

Anthrax (*Bacillus anthracis*) as a Bioterrorist Agent

Agent: *Bacillus anthracis*, a Gram-positive rod-like bacterium, may be an effective biological weapon because it is easy to cultivate, readily forms spores, and can be aerosolized. *B. anthracis* spores remain viable for years, remaining in soil and other materials long after initial contamination.

Disease: Inhalation anthrax (*B. anthracis* can also cause gastrointestinal and cutaneous anthrax)

Incubation Period: 1-6 days

Signs/Symptoms: Patients with inhalation anthrax usually have a biphasic illness with a benign initial phase followed by an acute second phase. Initially, nonspecific symptoms appear, resembling a common upper respiratory infection: fever, fatigue, malaise, myalgia, mild chest pain, and a nonproductive cough appear. The initial symptoms are often followed by a short period of improvement (hours to 2-3 days) followed by a sudden onset of severe respiratory distress with dyspnea, diaphoresis, stridor, and cyanosis. Chest wall edema may be observed. Physical findings are nonspecific except that rhonchi may be present. Without treatment, shock and death follow within 24-36 hours of onset of severe symptoms.

Diagnosis:

Differential Diagnosis: Other diagnoses to consider include aerosol exposure to staphylococcal enterotoxin B (SEB), pneumonic plague or tularemia, and invasive group A streptococcal pneumonia. With SEB, no prodrome would be evident prior to onset of severe respiratory symptoms. Patients with plague, tularemia, or invasive group A streptococcal pneumonia are far more likely than those with anthrax to have pulmonary infiltrates.

Diagnostic Tests: A widened mediastinum on chest x-ray should alert one to the diagnosis of anthrax.

Laboratory: Large Gram-positive rods may be seen on Gram stain of sputum, pleural fluid and/or blood. *B. anthracis* can also be readily detected by culture of sputum, pleural fluid or blood using routine media. Early postexposure (0-24 hours) nasal or throat swabs and induced respiratory secretions may be collected for culture, and for fluorescent antibody (FA). After overnight growth at 35°C, isolated colonies of *B. anthracis* are 2-5 mm in diameter and is non-pigmented, non-mucoid and has a surface appearance like ground glass, not smooth and shiny.

The edge of the colony is irregular, often with comma-shaped projections from the colony edge. This is the characteristic “Medusa Head” appearance. The colonies are non-hemolytic on blood agar. Often times the colonies on sheep blood agar are tenacious (sticky) and when teased with a loop the growth will stand up like a beaten egg white and not come off the plate.

The organism is a large Gram positive rod, usually in chains and is non-motile either on a wet mount or with motility medium.

During the clinical phase (24 - 72 hours) blood for serum may be collected in a tiger-top (SST) or red-top tube for toxin assays. Blood for convalescent sera may be collected in tiger-top (SST) or red-top tubes for serology.

Send specimens for laboratory confirmation in a triple container to the Oregon State Public Health Laboratory, 1717 SW Tenth Avenue, Portland, OR 97201. Prior notification is requested by calling the laboratory at 503-229-5882 and Acute and Communicable Disease Prevention at (503) 731-4024 if anthrax is suspected.

Supportive Tests: Neutrophilic leukocytosis is often revealed upon laboratory evaluation. Pleural and cerebrospinal fluids may be hemorrhagic. The chest x-ray may also show pleural effusions with or without infiltrates and mediastinal widening with absence of pulmonary parenchyma.

Treatment: Inhalation anthrax is almost always fatal if treatment is begun after a patient is symptomatic. Historically, penicillin has been the treatment of choice. However, naturally resistant strains occur, and it is relatively easy to induce penicillin and tetracycline resistance in the laboratory. In the absence of sensitivity data, treatment should be instituted with ciprofloxacin 400 mg q8-12h IV or doxycycline 200 mg IV initially, followed by 100 mg q12h IV. If the organism can be shown to be penicillin sensitive, therapy can be instituted with penicillin G2 million units q2h IV. Therapy should be continued for 7-10 days. Supportive therapy may be necessary.

Vaccines: A licensed vaccine (Bioport Corporation) is available. The vaccine is administered 0.5 ml SC at 0, 2, and 4 weeks and then at 6, 12, and 18 months. Boosters are given yearly.

Prophylaxis: Ciprofloxacin 500 mg bid po should be given for 60 days. If available, those exposed should receive 3 doses of anthrax vaccine at 0, 14, and 28 days. Once three doses of vaccine have been administered and the exposed

received 30 days of antibiotics, antibiotics may be discontinued. Those who have received fewer than three doses of vaccine should receive a single 0.5 ml booster. If penicillin sensitivity is established, prophylactic therapy can be switched to doxycycline 100 mg bid po or amoxicillin 500 mg q8h po.

Infection Control: There is no evidence of person-to-person transmission of inhalation anthrax. Standard precautions should be practiced. Wash surfaces with a sporicidal agent, such as, 0.5% sodium hypochlorite (1 part household bleach added to 9 parts water). Bed linens, clothing, and other exposed articles to cutaneous anthrax should be steam sterilized or incinerated.

Report: Immediately report any suspect cases to your local health department or the Oregon Health Division at (503) 731-4024 during working hours (8:00 am to 5:00 pm Monday through Friday) or (503) 731-4030 nights, weekends and holidays.

Adapted with permission from the Texas Department of Health