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**An Outbreak of *Escherichia coli* O157:H7 Infections  
Longville, Minnesota  
July 2006**

Background

During July 27-August 1, 2006 the Minnesota Department of Health (MDH) Public Health Laboratory received three isolates of *E. coli* O157:H7 from residents of and visitors to Longville, Minnesota. The pulsed-field gel electrophoresis (PFGE) patterns for all three isolates were indistinguishable (named EXHX01.1281 in the national PulseNet database); this pattern had not previously been observed in Minnesota. On July 31, 2006 MDH received a report concerning illness among members of Salem Lutheran Church in Longville, Minnesota. The church had recently held a funeral luncheon on July 10 and their monthly summer potluck smorgasbord on July 19. Subsequently, multiple individuals reportedly became ill with cramps and bloody diarrhea.

On August 2, MDH notified the Minnesota Department of Agriculture (MDA) of the outbreak occurring in Longville. MDA was informed that ground beef used to make meatballs for the smorgasbord was purchased at a grocery store in Longville. The following day, MDH learned that the United States Department of Agriculture (USDA) had recently isolated the outbreak PFGE subtype of *E. coli* O157:H7 from a sample of beef trimmings collected from a beef processing plant.

On August 4, MDH identified a fourth *E. coli* O157:H7 case isolate with the same PFGE pattern in a resident of Brainerd, Minnesota.

Methods

Epidemiologists from MDH obtained the member directory from Salem Lutheran Church and interviewed parishioners to obtain information on attendance at community events, dining at restaurants, shopping at grocery stores, and illness history. MDH requested that local clinics and hospitals send contact information for all individuals who recently had sought medical attention for bloody diarrhea.

A case was defined as a resident or visitor to the Longville area who became ill with bloody diarrhea since July 10, or a Minnesota resident with a confirmed *E. coli* O157:H7 infection matching the outbreak PFGE pattern. In addition to the four culture-confirmed samples already tested by MDH, stool kits from two ill church members were collected and submitted to MDH for bacterial and viral testing.

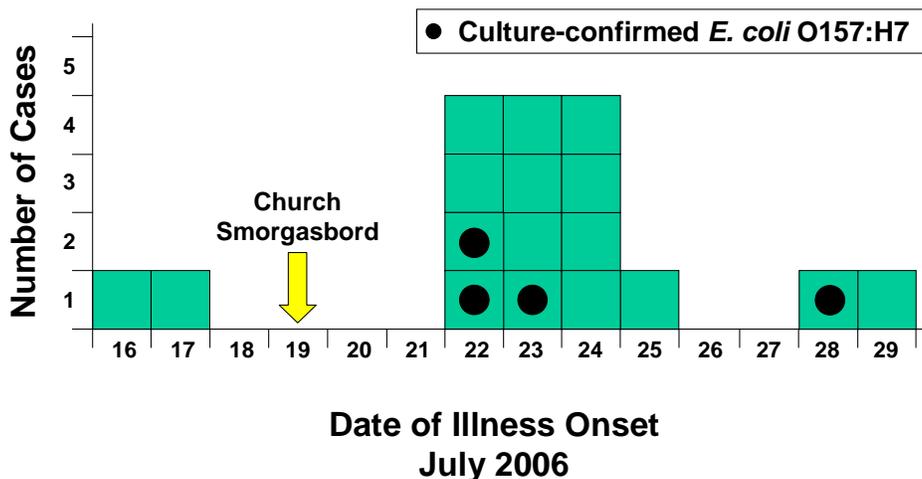
An MDH sanitarian visited Salem Lutheran Church to conduct an environmental assessment of the kitchen, which was used to prepare foods for the smorgasbord. MDA contacted the local grocery store and local restaurants to obtain information on the type and source of beef products.

MDA conducted an on-site inspection at the grocery store on August 7 and obtained samples of ground beef that was currently in retail; these samples were cultured for *E. coli* O157:H7. During this inspection the MDA inspector learned that several local restaurants and churches frequently purchase ground beef from the retail case at the grocery store. Officials from MDH and MDA contacted USDA for information regarding the beef sample *E. coli* O157:H7 isolate that matched the outbreak PFGE subtype.

### Results

A total of 146 people were interviewed, and 17 met the case definition. Fourteen other individuals reported recent gastrointestinal symptoms that did not meet the case definition; these persons were excluded from the analysis. All 17 cases reported bloody diarrhea, 16 (94%) had cramps, six (35%) had vomiting, and four of 16 (25%) had fever; nine cases (53%) were hospitalized (median length of stay, 5 days; range, 1 to 27 days). Three cases developed hemolytic uremic syndrome, and one case died. The median age of cases was 71 years (range, 28 to 84 years); there was no significant difference in age between cases and controls (i.e., those who were not ill). Dates of illness onset ranged from July 16 to 29; 13 cases reported onset from July 22 to 25 (Figure 1). The stool samples from both ill church members that were submitted directly to MDH were negative for norovirus and enteric bacteria (*Campylobacter*, *E. coli* O157:H7, *Salmonella*, *Shigella*, and *Yersinia*); only one of these members who submitted a stool sample to MDH met the case definition.

**Figure 1. Cases of Bloody Diarrhea Associated with the Longville Community *E. coli* O157:H7 Outbreak by Illness Onset Date, July 2006**



Attending the smorgasbord at Salem Lutheran Church on July 19 was significantly associated with illness (12 of 17 cases vs. 44 of 117 controls; odds ratio [OR], 4.0; 95% confidence interval [CI], 1.3 to 12.1;  $p = 0.01$ ). Many food items were available at the event, including meatballs, ham, turkey, mashed potato bake, baked beans, deviled eggs, a variety of cold salads, desserts, and beverages. Several of the food items, including the mashed potato bake, meatballs, turkey,

and potato salad were prepared at the church in the 3 days prior to the event; the remaining food items were prepared by church members in their homes. All food items were served buffet-style. According to the event coordinator, roughly 300 people attended the smorgasbord on July 19 between 5:00 p.m. and 7:00 p.m. The event was advertised to the public, and an admission fee was charged. Several people reported taking home leftover food, including potato salad, and eating it in the days following the smorgasbord; some reported sharing the leftover foods with friends and family members (some of whom did not attend the original event at the church). Consuming any foods from the church smorgasbord (whether or not a case actually attended the event) was significantly associated with illness (13 of 17 cases vs. 44 of 117 controls; OR, 5.4; 95% CI, 1.5 to 21.1;  $p = 0.002$ ). In particular, consuming lettuce salad at the church smorgasbord was significantly associated with illness (4 of 10 cases vs. 3 of 40 controls; OR, 8.2; 95% CI, 1.5 to 46.3;  $p = 0.02$ ). There may have been more than one lettuce salad dish available at the smorgasbord. Any lettuce salads that were available were prepared at the home of church members and brought to the church on the day of the smorgasbord. Consuming potato salad that was prepared for the smorgasbord approached significance (8 of 12 cases vs. 15 of 40 controls; OR, 3.3; 95% CI, 0.8 to 13.0;  $p = 0.07$ ). This included one case that consumed leftover potato salad at a dinner party the following day (this case did not consume potato salad at the smorgasbord event).

On July 17, members of the church purchased several food items from a local grocery store, including approximately 40 lbs. of ground beef for making meatballs. Officials from MDA determined that the grocery store received approximately 1,900 lbs. of chuck rolls from a meat distributor (Distributor A) on July 10, 2006. The majority of this chuck roll shipment was ground into ground beef at the grocery store. Based on the MDA inspector's interview of the meat manager, the grocery store probably sold ground beef from the July 10 shipment of chuck rolls to three restaurants in Longville during the same time period.

Four of the 17 cases identified in this outbreak did not consume food from the church smorgasbord. Of these, two consumed ground beef-containing food items from one of the three restaurants that may have received ground beef from the grocery store. One of these cases consumed tacos at a local restaurant. The restaurant did not prepare the tacos, but hosted the event for the local Lions Club. The hamburger used to prepare the tacos was purchased from the grocery store on July 17 (the same day the church purchased the hamburger used to make the meatballs).

One case became ill 2 days before the smorgasbord and did not attend the event due to illness. However, this person did prepare one of the food items served at the smorgasbord (this food item was not statistically associated with illness). This case was unsure of hamburger consumption in the week prior to illness onset. One culture-confirmed case had no identifiable connection to Longville.

#### *Environmental Assessment*

Per Minnesota Statute 157, the Salem Lutheran Church kitchen is not licensed or inspected by MDH or Cass County, and is not required to meet the standards applied to commercial kitchens. However, the kitchen was equipped with several pieces of commercial equipment, including a commercial stove/oven with ventilation hood, a 2-door NSF-approved refrigerator, dishwasher, and mixer. The kitchen was approximately 20 x 30 feet, had granite counters along two walls,

and had a large pass-through window to the dining room. There was a center island that contained two prep-sinks and a large granite counter workspace. The dishwashing area was equipped with a 3-compartment sink, dishwasher, and a small pass-through window to the dining area. There was a single handwashing sink equipped with soap and paper towels near the door that separated the kitchen from the dining area.

On July 17, members of the church purchased several food items from a local grocery store, including approximately 40 lbs. of ground beef and 20 lbs. of ground pork for making meatballs, five turkeys, and 100 lbs. of sliced ham. On the same day, church members began preparing the potato salad; potatoes and eggs were cooked and peeled, and then stored overnight in the refrigerator. The ground meat and other foods were also stored in this refrigerator.

On July 18, approximately 20 church volunteers assisted in preparing the large quantity of foods needed to accommodate the predicted smorgasbord attendance. The majority of volunteers worked for approximately 2 hours each, and most of the food was prepared during a 2-3 hour period. Volunteers cooked the turkeys, sliced the ham into smaller pieces, assembled the mashed potato bake, prepared and cooked the meatballs, made a carrot salad, and chopped the eggs and potatoes for the potato salad; all food items were then refrigerated overnight. The volunteers reported using all three sinks (i.e., the two prep sinks as well as the handwashing sink) for handwashing.

The mixture for the meatballs was prepared in batches in the mixer located next to the center island. Approximately 10-12 lbs. of ground beef and pork were placed in the mixer, along with chopped onions, milk, eggs, breadcrumbs, and seasonings. After the mixture was combined, volunteers started portioning and rolling the meatballs. Because of space restrictions, meatball preparation was extended out of the kitchen into the dining area. According to the event coordinator, the volunteer staff wore gloves during preparation of the meatballs. The rolled meatballs were placed on sheet pans and baked in the oven for 30-45 minutes. The final cook temperature of the meatballs was not measured; however, they were visually assessed for doneness by breaking open several meatballs to see if they appeared fully cooked. After being removed from the oven, meatballs were placed in roasting pans. Gravy was made using the pan drippings and then poured over the meatballs. The roasting pans were then placed in the refrigerator for storage overnight.

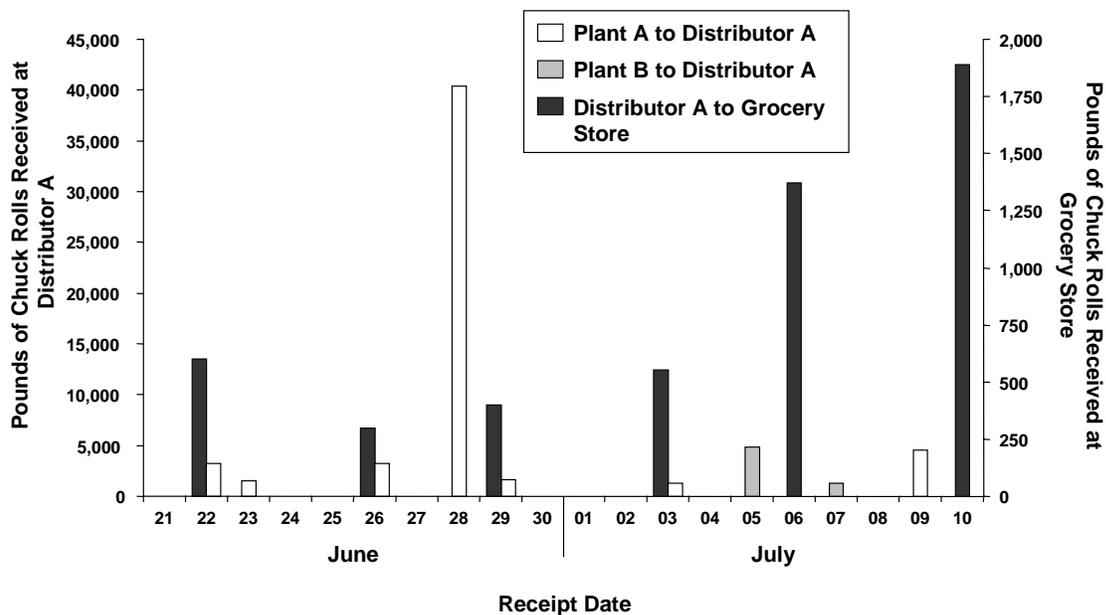
While the meatballs were being prepared, volunteers were also chopping the peeled eggs and potatoes for the potato salad. The event coordinator recalled this preparation being conducted at the center island. The mashed potato bake was also assembled and the cooled turkeys were cut and placed on platters during this time period.

On July 19, the dressing for the potato salad was cooked and then mixed with the previously chopped eggs and potatoes; the potato salad stayed in the same pot until it was served that evening. The meatballs and mashed potato bake were heated in the afternoon prior to the event. During the smorgasbord, warm foods were stored in roasting pans within the kitchen and brought out to the service line as needed.

*Product Traceback*

MDA attempted to trace back the chuck rolls received by the grocery store used to produce the ground beef that was purchased by the church. In the weeks prior to the outbreak, the grocery store had received all of its chuck rolls from a single distributor (Distributor A). The grocery store received approximately 5,100 lbs of chuck rolls from Distributor A on six separate dates, from June 22 through July 10, 2006 (Figure 2). The meat used to make meatballs for the church smorgasbord and the Lion’s Club’s tacos was ground at the grocery store on July 17. Based on timing and volume, the ground beef used by the church and the Lion’s Club most likely originated from the 1,900 lb shipment of chuck rolls received by the grocery store from Distributor A on July 10 (Figure 2). However, the grocery store did not keep grinding records, and there were no records to document sales of ground beef to either the church or the local restaurants. Grinding practices at the grocery store were not in violation of the Minnesota Food Code.

**Figure 2. Amount of Chuck Rolls Received at Distributor A and at the Longville Grocery Store, by Source and Receipt Date, June 22 through July 10, 2006**



MDA obtained sales invoices from Distributor A to determine potential sources of the chuck rolls that were supplied to the grocery store in Longville prior to July 16. Distributor A employees, via personal communication, reported to MDA that chuck rolls received from any processing plant are held for a minimum of 1 week, and an average of 2 weeks before distribution. Therefore the traceback focused on chuck rolls received by Distributor A since June 22.

According to the invoices, Distributor A received chuck rolls from two processing plants since June 22 (Plant A and Plant B). The majority of the chuck rolls (55,791 lbs, 90% of total)

received by Distributor A during this time frame came from Plant A. Because of the typical 1-2 week distribution lag time, the chuck rolls received at the grocery store on July 10 likely were received by Distributor A during June 26-July 3. All of the chuck rolls received by Distributor A during that time frame came from Plant A. Therefore, Plant A was the most plausible source of chuck rolls that were distributed to the grocery store. However, records at the grocery store and Distributor A were not adequate to definitively demonstrate this link.

The USDA reported that the sample of beef trimmings from the processing plant that yielded the outbreak PFGE subtype of *E. coli* O157:H7 was collected on June 14, 2006. However, USDA would not report the name of the processing plant to MDH or MDA, and therefore it is unclear if the sample was from Plant A.

The ground beef samples from the Longville grocery store tested negative for *E. coli* O157:H7.

### Conclusions

This was an outbreak of *E. coli* O157:H7 infections among members of the Longville, Minnesota community. Multiple potential routes of transmission of *E. coli* O157:H7 to cases were identified. An environmental assessment of the church kitchen and food preparation procedures indicated that there was a high potential for cross-contamination between ground beef and ready-to-eat foods during food preparation for the smorgasbord. This cross-contamination could have occurred via contamination of environmental surfaces, utensils, or hands during handling of the ground beef. In addition, church workers and smorgasbord patrons could have been exposed directly to contaminated surfaces. At least one case that prepared food items for the smorgasbord was ill prior to food preparation, and was present in the church kitchen facility while food preparation was taking place; this also could have contributed to contamination of food items or environmental surfaces, or person-to-person transmission to other volunteers.

Four of the 17 cases identified in the outbreak were not associated with the church smorgasbord. Some of these cases were likely associated with ground beef consumption at restaurants that may have purchased ground beef from the retail case at the same grocery store that supplied ground beef to the church for the smorgasbord. This finding provides further evidence that the ground beef purchased from the grocery store was the source of *E. coli* O157:H7 for this outbreak.

The isolation of the rare outbreak PFGE subtype of *E. coli* O157:H7 from a sample of beef trimmings from a USDA-inspected plant in the weeks prior to the outbreak suggests that the chuck rolls that were used to produce the ground beef at the store were likely already contaminated when received by the store. Grinding of this product at the grocery store may have mixed contaminated and uncontaminated product. The lack of sufficient records precluded a definitive traceback of the chuck rolls to the plant of origin. However, records that were available from the grocery store and Distributor A suggested that the ultimate source of the implicated chuck rolls was Plant A.

Due to the outbreak, the church canceled its potluck smorgasbord that was scheduled for August, and contacted the local and state health departments for advice in planning future events.