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Outbreak of *Salmonella* Typhimurium Infections Linked to Commercially Distributed Raw Milk — California and Four Other States, September 2023–March 2024

Eva Weinstein, MPH[1]; Katherine Lamba, MPH[1]; Christian Bond[1]; Vi Peralta, MPH[1]; Michael Needham, MPH[1]; Stephen Beam, PhD[2]; Francine Arroyo, MSc[1]; David Kiang, PhD[1]; Yishi Chen, PhD[1]; Seema Shah, MD[3]; Mark E. Beatty, MD[3]; Stephen Klish, MPH[4]; Akiko Kimura, MD[1]

Abstract

Unpasteurized (raw) milk has been linked to foodborne illness outbreaks caused by *Escherichia coli* bacteria and certain species of *Brucella*, *Campylobacter*, *Cryptosporidium*, and *Salmonella*. In October 2023, the County of San Diego Health and Human Services Agency notified the California Department of Public Health (CDPH) of eight cases of salmonellosis in persons who reported consuming brand A raw milk, produced exclusively by dairy farm A. A total of 171 outbreak-associated *Salmonella* Typhimurium cases were identified through review of standardized salmonellosis case report forms and a search of PulseNet, CDC's national molecular subtyping network for enteric disease surveillance, followed by administration of a dairy-focused supplementary questionnaire. Most cases (98%) were identified in California; one case each was identified in four other states. Among the 171 cases, 120 (70%) cases and 18 (82%) of the cases requiring hospitalization were among children and adolescents aged <18 years. Among 159 patients confirmed to be infected with the outbreak strain, 55 (70%) of those with exposure data consumed brand A raw milk or heavy cream. Four of 40 samples collected from dairy farm A, retail stores, and patients' homes, including raw milk and raw milk cheese aged for 60 days, tested positive for the outbreak strain of *S.* Typhimurium by whole-genome sequencing. Dairy farm A voluntarily recalled raw milk and raw heavy cream 1 week after the initial outbreak identification. Commercially distributed raw dairy products have the potential to cause large and widespread infectious disease outbreaks. Public health authorities should continue to raise awareness of the risks associated with consuming raw dairy products, especially by persons at increased risk for severe disease from enteric pathogens, including children.

Introduction

In California, unpasteurized (raw) milk is regulated by the California Department of Food and Agriculture (CDFA). CDFA requires raw milk dairy farms to hold a permit and pass dairy farm and bottling sanitation inspections. Livestock must be tested for brucellosis and tuberculosis annually. Raw milk must meet strict bacterial and cell count limits and be kept at 45°F (7.2°C) or below (*1*). Raw milk may be legally sold at retail stores but requires warning labels alerting customers of potential contamination by disease-causing microorganisms (*1*). The California Code of Regulations mandates that health care providers and laboratories report *Salmonella* infections to local public health departments (LHDs) within 1 working day of identification.* LHDs attempt follow-up of reported cases by interviewing patients using a standard form that includes questions about various potential source exposures. On October 18, 2023, the County of San Diego Health and Human Services Agency notified the California Department of Public Health (CDPH) of eight cases of salmonellosis with onset dates during September 21–October 12, 2023, in persons who reported having consumed brand A raw milk. Brand A raw milk is produced exclusively by dairy farm A and

* Title 17 Revisions, Section 2500 of the California Code of Regulations | CDPH; Salmonellosis | Information for Local Health Departments | CDPH

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is commercially distributed throughout California. This notification, coupled with a recent report from another California LHD of a patient with *S.* Typhimurium infection who consumed brand A raw milk before illness onset on October 3, 2023, prompted a statewide investigation.

Investigation and Findings

Case Identification

A confirmed outbreak-associated case was defined as a laboratory-confirmed infection with *S.* Typhimurium with allele code SALM1.0 – 6745.4.2.1x that is closely related based on whole-genome sequencing (WGS) to other isolates in the same outbreak,[†] in a person with symptom onset (diarrhea, fever, vomiting, or abdominal pain) during September 15, 2023–May 4, 2024. This period covered approximately 1 week before the first known illness onset through the end of the outbreak monitoring period, determined by the last known onset date plus additional lag time in days to account for delays in WGS and identification of confirmed outbreak-associated cases. A probable case was defined as laboratory-confirmed *Salmonella* infection without serotype and WGS results and with symptom onset during September 15, 2023–May 4, 2024 in a person who reported consuming brand A raw milk within 7 days before symptom onset. CDPH sought to identify outbreak-associated cases through review of California standardized salmonellosis case report forms for raw dairy product exposure and by searching PulseNet,[§] CDC's national molecular subtyping network for enteric disease surveillance, for clinical isolates related to the outbreak strain by WGS. Cases outside California were confirmed by WGS and identified in PulseNet.

CDPH requested, via email, that California LHDs and states with cases identified via the process described above reinterview patients using a supplementary questionnaire in paper form or in the REDCap electronic survey hosted at CDPH (*2*,*3*). The supplementary questionnaire contained questions about raw dairy product exposures, including the type of product, brand, purchase location and date, availability of leftover product for testing, and other exposure details.

The percentage of patients with confirmed cases who reported exposure to raw dairy products was compared with the background percentage of persons who reported raw dairy product exposure in the general population of the California catchment area included in the 2018–2019 Foodborne Diseases Active Surveillance Network Population Survey (*4*), using the binomial probability model; p-values <0.05 were considered statistically significant. CDPH deemed this activity routine public health response and not research, and it therefore did not require institutional review board review.

[†] Confirmed outbreak strain was *S.* Typhimurium with allele code SALM1.0 – 6745.4.2.1x and highly related (within two alleles) using core genome multilocus sequence typing or on the single nucleotide polymorphism (SNP) branch (0–6 SNPs) using the National Center for Biotechnology Information SNP analysis. Pathogen Detection | National Library of Medicine

[§] About PulseNet | PulseNet | CDC

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Patient Demographic and Clinical Characteristics

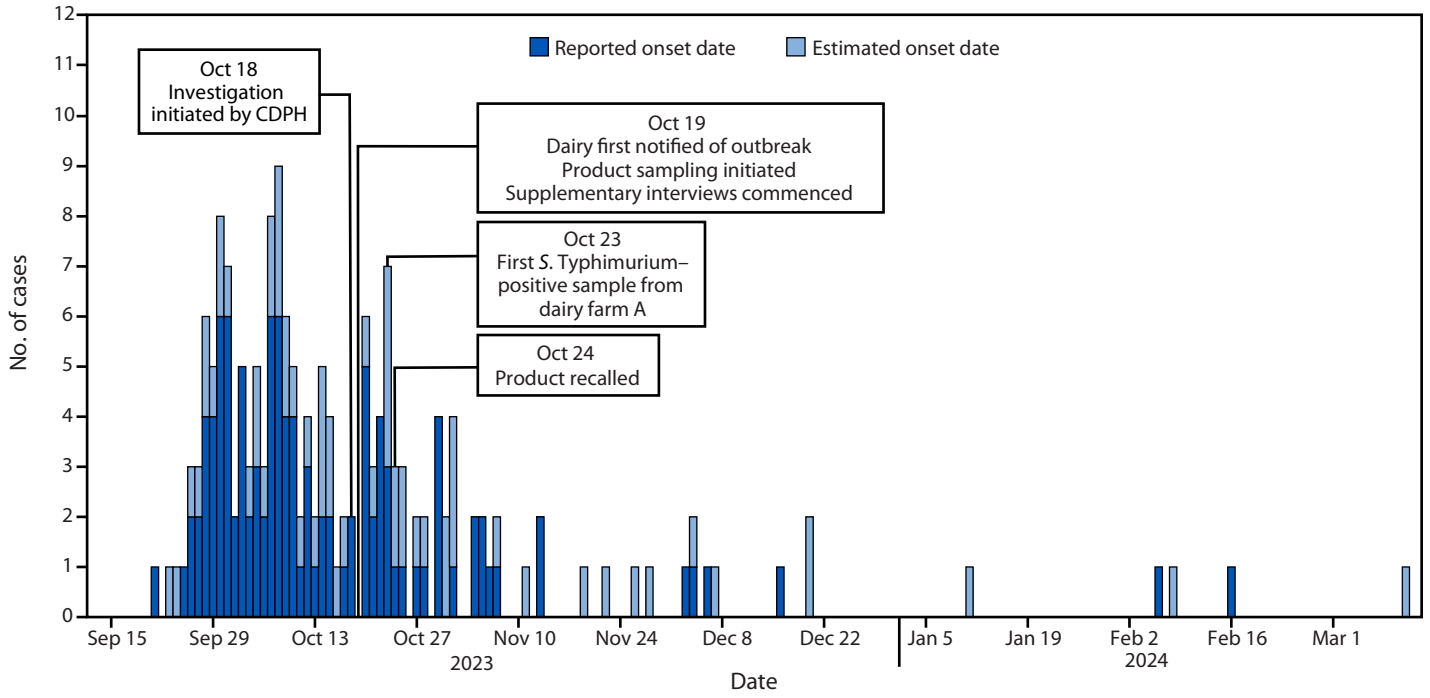
The investigation identified 171 salmonellosis cases in California and four other states, including 159 (93%) confirmed and 12 (7%) probable cases (Figure). Known illness onset dates ranged from September 21, 2023, through March 11, 2024; 140 (82%) cases occurred during September and October 2023 (median onset date was October 11, 2023). The distribution of the cases was consistent with a continuous common source outbreak (*5*).

Cases were identified from five states: 167 (98%) occurred across California, in 35 of California's 61 local health jurisdictions, and one case each was reported from New Mexico, Pennsylvania, Texas, and Washington (Table). The median patient age was 7 years (range = 9 months–87 years); 67 (39%) cases occurred in children aged <5 years, 40 (23%) in children aged 5–12 years, and 13 (8%) in adolescents aged 13–17 years. Overall, 108 (63%) patients were male, and among 136 (80%) with information on race reported, 105 (77%) were White. Among 162 patients with hospitalization information available, 22 (14%) were hospitalized, including 18 (82%) who were aged <18 years. No deaths were reported.

Reported Raw Dairy Product Exposure

Information on raw dairy product exposure was available from case report forms or supplementary questionnaires for 91 (53%) patients; among these, 79 (87%) and 12 (13%) had illnesses that met the confirmed and probable case definitions, respectively. The remaining 80 (47%) patients with confirmed salmonellosis either could not recall their exposure history or were lost to follow-up. Among the 91 interviewed patients, 72 (79%) reported consuming liquid raw milk products, including raw milk (71) and raw heavy cream (one); 67 (93%) of these patients reported consuming brand A raw milk or raw heavy cream during the 7 days preceding illness onset. The remaining 19 (21%) reported that they did not consume liquid raw milk. In addition, one patient reported consuming brand A raw milk cheese only. Among the 79 patients with confirmed cases, 55 (70%) reported exposure to brand A raw milk or heavy cream; this percentage was significantly higher than the expected background rate of raw milk consumption in the general California population (1.9%; p<0.001), based on the 2018–2019 FoodNet Population Survey. Because patients with probable cases consumed brand A raw milk by definition, these persons were excluded from the statistical analysis.

FIGURE. Outbreak of *Salmonella* Typhimurium linked to consumption of raw milk products, by reported* or estimated† illness onset date (N = 171) — California§ and four other states,¶ September 2023–March 2024



Abbreviation: CDPH = California Department of Public Health.
* Onset of diarrhea.
† If diarrhea onset date was unavailable, symptom onset date was used; for cases missing onset date, specimen collection date minus 3 days was used.
§ Cases reported from 35 of 61 California local health departments.
¶ New Mexico, Pennsylvania, Texas, and Washington each reported a single case.

Environmental Health Investigation

On October 19, 2023, CDPH and CDFA notified dairy farm A of the initial nine cases of salmonellosis associated with brand A raw milk, including the eight San Diego County cases and one from another LHD. During October 2023, CDPH, CDFA, and LHDs collected 40 brand A products (raw milk, cheese, heavy cream, and kefir) from the dairy farm, retail stores, and patients' homes. Samples were tested for *Salmonella* and underwent WGS if *Salmonella* test results were positive. CDPH initiated a traceback investigation of brand A raw milk to identify product lot numbers and production dates associated with contaminated products. On October 23, 2023, CDPH and CDFA notified dairy farm A that *S.* Typhimurium was detected in a sample from brand A bottled raw milk collected from the farm on October 19.

S. Typhimurium was detected in three of the 40 brand A product samples collected; isolates were indistinguishable by WGS from the clinical isolates collected from patients in the outbreak. The positive samples included two from bottled raw whole milk collected by CDFA at the bottling facility operated by dairy farm A on October 19 and 25, 2023; one retail sample of raw milk with a best-by date of October 27, 2023. No *Salmonella* bacteria were detected in the remaining samples from retail stores and patients' homes. In addition, the outbreak strain was detected in a sample of raw cheese aged for 60 days made from the contaminated milk and collected from the dairy during January 2024; *S.* Typhimurium was not detected in any raw milk cheese samples collected before January 2024.

TABLE. Characteristics of patients associated with a *Salmonella* Typhimurium outbreak linked to brand A raw milk — California and four other states,* September 2023–March 2024

Characteristic (no. of cases with available information)	No. (%)†
Case classification (N = 171)	
Confirmed§	159 (93)
Probable¶	12 (7)
State (N = 171)	
California	167 (98)
Other*	4 (2)
Median age (range)	7 yrs (9 mos–87 yrs)
Age group, yrs (N = 171)	
<5	67 (39)
5–12	40 (23)
13–17	13 (8)
18–64	45 (26)
≥65	6 (4)
Male sex	108 (63)
Hispanic or Latino ethnicity (n = 130)	19 (15)
Race (n = 136)	
Asian	10 (7)
Black or African American	5 (4)
White	105 (77)
Other	16 (12)
Hospitalized (n = 162)	
No	140 (86)
Yes	22 (14)
Death	0 (—)
Raw dairy exposure information (n = 91)**	
Any raw milk or heavy cream consumption (n = 91)	72 (79)
Brand (n = 72)	
Brand A	67 (93)
Other	3 (4)
Unknown	2 (3)
Frequency of consumption of brand A dairy products (n = 49)	
Once only	8 (16)
Weekly	17 (35)
Daily	24 (49)
Brand A product type (n = 68)	
Milk only	61 (90)
Heavy cream only	1 (1)
Raw cheese only	1 (1)
More than one product††	5 (7)

* New Mexico, Pennsylvania, Texas, and Washington each reported a single case.
† Percentages might not sum to 100 because of rounding.
§ Laboratory-confirmed infection with *Salmonella* Typhimurium (allele code SALM1.0 – 6745.4.2.1x) that was determined by whole-genome sequencing to be closely related to other isolates in the outbreak in a person with symptom onset during September 15, 2023–May 4, 2024.
¶ Laboratory-confirmed *Salmonella* infection without serotype and whole-genome sequencing results in a person reporting brand A raw milk consumption during the same symptom onset date range as that of confirmed cases.
** Includes confirmed and probable cases.
†† Includes milk and at least one of the following raw dairy products: cheese, heavy cream, or kefir.

Public Health Response

On October 24, 2023, in response to the epidemiologic evidence and the *Salmonella*-positive raw milk sample, dairy farm A halted production and voluntarily recalled its raw milk. The recall included fluid milk and heavy cream with best-by dates of October 11–November 6, 2023; recalled lots were destroyed or held at the facility for aged cheese production, with cheese to be held under impound by CFDA. Raw cheese made from the contaminated milk lots tested positive after 60 days of aging and was not distributed for retail sale. CDFA conducted a sanitary inspection of the raw milk bottling and cheese making plant on October 25, and a joint inspection of the dairy farm on October 27 along with county environmental health inspectors. The farm's internal testing detected *Salmonella* in milk from a recently purchased cow; the isolate was not further characterized. The cow was removed from the herd, and subsequent testing of the herd did not detect *Salmonella*. These efforts met CDFA requirements, allowing production to recommence on October 31, 2023. Extensive public messaging regarding this outbreak was issued by LHDs and CDPH in October 2023, including press releases and social media posts. Messaging instructed consumers to discard any recalled brand A milk or heavy cream; advised those experiencing symptoms of salmonellosis, including diarrhea, fever, vomiting, or abdominal pain to seek medical care; and recommended consuming pasteurized dairy products to prevent foodborne illnesses.

Summary

What is already known about this topic?

Unpasteurized (raw) milk has been linked to foodborne illness outbreaks caused by *Escherichia coli* bacteria and certain species of *Brucella*, *Campylobacter*, *Cryptosporidium*, and *Salmonella*.

What is added by this report?

During October 2023–March 2024, California public health officials investigated an outbreak of *Salmonella* Typhimurium infections linked to raw milk from a California dairy farm. Among 171 cases identified in California and four other states, 70% were among children and adolescents aged <18 years. Whole-genome sequencing detected the *S.* Typhimurium outbreak strain in raw milk and raw milk cheese aged for 60 days, both produced by the dairy.

What are the implications for public health practice?

Commercially distributed raw dairy products have the potential to cause large and widespread infectious disease outbreaks. Public health messaging should explain the risks associated with these products to consumers, especially those at risk for severe disease, including children.

Discussion

Consumption of commercially distributed raw milk resulted in a large and widespread salmonellosis outbreak that disproportionately affected young children. The median age of reported ill patients was 7 years, and children were those most likely to be hospitalized among all age groups.

This outbreak is one of the largest foodborne outbreaks linked to raw milk in recent U.S. history. During 2009–2021, a total of 143 enteric disease outbreaks that were confirmed or suspected to be associated with consumption of raw milk were reported to CDC (*6*). Of these, 16 were salmonellosis outbreaks, all of which were small (median number of cases = 10; range = 2–33). In California, four confirmed and three suspected enteric disease outbreaks have been linked to raw milk since 2012; no outbreaks associated with pasteurized milk have occurred during this period (CDPH, Infectious Diseases Branch, Disease Investigations Section, unpublished data, 2018–2021). In addition, this investigation confirmed that cheese produced from raw milk, even if aged for 60 days, has the potential to remain contaminated with *Salmonella*. The Food and Drug Administration permits the distribution of hard cheeses made from raw milk if they are aged for ≥60 days (*7*).

Rapid, accurate recognition of the likely outbreak source by an LHD and close collaboration between local and state health agencies resulted in an expedited and focused investigation and timely product recall; time from initiation of CDPH investigation to product recall was 1 week. Enhanced surveillance sampling by CDFA and CDPH and WGS of milk and clinical isolates were critical to confirming the source of the outbreak and facilitating the recall.

The source of the illness in the four non-California residents is unknown. Federal law prohibits the sale of raw milk for human consumption across state lines, and none of these four patients reported travel to California. However, federal law does not prohibit the interstate sale of raw milk intended for pet consumption or interstate sale of raw cheese aged for ≥60 days. One of the four non-California patients reported purchasing dairy farm A raw milk (and possibly cheese) in their state of residence, the second patient consumed dairy farm A raw cheese only from an unknown purchase location, the third patient did not recall consuming any raw dairy products, and the fourth patient was lost to follow-up. These patients could have purchased raw milk for pets or raw cheese within their states. Other possible explanations for the non-California outbreak cases are that patients could not recall or did not accurately report travel history or were infected through unrecognized secondary transmission.

Limitations

The findings in this report are subject to at least three limitations. First, cases continued to occur after the product was recalled, and not all patients with confirmed cases reported consuming raw milk. In any outbreak, some cases linked to the outbreak by laboratory data have uncertain exposure routes; intermittent cases might have resulted from indirect spread, such as through person-to-person transmission. Patients might also have had the products in their homes and continued to use them after the recall. Second, the interval between a patient's illness onset and reinterview with the supplementary questionnaire might have resulted in poorer recall of exposure history than that during the initial interview, introducing recall bias. Finally, patients might have chosen to not disclose their raw dairy product consumption history.

Implications for Public Health Practice

Consumption of raw dairy products, even from a licensed producer, continues to present a risk for enteric and other infectious diseases, especially among children. Public health agencies should continue to emphasize this message to help prevent future foodborne disease outbreaks, with educational efforts focusing on populations at high risk for complications from infection, including children (through their parents), as well as pregnant women and persons with immunocompromise (*8*). Systems for collaboration among local, state, and federal public health and regulatory partners and surveillance testing should be supported and enhanced to facilitate rapid evidence-based action during future foodborne outbreaks.

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Corresponding author: Eva Weinstein, eva.weinstein@cdph.ca.gov.

[1]California Department of Public Health; [2]California Department of Food and Agriculture; [3]County of San Diego Health and Human Services Agency, San Diego, California; [4]Orange County Health Care Agency, Anaheim, California.

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References

1. California Department of Food and Agriculture. Regulatory requirements for distribution of milk for raw consumption in California. Sacramento, CA: California Department of Food and Agriculture; 2021. https://www.cdfa.ca.gov/ahfss/milk_and_dairy_food_safety/pdfs/RawMilkRequirementsSummary.pdf
2. Harris PA, Taylor R, Thielke R, Payne J, Gonzalez N, Conde JG. Research electronic data capture (REDCap)—a metadata-driven methodology and workflow process for providing translational research informatics support. J Biomed Inform 2009;42:377–81. PMID:18929686 https://doi.org/10.1016/j.jbi.2008.08.010
3. Harris PA, Taylor R, Minor BL, et al.; REDCap Consortium. The REDCap consortium: building an international community of software platform partners. J Biomed Inform 2019;95:103208. PMID:31078660 https://doi.org/10.1016/j.jbi.2019.103208
4. CDC. Foodborne Diseases Active Surveillance Network: population survey. Atlanta, GA: US Department of Health and Human Services, CDC; 2022. https://wwwn.cdc.gov/Foodnetfast/PopSurvey
5. Fontaine RE. Describing epidemiologic data [Chapter 6]. In: Rasmussen RA, Goodman RA, eds. The CDC field epidemiology manual. Atlanta, GA: US Department of Health and Human Services, CDC; 2024. https://www.cdc.gov/field-epi-manual/php/chapters/describing-epi-data.html
6. CDC. BEAM dashboard. Atlanta, GA: US Department of Health and Human Services, CDC; 2024. https://www.cdc.gov/ncezid/dfwed/beam-dashboard.html
7. Food and Drug Administration. Cheeses and related cheese products. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2020. https://www.ecfr.gov/current/title-21/chapter-I/subchapter-B/part-133
8. Akhondi H, Goldin J, Simonsen KA. Bacterial diarrhea. Treasure Island, FL: StatPearls Publishing; 2025. https://www.ncbi.nlm.nih.gov/books/NBK551643/

Tetrahydrocannabinol Intoxication from Food at a Restaurant — Wisconsin, October 2024

Amanda Kita-Yarbro, MPH[1]; Stefanie Moccero[1]; Katie Brobston, MS[1]; Jacob Goebel[1]; Janice Block Banks[1]; Christy Vogt, MPH[1]; Casey Schumann, MS[1]; Katarina M. Grande, MPH[1]; Julia Olsen, MSEd[1]; Bonnie Armstrong, MPH[1]

Abstract

Tetrahydrocannabinol (THC), a psychoactive substance found in *Cannabis sativa* plants, including varieties such as hemp, is increasingly being used in consumer products. On October 24, 2024, local emergency medical services reported to Public Health Madison & Dane County (PHMDC) in Wisconsin that since October 22, they had transported seven persons to a local hospital for various symptoms, including dizziness, sleepiness, and anxiety. All seven persons reported having recently eaten food from the same local restaurant. Investigation by PHMDC determined that on October 22, the restaurant had run out of cooking oil and used oil from a cooperative (i.e., shared) kitchen located in the same building. One of the vendors who used the kitchen made edible products using hemp-derived Δ^9-THC. On October 24, PHMDC posted a food and symptom history questionnaire on its website and shared the link via press release and social media. Among 107 responses that were considered valid, 85 persons met the following case definition of THC intoxication: 1) ate pizza, garlic bread, cheese bread, or a grinder (submarine sandwich) purchased from the restaurant during October 22–24 and 2) reported at least one symptom of THC intoxication that began within 5 hours after eating the restaurant's food, defined as dizziness, sleepiness, anxiety, short term memory impact or time distortion, increased heart rate, nausea, paranoia, panic attack, increased blood pressure, vomiting, or hallucinations. Clinicians and public health practitioners should be alert to the possibility of mass THC intoxication events via food. Health care providers, public health professionals, and emergency responders should consider THC intoxication in persons with sudden onset of symptoms such as dizziness, sleepiness, anxiety, altered reality perception, increased heart rate, nausea, or other symptoms of THC ingestion. Regulations regarding practices such as standard, clear labeling and locked storage for ingredients containing THC, might decrease the risk for unintentional THC exposure at licensed food businesses.

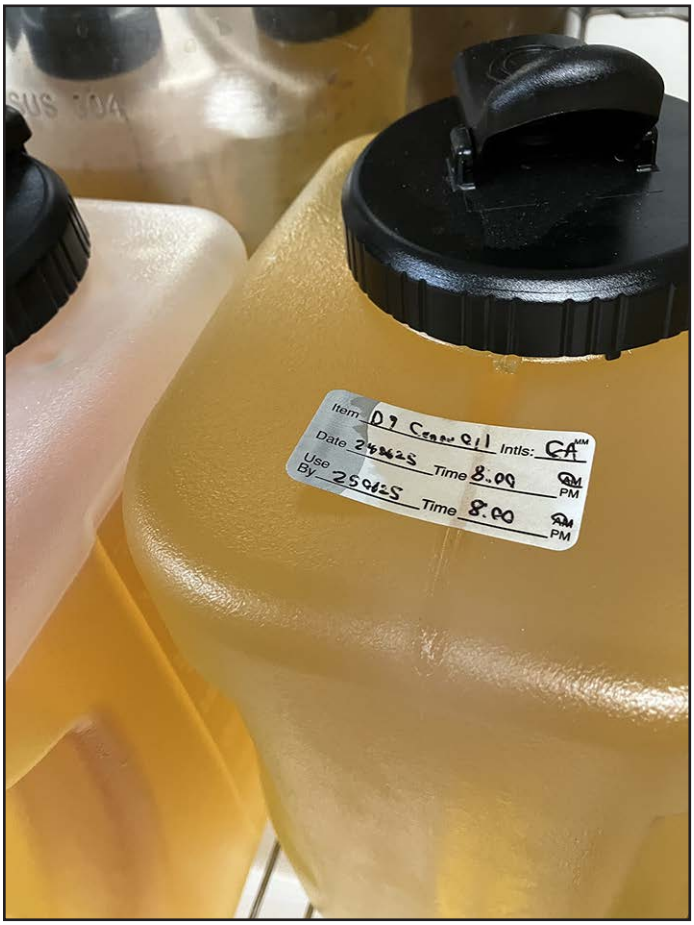
Investigation and Results

Tetrahydrocannabinol (THC) is a psychoactive substance found in *Cannabis sativa* plants, including varieties such as hemp; concentrations are lower in the hemp plant. On October 24, 2024, local emergency medical services reported to Public Health Madison & Dane County (PHMDC) in Wisconsin that since October 22, they had transported seven persons to a local hospital for various symptoms, including dizziness, sleepiness, and anxiety. All seven persons reported having recently eaten food from the same local restaurant. Emergency services conducted carbon monoxide testing in two residences of symptomatic persons and at the restaurant, and the test results were negative. The seven persons who were transported were treated in the emergency department (ED) of a Stoughton, Wisconsin hospital with symptoms of THC intoxication. Later that day, one of the ED patients, who had eaten pizza from the restaurant the previous day (October 23), contacted PHMDC at the suggestion of the hospital and reported receiving a positive THC test result without having knowingly consumed THC. PHMDC initiated an outbreak investigation. This investigation was determined by PHMDC to be nonresearch public health surveillance and therefore did not require institutional review board review.

On October 24, PHMDC contacted the restaurant owner. The owner was aware of the illnesses and agreed to close immediately. The same day, the restaurant owner called PHMDC and reported that a state-licensed business in a cooperative (i.e., shared) kitchen in the same building as the restaurant made edible products using hemp-derived Δ^9-THC. The vendor infused cooking oil on-site with hemp-derived THC. Because of the possible THC involvement, PHMDC notified local police. During a third call with PHMDC, the restaurant owner reported that on October 22, the restaurant had run out of cooking oil and used oil from the cooperative kitchen to prepare dough that was served during October 22–24. The owner initially thought the oil was plain canola oil but later realized it might have been infused with THC. Oil from a large, labeled storage container (Figure 1), in the same area where the owner found the oil he used, tested positive for THC using the qualitative Duquenois-Levine reagent test. A police investigation concluded that the provision of THC-contaminated food to customers was unintentional, and no criminal charges were pursued. The restaurant reopened on October 26 after cleaning and sanitizing following standards in the Wisconsin Food Code.*

* Wisconsin Food Code | Agriculture, Trade and Consumer Protection | ATCP 75 Appendix

FIGURE 1. Containers* with hemp-derived Δ^9-tetrahydrocannabinol–infused cooking oil located in the same area as oil used to prepare pizza and bread dough — Wisconsin, October 2024



Photo/Public Health Madison & Dane County
Abbreviation: D9 = Δ^9-tetrahydrocannabinol.
* Containers are labeled as D9 oil, with the type of oil unclear.

Public Health Response

On October 24, PHMDC posted a food and symptom history questionnaire on its website. The link was distributed widely through a press release and on social media. All persons who experienced symptoms after eating food from the restaurant during October 22–24 were asked to complete the questionnaire. Respondents were asked to provide the names of other persons who had eaten food from the restaurant and become ill. The hospital provided PHMDC with the names of nine patients who sought care during October 23–24 after eating at the restaurant. On October 25, PHMDC contacted persons on this list who had not completed a questionnaire and asked them to complete the questionnaire.

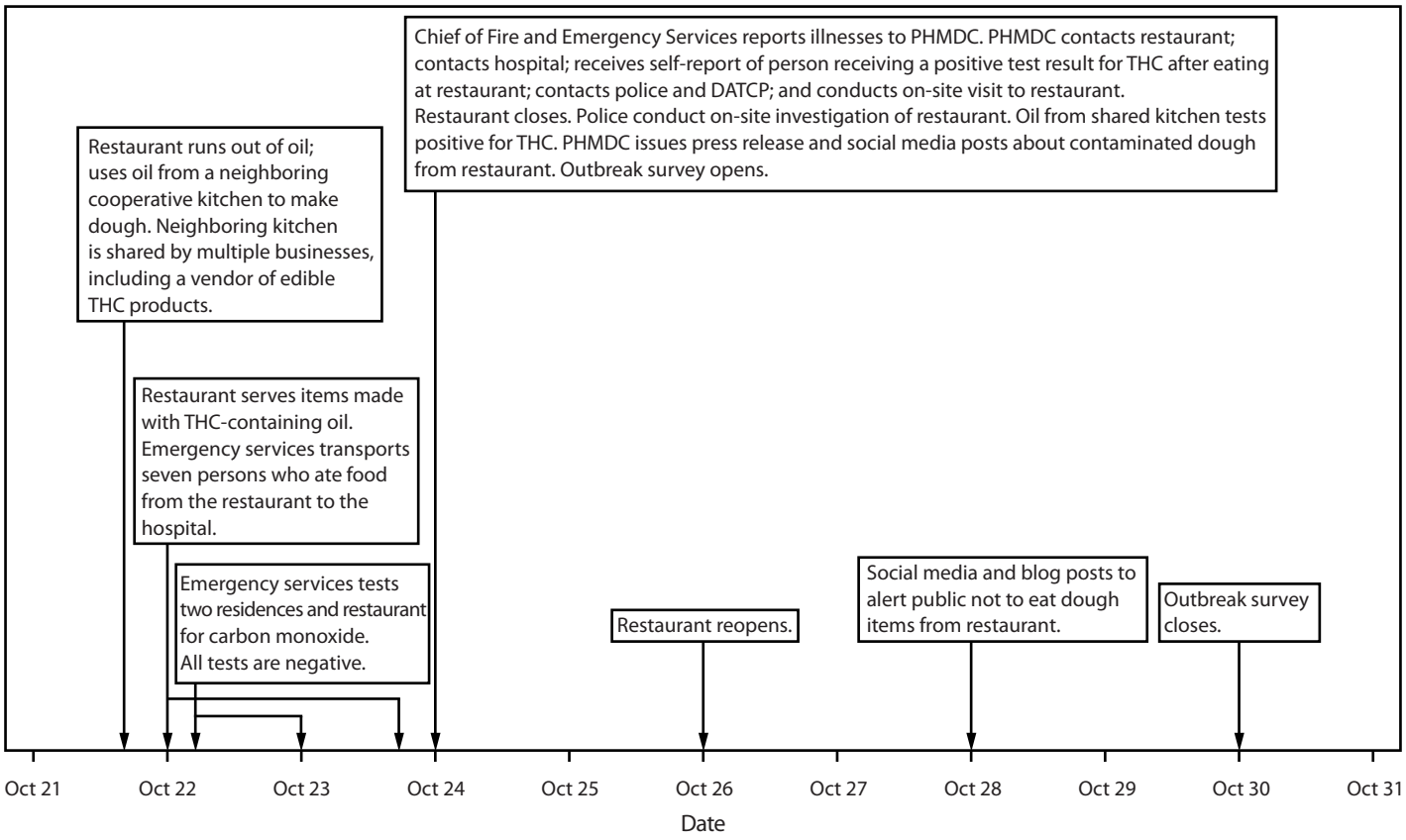
During October 24–30, PHMDC received 208 responses; 101 were excluded from analysis because they contained 1) mostly incomplete information, 2) the name of a fictional character, 3) names or addresses that included marijuana or THC-related words, or 4) information that indicated the person did not actually eat food from the restaurant. The remaining 107 responses were considered valid (Figure 2). An outbreak-associated case of THC intoxication was defined as at least one of the following signs or symptoms (Table): dizziness, sleepiness, anxiety, short term memory impact or time distortion, increased heart rate, nausea, paranoia, panic attack, increased blood pressure, vomiting, or hallucinations in a person who ate pizza, garlic bread, cheese bread, or a grinder (submarine sandwich) purchased from the restaurant during October 22–24, with symptom onset within 5 hours of eating the restaurant's food. Eighty-five persons met the case definition for THC intoxication. Median time from eating food to symptom onset was 1 hour (range = 0–4 hours). Forty-seven persons meeting the case definition were male, and 38 were female; median age was 43 years (range = 1–91 years). Thirty-three persons consulted a health care provider (28 in a hospital ED and five elsewhere), and three were hospitalized for at least 1 night. Based on self-reporting in the questionnaire comments and information from the hospital, 15 persons received a positive test result for THC (Supplementary Figure). Information about whether THC testing was performed was not available from the other 70 respondents. Eight persons (9%) were children and adolescents aged <18 years, none of whom was hospitalized. Dizziness was the only symptom reported for the youngest child (aged 1 year) with "not sure" indicated for all other symptoms in the questionnaire. Four children, aged <13 years (range = 3–8 years), had symptoms of dizziness (four), nausea (four), sleepiness (four), vomiting (three), anxiety (two), paranoia (one), short-term memory impact or time distortion (one), hallucinations (one), head or neck pain (one), and a heavy head (one). Respondents were asked to provide the names of other persons who ate food from the restaurant and became ill; eight additional persons who became ill after eating at the restaurant were identified, but none completed a questionnaire.

On October 24, PHMDC issued a press release alerting the public via social media not to eat leftover pizza purchased from the restaurant during October 22–24. This information was updated on October 28 to include leftover grinders, garlic bread, and cheese bread. The updated information was shared with the public via social media and PHMDC's blog, which is posted to the PHMDC website and emailed to approximately 3,000 subscribers.

Discussion

Eighty-five persons who responded to a health department questionnaire reported symptoms consistent with THC intoxication that occurred within 5 hours after eating food from a pizza restaurant, including 15 who received a positive THC test result. Respondents were asked to provide the names of others who ate

FIGURE 2. Timeline of events in an outbreak of tetrahydrocannabinol intoxication from food at a restaurant — Wisconsin, October 2024



Abbreviations: DATCP = Wisconsin Department of Agriculture, Trade and Consumer Protection; PHMDC = Public Health Madison & Dane County; THC = tetrahydrocannabinol.

Summary

What is already known about this topic?

Tetrahydrocannabinol (THC), a psychoactive substance found in *Cannabis sativa* plants, including varieties such as hemp, is increasingly being used in consumer products.

What is added by this report?

During October 22–24, 2024, at least 85 persons, ranging from age 1–91 years, ate food from a restaurant in Wisconsin and experienced symptoms consistent with THC intoxication. The restaurant was in a building with a cooperative (i.e., shared) kitchen used by a state-licensed vendor who produced edible THC products. The restaurant mistakenly used THC-infused oil from the cooperative kitchen to prepare dough.

What are the implications for public health practice?

Clinicians and public health practitioners should be alert to the possibility of mass THC intoxication events via food.

food from the restaurant and became ill, which identified eight additional ill persons. No leftover foods were tested for THC, no quantitative testing was performed on the oil, and no analytical study (e.g., case-control study) was conducted.

Although FDA has not found that any use of a cannabinoid, including THC, in food would be safe and lawful under the Federal Food, Drug, and Cosmetic Act,[†] these products can be found in adult cannabis and hemp marketplaces, some of which seek to follow state, territorial, or tribal laws regarding their use. Increased availability of food items containing THC increases the possibility that children (*1*,*2*) and adults (*3*) might unknowingly consume these items and experience symptoms that lead them to seek medical care. Co-location of food establishments with businesses that make THC-infused products increases the risk that a THC-containing ingredient might be added to food, either intentionally or unintentionally. Health care providers, public health professionals, and emergency responders should consider THC intoxication in persons with sudden onset of symptoms such as dizziness, sleepiness, anxiety, altered reality perception, increased heart rate, nausea, or other symptoms of THC ingestion. Regulations regarding practices such as standard, clear labeling (*4*) and locked storage

[†] Food and Drug Administration | Warning Letter | Latro Inc. - 698196 - 03/25/2025; Food and Drug Administration | Warning Letter | Mary Jane's Bakery Co. LLC - 678010 - 07/15/2024; Food and Drug Administration | Warning Letter | Earthly Hemps - 674916 - 07/15/2024

TABLE. Signs and symptoms reported by persons (N = 85) with outbreak-associated cases of tetrahydrocannabinol intoxication — Wisconsin, October 2024

Sign or symptom	Questionnaire response, no. (%)		
	Yes	No	Not sure
Solicited in questionnaire			
Dizziness	80 (94.1)	4 (4.7)	1 (1.2)
Sleepiness	76 (89.4)	6 (7.1)	3 (3.5)
Anxiety	67 (78.8)	11 (12.9)	7 (8.2)
Short-term memory impact or time distortion	59 (69.4)	13 (15.3)	13 (15.3)
Increased heart rate	54 (63.5)	7 (8.2)	24 (28.2)
Nausea	52 (61.2)	30 (35.3)	3 (3.5)
Paranoia	42 (49.4)	26 (30.6)	17 (20.0)
Panic attack	29 (34.1)	37 (43.5)	19 (22.4)
Increased blood pressure	28 (32.9)	4 (4.7)	53 (62. 4)
Hallucinations	22 (25.9)	53 (62.4)	10 (11.8)
Vomiting	10 (11.8)	72 (84.7)	3 (3.5)
Reported as free-text response			
Felt high, drugged, or drunk	13 (15.3)	—*	—
Ataxia†	11 (12.9)	—	—
Dry mouth	10 (11.8)	—	—
Head or neck pain	9 (10.6)	—	—
Perception distortion§	9 (10.6)	—	—
Numbness	8 (9.4)	—	—
Blurred vision	4 (4.7)	—	—
Food cravings	4 (4.7)	—	—
Affected work	3 (3.5)	—	—
Allergy-like symptoms	3 (3.5)	—	—
Body temperature irregularities	3 (3.5)	—	—
Confusion	3 (3.5)	—	—
Difficulty breathing	3 (3.5)	—	—
Fainting, light headedness, or weakness	3 (3.5)	—	—
Impaired driving	3 (3.5)	—	—
Muscle spasms	3 (3.5)	—	—
Behavioral abnormalities	2 (2.4)	—	—
Difficulty concentrating	2 (2.4)	—	—
Thirst	2 (2.4)	—	—
Diarrhea	1 (1.2)	—	—
Heavy head	1 (1.2)	—	—
Light sensitivity	1 (1.2)	—	—
Low potassium	1 (1.2)	—	—
Red eyes	1 (1.2)	—	—
Suicidal acts	1 (1.2)	—	—

* As free text entries, "no" and "not sure" were not questionnaire options.
† Examples of terms used by respondents to describe ataxia included loss of balance; unable to stand, walk, or move; and feeling unsteady.
§ Examples of terms used by respondents to describe perception distortion included false sense of reality, psychosis, felt like being in a dream, heightened hearing, and having an out-of-body experience.

for ingredients containing THC, might decrease the risk for unintentional THC exposure at licensed food businesses.

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Corresponding author: Amanda Kita-Yarbro, akita@publichealthmdc.com.

[1]Public Health Madison & Dane County, Madison, Wisconsin.

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References

1. Food and Drug Administration. FDA warns consumers about the accidental ingestion by children of food products containing THC. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2022. https://www.fda.gov/food/alerts-advisories-safety-information/fda-warns-consumers-about-accidental-ingestion-children-food-products-containing-thc
2. Thomas AA, Mazor S. Unintentional marijuana exposure presenting as altered mental status in the pediatric emergency department: a case series. J Emerg Med 2017;53:e119–23. PMID:28987305 https://doi.org/10.1016/j.jemermed.2017.08.007
3. Fong K, Hsueh A, Kendric K, et al. Unwitting adult marijuana poisoning: a case series. Clin Toxicol (Phila) 2021;59:913–7. PMID:33688774 https://doi.org/10.1080/15563650.2021.1891241
4. Soroosh AJ, Henderson R, Dodson L, Mitchell CS, Fahey JW. Mitigating potential public health problems associated with edible cannabis products through adequate regulation: a landscape analysis. Crit Rev Food Sci Nutr 2020;61:3091–99. PMID: 32791846 https://doi.org/10.1080/10408398.2020.1793099

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