Botulism

24-Hour Reportable Disease

Botulinum toxin is considered a potential bioterrorism agent.
All suspected cases of botulism should be reported to CDPHE immediately.

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1) THE DISEASE AND ITS EPIDEMIOLOGY

A. Etiologic Agent

Botulism is caused by a potent nerve toxin produced by *Clostridium botulinum*, an anaerobic (reproduces in low oxygen conditions), rod-shaped, gram-positive bacterium. The bacteria form heat-resistant spores that survive in a dormant state until exposed to conditions that can support growth. Conditions that support the growth of the bacteria are high-moisture, low-salt, and low-acid (pH > 4) environments where there is little or no oxygen or refrigeration. There are seven types of botulinum toxin (types A-G). Types A, B, E, and (rarely) F can cause botulism in humans.

B. Clinical Description

Botulism is a rare but serious intoxication that causes a neuroparalytic illness. Three forms of botulism can occur: foodborne, infant/intestinal, and wound botulism. The site of botulinum toxin production differs for each form; however, all three forms result in flaccid paralysis. **A case of botulism in a person greater than one year of age is considered a medical and public health emergency.** Clinically, other diagnoses may appear similar to botulism, such as Guillain-Barré syndrome, myasthenia gravis, chemical intoxication (such as carbon monoxide poisoning), mushroom poisoning, drug reactions, tick paralysis, or stroke. Consultation with the CDPHE Communicable Disease Epidemiology Program and the Centers for Disease Control and Prevention (CDC) is available to help distinguish between botulism and other diagnoses. Prompt diagnosis and early treatment are essential to minimize the risk of death.

Foodborne: Foodborne botulism is caused by ingesting foods that contain botulinum toxin. The toxin is absorbed through the gastrointestinal tract into the bloodstream and is carried to nerve endings where it blocks the release of neurotransmitters that allow for muscle response. Neurological symptoms always progress in a descending symmetric pattern causing flaccid paralysis: the head and neck are the first affected, then the shoulders, upper arms, lower arms, thighs, calves, etc. Paralysis of breathing muscles can result in death unless mechanical ventilation is provided. Early signs and symptoms include fatigue, weakness, and vertigo, and are usually followed by blurred vision, diplopia (double vision), drooping eyelids, dry mouth, dysphagia (difficulty in swallowing), and dysarthria (difficulty speaking). Vomiting, diarrhea, constipation, and abdominal swelling may occur. There is no fever, no loss of consciousness, no numbness or tingling, and cerebrospinal fluid (CSF) findings are normal. The case fatality rate is 5% to 10%, although recovery may take months.

Infant/Intestinal: Infant botulism is the most commonly reported form of botulism and affects children less than one year of age. Infants less than six months of age are more commonly affected. Intestinal botulism is rare and affects individuals with altered gastrointestinal anatomy and/or flora. Infant/intestinal botulism occurs when ingested *Clostridium botulinum* spores germinate in the intestine and the bacteria multiply and produce toxin. Illness in infants ranges from mild with gradual onset to rapidly progressive resulting in sudden death. Symptoms seen in infants include constipation, loss of appetite, decreased movement, loss of facial expression, weakness, an altered cry, and a loss of head control. Affected infants are often described as being "floppy".

Wound: Wound botulism occurs when *Clostridium botulinum* spores contaminate an open wound and germinate. The bacteria multiply in the wound and produce toxin. Symptoms are similar to foodborne botulism.

C. Reservoirs

Clostridium botulinum spores are ubiquitous in the soil. Spores are also found in marine sediments and in the intestinal tract of animals, including fish.

D. Modes of Transmission

Foodborne: When a food item contaminated with *Clostridium botulinum* spores is preserved improperly and stored under anaerobic conditions (such as canned or vacuum packaged items), the spores can germinate and the bacteria can multiply, resulting in botulinum toxin production. If the food is eaten without sufficient heating to inactivate the toxin, foodborne botulism can occur. Implicated foods include fermented, salted, or smoked fish and meat products, and home-canned vegetables and fruits such as asparagus, green beans, beets, chile peppers, corn, tomatoes, figs, apricots, pears, peaches, applesauce, persimmons, and mangoes. Other implicated foods include aluminum foil-wrapped baked potatoes, commercial potpies, homemade salsa, sautéed onions, potato salad, cheese sauce, chile peppers, and minced garlic in oil. Occasionally, commercially prepared foods are implicated, although this is rare due to safe canning and manufacturing practices used today. **Every case of foodborne botulism represents a public health emergency because the responsible food, whether homemade or commercial, may still be available for consumption and could make others ill.**

Infant/Intestinal: Infant/intestinal botulism occurs when *Clostridium botulinum* spores are ingested, rather than through ingestion of toxin. Possible sources of spores include foods (such as honey), soil, and dust; however, in most cases the source is not identified.

Wound: Wounds with ground-in soil or gravel can become contaminated with *Clostridium botulinum* spores. Wound botulism has been reported among illicit drug abusers (primarily among persons who inject black tar heroin or inhale cocaine).

E. Incubation Period

Foodborne: Symptoms of foodborne botulism usually appear within 18 to 36 hours (range: six hours to two weeks) after eating contaminated food.

Infant/Intestinal: The symptoms of infant/intestinal botulism are estimated to appear 3 to 30 days after exposure to the spore-containing material.

Wound: Symptoms of wound botulism usually appear 4 to 14 days after the time of injury.

F. Period of Communicability or Infectious Period

Botulism is not transmitted from person-to-person.

G. Epidemiology

Foodborne: Foodborne botulism cases occur sporadically and in outbreaks worldwide. The median number of annual foodborne cases in the United States is 24. Only one case of foodborne botulism was reported in Colorado from 1997 through 2004; this was associated with consuming home-canned pumpkin butter.

Infant/Intestinal: The median number of annual infant botulism cases in the United States is 100. In Colorado, from 1997 through 2004, seven cases of infant botulism were reported.

Wound: The number of cases of wound botulism in the United States has increased in recent years because of the use of black-tar heroin. In Colorado, from 1997 through 2004, two cases of wound botulism were reported.

Colorado statistics are available at the CDPHE website:
http://www.cdphe.state.co.us/dc/CODiseaseStatistics/index.html

2) CASE DEFINITION

The case definitions are for surveillance purposes and reporting to CDC. Report all suspected cases of botulism to CDPHE within 24 hours.

Foodborne:

Clinical Description

Ingestion of botulinum toxin results in an illness of variable severity. Common symptoms are diplopia (double vision), blurred vision, and bulbar weakness. Symmetric paralysis may progress rapidly.

Laboratory Criteria for Diagnosis

- Detection of botulinum toxin in serum, stool, or patient's food, or
- Isolation of *Clostridium botulinum* from stool.

Case Classification

Probable: A clinically compatible case with an epidemiologic link (e.g., ingestion of a home-canned food within the previous 48 hours).
Confirmed: A clinically compatible case that is laboratory confirmed or that occurs among persons who ate the same food as persons who have laboratory-confirmed botulism.

Infant:

Clinical Description

An illness of infants, characterized by constipation, poor feeding, and "failure to thrive" that may be followed by progressive weakness, impaired respiration, and death.

Laboratory Criteria for Diagnosis

- Detection of botulinum toxin in stool or serum, or
- Isolation of *Clostridium botulinum* from stool.

Case Classification

Confirmed: A clinically compatible case that is laboratory confirmed, occurring in a child aged less than one year.

Wound:

Clinical Description

An illness resulting from toxin produced by *Clostridium botulinum* that has infected a wound. Common symptoms are diplopia (double vision), blurred vision, and bulbar weakness. Symmetric paralysis may progress rapidly.

Laboratory Criteria for Diagnosis

- Detection of botulinum toxin in serum, or
- Isolation of *Clostridium botulinum* from wound.

Case Classification

Confirmed: A clinically compatible case that is laboratory confirmed in a patient who has no suspected exposure to contaminated food and who has a history of a fresh, contaminated wound during the two weeks before onset of symptoms.

Other (Intestinal):

Clinical Description

Ingestion of *Clostridium botulinum* spores by a susceptible host results in an illness of variable severity. Common symptoms are diplopia (double vision), blurred vision, and bulbar weakness. Symmetric paralysis may progress rapidly.

Laboratory Criteria for Diagnosis

- Detection of botulinum toxin in serum or stool, or
- Isolation of *Clostridium botulinum* from stool.

Case Classification

Confirmed: A clinically compatible case that is laboratory confirmed in a patient aged greater than or equal to one year who has no history of ingestion of suspect food, has no wounds, and has a compatible predisposing medical condition.

3) REPORTING CRITERIA

What to Report to the Colorado Department of Public Health and Environment (CDPHE) or Local Public Health Agency

- Health care providers and local public health agencies should report any **suspect**, **probable**, or **confirmed** case of foodborne, infant/intestinal, or wound botulism to CDPHE **immediately by telephone**. If a case is suspected after regular business hours, the after-hours telephone number should be used. CDPHE will contact CDC to arrange for a clinical consultation by telephone, and, if indicated, release of botulinum antitoxin. See below for telephone numbers.
- In addition, confirmed and probable cases should be entered into the Colorado Electronic Disease Reporting System (CEDRS).

Purpose of Surveillance and Reporting

- To ensure patient receives antitoxin treatment in a timely manner if indicated.
- To identify cases for investigation and potential outbreaks.
- To identify potential sources of contamination and prevent additional illnesses.

Important Telephone Numbers and Web Resources

- CDPHE Communicable Disease Epidemiology Program
  - Phone: 303-692-2700 or 800-866-2759
  - Fax: 303-782-0338
  - After hours: 303-370-9395
- Communicable Disease (CD) Manual website: http://www.cdphe.state.co.us/dc/Epidemiology/dc_manual.html

4) LABORATORY SERVICES

Laboratory Testing Services Available

*The services listed below are for public health purposes; clinical laboratories are **not** charged for these services.*

- Collect serum (10-15 cc serum is preferred), stool (15–30 gm preferred), and, if appropriate, wound specimens, from suspected cases.
- Currently, botulism testing (clinical and food specimens) is done by the CDC. Specimens should be sent to the CDPHE laboratory, which will then send the specimens to the CDC laboratory.
- Note: Authorization by the CDPHE Communicable Disease Epidemiology Program is required before submitting specimens or implicated food items to the CDC. **Contact the Communicable Disease Epidemiology Program immediately by telephone as soon as the need for botulism testing is recognized.**
- All materials and specimens suspected of containing botulinum toxin must be handled with caution due to the potent nature of the toxin.
- Specimens should be refrigerated, preferably not frozen.
- A toxin neutralization bioassay is done in mice to identify botulinum toxin in serum, stool, or suspect foods. *Clostridium botulinum* can also be cultured from stool and other clinical

specimens. Identification of organisms in suspect food is helpful but not diagnostic because *Clostridium botulinum* spores are ubiquitous. The presence of toxin in suspect food is more significant.
- Due to the nature of botulism laboratory testing, results may not be reported until several days after specimens are received.
- For more information on botulism testing, contact the CDPHE Communicable Disease Epidemiology Program.

5) CASE INVESTIGATION

***Foodborne*:** The investigation of a case of suspected foodborne botulism is done jointly by the health care provider, local public health agency, CDPHE, and the CDC. All cases are investigated to determine the potential source of infection, and to implement control measures as appropriate. A single case of botulism raises the question of a possible group outbreak involving a family or others who have shared a common food. Prompt epidemiological investigation is critical to prevent further cases from occurring if a hazardous food is still available for consumption. Individuals who have consumed an implicated product should have close medical observation. While home-canned foods are the prime suspect until ruled out, recent outbreaks have implicated unusual food items, so unlikely foods should be considered.

Interview the suspected case or a surrogate (someone familiar with what the case likely ate) as soon as possible. The interview should capture the following information:

- *Demographics (including address, date of birth, gender, ethnicity and race)*
- *Detailed description of symptoms and onset date and time (obtain medical record if possible or visit hospital to review the chart)*
- *Food history (during 2 days prior to onset)*
- *Ask specifically about any home canned foods; any foods eaten that were received as a gift that were prepared in someone else's home; or fermented, salted, or smoked fish and meat products*
- *Restaurant history (include food items and date consumed)*
- *Recent group activities where food was consumed*

If antitoxin is released, CDC will also request that the treating physician complete a form documenting the patient's response to antitoxin (the form will be sent with the antitoxin). Completed forms should be forwarded to CDC when the patient is discharged.

Infant/Intestinal: Cases of botulism in infants are not usually investigated by CDPHE or local public health agencies. CDPHE can assist health care providers in obtaining laboratory testing and treatment. Suspected cases of intestinal botulism in individuals greater than 12 months of age should be investigated to determine that the source is not foodborne (see above), after which no further investigation is usually performed.

Wound: The investigation of a case of wound botulism is done jointly by the health care provider, local public health agency, CDPHE, and the CDC to determine the potential source of infection and rule out foodborne transmission (see above).

6) DISEASE CONTROL MEASURES

A **Botulism Fact Sheet** is available on the CDPHE website.

A. Treatment

Meticulous supportive medical care, particularly respiratory and nutritional support, is an important component of treatment for all forms of botulism. In all forms of botulism, antibiotics do not improve the course of the disease, and should only be used to treat secondary infections.

Foodborne: Foodborne botulism cases must receive botulinum antitoxin as soon as possible. The antitoxin is administered intravenously and blocks the action of the toxin circulating in the blood unbound to nerve endings. The antitoxin is most effective if given early in the course of the illness, and can prevent the illness from worsening. **Notify the CDPHE Communicable Disease Epidemiology Program immediately if a case of botulism is suspected so the process of obtaining antitoxin can be initiated.** The antitoxin is only available through the CDC and must be requested by CDPHE. Serum and stool specimens should be collected before the antitoxin is administered. Antitoxin should not be withheld pending test results, as results may not be available for several days. Even with antitoxin treatment, recovery still takes many weeks.

Infant/Intestinal: In cases of infant botulism, antitoxin is not used because of potentially hazardous side effects and lack of evidence of its benefit. Immune globulin (BabyBIG) is available from the California Department of Health Services to treat infant botulism. This should be initiated as early in the illness as possible. Contact the CDPHE Communicable Disease Epidemiology Program or the California Department of Health Services (510-540-2646) if this type of treatment is needed. Usually infants are given comprehensive supportive care in the hospital for the course of the illness.

Wound: Wound botulism is treated similarly to foodborne botulism. In addition to the antitoxin, appropriate wound care is important.

B. Prophylaxis

Prophylactic treatment of close contacts or asymptomatic individuals who have ingested a food known to contain botulinum toxin is **not** recommended.

C. Education

- Persons who practice home canning should be educated regarding safe canning practices. Because of the high altitude in Colorado, safe canning procedures are different than at sea level. Instructions on safe home canning can be obtained from county extension services or from the United States Department of Agriculture: (http://foodsafety.cas.psu.edu/canningguide.html).

- Commercially canned or home-canned products showing signs of spoilage (such as mold growth or a bad odor) should not be consumed and should be disposed of properly. Bulging, leaking, or badly dented cans should be discarded.
- Oils infused with garlic or herbs should be refrigerated.
- Honey should not be given to children younger than 12 months of age.
- Wound botulism can be prevented by promptly seeking medical care for infected wounds and by not injecting drugs.

D. Managing Special Situations
Food Handlers / Child Care / Preschool / School / Community Residential Programs / Health Care Facilities
Because botulism is not spread through person-to-person transmission, there are no special actions to be taken if a case is a food handler, attends a child care center/preschool/school, is a resident in a community residential program, or is in a health care facility.

E. Environmental Measures
- Food samples associated with suspect or confirmed cases must be obtained immediately for laboratory analysis. Please consult with the CDPHE Communicable Disease Epidemiology Program.
- Implicated or recalled food items must be removed from the environment. Consult with the CDPHE Communicable Disease Epidemiology Program about proper disposal.
- If a commercial product is suspected, the CDPHE Communicable Disease Epidemiology Program will coordinate follow-up with the CDPHE Consumer Protection Division and relevant outside agencies.

REFERENCES

American Academy of Pediatrics. *2003 Red Book: Report of the Committee on Infectious Diseases*, *26th Edition.* Illinois, Academy of Pediatrics, 2003.

Case Definitions for Infectious Conditions Under Public Health Surveillance. http://www.cdc.gov/epo/dphsi/casedef/

CDC Website: http://www.cdc.gov/ → click on "Diseases and Conditions".

Heymann, DL, ed. *Control of Communicable Diseases Manual, 18th Edition.* Washington, DC, American Public Health Association, 2004.

Colorado State University Cooperative Extension Botulism Fact Sheet: http://www.ext.colostate.edu/pubs/foodnut/09305.html

Centers for Disease Control and Prevention: Botulism in the United States 1899-1996. Handbook for Epidemiologists, Clinicians, and Laboratory Workers: http://www.cdc.gov/ncidod/dbmd/diseaseinfo/botulism_a.htm