Botulism

By Cicely Quade

Name and history:
Botulism; Scientific name: *Clostridium botulinum*, it is a bacterium that is part of the *Clostridium* family and it is an endospore- it forms gram-positive bacilli. There are several common names for botulism including botulism toxin as well as Botox. There are seven types of botulism bacteria that have been discovered and the have been identified with the letters A-G but only the strains A, B, E and F can manifest themselves in humans as an illness. The taxonomy of the *C. botulinum* in the order of domain, kingdom, phylum, class, order, family, genus and species is as follows: Bacteria, Bacteria, Firmicutes, Clostridia, Clostridiales, Clostridiaceae, Clostridium and *Clostridium botulinum*. The bacterium is rod shaped and they grow best in environments that are low in oxygen. John Muller, who thought that the onset of symptoms was linked to eating sausage, first discovered this disease in 1870. Thus, the name of botulism was derived from the Latin word for sausage.

Transmission:
Botulism is unique from other infectious diseases in that it is not transmitted directly from human to human. There are two main types of botulism: wound botulism and foodborne botulism. Wound botulism occurs when a person ingests food that has been infected by the bacterium’s spores that can grow into bacteria in the intestines of both adults and infants. The bacteria release toxins in the intestines that affect the nerves of the host. Wound botulism occurs when a wound becomes infected with the *Clostridium botulinum* bacterium and it produces toxins within the wound that travel through the body to the nerves of the host.

Reservoir:
*Clostridium botulinum* can be found within soil. Most cases of foodborne botulism transmission occur when home-processed foods are not processed correctly and they do not have very much acid in their preservation solutions that allow the bacteria to become active. Botulism toxins in canned foods are more frequently present in the toxins that are not very acidic. When the human digests the food it can become infected with spores of the bacteria. Wound botulism occurs most frequently from illegal drug use, especially black tar heroin from Mexico that can contain the *Clostridium botulinum* spores. When the heroin is injected into the body the spores are absorbed into the blood stream and circulated around the body. The bacteria is extremely heat resistant.

General Characteristics:
Laboratory: It is often difficult to confirm the presence of botulism when trying to diagnose a patient, but routine tests are often helpful for ruling out other diseases for the diagnosis. Botulism is positively identified by finding botulinum neurotoxin in the serum of feces, vomit, or in a sample of the contents of the gastrointestinal fluids or if a sample of the food that was ingested if it is available. They perform either mouse toxicity or a
neutralization bioassay. In the mouse toxicity test, a mouse is injected with the serum of the patient and observed for signs of botulism. If that is not conclusive then the serum from the patient is added to six test tubes and then antibotulinum toxin (one for A, B, E and F and a combination of all four) are added to each test tube and then injected into the mouse and the mouse is observed for signs of botulism.

Clinical: The physician obtains a log of all the food ingested by the patient for the past five days. The physician tests the individuals’ muscle and neurological responses and looks for signs of muscle paralysis.

Signs and Symptoms:
In foodborne botulism the onset of symptoms is usually eighteen- thirty-six hours after ingesting the infected food. But, signs have been known to occur as early as six hours and as delayed as ten days. There are several symptoms of botulism that include double vision as well as blurry vision, droopy eyelids, muscle weakness, slurred speech, dry mouth as well as difficulty swallowing. In infants the symptoms include difficulty eating, poor muscle tone as well as being constipated and having a weak cry. All of these symptoms indicate that the bacterial toxin is causing muscle paralysis. If botulism is diagnosed early on the patient can take a botulism antitoxin but if the symptoms are left untreated the toxin could spread to the respiratory muscles and the abdominal muscles as well as the muscles of the limbs.

Virulence Mechanisms:
The Clostridium botulinum bacteria reproduce by spores that can remain dormant until it is in anaerobic conditions that are ideal for the bacteria to reproduce. For foodborne botulism the food is ingested that has been contaminated with the toxin and it is absorbed through the gastrointestinal tract into the bloodstream. The toxin circulates through the body until it reaches a peripheral neuromuscular synapse and the toxin will bind to the presynaptic terminals and that blocks the release of the acetylcholine. The release of acetylcholine is essential for the stimulation of muscle contractions.

Prevention:
Botulism is most commonly transmitted through infected food and water. To prevent botulism in infants (under twelve months of age) it is recommended to not allow them to eat honey. In adults and children, a common source is home-canned foods that have a low acid content but can also be found in commercially canned foods if it is improperly done. If canning foods at home it is important to follow proper canning methods. If you are wounded, proper treatment of the wound by seeking medical attention or cleaning the wound can prevent wound botulism.

Control/Treatment:
Botulism has a high mortality rate if it is not treated quickly after the onset of symptoms. The antibotulinum toxin can be used to treat the patient but it will not be effective if the botulinum toxin has already reached the neuromuscular synapses. If the toxin reaches the toxins then the individual still has a chance to recover but it is a very long and expensive process. The body never naturally becomes immune to the toxin and a vaccine has not been developed due to the incredibly rare nature of the disease. Infants can be protected
from the disease by not exposing them to solid food before twenty weeks of age. Adults can protect themselves from botulism by practicing safe canning practices and or eating canned food that has been processed as well as by not injecting black tar heroin into their bloodstream. A faster diagnosis test is currently being researched.

**Current Information:**
**United States:**
In the United States there are an average of 145 cases reported each year. Approximately 15% of these are foodborne, and the majority is represented by infant botulism and approximately 20% of cases are wound botulism. In 2015, there was an outbreak in Ohio that was the largest outbreak in recent history. The outbreak originated from a church potluck where there were over 52 foods available. The most likely source of the toxin was from a potato salad that was prepared using potatoes that had been canned at home. The individual used a boiling water canner instead of a pressure canner, which kills the *Clostridium botulinum* bacteria. For most of the individuals at the potluck their symptom onset was approximately 2 days after eating at the potluck. There were approximately 29 individuals affected during the outbreak but there were no casualties.

**Global information:**
Outbreaks of botulism are rare but the WHO considers infection a public emergency because it can be spread rapidly, especially if a large group of individuals are eating the same food. There was a massive outbreak of botulism in Northern Thailand in 2006. The outbreak was due to contaminated home-canned bamboo shoots. This outbreak affected 209 individuals and 134 of them were hospitalized. The response was overwhelming to prevent the outbreak from spreading further out of the village and to prevent any deaths. Also, Italy tends to have more outbreaks of botulism in general compared to other countries around the world. Of the outbreaks recorded, 57% are the result of vegetable canning and about 15% are the result of contaminated ham or sausage. The most recent outbreak was in 2011 in Finland but was the result of imported jars of olives that were canned in Italy; there were three cases detected and one death.

**Work cited:**


