

## Anthrax

### Introduction

Anthrax is an acute infectious disease caused by the spore-forming bacterium *B.anthraxis*. It occurs most frequently as a disease of herbivores (e.g., cattle, goats and sheep) that acquire spores from direct contact with contaminated soil. Humans usually become infected through contact with, or ingestion of, *B.anthraxis* spores from infected animals or their products. Human-to-human transmission has not been documented.

The spore form of *B.anthraxis* is durable and can be delivered as an aerosol, making it an effective biological warfare candidate. The incubation period of anthrax is 2 – 60 days. Inhalation causes the most serious form of human anthrax, and although contemporary experience in humans is limited, mortality may be high even with the appropriate therapy.

In order to cause disease, at least 8,000 to 10,000 spores need to lodge deep in the lungs, in the tiniest air sacs known as alveoli. This warm environment stimulates the bacterium to emerge from its protective spore. As each bacterium reproduces it releases toxins, which eventually spread throughout the body and destroy tissue and organs. One of the toxins, called protective antigen, attaches to a receptor found on most cells. Once seven of these antigens find a cell, they latch together to form a ring with a hole in the middle. Then one of the other toxins produced by the bacterium—either a killing or swelling toxin—plugs the hole and puts the cell immune system into overdrive to the point where tissue destruction starts.

The likelihood of developing cutaneous disease (i.e., being infected through the skin) is low, however, in situations where the threat for transmission of *B.anthraxis* spores is deemed credible, decontamination of skin and potential contact points (i.e., clothes, disks, chairs, etc.) must be considered, to reduce the risk of cutaneous and gastrointestinal (ingested) forms of disease.

### Symptoms and Effects of Anthrax

After an incubation period of 1-7 days, the onset of inhalation anthrax is gradual. Possible symptoms may include; fever, malaise/depression, fatigue, cough or mild chest discomfort followed by severe respiratory distress. This mild illness can progress rapidly to respiratory distress and shock in 2-4 days followed by a range of more severe symptoms, including breathing difficulty and exhaustion. Death usually occurs within 24 hours of respiratory distress.

### Clinical Features of Anthrax

Anthrax is an acute bacterial infection of the skin, lungs or gastrointestinal tract. Infection occurs most commonly via the skin. The cutaneous or skin form of the infection occurs most frequently on the hands and forearms of persons working with infected livestock or contaminated animal products and represents 95% of cases of human anthrax. It is initially characterized by a small solid elevation of the skin, which progresses to a fluid-filled blister

with swelling at the site of infection. The scab that typically forms over the lesion can be black as coal, hence the name anthrax—Greek for coal.

The inhaled form of anthrax is contracted by inhalation of the spores, occurs mainly among workers handling infected animal hides, wool and fur. Under natural conditions, inhaled anthrax is exceedingly rare, with only 18 cases reported in the United States in the 20<sup>th</sup> century. With treatment, the case fatality rate is less than 1% among people who get the skin form of the disease. The fatality rate for untreated inhaled or intestinal anthrax is over 90%.

### **Risks Associated with Anthrax**

Anthrax is only deadly when you inhale a huge number of spores. Once the spores hit the ground, they stay there, so the risk from re-aerosolization is minuscule. In Sverdlovsk (now Ekaterinburg) there was a large release of anthrax spores from a bio-weapons factory, due to a faulty or missing filter, in 1979. Only 66 people in the town of more than 1 million died from anthrax, although the citizens were not notified of the release, and therefore did not receive prompt antibiotics or optimal medical therapy.

Anthrax does NOT spread from person to person. When it travels with the wind, it follows a narrow path, and does NOT spread out widely over long distances. That is why there were so few cases in Sverdlovsk. Workers in American factories who were grossly contaminated with anthrax spores, who inhaled hundreds of spores a day, almost never developed inhalation anthrax, the most deadly form of the disease. Therefore, if anthrax is used, it will affect only a limited area, and relatively small numbers of people.

### **Coordination of Response Teams**

The public health response to bioterrorism requires effective communication and coordination with response teams and law enforcement. Senior management personnel should work with these groups to define the roles of each agency, including protection of first responders; and ensure that procedures are tested through simulation.

### **Terrorist Attacks – Chemical and Biological Agents**

In the aftermath of the September 11, 2001, World Trade Center and Pentagon tragedies, fears mounted that both chemical and biological agents could be used in terrorist actions against civilian targets. In fact, chemical agents identified as Anthrax have been sent through the mail in such a fashion, affecting the Washington, DC area and other communities throughout the United States.

### **Emergency Supplies**

It is recommended that the university keep an ample supply of bathrobes, plastic trash bags, soap, and household bleach reserves onsite in a detached storage facility (i.e., external to central air-conditioning supply system that feeds main building/office areas). If practical, portable shower enclosure(s) should also be kept onsite. These resources will be used to effectively mitigate further spread of anthrax on clothing and skin beyond the primary infection area.

## **Information About Possible Exposure to Anthrax**

### **What constitutes a “suspicious parcel?”**

Some typical characteristics that Postal Inspectors have detected over the years, that ought to trigger suspicion, include parcels that;

- are unexpected or from someone unfamiliar to you,
- are addressed to someone no longer with your organization or are otherwise outdated,
- have no return address, or have one that can't be verified as legitimate,
- are of unusual weight, given their size, or are lopsided or oddly shaped,
- are marked with restrictive endorsements, such as “Personal” or “Confidential,”
- have protruding wires, strange odors or stains,
- show a city or state in the postmark that doesn't match the return address.

### **What should a person do who has received a suspicious parcel in the mail?**

- Do not try to open the parcel.
- Isolate the parcel.
- Evacuate the immediate area.
- Call public safety (x3636) and the director of risk management (x2706).

### **What should a person be advised to do if they receive an anthrax threat by mail?**

The person should be advised not handle the mail piece or package suspected of contamination. Notify public safety (x3636) and the director of risk management (x2706). Make sure that damaged or suspicious packages are isolated and the immediate area cordoned off.

All persons who have handled a suspicious package should wash their hands with soap and water. List all persons who have touched the letter and/or envelope. Place all items worn when in contact with the suspect mail in plastic bags and keep them available for law enforcement agents. Contact public safety and the director of risk management and provide the above list of involved persons, informing them if clothing has been collected. Public safety will contact the police who will collect the mail, assess the threat situation, and coordinate with responding authorities. When practical, shower with soap and water.

### **Preserve the Immediate Area**

Avoid moving items in the direct area of the perceived threat. If possible, cover the threat area with a cloth or piece of clothing to prevent additional aerosol contamination. . Leave the immediate area closing the door behind you. Evacuate the building, and immediately wash your hands with soap and water.

**Evacuation – to “Staging Areas” only**

Public safety (once notified) should evacuate personnel from the building, but ensure that they remain at the secure, localized staging area until emergency authorities arrive and conduct an initial assessment of the threat. Personnel should NOT be sent home or allowed to leave the collection area(s) until an initial assessment has been completed, and they have been properly debriefed by responding authorities.

**HVAC shutdown**

If time permits, Facilities Management should shut down all HVAC systems to prevent further spread of airborne contaminants. HVAC systems should NOT be restarted until an initial assessment has been completed, and only under the instruction of responding authorities.

**Evidence Preservation**

Local police and Scene of Crime officials will coordinate the collection of evidence (e.g., letters, packages, or air-handling supply system samples) and deliver materials to an authorized local laboratory for testing. The intent is to obtain either a false or positive indication of anthrax contamination with 24-48 hours following a reported incident. This timeline is mission critical in order to commence treatment within the first 48 hours; otherwise, incubation of the disease will transpire, and the effects may not be controlled even given the proper treatment.

American University senior management personnel are NOT to engage in any anthrax investigation activities. This task is to be left to the properly tooled and trained emergency response authorities.

**Signs and symptoms debriefing**

Once the initial assessment is complete, local authorities should collect contact information for potentially exposed persons and all personnel should be debriefed and provided with information about the signs and symptoms of illness associated with the suspected biologic agent, and given details about who to contact if they develop a related illness. All staff is to be advised to also contact their supervisor if they become ill.

Once debriefed, all personnel should be instructed to engage in precautionary decontamination activities at the designated on-site location (if practical), or sent home to carry out these initial prevention activities.

**Decontamination – personal**

All staff should remove their clothing and personal effects, place clothing items in a sealed plastic bag, and shower using copious quantities of soap and water. All personal effects (i.e., watches, bracelets, etc.) should be decontaminated with a 0.5% hypochlorite solution (i.e., one part household bleach to 10 parts water).

Clothing and personal items not decontaminated using hypochlorite solution must be kept in labeled plastic bags as potential evidence. These items will be quarantined by responding



authorities and returned to the owner once the threat has been analyzed and a false-positive, or retained indefinitely as evidence if the threat is real.

***Decontamination – Affected Environment***

For incidents involving possibly contaminated letters, the environment in direct contact with the letter and its contents should be decontaminated with a 0.5% hypochlorite solution (i.e., one part household bleach to 10 parts water) following a crime scene investigation.

American University senior management personnel are NOT to engage in any anthrax abatement activities. This task is to be left to the properly tooled and trained emergency response authorities.

***What is the treatment for anthrax?***

Treatment with antibiotics beginning one day after exposure has been shown to provide significant protection against death in tests with monkeys, especially when combined with active immunization. Penicillin, doxycycline, ciproflaxin, are all effective drugs against most strains of the disease. Penicillin is the drug of choice for naturally occurring anthrax. If untreated, inhaled anthrax is fatal.

A Cipro vaccine is available and consists of a series of six doses over 18 months with yearly boosters. This vaccine, while known to protect against anthrax acquired through the skin, is also believed to be effective against anthrax inhaled spores. Does the government have a plan in place to make Cipro available if there were mass exposure to anthrax? Yes. Under emergency plans, the Federal government in the USA would ship appropriate antibiotics from its stockpile to wherever they are needed.

Effective decontamination can be accomplished by boiling contaminated articles in water for 30 minutes or longer and using common disinfectants. Chlorine is effective in destroying spores and vegetative cells. Remember, anthrax spores are stable, able to resist sunlight for several hours and able to remain alive in soil and water for years.

### **Anthrax Treatment Recommendations from the CDC**

Post-exposure treatment (prophylaxis) for personnel infected with *B.anthraxis* consists of chemoprophylaxis and vaccination. Oral (i.e., ingested) fluoroquinolones are the drugs of choice for adults, including pregnant women. If fluoroquinolones are not available, or are contraindicated by medical practitioners, doxycycline is an alternative. Treatment (prophylaxis) should continue until *B.anthraxis* exposure has been excluded.

Post-exposure vaccination with an inactivated, cell-free anthrax vaccine is indicated in conjunction with chemoprophylaxis following a proven biologic incident. Post-exposure vaccination consists of three injections; 1) as soon as possible after exposure, 2) at 2 weeks after exposure, and 3) at 4 weeks after exposure. Anthrax vaccine can be requested through the CDC or locally supplied agency; however, routine vaccine of civilian populations is not recommended as this vaccine has not been evaluated for safety and efficacy in children less than 18 years of age or adults more than 60 years of age. Recommended post-exposure prophylaxis for exposure to *B.anthraxis*\*

<b>Drug:</b>	<b>Adults:</b>	<b>Children**:</b>
<b>Oral fluoroquinolones:</b>		
One of the following:		
Ciprofloxacin	500mg twice daily	20-30mg per kg of body mass per day divided every 12 hours
Levofloxacin	500mg twice daily	Not recommended
Ofloxacin	400mg twice daily	Not recommended

#### **If fluoroquinolones are not available or are contraindicated:**

Doxycycline 100mg twice daily 5mg per kg of body mass per day divided every 12 hours

\*Prophylaxis should continue until exposure to *B.anthraxis* has been excluded. If exposure is confirmed, prophylaxis should continue for 4 weeks and until 3 doses of vaccine have been administered, or for 8 weeks if vaccine is not available.

\*\*Use of tetracyclines and fluoroquinolones in children has well-known adverse effects. These risks must be weighed carefully against the risk for developing life threatening disease. If a release of *B.anthraxis* is confirmed, children should receive oral amoxicillin 40mg per kg of body mass per day divided every 8 hours (not to exceed 500mg three times daily) as soon as penicillin susceptibility of the organism has been confirmed.