# Virginia Department of Health
# Anthrax: Overview for Healthcare Providers

| | Cutaneous | Inhalation | Gastrointestinal |
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| **Organism** | *Bacillus anthracis* is a large, gram-positive, encapsulated, spore-forming, nonmotile rod. Certain strains of *Bacillus cereus* that express anthrax toxin (e.g. *B. cereus* biovar *anthracis*) can also cause anthrax-like disease. | | |
| **Reporting to Public Health** | Suspected or confirmed cases require immediate notification to the local health department (LHD). See http://www.vdh.virginia.gov/local-health-districts/ | | |
| **Infectious Dose** | A few spores may cause infection. | As few as 1 to 3 spores may cause infection. | Unknown |
| **Occurrence** | Worldwide, especially in agricultural regions in Central and South America, sub-Saharan Africa, central and southwestern Asia, southern and eastern Europe, and the Caribbean. ~95% of naturally-acquired infections are cutaneous anthrax. In the United States, 1–2 cases are reported annually. | | |
| **Natural Reservoir** | Primary reservoirs are herbivores (e.g., livestock and wildlife herbivores). Spores can remain dormant in soil for decades. | | |
| **Route of Infection** | Contact via break in skin (especially, arms, hands, face, neck) | Inhalation of spores | Ingestion of contaminated meat from diseased animals |
| **Communicability** | Person-to-person transmission is very rare and has only rarely been reported for cutaneous anthrax via direct contact with lesions. | | |
| **Case-fatality Rate** | <1% with treatment; 20 % without treatment | ~ 75% with treatment; 97% without treatment | Unknown with treatment; 25%–60% without treatment |
| **Risk Factors** | Those at increased risk include persons who process animal products (e.g., hides, wool, hair, bone) from endemic areas, veterinarians, laboratorians, livestock producers, those who eat undercooked meat in endemic areas, heroin-injecting drug users; if bioterrorism, mail handlers, military personnel or other responders. | | |
| **Incubation period** | 1–7 days (1–12 days) | 2–60 days or longer (2001 outbreak: 4–6 days) | 2–5 days (range 1–7 days) |
| **Clinical Manifestations** | • Infection begins as a small papule or vesicle that ulcerates with central necrosis and drying. Painless, localized nonpitting edema surrounds the ulcerated area, which progresses to a dark, leathery eschar. Extensive nonpitting edema, regional lymphadenopathy, lymphangitis, fever, and malaise may be present. Lesions tend to occur on exposed areas of the body (e.g., face, hands, arms, neck). | • Phase 1: Nonspecific, including fever, nonproductive cough, fatigue, myalgias, sweats, chest discomfort<br>• Phase 2: Occurs after 1–3 days of improvement after Phase 1, with abrupt onset of high fever and severe respiratory distress (dyspnea, stridor, cyanosis); shock and death occurs within 24–36 hours at Phase 2. | • Intestinal form is manifested with nausea, vomiting, anorexia and fever, followed by severe abdominal pain, bloody diarrhea, vomiting of blood, and signs of septicemia.<br>• Oropharyngeal form is rare, manifested with dysphagia and posterior oropharyngeal necrotic ulcers, fever, sepsis, and bilateral neck swelling.<br>• GI tract ulcers may cause hemorrhage, obstruction or perforation |
| **Differential Diagnosis** | Brown recluse spider bite, staphylococcal or streptococcal cellulitis, vasculitides, bubonic plague, necrotizing soft tissue infections, orf, necrotic herpes simplex infection; ulceroglandular tularemia, scrub typhus, rickettsial spotted fevers, rat bite fever, ecthyma gangrenosum | Mycoplasmal pneumonia, Legionnaires' disease, psittacosis, tularemia, viral pneumonia, Q fever, histoplasmosis, coccidiodomycosis, acute bacterial mediastinitis, tuberculosis | • Intestinal form: typhoid fever, intestinal tularemia, bacterial peritonitis<br>• Oropharyngeal form: diphtheria, streptococcal pharyngitis, enteroviral vesicular pharyngitis, acute herpetic pharyngitis, *Yersinia enterocolitica* |
| **Radiography** | | Chest X-ray may show mediastinal widening, pleural effusion (often), or infiltrates (rare) | |

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| **Laboratory testing and Sample Collection** | • If systemic symptoms present, blood cultures (before start antimicrobial therapy)<br>• Swab vesicle/eschar/ulcer (2 dry cotton swabs per site: 1 for culture, 1 for PCR)<br>• Full thickness punch biopsy of papule or vesicle including adjacent skin<br>• If on antibiotics <24 hours, 2nd biopsy for culture and PCR<br>• Acute serum for anthrax lethal toxin testing and acute and convalescent serum samples for serologic testing | • Blood cultures (before start antimicrobial therapy)<br>• Blood (10mL in EDTA or sodium citrate tubes) for PCR<br>• Pleural fluid, if present, for culture, PCR and anthrax lethal toxin testing<br>• Plural and/or bronchial biopsies for immunohistochemistry (IHC)<br>• CSF, if meningeal symptoms, for culture and PCR<br>• Acute serum for anthrax lethal toxin testing and acute and convalescent serum samples for serologic testing<br>• If fatal case, autopsy tissues for histopathology, special stains, and IHC | • Blood cultures (before start antimicrobial therapy)<br>• Blood (10mL in EDTA or sodium citrate tubes) for PCR<br>• Ascites fluid for culture, PCR and anthrax lethal toxin testing<br>• Oropharyngeal form: 2 sterile moist swabs (1 for culture and 1 for PCR) of suspected lesions in the oropharynx or buccal cavity, or on the tongue, tonsils or posterior pharyngeal wall<br>• Intestinal form: stool (>5 grams) in a leak-proof sealed container<br>• Acute and convalescent serum samples for serologic testing<br>• If fatal case, autopsy tissues for histopathology, special stains, and IHC |
| | If anthrax is suspected, notify the LHD immediately to discuss the case and laboratory testing. Specimens may be sent to the Division of Consolidated Laboratory Services (DCLS) after VDH has approved testing. For questions about specimen collection and handling, the DCLS Emergency Officer can be reached 24/7 at 804-335-4617. | | |
| **Treatment** | Recommended treatment depends on the clinical form of anthrax. Treatment includes antimicrobial therapy with antitoxin for systemic illness. Information on preferred drugs, dosing, and duration of treatment is available at https://www.cdc.gov/anthrax/. For additional information on dosing, please consult the package inserts. | | |
| **Postexposure Prophylaxis (PEP)** | Exposed individuals should receive a full 60-day prophylaxis treatment regardless of anthrax vaccination status. Oral ciprofloxacin or doxycycline are recommended as first-line antimicrobial agents for PEP. Anthrax vaccine is also recommended for unvaccinated people of all ages who have been exposed to anthrax. Information on drugs, dosing and duration of prophylaxis is available at https://www.cdc.gov/anthrax/. For additional information on dosing, please consult the package inserts. | | |
| **Infection Control** | Use Standard Precautions; for patients with draining cutaneous wounds that cannot be contained, also use Contact Precautions. | | |
| **Vaccine** | There is a vaccine licensed to prevent anthrax (Anthrax Vaccine Adsorbed), but it is not typically available for the general public. The vaccine is recommended for adults aged 18–65 years at high risk of exposure (e.g., certain lab workers, people who handle potentially infected animals, and some military personnel). The vaccine is also recommended for unvaccinated people of all ages who have been exposed to anthrax. If there was an emergency, exposed people would be given the vaccine, in addition to antimicrobial drugs, to help prevent disease. Because the vaccine has not been approved for PEP in those <18 years, a special protocol to use the vaccine in this group would be needed in an emergency. | | |