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Foodborne Botulism Outbreak After Consumption of Home-Canned Cactus (Nopales) — Fresno County, California, June 2024

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Abstract

Foodborne botulism is a rare and potentially fatal illness caused by ingestion of food containing botulinum neurotoxin produced by the bacterium *Clostridium botulinum* or other neurotoxigenic *Clostridium* species. *C. botulinum* can grow in improperly prepared or stored food items such as home-canned or home-preserved vegetables. On June 25, 2024, the Fresno County Department of Public Health and California Department of Public Health, in collaboration with CDC and two local hospitals, initiated an investigation of a foodborne botulism outbreak linked to two related family gatherings in Fresno County, California. A total of 31 persons attended one or both gatherings. Eight attendees had symptoms compatible with botulism and received botulism antitoxin; five of eight had botulinum neurotoxin type A (BoNT/A) detected in serum. Patients had hospital stays ranging from 2 to 42 days, six patients were admitted to an intensive care unit, and two required invasive mechanical ventilation; all survived. Epidemiologic investigation identified home-preserved prickly pear cactus pads (nopales) included in a homemade salad and served at both events as a food item of interest; laboratory testing confirmed the nopales salad as the source of BoNT/A. This foodborne botulism outbreak is the first reported to be linked to home canning of nopales, a popular vegetable used in traditional Mexican cuisine. Rapid public health coordination is essential for responses to foodborne botulism outbreaks. Enhancing community and clinician awareness of foodborne botulism by increasing access to culturally and linguistically accessible home food preservation and canning guidelines might help prevent future outbreaks.

Investigation and Results

Outbreak Identification and Case Classification

On June 23, 2024, a woman aged 42 years (index patient [patient A]) was evaluated at a hospital in Fresno County for a 12-hour history of dizziness, sore throat, and gastrointestinal symptoms; she received a diagnosis of heat-related dehydration and was discharged. She returned to the hospital the next morning (June 24) but left without being evaluated.

On June 25, patient A returned to the same hospital with persistent dizziness, blurry vision, a drooping eyelid, and difficulty swallowing. She was admitted and received mechanical ventilation within 6 hours of arrival because of impending respiratory failure; botulism was suspected because of progressive descending paralysis, a primary clinical characteristic of botulism. The woman's relatives reported that she had attended two family gatherings, on June 21 and 22. Also on June 25, six other persons (patients B–G) who had attended these gatherings sought care at either the same hospital as patient A, or a second hospital in Fresno County, for a range of neurologic symptoms that started on June 23 and 24. Hospital staff members notified the California Poison Control System (CPCS) and the Fresno County Department of Public Health (FCDPH) of a suspected case of botulism in patient A, and similar illnesses among family members who attended the same events. FCDPH personnel contacted the California Department of Public Health (CDPH) to request equine heptavalent botulinum antitoxin (HBAT), the primary treatment for noninfant botulism, from CDC port

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health stations in California. On June 25, FCDPH also initiated an investigation to 1) determine the source of the outbreak, 2) identify all persons at risk, and 3) make recommendations to prevent further illness. Because the gatherings held on June 21 and 22 were considered the likely sites of exposure, detailed food and beverage consumption histories were collected from all attendees. A clinical diagnosis of botulism was made for cases in which history, epidemiologic links, or physical examination were highly suggestive of botulism, but laboratory diagnosis had not yet been established. A laboratory-confirmed case of botulism associated with this outbreak was defined as an illness that was clinically compatible with botulism in a person who had attended either or both of the family gatherings and that met at least one laboratory criterion: detection of botulinum neurotoxin (BoNT) in a patient's serum, stool, or food, or isolation of *Clostridium botulinum* from stool.

On June 27, three additional persons (patients H–J) were hospitalized, also with neurologic complaints and a history of having attended the same family gatherings on June 21 or 22. This activity was deemed routine public health response and not research by CDPH and was therefore exempt from review by institutional review board. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.*

* 45 C.F.R. part 46.102(l)(2), 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

Patient Characteristics

Among 31 persons who attended one or both gatherings, 10 patients sought evaluation at one of two hospitals in Fresno County (five patients at each hospital) during June 23–June 27, with illness onsets ranging from June 23 to June 27, and an interval of 1–5 days from symptom onset until evaluation (Figure 1). Eight of the 10 patients (patients A–F, H, and I) received a clinical diagnosis of botulism; the most common clinical findings included diplopia (eight patients), hoarseness (seven), dizziness (six) and difficulty swallowing (six) (Table). All patients were Hispanic or Latino, the median age was 44 years (range = 24–59 years), and five were women.

All 10 patients were hospitalized, and six patients were admitted to an intensive care unit; two (patients A and B) required invasive mechanical ventilation. All eight patients with a clinical diagnosis of botulism (patients A–F, H, and I) received HBAT, and all survived and recovered fully without residual functional limitations. Median hospital length of stay was 4 days (range = 2–42 days) (Supplementary Table). In two of the 10 patients who sought health care for symptoms after attending one or both gatherings (patients G and J), a clinical diagnosis of botulism was excluded after a thorough physical examination and brief period of observation in a hospital; the two patients were ultimately determined to have anxiety symptoms.

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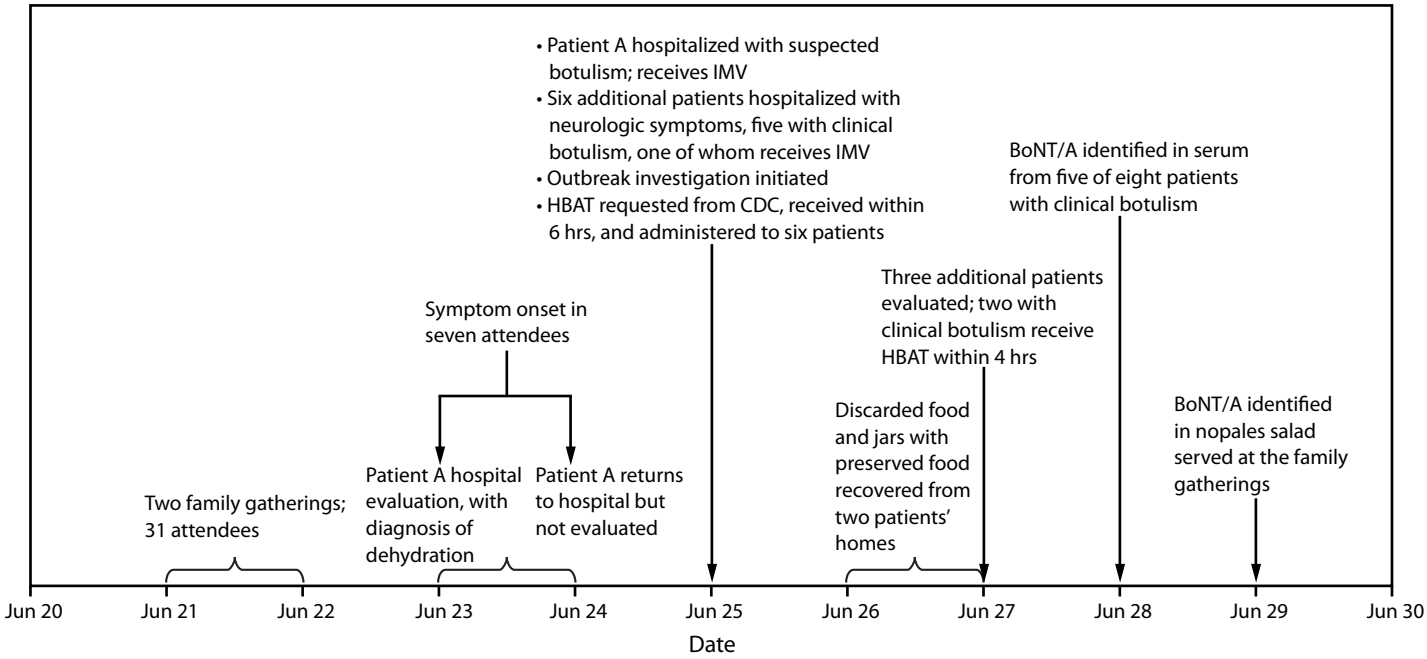
FIGURE 1. Timeline of events during a foodborne botulism outbreak associated with home-prepared cactus (nopales) — Fresno County, California, June 2024



Abbreviations: BoNT/A = botulinum neurotoxin type A; HBAT = heptavalent botulinum antitoxin; IMV = invasive mechanical ventilation.

Epidemiologic Investigation

Interviews with patients or their proxies indicated that six of the hospitalized patients had attended both gatherings, which were held indoors. Ambient outdoor temperatures exceeded 100°F (37.8°C) during both gatherings, and leftover food from the first gathering on June 21 was served again on June 22. Food served at the events included pork tamales, hamburgers, and salad made from nopales, prickly pear cactus pads that are a popular food in traditional Mexican dishes. The eight patients with clinical botulism were the only attendees who ate the nopales salad; patient A, who experienced the most severe symptoms, ate this item at both events.

Patient D reported that she had prepared the nopales salad using fresh onions, fresh tomatoes, and home-preserved nopales stored in glass jars. She had prepared the empty jars by immersing them in boiling water, and then added chopped, uncooked nopales mixed with a small amount of salt. She closed the jars with new metal lids and stored them for 6 weeks in an outdoor shed behind her home. The nopales salad she had prepared was not shared outside of these gatherings. She had been home preserving foods for years using this technique, which was taught to her by friends and relatives, and said she was unaware of the risk for botulism associated with this practice.

Environmental Investigation

The FCDPH Environmental Health Division inspected the homes of patients A and D on June 26 and 27, respectively. At the home of patient A, investigators recovered refrigerated leftover food items (including hamburger patties, homemade pork tamales, and home-pickled serrano peppers), as well as samples of fruit salad and nopales salad discarded in outside trash bins. At patient D's home, where the nopales salad was prepared, investigators collected 23 food jars containing either nopales or tomatoes stored in a covered structure without air conditioning. The jars were reused commercial food containers, and several had visibly corroded lids (Figure 2). FCDPH Environmental Health personnel sent these items to the CDPH Microbial Diseases Laboratory (MDL).

Laboratory Investigation

On June 26, serum specimens from the eight patients with a clinical diagnosis of botulism (patients A–F, H, and I) were sent to CDPH MDL to test for the presence of BoNT, and stool specimens from two patients (patients F and G) were submitted for *C. botulinum* culture and BoNT testing. The sera, extracts of the stool specimens, and food specimens prepared in gelatin phosphate diluent were screened for the presence of BoNT using a standard mouse bioassay (*1*). BoNT was presumptively identified in five serum specimens (patients A–D and F) on June 27; subsequent testing of these specimens by type-specific toxin neutralization using monovalent botulinum antitoxins A and B identified BoNT type A (BoNT/A) in all five specimens (Supplementary Table). BoNT and *C. botulinum* were not detected in the stool specimens from patients F and G. One jar

TABLE. Characteristics of patients with clinically diagnosed botulism associated with consumption of home-canned cactus (nopales) (N = 8)* — Fresno County, California, June 2024

Characteristic	No. of patients
Sex	
Female	5
Male	3
Age group, yrs	
20–30	1
31–40	1
41–50	4
51–60	2
Signs and symptoms	
Diplopia	8
Hoarseness	7
Dizziness	6
Difficulty swallowing	6
Fatigue	6
Dysphonia	5
Dry mouth	5
Nausea	4
Ptosis	4
Symptom latency	
1 day	2
2 days	4
3 days	0
4 days	0
5 days	2
Botulinum neurotoxin type A detected	**5**
Management and complications	
Hospitalization	8
Treatment with heptavalent botulinum antitoxin	8
Intensive care unit admission	6
Invasive mechanical ventilation	2
Death	0

* Two additional patients were briefly hospitalized before the diagnosis of botulism was excluded.

of nopales and one jar of tomatoes were tested, and both results were negative for the presence of BoNT; however, BoNT/A was detected in the discarded nopales salad that had been preserved in one of the glass jars, confirming the source of the toxin.

Public Health Response

Multiple agencies worked closely to support a timely response to this outbreak. CPCS and FCDPH initially provided clinical guidance for local hospital teams on the morning of June 25. FCDPH issued a public health alert for the health care community on the afternoon of June 25 and issued a press release on June 26. CDPH personnel contacted CDC botulism subject matter experts on June 25, within 2 hours of the first hospital's initial call to FCDPH, to communicate their concern about the potential for a large outbreak and to request 8 doses of HBAT.

CDC distributes HBAT from selected, geographically dispersed port health stations located at major U.S. airports.† HBAT delivery from two CDC port health stations was facilitated by helicopter transport to Fresno's regional airport, and subsequently to both local hospitals with the aid of California Highway Patrol. HBAT was administered to six patients (three at each hospital) on the evening of June 25, approximately 8 hours after the initial request for antitoxin. The 2 doses transported on June 25 that were not used were stored in the inpatient pharmacy at the first hospital and were later administered to the seventh and eighth patients (patients H and I), both of whom were evaluated at the second hospital on the evening of Thursday, June 27. HBAT was transferred locally by FCDPH within 4 hours of patient evaluation on June 27. This outbreak response temporarily depleted HBAT supplies stored at the CDC port health stations in California; however, the supply was replenished within 48 hours.

Discussion

This botulism outbreak involving eight patients who attended two gatherings where contaminated food was served is one of the largest documented foodborne botulism outbreaks in California, and the first reported outbreak of foodborne botulism linked to improperly preserved nopales. Nopales, a popular food in traditional Mexican dishes, are gaining popularity in other communities as a healthy ingredient.

Foodborne botulism is a rare but potentially fatal illness caused by BoNT produced by *C. botulinum* bacteria, and rarely, other neurotoxigenic *Clostridium* species (*2*). Recognition of early signs and symptoms of botulism can be challenging. The clinical syndrome is characterized by descending flaccid paralysis, beginning with cranial nerve dysfunction followed by arm and leg weakness and respiratory failure resulting from diaphragmatic and intercostal muscle weakness (*2*). A delay in diagnosis, especially when only early signs and symptoms of possible descending paralysis (i.e., dizziness, blurred vision, and difficulty swallowing) are present, can impede timely initiation of treatment (*3*). Therefore, recognition of botulism signs and symptoms, and prompt notification of public health partners, are vital (*4*). Ongoing health care provider education about the sources, clinical presentation, and clinical course of botulism might improve early recognition and facilitate initiation of lifesaving clinical management for this relatively rare condition (*4*). Medical societies, poison control centers, and media can also help increase botulism awareness among health care providers and the public, especially when a local botulism outbreak investigation has been initiated (*5*).

Clinicians suspecting botulism should immediately alert their local or state health department, which can facilitate CDC consultation and authorization for HBAT release and investigation into contaminated food sources (*4*). If clinical suspicion is high, timely HBAT treatment should be administered while awaiting laboratory confirmation, because HBAT halts disease progression by binding to BoNT in the bloodstream and preventing attachment to presynaptic

† Formulary: Infectious Diseases Laboratories | Section on Botulism Antitoxin Heptavalent | CDC

FIGURE 2. Three jars of home-canned prickly pear cactus pads (nopales) and four jars of tomato preserves with corroded lids, from the home of a patient with botulism who had canned these items — Fresno County, California, June 2024

Photo/Fresno County Department of Public Health Environmental Health Division

receptors (*6*). Close coordination between hospitals and public health agencies is required for successful outbreak response, and innovative methods of HBAT transportation and delivery might be needed to ensure timely release and delivery to remote locations.

Foods that are not properly processed, fermented, preserved, stored, or refrigerated can facilitate *C. botulinum* growth and toxin production, particularly if the food is in a low-acid, unrefrigerated, and anaerobic environment (*7*). Home canning or fermentation of vegetables are common practices used to preserve various foods by persons from diverse backgrounds and are the most common causes of foodborne botulism in the continental United States (*8*–*10*).

During this outbreak, epidemiologic and laboratory investigations identified home-canned nopales as the source of BoNT. Interviews and environmental health investigation revealed that the food preparation method created conditions favorable for persistence of *C. botulinum* spores. The person who preserved the nopales did not have formal training in food preservation or canning, or follow published canning guidance for low-acid foods such as nopales.[§] Proper canning of such foods requires sterilizing jars both when empty and after being filled with

[§] Resources: USDA Complete Guide to Home Canning | National Center for Home Food Preservation

Summary

What is already known about this topic?

Foodborne botulism is a potentially fatal illness caused by a neurotoxin produced by the bacterium *Clostridium botulinum*, which can grow in improperly prepared or stored food items, including home-canned vegetables.

What is added by this report?

In June 2024, an outbreak of eight cases of foodborne botulism was caused by contaminated home-prepared prickly pear cactus (nopales); two patients required invasive mechanical ventilation. The outbreak led to a coordinated investigation and intervention by local, state, and federal agencies. All patients received timely treatment with heptavalent botulinum antitoxin, and all recovered.

What are the implications for public health practice?

Rapid public health coordination is essential for responses to foodborne botulism outbreaks. Enhancing community and clinician awareness of foodborne botulism and increasing access to home food preservation and canning guidelines might help prevent future outbreaks.

food, with a pressure canner, rather than only immersing empty jars in boiling water, as was done before this outbreak.¶

Implications for Public Health Practice

Clinicians who identify a patient with botulism symptoms should immediately notify their local health jurisdiction or state health department. The clinical diagnosis of botulism requires a high index of suspicion, obtaining a meticulous food and exposure history, and a thorough physical examination to identify characteristic signs and symptoms of cranial neuropathy or descending paralysis. Disease progression can be halted with timely administration of HBAT; however, because HBAT is not stocked in hospitals, close coordination among clinical teams in hospitals, local and state public health agencies, and CDC is critical. A thorough field investigation by local public health departments can identify the likely food source and contain an outbreak. Public health agencies and partner organizations can play an important preventive role, by educating communities about proper home preservation and canning techniques using accessible language and culturally sensitive approaches.

¶ Home-Canned Foods | Botulism | CDC

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