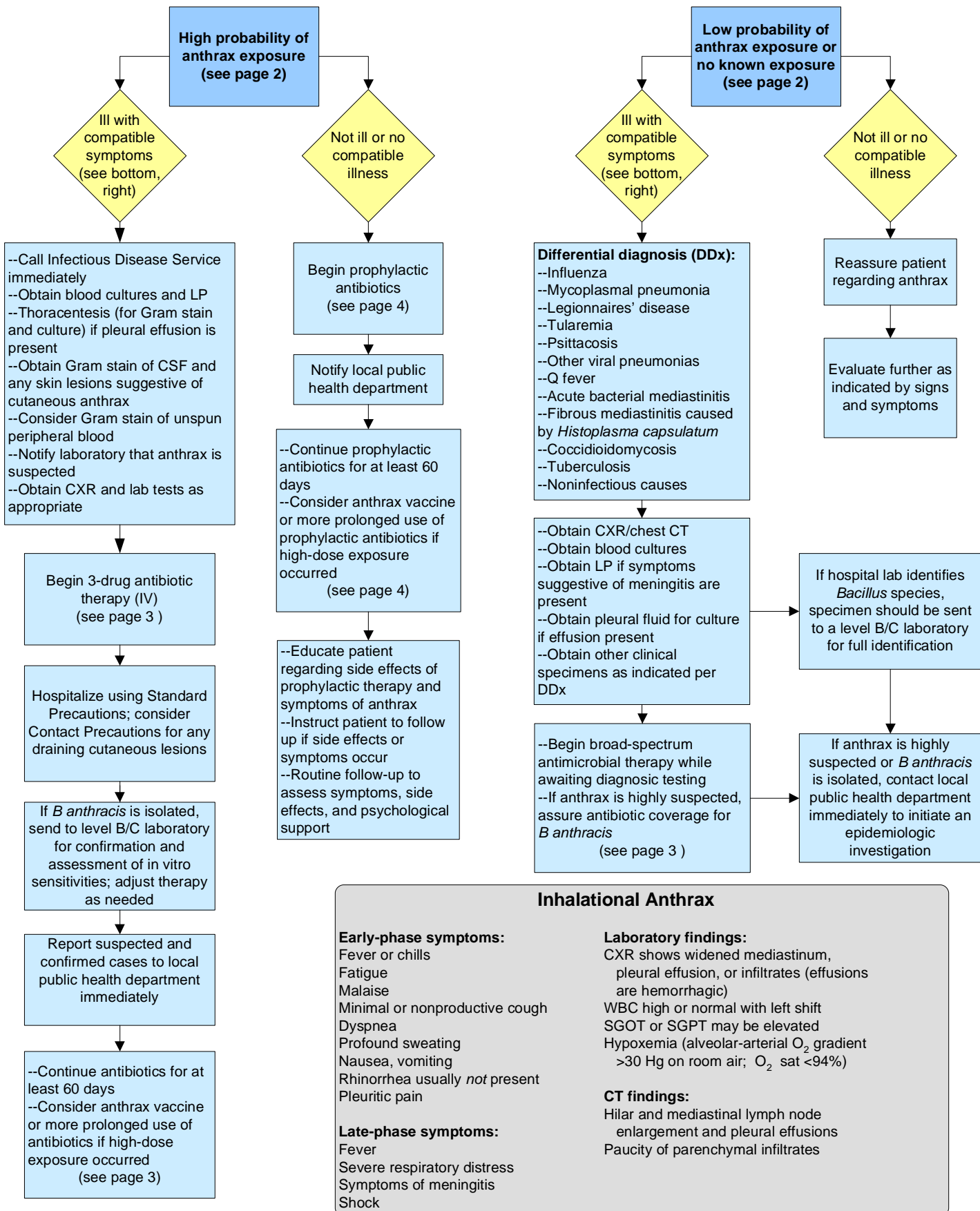


Clinical Pathway: Anthrax Inhalational Exposure



Inhalational Anthrax

| | |
|--|---|
| <p>Early-phase symptoms: Fever or chills Fatigue Malaise Minimal or nonproductive cough Dyspnea Profound sweating Nausea, vomiting Rhinorrhea usually <i>not</i> present Pleuritic pain</p> <p>Late-phase symptoms: Fever Severe respiratory distress Symptoms of meningitis Shock</p> | <p>Laboratory findings: CXR shows widened mediastinum, pleural effusion, or infiltrates (effusions are hemorrhagic) WBC high or normal with left shift SGOT or SGPT may be elevated Hypoxemia (alveolar-arterial O₂ gradient >30 Hg on room air; O₂ sat <94%)</p> <p>CT findings: Hilar and mediastinal lymph node enlargement and pleural effusions Paucity of parenchymal infiltrates</p> |
|--|---|

Assessing the Probability of Anthrax Exposure

| | |
|---|---|
| High Probability | <p><i>During a known anthrax event:</i></p> <ul style="list-style-type: none"> • Persons exposed to an air space where a suspicious material may have been aerosolized (eg, near a suspicious powder-containing letter during opening) • Persons who shared an air space likely to be the source of an inhalational anthrax case (eg, being exposed to a shared ventilation system) • Persons who may have been exposed to an item contaminated with <i>Bacillus anthracis</i> (eg, an envelope or other vehicle) along the transit path of the item (eg, a postal sorting facility in which an envelope containing <i>B anthracis</i> was processed) |
| | <p><i>In situations where anthrax has not previously been identified*:</i></p> <ul style="list-style-type: none"> • Persons who opened a suspicious letter or package that was found to contain a white powder suspected to be a source of <i>B anthracis</i> • Persons exposed to an air space where suspicious material may have been aerosolized (eg, near a suspicious powder-containing letter during opening) • Sudden appearance of multiple patients with acute onset of characteristic illness (suggests common source exposure such as would be seen with a bioterrorist attack) |
| Low Probability | <ul style="list-style-type: none"> • No history of exposure to an item (eg, an envelope or other vehicle) or powder confirmed or suspected to harbor <i>B anthracis</i> spores • No history of exposure to an air space where a suspicious material could have been aerosolized (eg, being present at the time a powder-containing letter was opened) • No history of exposure to an air space likely to have been the source for a confirmed case of inhalational anthrax |
| <p>*In situations where anthrax exposure is suspected but no prior cases of anthrax have been confirmed, a risk assessment should be conducted by local public health and law enforcement officials. If the probability of anthrax exposure is considered high on the basis of the risk assessment, prophylactic antimicrobial therapy should be initiated for asymptomatic exposed persons while the suspect material is being tested for <i>B anthracis</i>. Any persons who have symptoms compatible with anthrax should be treated with appropriate antibiotics, according to the clinical pathway (see page 1), until anthrax can be confirmed or ruled out.</p> | |

Treatment Protocol for Inhalational, Gastrointestinal, and Oropharyngeal Anthrax*

| Patient Category | Initial IV Therapy†‡ | Oral Regimens (continue therapy for 60 days [IV and PO combined]) |
|---------------------------|---|--|
| Adults | Ciprofloxacin, 400 mg every 12 hr or Doxycycline, 100 mg every 12 hr** and One or two additional antimicrobials (agents with <i>in vitro</i> activity include rifampin, vancomycin, penicillin, ampicillin, chloramphenicol, imipenem, clindamycin, and clarithromycin) †† | Patients should be treated with IV therapy initially.§ Treatment can be switched to oral therapy when clinically appropriate: Ciprofloxacin, 500 mg PO twice daily or Doxycycline, 100 mg PO twice daily |
| Children | Ciprofloxacin, 10-15 mg/kg every 12 hr, not to exceed 1 g/day †† or Doxycycline**§§: >8 yr and >45 kg: 100 mg every 12 hr >8 yr and ≤45 kg: 2.2 mg/kg every 12 hr ≤8 yr: 2.2 mg/kg every 12 hr and One or two additional antimicrobials (see agents listed under therapy for adults)†† | Patients should be treated with IV therapy initially.§ Treatment can be switched to oral therapy when clinically appropriate: Ciprofloxacin, 10-15 mg/kg PO every 12 hr, not to exceed 1 g/day or Doxycycline§§: >8 yr and >45 kg: 100 mg PO every 12 hr >8 yr and ≤45 kg: 2.2 mg/kg PO every 12 hr ≤8 yr: 2.2 mg/kg PO every 12 hr |
| Pregnant women*** | Same as for nonpregnant adults (high death rate from the infection outweighs risk posed by antimicrobial agent) | Patients should be treated with IV therapy initially.§ Treatment can be switched to PO when clinically appropriate. Oral therapy regimens are the same as for nonpregnant adults. |
| Immunocompromised persons | Same as for nonimmunocompromised persons and children. | Same as for nonimmunocompromised persons and children. |

Abbreviations: IV, intravenously; PO, orally.

*These treatment recommendations were made during US 2001 anthrax outbreak. In other situations, antimicrobial susceptibility testing should be used to guide therapy decisions.

†Ciprofloxacin or doxycycline should be considered an essential part of first-line therapy for inhalational anthrax.

‡Steroids may be considered an adjunct therapy for patients with severe edema (Doust et al. *Corticosteroid in treatment of malignant edema of chest wall and neck [anthrax]. Dis Chest* 1968;53:773-4) and for meningitis based on experience with bacterial meningitis of other etiologies.

§Initial therapy may be altered based on clinical course of patient; one or two antimicrobial agents (eg, ciprofloxacin or doxycycline) may be adequate as patient improves.

**If meningitis is suspected, doxycycline may be less optimal because of poor central nervous system penetration.

††Because of concerns of constitutive and inducible beta-lactamases in *Bacillus anthracis* isolates, penicillin and ampicillin should not be used alone. Consultation with an infectious disease specialist is advised.

‡‡If intravenous ciprofloxacin is not available, oral ciprofloxacin may be acceptable because it is rapidly and well absorbed from gastrointestinal tract with no substantial loss by first-pass metabolism. Maximum serum concentrations are attained 1-2 hours after oral dosing but may not be achieved if vomiting or ileus is present.

§§ American Academy of Pediatrics recommends treatment of young children with tetracyclines for serious infections (eg, Rocky Mountain Spotted Fever).

***Although tetracyclines are not recommended for pregnant women, their use may be indicated for life-threatening illness. Adverse effects on developing teeth and bones are dose-related; therefore, doxycycline might be used for a short time (7-14 days) before 6 months of gestation.

Adapted from CDC. Investigation of bioterrorism-related anthrax and interim guidelines for exposure management and antimicrobial therapy, October 2001. MMWR 2001;50(42):909-19.

Recommendations for Postexposure Prophylaxis for Prevention of Inhalational Anthrax Following Exposure to *Bacillus anthracis*

| Patient Category | Initial Therapy | Duration* |
|---|---|-----------|
| Adults (including immunocompromised patients) | Ciprofloxacin, 500 mg PO twice daily or Doxycycline, 100 mg PO twice daily | 60 days |
| Pregnant women and breastfeeding mothers | Ciprofloxacin, 500 mg PO twice daily or Doxycycline, 100 mg PO twice daily [Amoxicillin, 500 mg orally three times daily, may be used if isolate involved in exposure is determined to be susceptible to penicillin†‡§] | 60 days |
| Children (including immunocompromised patients) | Ciprofloxacin, 10-15 mg/kg PO every 12 hr, not to exceed 1 gm/day or Doxycycline: >8 yr and >45 kg: 100 mg PO twice daily >8 yr and <45 kg: 2.2 mg/kg PO twice daily <8 yr: 2.2 mg/kg PO twice daily [Amoxicillin, 80 mg/kg/day divided every 8 hr, not to exceed 500 mg/dose, may be used if the isolate involved in exposure is determined to be susceptible to penicillin‡] | 60 days |

Abbreviations: PO, orally.

*Additional recommendations were made for those exposed to high levels of anthrax; see comments below.

†See comments below from American College of Obstetricians and Gynecologists regarding use of amoxicillin.

‡Amoxicillin is not approved by the FDA for postexposure prophylaxis or treatment of anthrax; however, CDC indicated that it could be used for pregnant women or children for postexposure prophylaxis if the isolate is determined to be susceptible (CDC: Interim recommendations for antimicrobial prophylaxis for children and breastfeeding mothers and treatment of children with anthrax (<http://www.bt.cdc.gov/DocumentsApp/Anthrax/Protective/10242001Protect.asp>); CDC: Updated recommendations for antimicrobial prophylaxis among asymptomatic pregnant women after exposure to *Bacillus anthracis*. MMWR 2001;50(43):960.

§American Academy of Pediatrics considers ciprofloxacin and tetracyclines to usually be compatible with breastfeeding because the amount of either drug absorbed by infants is small, but little is known about the safety of long-term use. Therefore, amoxicillin may be considered an alternative for breastfeeding mothers if the isolate causing exposure is known to be susceptible to penicillin. Alternatively, mothers could consider expressing and discarding breast milk during therapy with ciprofloxacin or doxycycline and resuming breastfeeding after therapy is complete.

Adapted from CDC. Update: Investigation of bioterrorism-related anthrax and interim guidelines for exposure management and antimicrobial therapy, October 19, 2001. MMWR 2001;50(41):889-93.