



Date: December 1, 2016
To: Summit County Public Health, file
From: Alicia Cronquist, RN, MPH
Subject: Outbreak 2016-59-001: *Salmonella* Ohio Infections Associated with a Restaurant in Breckenridge - July 2016

Summary

CDPHE and Summit County Public Health investigated an outbreak of *Salmonella* Ohio infections. In total, 19 cases were identified. Infection occurred among patrons and staff of a single Breckenridge restaurant, which was found to have substantial food handling deficiencies. No single food item was identified as the source of infection. All 30 restaurant workers were tested for *Salmonella* infection, and 12 (40%) tested positive for the outbreak PFGE pattern. Transmission routes for the workers were not determined. The restaurant was closed and reopened after meeting public health requirements.

Introduction

On Thursday July 14, 2016 the CDPHE public health microbiology laboratory reported serotyping three *Salmonella* Ohio isolates, an unusual serotype in Colorado. Two were from Larimer County residents. The third was from a California resident whose specimen originated at a Summit County health care facility. Review of the CEDRS notes for the Larimer County cases revealed that both had traveled to Breckenridge and shared a house during their exposure periods. The notes also indicated that there were additional ill people among household members of the two diagnosed cases.

With permission from the California Department of Health, a CDPHE epidemiologist interviewed the California case, an adult male, on July 14 using the standard CDPHE *Salmonella* case investigation form. This patient reported staying in Breckenridge during his entire incubation period. He reported dining at a single restaurant with seven dining companions, at least one of whom was also ill. The same restaurant was noted in the case notes of the Larimer county cases.

Salmonella Ohio is rarely detected in Colorado. During 2006-2015 only seven cases were reported in Colorado (3 in 2006, 1 in 2008 and 3 in 2013) out of an average of 600 cases reported per year. No previous foodborne outbreaks with this serotype had been reported in Colorado, however some of the previous cases had been linked to multistate outbreaks associated with live poultry.

Concerned that these cases shared a common exposure, the CDPHE epidemiologist notified Summit County Public Health by email the evening of July 14. The next morning, Summit County Public Health and CDPHE began an environmental, epidemiologic, and laboratory investigation of the facility to determine the scope and source of the outbreak and to ensure appropriate control measures were implemented. Staff from Summit County Public Health, the CDPHE Communicable Disease Branch, the CDPHE Laboratory Services Division, the CDPHE Division of Environmental Health and Sustainability, and the regional epidemiologist from the northwest region participated in this investigation. This report summarizes the investigative methods and findings.

Methods

Epidemiologic

We used the following case definitions:

- Confirmed: A person with *Salmonella* Ohio isolated from a clinical specimen since June 15, 2016 with one of the two outbreak pulsed-field gel electrophoresis (PFGE) patterns who lived in or visited Colorado during their incubation period.
- Probable: Clinically-compatible illness (3 or more loose stools in a 24-hour period) with onset since June 15 in a person who dined at Oscar's restaurant or was epidemiologically-linked to a confirmed case.

Cases were further classified as worker cases, if the case had worked at the restaurant, or patron cases, if the case had dined at the restaurant or was epidemiologically-linked to another patron case.

We searched for additional cases by reviewing routine surveillance data reported in CEDRS and nationally in PulseNet. Because Breckenridge is a resort town with many out of town visitors, we posted a message on the foodborne outbreak listserv in which we asked state health departments to report salmonellosis cases with travel to Colorado to CDPHE.

Confirmed cases were interviewed using the standard CDPHE case investigation form with follow up telephone calls to determine specific foods consumed at the restaurant. We asked cases for the contact information of their dining companions. We attempted to interview all dining companions to inquire about symptoms and specific foods/beverages consumed from the restaurant.

All restaurant workers were interviewed by Summit County Public Health. They were asked about symptoms, work dates, work duties and foods commonly eaten or specifically avoided while at work.

Questionnaire data were entered into and analyzed using Microsoft Excel. Symptomatic dining companions meeting the case definition were determined to be probable cases. An epidemic curve was generated to visualize onsets of illness. To determine specific food items associated with illness, we compared foods eaten by cases and their dining companions. We attempted to identify other controls by asking about reservation logs, online orders, take out logs and other similar sources of information.

Environmental

Environmental health specialists from Summit County Public Health performed an environmental health assessment at Oscar's restaurant on July 15. They assessed food handling procedures and storage, hand washing, food temperatures, cross contamination, sanitation, chemical use and storage, and the health status of employees. They collected invoices for foods used during July, for use in case a traceback of one or more food items was initiated.

Laboratory

Stool testing for *Salmonella* was performed on all workers who had worked at the restaurant since late June. A single stool specimen or rectal swab was obtained from workers who reported no recent gastrointestinal illness. Repeat stool/rectal swabs were collected from workers who reported illness or who tested positive for *Salmonella* until two consecutive negative cultures were obtained at least 24 hours apart and at least 48 hours after completion of any antibiotics.

Specimens were transported to the CDPHE laboratory for testing using the CDPHE courier service or directly by Summit County Public Health and CDPHE employees. The CDPHE laboratory performed

culture on all specimens using standard methods. Serotyping and PFGE was performed on isolates that were recovered. PFGE patterns were uploaded to PulseNet, following standard methods.

Results

Epidemiologic

We identified 19 outbreak cases. Of these, seven were patrons and 12 were workers. Among patrons, four were confirmed and three were probable cases. All worker cases were culture-confirmed. No additional cases were identified via PulseNet or the posts to the foodborne outbreak listserv.

Among patrons, 3 cases (43%) were male. The median age was 46 years, with a range of 5 to 73 years. No patron cases were hospitalized and all survived. Reported clinical characteristics are in Table 1. Cases reported dining at Oscar's on July 1 and July 4.

Three additional illnesses were reported among household contacts of one of the confirmed patron cases, however, these persons did not respond to interview attempts and were not counted as outbreak cases because their illness and exposures were not verified.

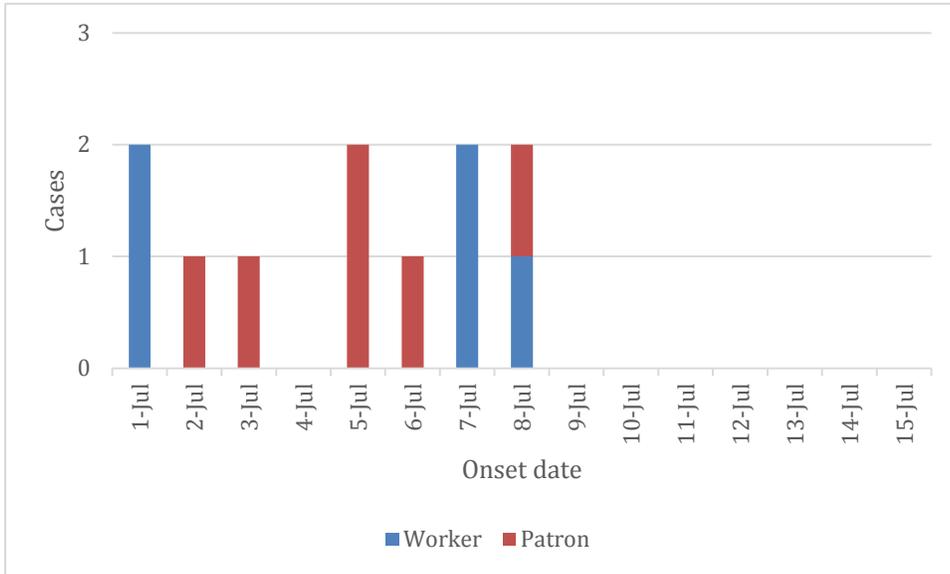
Table 1. Clinical characteristics of *Salmonella* Ohio cases (n=7) identified among restaurant patrons - Summit County, July 2016

Characteristic	Cases n/N (%)
Diarrhea	7/7 (100%)
Bloody diarrhea	1/7 (14%)
Fever	1/6 (17%)
Duration (median)	7 days (range 1-10 days)
Hospitalized	0

Seven dining companions of confirmed cases were interviewed. Three reported illness that met the probable case definition and were classified as patron cases, three reported no illness, and one reported a single episode of vomiting after the meal at Oscar's and could not be classified as a case or well. The restaurant did not have reservation logs, online ordering or take out order logs from which to identify other potential controls. Because only 3 potential controls (the well dining companions) were identified, no specific food item could be implicated as the source of infection. Since workers ate and handled multiple foods over multiple days, we did not attempt a case-control analysis using their work tasks or food consumption information.

Stool specimens or rectal swabs from thirty restaurant workers were tested at the state public health laboratory for *Salmonella*, and of these, 12 (40%) were positive for *Salmonella* Ohio. Seven of the 12 positive workers reported some form of illness, however one reported only headache with an unknown onset date and another reported only fever without reporting an onset date. The remaining five reported some form of gastrointestinal illness with onset dates from July 1 through July 10.

Figure 1. Onset dates* for cases of *Salmonella* Ohio infection among restaurant patrons and workers, Summit County, Colorado, 2016.



*Onset date for one patron case was not known. 5/12 worker cases reported an onset date.

Table 2. Clinical characteristics of *Salmonella* Ohio cases (n=7) identified among restaurant workers who reported any symptoms of illness - Summit County, July 2016

Characteristic	Worker cases reporting any symptoms of illness (n=7)
Diarrhea	4/7 (57%)
Bloody diarrhea	1/7 (14%)
Abdominal cramps	4/7 (57%)
Fever	2/7 (29%)
Vomiting	0
Hospitalized	0

We calculated the duration of *Salmonella* carriage in two ways.

Minimum possible carriage: Because only five workers were able to provide an onset date and date of infection for all workers was not known, we calculated the minimum range of possible carriage by subtracting the collection date of the last positive test from the collection date of the first positive test for each of the 12 culture-positive workers. The median number of days for minimum possible carriage was 10.5 days (range 0-31 days).

More likely possible carriage: For worker cases with symptoms and a known onset date, we calculated duration of carriage by subtracting their reported onset date from the collection date of their last positive specimen. Where onset was unknown or no symptoms were reported, the collection date of

first positive specimen was used, resulting in a more realistic duration of carriage, because onset date was used when available. Using this calculation, the median of the most likely possible carriage for workers was 12 days (range 0-45 days).

Three workers were cleared with their first two follow-up specimens (i.e. they had only one positive specimen). Of note, all three denied any symptoms. In contrast, all workers who reported illness of any type, including headache or fever had at least two positive specimens. Additionally, two workers who denied all symptoms had repeat positives with minimum calculated carriage duration of 4 and 11 days.

The median likely duration of carriage for workers with no reported symptoms (0 days, range 0-11 days) was much shorter than that for workers who reported any type of symptom (34 days, range 6-45 days).

However, the duration of carriage calculations are not a true reflection of how long workers were restricted from foodhandling because they do not account for the time it took to collect the final two specimens that tested negative and allowed the worker to be cleared. Once workers had several positive tests, the state lab was able to perform testing on only one specimen per worker per week due to workload issues, and arranging stool collection with workers was very challenging at times, further delaying specimen collection. The last worker was cleared on September 28 (the specimen was collected on September 19), over two months after the first positive specimen was collected.

Environmental

Summit County Public Health visited the facility on July 15. They noted the following violations:

01b- Spoiled milk.

01c- Potential cross contamination- improper storage of raw proteins and ready to eat foods.

02a- Ill staff working

03e- Potentially hazardous foods held too warm

03f- Probe thermometers not calibrated

04b- Mechanical dish machine not sanitizing.

The facility was asked to close on July 15 due to observed violations and potential illness in patrons. In a letter issued on 7/18/16 (see appendix), conditions for reopening were outlined. These included: 1. Correction of critical violations cited during the 7/15/16 inspection, 2. Staff must demonstrate that they are not carriers of *Salmonella* Ohio bacteria, 3. Staff must demonstrate that they are educated on safe food handling practices, 4. All food contact surfaces must be washed, rinsed, disinfected and then sanitized, and 5. Any outbreak implicated foods must be discarded.

On 7/22/16, the facility successfully demonstrated compliance with the opening criteria and was given approval to reopen. At first, only six staff were permitted to work, pending public health clearance as described above. As more staff met the criteria they were individually permitted to return to work.

Summit County Public Health made a total of 7 visits to the facility to ensure compliance with public health requirements, including the investigation of a report that the owner himself was handling foods even though he was restricted from doing so. Two of the post-reopening inspections resulted in more potential cross contamination violations. Summit County EH's civil penalty process was initiated before compliance was achieved.

Following the final employee being cleared for *Salmonella* Ohio infection, a 'no further action required' letter was issued on 10/17/16.

Laboratory

Isolates from patron cases and worker cases confirmed as *Salmonella* Ohio. The PFGE pattern was TDUX01.0007 (Colorado pattern 13-A). Three representative isolates were sent to NARMS per protocol. Each was susceptible to all antimicrobials on the NARMS panel.

The state laboratory performed culture on 85 stools/rectal swabs submitted as part of this investigation. The first stool specimens were collected from workers on July 15. The final one was collected on September 19.

Discussion

Nineteen cases of *Salmonella* Ohio infection were identified in this restaurant-associated outbreak. The source of *Salmonella* introduction into the restaurant was not determined. Although the outbreak among patrons was relatively large (7 patron cases), we were unable to identify suitable controls to allow for a case-control study to determine the specific food or foods implicated. Once *Salmonella* was introduced into the restaurant, poor conditions at the restaurant including inadequate refrigeration, cross contamination, and bare hand contact with ready to eat foods could have facilitated transmission among patrons and staff.

An unexpectedly high proportion of workers (40%) were infected with the outbreak strain of *Salmonella*. The specific conditions that led to this are unclear.

Infected workers were restricted from food handling until two consecutive stool tests were negative for *Salmonella*, which has been the established CDPHE protocol for management of infected restaurant workers during a *Salmonella* outbreak. This protocol originated with FDA model food code standards and has been in place in Colorado since at least 2003. When an individual case of salmonellosis in a retail food establishment worker is identified by public health, that person is excluded from work at least until diarrhea has been resolved for 24 hours. Follow up testing can be required at the discretion of the local public health agency, based on their knowledge of the facility at which the worker works and their judgement about whether adequate hand hygiene can be maintained.

More stringent requirements (i.e. the requirement for having two consecutive negative stool tests) are used in the setting of an outbreak because during an outbreak, transmission to more than one person has occurred, meaning a breakdown in one or more food safety systems. In addition, multiple positive food workers are often identified, magnifying the risk of transmission to others if those persons continue handling food while shedding.

Following this requirement during this outbreak was very difficult for workers and for public health staff. Some workers were restricted from food handling for 8 weeks, which was clearly very difficult from a financial perspective. Restaurants sometimes find a way to allow infected workers to stay on the job with restrictions on food handling but this was not feasible at this establishment. Public Health worked to connect workers who were excluded to social service and community resources. Some workers pursued worker's compensation claims with the restaurant. Many workers did not return to work at the implicated facility, so were waiting to be cleared so they could start jobs at other retail food establishments. In this situation, where a worker is not planning to return to facility with the outbreak, the value of food handling restrictions pending follow up stool testing is less clear, so long as the new facility has good environmental health practices. However, assessing food handling practice at all facilities where restricted workers intended to work would have been challenging from a logistic and resource perspective. Additionally, in a small town, allowing workers to go to another facility without being officially 'cleared' could have led to communication challenges and concerns about inconsistent application of public health requirements. From the perspective of the local public health agency, collecting 85 stool specimens from highly mobile workers, some of whom did not have telephones, was extremely challenging. In addition, thirteen of the thirty restaurant workers were

from other countries and held J1 student visas which further complicated the investigation in that they had little community familiarity, and few financial resources. Once they were excluded from work, six of them left state for work in Ohio.

The most recent version of the FDA model food code (2013) has broadened recommendations for allowing workers infection with *Salmonella* to return to food handling duties. The new option is to allow workers to return to work if at least 30 days has elapsed since symptom resolution or a positive test in an asymptomatic person. At the start of this investigation, CDPHE was unaware of the new recommendation. CDPHE will research the references that contributed to it and will consider whether to adopt this for future investigations.

One strength of this investigation was the high degree of collaboration among state and local public health agencies. The prompt and thorough response by Summit County Public Health, including immediate closure of the restaurant during the first public health visit when multiple problems were identified might have prevented additional illnesses.