

ANTHRAX

(Malignant Edema, Malignant Pustule, Woolsorter's Disease, Charbon, Ragpicker's Disease)

REPORTING INFORMATION

- **Class A: Report immediately via telephone** the case or suspected case and/or a positive laboratory result to the local public health department where the patient resides. If patient residence is unknown, report immediately via telephone to the local public health department in which the reporting health care provider or laboratory is located. Local public health departments should report immediately via telephone the case or suspected case and/or a positive laboratory result to the Ohio Department of Health (ODH).
- Reporting Form(s) and/or Mechanism:
 - *Immediate telephone reporting* is required.
 - The local health department should enter the case into the Ohio Disease Reporting System (ODRS) within 24 hours after the telephone report.
- Key fields for ODRS reporting include: import status (whether the infection was travel-associated or Ohio-acquired), date of illness onset, and all the fields in the Epidemiology module.

AGENT

Bacillus anthracis, a Gram-positive, encapsulated, spore-forming, non-motile rod. This organism is found in a vegetative state in humans and animals. When exposed to air, it forms spores which are highly resistant to physical and chemical agents. The spores live for years in contaminated soils.

CASE DEFINITION

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.

Injection Anthrax: Recently, another type of anthrax infection has been identified in heroin-injecting drug users in northern Europe. This type of infection has never been reported in the United States. Symptoms may be similar to those of [cutaneous anthrax](#), but there may be infection deep under the skin or in the muscle where the

drug was injected. Injection anthrax can spread throughout the body faster and be harder to recognize and treat.

Case Classification

Suspect: An illness suggestive of one of the known anthrax clinical forms. No definitive, presumptive, or suggestive 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;
- Evidence of *B. anthracis* DNA (for example, by LRN-validated polymerase chain reaction) 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);
- Positive result on testing of clinical serum specimens using the Quick ELISA Anthrax-PA kit;
- Detection of Lethal Factor (LF) in clinical serum specimens by LF mass spectrometry
- Positive result on testing of culture from clinical specimens with the RedLine Alert test.

Confirmed: A clinically compatible illness with one of the following:

- Culture and identification of *B. anthracis* from clinical specimens by the 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 Centers for Disease Control and Prevention (CDC) quantitative anti-PA IgG ELISA testing;
- Documented anthrax environmental exposure AND evidence of *B. anthracis* DNA (for example, by LRN-validated polymerase chain reaction) 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).

SIGNS AND SYMPTOMS

See case definition. Cutaneous anthrax is the most common form. The mortality rate is 5%-20% in untreated patients. Inhalation anthrax can present as respiratory distress with fever and shock. The mortality rate in inhalation anthrax is 80%-100%. Intestinal anthrax rarely occurs, but when it does, it usually manifests as explosive outbreaks of violent gastroenteritis with vomiting and bloody stools. The mortality rate is 25%-75%.

DIAGNOSIS

All specimens are sent to the ODH Laboratory, which will then forward them to the Centers for Disease Control and Prevention (CDC), as necessary.

Serology

EITB is available through the CDC. This requires 2cc serum. Acute serum may be submitted singly or acute and convalescent sera (taken two weeks apart) may be submitted paired.

Culture and Isolation

Isolation of the organism from lesions, blood or discharges. Organism isolation and polymerase chain reaction (PCR) testing can be done at ODH Laboratory. Immunofluorescence studies are done at CDC. For blood isolation, collect 10 cc of blood in a sterile red-topped tube. For cutaneous lesions use two dry sterile swabs. Soak both swabs in the clear serous fluid of the lesion or ring of lesions. If the lesion has a black eschar, slightly moisten both swabs in sterile saline or broth and rotate carefully under the edge of the eschar to avoid its detachment from the skin.

Swab 1 - Immediately prepare a smear for gram stain and another for DFA. Air-dry both smears and gently heat-fix both.

Swab 2 - Place in a dry sterile tube or silica gel pack (as is used for strep).

Transport all specimens by messenger at ambient temperatures to ODHL.

For further details, see Clinical Specimen Collection and Transport Guideline, in the [Microbiology Client Services Manual, Section 4](#) of the Infectious Disease Control Manual.

EPIDEMIOLOGY

Source

Infected animals, contaminated animal products or environmental contamination by spores from these sources. Also, eating raw or undercooked meat from infected animals. Anthrax associated with heroin injection has occurred in Europe; this has not been reported in the US.

Occurrence

Worldwide, but primarily in enzootic areas in developing countries among those individuals who work with livestock, eat insufficiently cooked meat from infected animals, or work in establishments where wool, goatskins and pelts are processed. In the United States, human anthrax is rare, with only one to two human cases reported annually. The last case in Ohio was reported in 1964. In 2001, an intentional release of anthrax spores through the U.S. postal system resulted in 11 cutaneous and 11 inhalational cases.

Mode of Transmission

Cutaneous anthrax is contracted by direct contact with contaminated animal tissues, pelts, wool or fur. Inhalation anthrax results from inhalation of spores from contaminated wool or pelts and the intestinal form is acquired from eating contaminated meat or animal byproducts. Transmission between humans is unusual. Insects can act as mechanical vectors. In Europe, cases have occurred among persons injecting heroin. *Bacillus anthracis* is a biologic warfare agent and potential terrorist weapon, as it can be aerosolized to expose large groups of people via inhalation.

Period of Communicability

Articles and soil contaminated with spores can remain infective for decades.

Incubation Period

From 1-7 days; incubation period of up to 60 days is possible.

PUBLIC HEALTH MANAGEMENT

Case

Investigation

Search for history of exposure to infected animals, contact or employment in industry working with hides, pelts, bone meal or other animal products, or heroin injection. If there are multiple cases, consider terrorist activity.

Treatment

Ciprofloxacin is recommended. If the isolate is susceptible, doxycycline and amoxicillin are acceptable alternatives.

Isolation and Follow-up Specimens

There is no isolation requirement. Convalescent serum specimen 14 -35 days after acute specimen.

Public Health Significance

Person-to-person transmission is not common. Important to identify source, if possible, as others may have similar contact (work or home) and may also contract disease. Spores remain viable for decades in soil. If bioterrorism is suspected, post-exposure prophylaxis may be recommended for persons who may have been exposed to the spores. Post-exposure prophylaxis would include antimicrobials (such as ciprofloxacin or doxycycline) and possibly anthrax vaccine. Please note that there is an existing standing medical order issued by the Director of the Ohio Department of Health for Ohio local health departments in an emergency situation to dispense prophylactic antibiotics and to provide anthrax vaccine to persons with known or suspected exposure to *Bacillus anthracis*. For further details, see <http://www.odh.ohio.gov/pdf/idcm/btstandorders.pdf>.

Contacts

Depending on the type of anthrax case (cutaneous, pulmonary, intestinal, oropharyngeal, or injection) and case history, look for others with similar exposure in family, co-workers, or community.

Prevention and Control

Educate workers handling potentially contaminated materials. Control dust in hazardous industries. Disinfect wool, bonemeal, and other animal products before processing. Consult state public health officials for advice on disposal of contaminated carcasses.

Source Investigation

In animal product manufacturing plants, follow-up cultures may be done. If an animal is involved, contact the Ohio Department of Agriculture, Division of Animal Industry, 8995 East Main Street, Reynoldsburg, Ohio 43068, 614-728-6220 or 800-300-9755.

Vaccination

For persons at high risk, such as veterinarians or workers handling potentially contaminated raw materials, a vaccine is available. This is obtained from CDC as needed or from Emergent BioSolutions, 2273 Research Boulevard, Suite 400; Rockville, MD 20850 Tel: 866-300-7602. In addition, Anthrax vaccine absorbed (AVA) may become available from CDC under an Emergency Use Authorization for post-exposure prophylaxis in a potential bioterrorism situation.

For livestock vaccination recommendations, contact the Ohio Department of Agriculture.

What is anthrax?

Anthrax is an infection caused by a bacterial organism called *Bacillus anthracis*. The disease can be spread between animals and humans, but most people and animals become ill from exposure to soil containing spores where animals with anthrax have died. The recent use of anthrax by terrorists and the possibility of spreading anthrax for the purpose of warfare have increased the public's awareness of this disease.

Although anthrax can be found anywhere in the world, it is most common in the developing countries of South and Central America, Eastern Europe, Asia, Africa, the Caribbean and the Middle East. Anthrax is also present in the Western United States which is where human cases of anthrax typically occur. Ohio is not endemic for Anthrax.

Who can get anthrax?

Anthrax is typically a disease of sheep, cattle, horses, goats, and swine; but humans and other mammals can also become infected.

How is anthrax transmitted?

The bacterium exists in the soil in the form of spores. Spores are inactive forms of the bacteria that can survive for decades. Humans and other animals can become infected through contact with infectious spores from animals, animal hide, or contaminated environments. It cannot spread from person to person.

There are three types of anthrax in humans caused by different routes of infection.

- Inhalation anthrax is caused by breathing in airborne spores
- Cutaneous anthrax is caused by touching the spores (soil, animal fur, etc)
- Gastrointestinal anthrax is caused by eating undercooked animal meat or other animal byproducts containing anthrax spores.

In Europe, anthrax associated with heroin injection has also been reported.

How long after exposure before symptoms appear?

The first symptoms usually occur within seven days, but typically within 48 hours.

What are the symptoms of anthrax?

Symptoms of disease vary depending on how the disease was contracted.

Cutaneous: Most anthrax infections occur when the bacterium enters a cut or abrasion. Skin infection begins as a raised itchy bump that resembles an insect bite but within 1-2 days develops into a small blister and then a painless ulcer, usually 1-3 cm in diameter, with a characteristic black area in the center. Lymph glands in the adjacent area may swell. About 20% of untreated cases of cutaneous anthrax will result in death. Deaths are rare with appropriate antimicrobial therapy.

Inhalation: Initial symptoms may resemble a common cold. After several days, the symptoms may progress to severe breathing problems and shock. Inhalation anthrax is usually fatal.

Intestinal: The intestinal disease form of anthrax may follow the consumption of contaminated meat and is characterized by inflammation of the intestinal tract. Initial signs of nausea, loss of appetite, vomiting, fever are followed by abdominal pain, vomiting of blood, and severe diarrhea. Intestinal anthrax results in death in 25% to 60% of cases.

How is anthrax diagnosed?

Anthrax is diagnosed by isolating *B. anthracis* from the blood, skin lesions, or respiratory secretions or by measuring specific antibodies in the blood of persons with suspected cases.

How is anthrax treated?

Anthrax can be treated with antibiotics. The earlier anthrax is treated, the higher the chances of recovery. If left untreated, anthrax can be fatal.

Is there a vaccine for anthrax?

There are effective vaccines for both animals and humans. In the United States these are recommended only for military personnel and those who have an increased occupational risk of exposure.

How can I prevent anthrax?

- When visiting countries where anthrax is common, humans should avoid contact with livestock and animal products.
- Avoid eating meat that has not been properly slaughtered and cooked.
- Do not open suspicious looking mail or packages

For more information visit these websites.

CDC Anthrax website: <http://www.cdc.gov/anthrax/index.html>

National Institutes of Health (NIH) Anthrax Fact Sheet:
<http://www.niaid.nih.gov/factsheets/anthrax.htm>.