

***Salmonella* Enteritidis Infections Associated with Romaine Lettuce**

April-May

Multiple counties/Multiple states

On April 17, 2017, the Minnesota Department of Health (MDH) Public Health Laboratory determined that a clinical *Salmonella* Enteritidis isolate identified through routine surveillance had a pulsed-field gel electrophoresis (PFGE) pattern (Centers for Disease Control and Prevention [CDC] *Xba*I designation JEGX01.0049; MDH designation SE16B84) that was indistinguishable from a multistate cluster of cases. This PFGE pattern combination was previously rare in Minnesota. At the time of the notification, there were 21 isolates in 10 states. As the national investigation progressed, CDC included additional PFGE patterns in the investigation.

Nationally, a case was defined as a person from whom *S. Enteritidis* with one of the outbreak PFGE patterns (JEGX01.0049, JEGX01.0047, or JEGX01.1186) was isolated. The Minnesota cases were interviewed with a routine exposure questionnaire and re-interviewed with supplemental questionnaires.

Environmental health specialists from the City of Brooklyn Park, Hennepin County, City of Minneapolis, Stearns County, Washington County, and MDH Environmental Health visited restaurants reported by cases to gather invoices, and inquire about employee illness and consumer complaints.

The Minnesota Department of Agriculture (MDA) reviewed records collected from restaurants and grocery stores and shared the information with the United States Food and Drug Administration (FDA).

Ten cases were identified through routine surveillance in Minnesota. All 10 case isolates had PFGE pattern JEGX01.0049, and were closely related by whole genome sequencing (WGS). Eight (80%) cases were female. The median age of cases was 43.5 years (range, 4 to 85 years). Known illness onset dates ranged from April 2 to May 23. All 10 cases reported diarrhea, 7 (70%) fever, 7 (70%) abdominal cramps, 4 (40%) vomiting, and 2 (20%) bloody stools. The one case with available information had an incubation period of 1 day. The median duration of illness was 9 days (range, 4 to 16 days) for the seven cases who had recovered by the time of interview. Two cases were hospitalized for 2 days, six cases sought care at an emergency department, and no cases died.

Nine (90%) cases reported that they ate romaine lettuce; six cases ate romaine lettuce at home, and seven cases ate or maybe ate romaine lettuce outside the home. The FoodNet Population Survey Atlas of Exposures, 2006-2007 was used to estimate the expected frequency of romaine lettuce consumption in Minnesota as 39%. Using the binomial probability model, the observed frequency of 90% among the Minnesota cases was significantly greater than the expected frequency ($p = 0.0014$).

Four cases reported purchasing hearts of romaine in a 3-pack, one case purchased a head of romaine, and one case purchased hearts of romaine in unknown packaging. Different brands and stores were reported. Early in the investigation, several cases had also reported tomato exposure. However, as more cases were interviewed, the types of tomatoes reported by cases were different and determined to be an unlikely cause of the outbreak.

Grocery purchase records were requested by MDA staff from the stores reported by cases. Invoices for possible romaine exposures at restaurants were also gathered by environmental health specialists and shared with MDA staff, who forwarded the information to FDA. MDA did not identify a single brand or farm location during the Minnesota traceback investigation. However, Brand X and farms in Yuma, Arizona were most frequently identified as the brand and source of romaine lettuce for the Minnesota cases.

Multistate Investigation

During April-June, 2017, 151 isolates of *S. Enteritidis* with *Xba*I patterns JEGX01.0049, JEGX01.0047, or JEGX01.1186 were reported to PulseNet from 36 states (AR [2], AZ [2], CA [9], CT [3], FL [2], GA, IA [19], ID [4], IL [7], IN [2], KS, KY, LA, MA, MD [3], MI [23], MN [10], MO [2], NC, NE [4], NJ [2], NM, NV [3], NY [6], OH [2], OK [5], OR, PA [3], SC, SD [4], TX [9], UT, VA [3], VT, WA [2], WI [9]). Isolation dates ranged from March 30 to June 6. Whole genome sequence analysis for 67 isolates showed that the isolates were highly related. Among cases with a completed National Hypothesis Generating Questionnaire, 47 (75%) of 63 reported eating romaine lettuce in the week prior to illness onset.

FDA and selected states initiated an informational traceback for single cases and restaurant clusters with exposure to romaine lettuce and whole head lettuce. The points of exposure were located in different states (Iowa, Maryland, Michigan, Minnesota, Nevada, New York, Oklahoma, Utah, and Texas), and each consisted of one to four ill human cases. The lettuce supplied to the points of service traced back to two major leafy green companies. The farm level information revealed geographic similarity for one major company, while the other company showed diverse growing regions. In conclusion, neither FDA nor State traceback of romaine lettuce converged on a single brand, supplier, or growing region.

This was an outbreak of *Salmonella* infections associated with consuming romaine lettuce. Ten cases related to this outbreak were identified in Minnesota. The ultimate source of the romaine lettuce was not identified.