

Botulism



Case Definition

Laboratory-confirmed Case:

Foodborne Botulism

Clinically compatible illness (see below) with a history of exposure to a probable food source and one of the following:

- detection of *C. botulinum* toxin in sera, feces or food;
- isolation of *C. botulinum* from stools.

Clinical Case:

Foodborne Botulism

Clinical and epidemiologic evidence of foodborne botulism but no laboratory confirmation is obtained. For example, a person with clinical illness who has consumed a food item incriminated in a laboratory-confirmed case.

Wound Botulism

Clinically compatible illness in a person with no history of exposure to suspect food but with a history of a contaminated wound two weeks or less before onset of symptoms and isolation of *C. botulinum* from a wound culture or detection of its toxin in the person's serum.

Infant Botulism

Symptoms compatible with botulism in an infant less than one year of age and the detection of botulinum toxin or *C. botulinum* from the infant's stool.

Reporting Requirements

- All positive isolates of *C. botulinum* or its toxin are reportable by laboratory.
- All cases of foodborne botulism are reportable by attending health care professional.
- *C. botulinum* or its toxin in commercial food products should be reported to the Canadian Food Inspection Agency.

Clinical Presentation/Natural History

There are three forms of botulism — foodborne (the classic form), wound and infant botulism. All forms are associated with flaccid paralysis that results from botulinum neurotoxin.

Foodborne Botulism: Ingestion of formed toxin. Acute bilateral cranial nerve impairment and descending weakness or paralysis characterize the illness. Visual difficulty (blurred or double vision), dysphagia and dry mouth are often the first complaints. These symptoms may extend to a symmetrical flaccid paralysis in a paradoxically alert person. Vomiting, constipation or diarrhea may be present initially. Fever is absent unless a complicating infection occurs. Recovery may take months. The case-fatality rate in North America is 5-10%.

Wound Botulism: Causative organism contaminates a wound (anaerobic conditions), with in-vivo toxin production in the wound. The same clinical picture as above.

Infant Botulism: Spore ingestion, subsequent outgrowth and in-vivo toxin production in the intestine. It affects infants under one year of age almost exclusively, but can affect adults who have altered GI anatomy and microflora. The illness typically begins with constipation, followed by lethargy, listlessness, poor feeding, ptosis, difficulty swallowing, loss of head control, hypotonia extending to generalized weakness (the “floppy baby”) and, in some cases, respiratory insufficiency and arrest. Infant botulism has a wide spectrum of clinical severity, ranging from mild illness with gradual onset to sudden infant death. The case-fatality rate of hospitalized cases in North America is less than 1%.

Etiology

Botulism is caused by toxins produced by *Clostridium botulinum*, a spore-forming obligate

anaerobic bacillus. Only a few nanograms of the toxin can cause illness. Most human outbreaks are due to types A, B, E and rarely to type F. Type G has been isolated from soil and autopsy specimens but an etiologic role has not been established. Most cases of infant botulism have been caused by type A or B.

Epidemiology

Reservoir: Spores are ubiquitous in soil worldwide; they are frequently recovered from agricultural products, including honey. Spores are also found in marine sediment and in the intestinal tract of animals and fish.

Foodborne Botulism: Toxin is produced in improperly processed, canned, low-acid or alkaline foods and in pasteurized and lightly cured foods held without refrigeration, especially in airtight packaging. Newer varieties of certain garden foods such as tomatoes, formerly considered too acidic to support growth of *C. botulinum*, may no longer be low-hazard foods for home canning. Most poisonings in North America are due to home-canned vegetables and fruits; meat is an infrequent vehicle. In Europe, most cases are due to sausages and smoked or preserved meats; in Japan, to seafood. Cases have also been reported from uneviscerated fish, baked potatoes, improperly handled commercial potpies, sautéed onions, and minced garlic in oil. Type E outbreaks are usually related to fish, seafood and meat from marine mammals and Type E toxin can be produced slowly at temperatures as low as 3°C (37.4°F), which is lower than that of ordinary refrigeration.

Wound Botulism: Wound botulism cases result from contamination of wounds by ground-in soil or gravel or from improperly treated compound fractures. Wound botulism has been reported among chronic drug users (dermal abscesses in “skin poppers” and sinusitis in cocaine “sniffers”).

Infant Botulism: Possible sources of spores for infants are multiple, including foods and dust. Honey often contains *C. botulinum* spores. Corn syrup may also be a source of spores.

Transmission:

Foodborne Botulism: Ingestion of food in which toxin has been preformed.

Wound Botulism: Contamination of wound with spores from soil, which germinate and produce toxin.

Infant Botulism: Ingestion of botulinum spores that then germinate in the intestinal tract, rather than by ingestion of preformed toxin.

Occurrence:

General: Worldwide outbreaks occur where food products are prepared or preserved by methods that do not destroy the spores and permit toxin formation. Cases rarely result from contaminated commercially processed products; outbreaks have occurred from contamination through cans damaged after processing. Cases of infant botulism have been reported worldwide and it is the most common form of botulism in North America. The actual incidence and distribution of infant botulism are unknown because physician awareness is limited. As of January 1994, over 1,000 hospitalized cases had been reported in the United States. Some studies suggest that it may cause up to 5% of cases of sudden infant death syndrome (SIDS).

Manitoba: One case of botulism has been reported since 1992.

Incubation Period:

Foodborne Botulism: Neurologic symptoms appear in 12 to 36 hours (occasionally a few days) after ingestion. In general, the shorter the incubation period, the more severe the disease and the higher the case-fatality rate.

Wound Botulism: Neurologic symptoms may appear in less than two weeks after wound occurrence.

Infant Botulism: Unknown, since it cannot be determined precisely when the infant ingested the causal botulinum spores.

Susceptibility and Resistance: Susceptibility is general. Almost all patients hospitalized with infant botulism have been between two weeks and one

year of age; 94% were less than six months, and the median age at onset was 13 weeks. Cases of infant botulism have occurred in all major racial and ethnic groups. Adults with special bowel problems leading to unusual GI flora (or with a flora unintentionally altered by antibiotic treatment for other purposes) may be susceptible to “infant-type” botulism.

Period of Communicability: No instance of secondary person-to-person transmission has been documented, despite excretion of *C. botulinum* toxin and organisms at high levels in the feces of infant botulism patients for weeks to months after onset of illness. Foodborne botulism patients typically excrete the toxin and organisms for shorter periods.

Diagnosis

Initially based on the clinical picture and history.

Foodborne Botulism: Demonstration of botulinum toxin in serum, stool, gastric aspirate or incriminated food; or by culture of *C. botulinum* from gastric aspirate or stool. Identification of organisms in a suspected food is helpful but not diagnostic because botulinum spores are ubiquitous; the presence of toxin in a suspected contaminated food source is more significant.

Wound Botulism: Toxin identified in serum or by positive wound culture.

Infant Botulism: Identification of *C. botulinum* organisms and/or toxin in patient’s feces or in autopsy specimens. With few exceptions, toxin has not been detected in the sera of patients.

Electromyography with rapid repetitive stimulation is useful in corroborating the clinical diagnosis for all forms of botulism.

Key Investigations

Suspicion of a single case of botulism requires immediate investigation to determine if a common source outbreak has occurred.

Foodborne Botulism:

- Identify others at risk of illness.
- Take food history of those who are ill, including consumption of home-preserved foods and traditionally prepared foods. Even theoretically unlikely foods should be considered. *C. botulinum* may or may not cause container lids to bulge and the contents to have “off-odours.” (Other contaminants can also cause cans or bottle lids to bulge.)
- Collect sera, gastric aspirates (when indicated) and stool from patients and, when indicated, from others exposed but not ill and forward immediately, with relevant clinical history, to the Cadham Provincial Laboratory (CPL) before administration of antitoxin. Specimens should be packaged in a sterile, wide mouth, screw-capped container, and kept cool. CPL should be telephoned as quickly as possible, since the specimens are forwarded to the Canadian Science Centre for Human and Animal Health (CSCHAH) laboratory.
- Involve environmental/public health inspectors. Collect food samples and forward to the laboratory for toxin analysis.

Infant Botulism:

- Investigate source and look for history of honey or corn syrup consumption.

Control

Management of Cases:

- Persons with botulism require immediate treatment. **Treatment must not await laboratory confirmation.**
- Serum should be collected to identify the specific toxin before antitoxin is administered, but antitoxin should not be withheld pending test results.

- The antitoxins are produced in horses, therefore hypersensitivity reactions are possible. Testing for hypersensitivity to horse sera may be undertaken prior to antitoxin administration.
- Provide immediate access to an intensive care unit so that respiratory failure can be anticipated and managed promptly.
- Isolation: Not required but hand-washing is indicated after handling soiled diapers.

Treatment:

Foodborne Botulism: Intravenous administration of two vials of trivalent (ABE) botulinum anti-toxin, as soon as possible, is considered routine treatment. Botulinum antitoxin is available from the Canadian Blood Services or Churchill Hospital via a Medical Officer of Health. A second dose of antitoxin may be necessary, but chance of hypersensitivity reaction increases. Antitoxin should be provided in an intensive care setting.

Wound Botulism: In addition to antitoxin, the wound should be debrided and/or drainage established and appropriate antibiotics administered.

Infant Botulism: Meticulous supportive care is essential. Botulinum antitoxin is not used because of the sensitization and anaphylaxis hazard. Antibiotics do not improve the course of the disease. Aminoglycoside antibiotics, in particular, may worsen it by causing a synergistic neuromuscular blockade. Thus, antibiotics should be used only to treat secondary infections.

Management of Contacts:

- Direct contacts do not require follow-up.
- Those who are known to have eaten the suspected food should be purged with cathartics and high enemas, given gastric lavage and kept under close medical observation. Botulinum antitoxins (equine ABE), given within one to two days of ingestion, may prevent development of symptoms; however, the risk of hypersensitivity must be considered.

Management of Environment:

- Search for any remaining food from the same source that may be similarly contaminated and submit for laboratory examination as above.
- The implicated food(s) should be detoxified by boiling before discarding or the containers broken and buried deeply in soil to prevent ingestion by animals. Contaminated utensils should be sterilized by boiling or by chlorine disinfection to de-activate any remaining toxin.
- Usual sanitary disposal of feces from infant cases.

Management of Outbreaks:

- Immediate recall of implicated food; international efforts may be required to recover and test implicated foods.
- Immediate search for people who shared the suspected food.

Preventive Measures:

- Effective control in processing commercially canned and preserved food.
- Adequately refrigerated storage of incompletely processed foods.
- Education of public in safe handling of food. Do not use food from damaged or bulging containers. Foods with off-odours should not be eaten or 'taste-tested.' Food that tastes unusual should not be eaten. Commercial cans with bulging lids should be returned, unopened, to the vendor.
- Education of those concerned with home canning and other food preservation techniques regarding the proper time, pressure and temperature required to destroy spores; the need for adequately refrigerated storage of incompletely processed foods; and the effectiveness of boiling, with stirring, home-canned foods for at least 10 minutes to destroy botulin toxins.
- Do not feed honey or corn syrup to infants.