

Notes from the Field

Typhoid Fever Outbreak Associated with an Asymptomatic Carrier at a Restaurant — Weld County, Colorado, 2015

Jessica Hancock-Allen, MSN^{1,2}; Alicia B Cronquist, MPH²;
JoRene Peden, MS³; Debra Adamson, MPH³; Nereida Corral, MPH²;
Kerri Brown MSPH²

On September 11, 2015, a single case of typhoid fever, caused by *Salmonella* Typhi infection, was reported to the Colorado Department of Public Health and Environment (CDPHE). Because the patient (patient A) had symptom onset September 2 and had traveled internationally for 4 days 60 days before symptom onset, the case initially was thought to be travel-associated* (1,2). On October 1, a second case of *S. Typhi* infection was reported in patient B, with symptom onset September 20. Patient B reported no international travel or contact with ill persons or known carriers. Patients A and B resided approximately 6 miles (10 kilometers) apart and had no discernible epidemiologic connection. Family members of patients A and B tested negative for *S. Typhi*. CDPHE and the Weld County Department of Public Health and Environment (WCDPHE) investigated to 1) determine whether these cases represented a larger outbreak, 2) identify common exposure sources, and 3) stop transmission. Investigators determined that the typhoid fever in both patients and in a third patient (patient C) was associated with eating in the same restaurant during a 5-day period.

CDPHE defined a case of typhoid fever as clinically compatible illness with isolation of *S. Typhi* during July 1–October 15 and identification of an isolate with one of two pulsed-field gel electrophoresis (PFGE) outbreak patterns that differed by one band. A carrier was defined as a person who had contact with patients, reported no recent illness, and had *S. Typhi* with either of the PFGE outbreak patterns in an isolate from a rectal swab or stool specimen. Case finding included searching PulseNet for other isolates that might have been associated with the Colorado cases (3). On October 13, CDPHE issued a health alert notification to clinicians, local public health authorities, and laboratories to be vigilant for additional cases and to encourage reporting. During October 1–9, CDPHE and WCDPHE used the *Salmonella* National Hypothesis Generating Questionnaire (4), credit card receipts, food recall, shopper card records, and social media to identify potential exposures shared by patients A and B during the 60 days preceding symptom onset. Investigators found that the

two patients had fresh produce purchases from the same grocery stores and had six common restaurant exposures.

On October 19, CDPHE was notified of a third Weld County resident who had tested positive for *S. Typhi* infection. Patient C had symptom onset September 15 and reported no recent travel or relation to patient A or B. Patient C was interviewed using the *Salmonella* questionnaire, and credit card receipts were reviewed. Patient C did not shop at the same grocery stores as patients A or B, but all three patients had eaten at restaurant A during August 16–20, 2015. Patients A and C were hospitalized. Isolates from patients B and C had indistinguishable PFGE patterns (pattern 2), and the isolate from patient A had a 1-band difference (pattern 1), which met the PFGE outbreak definition.

CDPHE hypothesized that a chronic *S. Typhi* carrier might be working in food service at restaurant A, where food is prepared using fresh ingredients. Possible transmission routes were investigated through environmental assessments and staff interviews; food service staff members were asked to be tested for *S. Typhi*. Environmental assessments performed on October 27 found no deficiencies in hand hygiene or other food handling issues. Administrators from restaurant A provided a list of all current and former employees who worked in food handling during August 10–August 20, 2015. These more conservative dates were chosen because food might have been served as many as 4 days after preparation, and because of concerns regarding the accuracy of credit card statement dates.

On October 28, current restaurant employees were confidentially interviewed at a local clinic by CDPHE and WCDPHE regarding international travel, symptoms, and work tasks. Because bacterial shedding can be intermittent, employees were requested to collect rectal swab specimens from themselves on October 28 and November 3 for culture and PFGE testing of isolates. All employees were allotted paid time to be interviewed and provide specimens. By October 29, a total of 28 (100%) current employees had responded and provided one or more rectal swab specimens. On October 30, CDPHE was notified by the state health laboratory that *S. Typhi* had been isolated from one employee. The isolate's PFGE pattern was indistinguishable from outbreak pattern 1, the pattern of patient A.

Interviews with the infected restaurant worker revealed travel to a country with endemic typhoid fever 15 years earlier, but no recent symptoms, and no contact with any ill persons. The worker was excluded from food service work, treated with azithromycin for 28 days, and monitored with stool testing until three consecutive specimens obtained ≥ 1 month apart

* The incubation period for *S. Typhi* infection is 3–60 days; the usual range is 8–14 days.

were negative for *S. Typhi* (2). Restaurant A agreed to keep the worker's job open and allow him to return to work once he was no longer a carrier.

S. Typhi infection is a nationally notifiable condition; in Colorado, reporting is required within 24 hours of case detection. Notable clinical symptoms of typhoid fever include insidious onset of fever, and headache, constipation, chills, myalgia, and malaise (1). Unlike other *Salmonella* species, *S. Typhi* does not commonly cause diarrhea, and vomiting typically is not severe (1).

S. Typhi infection is endemic in many low-income countries; an estimated 22 million cases and 200,000 deaths occur each year (2). In the United States, approximately 5,700 cases of typhoid fever are reported annually; the majority occur among travelers (1). In Colorado during 2009–2014, on average, six cases of confirmed typhoid fever were reported annually; all cases were associated with international travel or attributed to a household member or close contact with a carrier. Humans are the only reservoir for *S. Typhi*; disease is transmitted via the fecal-oral route, typically by contaminated food or water. Chronic carriage occurs in 2%–5% of cases (1,2), and shedding of *S. Typhi* in chronic carrier stools can be intermittent.

This investigation highlights the potential for chronic *S. Typhi* carriers to cause illness in other persons, even years

after infection. When cases of typhoid fever not associated with travel are detected, rapid and thorough interviewing is essential. Social media posts and credit card receipts to detect common exposures can be useful. The high cooperation rate among workers at the restaurant, which is rare in foodborne outbreak investigations, was attributed to the restaurant's support and accommodation, demonstrating the importance of collaboration among local public health, state public health, public health laboratories, patients, and industry for successful investigations.

¹Epidemic Intelligence Service, CDC; ²Colorado Department of Public Health and Environment; ³Weld County Department of Public Health and Environment, Colorado.

Corresponding author: Jessica Hancock-Allen, ydi3@cdc.gov.

References

1. CDC. Typhoid fever. Atlanta, GA: US Department of Health and Human Services, CDC; 2013. <http://www.cdc.gov/typhoid-fever/index.html>
2. Heymann DL. Control of communicable disease manual. 19th ed. Washington, DC: American Public Health Association; 2008.
3. CDC. PulseNet. Atlanta, GA: US Department of Health and Human Services, CDC; 2015. <http://www.cdc.gov/pulsenet/>
4. Council to Improve Foodborne Outbreak Response. CDC national hypothesis generating questionnaire. Atlanta, GA: Council to Improve Foodborne Outbreak Response; 2015. <http://www.cifor.us/clearinghouse/tool/detail.cfm?id=288>