

# BOTULISM

Report Immediately  
by phone

**Potential Bioterrorism Agent: Category A**

**Also known as:** *Clostridium botulinum*, *C. botulinum*, intestinal botulism, infant botulism

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## Responsibilities:

**Hospital:** Report immediately by phone

**Lab:** Report immediately by phone

**Physician:** Report immediately by phone

**Local Public Health Agency (LPHA):** Report immediately by phone; begin Active Surveillance for additional cases and interview case or family members for possible source.

**Iowa Department of Public Health**

**Disease Reporting Hotline: (800) 362-2736**

**Secure Fax: (515) 281-5698**

## 1) THE DISEASE AND ITS EPIDEMIOLOGY

### A. Agent

Botulism is caused by exposure to a neurotoxin produced by *Clostridium botulinum*. *C. botulinum* is an anaerobic, spore-forming bacterium. The toxin is produced as the bacteria multiply. The bacteria multiply under anaerobic conditions and in an acidic environment (generally pH<4). There are 7 types of botulinum toxin (A-G), but human botulism is caused only by types A, B, E, and F.

### Clinical Description

General information: *C. botulinum* toxin is one of the most potent lethal substances known. In humans, botulism manifests itself in one of 4 clinical forms: foodborne botulism, wound botulism, infant (intestinal) botulism and, rarely, adult infectious (intestinal) botulism. The site of toxin production is different in each form, but flaccid paralysis is common to all.

**Foodborne botulism** is a severe poisoning caused by the ingestion of pre-formed *C. botulinum* toxin.

Symptoms: The clinical syndrome is dominated by neurologic signs and symptoms, including blurred or double vision, dysphagia, dry mouth, and peripheral muscle weakness. Symmetric descending flaccid paralysis is classic diagnostic for botulism. Paralysis begins with the cranial nerves, then affects the upper extremities, respiratory muscles, and finally the lower extremities.

Complications: Patients usually require ventilatory support, which is commonly for 2 - 8 weeks. Clinical manifestations are similar regardless of toxin type, but type A has been associated with a higher case-fatality rate than Type B or Type E. In general, the case-fatality rate for foodborne botulism is 5% - 10%. Recovery may take months.

**Wound botulism** usually presents with the same clinical picture as foodborne botulism. In wound botulism, the organism multiplies and produces its toxin in the wound. The toxin is absorbed into the bloodstream.

**Infant (intestinal) botulism** has a distinctly different clinical presentation than wound and foodborne botulism. In infant botulism, the *C. botulinum* spores are ingested, and the toxin is formed

in the intestines in the absence of mature gastrointestinal flora. This disease is usually confined exclusively to infants less than one year of age.

**Symptoms:** The earliest clinical sign of infant botulism is constipation, followed by poor feeding, decreased sucking, lethargy, listlessness, ptosis (drooping eyelids), difficulty swallowing, a weak cry, and lack of muscle tone--giving rise to the term "floppy baby syndrome."

**Complications:** Respiratory failure may occur in some cases. Infant botulism presents with a wide range of severity, from mild illness to sudden death. Some studies suggest that infant botulism may be responsible for up to 5% of cases of sudden infant death syndrome (SIDS). Among hospitalized cases in the United States, the case-fatality rate is less than 1%.

**Adult infectious (intestinal) botulism** occurs as a result of toxin production in the intestines in a manner similar to infant botulism. Most people with adult infectious botulism are found to have suffered from a disruption of their natural intestinal flora due to abdominal surgery, antibiotic treatment, or gastrointestinal tract abnormalities.

## B. Reservoirs

*C. botulinum* spores are ubiquitous in soils worldwide. The spores can survive indefinitely in soil under almost any environmental condition. Spores are also found in marine sediment.

## C. Modes of Transmission

**Foodborne botulism** usually results from ingesting toxin in food that has been inadequately processed or prepared before being eaten. The most frequent source is home-canned foods, but outbreaks have also been attributed to potatoes baked in foil, minced garlic in oil, and sautéed onions held under a layer of butter. Tomato products, once considered low-risk foods because of their low pH, can no longer be dismissed as a potential vehicle. Boiling for ten minutes destroys the toxin.

**Wound botulism** occurs when wounds are contaminated with dirt or gravel containing botulism spores. Wound botulism has also been reported among chronic drug abusers.

**Infant (intestinal) botulism**, which is the most common form of botulism in the United States, results from ingestion of bacterial spores, which germinate and produce toxin in the intestines. Botulism can result ingestion of food, soil or dust contaminated with botulinum spores. Honey often contains *C. botulinum* spores. Some cases of infant botulism have occurred in children living in areas of construction and earth disruption.

**Adult infectious (intestinal) botulism** occurs in a manner similar to infant botulism.

**Inhalational botulism** can result from inhalation of aerosolized botulism neurotoxin

**Iatrogenic botulism** can result from accidental injection of botulism neurotoxin into the systemic circulation instead of the intended therapeutic location.

## D. Incubation Period

The incubation period is variable.

**Foodborne botulism:** neurologic symptoms appear within 12 - 36 hours (range: 6 hours to 8 days) after eating contaminated food.

**Wound botulism:** Median incubation period 7 days, with a range of 4 - 14 days. In general, the shorter the incubation period, the more severe the disease.

**Infant botulism:** Incubation period is unknown since the date of spore ingestion is usually not known.

Inhalation botulism: Ranges from 12-80 hours after exposure.

#### **E. Period of Communicability or Infectious Period**

Person-to-person transmission has not been documented.

#### **F. Epidemiology**

Botulism occurs worldwide, as sporadic cases and as family and general outbreaks. In the United States an average of 145 cases of botulism are reported each year. Of these, approximately 15% are foodborne, 65% are infant botulism, and the rest are wound botulism.

A total of 152 laboratory-confirmed cases of botulism were reported to CDC in 2013. Foodborne botulism accounted for 2 (1%), infant botulism for 134 (88%), wound botulism for 14 (9%), and botulism of unknown or other etiology for 2 (1%) cases.

#### **G. Bioterrorism Potential**

**Category A:** *C. botulinum* toxins are considered a potential bioterrorism agent. If acquired and properly disseminated, botulinum toxin could cause a serious public health challenge in terms of ability to limit the numbers of casualties and control other repercussions from such an attack.

## **2) DISEASE REPORTING AND CASE INVESTIGATION**

### **A. Purpose of Surveillance and Reporting**

- To assist in the diagnosis and treatment of potential cases.
- To identify sources of public health concern (*e.g.*, a commercially-distributed food product) and stop transmission from the source.
- To properly classify reported cases as foodborne, infant or wound botulism.
- To identify cases and clusters of human illness that may be associated with a bioterrorist event.

### **B. Laboratory and Healthcare Provider Reporting Requirements**

Iowa Administrative Code 641-1.3(139) stipulates that the laboratory and the healthcare provider must immediately report any suspected or confirmed case. The reporting number for IDPH Center for Acute Disease Epidemiology (CADE) is (800) 362-2736. If you call after business hours, you may call the Iowa State Patrol Office at (515) 323-4360. They will page a member of the on-call CADE staff.

#### **Laboratory Testing Services Available**

After communicating with IDPH, contact the University of Iowa State Hygienic Laboratory bacteriology department at (319) 335-4500 for further instructions.

### **C. Local public health agency (LPHA) and Follow-Up Responsibilities**

#### **Case Investigation**

- a. LPHA should immediately call IDPH Disease Reporting Hotline (800) 362-2738 upon learning of a suspected case of botulism.
- b. Case investigation of botulism in Iowa residents will be directed by IDPH Center for Acute Disease Epidemiology (CADE) in collaboration with local and federal agencies.
- c. Following notification of IDPH, the LPHA may be asked to assist in investigating any case(s) of botulism. The investigation form is available from the Iowa Disease Surveillance System (IDSS). Use the following guidelines in the investigation:
- d. Determine type of botulism: Foodborne botulism is a true medical and public health emergency, and should be investigated as such. Infant and wound botulism do not require the same investigative urgency, so it is essential to determine which illness is occurring.

1) **Foodborne botulism**

The source of exposure and names of all potentially exposed persons must be identified. The case must be interviewed concerning possible food sources. In most cases, information will need to be obtained from family members or other close contacts, since the case's condition will most likely not permit interviewing. Use of IDPH *Enteric Disease Investigation Report* will facilitate recording information pertinent to foodborne transmission. Please contact IDPH Center for Acute Disease Epidemiology for assistance in determining possible food sources. Use the following guidelines to investigate.

- a) Identify all home-canned foods eaten during the week prior to symptoms. The most suspect foods are those eaten less than two days before onset, low in acid, and not eaten by persons who stay well. Keep in mind that some cases may experience less severe symptoms later than the identified case.
- b) Identify all commercially canned foods eaten during the week prior to the onset of illness. For each implicated food, determine and record the brand, manufacturer, package size, lot number, and place and date of purchase.
- c) Identify all sausage and other preserved meats eaten during the week prior to onset of illness. Meat or potato products not adequately refrigerated should also be suspected.
- d) Identify all smoked or otherwise preserved fish eaten during the week before onset of symptoms.
- e) Identify other potentially exposed persons. All persons who have eaten implicated foods must be reached as soon as possible and advised to seek healthcare immediately. Depending on the time of ingestion, other exposed persons might be candidates for purging. At the very least they should be under close medical supervision.
  1. Obtain the name, address, and telephone number of every person who may have eaten the suspected food item.
  2. Obtain the name, address, and telephone number of every person who may have the suspect home-processed food in his or her possession.
- f) Remove implicated food items from the environment for testing. The University of Iowa State Hygienic Laboratory will coordinate testing of food samples.

2) **Wound botulism:** Investigate to determine the cause and do possible traceback.

3) **Infant botulism:** Ask caretakers about honey consumption; otherwise, extensive epidemiological follow-up is not usually required. Prevention education should be provided.

4) **Adult infectious botulism:** As with infant botulism, extensive epidemiological follow-up is not usually required. Prevention education should be provided.

e. **Botulism Testing:** In all cases of suspected botulism, the Center for Acute Disease Epidemiology and the case's healthcare provider determine the appropriateness of botulism testing, based on available clinical and epidemiological data. Arrangements are then made to submit appropriate specimens.

**Botulism Antitoxin:** Antitoxin therapy is only administered to adult patients with foodborne or wound botulism. Antitoxin is a horse serum product, and may cause serum sickness in approximately 20% of treated persons. Antitoxin is not indicated in cases of infant botulism. The healthcare provider, in consultation with the Center for Acute Disease Epidemiology must determine the need for antitoxin therapy. CDC must release and approve its use. If needed, antitoxin will immediately be flown to the nearest airport. LPHAs should be prepared to assist with logistic arrangements. The decision to administer antitoxin must be made immediately. The longer the wait, the less effective it will be. Testing for the presence of toxin or bacteria in clinical specimens can take many days. The decision to administer antitoxin cannot wait for testing results to confirm the infection. Tests to rule out myasthenia gravis, stroke and Guillain-Barre syndrome should be completed before antitoxin is released by the Centers for Disease Control and Prevention (CDC).

### 3) CONTROLLING FURTHER SPREAD

#### A. Isolation and Quarantine Requirements

##### Minimum Period of Isolation of Patient

No restrictions.

##### Minimum Period of Quarantine of Contacts

No restrictions.

#### B. Protection of Contacts of a Case

None.

#### C. Managing Special Situations

##### Reported Incidence Is Higher than Usual/Outbreak Suspected

Any case of botulism is considered an outbreak and must be investigated to determine the source of infection and mode of transmission.

#### D. Preventive Measures

##### Personal Preventive Measures/Education

To avoid future exposure, recommend that individuals:

- Learn about the proper time, pressure and temperature required destroying spores if they are interested in home canning and other preservation techniques. More information can be obtained from the Iowa Department of Inspections and Appeals, Food and Consumer Safety Division; US Food and Drug Administration, Center for Food Safety and Applied Nutrition; or Iowa State University Extension's web site <http://www.extension.iastate.edu/answerline/>
- **Do Not** open bulging containers, or eat, or even "taste-test" foods with "off" odors.
- **Do Not** feed unpasteurized sugar products, such as honey, to children less than one year old.

### 4) ADDITIONAL INFORMATION

The Council of State and Territorial Epidemiologists (CSTE) surveillance case definitions for Botulism can be found at: [www.cdc.gov/osels/ph\\_surveillance/nndss/phs/infdis.htm#top](http://www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis.htm#top)

CSTE case definitions should not affect the investigation or reporting of a case that fulfills the criteria in this chapter. (CSTE case definitions are used by the state health department and the CDC to maintain uniform standards for national reporting.)

### References

- American Academy of Pediatrics. *2000 Red Book: Report of the Committee on Infectious Diseases*. Illinois, Academy of Pediatrics, 1997.
- CDC Website. Botulism Emergency Preparedness and Response/Bioterrorism agents. Available at: [www.cdc.gov/nczved/divisions/dfbmd/diseases/botulism/](http://www.cdc.gov/nczved/divisions/dfbmd/diseases/botulism/)
- Heymann, D. L., MD., ed. *Control of Communicable Diseases Manual, 20<sup>th</sup> Edition*. Washington, D.C., American Public Health Association, 2015.
- Oregon Health Division. *Investigative Guidelines: Botulism*. Oregon Health Division, November, 1994.
- Shapiro, Roger L., *et al.* Botulism in the United States: A Clinical and Epidemiologic Review. *Annals of Internal Medicine*. August 1, 1998; 129:3, pp. 221-228.