CDC Morbidity and Mortality Weekly Report
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Case Studies—Using clippings from the CDC MMWR (Center for Disease Control, Morbidity and Mortality Weekly Report) have the students identify which food-borne pathogen is being described. Download the pathogen article of choice, making another copy that blanks out the name of the pathogen.

OR--Have students use this website or http://www.foodsafety.gov/ to bring in **news clippings** about food-borne illness outbreaks for extra credit points. (Science Core: Goal 2a "Voluntarily read and study books and other materials about science.")

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Botulism Associated with Home-Fermented Tofu in Two Chinese Immigrants — New York City, March–April 2012

In March 2012, the New York City Department of Health and Mental Hygiene (DOHMH) received two reports of recent immigrants from China admitted to the same hospital 23 days apart for suspected foodborne botulism. Patient 1 had a laboratory-confirmed case of foodborne botulism, and patient 2 had a probable case; patient 1's case was definitively associated with home-fermented tofu, and patient 2's case might have been associated with home-fermented tofu. Both patients had purchased fresh tofu from the same Chinese gro-cery in Queens, a New York City borough, in January 2012, and each had prepared home- fermented tofu using similar recipes. Similar fermentation practices at the two homes might have facilitated toxin production. Testing confirmed botulinum toxin type B in home-fermented tofu consumed by patient 1. Bulk tofu at the grocery in Queens was found to be sold in unrefrigerated, uncovered, water-filled bins. Traceback revealed that the grocery's fresh bulk tofu supplier at the time of the patients' purchases had gone out of business. DOHMH advised the grocery's manager of the need to properly store bulk tofu. Public health responders and clinicians should be aware of the association between botulism and fermented tofu.

Patient 1

On March 3, 2012, a Chinese man aged 39 years arrived at the hospital with a 4-day history of vomiting followed by dysphagia, diplopia, dysarthria, dyspnea, and difficulty walk-ing. Neurologic examination revealed bilateral cranial nerve deficits: dilated pupils minimally reactive to light, ptosis, oculomotor palsy, and facial paralysis. Motor strength was normal, but deep tendon reflexes were hypoactive. He was admitted to the intensive-care unit and intubated because of concern for impending respiratory failure. An edrophonium chloride test was interpreted as positive for myasthenia gravis, and intravenous immune globulin treatment was initiated. Electromyography studies eventually were determined to be suspicious for, but not diagnostic of, botulism. On March 9, unilateral upper extremity weakness was noted, and results of a test for antibodies to acetylcholine receptors (positive in myasthenia gravis) were negative. Serum and stool specimens were obtained for testing, and botulinum antitoxin was admin-istered. On March 27, botulinum toxin type B was identified by mouse bioassay in stool specimens. Patient 1 improved and was discharged to a rehabilitation facility on March 26.

Patient 2

On March 28, 2012, a Chinese woman aged 36 years from the same Queens neighborhood as patient 1 was admitted to the same hospital after 2 days of vomiting and diarrhea followed by dysarthria, dysphagia, and dizziness. On exami-nation, she had bilateral cranial nerve palsies: ptosis, dilated pupils minimally reactive to light, and oculomotor palsy. Mild, right upper extremity weakness and loss of upper extremity deep tendon reflexes were noted. She was intubated because of concern regarding impending respiratory failure. The same clinicians who had cared for patient 1, and who by this time had laboratory confirmation of botulism in patient 1, admit-ted patient 2; they immediately suspected botulism because of the similar clinical presentation. On March 29, serum and stool specimens were obtained, and botulinum antitoxin was administered. Electromyography studies performed March 30

INSIDE

Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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were consistent with, but not diagnostic of, botulism. No botulinum toxin was detected in serum or stool specimens. The patient improved and was discharged home on April 18.

Public Health Investigation

On February 25 and 26, approximately a week before symptom onset, patient 1 and his wife ate home-fermented tofu prepared by patient 1's wife. Patient 1's wife consumed the same amount of tofu as patient 1, but was asymptomatic. Patient 2 consumed home-fermented tofu on at least 3 of the 7 days preceding symptom onset. No other persons were known to have eaten patient 2's tofu.

Patient 1's wife and patient 2 had emigrated from the same locality in Jiangxi Province, China, to the United States within the previous 2 years. Both resided in Queens, but they did not know each other. They reported purchasing fresh bulk tofu in January 2012 at the same Chinese grocery in Queens. Patient 1's wife cubed the tofu and placed it in a plastic con-tainer in layers separated by heavy paper. She covered the container with a nonairtight lid and allowed the contents to ferment at room temperature for 1 week. She next added chili pepper and salt, transferred the tofu to a glass jar, and stored it in the refrigerator for 3 weeks before consumption. Patient 2 placed blocks of tofu in a colander covered with plastic wrap and kept it at room temperature for 7–10 days. She then added salt, dried chili pepper, and orange peel, and stored the fermented tofu in glass jars in the refrigerator. The fermented tofu was not heated before consumption in either case.

On March 29, samples of fermented tofu were collected from both patients, and fresh bulk tofu was obtained from the grocery for laboratory testing. No samples of unfermented tofu purchased by the patients in January were available for testing. The laboratory detected botulinum toxin type B by mouse bioassay on April 2 in leftover fermented tofu from the same batch consumed by patient 1. Toxin was not detected in tofu from patient 2, in any additional foods from either household, or in fresh tofu obtained by DOHMH from the grocery in March 2012.

To help detect additional cases, DOHMH notified health-care practitioners and issued press releases in English and Chinese; no new cases were identified. A site visit to the grocery revealed that bulk tofu was sold in unrefrigerated, uncovered, water-filled bins. DOHMH informed the manager that bulk tofu must be maintained at a temperature <41°F (<5°C) in covered or sneeze -guard–protected containers in a well-supervised area with a means of preventing bare-hand contact. Food traceback revealed that the grocery's fresh bulk tofu supplier at the time of the patients' purchases had since permanently closed, and the business owner no longer resided in the United States.

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Reported by

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Editorial Note

This suspected outbreak included one confirmed case linked to consumption of home-fermented tofu (patient 1) and one probable case in a person who also ate home-fermented tofu (patient 2). The recognition of these cases prompted concern that other cases might follow, and a rapid and vigorous public health response was conducted. This investigation was chal-lenging because both clinical presentations were atypical, and because fermented tofu, an uncommon vehicle for botulism in the United States, was not immediately recognized as the potential source of illness.

Botulism typically causes bilateral cranial nerve palsies, followed by bilateral descending flaccid paralysis over the course of hours or days, with eventual loss of deep tendon reflexes. Patients are usually afebrile, and sensation and cognition are unaffected; in foodborne botulism, neurologic symptoms might be preceded by nausea and vomiting (*1*,*2*). Atypical presentations, such as those of both patients in this cluster, can make recognition of botulism difficult. Both patients eventually were determined to have bilateral cranial nerve deficits, but this was not initially clear. Both patients also had loss of deep tendon reflexes and respiratory compromise but minimal or no muscle weakness. In patient 2's case, the weakness and loss of reflexes were unilateral. Patient 1 also had a positive edrophonium chloride test, a finding indicative of myasthenia gravis and only rarely reported positive in botulism (*3*). The clinicians caring for patient 2 ruled out other diseases that have similar signs and symptoms, and electromyography results were consistent with, but not diagnostic of, botulism.

Foodborne botulism occurs when *Clostridium botulinum* spores, which are ubiquitous in the environment, germinate and produce toxin. Spore germination and toxin formation require warm, anaerobic environments with low-acid, low-salt, and low -sugar content (*4*). A patient's history of exposure to foods commonly associated with botulism can help with recognition of botulism. In the United States, home-canned foods and traditional fermented Alaska Native foods are major sources of botulism (*5*). Fermented tofu has only once been reported as associated with botulism in the United States (*6*). In China, however, home-fermented tofu and other fermented bean products cause the majority of foodborne botulism cases (*7*). The occurrence of two suspected cases in such close temporal and geographic proximity increased suspicion of a common vehicle, although patient 1's tofu was the only confirmed source of botulinum toxin; no other foods tested from either household were determined to be a toxin source.

Contamination of bulk tofu with *C. botulinum* spores might have occurred at the tofu manufacturing facility or at the grocery. Both patients had purchased tofu during the same month from the same grocery and fermented it using similar recipes. Subsequently, the fermentation processes, which involved prolonged storage at room temperature in a low-acid and low-salt environment, might have created conditions conducive to spore germination and toxin formation. Neither patient heated the tofu before eating it; therefore, toxin would not have been inactivated by heat. Neither patient reported using an airtight container for fermentation, but anaerobic pockets might have existed within the tofu. Previous investigations reveal that botulinum toxin can be distributed unevenly in food (*8*), which might explain why patient 1's wife did not contract botulism. Uneven distribution of toxin also might explain the negative test results for patient 2's leftover tofu.

What is already known on this topic?

Foodborne botulism is caused by eating foods contaminated with botulinum toxin produced by the bacterium *Clostridium botuli-num*. Botulism is characterized by acute onset of bilateral cranial nerve palsies followed by descending symmetric flaccid paralysis that can progress to respiratory failure or death. In the United States, foodborne botulism typically is associated with home-canned foods and traditional fermented Alaska Native foods.

What is added by this report?

This report highlights the potential for consumption of home-fermented tofu, a food commonly prepared in Chinese communities, to be a risk factor for botulism in the United States. It also documents the atypical clinical presenta-tion of one confirmed and one probable case of botulism from home-fermented tofu prepared from fresh tofu purchased at the same grocery.

What are the implications for public health practice?

Public health professionals should be aware of the association between fermented tofu and botulism, and that botulism can present atypically. Early recognition of botulism can lead to timely diagnosis and appropriate treatment of suspected cases.

Public health responders and clinicians should be aware that fermented foods, including tofu, can be vehicles for foodborne botulism. They should consider botulism as the potential cause of cranial nerve palsies and ask about consumption of foods known to cause botulism. Education of populations known to include fermented tofu in their diets might help prevent foodborne botulism associated with consumption of home-fermented tofu.

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Outbreak of Campylobacteriosis Associated with a Long-Distance Obstacle Adventure Race — Nevada, October 2012

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On October 12, 2012, the Nellis Air Force Base Public Health Flight (Nellis Public Health), near Las Vegas, Nevada, was notified by the Mike O'Callaghan Federal Medical Center (MOFMC) emergency department (ED) of three active-duty military patients who went to the ED during October 10–12 with fever, vomiting, and hemorrhagic diarrhea. Initial interviews by clinical staff members indicated that all three patients had participated October 6–7 in a long-distance obstacle adventure race on a cattle ranch in Beatty, Nevada, in which competitors frequently fell face first into mud or had their heads submerged in surface water. An investigation by Nellis Public Health, coordinated with local and state health officials, identified 22 cases (18 probable and four confirmed) of *Campylobacter coli* infection among active-duty service members and civilians. A case-control study using data provided by patients and healthy persons who also had participated in the race showed a statistically significant association between inadvertent swallowing of muddy surface water during the race and *Campylobacter* infection (odds ratio = 19.4; p<0.001). Public health agencies and adventure race organizers should consider informing race attendees of the hazards of inadvertent ingestion of surface water.

Campylobacter is one of the most common causes of diarrheal illness in the United States. Most persons who become ill with campylobacteriosis get diarrhea, cramping, abdominal pain, and fever within 2–5 days after exposure to the organism. The diarrhea can be bloody and can be accompanied by nausea and vomiting. The illness typically lasts about 1 week. Most cases occur as isolated, sporadic events and are usually associated with eating raw or undercooked poultry or from cross-contamination of other foods by these items (*1*).

Initial Epidemiologic Investigation

Because of the three cases of hemorrhagic diarrhea and the suspected source of infection reported to Nellis Public Health by ED staff members on October 12, definitions were developed to identify additional cases. A probable case was defined as diarrhea (three or more loose stools in a 24-hour period), any episode of bloody diarrhea, or a combination of other gastrointestinal illness symptoms (e.g., abdominal cramps, nausea, or vomiting) in a person who participated in

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the obstacle adventure race during October 6–7. A confirmed case was defined as a probable case in a patient who also had laboratory isolation of *Campylobacter* from a stool specimen.

An additional 19 patients, including both military and civilian personnel, were identified through active reporting by clinical staff members throughout MOFMC, a retrospective review of ED logs from October 6–16, and announcements to the Nellis community that encouraged self-identification. These efforts resulted in the identification of a total of 18 probable and four confirmed cases of illness. The investigation was limited to the population of the Nellis community, primarily because of the short incubation period for *Campylobacter*, the time lags between the event, symptom onset, and investigative findings, and the lack of additional cases reported to the Southern Nevada Health District by civilian health-care providers.

Among the 22 patients, the mean time from exposure to illness was 3.3 days (range = 1–9 days) (Figure). The most common symptoms were diarrhea (18 of 19 patients), cramps (14 of 18 patients), fever (10 of 18 patients), and nausea (10 of 17 patients) (Table 1). Twenty of the 22 patients sought medical care, and two reported their illness directly to Nellis Public Health without seeking care. One person with chronic gastrointestinal illness was hospitalized and treated with supportive care and intravenous antibiotics. All 22 patients made a full recovery.

To obtain information about the outbreak source, a 72-hour food and drinking water history questionnaire, which included questions on surface water exposure, was used to interview the ill persons. An analysis of the questionnaire data indicated that muddy surface water was a possible source of infection.

Case-Control Study

A case-control study was conducted to identify the source of infection. Twenty-four healthy controls consisting of both military personnel and civilians who had been race participants were identified through contact investigation of the 22 case-patients. Nellis Public Health developed a new questionnaire for this investigation and administered it by telephone. The questionnaire evaluated the 22 case-patients and 24 controls with regard to their water consumption, food consumption,

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FIGURE. Number of probable and confirmed cases of *Campylobacter coli infection* among participants in a long-distance obstacle adventure race, by date of symptom onset — Nevada, October 2012

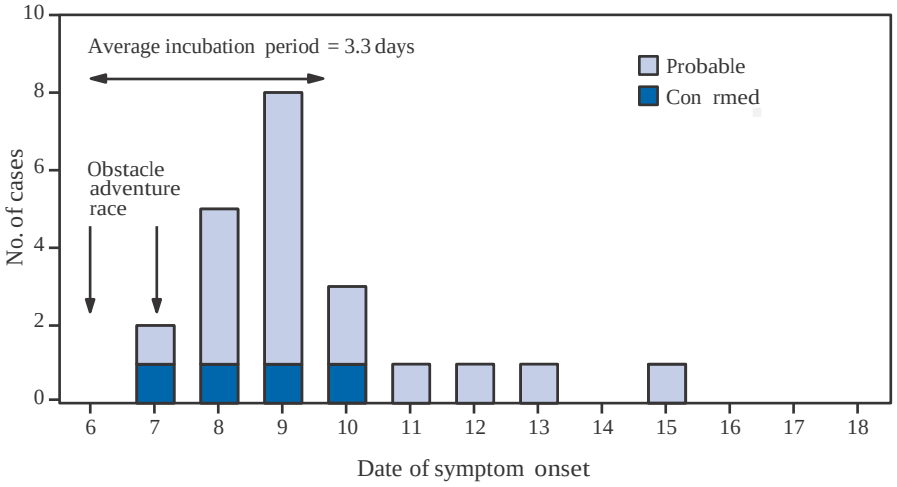

TABLE 1. Number of persons (N = 22) with signs and symptoms of confirmed or probable *Campylobacter coli* infection after participating in a long-distance obstacle adventure race — Nevada, October 2012

Sign/Symptom	No.*	(%*)
Diarrhea	18 of 19	(95)
Cramps	14 of 19	(74)
Fever	10 of 18	(56)
Nausea	10 of 18	(56)
Vomiting	9 of 17	(53)
Watery diarrhea	7 of 10	(70)
Bloody diarrhea	6 of 10	(60)
Influenza-like illness	6 of 10	(60)
Mucus-like diarrhea	3 of 10	(30)
Chills	3 of 7	(43)

* Denominator values varied as a result of nonreporting by some participants.

and environmental water exposure during the October 6–7 obstacle race.

Analysis of the case-control study identified a statistically significant association with "inadvertent swallowing of muddy water while competing" and *Campylobacter* infection (odds ratio = 19.4; p<0.001) (Table 2). No significant association (p<0.05) was found with drinking water or eating food provided by race organizers, full body submersion in surface water, or getting surface water or mud in the eyes or mouth.

Laboratory Testing

Nellis Public Health requested stool specimens from all 22 patients and recommended cultures for *Shigella, Campylobacter, Salmonella,* and *Escherichia coli* 0157:H7, plus testing for Shiga toxin and a search for ova and parasites. Initially, four stool specimens were obtained and each tested negative for all organisms, including *Campylobacter*. Persistence in obtaining seven additional stool specimens resulted in four laboratory-confirmed cases positive for *Campylobacter* by growth on selective media, oxidase testing, and Gram stain at the MOFMC laboratory. These four isolates were identified as hippurate-negative *Campylobacter* (not *Campylobacter jejuni*) by the Southern Nevada Health District Public Health Laboratory and further identified as *Campylobacter coli* by CDC.

Further characterization of the four *C. coli* isolates by pulsed-field gel electrophoresis using *SmaI* and *KpnI*, multilocus sequence typing, and antimicrobial susceptibility testing at CDC, identified all four as the same strain. This *C. coli* outbreak strain was pansusceptible to the antimicrobials tested on the CDC national antimicrobial resistance monitoring system panel, and was assigned PulseNet patterns DBBS16.0134/ DBBK02.0272 and sequence type (ST) 6159. All specimens tested for *E. coli* 0157:H7, *Salmonella, Shigella,* Shiga toxin, and ova and parasite testing were negative.

Public Health Action

Because commercial obstacle adventure races often are marketed to military personnel, Nellis Public Health provided educational outreach to the base population regarding the risk for disease when competing in such events. Emphasis was placed on the importance of hand washing and avoidance of exposure (especially ingestion) to contaminated surface water to prevent disease. This investigation also highlighted the importance of outbreak investigators continuing stool specimen collection, culture, and serial testing, even after initial results are negative.

Discussion

Inadvertent ingestion of muddy surface water contaminated with cattle or swine feces during a long-distance obstacle adventure course competition likely resulted in an outbreak of campylobacteriosis in 22 participants. Four of the 22 had laboratory-confirmed infections with *Campylobacter coli*.

High-intensity and competitive muddy obstacle adventure course races have surged in popularity across the United States, drawing an estimated 1.5 million participants in 2012 (*2*). These military-style adventure races attract high numbers of active-duty military personnel, along with young, active, extremely fit civilians. Persons typically are advised of the risks of participating and required to sign a liability waiver. Races are commonly held on farmlands where animal feces increase the risk for zoonotic disease transmission. Primary

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and emergency care providers, as well as public health professionals, should be aware that obstacle adventure race events

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TABLE 2. Comparison of case-patients with *Campylobacter coli* infection and control subjects among participants in a long-distance obstacle adventure race, by food and water exposures — Nevada, October 2012

	Case-patients (n = 22)	Controls (n = 24)		
Exposure	%*	%*	Odds ratio	p-value
Inadvertent swallowing of muddy water while competing	89	30	19.4	<0.001
Consumption of potable drinking water provided by race organizers	100	100	2.6	0.48
Consumption of food provided by race organizers	93	74	4.9	0.16
Full body submersion in surface water	94	96	0.7	0.86
Exposure of eyes or mouth to surface water or mud	100	74	6.4	0.09

* Denominator values varied as a result of nonreporting by some participants.

could pose a heightened risk for outbreaks from inadvertent ingestion of contaminated water or mud and might consider outreach to educate participants on the health risks from oral contact with contaminated surface water or mud.

Documented common-source outbreaks of campylobacteriosis (especially those caused by *C. coli*) are rare, but have been previously attributed to contact with nonchlorinated water contaminated with the feces of cattle, poultry, and swine (*3*). *Campylobacter* is an important cause of acute zoonotic bacterial diarrhea across all age groups. An estimated 5%–14% of diarrhea cases worldwide are attributed to this organism, and approximately 2.4 million human cases of campylobacteriosis occur annually in the United States (*4*).

Participation in obstacle adventure races is relatively common among men and women of the U.S. military. These events typically are held in rural areas and often include man-made slurry fields (a mixture of soil or clay and water) as race "challenges." In areas commonly frequented by animals (*5*), topsoil used in the creation of slurry fields can be contaminated with feces from domestic fowl (*6*) or ruminants (*7*) or wild animals. Competitors who run or ride through such areas might unintentionally swallow sufficient numbers of organisms to cause clinical disease. Fewer than 500 *Campylobacter* organisms are needed to cause illness (*1*). The race described in this report was held on a cattle ranch, and participants reported seeing cattle and swine on or near the course on race day. Obstacle adventure race planners should consider building slurry field challenges where animal fecal contamination is not likely.

Although contaminated food and drinking water are more common sources of *Campylobacter* outbreaks, previous outbreaks have been associated with unintentional ingestion of contaminated mud or muddy water. Campylobacteriosis outbreaks were associated with two bicycle races in Norway in the 1990s, in which unintentional ingestion of dirty water splashing from bicycle wheels was implicated (*8*). Similarly, ingestion of mud was found the most likely cause of *Campylobacter* outbreaks during mountain bike races in Wales in 2008 (*9*) and in British Columbia in 2010 (*10*).

Warning participants in outdoor sporting events who might be exposed to fecally contaminated water or slurry that

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What is already known on this topic?

Campylobacter is an important cause of acute zoonotic bacterial enteric disease worldwide. The most common cause of campylobacteriosis in humans is *Campylobacter jejuni*, with *Campylobacter coli* less common. Livestock, including cattle and swine, are important reservoirs for human infection with *C. coli*. Multiple outbreaks have been linked to contaminated surface water.

What is added by this report?

In 2012 a total of 22 cases of acute diarrheal disease attributed to *C. coli* were identified among participants in a long-distance obstacle adventure race in Beatty, Nevada. Eleven stool specimens were collected for culture, and four were positive for *C. coli*. This investigation established an association between inadvertent swallowing of muddy surface water and *C. coli* infection. In addition, the investigation demonstrated the potential need for ongoing collection of stool specimens for culture during a food or waterborne outbreak to identify the causative agent and implement public health preventive measures.

What are the implications for public health practice?

Participation in adventure races combining mud and obstacles has become popular with extremely fit members of the general public, including military personnel. The races often take place on farmland exposing participants to numerous zoonotic pathogens. This outbreak highlights *C. coli* as a cause of diarrhea associated with such exposures and the importance of informing participants and race organizers regarding these hazards.

potentially serious diarrheal disease can result if ingested, even inadvertently, could reduce exposures to these pathogens. Event organizers should consider including the risk for waterborne outbreaks in their participant waivers and advise participants to avoid drinking or swallowing unsafe water. Participants also need to be encouraged to seek appropriate medical care for postcompetition diarrhea, especially bloody diarrhea, and to inform medical personnel of their exposure. In addition, health-care providers need to be aware of the association between these adventure races and the risk for exposure to *Campylobacter* or other pathogens via contaminated water, mud, or slurry so that appropriate diagnostic testing and treatment can be provided to ill participants.

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Ongoing Multistate Outbreak of *Escherichia coli* serotype O157:H7 Infections Associated with Consumption of Fresh Spinach — United States, September 2006

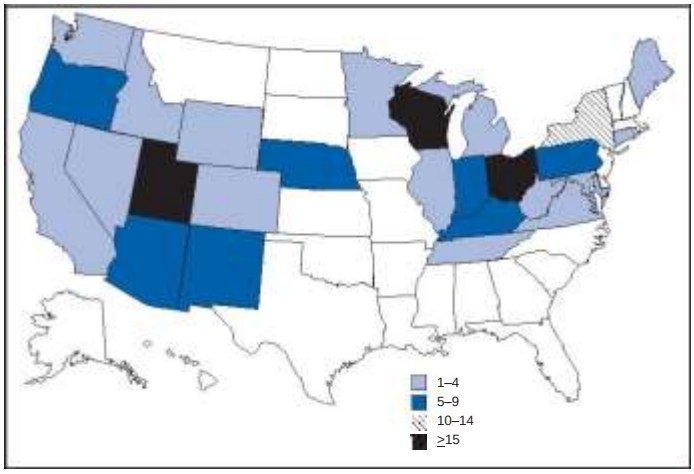
On September 26, this report was posted as an MMWR *Dispatch on the* MMWR *website* (http://www.cdc.gov/mmwr).

On September 13, 2006, CDC officials were alerted by epidemiologists in Wisconsin and Oregon that fresh spinach was the suspected source of small clusters of *Escherichia coli* serotype O157:H7 infections in those states. On the same day, New Mexico epidemiologists contacted Wisconsin and Oregon epidemiologists about a cluster of *E. coli* O157:H7 infections in New Mexico associated with fresh spinach con-sumption. Wisconsin public health officials had first reported a cluster of *E. coli* O157:H7 infections to CDC on Septem-ber 8. On September 12, CDC PulseNet had confirmed that the *E. coli* O157:H7 strains from infected patients in Wisconsin had matching pulsed-field gel electrophoresis (PFGE) patterns and identified the same pattern in patient isolates from other states. This report describes the joint in-vestigation and outbreak-control measures undertaken by state public health officials, CDC, and the Food and Drug Admin-istration (FDA). This investigation and additional case finding are ongoing.

As of September 26, a total of 183 persons infected with the outbreak strain of *E. coli* O157:H7 had been reported to CDC from 26 states (Figure 1). Among the ill persons, 95 (52%) were hospitalized, 29 (16%) had hemolytic uremic syndrome (HUS), and one person died. The deaths of two other patients possibly related to this outbreak are under

FIGURE 1. Number of confirmed cases (N = 183)* of *Escherichia coli* serotype O157:H7 infection, by state —

United States, September 2006



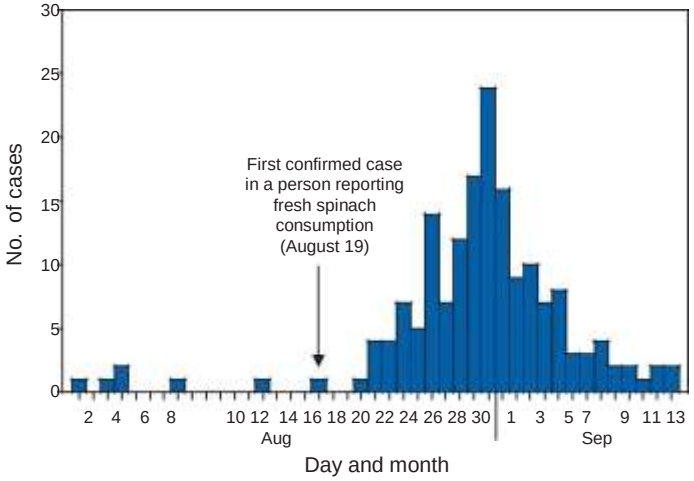
* Confirmed cases reported as of 1:00 p.m. EDT on September 26, 2006.

investigation. Eighty-five percent of patients reported illness onset from August 19 to September 5 (Figure 2). Fresh spin-ach was identified as the source of the outbreak. One hun-dred twenty-three of 130 patients (95%) reported consuming uncooked fresh spinach during the 10 days before illness onset. In addition, *E. coli* O157:H7 with a PFGE pattern matching the outbreak strain has been isolated from three open pack-ages of fresh spinach consumed by patients (one from New Mexico, one from Utah, and one from Pennsylvania).

On September 14, FDA advised consumers by press release and press conference to not eat bagged fresh spinach. On September 15, a California company that bags spinach under several brand names announced a voluntary recall of all fresh spinach-containing products. On September 16, FDA expanded its warning and advised consumers to not eat fresh spinach or fresh spinach-containing products. On September 21, FDA informed consumers that only spinach grown in three California counties (Monterey, San Benito, and Santa Clara) was implicated in the outbreak.

A confirmed case is defined as a culture-confirmed *E. coli* O157:H7 infection in a person residing in the United States, with illness onset from August 1 to the present (or, if date of onset is unknown, *E. coli* O157:H7 isolated from August 15 to the present) and a PFGE pattern identified by the *Xba*I restriction enzyme that matches the pattern of the outbreak strain. August 1 was selected as the earliest illness onset date in the case definition to ensure that the earliest cases in the outbreak were identified and investigated. However, the first six confirmed cases (with illness onsets during August 2–15) were in persons who did not report fresh spinach consump-tion during the week before illness onset. The first date that illness onset was reported by a person who recently consumed fresh spinach was August 19.

FIGURE 2. Number of confirmed cases (n = 171)* of *Escherichia coli* serotype O157:H7 infection, by date of illness onset — United States, August–September 2006



* Confirmed cases with known dates of illness onset reported as of 1:00 p.m. EDT on September 26, 2006.

Infections with this outbreak strain of *E. coli* O157:H7 (one of 3,520 unique *E. coli* O157:H7 strains reported to CDC PulseNet since 1996) have been reported sporadically to CDC PulseNet since 2003 (an average of 21 cases per year during 2003–2005). This finding suggests the occasional presence of this strain in the environment and food supply; however, it has not been associated with a recognized outbreak in the past.

The time from illness onset to confirmation that a case of *E. coli* O157:H7 is part of an outbreak is typically 2–3 weeks, including the time required for an infected person to seek medical care and for health-care providers and public health officials to obtain a culture, transfer the bacterial culture to a public health laboratory, perform PFGE testing, and submit the PFGE pattern into the national database at CDC. In this outbreak, the average time from illness onset to PFGE pat-tern submission to the national database at CDC has been 15 days; additional information is available at http://www.cdc.gov/foodborne/ecolispinach/reportingtimeline.htm.

Parallel laboratory and epidemiologic investigations were crucial in identifying the source of this outbreak. Timely PFGE testing by state public health laboratories, PFGE pattern sub-mission by states to CDC PulseNet, and analysis of PFGE patterns in the CDC PulseNet national database resulted in rapid detection of the outbreak. Concurrent collection of case exposure information by epidemiologists in affected states and sharing of exposure information among states and CDC led to rapid identification of the suspected food source and pub-lic health action. Continued rapid diagnosis, culture, PFGE analysis, and reporting to CDC of *E. coli* O157:H7 infec-tions are needed to aid this investigation and to detect and investigate *E. coli* O157:H7 outbreaks in the future.

New information regarding the current *E. coli* O157:H7 outbreak will be available regularly. The most current infor-mation is available online at http://www.cdc.gov/foodborne/ecolispinach; this website contains information updated daily on the number of cases and affected states in addition to gen-eral information regarding *E. coli* O157:H7, resources for clinicians, and activities by CDC and other agencies. The FDA website, at http://www.fda.gov/oc/opacom/hottopics/spinach.html, contains advice for consumers on the current outbreak and food-safety guidelines. CDC's public inquiry line (tele-phone, 1-800-CDC-INFO) also can provide information on the current outbreak to both the public and health-care work-ers. Information about the current *E. coli* O157:H7 outbreak is also available by RSS (Really Simple Syndication); a sub-scription to the *E. coli* O157:H7 outbreak RSS information can be obtained at http://www.bt.cdc.gov/rss.

Reported by: *State and local health departments.* E. coli *O157:H7 investigation team, CDC.*

Morbidity and Mortality Weekly Report

Weekly / Vol. 63 / No. 13

April 4, 2014

Notes from the Field

Multistate Outbreak of Listeriosis Linked to Soft-Ripened Cheese — United States, 2013

Mary J. Choi, MD[1,2], Kelly A. Jackson, MPH[3], Carlota Medus, PhD[1], Jennifer Beal, MPH[4], Carrie E. Rigdon, PhD[5], Tami C. Cloyd, DVM[4], Matthew J. Forstner[5], Jill Ball[6], Stacy Bosch, DVM[3], Lyndsay Bottichio, MPH[7], Venessa Cantu, MPH[8], David C. Melka[9], Wilete Ishow[10], Sarah Slette, MS[11], Kari Irvin, MS[4], Matthew Wise, PhD[3], Cheryl Tarr, PhD[3], Barbara Mahon, MD[3], Kirk E. Smith, DVM, PhD[1], Benjamin J. Silk, PhD[3]

(Author affiliations at end of text)

On June 27, 2013, the Minnesota Department of Health notified CDC of two patients with invasive *Listeria monocytogenes* infections (listeriosis) whose clinical isolates had indistinguishable pulsed-field gel electrophoresis (PFGE) patterns. A query of PulseNet, the national molecular subtyping network for foodborne disease surveillance, identified clinical and environmental isolates from other states. On June 28, CDC learned from the Food and Drug Administration's Coordinated Outbreak Response and Evaluation Network that environmental isolates indistinguishable from those of the two patients had been collected from Crave Brothers Farmstead Cheese during 2010–2011. An outbreak-related case was defined as isolation of *L. monocytogenes* with the outbreak PFGE pattern from an anatomic site that is normally sterile (e.g., blood or cerebrospinal fluid), or from a product of conception, with an isolate upload date during May 20–June 28, 2013. As of June 28, five cases were identified in four states (Minnesota, two cases; Illinois, Indiana, and Ohio, one each). Median age of the five patients was 58 years (range: 31–67 years). Four patients were female, including one who was pregnant at the time of infection. All five were hospitalized. One death and one miscarriage were reported.

Case–case analysis of *Listeria* Initiative* data (*1*) was conducted, comparing food exposure frequencies among the five outbreak-related cases identified by June 28 with food exposure frequencies in 1,735 sporadic listeriosis cases reported to CDC during 2004–2013. The analysis indicated that any soft cheese consumption during the month before illness onset was associated with outbreak-related listeriosis: five of five (100%) in the outbreak-related cases versus 569 of 1,735 (33%) in the sporadic cases (odds ratio = 10.8; 95% confidence interval = 1.8–∞).

* The *Listeria* Initiative is an enhanced surveillance system that has routinely collected data regarding food consumption from all patients with listeriosis since 2004. Additional information is available at http://www.cdc.gov/listeria/pdf/listeriainitiativeoverview_508.pdf.

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The five patients were reinterviewed to assess their cheese exposures. All five patients had definitely or probably eaten one of three varieties of Crave Brothers soft-ripened cheese (Les Frères, Petit Frère, or Petit Frère with truffles). Three patients had purchased the cheese at three different restaurants, and two had purchased the cheese at two different grocery stores. The cheeses were shipped as intact wheels to the three restaurants and two grocery stores, where they had been cut and served or repackaged and sold to customers.

Testing at the Minnesota Department of Agriculture identified the outbreak pattern of *L. monocytogenes* in two cheese wedges (Les Frères and Petit Frère with truffles) collected from two different grocery stores in Minnesota. Inspection of the cheese-making facility revealed that substantial sanitation deficiencies during the cheese-making process itself, after the milk was pasteurized, likely led to contamination. On July 1, Crave Brothers halted production of Les Frères, Petit Frère, and Petit Frère with truffles. On July 3, Crave Brothers issued a voluntary recall of these products with a production date of July 1, 2013, or earlier. On July 11, the company voluntarily halted production of all cheese products manufactured at the facility. After product recall, one additional case was identified in Texas through whole genome sequencing, bringing the total case count for the outbreak to six.

This outbreak was linked to soft cheeses that were likely contaminated during the cheese-making process (*2*,*3*). Pasteurization eliminates *Listeria* in milk. However, contami- nation can occur after pasteurization. Cheese-making facilities should use strict sanitation and microbiologic monitoring, regardless of whether they use pasteurized milk.†

Persons at greater risk for listeriosis, including older adults, pregnant women, and those with immunocompromising conditions, should be aware that certain soft cheeses made with unpasteurized milk, or made under unsanitary conditions, regardless of whether the milk was pasteurized, have been shown to cause severe illness. These soft cheeses include fresh (unripened) cheeses, such as queso fresco (*4*), and soft-ripened cheeses, such as the cheeses implicated in this outbreak.

† Joint Food and Drug Administration/Health Canada quantitative assessment of the risk of listeriosis from soft-ripened cheese consumption in the United States and Canada: draft report. Available at http://www.fda.gov/downloads/food/foodscienceresearch/ucm338617.pdf.

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[1]Minnesota Department of Health; [2]EIS officer; [3]Div of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [4]Coordinated Outbreak Response and Evaluation Network, Food and Drug Administration; [5]Minnesota Department of Agriculture; [6]Wisconsin Department of Agriculture, Trade, and Consumer Protection; [7]Ohio Department of Health; [8]Texas Department of State Health Services; [9]Center for Food Safety and Applied Nutrition, Food and Drug Administration; [10]Chicago Department of Public Health; [11]Indiana State Department of Health (Corresponding author: Mary J. Choi, mjchoi@cdc.gov, 651-201-5193)

References

1. McCollum JT, Cronquist AB, Silk BJ, et al. Multistate outbreak of listeriosis associated with cantaloupe. N Engl J Med 2013;369:944–53.
2. CDC. Vital signs: *Listeria* illnesses, deaths, and outbreaks—United States, 2009–2011. MMWR 2013;62:448–52.
3. CDC. Multistate outbreak of listeriosis linked to imported Frescolina Marte brand ricotta salata cheese (final update). Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://www.cdc.gov/listeria/outbreaks/cheese-09-12/index.html.
4. CDC. Outbreak of listeriosis associated with homemade Mexican-style cheese—North Carolina, October 2000–January 2001. MMWR 2001;50:560–2.

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Morbidity and Mortality Weekly Report

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May 2, 2014

Outbreak of _____Associated with a Long-Distance Obstacle Adventure Race — Nevada, October 2012

Mariah Zeigler, DVM[1], Chad Claar, MPH[1], Daviesha Rice, MPH[1], Jack Davis, PhD[1], Tammy Frazier[1], Alex Turner[1], Corinna Kelley[1], Jonathan Capps[1], Andrea Kent[1], Valerie Hubbard[1], Christiana Ritenour[1], Cristina Tuscano[1], Zuwen Qiu-Shultz, MPH[2], Collette Fitzgerald Leaumont, PhD[3] (Author affiliations at end of text)

On October 12, 2012, the Nellis Air Force Base Public Health Flight (Nellis Public Health), near Las Vegas, Nevada, was notified by the Mike O'Callaghan Federal Medical Center (MOFMC) emergency department (ED) of three active-duty military patients who went to the ED during October 10–12 with fever, vomiting, and hemorrhagic diarrhea. Initial interviews by clinical staff members indicated that all three patients had participated October 6–7 in a long-distance obstacle adventure race on a cattle ranch in Beatty, Nevada, in which competitors frequently fell face first into mud or had their heads submerged in surface water. An investigation by Nellis Public Health, coordinated with local and state health officials, identified 22 cases (18 probable and four confirmed) of _____infection among active-duty service members and civilians. A case-control study using data provided by patients and healthy persons who also had participated in the race showed a statistically significant association between inadvertent swallowing of muddy surface water during the race and _____infection (odds ratio = 19.4; p<0.001). Public health agencies and adventure race organizers should consider informing race attendees of the hazards of inadvertent ingestion of surface water.

XXXXXXXXXXXX is one of the most common causes of diar- rheal illness in the United States. Most persons who become ill with XXXXXXXXXXXXiosis get diarrhea, cramping, abdominal pain, and fever within 2–5 days after exposure to the organ- ism. The diarrhea can be bloody and can be accompanied by nausea and vomiting. The illness typically lasts about 1 week. Most cases occur as isolated, sporadic events and are usually associated with eating raw or undercooked poultry or from cross-contamination of other foods by these items (*1*).

Initial Epidemiologic Investigation

Because of the three cases of hemorrhagic diarrhea and the suspected source of infection reported to Nellis Public Health by ED staff members on October 12, definitions were developed to identify additional cases. A probable case was defined as diarrhea (three or more loose stools in a 24-hour period), any episode of bloody diarrhea, or a combination of other gastrointestinal illness symptoms (e.g., abdominal cramps, nausea, or vomiting) in a person who participated in

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the obstacle adventure race during October 6–7. A confirmed case was defined as a probable case in a patient who also had laboratory isolation of *XXXXXXXXXXXX* from a stool specimen. An additional 19 patients, including both military and civilian personnel, were identified through active reporting by clinical staff members throughout MOFMC, a retrospective review of ED logs from October 6–16, and announcements to the Nellis community that encouraged self-identification. These efforts resulted in the identification of a total of 18 probable and four confirmed cases of illness. The investigation was limited to the population of the Nellis community, primarily because of the short incubation period for *XXXXXXXXXXXX*, the time lags between the event, symptom onset, and investigative findings, and the lack of additional cases reported to the Southern Nevada Health District by civilian health-care providers.

Among the 22 patients, the mean time from exposure to illness was 3.3 days (range = 1–9 days) (Figure). The most common symptoms were diarrhea (18 of 19 patients), cramps (14 of 18 patients), fever (10 of 18 patients), and nausea (10 of 17 patients) (Table 1). Twenty of the 22 patients sought medical care, and two reported their illness directly to Nellis Public Health without seeking care. One person with chronic gastrointestinal illness was hospitalized and treated with supportive care and intravenous antibiotics. All 22 patients made a full recovery.

To obtain information about the outbreak source, a 72-hour food and drinking water history questionnaire, which included questions on surface water exposure, was used to interview the ill persons. An analysis of the questionnaire data indicated that muddy surface water was a possible source of infection.

High-intensity and competitive muddy obstacle adventure course races have surged in popularity across the United States, drawing an estimated 1.5 million participants in 2012 (*2*). These military-style adventure races attract high numbers of active-duty military personnel, along with young, active, extremely fit civilians. Persons typically are advised of the risks of participating and required to sign a liability waiver. Races are commonly held on farmlands where animal feces increase the risk for zoonotic disease transmission

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April 4, 2014

Notes from the Field

Multistate Outbreak of XXXXXX Linked to ~~Soft-Ripened Che~~ese — United States, 2013

Mary J. Choi, MD[1,2], Kelly A. Jackson, MPH[3], Carlota Medus, PhD[1], Jennifer Beal, MPH[4], Carrie E. Rigdon, PhD[5], Tami C. Cloyd, DVM[4], Matthew J. Forstner[5], Jill Ball[6], Stacy Bosch, DVM[3], Lyndsay Bottichio, MPH[7], Venessa Cantu, MPH[8], David C. Melka[9], Wilete Ishow[10], Sarah Slette, MS[11], Kari Irvin, MS[4], Matthew Wise, PhD[3], Cheryl Tarr, PhD[3], Barbara Mahon, MD[3], Kirk E. Smith, DVM, PhD[1], Benjamin J. Silk, PhD[3]

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The five patients were reinterviewed to assess their cheese exposures. All five patients had definitely or probably eaten one of three varieties of Crave Brothers soft-ripened cheese (Les Frères, Petit Frère, or Petit Frère with truffles). Three patients had purchased the cheese at three different restaurants, and two had purchased the cheese at two different grocery stores. The cheeses were shipped as intact wheels to the three restaurants and two grocery stores, where they had been cut and served or repackaged and sold to customers.

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Weekly / Vol. 63 / No. 10 March 14, 2014

Notes from the Field

Multistate Outbreak of Human *XXXXXXXXXXXXX* Infections Linked to Live Poultry from a Mail-Order Hatchery in Ohio — March–September 2013

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(Author affiliations at end of text)

In early 2013, four clusters of human *XXXXXXXXXXXXX* infections were identified through PulseNet, the national molecular subtyping network for foodborne bacteria. Many of the ill persons in these four clusters reported contact with live poul- try, primarily chicks and ducklings, from a single mail-order hatchery; therefore, these investigations were merged. During March 4–October 9, 2013, a total of 158 persons infected with outbreak strains of *XXXXXXXXXXXXX* serotypes Infantis, Lille, Newport, and Mbandaka were reported from 30 states.

Forty-two percent (65 of 155) of ill persons were aged ≤10 years, and 28% (29 of 103) were hospitalized; no deaths were reported. Eighty-six percent (80 of 93) of ill persons who were interviewed reported live poultry contact in the week before illness onset. Sixty-nine percent (44 of 64) of ill persons who completed a supplemental live poultry questionnaire reported chick exposure, and 40% (26 of 64) reported duck- ling exposure. Seventy-five percent (33 of 44) of respondents reported live poultry exposure at their home; 59% (26 of 44) specifically reported keeping poultry inside their home.

Of the 40 ill persons who had recently purchased young poultry, the average time from purchase of poultry to illness onset was 21 days (range = 2–52 days); 48% (19 of 40) ill per- sons reported illness onset within 2 weeks of poultry purchase. Among persons with purchase information, 94% (62 of 66) reported buying young poultry sourced from a single mail- order hatchery in Ohio.

This outbreak investigation identified an Ohio hatchery as the likely source of the outbreak. This hatchery previously has been linked with multiple, large human *XXXXXXXXXXXXX* outbreaks (*1*,*2*). These recurring outbreaks highlight the need for comprehensive *XXXXXXXXXXXXX* prevention and control programs to be implemented and maintained at this mail- order hatchery and its associated breeder farms. Mail-order hatcheries and their source flocks should comply with management and sanitation practices out- lined by the U.S. Department of Agriculture's National Poultry Improvement Plan.* Additional owner education is necessary because healthy birds can still transmit *XXXXXXXXXXXXX* to humans. Educational material warning customers and advising them on how to reduce the risk for *XXXXXXXXXXXXX* infection from live poultry should be distributed by farm/feed stores and mail- order hatch- eries with all live poultry purchases (*3*). Reducing the spread of *XXXXXXXXXXXXX* in mail-order hatcheries, in their source flocks, and in the feed store environment is critical to reduce the risk for human illness. This outbreak highlights the need for a compre- hensive approach involving human and animal health officials and practitioners, industry, ~~and backyard poultry~~ flock owners.

* Additional information available at http://www.aphis.usda.gov/publications/animal_health/content/printable_version/HelpingYouPoultryBreeder-PA1708-FinalJuly09.pdf.

[1]EIS Officer, CDC; [2]Ohio Department of Agriculture; [3]Ohio Department of Health; [4]US Department of Agriculture; [5]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC (Corresponding author: Colin Basler, cbasler@cdc.gov, 404-639-2214)

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1. CDC. Notes from the field: multistate outbreak of *XXXXXXXXXXXXX* Altona and Johannesburg infections linked to chicks and ducklings from a mail-order hatchery—United States, February–October 2011. MMWR 2012;61:195.
2. CDC. Notes from the field: multistate outbreak of *XXXXXXXXXXXXX* Infantis, Newport, and Lille infections linked to live poultry from a single mail- order hatchery in Ohio—March–September 2012. MMWR 2013;62:213.
3. CDC. Gastrointestinal (enteric) diseases from animals. Atlanta, GA: US Department of Health and Human Services, CDC; 2013. Available at http://www.cdc.gov/zoonotic/gi.

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Morbidity and Mortality Weekly Report

Weekly September 29, 2006 / Vol. 55 / No. 38

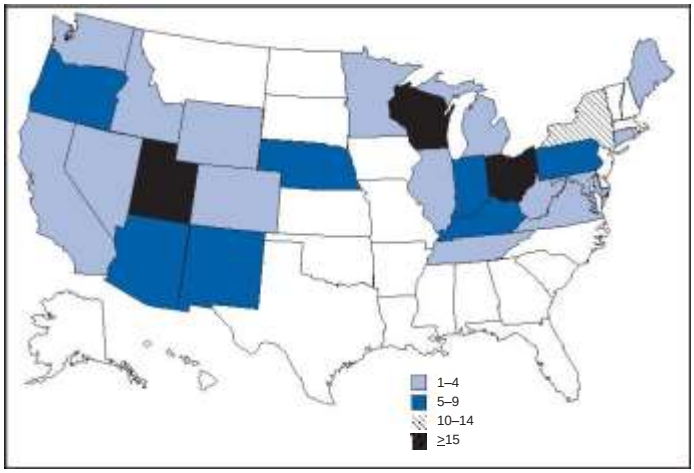
Ongoing Multistate Outbreak of XXXXXXXX Infections Associated with Consumption of Fresh Spinach — United States, September 2006

On September 26, this report was posted as an MMWR *Dispatch on the* MMWR *website* (http://www.cdc.gov/mmwr).

On September 13, 2006, CDC officials were alerted by epidemiologists in Wisconsin and Oregon that fresh spinach was the suspected source of small clusters of XXXXXXXX infections in those states. On the same day, New Mexico epidemiologists contacted Wisconsin and Oregon epidemiologists about a cluster of XXXXXX infections in New Mexico associated with fresh spinach consumption. Wisconsin public health officials had first reported a cluster of XXXXXXX infections to CDC on September 8. On September 12, CDC PulseNet had confirmed that the XXXXX strains from infected patients in Wisconsin had matching pulsed-field gel electrophoresis (PFGE) patterns and identified the same pattern in patient isolates from other states. This report describes the joint investigation and outbreak-control measures undertaken by state public health officials, CDC, and the Food and Drug Administration (FDA). This investigation and additional case finding are ongoing.

As of September 26, a total of 183 persons infected with the outbreak strain of XXXXXXX had been reported to CDC from 26 states (Figure 1). Among the ill persons, 95 (52%) were hospitalized, 29 (16%) had hemolytic uremic syndrome (HUS), and one person died. The deaths of two other patients possibly related to this outbreak are under

FIGURE 1. Number of confirmed cases (N = 183)* of XXXXXX infection, by state — United States, September 2006



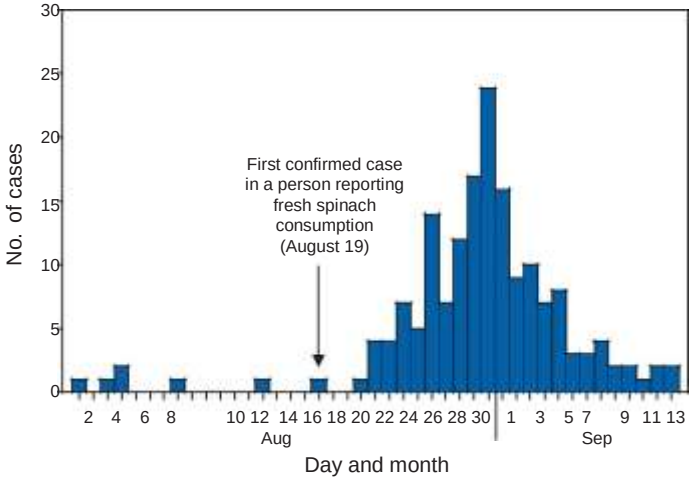
* Confirmed cases reported as of 1:00 p.m. EDT on September 26, 2006.

investigation. Eighty-five percent of patients reported illness onset from August 19 to September 5 (Figure 2). Fresh spinach was identified as the source of the outbreak. One hundred twenty-three of 130 patients (95%) reported consuming uncooked fresh spinach during the 10 days before illness onset. In addition, XXXXXX with a PFGE pattern matching the outbreak strain has been isolated from three open packages of fresh spinach consumed by patients (one from New Mexico, one from Utah, and one from Pennsylvania).

On September 14, FDA advised consumers by press release and press conference to not eat bagged fresh spinach. On September 15, a California company that bags spinach under several brand names announced a voluntary recall of all fresh spinach-containing products. On September 16, FDA expanded its warning and advised consumers to not eat fresh spinach or fresh spinach-containing products. On September 21, FDA informed consumers that only spinach grown in three California counties (Monterey, San Benito, and Santa Clara) was implicated in the outbreak.

A confirmed case is defined as a culture-confirmed XXXXX infection in a person residing in the United States, with illness onset from August 1 to the present (or, if date of onset is unknown, XXXXX isolated from August 15 to the present) and a PFGE pattern identified by the *Xba*I restriction enzyme that matches the pattern of the outbreak strain. August 1 was selected as the earliest illness onset date in the case definition to ensure that the earliest cases in the outbreak were identified and investigated. However, the first six confirmed cases (with illness onsets during August 2–15) were in persons who did not report fresh spinach consumption during the week before illness onset. The first date that illness onset was reported by a person who recently consumed fresh spinach was August 19.

FIGURE 2. Number of confirmed cases (n = 171)* of *XXXXXX* infection, by date of illness onset — United States, August–September 2006



* Confirmed cases with known dates of illness onset reported as of 1:00 p.m. EDT on September 26, 2006.

Infections with this outbreak strain of *XXXXXX* (one of 3,520 unique *XXXXXX* strains reported to CDC PulseNet since 1996) have been reported sporadically to CDC PulseNet since 2003 (an average of 21 cases per year during 2003–2005). This finding suggests the occasional presence of this strain in the environment and food supply; however, it has not been associated with a recognized outbreak in the past.

The time from illness onset to confirmation that a case of XXXXXX is part of an outbreak is typically 2–3 weeks, including the time required for an infected person to seek medical care and for health-care providers and public health officials to obtain a culture, transfer the bacterial culture to a public health laboratory, perform PFGE testing, and submit the PFGE pattern into the national database at CDC. In this outbreak, the average time from illness onset to PFGE pat-tern submission to the national database at CDC has been 15 days; additional information is available at http://www.cdc gov/foodborne/reportingtimeline.htm

Parallel laboratory and epidemiologic investigations were crucial in identifying the source of this outbreak. Timely PFGE testing by state public health laboratories, PFGE pattern submission by states to CDC PulseNet, and analysis of PFGE patterns in the CDC PulseNet national database resulted in rapid detection of the outbreak. Concurrent collection of case exposure information by epidemiologists in affected states and sharing of exposure information among states and CDC led to rapid identification of the suspected food source and public health action. Continued rapid diagnosis, culture, PFGE analysis, and reporting to CDC of *XXXXX* infections are needed to aid this investigation and to detect and investigate *XXXXX* outbreaks in the future.

New information regarding the current outbreak will be available regularly. The most current information is available online at http://www.cdc.gov/foodborne/this website contains information updated daily on the number of cases and affected states in addition to gen-eral information regarding XXXXXX, resources for clinicians, and activities by CDC and other agencies. The FDA website, at http://www.fda.gov/oc/opacom/hottopics/spinach. html, contains advice for consumers on the current outbreak and food-safety guidelines. CDC's public inquiry line (tele-phone, 1-800-CDC-INFO) also can provide information on the current outbreak to both the public and health-care workers. Information about the current *XXXXXX* outbreak is also available by RSS (Really Simple Syndication); a subscription to the *XXXXX* outbreak RSS information can be obtained at http://www.bt.cdc.gov/rss.

Reported by: *State and local health departments.* XXXXX *investigation team, CDC.*

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Notes from the Field

Multistate Outbreak of Human *Salmonella* Infections Linked to Live Poultry from a Mail-Order Hatchery in Ohio — March–September 2013

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In early 2013, four clusters of human *Salmonella* infections were identified through PulseNet, the national molecular subtyping network for foodborne bacteria. Many of the ill persons in these four clusters reported contact with live poul- try, primarily chicks and ducklings, from a single mail-order hatchery; therefore, these investigations were merged. During March 4–October 9, 2013, a total of 158 persons infected with outbreak strains of *Salmonella* serotypes Infantis, Lille, Newport, and Mbandaka were reported from 30 states.

Forty-two percent (65 of 155) of ill persons were aged ≤10 years, and 28% (29 of 103) were hospitalized; no deaths were reported. Eighty-six percent (80 of 93) of ill persons who were interviewed reported live poultry contact in the week before illness onset. Sixty-nine percent (44 of 64) of ill persons who completed a supplemental live poultry questionnaire reported chick exposure, and 40% (26 of 64) reported duckling exposure. Seventy-five percent (33 of 44) of respondents reported live poultry exposure at their home; 59% (26 of 44) specifically reported keeping poultry inside their home.

Of the 40 ill persons who had recently purchased young poultry, the average time from purchase of poultry to illness onset was 21 days (range = 2–52 days); 48% (19 of 40) ill persons reported illness onset within 2 weeks of poultry purchase. Among persons with purchase information, 94% (62 of 66) reported buying young poultry sourced from a single mail-order hatchery in Ohio.

This outbreak investigation identified an Ohio hatchery as the likely source of the outbreak. This hatchery previously has been linked with multiple, large human *Salmonella* outbreaks (*1*,*2*). These recurring outbreaks highlight the need for comprehensive *Salmonella* prevention and control programs to be implemented and maintained at this mail-order hatchery and its associated breeder farms. Mail-order hatcheries and their source flocks should comply with management and sanitation practices outlined by the U.S. Department of Agriculture's National Poultry Improvement Plan.* Additional owner education is necessary because healthy birds can still transmit *Salmonella* to humans. Educational material warning customers and advising them on how to reduce the risk for *Salmonella* infection from live poultry should be distributed by farm/feed stores and mail-order hatcheries with all live poultry purchases (*3*). Reducing the spread of *Salmonella* in mail-order hatcheries, in their source flocks, and in the feed store environment is critical to reduce the risk for human illness. This outbreak highlights the need for a comprehensive approach involving human and animal health officials and practitioners, industry, and backyard poultry flock owners.

* Additional information available at http://www.aphis.usda.gov/publications/animal_health/content/printable_version/HelpingYouPoultryBreeder-PA1708-FinalJuly09.pdf.

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