

July 2020

# Anthrax

## Surveillance and Investigation Protocol

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### Summary

Anthrax is an infectious disease caused by *Bacillus anthracis*, a spore-forming bacteria. Human infection may result from naturally occurring, unintentional exposure (e.g. through infected animals, contaminated animal products, or contaminated heroin), or from an intentional exposure such as a bioterrorism (BT) event. This protocol applies when a clinical case of cutaneous, gastrointestinal, inhalation, or injection anthrax is highly suspected or confirmed.

Anthrax is immediately notifiable to the local health department.

### Healthcare Provider Responsibilities

IMMEDIATELY report confirmed or suspected cases of anthrax to the local health department by phone 24/7/365; do not wait for laboratory confirmation. Anticipate the need to collaborate with public health:

1. Confirmation of the clinical diagnosis. Anticipate the urgent need to share medical records and laboratory and radiological data to assist with confirmation of the diagnosis. Radiographs are critical for confirmation of inhalation anthrax. Photos of skin lesions are extremely helpful in the process of confirmation of cutaneous anthrax.
2. Laboratory confirmation of the diagnosis. Laboratory testing should begin at the hospital laboratory. If results are suspicious for anthrax, confirmatory testing must occur through the WV Office of Laboratory Services (OLS) at (304)-558-3530. The health department may also request tissue blocks and other pathological specimens, if available and appropriate.
3. Investigation of the source of infection. Health officials will need to investigate urgently to identify the source of infection. This investigation will usually begin with interviews of the patient, family and close friends about all activities and travel during the incubation period.

### Laboratory Responsibilities

1. Laboratories may identify an organism from a clinical specimen that is reported as *bacillus species, unable to rule out anthrax*. Contact the Division of Infectious Disease Epidemiology (DIDE) Epidemiologist on-call at (304) 558-5358 and forward the isolate to OLS. Further investigation will depend on the diagnosis.
2. Immediately report confirmed or suspect cases of anthrax to the local health department via phone and send the laboratory report via ELR.
3. Consult with OLS at (304) 558-3530 regarding specimen collection, shipment, and testing of anthrax in a clinical or environmental sample.
4. Prior to sending specimens to CDC for anthrax diagnostic testing, laboratories should consult with and obtain authorization from DIDE by calling the Epidemiologist on-call at (304) 558-5358.

The OLS can test clinical and environmental specimens by PCR and conventional methods. Guidance on specimen collection for diagnosis of anthrax is available at [Recommended Specimens for Microbiology and Pathology for Diagnosis of Anthrax](#).

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350 Capitol Street Room 125, Charleston, WV 25301-3715

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### Local Health Responsibilities

#### 1. Prior to the occurrence of an anthrax case:

- a. Educate employees to protect employee health.
  - i. Anthrax is NOT transmitted from a person who has the disease. Standard precautions should be used with persons diagnosed with anthrax.
  - ii. Anthrax CAN be transmitted by direct contact with or inhalation of spores. Untrained, unprotected workers should NOT enter an area known or suspected to be contaminated with anthrax spores or come into direct contact with items or equipment contaminated with spores until the area has been decontaminated.
- b. Assemble and train outbreak response teams. The best training or 'drill' for anthrax response is participation in outbreak investigations. ALL epidemiological skills required for response to anthrax, including development of a case definition, case-finding, conducting patient and family interviews and contact tracing, hypothesis formulation and testing, can be practiced during routine outbreak investigations.
- c. Educating healthcare providers and the public in the diagnosis and recognition of anthrax, respectively.
- d. Educating providers and laboratories to report anthrax infections to the local health department in the patient's county of residence immediately.

#### 2. If a suspected case of anthrax is reported, the LHD should contact the DIDE immediately (do not wait for lab confirmation). The local health department should anticipate the need to collaborate with DIDE, other state and local jurisdictions, federal public health officials and law enforcement.

#### 3. Steps in investigation

##### a. Ascertain and confirm cases:

- i. For each suspected case, immediately obtain complete clinical and laboratory history. Review the [WVEDSS Anthrax Investigation Form](#), complete any missing data, and determine whether a case is clinically or laboratory confirmed by using the case definition.
- ii. Assure that appropriate laboratory specimens are obtained on each suspected case. Specimens of blood or vesicular fluid (for cutaneous anthrax cases) are to be sent to the local hospital laboratory (sentinel lab) for preliminary confirmation of *B. anthracis*. If results are suspicious, the specimens should be sent to OLS for confirmation. Specimens should be packaged and shipped to OLS according to OLS laboratory protocol.

##### b. Incident Triage – critical:

- i. Evaluate the possibility of a laboratory artifact: Are the history, clinical picture and laboratory results all consistent with anthrax? (See Laboratory Responsibilities)
- ii. Determine if the case experienced natural exposure to anthrax during the incubation period, including:

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- Exposure to infected livestock, wool, hides, leather or other leather products from infected animals, or ingestion of infected animal products.
- Obtain a travel history to determine if the case traveled to an enzootic area during the incubation period.
- Determine if the index case has injected drugs.
- iii. If a plausible source is identified during the initial interview, begin active surveillance to identify other cases exposed to the same source. Consider expanded active surveillance to evaluate other potential sources of infection, as indicated.
- c. **Disease investigation:** Since anthrax does not occur naturally in West Virginia, a single case is considered an outbreak. Outbreak investigation requires collaboration with epidemiologists, environment health and laboratorians. See the DIDE outbreak protocol for details. Some of the basic steps are identified here:
  - i. Case finding:
    - Begin enhanced passive surveillance: Using the standard anthrax case definition, immediately begin enhanced passive surveillance as needed with health care providers and laboratories in the county. Educate health care providers and the public in the recognition and diagnosis of anthrax.
    - Conduct active surveillance: Be prepared to expand active surveillance throughout the region, e.g., be prepared to contact providers and laboratories searching for additional cases, and review/abstract patient records.
    - Confirm new cases: Receive and screen reports of suspected cases, confirm new cases.
  - ii. Case investigation: Collect clinical, epidemiologic, and laboratory data using the [WVEDSS Anthrax Investigation Form](#).
  - iii. Collaborate with DIDE on the case/outbreak investigation.

#### 4. Identify exposed population(s):

- a. Define an exposed individual: An exposed individual will be a person who shared or possibly shared airspace that was contaminated by *B. anthracis*, had direct contact with contaminated material such as spores or other environmental exposures as part of an intentional biologic event, touched an infected animal, processed animal hides or wool from an endemic area, injected potentially contaminated illicit drugs, or ingested contaminated food or water.
- b. Develop a line listing of all persons possibly exposed.

#### 5. Surveillance of exposed population(s):

- a. Contact and referral of exposed: Assure that all exposed individuals are contacted within 24 hours and refer them for post exposure prophylaxis (PEP) and anthrax vaccine (See Prevention Section). For large populations, incident command should alert the public about the location of clinical centers for treatment or PEP through media announcements.

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- b. Surveillance of exposed individuals: Conduct regular surveillance of all exposed individuals for the appropriate incubation period. For respiratory exposure, the incubation period may be up to 100 days.
- c. Document surveillance activities on a line list. Consult with DIDE on line list development.

### 6. Prevention and Control:

- a. Environmental exposures: After the source has been identified, remove people from any environment confirmed or suspected to be contaminated with anthrax spores until decontamination is achieved.
- b. Post exposure prophylaxis: Because of the short incubation period, and the high mortality, PEP must begin before the investigation is complete. In consultation with CDC, DIDE will recommend to the State Health Commissioner that PEP should be offered to:
  - i. Groups of persons in which 2 or more persons have culture-confirmed anthrax (and therefore common-source exposure is likely or plausible). PEP should be offered until inhalational exposure is confirmed or ruled out or for 60 days.
  - ii. Groups of persons in which 1 person has culture-confirmed anthrax and an associated environmental source is also culture positive. PEP should be offered until inhalational exposure is confirmed or ruled out or for 60 days.
  - iii. Groups of persons undergoing investigation for probable exposure (e.g., environmental sampling). PEP should be offered for 5-10 days pending laboratory results and a final recommendation.

- 7. **Treatment of Cases:** In consultation with CDC, DIDE will recommend to the State Health Commissioner that cases should be treated according to current guidelines (See Treatment Section.)

### State Health Responsibilities

#### 1. Prior to the report of a case of anthrax:

- a. Train DIDE response staff in occupational health issues surrounding anthrax case investigation.
- b. Maintain capacity to respond rapidly to consultation, outbreak investigation and field investigation by routine response to infectious disease outbreaks and, regular training and education through attending conferences and conducting literature reviews. Maintain a skilled and experienced epidemiology workforce. Maintain updated protocols, information sheets, investigation forms and website.

#### 2. Notify CDC urgently of a confirmed or suspected case or outbreak.

#### 3. During an outbreak:

- a. Support the local health department(s) as needed, including leadership of field investigation.
- b. Brief the chain of command within BPH.
- c. Make recommendations for:
  - Initiating incident command. A single case of intentionally disseminated anthrax will result in a recommendation to open incident command.

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- Offering vaccination and prophylaxis to targeted populations
- Disseminating appropriate messages for public and providers
- d. Develop outbreak case definition as needed, based on the CDC/CSTE case definition and incorporating elements of person, place and time. In the event of a large exposure, a loose definition (e.g., a person with fever (>38.5C) and cough or dyspnea) may be suitable for initial case-finding. The case definition should evolve as more information (e.g., exposures/risk factors) is obtained.
- e. Develop expanded investigation forms and line lists to support investigation activities.
- f. Develop a line listing of all persons possibly exposed and cases (confirmed and suspect). Items on the line list should include:
  - Case ID number (use this number to link to other databases)
  - Demographic information: name, age, date of birth, occupation, contact information
  - Location (hospital, clinic, home)
  - Clinical information: symptoms (record date and time of onset of symptoms, enter into the case line list and assign follow-up)}
  - Laboratory and diagnostic information: specimen source, test type, date of collection, result
  - Classification of case (pending, ruled out, suspected, clinically confirmed, and laboratory confirmed)
  - Investigation information: date and time contacted, date and time interview completed, exposure information
  - Prophylaxis and treatment:
    - Anthrax vaccine: date first dose of anthrax vaccine given (use the West Virginia Statewide Immunization Information System (WVSIS) to record ALL doses, site of injection, lot number, etc. of anthrax vaccine)
    - Antibiotic: name of antibiotic, and dose, date and time antibiotic prophylaxis started
    - Antitoxin
- g. Outcome: Follow up date and status (well, referred for evaluation, case, no information)

Use the line list to organize the work of the team assigned to follow up exposed persons and complete missing information.

- h. Develop and maintain a database of pertinent clinical and exposure data for hypothesis testing, as follows:
  - In collaboration with local health departments/CDC, interview a representative sample of cases and obtain a complete risk factor and exposure history, including travel and activities during the cases' exposure period (during the incubation period before onset of symptoms). Exposure period/incubation period for inhalation anthrax may be up to 100 days.

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- If a possible source is suspected, continue the interview with the same sample of cases. Obtain more detailed information including the type, location, duration of exposure, and other details to characterize the possible exposure source.
- Perform epidemiological, laboratory and environmental studies to test, refine, and confirm hypotheses.
- Analyze and report data on numbers of cases and epidemiological findings. Share with incident command and key decision makers.

- i. Collaborate with OLS to confirm suspected cases and publish antimicrobial susceptibility data. Refine treatment and prophylaxis recommendations based on susceptibility data.

### **Occupational Health**

Use standard precautions with anthrax patients.

### **Disease Control Objectives**

Prevent disease in high risk populations through education of professionals and the public to avoid exposure to any identified risk.

### **Disease Prevention Objectives**

Prevent unnecessary illness and death through rapid identification of populations exposed to anthrax so appropriate treatment or post exposure prophylaxis can quickly be administered.

### **Disease Surveillance Objectives**

Rapidly detect and confirm a case or outbreak of anthrax if it occurs in WV.

### **Public Health Significance**

In the United States, the incidence of naturally acquired anthrax is extremely low; only a handful of naturally occurring cases have been reported in the last decade including inhalation and gastrointestinal cases related to drum-making from contaminated animal hides or exposure to animal products and dust.

In the fall of 2001, 11 cases of inhalation anthrax and 11 cases of cutaneous anthrax were linked to *B. anthracis* sent through the mail. Letters were mailed to media targets and the United States Senate. In general, media targets were more likely to develop cutaneous disease. Letters processed through high-speed sorters at postal facilities likely resulted in aerosolization of *B. anthracis* spores and inhalation anthrax in postal workers. Epidemiologists used multiple tools to address this crisis, including:

- Case finding through active surveillance and enhanced passive surveillance;
- Case and key informant interviews;
- Environmental sampling;
- Antimicrobial susceptibility testing and molecular analysis of *B. anthracis* isolates; and
- Antimicrobial prophylaxis and vaccination of exposed persons.

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Within the last two decades, injectional anthrax has been reported among injection drug users in Europe; this type of infection has never been reported in the United States. It is thought that contaminated heroin is the source.

The mortality rate for anthrax, even with treatment, ranges from <2% for cutaneous anthrax to 45% for inhalation anthrax. Anthrax meningitis, a complication of any of the four forms of anthrax or when there is no obvious portal of entry, has a 92% mortality rate.

### **Etiologic Agent**

*Bacillus anthracis*, the causative agent of anthrax, is an aerobic, gram-positive spore-forming, nonmotile rod. The spores are the usual infective form. The spores are environmentally stable, resistant to extremes of temperature, humidity and ultraviolet light. They can survive extended periods of time in the environment without nutrients. When introduced into a human or animal host, they rapidly germinate leading to disease.

### **Reservoir**

Anthrax is primarily a zoonotic disease of herbivores, with cattle, sheep, goats, and horses being the usual animal hosts, but other animals may be infected. These animals become infected while grazing due to exposure to spores in contaminated soil. Presumably, infected animals die rapidly enabling the carcass to further contaminate the soil, thereby perpetuating the transmission cycle. Anthrax is enzootic in sub-Saharan Africa, Asia, and some parts of southern Europe and Australia. Parts of the Western United States have cases in livestock with rare spillover into humans.

### **Mode of Transmission**

Humans generally contract the disease through contact with infected animals or contaminated animal products, such as handling of contaminated hair, wool, hides, flesh, blood, or excreta of infected animals. Infection is introduced by:

1. Getting spores in a wound, cut or scrape in the skin (e.g. following contact with contaminated soil or by handling contaminated hair, wool, hides, flesh, blood, or excreta of infected animals)
2. Eating food or drinking water contaminated with spores (e.g. ingestion of insufficiently cooked infected meat)
3. Inhalation of spores (e.g. handling contaminated animal products)
4. Injection of contaminated drugs (e.g. heroin)

With intentional exposure, as in a bioterrorist release, breathing in the spores or contact with an opening in the skin (cuts, scratches, abrasions, etc.) have been the most likely routes of entry into the body.

### **Incubation Period**

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The incubation period depends on the route of exposure.

- Cutaneous: 1-12 days, but can be up to 17 days
- Gastrointestinal and oropharyngeal: 1-6 days, but can be up to 16 days)
- Inhalational: usually 1-6 days, but can be up to 60 days or longer
- Injection: 1-7 days, but can be up to 20 days

### **Period of Communicability**

Person-to-person transmission has not been documented. Products and soil contaminated with *B. anthracis* spores may remain infectious for years or decades.

### **Outbreak Recognition**

One case of anthrax constitutes an outbreak.

An outbreak due to intentional dissemination of anthrax spores might present initially as large numbers of previously healthy patients with influenza-like illness; followed by sudden progression to shock and multi-organ failure a few days after illness onset.

### **Clinical Description**

An illness or post-mortem examination characterized by several distinct clinical types, including:

**Cutaneous anthrax:** Usually begins as a small, painless, pruritic papule on an exposed surface, which progresses through a vesicular stage into a depressed black eschar; the eschar is often surrounded by edema or erythema and may be accompanied by lymphadenopathy. Fever is also common.

**Ingestion anthrax:** Presents as two sub-types:

- **Oropharyngeal:** When anthrax spores germinate in the oropharynx, a mucosal lesion may be observed in the oral cavity or oropharynx. Symptoms include sore throat, difficulty swallowing, and swelling of the neck. Less specific symptoms include fever, fatigue, shortness of breath, abdominal pain, and nausea/vomiting; the symptoms may resemble a viral respiratory illness. Cervical lymphadenopathy, ascites, and altered mental status may be observed.
- **Gastrointestinal:** When anthrax spores germinate in the lower gastrointestinal tract, symptoms include abdominal pain, nausea, vomiting or diarrhea (either of which may contain blood), and abdominal swelling. Less specific symptoms such as fever, fatigue, and headache are also common. Altered mental status and ascites may be observed.

**Inhalation anthrax:** Often described as a biphasic illness. Early nonspecific symptoms of inhalation anthrax include fever and fatigue. Localized thoracic symptoms such as cough, chest pain, and shortness of breath follow, as may non-thoracic symptoms such as nausea, vomiting, abdominal pain, headache, diaphoresis, and altered mental status. Lung sounds are often abnormal, and imaging often shows pleural effusion or mediastinal widening.

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**Injection anthrax:** Usually presents as a severe soft tissue infection manifested as significant edema or bruising after an injection. No eschar is apparent, and pain is often not described. Nonspecific symptoms such as fever, shortness of breath, or nausea are sometimes the first indication of illness. Occasionally patients present with meningeal or abdominal involvement. A coagulopathy is not unusual.

Additional considerations:

1. Signs of systemic involvement from the dissemination of either the bacteria and/or its toxins can occur with all types of anthrax and include fever or hypothermia, tachycardia, tachypnea, hypotension, and leukocytosis. One or more of these signs are usually present in patients with gastrointestinal anthrax, inhalation anthrax, and injection anthrax and may be present in up to a third of patients with cutaneous anthrax.
2. Anthrax meningitis may complicate any form of anthrax and may also be a primary manifestation. Primary symptoms include fever, headache (which is often described as severe), nausea, vomiting, and fatigue. Meningeal signs (e.g., meningismus), altered mental status, and other neurological signs such as seizures or focal signs are usually present. Most patients with anthrax meningitis have cerebral spinal fluid (CSF) abnormalities consistent with bacterial meningitis, and the CSF is often described as hemorrhagic.

### Diagnostics

Confirm the diagnosis of anthrax by:

1. Testing clinical specimens for *Bacillus anthracis*. Collect samples prior to initiation of antibiotics.
  - blood
  - skin lesion or exudates - swab
  - pleural, ascitic or cerebrospinal fluid
  - respiratory secretions
2. Measuring antibodies or toxin in blood.

If inhalation anthrax is suspected, chest X-rays or CT scans can confirm if the patient has mediastinal widening or pleural effusion, which are X-ray findings typically seen in patients with inhalation anthrax.

### **Anthrax (*Bacillus anthracis*) 2018 Case Definition (CSTE)**

The most current case definition should always be used for case classification and may not be reflected in the protocol. This information is located at <https://wwwn.cdc.gov/nndss/conditions/anthrax>.

### **CLINICAL CRITERIA**

- For surveillance purposes, an illness with at least one specific **OR** two non-specific symptoms and signs that are compatible with cutaneous, ingestion, inhalation, or injection anthrax; systemic involvement; or anthrax meningitis; **OR**
- A death of unknown cause **AND** organ involvement consistent with anthrax.

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### LABORATORY CRITERIA FOR DIAGNOSIS

Presumptive laboratory criteria for *Bacillus anthracis* or *Bacillus cereus* expressing anthrax toxins:

- Gram stain demonstrating Gram-positive rods, square-ended, in pairs or short chains;
- Positive result on a test with established performance in a CLIA-accredited laboratory.

Confirmatory laboratory criteria for *Bacillus anthracis* or *Bacillus cereus* expressing anthrax toxins:

- Culture and identification from clinical specimens by Laboratory Response Network (LRN);
- Demonstration of *B. anthracis* antigens in tissues by immunohistochemical staining using both *B. anthracis* cell wall and capsule monoclonal antibodies;
- Evidence of a four-fold rise in antibodies to protective antigen between acute and convalescent sera or a fourfold change in antibodies to protective antigen in paired convalescent sera using CDC quantitative anti-PA immunoglobulin G (IgG) ELISA testing in an unvaccinated person;
- Detection of *B. anthracis* or anthrax toxin genes by the LRN-validated polymerase chain reaction and/ or sequencing in clinical specimens collected from a normally sterile site (such as blood or CSF) or lesion of other affected tissue (skin, pulmonary, reticuloendothelial, or gastrointestinal);
- Detection of lethal factor (LF) in clinical serum specimens by LF mass spectrometry.

### EPIDEMIOLOGIC LINKAGE

- Exposure to environment, food, animal, materials, or objects that is suspect or confirmed to be contaminated with *B. anthracis*;
- Exposure to the same environment, food, animal, materials, or objects as another person who has laboratory-confirmed anthrax;
- Consumption of the same food as another person who has laboratory-confirmed anthrax.

### CRITERIA TO DISTINGUISH A NEW CASE FROM AN EXISTING CASE

- Case not previously reported to public health authorities.

### CASE CLASSIFICATION

#### Suspected

- A case that meets the clinical criteria **AND** for whom an anthrax test was ordered, but with no epidemiologic evidence relating it to anthrax.

#### Probable

- A case that meets the clinical criteria **AND** has presumptive laboratory test results, **OR**
- A case that meets the clinical criteria **AND** has an epidemiologic evidence relating it to anthrax.

#### Confirmed

- A case that meets the clinical criteria **AND** has confirmatory laboratory test results.

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### Preventive Interventions

1. Pre-exposure prophylaxis for the prevention of anthrax among persons with potential risk for exposure
  - a. Anthrax vaccine (*Anthrax vaccine adsorbed; AVA*) for pre-exposure prophylaxis (PrEP) for adults 18-65 years at high risk for exposure to *B. anthracis*, such as members of the military deployed to high-risk areas, laboratory workers working in areas with high concentration of *B. anthracis*, and persons (farmer, veterinarian, livestock handlers) who might handle infected animals or animal products.
    - Administer AVA via IM at 0, 1, 6 months (priming series) and booster at 12 and 18 months and annually thereafter
  - b. Not recommended for emergency and other responders but may opt to receive voluntarily
    - 3-dose priming and booster series then every 3 years to maintain protection

For more information about PrEP, see [Use of Anthrax Vaccine in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2019](#)

2. Post-exposure prophylaxis for the prevention of anthrax among persons with suspected or known exposure
  - a. ACIP recommends AVA for post-exposure prophylaxis (PEP) for use in adults 18-65 years old (0.5 ml SC at 0, 2, 4 weeks) to be given in conjunction with antibiotics (see below) for persons exposed to anthrax. Since anthrax is highly lethal, prophylaxis must begin as soon as possible.
  - b. AV7909 is an investigational second-generation anthrax vaccine under development for PEP of inhalational anthrax in conjunction with appropriate antibiotics. If supplies of AVA are not available, AV7909 is an option for PEP of persons exposed to aerosolized *B. anthracis* spores under an EUA granted by FDA.

For more information about PEP, see [Use of Anthrax Vaccine in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2019](#)

3. Personal protective equipment (PPE): Proper PPE must be employed by all personnel who will enter an area contaminated with *B. anthracis* spores. Untrained and unprotected personnel should NOT enter a contaminated zone until decontamination is complete.
4. Infection control procedures:
  - a. Standard precautions are recommended for patient care.
  - b. Handwashing following contact with animal products may decrease risk for cutaneous anthrax.
5. In the event of a naturally occurring case of anthrax, remove people from the source of infected livestock, wool, hide, or leather products, etc.

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6. Decontamination of the environment is technically difficult and should be undertaken only with expert guidance. Depending on the situation, a mixture of technologies may be required.
7. Management of deceased persons or animals with anthrax:
  - Cremation is recommended. Embalming may be associated with special risks.
  - If autopsy is performed, all instruments should be autoclaved or incinerated.
  - Disinfection should be completed with a sporicidal agent.

### Treatment Interventions

Expert consultation is recommended, as well as review of CDC's [Anthrax Medical Care](#). This website has recommendations for adults, pregnant women and children. Important elements of treatment are:

- Prompt antimicrobial therapy (table 1 and 2) to be adjusted when antimicrobial susceptibility results are available.
  - Systemic anthrax with suspected anthrax meningitis or when meningitis cannot be excluded: 3 drug treatment
  - Systemic anthrax and anthrax meningitis has been excluded: 2 drug treatment
  - Cutaneous anthrax with no systemic disease: single oral agent
  - For more information, see [Clinical Framework and Medical Countermeasure Use During an Anthrax Mass-Casualty Incident, 2015](#) and [Use of Anthrax Vaccine in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2019](#).
- For patients with systemic illness, in addition to antimicrobial therapy:
  - Careful monitoring in hospital with attention to airway and hemodynamic status as these patients can deteriorate rapidly.
  - Evacuate pleural effusions and ascites as this appears to offer a survival advantage.
  - Use of anthrax antitoxin which bind to protective antigen by suppressing the action of toxins released by *B. anthracis*. Three licensed anthrax antitoxins: Anthrax Immune Globulin (AIGIV), Abiltoxaximab (Anthim, and Raxibacumab (ABthrax) are available from the Strategic National Stockpile.—Anthrax antitoxin is indicated in all adults and children for the treatment of inhalation anthrax in combination with appropriate antibiotics.
  - Use of systemic steroids for patients with cutaneous involvement of the head or neck or patients with meningitis.
- Patients who were exposed to spores should receive long-term antibiotic therapy similar to prophylactic regimens to suppress *B. anthracis* released from spores.
- Patients exposed to anthrax spores should receive the recommended doses of anthrax vaccine.

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Table 1. Oral antimicrobial dosages for use in adults in conjunction with anthrax vaccine adsorbed for postexposure prophylaxis

Strain	Drug and dosage*
For all strains, regardless of penicillin susceptibility or if susceptibility is unknown	Ciprofloxacin, <sup>†</sup> 500 mg every 12 hrs Doxycycline, <sup>†</sup> 100 mg every 12 hrs Levofloxacin, 750 mg every 24 hrs Moxifloxacin, <sup>§</sup> 400 mg every 24 hrs Clindamycin, <sup>§</sup> 600 mg every 8 hrs
Alternatives for penicillin-susceptible strains	Amoxicillin, <sup>§</sup> 1,000 mg every 8 hrs Penicillin VK, <sup>§</sup> 500 mg every 6 hrs

**Abbreviations:** FDA = Food and Drug Administration; PEP-Abx = antimicrobial postexposure prophylaxis.  
\* Any one of these drug regimens.  
<sup>†</sup> First-line drugs; alternative drugs are listed in order of preference for PEP-Abx for patients who cannot take first-line treatment or if first-line PEP-Abx is unavailable.  
<sup>§</sup> Not FDA approved for PEP-Abx of inhalation anthrax.

Table 2. Antimicrobial duration when used in conjunction with Food and Drug Administration–licensed or dose-sparing postexposure prophylaxis regimens of anthrax vaccine adsorbed\*

Population with suspected or known exposure	Duration of antimicrobial regimen
Immunocompetent adults aged 18–65 yrs	42 days when initiated concurrently with first dose of AVA or for 14 days after last AVA dose, whichever is later (not to exceed 60 days)
Adults aged 18–65 yrs with immunocompromising conditions (e.g., cancer or HIV infection) or receiving immunosuppressive therapy (e.g., high-dose corticosteroids for >2 wks or radiation therapy) <sup>†</sup>	60 days
All older adults (>65 yrs)	60 days
All pregnant women and nursing mothers	60 days
All children (≤17 yrs)	60 days

**Abbreviation:** AVA = anthrax vaccine adsorbed.  
\* If the AVA series cannot be completed, then antimicrobial therapy should continue for 60 days.  
<sup>†</sup> **Source:** Löbermann M, Boršo D, Hilgendorf I, Fritzsche C, Zettl UK, Reisinger EC. Immunization in the adult immunocompromised host. *Autoimmun Rev* 2012;11:212–8.

### Division of Infectious Disease Epidemiology

350 Capitol Street Room 125, Charleston, WV 25301-3715

Phone: (304) 558-5358 ext. 2, Fax: (304) 558-6335, [www.oeps.wv.gov](http://www.oeps.wv.gov)

July 2020

# Anthrax

## Surveillance and Investigation Protocol

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### Surveillance Indicators

See outbreak protocol.

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