NJHealth New Jersey Department of Health
Communicable Disease Service

Anthrax

2025

Bacillus anthracis

REPORT CONFIRMED OR SUSPECT CASES IMMEDIATELY

Cases should be reported to the local health department where the patient resides. If patient residence is unknown, report to your own local health department. Contact information is available at: http://localhealth.nj.gov.

If the individual does not live in New Jersey, report the case to the New Jersey Department of Health at: (609) 826-5964.

In cases of immediately reportable diseases or other emergencies – if the local health department cannot be reached – the New Jersey Department of Health maintains an emergency after-hours phone number at: (609) 392-2020.

THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Anthrax is a disease caused by bacterium *Bacillus anthracis*. It occurs naturally in soil and commonly affects domestic and wild animals around the world. It is primarily a disease of wild and domestic animals.

B. Clinical Description

The clinical manifestations of anthrax vary in presentation according to route of introduction. Anthrax typically develops 1 day to more than 2 months after exposure to *B. anthracis*. There are five forms of anthrax based on the route of exposure: cutaneous, inhalation, ingestion, injection and welder's. An occupational disease known as welder's anthrax has recently been identified-the causative agent is an anthrax-toxin producing strain of *Bacillus cereus* bacteria. Anthrax may also cause meningitis as the primary manifestation or as a complication of one of the other forms. Without proper treatment, all types of anthrax have the potential to spread through the body and cause severe illness and death.

- Cutaneous anthrax is the most common form, accounting for more than 95% of naturally occurring human cases. The incubation period ranges from 1 to 12 days (commonly 5-7 days). It is usually found on exposed areas of the body (hands, wrist, neck, face). Symptoms usually begin with itching of the affected site, which is then followed by the development of a lesion that progresses over the span of 2-6 days from a papule to a blister and, ultimately, a painless scabbed black ulcer (eschar). The eschar may be surrounded by extensive local edema and regional lymphadenopathy and lymphangitis is frequently noted. Systemic symptoms such as fever can occur but do not appear in the majority of cases. Untreated infections can spread to the bloodstream causing sepsis, meningitis and death, but with effective treatment, death from cutaneous anthrax is very rare.

- Inhalation anthrax occurs when aerosolized spores are inhaled. The median incubation period is estimated between 7 and 9 days but cases may occur as soon as 1 day after exposure or as long as 2+ months later. Often described as a biphasic illness, the course of the disease is usually composed of an initial or prodromal phase followed in about 4-5 days by a fulminant phase. The initial symptoms of inhalation anthrax are usually mild and non-specific; they may mimic a viral respiratory infection with fever, chills, headache, sore throat, dry cough, fatigue and muscle aches. Additional symptoms may also be present such as nausea, hemoptysis, dyspnea, painful swallowing or chest pain. The fulminant phase is marked by severe symptoms and includes severe respiratory distress, fever, and shock, with death following shortly thereafter. Chest x-ray almost always has some abnormality, with pleural effusions and mediastinal widening being most common but other abnormalities such as hilar fullness, infiltrates and consolidations may also be seen. Hemorrhagic mediastinitis and/or meningitis are frequent severe complications. Without treatment, inhalation anthrax is almost always fatal. Patients should be treated early in the course of disease, as treatment rarely

prevents death once the severe symptoms begin. Prior to Fall 2001, the case-fatality rate for inhalation anthrax was reported to be 85% to 100%. However, in the bioterrorism-associated outbreak in October 2001, the case-fatality rate was 45.5% (five of 11 inhalation patients died).

- Ingestion anthrax is a rare form of disease resulting from the consumption of undercooked meat from infected animals. The incubation period is estimated to be between 1 and 7 days. It may present as one of two subtypes:

    - Oropharyngeal: occurs when anthrax spores germinate in the oropharynx; a mucosal lesion may be observed in the oral cavity or oropharynx. Signs and symptoms are non-specific and include sore throat, dysphagia, swelling of the neck, fever, fatigue, shortness of breath, abdominal pain, and nausea/vomiting; the signs and symptoms may resemble a viral respiratory illness. Cervical lymphadenopathy, ascites, and altered mental status may be observed.

    - Gastrointestinal: occurs when anthrax spores germinate in the lower gastrointestinal tract. The signs and symptoms of infection are mainly non-specific and include abdominal pain, nausea, vomiting or diarrhea (either of which may contain blood), abdominal swelling, fever, fatigue, and headache. Altered mental status and ascites may be observed. It may affect any portion of the gastrointestinal tract from the mouth to the ascending colon. Alternatively, patients may present with oropharyngeal symptoms including edema, pharyngitis, fever accompanied by edematous lesions which progress to necrotic ulcers. Without treatment, more than half of patients with gastrointestinal anthrax die. However, with proper treatment, 60% of patients survive.

- Injection anthrax has been identified in a few clusters of people who inject drugs in northern Europe, but to date it has not been reported in the United States. The incubation period is thought to be between 1 and 4 days. It 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 signs and symptoms such as fever, shortness of breath, or nausea, vomiting and abdominal pain are commonly reported. Occasionally patients present with meningeal or abdominal involvement. A coagulopathy is not unusual.

- Welder's anthrax is caused by anthrax-toxin producing *B. cereus*, and usually presents as a pneumonia that may be accompanied by hemoptysis or pleural effusion. Unlike inhalation anthrax, mediastinal widening is not common. Non-specific signs and symptoms include fever or chills, cough, dyspnea, and hemoptysis. Lung sounds are often abnormal.

Systemic involvement due to the spread of either the bacteria or its toxins can occur in all types of anthrax. Signs may include fever or hypothermia, tachycardia, tachypnea, hypotension, and leukocytosis.

Anthrax meningitis may occur through secondary bacterial spread in up to a third of patients with other forms of systemic anthrax, and it has been identified in patients with cutaneous, inhalation, injection and gastrointestinal disease. It may also more rarely occur as the primary manifestation of anthrax disease. It is frequently associated with intracranial hemorrhage. Signs and symptoms include fever, headache (which is often described as severe), nausea, vomiting, and fatigue. Meningeal signs (e.g., meningismus), altered mental status, and other neurological signs such as seizures or focal signs are usually present. Most patients with anthrax meningitis have cerebrospinal fluid abnormalities consistent with bacterial meningitis and is often described as hemorrhagic.

C. Reservoirs

The natural reservoir for *B. anthracis* is soil. Anthrax spores, which are very resistant to disinfection and adverse environmental conditions, are capable of surviving in soil for decades. Skins and hides of infected animals may harbor the spores for years. Livestock and wild animals can become infected when they breathe in, eat, or drink spores in contaminated soil, plants, or water.

D. Modes of Transmission

- Cutaneous infection occurs when anthrax spores get into a cut or scrape on the skin through (1) contact with contaminated skins, wool or hides, or products made from these; (2) contact with tissues of animals that are clinically ill or dead from anthrax; or (3) contact with soil contaminated with spores or contaminated bone meal used in gardening.

- Ingestion anthrax occurs through ingestion of raw or undercooked meat from an infected animal.

- Inhalational anthrax occurs through inhalation of spores, particularly in people who work in places such as wool mills, slaughterhouses, and tanneries who may breathe in the spores when working with infected animals or contaminated animal products. It may also occur in association with accidental or intentional aerosolization of spores, as may occur with a laboratory accident or bioterrorist event.

- Injection anthrax occurs through injection of a contaminated drug into the body.

- Welder's anthrax occurs through inhalation of fumes or dust containing bacteria (*Bacillus cereus group*) that produce anthrax toxins, particularly in welding environments.

E. Incubation Period

The incubation period for anthrax may range from one day to more than two months, and varies based on the clinical syndrome (see above).

F. Period of Communicability or Infectious Period

In rare cases, person-to-person transmission has been reported with cutaneous anthrax only, where discharge from skin lesions might be infectious. In addition, products and soil contaminated with spores may remain infectious for decades.

G. Epidemiology

Anthrax is primarily a disease of wild and domestic herbivorous (plant-eating) animals. Unaffected herds of livestock may be exposed through feed containing contaminated bone meal. Anthrax is an infrequent and sporadic cause of human disease in the United States and in most industrialized countries.

Only 18 cases of inhalational anthrax were reported in the United States from 1900 to 1978, with the majority occurring in special risk groups, including two that were laboratory-associated. Prior to October 2001, the last reported case of inhalational anthrax occurred in 1976. In the United States, 224 cases of cutaneous anthrax were reported between 1944 and 1994.

Anthrax in animals is common in Central and South America, southern and Eastern Europe, Africa, and Asia. Persons at greatest risk of contracting anthrax are those whose occupations may expose them to contaminated meat, hides, wool, or cultures of the bacteria. Veterinarians and others who handle and treat infected animals are also at risk.

H. Bioterrorist Potential

B. anthracis has been used as a bioterrorist agent. The most recent occurrence in the United States was in Fall 2001 when 22 cases (11 inhalational cases and 11 cutaneous cases) from seven states along the East Coast were related to contaminated letters sent through the US Postal Service. Five of the twenty-two cases died.

CASE DEFINITION – NEW 2025

The NJDOH Infectious & Zoonotic Disease Program follows the current case definition as published on the CDC National Notifiable Disease Surveillance System (NNDSS) website

Anthrax Case Definition: https://ndc.services.cdc.gov/conditions/anthrax/

Case definitions enable public health to classify and count cases consistently across reporting jurisdictions and should not be used by healthcare providers to determine how to meet an individual patient's health needs.

A. Clinical Description

- Death of an unknown cause with organ involvement consistent with anthrax; OR
- In the absence of another more likely etiology, at least one of the following specific signs and symptoms: evidence of pleural effusion, evidence of mediastinal widening or hemorrhagic mediastinal lymphadenopathy on imaging, blood in the CSF, painless or pruritic or vesicular lesion or eschar (may be surrounded by edema or erythema), or pneumonia, OR

At least two of the following non-specific signs and symptoms: abdominal pain, abdominal swelling, abnormal lung sounds, altered mental status, ascites, Cervical lymphadenopathy/Swelling of the neck, Coagulopathy, cough, diarrhea, difficulty swallowing, dyspnea, edema, fever, headache, hemoptysis, hypotension, lymphadenopathy, meningeal signs, nausea/vomiting, sore throat, tachycardia, or tachypnea.

B. Laboratory Criteria

Confirmatory laboratory evidence:

- Culture and identification of *B. anthracis* or *Bacillus spp.* expressing anthrax toxins from clinical specimens by Laboratory Response Network (LRN), **OR**
- Evidence of a four-fold rise in antibodies to protective antigen (PA; one of the anthrax toxins) between acute and convalescent sera collected two to four weeks apart using quantitative anti-PA IgG ELISA testing in an unvaccinated person; **OR**
- Evidence of a four-fold change in antibodies to protective antigen (one of the anthrax toxins) in paired convalescent sera collected two-four weeks apart using quantitative anti-PA IgG ELISA testing in an unvaccinated person; **OR**
- Detection of *B. anthracis* or anthrax toxin genes by the LRN-validated polymerase chain reaction and/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, or gastrointestinal); **OR**
- Detection of lethal factor (LF) in clinical serum specimens by LF mass spectrometry.

Presumptive laboratory evidence:

- Demonstration of *B. anthracis* antigens in tissues by immunohistochemical staining; **OR**
- Gram stain demonstrating Gram-positive rods, square-ended, in pairs or short chains; **OR**
- Positive result on an anthrax test with established performance in a CLIA-accredited laboratory^.

Note: The categorical labels used here to stratify laboratory evidence are intended to support the standardization of case classifications for public health surveillance. The categorical labels should not be used to interpret the utility or validity of any laboratory test methodology.

^ *For example, the RedLine Alert test, http://tetracore.com/bacillus-anthracis- detection/Tetracore_RedLine_Alert_Test.pdf.*

C. Epidemiologic Linkage

- Exposure to environment, food, animal, materials, or objects that is/are suspected or confirmed to be contaminated with *B. anthracis* or anthrax toxin-producing *Bacillus* spp.; **OR**
- Exposure to the same environment, food, animal, materials, place of occupation, or objects as another person who has laboratory-confirmed anthrax.

D. Vital Records Criteria

A person whose death lists anthrax as a cause of death or a significant condition contributing to death.

E. Criteria to Distinguish a New case from an Existing Case

A new case should be enumerated when:

- Person not previously enumerated as a case; **OR**
- Person previously enumerated as a case **AND** newly meets confirmatory lab criteria after completing treatment for their previous infection **AND** had a new exposure to an anthrax-toxin producing *Bacillus spp*.

F. Case Classification

Cases should be classified in CDRSS as Anthrax with one of the following subgroups:

- Cutaneous
- Ingestion
- Inhalation
- Injection
- Welder's

CONFIRMED

- Meets the clinical criteria **AND** has confirmatory laboratory test results; **OR**
- Meets vital records criteria **AND** meets confirmatory laboratory evidence

PROBABLE

- Meets the clinical criteria **AND** meets presumptive laboratory evidence, **OR**
- Meets vital records criteria **AND** meets presumptive laboratory evidence, **OR**
- Meets the clinical criteria **AND** meets epidemiologic linkage criteria.

POSSIBLE

- Meets vital records criteria only.

LABORATORY TESTING

Bacterial Isolation

Culturing *B. anthracis* from clinical specimens is the gold standard for diagnosing anthrax. To accurately diagnose anthrax, samples ideally should be taken before the patient starts antibiotic treatment, if possible. The type of samples collected for testing will depend on the exposure and/or symptoms the patient has. Depending on the form of disease, *B. anthracis* can be cultured from the following specimens: ascites fluid, biopsy tissue, blood, cerebrospinal fluid, pleural fluid, rectal swab,

and skin lesion fluid. Suspected *B. anthracis* cultures shall be handled under strict bio-safety precautions as the organism can aerosolize easily and potentially infect laboratory workers. Clinical laboratories are required to immediately report all bacterial cultures resembling *B. anthracis* to the NJDOH CDS, which will arrange for confirmatory testing at the NJDOH Public Health and Environmental Laboratories if indicated.

Other testing

Rapid identification of the organism is also possible using immunodiagnostic testing, enzyme-linked immunoassay (ELISA), or polymerase chain reaction (PCR). Serological testing is generally of use in making a retrospective diagnosis.

PURPOSE OF SURVEILLANCE AND REPORTING

- To identify cases and clusters of human illness that may be associated with a bioterrorist event.
- To identify human and animal cases as early as possible to prevent transmission to other persons or animals, either through direct contact (unlikely) or through exposure to environmental sources such as spores that form in carcasses of dead animals.
- To identify potential sources of transmission in the United States (e.g., imported wool, livestock, or soil), and to stop transmission from such sources.
- To identify sources of transmission and geographical areas of risk outside the United States and to stop transmission from such sources.

CASE INVESTIGATION

A. Investigation

1. Upon learning of a suspected bioterrorist event or report of a suspected *B. anthracis* case or culture, immediately call NJDOH Communicable Disease Service, during the day at (609) 826-5964 or at (609)392-2020 on nights and weekends. Following immediate notification to NJDOH, the health officer may be asked to assist in investigating cases within their communities, including gathering the information necessary to complete data entry in CDRSS. It is the health officer's responsibility to investigate the case by interviewing the patient, physician and others who may be able to provide pertinent information. The Anthrax Investigation Worksheet may be used to help guide the patient or physician interview. All information collected using the worksheet should be documented in CDRSS. Worksheets should not be sent to NJDOH unless requested.

2. An epidemiological investigation to identify the source of infection should be immediately initiated by the local health officer, focusing on the period of 2 months prior to onset of symptoms. Specific risk factors for infection can be found on the Anthrax Investigation Worksheet.

3. If a bioterrorist event is suspected, NJDOH Communicable Disease Service will oversee and direct the case investigation of anthrax in New Jersey residents in conjunction with CDC. CDS and other response authorities will work closely with local health officers, the regional epidemiologist, and infection control professionals, and will provide instructions and information on how to proceed. CDRSS will be used to track cases and those exposed.

B. Key CDRSS Fields Specific for Anthrax

CDRSS Screen	Required Information
Disease Information	• After reviewing clinical presentation, select a subgroup: Cutaneous, Ingestion, Inhalation, Injection, Welder's
Patient Personal Information	• Enter demographic information. If patient is under the age of 18, enter parent or guardian information under Patient Relation Information.
Laboratory and Diagnostic Information	• Enter laboratory test result in full. • Enter diagnostic tests such as chest x-ray or MRI
Clinical Status	• Enter date of illness onset, pre-existing conditions, date of initial health care evaluation, if patient was hospitalized as a part of this investigation, and mortality information (including date of death).
Immunization Information	• Enter if patient is vaccinated
Industry and Occupation	• Enter employer name and address, current occupation and industry.
Medical Facility and Provider Information	• Enter contact information for healthcare provider. • For admitted/hospitalized patients, ensure patient status is marked as INPATIENT. Medical record number, and admission and discharge dates must be entered as well. If patient was transferred, ensure all medical facilities and admission and transfer dates are documented.
Risk Factors	• Enter yes/no responses for all risk factors focusing on 2 months prior to illness onset. Enter start and end dates for all positive responses.
Signs and Symptoms	• Inquire if the patient had each sign/symptom and update the response to Yes, No or Unknown accordingly. Not Asked should not be left as a default response. Enter onset and resolution dates, if known.
Treatment Information	• Document all treatment provided to patient for anthrax. Required information includes name of treatment, start date, end date and duration (# of days).

CDRSS Screen	Required Information
Case Comments	• Missing information should be obtained by interviewing the patient. If the patient is non-responsive, document attempts and outcomes in Comments section. • Enter any additional information from the Investigational Worksheet that does not have a specific entry field in CDRSS.

CONTROLLING FURTHER SPREAD

A. Isolation and Quarantine Requirements

Minimum Period of Isolation of Patient

For cutaneous anthrax cases, patient should be isolated until skin lesions are healed or free of *Bacillus anthracis* , or patient is on antibiotics.

B. Protection of Contacts of a Case

There is no immunization or prophylaxis recommended for contacts of cases (see section Post Exposure Prophylaxis below). Appropriate infection control procedures are recommended (see Personal Preventive Measures and Education below).

C. Managing Special Situations

- If any cases of anthrax occur in individuals in a city or town in New Jersey, investigate to determine the source of infection and mode of transmission. Contact NJDOH IZDP immediately at (609) 826-5964 during business hours or at (609) 392-2020 during any other time.

- Program staff can help determine a course of action to prevent further cases and can perform surveillance for cases that may cross several jurisdictions and, therefore, be difficult to identify at a local level.

- For a potential bioterrorist event, NJDOH and other response authorities will work closely with local health officers and provide instructions and information on how to proceed.

D. Preventative Measures

Environmental Measures

- In the event that a food item is epidemiologically implicated in the transmission of disease, implicated food items must be removed from the environment.

- A decision about culturing implicated food items must be made in consultation with NJDOH IZDP staff. Coordination for pickup and testing of food samples is the responsibility of the local health department.

- If a commercial product is suspected, report this to NJDOH Food and Drug Safety Program at (609) 826-4935, which will coordinate follow-up with relevant outside agencies.

Personal Preventive Measures and Education—To avoid cases of anthrax, NJDOH recommends the following:

- Individuals at significant, continuing risk of acquiring anthrax (e.g., laboratory workers) should be vaccinated.

- Employees who work with hides of potentially infected animals should be educated about anthrax and how to minimize exposures.

- Appropriate infection prevention measures should be used in healthcare settings. This includes standard precautions except in the case of draining wounds. When caring for a patient with uncontained drainage from cutaneous wounds, contact precautions should also be used. Transmission of anthrax from person-to-person is extremely rare and has only been reported for cutaneous anthrax, but not for other forms.

- Post-exposure prophylaxis for employees who work in environments involved in outbreaks will be handled on an individual basis.

B. Post Exposure Prophylaxis

- Antibiotics can be used for post-exposure prophylaxis to prevent anthrax from developing in people who have been exposed but are not symptomatic.
- The need for post-exposure prophylaxis is determined by public health officials on the basis of an epidemiologic investigation. In the event of mass exposure to anthrax, CDS will work with federal and local partners to provide guidance on post-exposure prophylaxis, which may include antibiotics, antitoxins and/or vaccines.
- Prophylaxis is not indicated for healthcare and mortuary workers who care for patients or attend to corpses using recommended precautions, or for persons who handle or open mail in the absence of a credible threat.
- Post-exposure prophylaxis after an aerosol exposure includes antimicrobial therapy with activity against *B. anthracis* and may also include anthrax vaccine. Ciprofloxacin, doxycycline, and levofloxacin have been approved by the Food and Drug Administration for post-exposure prophylaxis, although alternative antibiotics may also be used. Penicillin/amoxicillin should **only** be used if the anthrax strain is known to be susceptible. When antimicrobial therapy is not available, anti-toxin may be used for post-exposure prophylaxis. Full details on preferred drugs, dosages and alternative regimens for all ages and for those who cannot use first-line antibiotics are available in the CDC Guidelines for the Prevention and Treatment of Anthrax, 2023. If exposure to an antibiotic-resistant strain has occurred, additional guidance on therapies indicated for PEP will be provided as needed.
- Duration of post-exposure prophylaxis for those with aerosol exposure to anthrax should be from 42 to 60 days, with the exact length depending on the age, underlying health conditions

and vaccination status of the individual. The shorter interval is only appropriate for healthy, non-pregnant adults aged 18-65 who also receive vaccine at least 2 weeks prior to discontinuing the drug. Post-exposure prophylaxis after a cutaneous or ingestion exposure should continue for 7 days.

C. Vaccine

Two vaccines (BioThrax and Cyfendus) are approved by the FDA to prevent disease in persons 18 through 65 years of age following suspected or confirmed *Bacillus anthracis* exposure, when administered in conjunction with recommended antibacterial drugs. BioThrax is also approved for pre-exposure prophylaxis of disease in persons 18 through 65 years of age who are at high risk of exposure. Since these vaccines are not approved for those younger than 18 or older than 65, in the event of an emergency, a special protocol would be needed in order to administer vaccine to those individuals, if indicated.

Additional Information

An Anthrax Fact Sheet is available at the NJDOH Web site at nj.gov/health/cd/topics/anthrax.shtml.

Technical information about anthrax is available from CDC at cdc.gov/anthrax/about/index.html.

References

American Academy of Pediatrics. *2000 Red Book: Report of the Committee on Infectious Diseases.* 25th ed. Elk Grove Village, IL: American Academy of Pediatrics; 2001.

Bell DM, Kozarsky PE, Stephens DS. Conference summary. Clinical issues in the prophylaxis, diagnosis, and treatment of anthrax. *Emerg Infect Dis.* 2002;8:222-224.

Bower WA, Schiffer J, Atmar RL, et al. Use of Anthrax Vaccine in the United States: Recommendations of the Advisory Committee on Immunization Practices, 2019. MMWR Recomm Rep 0019;68(No. RR-4):1–14. DOI: http://dx.doi.org/10.15585/mmwr.rr6804a1

Bower WA, Yu Y, Person MK, et al. CDC Guidelines for the Prevention and Treatment of Anthrax, 2023. MMWR Recomm Rep 2023;72(No. RR-6):1–47. DOI: http://dx.doi.org/10.15585/mmwr.rr7206a1.

Centers for Disease Control and Prevention. *2019. Biosafety in microbiological and biomedical laboratories (6th ed.)* [PDF]. Centers for Disease Control and Prevention. cdc.gov/labs/pdf/SF__19_308133-A_BMBL6_00-BOOK-WEB-final-3.pdf

Centers for Disease Control and Prevention. Case definitions for infectious conditions under public health surveillance. *MMWR Morb Mortal Wkly Rep*. 1997;46(RR-10).

Centers for Disease Control and Prevention. Anthrax. cdc.gov/anthrax/index.html

Centers for Disease Control and Prevention. The Yellow Book 2024. cdc.gov/travel/yellowbook/2024/infections-diseases/anthrax

FDA. Anthrax Vaccines. fda.gov/vaccines-blood-biologics/vaccines/anthrax

Heymann, DL, ed. *Control of Communicable Diseases Manual*. 20th ed. Washington, DC: American Public Health Association; 2015.

Inglesby TV, O'Toole T, Henderson DA, et al. Anthrax as a biological weapon, 2002. *JAMA*. 2002;287:2236-2252.

Mandell G, Bennett J, Dolin R, eds. *Principles and Practice of Infectious Diseases*. 5th ed. New York, NY: Churchill Livingstone; 2000.

Wilson, K. (2025). Microbiology, pathogenesis, and epidemiology of anthrax. UpToDate. Retrieved April 4, 2025 from uptodate.com/contents/microbiology-pathogenesis-and-epidemiology-of-anthrax