

SMALLPOX SURVEILLANCE PROTOCOL

Draft

Because smallpox has been eradicated world-wide, the only explanation for a case in West Virginia would be most likely due to a bioterrorism (BT) event. This protocol applies if a case of smallpox is highly suspected, i.e. meets the clinical case definition, and does not apply to non-specific fever or rash illnesses.

Public Health Action

The local county health department (LHD) with support of the Division of Surveillance and Disease Control (DSDC), WV Bureau for Public Health (WVBPH) should do the following:

1. Prior to the occurrence of a case of smallpox
 - a. Protect employee health
 - i. Identify high risk employees: Identify high risk employees who will be involved in the response to a BT event or may have direct contact to smallpox cases. High risk individuals may include 1) selected health care workers and support workers in hospitals and clinics that have ERs and negative pressure isolation rooms that will come into contact with smallpox cases, 2) persons who will administer smallpox vaccine, 3) state and local epidemiologic response teams who will have face-to-face contact with suspected, probable, or confirmed smallpox cases; 4) hazmat teams, industrial hygienists, health department sanitarians, and other personnel who may collect environmental samples, and 5) first responders, such as law enforcement, EMS, and fire department personnel who respond to a BT event. These recommendations may change as new information about risk of exposure becomes available.
 - ii. Educate high risk employees:
 - (1) Educate high risk employees about the risk and mortality associated with exposure to smallpox.
 - (2) Educate high risk employees about contact and airborne precautions, and isolation of cases (See Preventive Interventions Section).
 - (3) Educate them about the effectiveness of vaccine to reduce risk of smallpox and the adverse effects of the vaccine.
 - (4) Provide them fact sheets prepared by C.D.C. or the Infectious Disease Epidemiology Program (IDEP), DSDC.
 - iii. Vaccinate high risk employees: At this time, DSDC will collaborate with local health departments to arrange for vaccinations to be offered to high risk individuals pending availability of the vaccine.
 - iv. Personal Protective Equipment (PPE): Educate employees on the use of proper PPE, provide appropriate PPE to employees for use during an outbreak, and ensure fit testing for employees for respirator use (see Preventive Interventions section.)

- b. Assemble and train a BT epidemiologic response team.
 - i. Assemble BT response team: Identify staff for a BT epidemiologic response team that can adequately respond to a large outbreak by conducting surveillance and epidemiologic investigations after a BT event.
 - ii. Surge capacity for BT response team: Identify pools of individuals for surge capacity for the response teams during large outbreaks.
 - iii. Train BT response team: Periodically train and pre-drill individuals on the team in their respective responsibilities during an outbreak.
 - c. Educate health care providers and the public in the recognition and diagnosis of smallpox, and in their role in active surveillance.
 - d. Educate providers and laboratories to report smallpox to the local health department in the patient's county of residence immediately.
 - i. Establish mechanisms for reporting suspected, probable, and confirmed cases (e.g., 24/7 telephone number).
 - ii. Establish points of contacts for reporting cases.
 - iii. Establish multiple means of communicating information back to health providers and labs (e.g., 24/7 telephone number).
 - e. Identify and train experts on smallpox who can be contacted by the media and public to provide reliable information on the disease.
2. When a smallpox case is reported
- If a suspected case of smallpox is reported, the LHD should contact IDEP immediately,** and should anticipate that state and local BT response teams will be formed to respond to the outbreak.
- a. Isolation of case: Assure the case is appropriately isolated (contact and airborne precautions should be followed - see Preventive Interventions section).
 - b. Confirm and follow-up of cases
 - i. For each suspected case, immediately obtain a complete clinical and laboratory history. Using the *CDC Smallpox Post Event Surveillance Form (Form 1)* obtain information and determine whether a case is clinically or laboratory confirmed (See Case Definition).
 - ii. Assure that appropriate laboratory specimens are obtained on each suspected case (see Laboratory Notes). Specimens from vesicles, pustules, and scabs; autopsy specimens; and/or blood are to be sent to C.D.C. according to their guidelines and in consultation with them.
 - iii. Follow-up on cases until scabs fall off and record clinical and laboratory information on *C.D.C. Form 1*.
 - c. Confirmation of a BT threat and Notification Procedure:
When IDEP is notified of a suspected or probable case, IDEP will notify the State Epidemiologist who will notify the State Health Commissioner. The WVBPB shall coordinate the response with other federal, state and local agencies according to the Biological Terrorism (BT) confirmation and notification procedure in the WV Public Health Threat Preparedness Surveillance and Epidemiologic Response Plan.
 - d. Activate the BT response team: Activate staff on the BT epidemiologic response team and review their responsibilities in the investigation.

- e. Protect employee health:
 - i. Identify all high risk employees (See Section 1.a).
 - ii. Assure protection of employee health following procedures in the Preventive Interventions section.
- f. Case Finding:
 - i. Develop a working case definition: Develop a working case definition for the outbreak investigation. A working case definition may be considered as follows: anyone who meets our CDC case definition for a suspected, probable, or confirmed case (See case definition); and in addition anyone with fever (>38.5C or 101 F) or rash who was in a confirmed exposed area during the BT event or came in contact with a confirmed or probable case.
 - ii. Begin enhanced passive surveillance: Immediately begin enhanced passive surveillance as needed with health care providers and laboratories in the county.
 - (1) Educate health care providers and the public in the recognition and diagnosis of smallpox.
 - (2) Educate providers and laboratories to immediately report possible smallpox infections that meet the 'Working Case Definition' to the local health department in the patient's county of residence.
 - iii. Prepare for active surveillance: Alert the regional epidemiologist and be prepared to expand active surveillance throughout the region, e.g., be prepared to interview providers and patients, and review/abstract patient records.
 - iv. Confirm new cases: Receive and screen reports of suspected cases, and confirm new cases.
 - v. Develop line list of cases: Develop a line listing of all suspect, probable, and laboratory confirmed cases using a *Case Outbreak Line listing Form*. Prioritize and refer high and medium risk cases to Type C and X isolation facilities, respectively (see hospital plan for smallpox).

Note: A Type C hospital is a facility with negative pressure isolation rooms for patients who are contagious (fever and rash). A Type X hospital is a facility with negative pressure isolation rooms for vaccinated contacts under surveillance who develop fever on two successive days. Alternative Type X facilities may be motels, hotels, armories etc. if hospital facilities are not available. A Type R facility may be a person's home or alternative living accommodations such as motels, hotels, armories etc. arranged by LHDs.
- g. Maintain the line listing of cases and develop a risk factor/exposure data base:
 - i. Track cases and update their clinical status on *CDC Smallpox Form 1*. Ensure that clinical and laboratory information are collected from health providers and laboratories, if not done.
 - ii. Develop and maintain an electronic data base of pertinent clinical and exposure data for hypothesis testing.
 - (1) Compile clinical, laboratory, and exposure assessment data as they are collected or submitted by health providers and labs.
 - (2) Review data for completeness and complete pending case investigations and incomplete exposure assessments.
 - (3) Develop and maintain electronic database for hypothesis testing.

- h. Hypothesis testing:
 - i. Exposure assessment: Conduct an assessment of the source and characteristics of exposure immediately after a case is suspected as follows:
 - (1) Interview a sample of cases and determine where the cases received their exposure using *C.D.C. Smallpox forms 3A (persons exposed to and places visited within 7 to 19 days before fever onset), 3B (Case's activities during exposure period), and 3C (Case's travel history during exposure period)*.
 - (2) If a possible BT event or intentional exposure is suspected, and after the source is confirmed, continue the interview with the same sample of cases. Obtain information on the type, location and specific areas, duration, relative amount, and method of dissemination of exposure for the possible BT event.
 - ii. Analyze clinical, laboratory, risk factor, and exposure data. In consultation with CDC, as plausible hypotheses emerge for the source and location of exposure, design and conduct studies to confirm or rule out hypotheses.
- i. Identify exposed population:
 - i. After the source of exposure is confirmed, identify the exposed population. Definition of an exposed individual: An exposed individual will be a person who shared or possibly shared airspace in common with that of confirmed cases during a BT event.
 - ii. If the exposed population is well defined and small enough to record on a line list, then develop line listing of all persons possibly exposed using an *Exposed Individual Line Listing Form*. Record each person's exposure risk based upon proximity to exposure.
- j. Contact tracing:
 - i. Identify case-contacts: Interview all suspected, probable, and confirmed cases and identify all persons who had **direct contact** to the case since the case's onset of fever (henceforth referred to as case-contacts). Using *C.D.C. Forms 2A and 2C*, record the case's activities and travel within 19 days after onset of fever, and then, record all case-contacts on *C.D.C. Form 2B*. Continue interviewing the case daily and continue to record contacts until scabs fall off or case dies. For each case develop a line list of all case-contacts including all household members of the case-contacts using *C.D.C. Form 2B*. Record locating information on *C.D.C. Form 2D* for each case-contact and assign a priority to the case-contact for the management of tracing.
 - Direct contacts: Direct contacts are defined as any person who has had face-to-face contact (within 6 feet) with a suspected, probable, or confirmed case of smallpox during the infectious period (onset of fever until time of interview, time that scabs fall off of case, or death of case).
 - ii. Locate case-contacts: If necessary, obtain locating information for each case-contact from sources other than the case. Use work and school telephone numbers, telephone directories, voting lists, neighborhood interviews, site visits, "hangouts" etc., to trace case-contacts when information is unknown or incomplete. If case-contacts cannot be found through these mechanisms, other sources for notification, such as media announcements, may have to be considered.
 - iii. Interview case-contacts: Interview all case-contacts and record all

household members of case-contacts including those who work full time in the household and record on *C.D.C. Form 2F*. **Assure that all case-contacts are contacted within 24 hours.**

- k. Surveillance and management of case-contacts and exposed populations
 - i. Management of case-contacts

(1) **Prioritize case-contacts:** Once all case-contacts are identified, they should be allocated to priority categories for vaccination and follow-up based upon duration of exposure using priority information recorded on *C.D.C. Form 2D* according to the following guidelines:

- (a) Highest priority: household case-contacts, immediate family members, and persons who spent > 3 hours in household.
- (b) Second priority: i) named case-contacts who spent >3 hours in cases home but who do not live there (e.g., close friends who visited, any person who spent the night), ii) named non-household contacts with >3 hours of exposure, and iii) persons exposed in a doctor's office or other medical facility.
- (c) Third priority: named non-household case-contacts with 3 hours or less time of exposure.
- (d) Fourth priority: named non-household case-contacts who had been 6 feet or more from case with <1 hour of exposure.
- (e) Last priority: non-household case-contacts who had been 6 feet or more from case with <1 hour of exposure at a designated location.

Other factors for contact tracers to consider when assigning case-contacts to priority groups include case's status, e.g., fever, rash, presence of cough, and proximity of exposure, e.g., sat next to potentially infectious cases for 2 hours at a meeting versus sat in same room for the meeting.

If the number of case-contacts exceeds the capabilities of contact tracing to provide rapid identification and interviewing, state and Federal health authorities may in addition to identifying face-to-face contacts may identify presumptive contacts based on determining locations and times where the case was present following onset of fever. This addition should only be implemented by the State Medical Officer after consultation with Federal health authorities and only if limited personnel resources and the size of the outbreak do not permit effective institution of the standard procedure.

- (2) Vaccinate all case-contacts and their household members within 3-4 days after direct contact with a case.
- (3) Isolate in a Type X hospital facility all case-contacts and their household members who exhibit fever or rash.
- (4) Educate case-contacts and their household members about recognition of smallpox symptoms, what to anticipate, who to call and where to go during the surveillance phase.
- (5) **Case-contacts who do not have fever or rash at the time of interview must remain under active surveillance for 21 days after their last contact with the smallpox case, or 14 days following successful vaccination.** The contact tracer will establish methods for daily reporting with the case contact including methods for daily tracking if the case-contact does not have access to a home telephone. During

the daily interview of contacts, information on case-contacts will be recorded on *C.D.C. Form 2E* and information on household members will be recorded on *Form 2F*.

- (a) Case-contacts must monitor and record their temperature in the morning and early evening each day.
 - (b) Each day before 8 p.m. case-contacts must call or be called by a designated person (or staff at a designated phone number) to report their daily temperatures, health status, vaccination status, and any severe adverse vaccine reaction in themselves or household members following vaccination.
 - (c) During the surveillance period they may continue their usual daily activities, going to work or attending school, as long as no temperatures $\geq 101^{\circ}\text{F}$ (38°C) are measured. They should not, however, travel away (more than 20 miles) from their city of residence.
 - (d) **If they have a temperature $\geq 101^{\circ}\text{F}$ (38°C), they must remain in their own home. If they have temperature readings of $\geq 101^{\circ}\text{F}$ on two consecutive days or evidence of a rash, they must 1) contact their health department personnel immediately, and remain at home, having contact only with vaccinated household members, until further evaluated by health department personnel, and 2) be isolated in a type X facility.**
 - (e) On day 7 following vaccination, depending on local arrangements and staff availability, contacts must visit or report to the health department the status of their vaccine site (does the area of their arm where they were vaccinated look like the picture they were given when they were vaccinated?) and the vaccine sites of their household members.
- (6) Vaccine safety monitors who are assigned to monitor the health status of case-contacts and their household members who are under surveillance will answer questions, record daily temperature readings and health status, record information on vaccine “take” and severe adverse vaccine reactions, and will refer for in-home follow-up any individuals who fail to report in and cannot be contacted by telephone. If resources permit, they will visit the household on day 7 following vaccination to record vaccine “take”. If personnel are limited in a large outbreak, face-to-face and telephone interviewers may be employed for this purpose.
- (a) These personnel will record information on case-contacts using *Form 2E* on the date and type of follow up (in person or by telephone), recorded temperature, other symptoms of illness, and on day 7 after vaccination, vaccine site reaction.
 - (b) These personnel will obtain information on the vaccine “take” of household members of case-contacts in the household and record it on the *Form 2F*. Persons who do not have a successful vaccination should be re-vaccinated.
 - (c) A daily tracking form such as a case-contact line list form should be used to record on a master sheet summary information from all case-contacts monitored.

- (7) If personnel are limited, Federal health and state authorities may institute a passive system of monitoring of health status of contacts. In this approach, contacts under monitoring are only required to call or be interviewed by health department personnel if:
- (a) They have temperatures $\geq 101^{\circ}$ F (38° C) on 2 consecutive days or develop a rash;
 - (b) They have no reaction at the vaccine site on day 7;
 - (c) They have a severe adverse vaccine reaction; or
 - (d) They have completed the period of monitoring (21 days from last contact with the case or 14 days following successful vaccination) and are reporting in to be officially released from monitoring.
- This change should only be implemented by the State Epidemiologist after consultation with Federal health authorities and only if limited personnel resources and the size of the outbreak do not permit effective institution of the standard procedure.
- (8) Coordination of contact tracing with vaccination personnel:
- (a) Make a list of names and social security numbers (or drivers license numbers) of contact and household members who will be referred for vaccination and provide this list to the fixed vaccination clinic site where the contacts/household members will be sent.
 - (b) Provide a daily Master Report to the person responsible for coordinating contact tracing which includes:
 - (i) Contacts found.
 - (ii) Contacts not found
 - (iii) Symptoms of contacts
 - (iv) Disposition of found Contacts
 - 1) Interviewed and vaccinated/referred for vaccination
 - 2) Interviewed and referred for illness evaluation
 - 3) Isolated if fever or rash develops
 - (v) Status of contacts not found
 - 1) Whereabouts known but unable to contact for interview.
 - 2) Whereabouts unknown
 - (vi) Number of contacts' household members
 - (vii) Number of contacts' household members vaccinated or referred for vaccination
- (9) Contacts who refuse vaccination shall be quarantined to their home. Accommodation for quarantine at Type R facilities will be arranged by the LHD for contacts who refuse vaccination and cannot remain at home.
- ii. Management of exposed:
- If the exposed population can be identified, then do the following:
- (1) If the population is small, and can be put under a line listing, each exposed individual will be contacted, educated in their risk and recognition of smallpox symptoms, and if no fever or rash has developed, they will be referred to a vaccination clinic for a vaccination. If fever or rash has developed they will be referred to a Type C or X hospital.
 - (2) If the population is large and impossible to put under a line listing, the population will be alerted to recognize symptoms, and if no fever or rash has developed, they will be advised to go to a vaccination clinic for

vaccination. If fever or rash has developed they will be advised to go to a Type C hospital.

- (3) If possible, all household contacts will be identified, educated, put under surveillance and offered vaccine.
- (4) All individuals who were exposed in a BT event and their household members will be traced and managed using the same procedures described above for case-contacts in Section 2.k.i.
- iii. The vaccination strategy should be reevaluated continually based on the type and size of the outbreak and expanded or modified as necessary to maximize the health benefit to the population.
- I. Quarantine/isolation procedures
 - i. Quarantine procedures: Based upon available data, IDEP will recommend to the State Health Officer appropriate quarantine measures which may include:
 - (1) Active surveillance of presumed infected individuals and their contacts
 - (2) Isolation (separation of person or group of persons from other persons to prevent the spread of infection), and
 - (3) Population-wide quarantine measures which restrict activities or limit movement of individuals.C.D.C. recommends 4 quarantine levels in response to a suspected smallpox outbreak:
 - Level 1 (Enhanced passive alert procedures):
 - (1) Travel alerts and information
 - (2) Press releases
 - (3) Interagency partner notifications
 - Level 2:
 - (1) Level 1 activities
 - (2) Travel advisories
 - (3) Recommendation against elective travel
 - (4) Suspension of large public gatherings
 - (5) Closing of public places
 - Level 3:
 - (1) Level 2 activities
 - (2) Restriction of travel (air, rail, water, motor vehicle, and pedestrian)
 - Level 4:
 - (1) Level 3 activities
 - (2) "Cordon sanitaire": literally a sanitary cord or line around a quarantined area guarded to prevent spread of disease by restricting passage into or out of the area.
 - (3) Community-wide interventions (e.g., mass treatment and mass prophylaxis)In addition to enforcement activities, validation and vaccination of personnel must be conducted for 1) movement of essential personnel (e.g., rescue workers and first responders) into and out of quarantine area, 2) moving materials, food, and supplies into and out of quarantine, and 3) movement of individuals out of quarantine area for legitimate health and safety reasons.
 - ii. Isolation of symptomatic and unvaccinated case-contacts.

Vaccinated case-contacts of smallpox cases who exhibit fever, and case-

contacts who refuse vaccination or who cannot safely be vaccinated shall be isolated. Isolation may be at home or in an isolation facility for febrile contacts (Type X facility). The Commissioner may permit home isolation when there is a vaccinated, asymptomatic responsible adult care giver in the household, or there is another acceptable method available for providing food and other sustenance to the person(s) isolated (e.g., vaccinated home health agency staff), and when physical inspection of the premises documents the risk of incidental exposure of persons not in the household is negligible (e.g., there is no common ventilation system with other households).

All residents of the home in which isolated individuals live shall be vaccinated, or shall themselves be isolated. No one who is symptomatic or who is not vaccinated will be permitted to leave home isolation during the isolation period (18 days after last contact of the most recently exposed individual with either a smallpox case or a febrile case-contact or 14 days following successful vaccination) except for transfer to a Type X isolation facility. Each home in which isolation occurs will keep a log of persons visiting for inspection by public health officials.

During home isolation, the responsible care giver shall immediately report new development of fever, rash, cough, or other symptoms among all household residents, or any suspected violation of the conditions of isolation, to the local health department. The local health department shall maintain active contact with the household for the duration of isolation, meaning at least daily telephone or in person conversation with the responsible care giver, to document new symptoms.

As a less restrictive alternative to isolation in a designated facility, the Commissioner of the West Virginia Board of Public Health may impose additional conditions on a home isolation site, if conditions warrant it. These may include posting a warning placard at the entrance to the home, stationing staff at the entrance to the home to verify vaccination status of those entering and leaving, or requesting police assistance by providing a guard to enforce isolation.

Individuals subject to home isolation who violate the conditions of home isolation and those who are unable to meet those conditions shall be placed in a Type X facility for the required isolation period. The Commissioner of the West Virginia Board of Public Health may enforce isolation through a quarantine order.

Legal authority for public health powers: The Commissioner of the WVBPH has legal authority for quarantine power (Article 3, Section 16-3-1 of WV State Code, and 64CSR7-15)

Disease Prevention Objectives

Reduce risk of smallpox in high risk individuals through vaccination of medical and public health smallpox response teams.

Disease Control Objectives

Reduce risk of secondary transmission by 1) recognition and isolation of medium and high risk smallpox cases, 2) contact tracing and vaccination of contacts and household members, and 3) early institution of isolation/quarantine measures, as indicated.

Surveillance Objectives

To rapidly detect and confirm a case of smallpox if it occurs in WV.

Public Health Significance

Smallpox was globally eradicated in the 1970's. If an outbreak of smallpox was to occur, several factors could contribute to a more rapid spread of smallpox than was routinely seen before this disease was eradicated. These factors include 1) virtually nonexistent immunity to smallpox in the absence of naturally occurring disease and the discontinuation of routine vaccination in the United States in the early 1970's, 2) potentially delayed recognition of smallpox by health personnel who are unfamiliar with the disease, and 3) increased mobility and crowding of the population. Because of these factors, a single case of smallpox would require an immediate and coordinated public health and medical response to contain the outbreak and to prevent further infection of susceptible individuals. Because of the terrorist events of 2001 associated with anthrax, and because large quantities of smallpox were weaponized by Russia, a bioterrorist event in which *the variola virus* is aerosolized cannot be ruled out.

Clinical Description

Smallpox is characterized by both an enanthem with lesions in the mouth and on the posterior pharynx and an exanthem (rash). Constitutional symptoms prior to onset of rash (exanthem) include fever (100%), which generally occurs about 1-3 days before rash onset, headache (90%), backache (90%), chills (60%), and vomiting (50%). Less common symptoms include pharyngitis and severe abdominal pain. The hallmark of the ordinary (or classic) type of smallpox is a generalized vesiculopustular rash with lesions found more densely on the face and extremities (centrifugal), including the palms and soles. All lesions on any one part of the body are at a similar stage of development and are approximately the same size. Rash progresses from sparse macules (day 1), to papules (days 2), vesicles (days 3-4), pustules (days 5 to approximately 12), and scabs (days 13-18) for a total duration of 2-3 weeks.

Less common presentations of the smallpox rash include flat, or hemorrhagic lesions. A rash that progresses through the stages more rapidly and has fewer lesions characterizes modified smallpox, which occurs more commonly among previously vaccinated persons. Infection via cutaneous inoculation also has a shorter course with appearance of one or several vesicles at the site of inoculation after about 3 days.

Asymptomatic cases are very uncommon and their role in transmission is unclear but likely to be minimal.

Because routine childhood vaccination in the United States stopped in 1971, persons currently < 30 years are totally susceptible to smallpox and if exposed, are expected to exhibit classic or atypical presentations. Persons > 30 years may have been vaccinated during childhood or as adolescents or adults for travel or occupational reasons. Vaccination of health care workers and persons traveling overseas continued until the late 1970s and military personnel were vaccinated until 1990. Epidemiological studies have shown that an increased level of protection against smallpox persists for ≤ 5 years after primary vaccination and substantial but waning immunity can persist for ≥ 10 years. Antibody levels after re-vaccination can remain high longer, conferring a greater period of immunity than occurs after primary vaccination alone. Although it is assumed that adults > 30 years in the United States have little or no immunity to smallpox, there is evidence that vaccination during infancy results in long term reduction in mortality. Therefore, it is possible that if smallpox virus were introduced into the U.S. population, some vaccinated adults -- especially those who have received 2 or more doses of smallpox vaccine -- may develop modified smallpox following exposure and that mortality would be markedly lower than unvaccinated persons.

The most likely condition to consider in the differential diagnosis of vesiculopustular rash is varicella (see box). Major and minor distinguishing characteristics are listed below:

	Smallpox: clinical features	Varicella: clinical features
Major distinguishing features	Febrile prodrome: temperature >102 and systemic symptoms (prostration, severe headache, backache, abdominal pain, or vomiting) 1-4 days before rash onset	No or mild prodrome before rash onset
	Lesions are deep, firm, well-circumscribed pustules; may be confluent or umbilicated	Lesions typically superficial vesicles
Other distinguishing features	Rash concentrated on face and distal extremities (centrifugal)	Rash concentrated on trunk and proximal extremities (+/- face, scalp)
	Rash in same stage of evolution on any one part of the body	Rash appears in crops so lesions are in different stages of evolution (papules, vesicles, crusts) on any one part of the body
	First lesions on oral mucosa/palate (enanthem); followed by exanthem (rash) on face or forearm	First lesions on trunk (occasionally face)
	Lesions on palms and soles (seen in > 50%)	Lesions very uncommon on palms and soles
	Lesions may itch at scabbing stage	Lesions generally intensely itchy
	Lesions evolve from papule to pustule in days	Lesions generally evolve from macules to papules to vesicles to crusts in <24 hours
	Illness lasts 14 to 21 days	Illness lasts 4-7 days

In herpes zoster, lesions are usually localized to 1 or 2 dermatomes, but can become generalized, especially among immuno-compromised persons. The lesions in localized herpes zoster are painful and could likely be differentiated from smallpox based on their appearance. Other diagnoses to including drug eruptions, erythema multiforme, impetigo, disseminated herpes simplex, enteroviral infections associated with a vesicular rash, and others (See Rash Illness protocol).

Etiologic Agent

Variola virus a species of orthopox virus.

Reservoir

Officially now only in designated freezers in U.S. and Russian laboratories.

Mode of Transmission

Smallpox is transmitted person-to-person by 1) airborne droplet transmission (most common), 2) contact with material from pustules/rash lesions, or 3) contaminated clothing or bedding (less common), or small particle aerosol (least common). A bioterrorist event for an intentional exposure would most likely occur through aerosolization.

Incubation Period

12 days (7-19 days).

Infectious Period

A person is infectious from onset of rash including oropharyngeal lesions until scabs fall off.

Outbreak Recognition

Since the baseline number of cases is zero, one case is defined as an outbreak and is a national public health emergency.

Case Definition

Preliminary case definitions are included below but may require revision by public health personnel conducting the epidemiological investigation depending upon the specifics of the epidemic.

Clinical Description

An illness with acute onset of fever $\geq 101^{\circ}$ F followed by a rash characterized by vesicles or firm pustules in the same stage of development without other apparent cause.

Laboratory Criteria for Confirmation* (to be conducted in Level C or D laboratories only)

- Isolation of smallpox (variola) virus from a clinical specimen (Level D laboratory only), or
- Polymerase chain reaction (PCR) identification of variola DNA in a clinical specimen, or
- Negative stain electron microscopy (EM) identification of variola virus in a clinical specimen (Level D laboratory or approved Level C laboratory)
 - *Level D laboratories include the CDC and USAMRIID. Initial confirmation of a smallpox outbreak requires testing in a Level D laboratory. Level C laboratories will assist with testing of clinical specimens following initial confirmation of an outbreak by CDC.

Case Classification

Confirmed:

- A case of smallpox that is laboratory confirmed.

Probable:

- A case that meets the clinical case definition that is not laboratory confirmed but has an epidemiological link to another confirmed or probable case.

Suspected:

- A case that meets the clinical case definition but is not laboratory confirmed and does not have an epidemiological link to a confirmed or probable case of smallpox, OR a case that has an atypical presentation that is not laboratory confirmed but has an epidemiological link to a confirmed or probable case of smallpox. Atypical presentations of smallpox include a) hemorrhagic lesions OR b) flat, velvety lesions not appearing as typical vesicles nor progressing to pustules.

Definition of Contact:

A person who has had contact with a suspected, probable, or confirmed case of smallpox. A contact's risk of contracting smallpox increases with close contact (6 feet or less), increasing length of exposure to a case and the stage and severity of clinical case (increasing with onset of rash and/or cough.) Thus, close contact is defined as any face-to-face contact (\leq 6 feet, able to reach out and touch) with a smallpox case and duration of contact should be quantified, if possible.

The importance of case confirmation using laboratory diagnostic tests differs depending on the epidemiological situation. Laboratory confirmation is important for a first case in a geographic area, leading to release of vaccine as part of a response. In a setting where multiple cases are identified, laboratory capacity may soon be overwhelmed. In such instances, priority for laboratory resources will include 1) testing of clinical or environmental specimens that will provide information about a potential source of exposure, facilitating law enforcement activities and case detection; and 2) testing of clinical specimens from cases with an unclear presentation but who are suspected as cases following expert consultation (see above).

Laboratory Notes

Specimens

Fluid from vesicles, pustules, and scabs; autopsy specimens from major organs including the skin, spleen, lymph node, liver, lung, kidney, and heart; tonsillar tissue; and/or blood are to be sent to C.D.C. according to their guidelines and in consultation with them.

Laboratory tests

Contact IDEP and OLS for approval to submit samples to CDC for confirmation of smallpox. C.D.C. emergency contact number is 770-488-7100. Confirmatory tests include isolation of a variola virus, PCR identification of variola DNA, or negative stain electron microscopy identification of variola virus by a National lab (previously referred to as a Level D lab - C.D.C. or USAMERIID).

Preventive Interventions

1. Environmental exposure precautions: Proper PPE including clothing and respirator use must be employed by all personnel who are exposed to *variola virus* by entering an environmentally contaminated exposure zone in a BT event (See CDC, "Interim Recommendations for the Selection and Use of Protective Clothing and Respirators Against Biological Agents," October 24, 2001.)
2. Proper personal protective equipment: Proper personal protective equipment and clothing must be employed by all personnel who have close contact with a smallpox patient (See C.D.C. "Interim Recommendations for the Selection and Use of Protective Clothing and Respirators Against Biological Agents," October 24, 2001).
3. Infection control: Contact and airborne precautions are recommended for suspected, probable or confirmed cases of smallpox (–95 mask, gown, gloves, and eye protection) (See C.D.C., Guide C - Infections control Measures for Healthcare and Community Settings, April 2, 2003).
4. Vaccination: Vaccination must be given to 1) hospital isolation facility staff and public health smallpox response teams, 2) contacts of cases, 3) household members of contacts to eradicate the disease, and 4) all person entering and admitted to a Type C facility. Isolation/quarantine will be necessary for contacts and household members who are immuno-compromised or who cannot or will not be vaccinated.
5. Isolation: Prevention of the spread of smallpox virus from patients to others is a critical part of the control strategy. Smallpox patients usually transmit infection by expelled droplets to close contacts (those within 6 feet). Although smallpox patients generally are infectious from the time of first development of rash, the earliest stages of the rash may be difficult to recognize. However, preceding the development of rash, the patient will run a high fever for 2 to 3 days. Isolation of a possible case from time of onset of fever will provide a sufficient time to assure appropriate isolation measures are in place at the onset of their infectious period (rash). This

isolation strategy in addition to vaccination of all of the close contacts to the case should sharply limit the spread of smallpox (See C.D.C. Smallpox Response Plan and Guidelines, draft 3.0, September 21, 2002, Guide C, Insolation and Quarantine Guidelines).

Treatment

There is no proven treatment for smallpox. Supportive therapy may be coupled with the use of an IND drug (Cidofovir) which has activity in vivo. Prophylaxis for smallpox is vaccination within 3-4 days of exposure. Vaccination of smallpox case-contacts and household members of contacts will be administered at vaccination clinics as part of the state/local smallpox plan. Vaccine will be made available by C.D.C. upon request by the State Health Officer in consultation with C.D.C.

Adverse reactions to the vaccine include:

1. Inadvertent inoculation at other sites: occurs following vaccination. Rate of 1 per 2000 primary vaccinations. Some ocular cases are treated with VIG.
2. Generalized vaccinia: occurs 6 to 9 days following vaccination. Rate of 1 per 5000 vaccinations. Usually requires no treatment with VIG except in patients who appear toxic or who have serious underlying conditions.
3. Eczema vaccinatum: Rate of 1 per 26,000. VIG is effective in treating serious cases.
4. Progressive vaccinia: this severe and potentially fatal complication occurs in persons with underlying immune deficiencies and can occur following primary vaccination. VIG may be used to treat this complication with varying success.
5. Post-vaccination encephalitis: Occurs between 8 and 15 days post vaccination. Rate of 1 per 300,000 vaccinations. Majority among children < 1 year of age. 15 to 25% of cases die and 25% with permanent neurological sequella. No known treatment: VIG not effective.

Surveillance Indicators

1. Time between suspicion of smallpox and first report to public health.
2. Time between suspicion of smallpox and confirmation of a case.
3. Time between suspicion of smallpox and identification of source of exposure in a BT event.
4. Time between confirmation of a probable or confirmed case and interview of contacts and household members.
5. Time between confirmation of probable and confirmed cases and vaccination of contacts and household members.