

Virginia Department of Health
Vaccinia Disease and Vaccinia Adverse Events: Overview for Healthcare Providers

Organism	Vaccinia virus that is used in the smallpox vaccine; genus <i>Orthopoxvirus</i> , family <i>Poxviridae</i>
Reporting to Public Health	Suspected or confirmed cases of vaccinia disease and vaccinia adverse events require <u>immediate</u> notification to the local health department (LHD). See https://www.vdh.virginia.gov/health-department-locator/
Infective Dose	Unknown
Route of Infection	Inoculation with vaccine (ACAM2000® or APSV) or direct contact with vaccine site or materials containing vaccinia virus
Communicability	Communicable to close contacts. Virus can be cultured 2–5 days after vaccination until the scab separates from the skin (14–21 days after vaccination); viral shedding peaks ~4–15 days after vaccination.
Risk factors	<ul style="list-style-type: none"> • History or presence of eczema or other acute, chronic, or exfoliative skin condition • Having a weakened immune system caused by a disease, condition, or treatment • Pregnancy • Children, especially aged 1–4 years • Close contacts of vaccinee, including sexual partners, especially if contact meets any of the criteria listed above • Laboratory staff who handle replication-competent vaccinia virus or virus derived from replication-competent vaccinia virus
Case-fatality Rate	Depends on the type of adverse event
Incubation Period	Varies by adverse event (see Clinical Description section)
Clinical Description Postexposure means after inoculation with the vaccine or after direct contact with vaccine site or infectious materials.	<p><u>Normal Site Reaction:</u> Papule (3–5 days after vaccination) → vesicle (days 5–8) → pustule (maximum size days 8–10) → scab or crusting (separates between 14–21 days) → pitted scar. Determination of a successful vaccination ('take') is made on days 6–8 after vaccination.</p> <p><u>Normal Variants:</u> Satellite lesions; lymphangitis from site to regional nodes; regional lymphadenopathy; considerable local edema at the site; intense erythema. Variants usually resolve spontaneously.</p> <p><u>Adverse Events:</u></p> <ul style="list-style-type: none"> • Inadvertent autoinoculation: virus is transferred from vaccination site to another location on vaccinee or to close contact. Most common adverse events involve face, eyelid, nose, mouth, lips, genitalia, and anus. Lesions at inoculation site progress through the same stages (e.g., papular, vesicular, pustular, crusting, and scar) at the vaccination site. • Ocular vaccinia: occurs if vaccinia virus is transferred to periocular soft tissue or the eye itself (conjunctivitis, blepharitis, iritis, or keratitis); accounts for the majority of inadvertent inoculations. Infections range from mild to severe and can potentially lead to vision loss. • Bacterial infection: uncommon but reported more frequently in children than adults. Examples include staphylococcal or streptococcal infections. Obtain Gram stain and bacterial culture or swab (for purulent lesions). • Generalized vaccinia: disseminated pustular or vesicular lesions; fever might be present; usually self-limiting; occurs within a week after exposure. First-time vaccinees are at higher risk than those who previously received the vaccine. Differential Diagnosis: erythema multiforme, eczema vaccinatum, progressive vaccinia, severe varicella; inadvertent inoculation at multiple sites; smallpox; disseminated herpes. • Eczema vaccinatum: vaccinia lesions, generalized or focal, usually in persons with eczema/atopic dermatitis history. Occurs ~5–19 days postexposure. Fever and lymphadenopathy are often present. Can be fatal.

	<ul style="list-style-type: none"> • Erythema multiforme: rash might be erythematous macules, papules, urticaria, bulls-eye vesicles or even pustules. Occurs 1–2 weeks postexposure. Pruritic rash leads to scratching and possible superinfection. Rare evolution to Stevens-Johnson syndrome requires hospitalization. Differential Diagnosis: generalized vaccinia; inadvertent inoculation. • Progressive vaccinia: rare, severe, often fatal, spreading necrosis at vaccination site; metastatic necrotic lesions might occur elsewhere on body. Suspect if lesion progresses without healing >15 days postexposure. Secondary bacterial, viral, or fungal infection might ensue. Differential Diagnosis: bacterial infection; severe varicella; severe smallpox; disseminated herpes. • Fetal vaccinia: rare, but transmission can occur any time during pregnancy. Can result in miscarriage, stillbirth, or live birth (often premature) with macular, papular, vesicular, pustular, or ulcerative rash in newborn. • Postvaccinial central nervous system disease (e.g., encephalitis, encephalomyelitis): rare, but most common among infants aged <12 months; occurs ~10–14 days postexposure; symptoms reflect cerebral or cerebellar dysfunction with headache, fever, vomiting, altered mental status (confusion, delirium, somnolence), lethargy, seizures, coma, or sensorimotor dysfunction (altered sensation, paresis). Differential Diagnosis: EBV (Epstein-Barr virus), Herpes viruses, enteroviruses, measles, mumps, <i>Mycoplasma pneumoniae</i>, varicella zoster virus, arboviruses. • Cardiac adverse events (e.g., myo/pericarditis, dilated cardiomyopathy, and cardiac ischemia): pain, dyspnea, and mild/severe palpitations • See Smallpox Vaccination and Adverse Reactions: Guidance for Clinicians (2003 MMWR) and CDC's website for clinicians. For surveillance guidelines for adverse events, see Surveillance Guidelines for Smallpox Vaccine (vaccinia) Adverse Reactions (2006 MMWR).
Differential Diagnosis	Depends on the type of adverse event (see Clinical Description section)
Specimen Collection and Laboratory Testing	<ul style="list-style-type: none"> • If vaccinia disease or a vaccine adverse event is suspected, notify the LHD immediately. Specimens may be sent to the Division of Consolidated Laboratory Services (DCLS) <u>after</u> VDH has approved testing. For questions about specimen collection and handling, the DCLS Emergency Officer can be reached 24/7 at 804-335-4617. • When clinical diagnosis is not straightforward, laboratory diagnostics for vaccinia may be helpful and may prevent inappropriate use of potentially toxic therapies. However, diagnostics for conditions easily confused with vaccinia infections (i.e., varicella, herpes zoster, herpes simplex, and enteroviruses) should be considered initially, especially for a nonvaccinee or someone believed to be a noncontact of a vaccinee.
Treatment	<ul style="list-style-type: none"> • Vaccinia Immune Globulin Intravenous (VIGIV), which is licensed by FDA and only available through CDC, is first line therapy for: 1) eczema vaccinatum; 2) progressive vaccinia; 3) severe generalized vaccinia; 4) vaccinia infections in individuals who have skin conditions; 5) aberrant infections induced by vaccinia virus (except isolated keratitis) • In addition to VIGIV, antivirals (e.g., tecovirimat, cidofovir, brincidofovir) may be considered as second line therapy after CDC consultation • CDC is available for clinical consultation 24/7 at 770-488-7100
Postexposure Prophylaxis	Recommendations about whether to use the vaccinia virus smallpox vaccine following exposure to an orthopoxvirus that infects humans (e.g., monkeypox, cowpox, and variola) are made on a case-by-case basis in consultation with public health (e.g., VDH, CDC)
Vaccine	Not applicable (the smallpox vaccine is composed of vaccinia virus)
Infection Control	<ul style="list-style-type: none"> • People being vaccinated should follow instructions for properly caring for the vaccination site until scab separates on its own from the skin. These include covering vaccination site loosely with gauze and first-aid tape; wearing a shirt with sleeves to cover the bandage; keeping the site dry; changing the bandage at least every 3 days; putting used bandages in plastic zip bags and throwing them away in the regular trash; thoroughly washing hands with soap and water or hand sanitizer with ≥60% alcohol after direct contact with the vaccination site or materials that touched the site; and preventing others from contacting the vaccination site or contaminated materials. Vaccinated healthcare workers should cover the vaccination site with gauze and semi-permeable dressing until scab separates (≥21 days) and observe hand hygiene. • Patients with vaccine adverse events with virus-containing lesions (e.g., inadvertent autoinoculation, ocular lesions [blepharitis, conjunctivitis], generalized vaccinia, progressive vaccinia, eczema vaccinatum) should be placed on Standard and Contact Precautions until all lesions are crusted. Contact Precautions are also recommended for bacterial superinfection if the exudates cannot be contained. • Decontaminate surfaces with an EPA-registered disinfectant approved to inactivate vaccinia virus and follow the manufacturer's directions • Follow waste management guidelines and regulations for Category B infectious substances