

# Smallpox

## Traveler Summary

### Key Points

- Smallpox is a contagious, viral infection acquired through the inhalation of infected aerosolized respiratory droplets or via direct contact with infected skin lesions, bodily fluids, or contaminated bedding or clothing.
- Naturally occurring smallpox has been eradicated. International travelers are not at risk unless a bioterrorism event occurs.
- Symptoms include fever, muscle aches, fatigue, headache and backache, and a rash (on the face, hands, forearms, and trunk) that progresses to blisters with pus and scabs.
- Consequences of infection include death in about 30% of cases.
- Prevention includes strict infection-control measures for persons who work with the virus.
- Smallpox vaccines are available only to the military, certain researchers, and designated first responders.
- Vaccine side effects include fever, headache, and severe vaccination-site reactions; serious cardiac side effects may occur with certain vaccines.
- Duration of vaccine protection is about 2 to 10 years depending on the vaccine. Booster doses are recommended for certain at-risk groups at intervals that vary according to exposure risk.
- Postexposure prevention includes vaccination or the use of an antiviral within 3 days of exposure.

### Introduction

Smallpox (variola) is a contagious (sometimes fatal) viral infection transmitted from person to person through inhalation of infected aerosolized respiratory droplets or direct contact with infected bodily fluids, lesions, or contaminated clothing from infected persons. Travelers are not at risk of smallpox infection (it was declared eradicated in 1980) unless an intentional act of bioterrorism occurs; death occurs in about 30% of cases. Monkeypox, a milder viral infection occurring in certain West and Central African countries, causes rashes similar to smallpox (although with lower risk of death).

### Risk Areas

Naturally occurring smallpox has been eliminated.

### Transmission

Smallpox is transmitted mainly via direct and prolonged face-to-face contact with a contagious person (via inhalation of infected aerosolized respiratory droplets, e.g., from coughs or sneezes) or through direct contact with infected bodily fluids, lesions, or contaminated bedding, towels, or clothing. Rarely, smallpox has been spread via exposure to an aerosol release of the virus, such as in enclosed buildings, buses, or trains, or through airborne transmission in hospitals and laboratory settings.

### Risk Factors

International travelers are not at risk of smallpox infection.

Risk of exposure to smallpox is increased for military personnel, first responders, laboratory workers who work with the vaccinia virus (used to make smallpox vaccine), persons who work with animals contaminated or infected with the vaccinia virus, and health care workers (HCWs) who are involved in clinical trials or who are preselected to care for smallpox cases in the event they occur. Smallpox also represents a potential bioterrorism threat because the virus may be weaponized and subsequently spread from person to person.

### Symptoms

Symptoms most commonly appear approximately 10 to 14 days (range: 7-19 days) following exposure and include fever, muscle aches, exhaustion, and severe headache and backache, followed by the appearance of mouth sores and a flat red rash on the face and forearms 2 to 4 days later. The rash progresses to raised bumps, blisters containing pus, and scabs, and may spread to the trunk, legs, palms, and soles. Within 4 weeks, the scabs fall off and the person is no longer contagious.

## Consequences of Infection

Death occurs in about 30% of cases.

## Need for Medical Assistance

Persons who may have been exposed to smallpox (variola) virus should seek immediate medical attention for evaluation of the need for postexposure treatment.

## Prevention

### Nonvaccine

Persons who work with the virus or who may have been exposed during release events should observe strict infection-control measures. Antiviral agents are under evaluation for use as smallpox postexposure prophylaxis during outbreaks possibly due to bioterrorism or accidental release.

### Vaccine

Vaccines effective against smallpox (ACAM2000, APSV, and Jynneos) exist; all are live virus vaccines containing vaccinia virus (not the smallpox virus). Jynneos is a dual-pox vaccine that provides protection against both smallpox and monkeypox. Vaccination with ACAM2000 or APSV causes a blister to form (the "take"), which indicates a protective immune response against smallpox. Vaccination with Jynneos does not result in a "take," but the protective immune response is similar to that of ACAM2000 and APSV.

Smallpox vaccines and immune globulin are stockpiled and controlled by national governments. In the US, smallpox vaccine is not commercially available to travelers or health care providers, but the US government has sufficient quantities of the vaccine to inoculate every person in the country in an emergency. If needed, the vaccine would be distributed by US CDC. Vaccination within 7 days of exposure may reduce symptoms or prevent illness if given even earlier; if a rash has already developed, the vaccine will not provide protection.

Vaccination is routinely recommended for the following persons at high risk:

- Certain laboratory workers that work with the viruses
- HCWs involved in clinical trials using vaccinia-virus vaccines
- US military and support personnel (may be required)
- Designated civilian first responders

In the event of a credible smallpox threat or outbreak, "out-the-door" revaccination is recommended for:

- Civilian first responders (i.e., previously vaccinated public health and health care volunteers in the US Civilian Smallpox Preparedness and Response Program)
- US military and support personnel at increased risk
- Persons administering the vaccine, regardless of interval since last dose

Smallpox vaccination is not recommended for international travel unless otherwise indicated.

## Side Effects

The most common side effects of ACAM2000 include vaccination-site reactions (redness, itching, pain, or swelling); swollen, tender lymph nodes in the armpit; low-grade fever with headache, muscle aches, nausea, or tiredness. Serious side effects include inflammation of the heart and cardiac lining, generalized spread of the virus in the bloodstream or to the brain, seizures, and a life-threatening rash.

Side effects following vaccination with Jynneos are milder (than with ACAM2000) and include injection-site reactions (redness, pain, swelling and itching), headache, nausea, muscle aches, swelling, and nonserious cardiac adverse events.

ACAM2000 (live vaccine virus replicates in the body) should not be used in persons with weakened immune systems. However, Jynneos (live vaccine virus does not replicate in the body) is safe for use in HIV-infected persons and/or those with weakened immune systems.

Persons with underlying medical conditions or who have concerns about the vaccines should speak to their health care provider before vaccine administration.

## Timing

The primary series with ACAM2000 or APSV consists of a single dose; the person must return to the health care provider 6 to 8 days after vaccination for evaluation of the "take" and to determine whether vaccination was successful.

The primary series with Jynneos consists of 2 doses, given 4 weeks apart to persons 18 years and older.

Duration of protection is 5 to 10 years following vaccination with ACAM2000 or APSV and about 2 years following vaccination with Jynneos (complete primary series).

Timing of revaccination (if indicated) depends on the vaccine and level of risk and ranges from 2 to 10 years.

## Special Considerations

### Care of the Vaccination Site

The live vaccinia virus can shed from the vaccination site after vaccination with ACAM2000 or APSV and be spread to other parts of the body or to other people. After vaccination:

- Cover the vaccination site with a sterile nonstick dressing and secure loosely with tape.
- Keep the site clean and dry and change the dressing every 1 to 2 days or if it becomes wet (discard dressing carefully in plastic bags).
- Wear a long-sleeved shirt to cover the vaccination site until the scab separates.
- Apply povidone-iodine ointment to the vaccination site (every 1-3 days) starting on day 7 after vaccination to minimize the risk of transmission.
- Do not scratch or rub the site.
- Wash hands thoroughly with soap and water or with disinfecting agents after any contact with the site, the dressing, or materials (clothing, bedding, etc.) that have come in contact with the site.
- Wash clothing and bedding that come into contact with the vaccination site in hot water.

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