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CASE REPORT

An Outbreak of Food-borne Botulism Caused by a Traditional Yogurt

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Abstract

Introduction: Foodborne botulism (FB) is a potentially fatal and paralytic disease which can be prevented by the application of simple measures. FB outbreaks are usually the results of consuming contaminated canned vegetables or meat. However, in rare cases, dairy products can be their source of occurrence.
Case Presentation: We report on nine cases of confirmed botulism who referred to our center on December 2019 with a common history of exposure to a type of traditional yogurt called "Poost yogurt" in local language. Patients presented with various combination of symptoms, 5 of them required ICU admission. All hospitalized patients fully recovered and discharged at a median of 14.5 days. In addition to these 9 cases, 60 patients were admitted and treated at Neyshabour University of Medical Sciences, as well. Totally, 69 patients in the area were diagnosed with FB with a definite history of "Poost yogurt" consumption and telltale symptoms of botulism.
Discussion: Dairy products are a relatively uncommon source of FB. However, home-prepared cheese, and rarely yogurt, could bear contamination with clostridium botulinum, leading to intoxication due to improper refrigeration or incomplete heating. In this outbreak, the source of toxin was tracked down to a home-prepared Poost yogurt being sold at a dairy shop in Neyshabour. It is conceivable that improper refrigeration or incomplete heating of the milk, before fermentation, has led to spore vegetation and toxin production.
Conclusion: It is necessary to increase public awareness about traditional dairy products as a potential source of FB.

Keyword: botulism, dairy products, disease outbreak, yogurt

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INTRODUCTION

Foodborne botulism is a potentially fatal paralytic disease which is caused by ingestion of food contaminated by botulinum neurotoxin (BNT). BNT is produced mainly by strains of *Clostridium botulinum*, a species of gram-positive, spore-forming bacteria (1). *C. botulinum* strains A, B, E, and F can cause botulism in human, while strains C and D are disease-causing in animals such as cattle, duck, and chicken (2). Botulinum toxin is the most lethal bacterial toxin with its estimated minimum lethal dose in human being 0.7 – 0.9 µg for aerosolized form and 70 µg when used orally. It is estimated that one gram of aerosolized botulism toxin could kill approximately 1.5 million people (3). Clinical characteristics include a spectrum of mild symptoms such as dizziness, blurred vision, slurred speech, and ptosis to more severe symptoms of swallowing impairment, respiratory failure, and dysautonomia (4). Annual incidence of foodborne botulism is 7.1 and 3.3 per 100,000 Iranian men and women, respectively (5). Based on _____ recent national surveillance data, common sources of foodborne botulism in Iran include home-prepared traditional processed fish, commercially canned fish, fish spawn, dairy products, vegetables and home-prepared legumes, cottage cheese, and canned fruits (5).

In the present study, we report on nine cases of confirmed botulism referred from Neyshabour, a city in northeast Iran, to our center on December 2019 with a common history of exposure to a type of traditional yogurt called "Poost yogurt" in local language. In addition, 60 other patients around Neyshabour were diagnosed with FB with a definite history of Poost yogurt consumption accompanied with telltale symptoms.

CASE REPOT

Our first case was an 8-year-old male presented with dizziness. After 6 hours of admission, he developed bilateral ptosis and at 24 hours swallowing and breathing was impaired which obviated endotracheal intubation and ICU admission. Examination showed dilated and sluggish pupils, bilateral ophthalmoplegia, decreased gag reflex, bilateral facial palsy,

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mild generalized limb weakness, and areflexia all suggestive of botulism. His parents confirmed that he had ingested "Poost yogurt" 24 hours prior to symptom onset. He was treated with trivalent (A, B, and E) antitoxin with complete recovery and discharged home 33 days after his admission.

Subsequently, 8 additional cases were referred to our center with clinical presentation suggestive of botulism and a common history of ingesting Poost yogurt. Clinical features of all patients are summarized in Table 1.

Interestingly, one of our patients (patient 9) presented approximately 3 months later and the reason for this delay was that patient stored Poost yogurt in the freezer for 3 months and started to use it afterward which led to botulism symptoms 7 days later.

Furthermore, we managed to detect botulinum neurotoxin in the serum of one of our patients (patient 6), though, the confirmation of other cases was based on characteristic clinical features, known exposure to a definite source of toxin, and excellent response to trivalent botulinum antitoxin. It is essential to note that all hospitalized patients were treated with trivalent antitoxin which led to complete recovery and discharge after a median of 14.5 days.

Table 1. Patient characteristics, signs, symptoms, and lab findings.

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5[c]	Patient 6	Patient 7	Patient 8	Patient 9
Gender	M	M	M	M	F	M	F	M	M
Age (years)	8	36	62	27	24	46	43	48	47
Latency[a] (days)	1	3	7	1	1	3	2	1	7
Consciousness	Decreased	Awake	Awake	Awake	Awake	Awake	Awake	Decreased	Awake
Ptosis	+	+	+	+	+	+	+	+	+
Diminished gag reflex	+	-	-	+	-	+	+	-	+
Facial paralysis	+	-	-	-	-	+	-	-	-
Ophthalmoplegia	+	-	-	+	-	-	+	+	+
Dilated pupils	+	-	-	-	-	-	-	N/A	-
Nystagmus	-	-	N/A[b]	+	-	-	-	N/A	-
Ataxia	-	-	-	-	-	-	-	-	-
Loss of DTR	+	-	N/A	-	-	+	-	N/A	-
Dysphagia	+	-	-	+	-	+	+	-	+
Difficulty speaking	-	-	-	+	-	+	+	-	+
Diplopia	+	+	+	+	+	+	+	+	+
Blurred vision	-	+	+	+	+	-	-	+	+
Paresthesia	-	-	-	-	-	+	-	-	-
Dry mouth	+	+	+	+	-	-	-	-	-
Neck weakness	+	-	-	+	-	-	-	-	-
Limb weakness	+	+	+	-	-	-	+	+	-
Headache	-	-	-	-	-	-	+	-	-
Dizziness	+	+	+	-	+	+	-	+	+
Sore throat	-	-	-	-	-	-	-	-	-
Fatigue	+	+	+	+	+	+	+	+	+
Abdominal pain	-	-	-	-	-	-	-	-	-
Nausea	-	-	-	-	+	-	+	+	-

Table 1. Continued

	Patient 1	Patient 2	Patient 3	Patient 4	Patient 5[c]	Patient 6	Patient 7	Patient 8	Patient 9
Vomiting	-	-	-	-	+	-	+	+	-
Diarrhea	-	-	-	-	-	+	-	-	-
Constipation	-	-	-	-	-	-	-	-	-
NCS studies	NL NCVs Mildly reduced CMAPs amplitude	NL	NL NCVs Mildly reduced CMAPs amplitude	NL	NL	NL	N/A	NL	NL
EMG studies	Myopathic pattern with mild muscle irritability	NL	Myopathic pattern with mild muscle irritability	NL	NL	NL	N/A	NL	Myopathic pattern with muscle irritability
RNS studies	N/A	NL	Incrementing Pattern on high frequency RNS study	Mild increment on post-exercise study (High frequency RNS not performed)	NL	Incrementing Pattern on high frequency RNS study	N/A	Mild increment on post-exercise study (High frequency RNS not performed)	Decrementing pattern on low frequency RNS study, Incrementing Pattern on high frequency RNS study
Intubation	+	-	-	-	-	+	-	+	-
Duration of hospitalization	33	3	Outpatient	10	3	21	11	18	9
ICU admission	+	-	-	+	-	+	+	+	-
Outcome	Complete recovery	Complete recovery	Complete recovery	Complete recovery	Complete recovery	Complete recovery	Complete recovery	Complete recovery	Complete recovery

CMAP, compound muscle action potential; DTR, deep tendon reflex; EMG, electromyography; NCS, nerve conduction study; RNS, repetitive nerve stimulation.
[a] Time from exposure to symptom onset.
[b] Not available.
[c] Patient was 14-week pregnant.

DISCUSSION

In this article, we reported on nine cases of FB referred to our center during December 2019. An outbreak was suspected after multiple patients presented with clinical features of botulism. This outbreak was one of the largest outbreaks nationwide with at least 69 affected people. Poost yogurt, sold at a dairy shop in Neyshabour, was found as the common source after carrying out detailed interviews with the patients.

Although FB cases are usually sporadic and an outbreak of botulism is rare, in the past couple of years, despite progress in the food-preservation, numerous FB cases have been reported (5). Early symptoms of foodborne botulism occur within a few hours to days after the ingestion of the contaminated food (6) which requires prior preparation with antidote stocking (7), however, delayed symptom onset in some patients could be due to uneven distribution of toxin in foods with firm and dense texture, such as Poost yogurt. This type of traditional yogurt is prepared by repeated cycles of draining sour milk, and/or fresh yogurt, in a tanned sheep hide. Poost yogurt producers commonly use unpasteurized milk and store the product in room temperature. In general, factors that may lead to spore germination and toxin production in dairy products include insufficient heating, improper refrigeration, or inadequate fermentation with PH being greater than 5 (8). Hence, it can be argued that the first two factors, i.e. improper refrigeration or incomplete heating of the milk before fermentation, might have been involved in spore germination and toxin production in this case. This is the case because fermentation, while effective in restricting the growth of vegetative cells, cannot inactivate preformed toxin.

CONCLUSION

FB due to dairy products are rare compared to vegetable, meat, or fish sources, however, they can cause large outbreaks as demonstrated in this research study. Considering the plausible causes of this outbreak, we imply that future outbreaks could only be prevented via education and increasing public awareness and knowledge about the disease and offering preventive measures.

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Ethical statement

This research was conducted in accordance with the Declaration of Helsinki. Informed consent was obtained from all participants.

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