



Vaccinia Virus

General Information

Vaccinia virus (VACV) is a large, enveloped, double-stranded virus that belongs to the *Poxviridae* family. VACV is used as a live-virus vaccine for smallpox. Commonly used VACV strains in laboratory-based research include Western Reserve (WR) and Copenhagen.

Host Range

Mammals, including humans, horses, rabbits, and cows

Incubation Period

As VACV is an immunizing agent, there is no incubation period. The time it takes to become immunized is usually 7-14 days.

Survival Outside Host

Dried VACV can survive up to 39 weeks at 4°C. Lyophilized VACV remains potent for 18 months at 4-6°C.

Laboratory Hazards

Dermal contact (virus lesion contact with broken skin), parenteral inoculation, mucous membrane exposure (e.g., ocular exposure), ingestion

Symptoms of Exposure

Vaccination symptoms: rash, fever, head and body aches, lymphadenopathy, and fatigue

Symptoms for lab-acquired infections: ocular vaccinia (eye pain, eyelid swelling and pain, mucoid discharge, pustule formation, conjunctival infection), skin lesions, fatigue, lymphadenopathy, and fever.

Lab Acquired Infections (LAIs)

At least 10 reported cases in the United States. Most common routes of transmission were by needles and eye splash. The Western Reserve VACV strain was involved in most or all cases.

Personal Protective Equipment



Lab Coat



Gloves



Closed-toed Shoes



Eye Protection

Disinfection & Inactivation

Susceptible to many disinfectants including 10% bleach, 70% ethanol. VACV is inactivated by dry heat (95°C for 2hrs) and moist heat (121°C for 15min)

Waste Management

Refer to [USC's Biological and Infectious Waste Management Plan](#).

Lab Containment

[Biosafety Level 2 \(BSL-2\)](#) for activities with materials and cultures known or reasonably expected to contain VACV

Animal Containment

[Animal Biosafety Level 2 \(ABSL-2\)](#) for activities with experimentally infected animals.

Medical Surveillance/Treatment

Surveillance: Monitor for symptoms and confirm using PCR, electron microscopy, and histology.

Prophylaxis: None

Vaccines: Smallpox vaccination is recommended for lab personnel working with replication competent VACV strains. Vaccination is recommended every 10 years. Vaccination is contraindicated for those who have eczema, cardiac disease and for immunocompromised or pregnant individuals. CDC is the only source of the vaccine (ACAM2000) for lab personnel.

Treatment: VACV immune globulin and tecovirimat or cidofovir. Antibiotics have also been given after LAIs because of possible secondary bacterial infection.

Spill Procedures

See [USC Biological Spill Procedures](#)

Exposure Procedures

See [USC Protocol for Post Exposure Evaluation and Follow-up](#) Use of sharps should be strictly limited. All procedures with the potential for creating aerosols should be performed in a biosafety cabinet.

References

Public Health Agency of Canada. [Vaccinia Virus](#)

Boston University Vaccinia virus [Agent Information Sheet](#).

CDC <https://www.cdc.gov/mmwr/volumes/65/wr/mm6510a2.htm>

MacNeil, A., Reynolds, M., Damon, I., 2009. Risks associated with vaccinia virus in the laboratory. *Virology* 385 1-4