continuing to vaccinate personnel today.

Until the recent OHSU study, officials assumed that no one has much immunity after about five years.

What is smallpox?

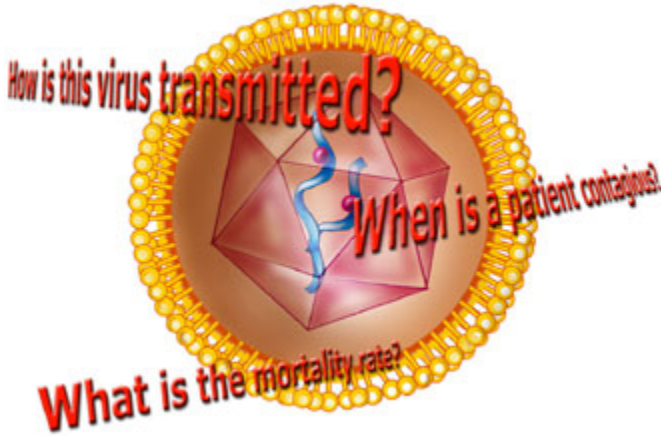


A patient when admitted to the hospital

The same patient 24 hours later

The same patient 48 hours later (Source: C.W. Dixon, [Smallpox](#), 1962)

According to the [US Centers for Disease Control](#), smallpox is a serious, contagious, and sometimes fatal infectious disease. It is caused by the variola virus that emerged in human populations thousands of years ago. Smallpox outbreaks have occurred from time to time for thousands of years. 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. However, the U.S. military continued vaccinating military recruits up until 1990 because of fears that smallpox might be made into a weapon by the former Soviet Union and used in biological warfare.



In general, direct and fairly prolonged face-to-face contact is required to spread smallpox from one person to another. It can also be spread through direct contact with infected bodily fluids or contaminated objects such as bedding or clothing. Only rarely has smallpox 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.

There is no proven treatment for smallpox, but there are some promising candidates such as Cidofovir, a potent FDA-approved antiviral drug that is currently licensed for treating Cytomegalovirus retinitis. Prior

vaccination against smallpox is highly effective in preventing the disease and vaccination can even be used 3 to 4 days *after* exposure to smallpox and still provide protection against this potentially lethal virus.

Vaccination

The first vaccine was developed more than 200 years ago when there was scant knowledge about the human immune system. In 1796 English physician [Edward Jenner](#) noticed that milkmaids had contracted cowpox, a disease that caused only mild illness in humans. But the women never developed the more severe and often fatal smallpox. Jenner learned how to inoculate people for smallpox by injecting them with cowpox virus. His success led to a smallpox vaccination and the eventual worldwide annihilation of the deadly disease.

A good "Jeopardy" question

Category: Medicine

Clue: It affected our first American president, had a role in shaping some battle strategies during the American Revolution, brought about the end of many Native American nations, allowed US citizens to open the "Wild West," and helped spread Spanish and Catholic influence in the Southwest United States.

[Answer](#)

Activity: Interview members of your family, especially older members.

- Do any of them remember people who had smallpox?
- Were any of them vaccinated against smallpox?
- If so, can you still see the vaccination scar?
(Probably on their left arm)
- Did any of those vaccinated have severe reactions?

A few questions you might have



Is it dangerous for me to get vaccinated against smallpox?

It depends on your age, general health, and whether or not you have had eczema. Although smallpox vaccination in the 1960s resulted in approximately one death per million vaccinations, that death typically occurred in infants less than one year of age or in people who had weakened immune systems. (Thus, for example, four of eight adults who died after smallpox vaccination were dying of terminal cancer when they were vaccinated and so their immune systems were unable to protect them

from the vaccine). If you are over the age of 10 and are in good health, the odds of dying from the smallpox vaccine are probably far less than one per 10 million vaccinations.



Does the smallpox vaccine cause heart attacks?

In 2003, the United States began vaccinating health care professionals against smallpox and there were three deaths due to heart attacks that occurred between four and 17 days after vaccination. This led some to believe that there might be a link between smallpox vaccination and heart attacks. Researchers went back to historical records from a smallpox outbreak in New York in 1947. During a four week span, over six million people (of all ages and health status) were vaccinated (almost one million people were vaccinated in one day!) and yet there was no increase in deaths due to heart attacks or to any other causes during the period directly after the vaccination program had started. This indicates that the heart attacks that occurred in people vaccinated against smallpox in 2003 were likely to be just a coincidence and not the results of a cause-effect relationship.



How many people in the United States have been vaccinated against smallpox?

The U.S. stopped routine smallpox vaccination of the general public in 1972. This means that there are lots of people born before 1972 that have already been vaccinated (about 150 million people or about 51 percent of the population), figures which do not even include statistics from the military, which continued vaccinating new recruits every year until 1990.



How effective is the smallpox vaccine?

It is important to keep in mind that no vaccine can guarantee 100 percent protection of all people against any one virus. However, the smallpox vaccine can protect more than [95 percent](#) of people from getting infected with smallpox, and it is likely to protect more than 99 percent of people from dying from this disease.

| Three more "Jeopardy" questions | | |
|--|---|--|
| Question: This physician, living 200 years ago, tested a theory that led to the first vaccine. Answer | Question: An old-wives' tale that milkmaids never got smallpox played a role in the discovery of this medical practice. Answer | Question: This word comes from the Latin word for cow and honors Blossom, the cow that was being milked by the young girl from whom Jenner extracted cowpox virus. Answer |

Some "extra credit" activities

1. How are vaccines tested for safety and for efficacy? What regulations govern vaccine testing? When is it ethical to use humans in vaccine trials? To use animals? Here's a lead: [FDA regulations](#).
2. Check out some thought challenges concerning [Jenner](#).

For further reading:

<http://www.nature.com/cgi-taf/DynaPage.taf?file=/nm/journal/v9/n9/abs/nm917.html&dynoptions=doi1066839175>