



Merlin disease code: 02200 Anthrax

CONTACT BUREAU OF EPIDEMIOLOGY



Isolates for all cases must be sent to the Bureau of Public Health Laboratories

No paper case report form

**This condition has been identified as a potential bioterrorism agent by the CDC.**

No Merlin extended data

## Background

Anthrax is a serious zoonotic disease caused by the toxin-producing bacterium *Bacillus anthracis*. Human cases of anthrax are uncommon in the U.S and other industrialized countries. Animal cases and environmental contamination in the U.S. are most frequently reported from midwestern and western states, particularly North and South Dakota, Texas, Minnesota, and Nevada. Worldwide, grazing animals such as cattle, sheep, and goats are the most commonly infected species. *Bacillus cereus*, a common soil bacterium with worldwide distribution, can also occasionally carry toxin genes found in *B. anthracis* and cause similar signs and symptoms. Groups at increased risk for exposure include people who handle animal products such as untreated animal hides (including some types of drum skins), veterinarians, livestock producers, travelers, laboratorians, injection drug users, and people in contact with soil in endemic areas. In the case of intentional release, mail handlers, military personnel, and response workers may also be at increased risk.

Anthrax illnesses and deaths are characterized into **several distinct clinical types** defined by route of exposure and clinical or post-mortem findings, including:

- **Cutaneous:** A painless skin lesion usually evolving during a period of 2–6 days from a papule, through a vesicular stage, to a depressed black eschar with surrounding edema. Fever, malaise, and lymphadenopathy may accompany the lesion.
- **Ingestion oropharyngeal:** A painless mucosal lesion in the oral cavity or oropharynx, cervical adenopathy and edema, pharyngitis, fever, and possibly septicemia.
- **Ingestion gastrointestinal:** Severe abdominal pain and tenderness, nausea, vomiting, hematemesis, bloody diarrhea, anorexia, fever, abdominal swelling, and septicemia.
- **Inhalation:** A brief prodrome resembling a viral respiratory illness, followed by development of hypoxia and dyspnea or acute respiratory distress with resulting cyanosis and shock, often with radiographic evidence of mediastinal widening or pleural effusion.
- **Injection:** Usually presents as a severe soft tissue infection manifested as significant edema or bruising after an injection. No eschar is apparent, and pain is often not described. Nonspecific symptoms such as fever, shortness of breath, or nausea are sometimes the first indication of illness. Occasionally patients present with meningeal or abdominal involvement. A coagulopathy is not unusual.
- **Systemic disseminated:** Can occur with any of the types/routes of exposure listed above and include fever or hypothermia, tachycardia, tachypnea, hypotension, and leukocytosis. One or more of these signs are usually present in patients with ingestion, inhalational and injection anthrax and may be present in up to a third of patients with cutaneous anthrax.
- **Anthrax meningitis:** May complicate any type of anthrax listed above, and may also be a primary manifestation. Primary symptoms include fever, headache (often severe), nausea, vomiting and fatigue. Meningitis signs/symptoms (e.g., headache, stiff neck, vomiting, and dizziness), altered mental status, and other neurological signs such as seizures and focal signs are usually present. Most patients with anthrax meningitis have cerebrospinal fluid (CSF) abnormalities consistent with bacterial meningitis, and the CSF is often described as hemorrhagic.

## Clinical criteria for case classification

One or more of the following:

- One or more **specific** sign or symptom compatible with cutaneous, ingestion, inhalational, or injection anthrax; systemic involvement; or anthrax meningitis:
  - Painless or pruritic papular or vesicular lesion or eschar which may be surrounded by erythema,
  - **Or** blood in CSF,
  - **Or** evidence of pleural effusion,
  - **Or** evidence of mediastinal widening on imaging;
- **Or** two or more **non-specific** symptoms and signs:
  - Abdominal pain, abnormal lung sounds, altered mental status, ascites, cough, dyspnea, fever, headache, hypotension, localized edema, meningitis signs/symptoms (e.g., headache, stiff neck, vomiting, and dizziness), nausea/vomiting (may be bloody), sore throat, tachycardia;
- **Or** both of the following:
  - A death of unknown cause
  - **And** organ involvement consistent with anthrax, including one or more of the following lesions:
    - Eschar;
    - **Or** epidermal or dermal necrosis;
    - **Or** dermal hemorrhage, perivascular inflammation, and vasculitis;
    - **Or** enlarged, necrotic, and hemorrhagic lymph nodes;
    - **Or** hemorrhagic ulcers in the terminal ileum and caecum with mesenteric hemorrhagic lymphadenitis, and peritonitis;
    - **Or** hemorrhagic mediastinal lymphadenitis with pleural effusion;
    - **Or** petechial hemorrhage of abdominal organs;
    - **Or** hemorrhagic meningitis.

## Laboratory criteria for case classification

Confirmatory for *Bacillus anthracis* or *Bacillus cereus* expressing anthrax toxins:

One or more of the following:

- Culture and identification from a clinical specimen by the Laboratory Response Network (LRN);
- **Or** detection of *B. anthracis* antigens in tissues by immunohistochemical (IHC) staining using both *B. anthracis* cell wall and capsule monoclonal antibodies;
- **Or** a fourfold rise in antibodies to protective antigen between acute and convalescent sera or a fourfold change in antibodies to protective antigen in paired convalescent sera using CDC quantitative anti-PA IgG enzyme-linked immunosorbent assay testing in an unvaccinated person;
- **Or** detection of *B. anthracis* or anthrax toxin genes by LRN-validated polymerase chain reaction (PCR) or sequencing in clinical specimens collected from a normally sterile site (such as blood or CSF) or lesion of other affected tissue (skin, pulmonary, reticuloendothelial [e.g., lymph nodes, liver, spleen], or gastrointestinal);
- **Or** detection of lethal factor (LF) in clinical serum specimens by LF mass spectrometry.

Presumptive for *Bacillus anthracis* or *Bacillus cereus* expressing anthrax toxins:

Either of the following:

- Gram stain demonstrating Gram-positive rods, square-ended, in pairs or short chains
- **Or** positive result on a test with established performance in a CLIA-accredited laboratory.

## Epidemiological criteria for case classification

One or more of the following:

- Exposure to environment, food, animal, material, or object that is suspect or confirmed to be contaminated with *B. anthracis*,
- **Or** exposure to the same environment, food, animal, material, or object as another person who has laboratory-confirmed anthrax;
- **Or** consumption of the same food as another person who has laboratory-confirmed anthrax.

## Case classification

Confirmed:

A clinically compatible illness in a person with confirmatory laboratory criteria.

Probable:

Either of the following:

- A clinically compatible illness in a person with presumptive laboratory criteria
- **Or** a clinically compatible illness in a person with epidemiological criteria.

Suspect:

A clinically compatible illness in a person for whom an anthrax test was ordered, but who has no epidemiological criteria relating to anthrax.

## Criteria to distinguish a new case from previous reports

A new case should be created for any case not previously reported to public health authorities.

## Comments

Detection of a suspected case is a **public health emergency** and requires immediate reporting to the Bureau of Epidemiology at 850-245-4401.