

ANTHRAX

Bioterrorism Agent Profiles for Health Care Workers

Causative Agent: *Bacillus anthracis* is a spore-forming, rod-shaped gram-positive bacillus.

Routes of Transmission: Inhalation; dermal inoculation; or ingestion through consumption of insufficiently cooked contaminated meat. Person-to-person transmission of anthrax does not occur.

Incubation Period: The incubation period following an inhalation exposure to anthrax is 1-60 days, with most cases occurring 1-6 days after exposure. The incubation period for cutaneous anthrax is 1-5 days after inoculation. Although rare, esophageal and gastrointestinal anthrax occurs after an incubation period of 2-5 days.

Clinical Effects: Anthrax can present in three clinical forms: inhalation, cutaneous, or gastrointestinal. Patients with inhalation anthrax will initially experience a non-specific prodrome of flu-like symptoms including fever, myalgia, headache, non-productive cough, and mild chest discomfort. Upper respiratory symptoms such as nasal congestion or rhinorrhea are not consistent with an anthrax infection. Following the prodromal period, patients may experience a brief interim improvement. Two to four days after initial symptoms, patients will experience abrupt onset of respiratory distress, high fever and hemodynamic collapse. Symptoms of respiratory stridor and dyspnea are caused by massive mediastinal lymphadenopathy, thoracic edema, and pleural effusions rather than bronchopneumonia. In its final stage, widened mediastinum is a distinguishing though inconsistent feature of anthrax infection. Approximately 50% of all cases of inhalation anthrax are accompanied by fatal hemorrhagic meningitis.

Cutaneous anthrax begins with a localized pruritic papule or macule. The lesion develops into a vesicle filled with serosanguinous fluid and localized satellite vesicles may also appear. The vesicle ruptures leaving a painless, necrotic ulcer. A black eschar forms in the base of the ulcer and remains for 2-3 weeks before separating. The ulcer is usually accompanied by fever, malaise and headache. Severe local edema and lymphadenitis may be present.

Lethality: Without treatment, the mortality rate for inhalation anthrax is almost 100%. Rapid treatment increase the chance of survival. In the anthrax outbreak of 2001 in the United States, six out of eleven patients with inhalational anthrax survived. Up to 20% of untreated cutaneous anthrax cases may die from septicemia; however, when appropriately treated with antibiotics, less than 1% die.

Transmissibility: Person-to-person transmission of inhalational anthrax does not occur. Vegetative bacteria can be grown from the bullae and under the eschar of cutaneous anthrax lesions, so care must be taken with draining lesions to prevent person-to-person spread.

Primary Contamination & Methods of Dissemination: *B. anthracis* (anthrax bacteria) may be delivered through aerosolization, direct dermal inoculation with spores, or contamination of food products. It is now documented that in some conditions, spores can be disseminated from an ordinarily sealed paper envelope during mechanical mail sorting activities and by simply removing the contents from a contaminated envelope.

Secondary Contamination & Persistence of Organism: Spores can persist in the environment indefinitely. However, secondary aerosolization of spores from clothing or skin is uncommon.

Decontamination & Isolation:

Patients – Exposed areas of skin should be washed with soap and water after potential contact with contaminated materials. Patients with anthrax infection should be managed using standard precautions.

Equipment, clothing & other objects – A 0.5% hypochlorite solution is effective in cleaning the environment (1 part household bleach + 9 parts water = 0.5% solution). Contact with hypochlorite solution should be maintained for 10 minutes, to effectively kill any spores present. Sporicidal disinfectants may be effective. Contaminated clothing should be washed in soap and water, with or without bleach.

Outbreak Control: Only those people who were exposed directly to anthrax should receive prophylaxis. There is no need to immunize or give prophylaxis to people who have later contact with anthrax-exposed individuals.

Laboratory testing: The most useful microbiologic test is the standard blood and or wound culture, which should show growth within 24 hours. If the laboratory has been alerted to the possibility of *B. anthracis* (anthrax), biochemical testing and review of colonial morphology should provide a preliminary diagnosis within 12 to 24 hours. A direct fluorescent antibody test (DFA) is currently available for preliminary diagnosis at the Arizona State Health Laboratory. Laboratory confirmation for diagnosis requires an additional 1 to 2 days of testing. Sputum or nasal cultures are not useful for screening exposures.

For cutaneous lesions, collect vesicular fluid on sterile swabs. If it is in the eschar stage, use sterile swab to collect lesion material under eschar. For evaluation of inhalational anthrax, collect a routine blood culture and sputum culture.

For suspected gastrointestinal anthrax collect cultures of blood, stool, and vomitus. In addition a chest radiograph and/or chest CT scan is needed to evaluate for a widened mediastinum and pleural effusions. If symptoms of meningitis are present, cerebrospinal fluid should be cultured.

Therapeutic Treatment: For inhalation anthrax, ciprofloxacin or doxycycline should be used for initial intravenous therapy until antimicrobial susceptibility results are known. In addition, there should be added at least one or two other antibiotics predicted to be effective, these include: vancomycin, rifampin, imipenem, chloramphenicol, clarithromycin, penicillin, or ampicillin. Although many strains of *B. anthracis* are sensitive to penicillin, treatment of systemic anthrax infection using penicillin alone (i.e., penicillin G or ampicillin) is not recommended until sensitivities are known.

For cutaneous anthrax infections, ciprofloxacin or doxycycline are first line therapeutic drugs. As for inhalation infection, intravenous therapy with a multidrug regimen is recommended for cutaneous anthrax if there is extensive edema, systemic involvement, or for lesions on the head and neck.

Prophylactic Treatment: The recommended post-exposure prophylaxis for asymptomatic patients with confirmed or highly likely exposure to *B. anthracis* is ciprofloxacin or doxycycline. High dose penicillin (e.g., amoxicillin or penicillin VK) may be an option for antimicrobial prophylaxis when ciprofloxacin or doxycycline are contraindicated. Amoxicillin is the preferred prophylaxis for children or pregnant women if it is known that the anthrax strain is sensitive to penicillin.

Differential Diagnosis: Anthrax should be considered in any previously healthy patient that presents with acute mediastinitis. Differential diagnoses may include bacterial pneumonias, (including pneumonic plague and tularemia pneumonia), gram negative sepsis, influenza, and other influenza-like illnesses.

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For more information call (602) 364-3289

Frequently Asked Questions About Anthrax

What is anthrax?

Anthrax is a serious disease caused by *Bacillus anthracis*, a bacterium that forms spores. A bacterium is a very small organism made up of one cell. Many bacteria can cause disease. A spore is a cell that is dormant (asleep) but may come to life with the right conditions.

There are three types of anthrax:

- Skin (cutaneous)
- Lungs (inhalation)
- Digestive (gastrointestinal)

How do you get it?

Anthrax is not known to spread from one person to another.

- *Anthrax from animals* – Humans can become infected with anthrax by handling products from infected animals or by breathing in anthrax spores from infected animal products (like wool, for example). People also can become infected with gastrointestinal anthrax by eating undercooked meat from infected animals.
- *Anthrax as a weapon* – Anthrax also can be used as a weapon. This happened in the United States in 2001. Anthrax was deliberately spread through the postal system by sending letters with powder containing anthrax. This caused 22 cases of anthrax infection.

How dangerous is anthrax?

The Centers for Disease Control and Prevention classify agents with recognized bioterrorism potential into three priority areas (A, B and C). Anthrax is classified a Category A agent. Category A agents are those that:

- Pose the greatest possible threat for a bad effect on public health
- May spread across a large area or need public awareness
- Need a great deal of planning to protect the public's health

In most cases, early treatment with antibiotics can cure cutaneous anthrax. Even if untreated, 80 percent of people who become infected with cutaneous anthrax do not die. Gastrointestinal anthrax is more serious because between one-fourth and more than half of cases lead to death. Inhalation anthrax is much more severe. In 2001, about half of the cases of inhalation anthrax ended in death.

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What are the symptoms?

The symptoms (warning signs) of anthrax are different depending on the type of the disease:

- *Cutaneous* – The first symptom is a small sore that develops into a blister. The blister then develops into a skin ulcer with a black area in the center. The sore, blister and ulcer do not hurt.
- *Gastrointestinal* – The first symptoms are nausea, loss of appetite, bloody diarrhea, and fever, followed by bad stomach pain.
- *Inhalation* – The first symptoms of inhalation anthrax are similar to influenza with fever, fatigue, a dry cough, and muscle aches. Later symptoms include worsening cough, chest discomfort, and shortness of breath. (Caution: Most people with cold or influenza symptoms do not have inhalation anthrax.)

How soon do infected people get sick?

Symptoms usually appear within 7 days of coming in contact with the bacterium for all three types of anthrax. However, for inhalation anthrax, symptoms can sometimes take up to 42 days to appear.

How is anthrax treated?

Antibiotics are used to treat all three types of anthrax. Early identification and treatment are important.

- *Prevention after exposure* – Antibiotics such as ciprofloxacin, doxycycline, or penicillin will be given to people who are known to be exposed to anthrax, but are not yet sick. In addition, anthrax vaccine may be used.
- *Treatment after infection* – Treatment involves a 60-day course of effective antibiotics. Response to therapy depends on how ill the patient is, where the infection is located, and how quickly effective antibiotics are begun.

Can anthrax be prevented?

There is a vaccine to prevent anthrax, but it is not yet available for the general public. Anyone who may be exposed to anthrax, including certain members of the U.S. armed forces, laboratory workers, and workers who may enter or re-enter contaminated areas, may get the vaccine. Also, in the event of an attack using anthrax as a weapon, people exposed could get the vaccine.

What should I do if I think I have anthrax?

If you are showing symptoms of anthrax infection, call your health-care provider.

What should I do if I think I have been exposed to anthrax?

Contact local law enforcement immediately if you think that you may have been exposed to anthrax. This includes being exposed to a suspicious package or envelope that contains powder.

For more information, call (602) 364-3289