

# Botulism and hospitalization

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Microbial intoxication refers to the diseases followed by ingestion of toxins produced by pathogens outside the body. Botulism is a water-borne and food-borne disease transmitted in foods (Englel Kirk & Duebn-Engelkirk, 2007). Patients with botulism are required to prolonged hospitalization and intensive care (Evans & Brachman, 1998). Although this disease is rare, both animals and humans can be affected which can cause flaccid muscle weakness or even death (Lewis, Knight, Lewis, & Lewis, 1995). In the early human history, it was speculated that our prehistoric ancestors suffered also from botulism.

They usually preserved extra meat by wrapping it animal skins and animal organs then smoked it and buried underneath the ground which served as a basic refrigerator, allowing the meat to freeze (Rosaler, 2003). The history of first botulism outbreak happened on 1793 in Wildbad, Germany from consumption of a favorite local dish—blood sausages (Fig. 1). The blood sausages were prepared from washing out the pig intestines, then blood and various spices are stuffed in. Both ends are tied, boiled in water, smoked, and stored for weeks at room temperature.

Usually, the people who ate it did not have effect but after people share it they became sick. Most of them vomited, some partially paralyzed, and speech thickened. Later, there were six people dead. Justinus Kerner, the local medical officer and physician, was sent to find out the cause of the incident. However, Kerner was not able to identify the cause of deaths from eating blood sausages. Nevertheless, he was able to note significant observations such as blood sausages with air pockets did not become poisonous and the sausages in large casings are likely to be poisonous.

He conducted a dangerous experiment by injecting the sausage fluid, wurstgift, into his own body (Rosaler, 2003). Until then, he was able to observe the symptoms similar to the patients. The disease was named “Kerner’s disease” for many years. He conducted follow up experiments on various cases food poisoning and published his findings. Aside from food-borne and water-borne, botulism can also be wound botulism when toxins are produced from the wound that is infected with the bacteria *Clostridium botulinum* (Fig. 2).

The bacteria is a gram positive spore-forming bacilli that is invasive and toxin mediated (Shimeld, 1999). This rod-shaped bacteria is often found in soil where there is low-oxygen forming spores that allow it to survive in dormant state. People infected with botulism usually have the symptoms of blurred vision, difficulty in swallowing, and muscle weakness; while infants with botulism appear lethargic, constipated, weak cry and muscle tone which are all signs of muscle paralysis that is caused by the bacterial toxin. The paralysis can progress in the arms, legs, and respiratory muscles if untreated.

On the other hand, in food botulism, symptoms appear as early after six hours to thirty-six hours and the latest is ten hours (Bullock, Haddow, & Coppola, 2006). In general there are seven forms of botulism coded as types A, B, C, D, E, F, and G. These forms are grouped if they are proteolytic. In Group I is proteolytic which includes types A, B, or F toxins. Group II is non-proteolytic which includes types B, E, or F toxins. Group III is also non-proteolytic which includes types C or D toxins. Lastly, the Group IV is also non-proteolytic and non-saccharolytic including G toxin.

Among the four groups, Groups I and II cause botulism in humans while Group III causes botulism in birds and animals. Group IV, on the other hand, are very rare and does not affect humans. Proteolytic strains normally live in minima temperatures of growth which is 12°C or above, while the non-proteolytic can live to a temperature as low as 3. 3°C (Wilkinson & Gould, 1996). Figure 2 Clostridium botulinum. The pale bodies are the spores (Sebaiha et al. 2007) C. botulinum lives as dormant spore or a scavenger in decaying animal materials in soil but it has no specific mechanism to evade human defenses.

The variants of each single species are connected because of the deadly toxin. For example, some of the genes found in C. botulinum are not found in other sequence. It can be easily destroyed by a toxin in some cases. However, the toxins never stop poisoning killing its preys. It has the ability to hide and hibernate through dormant spores when environment is harsh. This bacteria uses many strategies to increase its probability of survival (Sebaiha, Peck, Minton, & Thomson, 2007). In diagnosing botulism, patient's history and physical examination is taken into consideration but these are not enough to identify botulism.

Diseases such as Guillain-Barre syndrome, stroke, and myasthenia gravis appear to be similar with botulism. Tests such as brain scan, spinal fluid examination, electromyography, or Tensilon test for myasthenia gravis are conducted in order to diagnose which disease. Another way of diagnosis is by injecting placing botulinum toxin to the patient' serum or stool, then injecting it to a mice and observe for relevant symptoms; while other test of

stool can be conducted by some state health department laboratories and at CDC (Bullock et al. , 2006).

Otherwise, the patients should undergo passive immunization which has horse serum with anti-A, B, and E toxins. There is also trivalent antitoxin available in CDC, Atlanta and botulism toxoid (Evans & Brachman, 1998). Cases of botulism vary depending on the types of botulism toxin. If there is respiratory failure and paralysis, the patient needs to be in ventilator for weeks and intensive medical care and the paralysis will improve. Respiratory failure can cause death but there is an antitoxin which can block the reaction of toxins on food-borne and wound botulism.

The source on the wound, however, should be removed surgically. The recovery can take weeks nevertheless the progress of the disease will be prevented. Moreover, the death cases of botulism from the past fifty years decreased from 50% to 8%. Among those who survived poisoning, patients may experience fatigue and shortness of breathe that could last for years thus therapy is required (Bullock et al. , 2006). There are ways to prevent botulism. The source of most food-borne botulism is home-canned goods.

Other sources can be from chopped garlic in oil, chili peppers, tomatoes, aluminum foil-wrapped potatoes (improperly cooked), and home canned/fermented fish. Hygienic procedures are necessary in order to prevent contamination especially in home canning and that oils with herbs and garlic should be refrigerated; baked potatoes wrapped in aluminum foil should be kept hot before serving or refrigerated; home-canned goods should be boiled before eating since the botulism toxin will be destroyed in high

temperatures, and children below one year should not be fed with honey since *Clostridium botulinum* spores are present in honey.

There are public education about botulism prevention and there are also experts on botulism available for consultancy in state health departments and CD (Bullock et al. , 2006). In the United States, the average botulism case is 110 every year were majority of these cases are infant botulism (72%). It is followed by followed by food-borne which is 25% and the rest are wound botulism. Outbreaks are usually caused by eating contaminated home-canned goods (Bullock et al. , 2006). Botulism outbreaks, on the other hand, are rare in tropical regions.

Most occurred in temperate and colder regions during spring and winter seasons in the northern hemisphere such as Alaska, Canada, United States, Poland, United kingdom, Russia, Iran, and China (Doyle, Steinhart, & Cochrane, 1994). The largest botulism outbreak in the United States in the last 25 years caused 30 cases where four were in severe conditions. The cause was from a potato-based dip that were wrapped in aluminum foil and stored in ambient temperature (Fratarnico, Bhunia, & Smith, 2005).

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