HISTORY:

Botulism is a serious neurotoxic illness caused by specific bacteria that is often but not exclusively spread by food consumption. Botulinum toxin is a very common natural bacteria that rarely makes people sick but when it does, the disease can be fatal if not treated immediately.

The first recorded case of botulism occurred in 1735 and was associated with the consumption of contaminated sausage. Over a century later, a funeral dinner in a small Belgian village at which smoked ham was served resulted in a botulism outbreak that led to the discovery of the clostridium botulinum toxin. The disease was named after the Latin word for sausage (“botulus”) because of its early association with sausages.

In the 1970s, the US Army was the first to develop a botulinum antitoxin. Today, there are just a handful of formulations worldwide to treat the various types of toxins, though research and development is still being pursued.

The dataset used here comes from the Center for Disease Control and Prevention’s data catalog (<https://data.cdc.gov/Foodborne-Waterborne-and-Related-Diseases/Botulism/66i6-hisz>).

TYPES OF BOTULISM:

There are five main types of botulism, the first three of which are explored in this dataset:

1. Foodborne: this type of botulism occurs when foods that have been contaminated with botulinum toxin are consumed. The most common source is improperly canned, preserved, or fermented foods (primarily homemade but occasionally commercial), honey, herb-infused oils, and other ready-to-eat foods in low oxygen packaging. Foods with low acid content are the most risky.
2. Infant: occurs when the bacteria gets into an infant’s intestines (this is often not an issue for people older than six months because the body’s natural defenses prevent germination of the spores in the intestines). The most common source of infant botulism is honey.
3. Wound: occurs if the spores of the bacteria get into a wound. It is most common among people who inject drugs though it has also occurred in people after a traumatic injury such as a motorcycle accident or surgery. The symptoms may take up to two weeks to occur.
4. Adult Intestinal Toxemia: this is similar to infant botulism but is very rare and occurs in adults.
5. Iatrogenic: occurs if too much botulinum toxin is injected for medical or cosmetic reasons.

The toxin causes muscle paralysis which can result in symptoms such as double or blurred vision, difficulty swallowing or breathing, dry mouth, slurred speech, and muscle weakness. If botulism is suspected, it is considered an emergency and the antitoxin must be administered immediately. Though the antitoxin cannot reverse the damage caused by the botulinum toxin, it can halt further spread of it.

TYPES OF TOXINS:

There are eight types of C. Botulinum toxins: A, B, C1, C2, D, E, F, and G.

A is the most potent, followed by types B and F.

A, B, and E are most commonly associated with systemic botulism in humans.

INTERESTING FACTS:

Bioterrorism: Botulinum toxin is one of the most poisonous known substances. Just 1 kilogram is lethal to humans. Because of this, it could be used in a biological attack by releasing it into the food supply or air. It would be virtually undetectable until people start getting sick. A large stock of antitoxin is stored in the Strategic National Stockpile to be dispatched in the case of an attack.

Ubiquity: C. Botulinum spores are found nearly everywhere: soil, lakes, rivers, oceans, produce surfaces, and more. The spores most commonly germinate into the toxin when introduced into a low-oxygen environment such as the inside of a can of food.

Fatality: the fatality rate from botulism was over 60% in the first half of the 20th century but has now been reduced to under 5% thanks to better food safety practices and education, availability of the antitoxin, and adequately prepared medical facilities.

Prison moonshine: eight inmates in Utah were infected when an inmate made moonshine with grapefruit, oranges, powdered drink mix, canned fruit, water, and a potato. The spores were traced back to the potato which had been pilfered from the cafeteria days earlier.

Alaskan whale: in 2002, two people found a beached whale that appeared to have died a few months earlier. They collected some of the meat, put it in plastic bags, refrigerated it, and gave it to family and friends. Eight of the fourteen people who consumed it became infected.

Baked potatoes: spores can be present on potatoes since they grow in soil, which naturally contains C. Botulinum. It has been noted that when potatoes are baked in aluminum foil and left inside the foil to cool, botulinum toxin can grow. Potatoes should be taken out of the foil before being stored in the fridge or should be eaten immediately when hot.

Nacho cheese: in 2017, a rare case of botulism found in gas station nacho cheese killed one man and infected nine others.

References:

CDC: National Botulism Surveillance.

Foodsafety.gov: <https://www.foodsafety.gov/food-poisoning/bacteria-and-viruses#botulism>

WHO: <https://www.who.int/news-room/fact-sheets/detail/botulism>

Ontario Ministry of Health: <http://www.health.gov.on.ca/en/public/publications/disease/botulism.aspx>

Paper on NCBI: <https://www.ncbi.nlm.nih.gov/pubmed/15027048>

NCBI botulism antitoxin: <https://www.ncbi.nlm.nih.gov/books/NBK534807/>

NCBI botulinum toxin: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2856357/>

Atlantic: <https://www.theatlantic.com/health/archive/2013/12/how-not-to-die-of-botulism/281649/>