Bioterrorism Agent Fact Sheet

Anthrax/*Bacillus anthracis*

Disease

In its natural form, anthrax is a zoonotic disease rarely seen in the US that is caused by the gram-positive spore-forming bacterium *Bacillus anthracis*. It has already been proven to be a very dangerous biological weapon, causing 22 cases and 5 deaths during the U.S. outbreak of 2001 associated with spores sent through the mail.

There are three clinical forms of anthrax:

- **Inhalational**
  Most lethal form (mortality 45-87%) that occurs following inhalation of spores • Prior to 2001, had not been reported in the US in over 20 yrs • Most likely form of the disease to occur in a bioterrorism incident • Identification of a single case should raise suspicion of a possible bioterrorism event
- **Cutaneous**
  Most common natural form, involving the skin •Mortality 10-20% if un treated, <1% when treated
- **Gastrointestinal**
  Rare, but highly fatal form that occurs after ingestion of spores • Potential, but less likely mode of delivery during a bioterrorism event • Might be seen in aerosol release

Diagnosis

Presumptive diagnosis should be made based on signs and symptoms alone in the setting of a known or suspected outbreak. Basic diagnostic testing should be undertaken by the treating physician. This should include gram stain and culture of blood, which usually demonstrates gram-positive bacilli after bacteremia and severe disease have developed. There are no readily available rapid specific tests for early anthrax disease. PCR, immunohistochemical stains and gamma phage lysis are available at reference laboratories for confirmation of suspected anthrax cases. Serologic tests for detecting IgG are also available at reference labs to support a diagnosis retrospectively.

Treatment

Management of inhalational anthrax consists of hospitalization, IV antibiotics and intensive supportive care. Antibiotic treatment should be administered as soon as the diagnosis is suspected because early initiation can dramatically reduce the mortality, which approaches 100% when treatment is significantly delayed. Initial treatment should be empiric with multiple antibiotics until susceptibility testing is available.

- **Adults**
  ciprofloxacin 400mg IV q 12hrs or
  doxycycline 100mg IV q 12hrs plus
  one or two other antibiotics (including penicillin, rifampin, clindamycin, vancomycin, imipenem, and chloramphenicol). Other fluoroquinolones have demonstrated in vitro activity but animal studies are limited.

Anthrax

Clinical Features of Inhalation Anthrax

Infection begins after spores are inhaled and deposited in the alveolar spaces of the lungs. Spores migrate to the mediastinum via lymphatics and begin to germinate into vegetative bacilli. Incubation period: 1-10 days, although there have been reported cases several weeks after exposure. Typically, a two stage illness follows. Prodromal phase (lasting from a few hours to a few days): nonspecific flu-like symptoms including fever, malaise, dyspnea, onproductive cough, and nausea. May easily be confused with influenza, but rhinorrhea is unlikely to be seen in anthrax while chest discomfort may be a prominent feature. Some patients experience a brief improvement or resolution of symptoms before progressing to the second phase. Fulminant stage (usually progresses to death within 36 hrs): development of high-grade bacteremia characterized by fever, diaphoresis, respiratory distress, cyanosis and shock. Approximately half will develop hemorrhagic meningitis with concomitant headache, stiff neck and mental status changes. There are no specific laboratory tests associated with inhalational anthrax, but a widened mediastinum with or without infultrates on CXR is highly suggestive in a young or otherwise healthy patient with a typical presentation. Bloody pleural effusions are also common.

Infection Control

Cutaneous, but not inhalational anthrax has rarely been transmitted person to person; only Standard Precautions are needed. Neither a private nor negative pressure room are necessary. Laboratory personnel should be notified of known or suspected cases so that safe specimen processing can be undertaken (biosafety level 2 is required for clinical specimens).

Treatment (continued)

- **Children**
  ciprofloxacin 10mg/kg/day IV q 12hrs (not to exceed 400mg/dose) or doxycycline 2.2mg/kg IV q 12hrs for patients < 45kg, adult dose for > 45kg plus one or two other antibiotics (as for adults).

For confirmed cases, treatment should be continued for 60 days. Maintenance therapy should be altered based upon clinical response and susceptibilities. Penicillins should not be used alone because of inducible B-lactamases. Upon improvement, a change to one or two oral agents can be considered. Localized cutaneous anthrax should be treated with oral ciprofloxacin or doxycycline at equivalent doses.

Noneffective therapies include: trimethoprim/sulfamethoxazole, third generation cephalosporins, most macrolides

Post-Exposure Prophylaxis

Post-exposure prophylaxis should be provided to all persons who may have been directly exposed to the initial release. It is critical that antibiotics be administered as soon as possible after potential exposure, before symptoms appear, as this offers the best chance of disease prevention and survival. Patient contacts (e.g., family, friends, healthcare providers) who were not originally exposed to the release do not require prophylaxis.

- Administration of vaccine should be considered if it is available
- Oral antibiotic therapy should be provided for at least 60 days
- Ciprofloxacin 500mg po bid (15 mg/kg bid, max 500mg/dose for children)
- Doxycycline 100mg po bid is an alternative for adults if the strain proves susceptible
- Amoxicillin 500mg po tid (40 mg/kg tid for children <20kg) is an alternative for susceptible strains in either adults or children after at least 14 days of ciprofloxacin or doxycycline have been received
- Amoxicllin is preferred over doxycycline as an alternative to ciprofloxacin in women who are or might become pregnant

Vaccination

A licensed cell-free, effective and safe vaccine exists, but is currently not available to the general public. The vaccination consists of an initial 6-dose series (0, 2 & 4 weeks; 6, 12 & 18 months) followed by an annual booster. All doses are administered 0.5 ml SQ. A single booster should be administered to those who received the initial series at least 6 months prior to exposure.

Additional information and references available at www.bioterrorism.slu.edu

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Decontamination

The highest risk of infection occurs during the initial release while a large concentration of anthrax spores remain airborne; in ideal conditions, this is estimated to be up to 1 day. Although the spores can survive many years in the soil, cases resulting from secondary aerosolization are less likely but still possible. Decontamination of surfaces following an aerosol release is a complicated and costly process and the decision to decontaminate must be made in consultation with environmental experts. In addition to giving post-exposure prophylaxis, persons with suspected direct spore contact should be managed with thorough washing of exposed skin and clothing with soap and water; bleach is not necessary. All instruments used for invasive procedures (such as surgeries or autopsies) on patients with known or suspected anthrax should be sterilized with a sporicidal agent such as hypochlorite (bleach).

Reporting

Report suspected cases of inhalational anthrax to your local health department. The local health department is responsible for notifying the state health department, FBI and local law enforcement. The state health department will notify the CDC.

Disclaimer

Information contained in this fact sheet was current as of November 2002, and was designed for educational purposes only. Medication information should always be researched and verified before initiation of patient treatment. Report suspected cases of inhalational anthrax to your local health department. The local health department is responsible for notifying the state health department, FBI and local law enforcement. The state health department will notify the CDC.

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