

## BOTULISM

### Bioterrorism Agent Profiles for Health Care Workers

**Causative Agent:** A group of seven related toxins produced by the bacillus, *Clostridium botulinum*. The seven distinct toxins (A through G) are produced by different strains of the bacillus.

**Routes of Exposure:** Inhalation, oral (infant botulism and wound botulism are not included in the discussion below)

**Toxic Dose:** 1 ng/kg (for type A toxin)

**Incubation Period:** Neurologic symptoms of foodborne botulism generally begin 12-36 hours after ingestion. Neurologic symptoms of inhalational botulism generally begin 24-72 hours after aerosol exposure. However, the incubation period for both can range from 6 hours to 10 days.

**Clinical Effects:** Acute, afebrile, symmetric descending paralysis. Botulinum toxins are neurotoxins that act to prevent the release of acetylcholine presynaptically and thus block neurotransmission. Multiple cranial nerve palsies are often the first symptoms seen. Bulbar palsies are prominent early, with eye symptoms such as blurred vision due to mydriasis, diplopia, ptosis and photophobia, in addition to other bulbar signs such as dysarthria, dysphonia, and dysphagia. Skeletal muscle paralysis follows with a symmetrical descending and progressive weakness, which may culminate abruptly in respiratory failure. Deep tendon reflexes may be present or absent.

**Lethality:** The mortality rate from botulism is 60% if the patient goes untreated and less than 5% if the patient receives appropriate treatment. All the botulinum toxins are slightly less toxic when exposure is by the pulmonary route.

**Transmissibility:** Botulinum toxin cannot be transmitted person-to-person.

**Primary Contaminations & Methods of Dissemination:** The use of botulinum toxin as a biological weapon would likely be by aerosolization, or by intentional contamination of food or water supplies.

**Secondary Contamination & Persistence of Organism:** The toxin does not penetrate intact skin. *C. botulinum* spores can persist in the environment, and wound botulism can result when an open wound is contaminated.

**Decontamination & Isolation:**

*Patients* – Patients can be managed using standard precautions. No decontamination is necessary following foodborne exposure. Following aerosol exposure to botulinum toxin, skin should be rinsed with soap and water.

**Bioterrorism Agent Profiles for Health Care Workers - Botulism**  
(continued from previous page)

*Equipment, clothing & other objects* – A 0.5% hypochlorite solution (1 part household bleach + 9 parts water = 0.5% solution) applied for 10 to 15 minutes and/or soap and water should be used for environmental decontamination. Clothing should be washed with soap and water.

**Laboratory Testing:** For detection of inhaled aerosolized botulinum toxin, gastric aspirate and possibly stool may contain the toxin. In suspected food borne disease the appropriate specimens for toxin assay are serum, stool, gastric aspirate, vomitus, and the implicated food (if available). The confirmatory test is based on a mouse bioassay demonstrating the toxin. Diagnostic services are available only through the CDC via the state health department.

**Therapeutic Treatment:** Treatment is the same for inhalation (aerosolized) exposure as for ingestion (foodborne). Care is supportive. Long term mechanical ventilation may be needed for several weeks to months. A trivalent equine antitoxin for food-borne botulism is available from the CDC through the Arizona Department of Health Services. Use of the antitoxin requires skin testing for horse serum sensitivity prior to administration. Providers should refer to the information sheet that comes with the antitoxin.

**Prophylactic Treatment:** Currently, there is no commercially available vaccine.

**Differential Diagnosis:** Single cases may be confused with various neuromuscular disorders such as atypical Guillain-Barré syndrome, myasthenia gravis, or tick paralysis. Botulism could also be confused with enteroviral infections, but in these patients, fever is present, paralysis is often asymmetrical, and the CSF is abnormal. It may be necessary to distinguish nerve agent and atropine poisoning from botulinum intoxication. In organophosphate nerve agent poisoning pupils are miotic and copious secretions are present. In atropine poisoning, the pupils are dilated and mucous membranes are dry, but central nervous system excitation with hallucinations and delirium is present.

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For more information call (602) 364-3289

## Frequently Asked Questions About Botulism

### What is botulism?

Botulism is a rare but serious paralytic illness caused by a nerve toxin that is produced by the bacterium *Clostridium botulinum*. There are three main kinds of botulism. Foodborne botulism is caused by eating foods that contain the botulism toxin. Wound botulism is caused by toxin produced from a wound infected with *Clostridium botulinum*. Infant botulism is caused by consuming the spores of the botulinum bacteria, which then grow in the intestines and release toxin. All forms of botulism can be fatal and are considered medical emergencies.

### What kind of germ is *Clostridium botulinum*?

*Clostridium botulinum* is the name of a group of bacteria commonly found in soil. These rod-shaped organisms grow best in low oxygen conditions. The bacteria form spores that allow them to survive in a dormant state until exposed to conditions that can support their growth. There are seven types of botulism toxin designated by the letters A through G.

### How common is botulism?

In the United States an average of 110 cases of botulism are reported each year. Of these, approximately 25% are foodborne, 72% are infant botulism, and the rest are wound botulism. Outbreaks of foodborne botulism involving two or more persons occur most years and usually caused by eating contaminated home-canned foods. The number of cases of foodborne and infant botulism has changed little in recent years, but wound botulism has increased because of the use of black-tar heroin, especially in California.

### What are the symptoms of botulism?

The classic symptoms of botulism include double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth, and muscle weakness. Infants with botulism appear lethargic, feed poorly, are constipated, and have a weak cry and poor muscle tone. These are all symptoms of the muscle paralysis caused by the bacterial toxin. If untreated, these symptoms may progress to cause paralysis of the arms, legs, trunk and respiratory muscles. In foodborne botulism, symptoms generally begin 18 to 36 hours after eating a contaminated food, but they can occur as early as 6 hours or as late as 10 days.

### How is botulism diagnosed?

Physicians may consider the diagnosis if the patient's history and physical examination suggest botulism. However, these clues are usually not enough to allow a diagnosis of botulism. Other diseases such as Guillain-Barré syndrome, stroke, and myasthenia gravis can appear similar to botulism, and special tests may be needed to exclude these other conditions. These tests may include a brain scan, spinal fluid examination, nerve conduction test (electromyography, or EMG), and a tensilon test for myasthenia gravis. The most direct way to confirm the diagnosis is to demonstrate the botulinum toxin in the patient's serum or stool by injecting serum or stool into mice and looking for signs of botulism. The bacteria can also be isolated from the stool of persons with foodborne and infant botulism. These tests can be performed at the Centers for Disease Control and Prevention.

## **Frequently Asked Questions About Botulism**

(continued from previous page)

### **How can botulism be treated?**

The respiratory failure and paralysis that occur with severe botulism may require a patient to be on a breathing machine (ventilator) for weeks, plus intensive medical and nursing care. After several weeks, the paralysis slowly improves. If diagnosed early, foodborne and wound botulism can be treated with an antitoxin that blocks the action of toxin circulating in the blood. This can prevent patients from worsening, but recovery still takes many weeks. Physicians may try to remove contaminated food still in the gut by inducing vomiting or by using enemas. Wounds should be treated, usually surgically, to remove the source of the toxin-producing bacteria. Good supportive care in a hospital is the mainstay of therapy for all forms of botulism.

### **Are there complications from botulism?**

Botulism can result in death due to respiratory failure. However, in the past 50 years the proportion of patients with botulism who die has fallen from about 50% to 8%. A patient with severe botulism may require a breathing machine as well as intensive medical and nursing care for several months. Patients who survive an episode of botulism poisoning may have fatigue and shortness of breath for years and long-term therapy may be needed to aid recovery.

### **How can botulism be prevented?**

Botulism can be prevented. Foodborne botulism has often been from home-canned foods with low acid content, such as asparagus, green beans, beets and corn. However, outbreaks of botulism have occurred from more unusual sources such as chopped garlic in oil, chili peppers, tomatoes, improperly handled baked potatoes wrapped in aluminum foil, and home-canned or fermented fish. Persons who do home canning should follow strict hygienic procedures to reduce contamination of foods. Oils infused with garlic or herbs should be refrigerated. Potatoes that have been baked while wrapped in aluminum foil should be kept hot until served or refrigerated. Because botulism toxin is destroyed by high temperatures, persons who eat home-canned foods should consider boiling the food for 10 minutes before eating it to ensure safety. Instructions on safe home canning can be obtained from county extension services or from the US Department of Agriculture. Because honey can contain spores of *Clostridium botulinum* and this has been a source of infection for infants, children less than 12 months old should not be fed honey. Honey is safe for persons 1 year of age and older. Wound botulism can be prevented by promptly seeking medical care for infected wounds and by not using injectable street drugs.

### **What are public health agencies doing to prevent or control botulism?**

Public education about botulism prevention is an ongoing activity. Information about safe canning is widely available for consumers. State health departments and CDC have persons knowledgeable about botulism available to consult with physicians 24 hours a day. If antitoxin is needed to treat a patient, it can be quickly delivered to a physician anywhere in the country. Suspected outbreaks of botulism are quickly investigated, and if they involve a commercial product, the appropriate control measures are coordinated among public health and regulatory agencies. Physicians should report suspected cases of botulism to county or state health departments.

For information and guidelines on canning foods at home visit the USDA Home Canning Guide at <http://foodsafety.cas.psu.edu/canningguide.html>

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