

Anthrax

1. DISEASE REPORTING

A. Purpose of Reporting and Surveillance

1. To rapidly detect anthrax-related illness and promptly treat those who are ill.
2. To promptly identify the source of infection, including identification of intentional release of anthrax in context of a bioterrorist attack.
3. To involve appropriate public safety agencies in an investigation.
4. To rapidly implement control measures.

B. Legal Reporting Requirements

1. Health care providers: **immediately notifiable to local health jurisdiction**
2. Health care facilities: **immediately notifiable to local health jurisdiction**
3. Laboratories: *Bacillus anthracis* **immediately notifiable to local health jurisdiction**; specimen submission required - culture (2 business days). Any other specimens with results indicating *B. anthracis* infection should be submitted too (see Sections 3 and 4).
4. Veterinarians: **suspected human cases notifiable immediately to the local health jurisdiction**; animal cases notifiable to Washington State Department of Agriculture (see: <http://app.leg.wa.gov/WAC/default.aspx?cite=16-70>).
5. Local health jurisdictions: **immediately notifiable to Washington State Department of Health (DOH) Office of Communicable Disease Epidemiology (OCDE)**.

C. Local Health Jurisdiction Investigation Responsibilities

1. **All cases or potential cases must be immediately reported to DOH: 1-877-539-4344 or 206-418-5500.** Conduct a rapid assessment to determine whether bioterrorism is a potential. **If bioterrorism is suspected, immediately notify DOH of this possibility**
2. Facilitate the transport of specimens to the Washington State Public Health Laboratories.
3. Determine the source of infection.
4. Identify other persons exposed and recommend chemoprophylaxis as indicated.
5. Report all confirmed, probable, and suspect cases to OCDE. Complete the case report form (www.doh.wa.gov/Portals/1/Documents/5100/210-055-ReportForm-Anthrax.pdf) and enter the data into the Public Health Issues Management System (PHIMS).

2. THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Bacillus anthracis is an aerobic, non-motile, spore-forming, encapsulated, gram-positive, rod-shaped bacterium.

B. Description of Illness

Anthrax causes three main clinical syndromes, depending on the route of exposure.

1. Cutaneous anthrax (>95% of human anthrax)

Cutaneous disease is characterized by one or more painless, itchy papules or vesicles on the skin, typically on exposed areas such as the face, neck, forearms, or hands. Within 7–10 days of the initial lesion, a papule lesion forms a skin ulcer. The ulcer subsequently crusts over, forming a painless black eschar that is the hallmark of cutaneous anthrax. In addition, localized swelling, painful swollen regional lymph nodes, and systemic symptoms can occur. Lesions can also form in the upper tract (oropharyngeal anthrax). The untreated case fatality rate is 5–20%; death is rare with appropriate therapy.

2. Inhalational anthrax

Inhalational anthrax typically progresses through two distinct stages. The first, lasting from several hours to several days, involves influenza-like symptoms such as low grade fever, non-productive cough, malaise, fatigue and chest discomfort. The second stage involves abrupt onset of high fever, severe respiratory distress (dyspnea and hypoxia), and shock. A widened mediastinum is the classic chest X-ray finding. Therapy must be started early in the course of illness to be effective. Of 11 people who developed inhalational disease during the 2001 anthrax attacks, five (45%) died.

3. Gastrointestinal anthrax

Gastrointestinal anthrax is an uncommon form of the disease. Symptoms begin with nausea, vomiting, and fever, then can progress to bloody diarrhea, bloody vomiting, acute abdomen, and sepsis. The case fatality rate is estimated to be 25–60%. While antibiotic use may decrease deaths, the nonspecific initial presentation makes diagnosis difficult in the absence of a known exposure or cluster of disease. Recent outbreaks due to contaminated meat have occurred in Bangladesh, Kenya, the Philippines, and Uganda.

4. Oropharyngeal anthrax

Oropharyngeal anthrax is a very rare form of the disease occurring as an acute illness or identified on post-mortem examination revealing a lesion. The typical lesion is a painless mucosal ulcer in the oral cavity or oropharynx, often at the base of the tongue. Lesions are initially edematous and hyperemic but may progress to necrosis. Symptoms begin with fever, sore throat, difficulty swallowing, unilateral or bilateral cervical adenopathy, swelling that may compromise the airway, and possibly septicemia. Case fatality was 50% in an outbreak in Thailand due to contaminated water buffalo meat.

5. Meningeal anthrax

Meningeal anthrax is the rarest form of the disease occurring as an acute illness with fever, convulsions, coma, or meningeal signs, or post-mortem examination revealing hemorrhagic inflammation. Signs of another form of anthrax would likely be evident as this syndrome is usually a complication to the above syndromes. Mortality is likely 100% even with treatment.

C. Anthrax in Washington

The last documented human case of anthrax in Washington occurred in 1957.

In 2001, processed *B. anthracis* spores put in letters caused an outbreak of 22 anthrax cases in the eastern United States. In 2009, a woman in Massachusetts developed gastrointestinal anthrax after attending a drumming event using drums with imported animal hides. Minnesota identified a case of inhalational anthrax in 2011 in a man who had traveled through several states and had multiple exposures to animals, animal products, and dust in areas with wildlife; however, no specific source was identified following a thorough multi-state and multi-agency investigation. Animal cases are periodically identified in cattle and other herd animals including in the United States and Canada as well as many other regions of the world.

Update: Investigation of Bioterrorism-Related Anthrax and Interim Guidelines for Clinical Evaluation of Persons with Possible Anthrax <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5043a1.htm>.

Gastrointestinal Anthrax after an Animal-Hide Drumming Event – New Hampshire, Massachusetts, 2009. MMWR 2010;59(28):872-877. (Available at <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5928a3.htm>).

D. Reservoir

Historically, anthrax has come from contact with herbivores (such as cattle, sheep, or goats) ill with the disease or from contaminated products (such as meat, wool, hides or hair) from ill herbivores. While dormant anthrax spores are found in the soil of many parts of the world including the United States, infection resulting from direct inhalation of natural spores in soil is felt to be very rare. Animal cases have been reported periodically including infected bison in Saskatchewan and North Dakota during 2015.

From a bioterrorism perspective, the main concern is specially processed anthrax spores which have a higher potential for causing infection, particularly inhalational anthrax. The extent of stockpiling of such biological weapons by nations and/or terrorist groups is unknown.

E. Modes of Transmission

Transmission can occur from skin contact with contaminated animals or animal products (e.g., wool or hides), eating contaminated food such as meat from an infected animal, or inhaling processed spores. Hides imported into the United States have been contaminated with spores and have caused illness.

F. Incubation period

The incubation period is usually < 1 week but as long as 60 days for inhalational anthrax, 1–12 days for cutaneous anthrax, 1–7 days for gastrointestinal anthrax, and 1-7 days for oropharyngeal anthrax.

G. Period of Communicability

Person-to-person spread is rare, and has only been documented with the cutaneous form.

H. Treatment

Prompt administration of appropriate antibiotics is essential for effective treatment. Note that there may be resistance to extended-spectrum cephalosporins or to trimethoprim/sulfamethoxazole. For specific information regarding the treatment of anthrax see: <http://www.cdc.gov/anthrax/medicalcare/treatment/index.html>.

3. CASE DEFINITIONS

A. Clinical description

- **Cutaneous anthrax:** An acute illness, or post-mortem examination, revealing a painless skin lesion developing over 2 to 6 days from a papular through a vesicular stage into a depressed black eschar with surrounding edema. Fever, malaise and lymphadenopathy may accompany the lesion.
- **Inhalation anthrax:** An acute illness, or post-mortem examination, revealing a prodrome resembling a viral respiratory illness, followed by hypoxia, dyspnea or acute respiratory distress with resulting cyanosis and shock. Radiological evidence of mediastinal widening or pleural effusion is common.
- **Gastrointestinal anthrax:** An acute illness, or post-mortem examination, revealing severe abdominal pain and tenderness, nausea, vomiting, hematemesis, bloody diarrhea, anorexia, fever, abdominal swelling and septicemia.
- **Oropharyngeal anthrax:** An acute illness, or post-mortem examination, revealing a painless mucosal lesion in the oral cavity or oropharynx, with cervical adenopathy, edema, pharyngitis, fever, and possibly septicemia.
- **Meningeal anthrax:** An acute illness, or post-mortem examination, revealing fever, convulsions, coma, or meningeal signs. Signs of another form will likely be evident as this syndrome is usually secondary to the above syndromes.

B. Laboratory criteria for diagnosis

Definitive

1. Culture and identification of *Bacillus anthracis* from clinical specimens by the Laboratory Response Network (LRN); **OR**
2. Demonstration of *B. anthracis* antigens in tissues by immunohistochemical staining using both *B. anthracis* cell wall and capsule monoclonal antibodies; **OR**
3. Evidence of a four-fold rise in antibodies to protective antigen between acute and convalescent sera or a four-fold change in antibodies to protective antigen in paired convalescent sera using Centers for Disease Control and Prevention (CDC) quantitative anti-PA IgG ELISA testing; **OR**
4. Documented anthrax environmental exposure AND evidence of *B. anthracis* DNA (for example, by LRN-validated polymerase chain reaction [PCR]) 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).

Presumptive

1. Evidence of *B. anthracis* DNA (e.g., by LRN-validated PCR) in clinical specimens from a normally sterile site (such as blood or CSF) or lesion of other affected tissue (skin, pulmonary, reticuloendothelial, or gastrointestinal); **OR**

2. Positive result on testing of clinical serum specimens using the Quick ELISA Anthrax-PA kit; **OR**
3. Detection of Lethal Factor (LF) in clinical serum specimens by LF mass spectrometry; **OR**
4. Positive result on testing of culture from clinical specimens with the RedLine Alert test.

C. Case classification (2010)

Suspect: An illness suggestive of one of the known anthrax clinical forms, but with no definitive or presumptive laboratory evidence of *B. anthracis*, or epidemiologic evidence relating it to anthrax.

Probable: A clinically compatible illness that does not meet the confirmed case definition, but with one of the following:

- Epidemiological link to a documented anthrax environmental exposure; **OR**
- Presumptive but not definitive laboratory evidence.

Confirmed: A clinically compatible illness with definitive laboratory evidence.

4. DIAGNOSIS AND LABORATORY SERVICES

A. Laboratory Diagnosis

Clinical suspicion is the most critical element for accurate diagnosis. In the absence of trauma, a chest X-ray with mediastinal widening is suggestive of inhalational anthrax. A painless black eschar suggests cutaneous anthrax. Gastrointestinal or oropharyngeal anthrax would result from consumption of contaminated food. Meningeal anthrax is a complication of any form of the disease.

Confirmatory laboratory testing must be performed by a reference laboratory such as the Washington State Public Health Laboratories (PHL).

Laboratory tests available for the diagnosis of anthrax include gram stain and culture, electrophoretic immunotransblot (EITB) reaction, time-resolved fluorescent assay, real-time PCR, and EIA to detect IgG in acute and convalescent sera. Obtain specimens for culture before initiating antimicrobial therapy. For details of specimen requirements see: <http://www.doh.wa.gov/ForPublicHealthandHealthcareProviders/PublicHealthLaboratories/MicrobiologyLabTestMenu>

B. Tests Available at the Washington State Public Health Laboratories (PHL)

PHL will do culture and PCR. In addition, clinical laboratories can send suspect *Bacillus* cultures to PHL for species identification; such cultures are generally *B. megaterium*, another non-motile *Bacillus*. Contact PHL for shipping instructions.

Note that PHL require all clinical specimens have two patient identifiers, a name **and** a second identifier (e.g., date of birth) both on the specimen label and on the submission form. Due to laboratory accreditation standards, specimens will be rejected for testing if not properly identified. Also include specimen source and collection date.

C. Specimen Collection

For information regarding specimen collection, see:

<http://www.cdc.gov/anthrax/specificgroups/lab-professionals/cdcspecimens.html>.

All specimens should be submitted to PHL with a completed Microbiology form:

<http://www.doh.wa.gov/Portals/1/Documents/5230/302-013-Micro.pdf>.

5. ROUTINE CASE INVESTIGATION

Notify Office of Communicable Disease Epidemiology (OCDE) at 206-418-5500 or 877-539-4344 of any suspected case. **The FBI may want to be present for interviews even if bioterrorism is not suspected.** Immediately interview the case, suspect or confirmed, and others who may be able to provide pertinent information.

A. Evaluate the Diagnosis

Review the clinical presentation and laboratory findings. **Confirmatory laboratory testing must be performed by a reference laboratory such as the Washington State Public Health Laboratories (PHL).** Facilitate the transport of specimens (obtain before antibiotic therapy) to PHL for confirmatory testing.

B. Identify Potential Sources of Infection

Treat any case of anthrax as a potential bioterrorism incident until this can be ruled out. Any resulting investigation is potentially both a public health and a criminal investigation. Local public safety or the FBI may need to be involved during the interview or for follow-up of potential exposures. Department of Agriculture (domestic animals) or Department of Fish and Wildlife (wildlife) may need to be involved if animals in Washington are a suspected source.

Ask about potential sources of transmission in the exposure period, including:

- Contact with animals or animal products (e.g., hides, wool, bones, etc.), including the country of origin of any such animals or products;
- Inhalation of dust from soil, grain or hay;
- Occupational exposures (e.g., agricultural worker, veterinarian, wildlife/field biologist, wool-sorter, drum-maker, etc.); or
- Attendance at a large social gathering.

C. Infection Control / Case Management

1. Hospitalized patients should be cared for using standard precautions.
2. Contact precautions should be used if uncontrolled drainage is occurring from a wound.

D. Identify Potentially Exposed Persons

Contacts of the case are not generally considered at risk because person to person transmission is rare. The concern for contacts of the case is whether any contacts shared the same exposure source as the case. Once the route and likely venue of the case's exposure have been established:

1. Determine the time and spatial extent of the exposure.

2. Develop a list of persons with suspected exposure based on interviews with ill persons as well as other evidence such as attendee lists or credit card receipts of any functions where exposure is suspected to have occurred.
3. Discuss interview scheduling with OCDE to determine if FBI presence is needed at interviews.
4. Contact all potentially exposed persons to assess for illness and to discuss possible prophylaxis.

E. Management of Exposed Persons

Educate persons potentially exposed to the same source as the patient about the incubation period and symptoms of anthrax, including specific symptoms that should prompt immediate medical evaluation, such as: fever, cough, shortness of breath, vomiting, diarrhea, or appearance of a painless black scar on the skin.

For information regarding post-exposure antimicrobial and vaccine prophylaxis for exposed individuals (Tables 1, 2) see: <http://www.cdc.gov/mmwr/pdf/rr/rr5906.pdf>.

F. Environment Measures

Consider directed environmental sampling of a suspect venue to localize the exposure after consultation with an expert in such sampling. Expert advice is also needed for decontamination of processed spores in buildings.

6. MANAGING SPECIAL SITUATIONS

A. Bioterrorist Event

Anthrax has been classified as a "category A" agent for bioterrorism; it is easy to disseminate by aerosol and can cause severe illnesses with high mortality rates. An intentional release (bioterrorist event) should be suspected if unusual clusters are seen in otherwise healthy individuals or in people in buildings with common ventilation systems. **Call Office of Communicable Disease Epidemiology immediately at 1-877-539-4344 or 206-418-5500 if anthrax is suspected.**

B. Response Following Discovery of a Suspicious Substance

1. Evaluation by Local Law Enforcement

Immediately call 911 if a suspicious substance (white powder or otherwise) is discovered. The initial key step is for law enforcement to assess whether or not a "credible threat" exists. They may call in a hazardous materials (Haz-Mat) team to assess the situation.

2. Public Health Response

If law enforcement concludes that there is a credible threat, additional laboratory tests should be performed at state or federal laboratories. Public health agencies may be involved with the ongoing investigation or prophylaxis of those exposed.

7. ROUTINE PREVENTION

A. Vaccine Recommendations

Pre-exposure vaccination is currently recommended only for:

- Persons who work directly with high concentrations of the organism in the laboratory.
- Persons handling potentially infected animals in research settings or in areas with a high incidence of enzootic anthrax or when standards and restrictions are insufficient to prevent exposure to *B. anthracis* spores.
- Persons involved in environmental investigation or remediation efforts.
- Military personnel deployed to areas with high risk for exposure to the organism.

For information regarding pre-exposure vaccination for high risk individuals, see (Tables 2, 3): <http://www.cdc.gov/mmwr/pdf/rr/rr5906.pdf>.

B. Prevention Recommendations

Recent cutaneous anthrax cases in the United States have been associated with untreated imported animal hides. Only processed animal hides should be used for products such as drums.

ACKNOWLEDGEMENTS

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UPDATES

January 2010: Updated case definition with new meningeal syndrome and new suspect and probable definitions (Section 3); new link for reporting form (Section 1).

January 2011: The Legal Reporting Requirements section has been revised to reflect the 2011 Notifiable Conditions Rule revision. Clarification of LHJ responsibilities if bioterrorism is suspected and the inclusion of reporting all case classifications were added to Section 1C. Updated historical case details were added to Section 2B-3 and 2C. The laboratory evidence and case definition sections were reformatted (Section 3B and 3C). Section 4A and 5A were modified to reflect that confirmatory testing should be performed at WA PHL or another PHL. Vaccine recommendations were updated.

June 2012: A description of the 2011 inhalational anthrax case in Minnesota was added in Section 2C. Information about communicable period was clarified in Section 2G. Additional discussion regarding potential sources is included in Section 5.

July 2014: Time resolved fluorescence testing is not performed at PHL and was deleted from list of available tests. The link for CDC anthrax treatment guidance was updated.

November 2015: Noted that LHJ investigations of suspect cases including interviews may need to include the FBI. New link added for PHL directory of microbiology services. Section 6 (Controlling Further Spread) incorporated into Section 5 (Routine Case Investigation) and remaining sections were renumbered.