



## *X-Plain* *Anthrax and Bioterrorism* **Reference Summary**

### **Introduction**

Anthrax is a very rare infectious disease that can spread from animals to humans. The recent use of anthrax by terrorists and the possibility of spreading anthrax for the purpose of warfare have increased people's awareness of this disease.

This health education program explains the causes and types of anthrax. It also reviews symptoms, diagnosis, treatment, and prevention of anthrax through vaccination and awareness of bioterrorism.

### **What is Anthrax?**

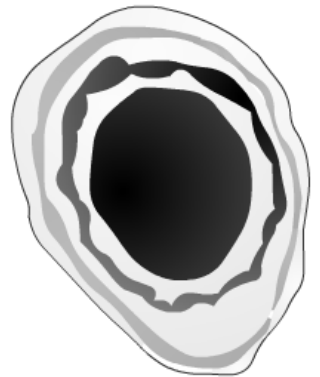
Anthrax is an infection caused by a bacterial organism called *Bacillus anthracis*. The bacterium exists in the soil in the form of spores. Spores are inactive forms of the bacteria. They can survive for decades in spore form.

Warm-blooded animals such as sheep, cattle, horses, goats, and swine become infected when they eat food contaminated with anthrax spores.

Humans can become infected through contact with the anthrax spores from infected animals or animal hide.

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.

Before the anthrax bioterrorism cases of 2001, only 18 cases of inhalation anthrax were reported in the United States in the last 100 years, the most recent of which was reported in 1976.



Anthrax Spore

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## Types Of Anthrax

There are three ways in which people can become infected by anthrax:

1. By inhaling air contaminated with anthrax spores. This is known as inhalation anthrax.
2. By touching contaminated animal fur, skin, or anything containing anthrax spores. This is known as cutaneous anthrax because it involves the skin. Cutaneous means “of the skin.”
3. By eating undercooked animal meat containing anthrax spores. This is known as gastrointestinal anthrax.

Inhalation anthrax is rare. However, it is the most serious and deadly type of anthrax. People working in factories processing animal skins can inhale anthrax spores from contaminated animal hide.

Cutaneous anthrax is more common than inhalation anthrax. Cutaneous anthrax is caught through direct contact with the skins or tissues of infected animals. The spores have to come in contact with a human skin lesion or a skin wound for infection to occur. Cutaneous anthrax is common in occupations where people come in direct contact with infected cattle.

Gastrointestinal anthrax is extremely rare and no cases have been reported in the United States in the last fifty years.

It usually takes thousands of spores to infect a person. This may seem to be a high number of spores, but in reality, that many spores can fit within an area the size of a pinhead.

Anthrax is not contagious. It cannot spread from an infected person to another person.

## Symptoms

The symptoms of this disease vary depending on how it was contracted. The first symptoms usually occur within seven days of exposure. After an exposure, symptoms of inhalation anthrax generally appear sooner than symptoms of cutaneous anthrax.

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## ***Inhalation Anthrax***

The initial symptoms of inhalation anthrax may be like those of a common cold or flu. They may start with a cough. But in few days, the symptoms may develop into nausea and severe breathing problems and total collapse of bodily functions, known as shock.

The majority of patients with inhalation anthrax die, usually within a day or two after the appearance of severe breathing problems, in spite of treatment with antibiotics. Inhalation anthrax can be successfully treated if the appropriate antibiotic therapy is started very early.

## ***Cutaneous Anthrax***

When anthrax spores enter a skin cut, skin infection begins as a raised itchy bump that resembles an insect bite. Within a day or two it develops into a blister and then a painless ulcer, usually 1-3 cm in diameter, with a dying area in the center.

Lymph glands in the adjacent area may swell. Fever, swelling, and headache may follow. About 20% of untreated cases of cutaneous anthrax result in death. Deaths are rare when the appropriate antibiotic therapy is used.



## ***Gastrointestinal Anthrax***

Intestinal anthrax results in a severe inflammation of the intestinal tract. The initial signs of nausea, loss of appetite, vomiting, and fever are followed by abdominal pain, vomiting of blood, and severe diarrhea.

Intestinal anthrax results in death in 25% to 60% of worldwide cases. As noted, no such cases have been reported in the United States in the last fifty years.

Once inside the body and lungs, anthrax spores migrate to the lymph nodes and change to the bacterial form. The bacteria multiply and produce toxins. The toxins cause bleeding and destruction of structures in the middle of the chest.



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## Diagnosis

Anthrax can be diagnosed in two common ways:

1. by finding the bacterium in body tissue samples, or
2. by checking for certain substances in the blood.

The doctor can take a sample of blood, skin lesion, or mucus and check for the presence of the anthrax bacterium under the microscope.

A blood test is also available to check for the presence of anthrax antibodies: substances made by the body to fight anthrax. The blood is drawn from a vein. This test is possible late in the course of the disease when antibodies are present.

If no antibodies are present, the blood is normal. If antibodies are found, further blood tests and other tests are needed to confirm that the person has recently been infected with anthrax.

## Treatment

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

Usually, ciprofloxacin is prescribed, but other recommended antibiotics include, penicillin, erythromycin, tetracycline, or chloramphenicol.

Like any medicine, antibiotics may cause unwanted side effects. The side effects of ciprofloxacin may include dizziness, headaches, and diarrhea.

## Vaccination

An anthrax vaccine has been licensed for use in humans. The vaccine is reported to be 93% effective in protecting against anthrax.

Anthrax in the United States is extremely rare. In countries where anthrax is common and vaccination levels of animal herds is low, people should avoid contact with livestock and animal products, and avoid eating meat that has not been properly slaughtered and cooked.

The Center for Disease Control does not recommend the anthrax vaccine for Americans traveling to countries with a high occurrence of anthrax. Vaccination is only recommended for at risk occupations.

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The body produces natural antibodies that fight anthrax. However, when the anthrax bacteria are too many, the body cannot keep up with them.

Vaccination causes the body to produce the anthrax fighting antibodies without actual exposure to anthrax. The vaccine includes the PA protein from a type of anthrax that does not cause disease. This protein causes the body to produce anthrax antibodies.

After vaccination, if the body is exposed to anthrax spores, the body contains enough antibodies to fight anthrax.

The immunization consists of three injections under the skin given two weeks apart followed by three additional injections given at 6, 12, and 18 months. Annual booster injections of the vaccine are required in order to maintain immunity.

Like all vaccines, the anthrax vaccine may cause soreness, redness, itching, swelling, and lumps at the injection site. Beyond the injection site, headache, fever, nausea, and related symptoms are possible but rare. Severe allergic reactions can occur after any vaccination, however, this is extremely rare.

Studies on service personnel who have been vaccinated against anthrax reveal no long-term side effects for anthrax vaccines.

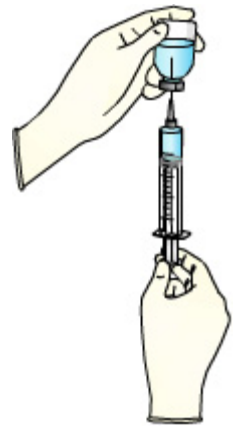
Currently all anthrax vaccines produced in the United States are primarily for military use in recognition of the threat to military personnel. Small quantities are made available as needed to civilians who are exposed to anthrax hazards in their work environment, such as veterinarians and lab workers.

## **Bioterrorism**

Anthrax is one of a handful of microorganisms that have been or can be turned into a biological weapon designed to infect and kill large populations. Anthrax has been used in biological weapons because:

1. anthrax spores can survive for a long period of time,
2. spores can be spread in the air, and
3. infection can cause severe fatal symptoms in about one week.

Armies that have developed biological weapons have loaded anthrax into bombs and missiles. Fortunately, a treaty signed by 143 nations bans their use.

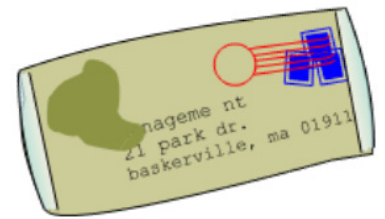


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However, terrorists do not abide by these treaties. They may spread anthrax by spraying it, releasing it into a ventilation system, or by including it in mailed packages.

After the events of September 11, 2001, some people in the United States have been exposed to biological agents. The most common scenario has involved the discovery of an envelope with anthrax spores inside. The anthrax is usually found in a powder form.



Do not open letters or packages that seem suspicious such as packages that appear oily, poorly wrapped, or have unusual sounds or odors coming from them.

If you receive a letter or package containing a threat or a powdery substance, follow these guidelines. For further information, contact your departments of public health and public safety.

1. Place the envelope, letter or package down on the nearest surface. Do not carry the item around your office, cubicle or home.
2. Leave the immediate area, i.e., the cubicle or room, and insure that no one can enter that area by closing the door or blocking the entrance. Other persons in the immediate area should also leave. Remember that just being exposed, even if the threat is real, does not mean you will develop symptoms.
3. The person who opened the envelope/package should immediately wash her/his hands and arms with warm water and soap.
4. Call your police department or public safety department and state that you have received a potential biological threat. Do not evacuate the building. Your public safety department may contact the Department of Emergency Management and a hazardous materials team.
5. While you wait for the responders, write down the names, addresses and home phone numbers of everyone who was in the immediate area when the envelope or package was opened.
6. The law enforcement officials will remove the letter or package. Usually this will be done by a gloved and masked person who will place the letter or package in a plastic bag within another plastic bag.
7. Please check with proper authorities before leaving the building. The amount of time that you may need to stay in the building depends upon the nature of the incident, but it could be hours. You must be patient. When it is safe for exposed persons to go home, they can take a shower and wash their clothes in their own washer and dryer.

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8. Managers in affected departments should distribute information as soon as possible to inform all departmental employees of the potential threat, possible symptoms, and appropriate medical response.

If necessary, the letter or package will be sent off for testing. Some information may be available within hours, but one to two days may be required for results.

While waiting for results, exposed persons do not need to be isolated or quarantined, nor do they need to be put on antibiotics.

Exposed persons will be informed immediately if test results indicate that medical attention is needed. They will also be notified if the results are negative.

If an individual who was exposed to the letter or package becomes ill while waiting for results, medical attention should be sought and the public health department should be contacted. Follow medical advice; do not treat yourself.

## Summary

Anthrax is a bacterial infection that can spread from infected animals to humans. If not treated promptly it can be fatal.

Anthrax infections are extremely rare in the United States. However, recent bio-terrorist activities have created the need for increased awareness about exposure to anthrax spores.

For up-to-date information on the threat of anthrax exposure and how to be aware of potential bioterrorist acts, rely on current information from your public health and public safety officials.



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