

2003 Outbreak of Escherichia Coli 0157 Infections Associated with Consumption of Alfalfa Sprouts Produced in Minneapolis

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Background

On February 14, 2003, through routine surveillance of *E. coli* 0157 isolates submitted from clinical laboratories, the Minnesota Department of Health (MDH) identified a cluster of five *E. coli* 0157 case-isolates

with an indistinguishable pulsed- field gel electrophoresis (PFGE) pattern.

Methods

Epidemiologic investigation

During February 14 to 18, 2003, MDH conducted a case-control study based on hypotheses generated from standard enteric pathogen interviews of the first four cases. A case was defined as a Minnesota resident with a culture-confirmed *E. coli* 0157 infection with illness onset after January 1, 2003 and with an isolate matching the outbreak PFGE subtype. Two age-matched controls were selected for each case by sequential digit dialing anchored on the case's telephone number. Using the same format as the cases, controls were asked about specific foods had eaten and any restaurant exposures for the week before illness onset of the matched case. Additionally, the interview included questions about food consumption at 22 chain restaurants because initial case interviews suggested a common exposure to one of two restaurant chains. Potential controls were excluded if they reported traveling outside Minnesota in the month before the case's illness onset date, or if they reported any diarrhea (defined as three or more loose stools in a 24-hour period) or anyone in their household with an *E. coli* 0157 infection in the month before the case's illness onset date.

Laboratory methods

PFGE testing after digestion with the enzyme *Xba*1 was performed on all *E. coli* 0157 isolates received at MDH, and those with the pattern common to this cluster were designated MN726. All MN726 isolates were also tested by PFGE after digestion with a second enzyme, *Bln*1. *E. coli* 0157:H7 (motile) MN726 isolates indistinguishable by PFGE after digestion with *Bln*1 were designated PulseNet pattern EXHXOI.1424. *E. coli* 0157:NM (non-motile) MN726 isolates indistinguishable from the motile strains by PFGE after digestion with *Bln*1, were designated PulseNet pattern EXNXO1.0116.

Traceback methods

Investigators from the Minnesota Department of Agriculture (MDA) and sanitarians from the Minneapolis Department of Health and Family Support and the Hennepin County Community Health Department participated in the traceback investigation. MDA inspected the sprouter-grower plant on February 17, and sampled seeds, sprouted seeds, and irrigation water. The Food and Drug Administration (FDA) collected environmental samples for culture from the sprouter-grower plant on March 4, 2003.

Results

There were five primary cases and two secondary cases identified. *E. coli* 0157 MN 726 isolates from cases two, three, four and five were motile and designated PulseNet pattern EXHX01.1424. *E. coli* 0157 MN 726 isolates from case one, and two family members of case five were non-motile and designated PulseNet pattern EXNX01.0116. The seven isolates were indistinguishable by PFGE testing with two enzymes, *Xba*1 and *Bln*1.

Illness onset dates for the five primary cases ranged from January 15 to February 2, 2003. The median age of the five primary cases was 30 years (range, 21 to 57 years); four cases were female and one was male.

All seven cases reported diarrhea, three (43%) with blood. All seven cases reported cramps, four (57%) reported fever, and one (14%) reported vomiting. Two cases were hospitalized for three and five days, respectively, and two additional cases visited an emergency room.

Three of the first four cases reported eating sandwiches with alfalfa sprouts and lettuce at a chain sandwich restaurant (2 cases, each at a different restaurant in the chain) or a chain bagel restaurant (1 case). Meal dates for the three ranged from January 10 to January 29, 2003. The restaurants were all in the Minneapolis-St. Paul metropolitan area. The fourth ate regularly at the same chain sandwich restaurant, and when she did she typically ordered a sandwich with sprouts. However, she could not recall eating there the week before illness onset. The fifth case was a 6-year-old male with illness onset on February 8. His mother (44 years old) reported a diarrheal illness with onset on February 1. She ate at a different location of the bagel restaurant chain on January 30, and had a bagel with alfalfa sprouts and lettuce. There appears to have been secondary transmission to a second child as well, a 3-year-old female with illness onset on February 5. The outbreak strain of *E. coli* O157:NM was isolated from stool samples submitted by this child and the mother, collected on February 17 and February 24, respectively. Neither of the children had independent sprout or lettuce exposures.

In the case-control study, three of four cases reported eating sprouts during the week before illness onset, compared to zero of eight controls (odds ratio [OR], undefined; 95% confidence interval [CI] lower limit, 1.7; $p=0.01$). Alfalfa sprouts were the only food item statistically significantly associated with *E. coli* O157 MN726 infection. Four of four cases reported eating lettuce compared to seven of eight controls (OR, undefined; 95% CI lower limit, 0.01; $p=0.72$).

Sprouts from four different restaurants identified by cases were traced back to the same distributor, then to a single sprouter-grower plant in Minneapolis, and from there to a single seed distributor. The sprouter received 12,000 lbs of seeds from a Kentucky distributor on December 31, 2002. The seeds were from a single lot of 44,000 lbs of seed imported from an Australian seed producer; these seeds had been distributed nationwide, and only 220 lbs remained in Kentucky. Sprouts consumed by case-patients at all four restaurants were traced to this lot of 44,000 pounds of seed.

The MDA cultures of samples of sprouts, irrigation water, and remaining seed at the sprouter plant were negative for *E. coli* O157. Results of the FDA's March 4, 2003 cultures of environmental samples could not be obtained.

Two problems pertaining to disinfection of seeds were identified by MDA during inspection of the sprouting plant: inadequate concentration of chlorine (the sprouter's process achieved 15,000 PPM rather than the FDA requirement for 20,000 PPM chlorine) and inadequate agitation of the seeds with the chlorine solution. The Minneapolis sprouter voluntarily stopped production of alfalfa sprouts, and cleaned and disinfected the plant. The remaining 8,000 lbs of seed from the lot was returned to the Kentucky distributor. After inspection by MDA on 2/21/2003, the sprouter resumed production with a new lot of seeds.

Conclusion

This was an outbreak of *E. coli* O157, motile and non-motile strains, associated with consumption of sprouts traced to a Minneapolis sprouter-grower plant. Deficiencies in disinfection of the seeds prior to sprouting were discovered and corrected.