



Letter to the Editor

Towards safer practices: A spotlight on foodborne botulism following the recent outbreak in Saudi Arabia in 2024

ARTICLE INFO

Handling Editor: Patricia Schlagenhauf

Keywords:

Foodborne Botulism

Saudi Arabia

Outbreak

Food Safety

BoNTs

Dear Editor,

Many diseases can affect humans through consuming food items or beverages which are contaminated by harmful microorganisms and chemicals, including naturally occurring toxins [1]. Food contamination may occur at different stages of food production and consumption chain such as during food cultivation, processing and manufacturing, storage, distribution, preparation, handling, and consumption [1]. Contracting a foodborne infection or intoxication can result in a wide range of illnesses, which sometimes can be severe enough to cause lethal consequences and life-threatening complications. Foodborne diseases do not only result in a health burden, but also in economic impacts whether due to direct or indirect financial losses. Around 40% of the health burden of foodborne diseases occurs among children under 5 years of age. Approximately, 420,000 fatalities occur every year due to consuming contaminated food (125,000 deaths among children under 5 years of age) [2]. In low- and middle-income countries, more than 100 billion US Dollars in terms of lost productivity and medical expenses comprises the annual economic burden due to consuming unsafe food [2].

One of the lethal foodborne diseases is foodborne botulism which is caused by the Botulinum Neurotoxins (BoNTs) produced by *Clostridia* species. BoNTs are produced by anaerobic, gram-positive, spore-forming bacterium *Clostridium botulinum* and, rarely, by other related species [3]. The bacterium cannot grow in acidic environments (the bacteria cannot grow or produce toxins at a pH below 4.6), yet it can contaminate food items, including preserved vegetables, fish, and meat products. Boiling at temperature greater than 85 °C for at least 5 minutes will inactivate/destroy the toxin but does not kill the bacterial spores as they are heat-resistant, making low-oxygen packaged foods more vulnerable for contamination. Despite the existence of more than 200 *Clostridia* species, only 15 of them produce potent toxins that pose harmful consequences and cause lethal disease in humans and animals [4]. BoNTs are considered very potent natural toxins and are distinguished by their ability to suppress cholinergic neurotransmission, resulting in acute flaccid paralysis. A tiny oral dose as less as 30 nanograms of BoNTs can be sufficient to result in botulism in humans [4]. Although BoNTs are

lethal, they are cautiously being used in medical applications whether therapeutic or cosmetic especially in treating some medical conditions like multiple sclerosis, strabismus, blepharospasm, and in cosmetic industry.

Generally, human botulism is classified into many types including foodborne botulism, infant botulism, wound botulism, inhalational botulism, and iatrogenic botulism. Foodborne botulism is caused by the growth of neurotoxicogenic *Clostridium botulinum* in food prior to consumption, especially in low-oxygen conditions [3]. Symptoms of Foodborne botulism may include a wide range of manifestations, but the main pathologic characteristic of botulism is acute, afebrile, symmetric descending flaccid paralysis of variable extent that affects both voluntary and involuntary muscles, excluding sensory and intellectual functions [3]. The symptoms often appear within 12–36 hours after ingesting contaminated food, although in some cases, the symptoms may appear after few days [3].

In April 2024, the Saudi ministry of health declared an outbreak of food poisoning which was linked to one major fast-food establishment in the capital city of Saudi Arabia, Riyadh. The food poisoning was confirmed to be caused by BoNTs [5]. As of May 04, 2024, there were 75 victims, including one fatality [5].

Although botulism is uncommon, but it carries high mortality, and it is considered a life-threatening condition. Therefore, a prompt diagnosis is necessary for effective management. Differential diagnoses may include other neurological diseases that share many clinical features with botulism such as myasthenia gravis and Guillain-Barré syndrome [3]. Aside from clinical manifestations and patient history, the usual laboratory confirmatory diagnosis of botulism is based on detecting botulinum neurotoxin in the patient. However, and due to the lethal consequences of botulism, it is recommended to start treatment and management based on clinical suspicion and before obtaining the laboratory confirmation. Antitoxin should be given as soon as feasible following a clinical diagnosis. Timely treatment is crucial for reducing fatality rates and enhancing patient outcomes. Severe cases of botulism require comprehensive supportive care, especially mechanical ventilation [3]. Antibiotics are generally unnecessary, except in wound

<https://doi.org/10.1016/j.nmni.2024.101534>

Received 6 October 2024; Accepted 12 November 2024

Available online 14 November 2024

2052-2975/© 2024 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

botulism.

Responding to foodborne botulism outbreak should be coordinated between various authorities and sectors by initiating surveillance and early detection, coordinating and exchanging data through the International Network of Food Safety Authorities (INFOSAN) which connects various local authorities between countries to report and evaluate food safety events, conducting risk assessment to evaluate the type of botulism outbreak (natural, accidental, intentional), and containing the outbreak source.

As foodborne diseases may be contracted at various stages of food production and consumption chain, combatting this public health threat requires a comprehensive multifaceted and multisectoral approach that unravels the driving factors and potential pathogens at each stage. Concerning botulism, there is no vaccine that prevents it; however, prevention of foodborne botulism requires the implementation of stringent safe practices and measures during food handling and consumption [2]. This applies to capacity building of food handlers as well as consumers utilizing the WHO five keys to safer food. This includes maintaining cleanliness, separating raw and cooked foods, ensuring thorough cooking, storing food items at safe temperatures, and using safe water and ingredients. Additionally, foodborne botulism poses a significant challenge due to the global movement of food products and the potential for cross-border contamination. *Clostridium botulinum* spores may be inadvertently introduced into food supplies through imports, particularly in canned, preserved, or processed foods. Accordingly, strict food safety regulations and import/export standards are crucial in mitigating this public health threat, ensuring that food products are properly handled, processed, and stored in compliance with international standards. The inhibition of the bacterial growth and toxin production acts as an important prevention measure to mitigate the risks of foodborne botulism, accompanied by safe food handling practices.

CRedit authorship contribution statement

Muna Horabi: Writing – original draft, Writing – review & editing.
Dalia Zayed: Writing – original draft, Writing – review & editing.
Ala'a B. Al-Tammemi: Conceptualization, Data curation, Supervision, Validation, Writing – original draft, Writing – review & editing.

Financial Support

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgments

None.

References

- [1] Camino Feltes MM, Ariseto-Bragotto AP, Block JM. Food quality, food-borne diseases, and food safety in the Brazilian food industry. *Food Qual Safety* 2017;1: 13–27. <https://doi.org/10.1093/fqsafe/fyx003>.
- [2] World Health Organization. Food safety. Online; 2022. <https://www.who.int/news-room/fact-sheets/detail/food-safety> (accessed May 7, 2024).
- [3] Rao AK, Sobel J, Chatham-Stephens K, Luquez C. Clinical guidelines for diagnosis and treatment of botulism, 2021. *MMWR Recomm Rep* 2021. <https://doi.org/10.15585/mmwr.rr7002a1>.
- [4] Poulain B, Popoff MR. Why are botulinum neurotoxin-producing bacteria so diverse and botulinum neurotoxins so toxic? *Toxins (Basel)* 2019;11. <https://doi.org/10.3390/toxins11010034>.
- [5] Al Sherbini R. Saudi Arabia: 75 hospitalised, 1 dead in food poisoning outbreak at Riyadh restaurant. Online; 2024. <https://gulfnews.com/world/gulf/saudi/saudi-arabia-75-hospitalised-1-dead-in-food-poisoning-outbreak-at-riyadh-restaurant-1.1714818094743>. [Accessed 7 May 2024].

Muna Horabi, Dalia Zayed, Ala'a B. Al-Tammemi*
 Research, Policy, and Training Directorate, Jordan Center for Disease
 Control (JCDC), 11183 Amman, Jordan

* Corresponding author. Jordan Center for Disease Control, Amman,
 Jordan.
 E-mail address: a.altammemi@jcdc.gov.jo (A.B. Al-Tammemi).