Connecticut Epidemiologist

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A Review of Botulism Cases in Connecticut, January 2014–October 2024

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In this issue...

A Review of Botulism Cases in Connecticut, January 2014–October 2024 1

A Connecticut Outbreak of Listeriosis – An Interstate Investigation 4

Background

Clostridium botulinum is a spore-forming obligate anaerobic bacillus that produces toxins that cause botulism, a rare but dangerous illness that attacks the body's nervous system. The toxins inhibit the release of acetylcholine from the presynaptic nerve endings causing flaccid paralysis, which may result in extensive respiratory muscle paralysis leading to ventilatory failure and death unless supportive care is provided. (1) Given the severity of disease caused by *C. botulinum*, it is considered a potential agent of bioterrrorism.

Spores produced by the bacteria *C. botulinum* are heat-resistant and germinate in the absence of oxygen; they are naturally ubiquitous in the environment, and are commonly found in soil and dust, or improperly canned or preserved foods. Most people do not get sick when exposed to botulinum toxin. Under certain conditions, these spores can grow and make one of the most lethal toxins that exists. In addition to low-oxygen or no oxygen, these conditions include low acid, low sugar, low salt, a certain temperature range, and a certain amount of water. (2) Botulinum toxins are classified into seven related neurotoxins, A through G. Types A (BoNT A) and B (BoNT B) are the primary cause of disease in humans; rarely, Types E (BoNT E) and Type F (BoNT F) can cause human illness.

The Centers for Disease Control and Prevention (CDC) categorizes human botulism cases into four transmission subtypes: foodborne botulism, wound botulism, infant botulism, and "other" botulism (includes adult intestinal colonization, iatrogenic botulism, and unknown routes of transmission). (2) Infant botulism is the most common form of botulism in the U.S. Of foodborne-related infant botulism cases, honey is the main souce of infection in infants under 12 months old. According to CDC's 2019 national botulism surveillance summary, health departments reported 215 cases of botulism to CDC. Among those cases, 201 were laboratory confirmed and 14 were probable. The cases were of the following types: 152 (71%) infant, 41 (19%) wound, 21 (10%) foodborne, and 1 (<1%) other, diagnosed as probably adult intestinal colonization. (3)

Methods

In Connecticut, botulism is a Category 1 disease that is provider reportable immediately by telephone on the day of recognition or strong suspicion to both the Connecticut Department of Public Health (CT DPH) and the local health department (LHD). The director of any clinical laboratory must also report laboratory evidence of botulism to both the DPH and the LHD. (1) The DPH and the LHD collaborate to follow up on all botulism reports with a patient or surrogate interview to collect information on symptoms and possible exposures. Clinical specimens (serum and/or stool) are collected and sent to the CT State Public Health Laboratory (SPHL) and are then forwarded to Wadsworth Center Laboratory at the New York State Department of Health for botulism testing. Food samples might be collected for testing when food exposures are reported or suspected. A confirmed case of foodborne or infant botulism requires a clinically compatible illness and laboratory detection of botulinum toxin in serum, stool, or patient's food or isolation of *C. botulinum* from stool. (4)

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A Review of Botulism Cases in Connecticut, January 2014–October 2024 *(continued)*

Results

During January 2014–October 2024, CT DPH received reports of 11 (10 infant, 1 adult) confirmed cases of botulism (Figure 1). Six (55%) of the cases occurred since 2023. Of the 11 confirmed cases, 7 (64%) tested positive for BoNT B and 4 (36%) tested positive for BoNT A. All 11 cases were hospitalized and received antitoxin. All 10 infant cases survived; 1 adult case died.

Among the 10 infant botulism cases, the median age at onset of illness was 21.1 weeks (range of 3.5 weeks to 29.7 weeks); 6 (60%) were male; 8 (80%) were White, non-Hispanic and 2 (20%) were Hispanic. Seven (70%) tested positive for BoNT B and 3 (30%) for BoNT A. Five infant cases were reported to have had environmental exposures to construction, a highly unsanitary living environment, and/or gardening and other yardwork around the home or other locations. Four infant botulism cases that occurred between 2021–2024 had more extensive investigations conducted that included food and product testing. One infant case was reported to have consumed honey during the incubation period; a honey sample collected from the home tested positive for BoNT A. Food and product samples collected as part of investigations into the other three infant botulism cases all tested negative for *C. botulinum* toxin. These collected samples included oatmeal, infant formula, nipple cream, applesauce, diaper cream, and homemade granola.

The one adult botulism case was a White, non-Hispanic male, >70 years of age, with BoNT A. No high-risk foods were identified through surrogate or case interviews. A home assessment was conducted and four food samples collected from the home tested negative for *C. botulinum* toxin. The cause of illness could not be determined for the adult case.

Discussion

All forms of botulism can be fatal and are considered medical emergencies. Prompt diagnosis, treatment with antitoxin, and supportive care can lower the risk of complications. Rapid epidemiologic response, including case investigation can help identify suspect foods in cases of adult or foodborne botulism. Honey is a well-known risk and is not safe for infants.

Exposure to dust can also be a significant risk factor for infant botulism since *C. botulinum* bacteria can dwell in soil and dust. Infants can be exposed to dust and soil through a variety of mechanisms; household dust, home renovation works, construction sites near where they live, and dust carried by parents from their working site to home. (6)

Although cases of botulism have been rare in CT since 2014, the increase in the number of infant botulism cases in the last year is concerning. The reason for this increase and whether similar increases are being seen in other states is unknown. Further study is needed to determine if factors such as diagnostic testing practices and/or environmental conditions might have a potential impact on disease incidence.

The investigation and management of botulism requires a high level of public health collaboration. It involves not only the partners described above but also botulism specialists. The Infant Botulism Treatment and Prevention Program (IBTPP) at the California Department of Public Health provides consultations for infant botulism while CDC's clinical emergency botulism service provides consultations for adult botulism. When the clinical consultation supports a diagnosis of botulism, antitoxin can be immediately requested and treatment should begin as soon as possible, even if confirmatory testing has not been completed. The IBTPP releases BabyBIG®, Botulism Immune Globulin Intravenous (Human) (BIG-IV), which has been approved by the Food and Drug Administration (FDA) for the treatment of infant botulism types A and B. Botulism Antitoxin Heptavalent (BAT), which has been approved by the FDA for the treatment of symptomatic botulism following exposure to botulinum neurotoxin serotypes A, B, C, D, E, F, or G is used in adult and pediatric patients. (5)

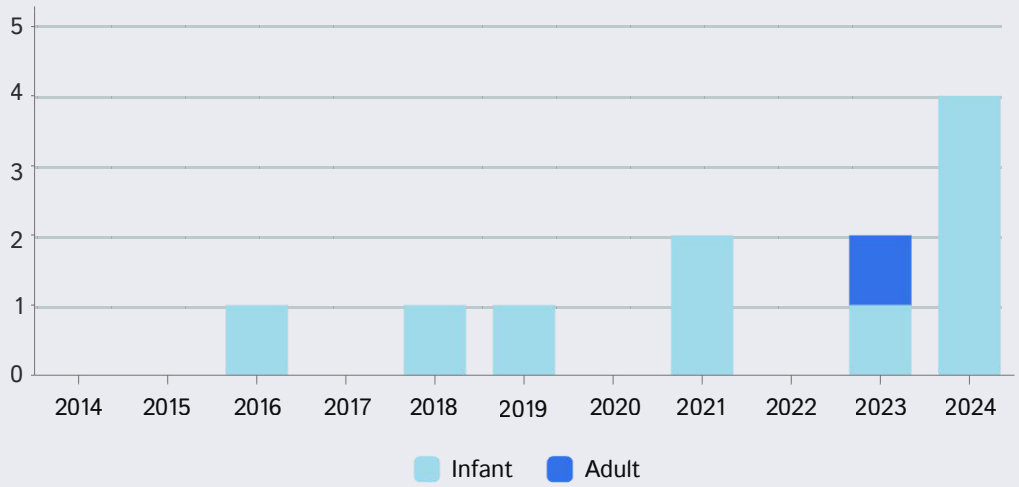
Healthcare providers evaluating patients suspected of having botulism should immediately notify the CT DPH and LHD by telephone at (860) 509-7994 during business hours and (860) 509-8000 during evenings, weekends, and holidays.

Acknowledgements

Wadsworth Center at the New York State Department of Health, Infant Botulism and Treatment Program at the California Department of Health. CDC Clinical Botulism Service, and CT Local Health Departments.

A Review of Botulism Cases in Connecticut, January 2014–October 2024 *(continued)*

Figure 1. Botulism Cases by Year, Connecticut January 2014—October 2024 (N=11)



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A Connecticut Outbreak of Listeriosis – An Interstate Investigation

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Background

Listeriosis is a low incidence disease due to infection with the *Listeria monocytogenes* bacterium that averages only eighteen cases reported per year in Connecticut (CT). Outbreaks of listeriosis involving CT residents are rare. Between 2008–2022, CT investigated *Listeria* cases identified as part of eight multistate outbreaks. (1) Historically, outbreaks of listeriosis have been linked to unpasteurized dairy products, ice cream, vegetables, fruits, poultry, sausages, hot dogs, deli meats, smoked or raw fish and other seafood. (2) During March–April 2024, three cases of listeriosis were reported in CT and became identified as an outbreak through whole genome sequencing (WGS). This was the first local outbreak of listeriosis identified and investigated in CT. The CT Emerging Infections Program (EIP), Food Protection Program (FPP), State Public Health Laboratory (SPHL), Local Health Department (LHD), and Rhode Island Department of Health (RIDOH) collaborated to investigate this outbreak. This report summarizes the epidemiologic, laboratory, and environmental findings of the investigation.

Epidemiologic Investigation

All reported cases of listeriosis are routinely interviewed using a standardized Centers for Disease Control and Prevention (CDC) questionnaire. All three cases in this CT outbreak were female and between 60–80 years of age. All three cases had bloodstream infections, one had meningitis, and all three were hospitalized; none died. Cases were interviewed either directly or through a surrogate. Specific symptoms reported by cases included diarrhea (n=3), fever (n=3), and altered mental status/hallucinations (n=2).

Review of initial routine interviews did not reveal any common food, restaurant, or grocery store exposures for all three cases. However, upon notification from the SPHL in April 2024 that isolates from all three cases were genetically related, additional investigation steps were undertaken, including a review of the case-patients' medical charts. The medical record review indicated that all three patients had been previously hospitalized at the same hospital (Hospital X) during their respective incubation periods, prior to their onset of listeriosis. Patient menus and dietary records were requested from Hospital X and reviewed. This review identified eight common food items that might have been consumed by the three case-patients during their stay at Hospital X. Of particular interest were fresh fruit salad cups and vanilla ice cream, as these types of foods have previously been implicated in listeriosis outbreaks.

Environmental Investigation

In April 2024, DPH and LHD staff made onsite visits to Hospital X. During these visits, information regarding hospital food service and food suppliers were gathered, and food samples and environmental swabs were collected. A total of 20 food samples, including prepared fruit cups, unopened sealed packages of pre-cut cantaloupe and honeydew melon, and vanilla ice-cream cups were collected. Environmental swabbing was focused on kitchen areas and surfaces deemed to be at higher risk for growth of *L. monocytogenes*, such as a deli slicer, food prep sink and drain, and prep table.

The cantaloupe and honeydew melons used in the fruit cups served to patients came from a vendor that pre-cuts the melons prior to placing them in sealed packages. Based on information on the packaging for these products and review of invoices provided by Hospital X, the pre-cut melons originated from a food producer in Rhode Island. Hospital X prepared the fruit cups by portioning the pre-cut pieces of cantaloupe and honeydew melon into small plastic cups with other fruits (such as grapes) and sent them to patient rooms along with the patients' meal orders.

The RIDOH conducted onsite investigation, product and environmental sampling at the RI food producer twice in May 2024. During the first visit to the producer, 23 food samples (including honeydew melon, cantaloupe, and fruit medley) and 10 environmental swabs were collected. During the subsequent visit, 10 samples of unopened packaged honeydew and cantaloupe, and 25 environmental swabs were collected.

Laboratory Investigation

All three clinical *L. monocytogenes* isolates from case-patients were forwarded to the SPHL where whole genome sequencing (WGS) was conducted. All three isolates were identical (0 alleles apart) by core genome multi locus sequence typing (cgMLST) . Ongoing monitoring of PulseNet, the CDC national database of DNA fingerprints of bacteria that cause foodborne illnesses, did not identify any other clinical isolates in the United States that matched this outbreak.

All food and environmental samples collected from Hospital X were tested at the SPHL following the Food and Drug Administration (FDA) Bacteriological Analytical Manual (BAM) protocols for the detection of *Listeria* species in food and environmental samples. Samples were enriched using buffered *Listeria* enrichment broth (BLEB), screened by BAX PCR for *Listeria* species and specifically *L. monocytogenes*.

A Connecticut Outbreak of Listeriosis – An Interstate Investigation *(continued)*

Selective agar was used to culture *Listeria* species and cultures were confirmed biochemically using Analytical Profile Index (API) *Listeria* test. *L. monocytogenes* was not detected in any of the food or environmental samples. However, *Listeria innocua* was detected in packages of unopened cantaloupe and unopened honey dew and 2 out of 4 fruit cups. Additional submitted samples of unopened cantaloupe and unopened honeydew also tested positive for *L. innocua*.

Testing at the RIDOH of food and environmental swabs collected from the food producer during the first onsite visit found two found two pre-cut cantaloupe samples positive for *L. innocua* and one environmental swab from a prep table positive for *L. newyorkensis*. Additional testing of food and environmental swabs collected during the second onsite visit did not identify any *Listeria* species.

Discussion

This was the first local outbreak of listeriosis identified and investigated in CT. The three cases of listeriosis in this outbreak likely acquired infection by consuming food during their hospitalizations at Hospital X. Extensive food and environmental sampling at Hospital X and at the food producer in RI did not identify *Listeria monocytogenes*. However, another species of *Listeria*, *L. innocua*, was found in unopened packages of cut cantaloupe and honeydew melon.

L. innocua is a close relative of *L. monocytogenes* and is often present in the same environmental niches as *L. monocytogenes*, but is considered to be non-pathogenic. (3) *L. innocua* has been reported to be more commonly found in food production environments than *L. monocytogenes* and is thought to be a good hygiene indicator and also a marker for unrecognized *L. monocytogenes* contamination. (4)

In this investigation, the presence of *L. innocua* in unopened food products suggested the production environment and food had potential to support growth of *L. monocytogenes* as well. Based on these findings of *L. innocua* in unopened cantaloupe and honeydew melon collected from Hospital X, a recommendation was made for the hospital to consider serving different products to patients.

A number of challenges were encountered during this investigation. These included not being able to interview all cases directly due to severity of the case-patients' illness and/or poor mental status. In addition, the long incubation period for invasive listeriosis hampers recall regarding specific exposures. Although patient dietary records were available from the hospital, these records only showed what foods were ordered. Assumptions were made regarding foods patients likely consumed based on their dietary records. Finally, leftover foods from the exposure period of interest were no longer available for testing.

This investigation highlighted the importance of strong partnerships. In particular, collaborative efforts between DPH, the hospital, and the RIDOH were crucial during this investigation into Connecticut's first local outbreak of listeriosis.

Acknowledgements

Rhode Island Department of Health, New York Integrated Food Safety Center of Excellence, CT Rapid Response Team, Centers for Disease Control and Prevention, Food and Drug Administration, Local Health Department, Hospital X Infection Prevention and Dietary staff.

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