



# ANTHRAX

1. **Agent:** *Bacillus anthracis*, a Gram-positive rod; spore-forming bacillus.

2. **Identification:**

a. **Symptoms:**

**Cutaneous anthrax:** An initial vesicle at site of inoculation develops into a painless black eschar; fever, malaise and lymphadenopathy may occur with the lesion. Progresses to systemic anthrax in 10-20% of cases; systemic anthrax, if untreated, has a fatality rate up to 20%. Fatalities for cutaneous anthrax are <1% if effective antibiotics are given.

**Inhalational anthrax:** Initially fever, chills, sweats, malaise, mild cough, dyspnea, nausea, or vomiting followed by acute onset of respiratory distress and shock 3-5 days later; radiologic evidence of mediastinal widening and pleural effusion is common. Fatality rate is extremely high.

**Gastrointestinal (GI) anthrax:** Acute vomiting, abdominal distention, GI bleeding, and peritonitis; fever and septicemia can occur; fatality rate high.

**Oropharyngeal anthrax:** Painless mucosal lesion in the oral cavity or oropharynx with cervical adenopathy and pharyngitis; edema, fever and possibly septicemia.

**Anthrax meningitis:** Hypotension, delirium or coma follow quickly; refractory seizures, cranial nerve palsies, and myoclonus have been reported. Can develop hemorrhagic meningitis with cerebrospinal fluid analysis showing elevated protein, low glucose, and a positive Gram stain and culture. Seventy-five percent of patients can die within 24 hours of presentation.

**Injection anthrax:** Injection anthrax cases were reported in northern Europe in heroin-injecting drug users. Symptoms include fever, chills, a group of small

blisters or bumps that may itch (appearing where the drug was injected), a painless skin sore with a black center that appears after the blisters or bumps, swelling around the sore, abscesses deep under the skin or in the muscle where the drug was injected.

b. **Differential Diagnosis:** Cutaneous anthrax- includes spider bite, Orf, ulceroglandular tularemia, scrub typhus, ecthyma gangrenosum, cutaneous leishmaniasis rickettsialpox. Inhalational anthrax- includes pneumonic plague, tularemia, community acquired pneumonia, viral pneumonias, Q fever.

c. **Diagnosis:** Demonstration of *B. anthracis* by smear, animal inoculation or culture or PCR from blood, CSF, pleural fluid, ascitic fluid, vesicular fluid, or lesion exudate. Serologic test for *B. anthracis* toxin. Histopathology from fresh or frozen tissue.

3. **Incubation:** Within 7 days, usually 2 to 5.

4. **Reservoir:** Soil; infected animals (cattle, sheep, goats, horses, pigs, etc.).

5. **Source:** Spores from soil or contaminated animal products (hides, hair, meat, bones).

6. **Transmission:** Inoculation, inhalation of spores, or ingestion of undercooked, contaminated meat.

7. **Communicability:** Inhalational Anthrax: No evidence of transmission from person to person. Contaminated products and soil remain infective for years. Cutaneous Anthrax: Transmission through non-intact skin contact with draining lesions possible, therefore use Contact Precaution if large amount of uncontained drainage. Handwashing with soap and water preferable to use of waterless alcohol-based antiseptics since alcohol does not have sporicidal activity. Environmental: Aerosolizable spore-containing powder or other substance: Until decontamination of environment is complete, wear respirator (N95 mask or PAPRs), protective clothing; decontaminate persons.



## 8. Specific Treatment:

Cutaneous anthrax: ciprofloxacin or doxycycline.

Inhalation or gastrointestinal anthrax: ciprofloxacin or doxycycline in combination with one or two other active drugs. Penicillin or amoxicillin may be used if strain is susceptible.

### Post-Exposure Prophylaxis (PEP)

Inhalational anthrax: PEP involves a combination of antimicrobial agents and vaccination. Asymptomatic individuals should start PEP immediately following the exposure or within 48 hours of exposure. Duration of PEP antimicrobial therapy is 60 days, which covers incubation period of anthrax and provides protection until immunity from the vaccine. All doses may be taken by mouth.

For non-pregnant adults:

- Ciprofloxacin – 500 mg every 12 hours or
- Doxycycline – 100 mg every 12 hours

For pregnant women and nursing mothers:

- Ciprofloxacin - 500 mg orally every 12 hours

If Ciprofloxacin is unavailable:

- Clindamycin – 600 mg every 8 hours or
- Doxycycline – 100 mg every 12 hours

For children:

- Ciprofloxacin – 30 mg/kg per day divided every 12 hours (not to exceed 500 mg/dose) or
- Doxycycline:
  - less than 45 kg (wt): 4.4mg/kg per day divided every 12 hours (not to exceed 100mg/dose)
  - greater than or equal to 45 kg (wt): 100 mg every 12 hours daily

For penicillin-susceptible strains:

- Amoxicillin 75 mg/kg per day divided every 8 hours (not to exceed 1g/dose)

Note: Individuals exposed to aerosolized B. anthracis spores should receive a full 60-day course of PEP regardless of their vaccination status.

Cutaneous or gastrointestinal exposure: Recommendations of antimicrobial agents are similar to PEP to prevent inhalation anthrax; prophylaxis may be considered for a 7-10-day period.

Note: Vaccination is not recommended following either naturally occurring cutaneous or gastrointestinal exposure in which there is no risk of inhalational exposure to anthrax.

9. Immunity: Uncertain.

## REPORTING PROCEDURES

1. Report any case or suspect case by telephone immediately (Title 17, Section 2500. *California Code of Regulations*).

- a. Call Morbidity Unit during working hours.
- b. Call ACDC; after working hours, contact Administrative Officer of the Day (AOD) through County Operator.
- c. Any laboratory that receives a specimen for anthrax testing is required to report to the State Microbial Diseases Laboratory immediately (Title 17, Section 2505, *California Code of Regulations*).
- d. ACDC must notify the State Division of Communicable Disease Control (DCDC) immediately upon receiving notice of a case of suspected anthrax. ACDC will supervise investigation and control measures.

2. Report Form: [ANTHRAX \(HUMAN\) CASE REPORT \(CDPH 8578\)](#)

3. Epidemiologic Data:

- a. Specify type (cutaneous, inhalational, or gastrointestinal).
- b. Occupation: Farmer, dairyman, veterinarian, wool processor, weaver, butcher, slaughterhouse employee, tanner, taxidermist, hunter, or laboratory worker. Also postal workers, politicians and their staff, and members of news media as in the 2001 anthrax letter attacks.



- c. Organism can be part of normal soil flora and with favorable conditions can multiply, which increases the risk of infection in grazing animals. Humans can accidentally be exposed through contact with infected animals or animal products. Determine if veterinary diagnosis was made.
- d. Ingestion of raw or undercooked meat.
- e. Exposure to animal products (e.g., hair, skins or animal hides, paint brushes, bongo drums, leather, and wool); especially imported animal products from highly endemic areas, such as Iran, Iraq, Turkey, Pakistan, and sub-Saharan Africa, agricultural regions of South and Central America, central and southwestern Asia and southern and eastern Europe.
- f. **Bioterrorism:** *B. anthracis* has been listed by the CDC as one of the agents most likely to be used in a bioterrorist attack because of the devastating physical and psychological effects of inhalational anthrax and the ability to be weaponized and effectively delivered to a target area. Please refer to State of California Bioterrorism Surveillance and Epidemiological Response Plan.

#### **CONTROL OF CASE, CONTACTS & CARRIERS**

Notify ACDC immediately and open promptly for ACDC review. ACDC will investigate to identify potential association to bioterrorist activity. If deemed to be unaffiliated with bioterrorism, the responsibility for the control of cases, contacts and carriers will be returned to the district where upon action should be initiated within 7 days.

#### **CASE:**

##### **Precautions:**

1. **Cutaneous:** Wound and skin precautions until lesions are completely healed.
2. **Inhalational:** Standard precautions as in Title 17, Section 2500, *California Code of Regulations*. Section 2518 is recommended until patient recovers.

**CONTACTS:** No restrictions.

**CARRIER:** Not applicable.

**ANIMAL:** Veterinary Public Health will investigate potential animal sources.

#### **PREVENTION-EDUCATION**

1. Disinfect animal products prior to processing.
2. Educate workers in high-risk occupations.
3. Double-bag discharges from lesions and soiled articles. Autoclave or burn all infectious material.
4. If anthrax is suspected, necropsy must not be done on the animal.
5. Infected animal carcasses should be burned or deeply buried and covered with calcium oxide (CaO, quicklime).
6. Maintain proper ventilation in high-risk industries.
7. Ensure proper disposal of wastes from rendering plants and factories that process potentially contaminated animal products.
8. A vaccine is available for veterinary and other high-risk occupations.
9. Any possible bioterrorist exposures should be reported immediately to local law enforcement and public health officials for evaluation.

#### **DIAGNOSTIC PROCEDURES**

**Specimens:** Blood, CSF, pleural fluid, ascitic fluid, vesicular fluid, lesion exudates or other materials for direct examination or culture. Consult the Public Health Laboratory.