Outbreaks of Escherichia coli O157:H7 Infection Associated with Eating Alfalfa Sprouts -- Michigan and Virginia, June-July 1997

In June and July 1997, simultaneous outbreaks of Escherichia coli O157:H7 infection in Michigan and Virginia were independently associated with eating alfalfa sprouts grown from the same seed lot. The outbreak strains in Michigan and Virginia were indistinguishable by molecular subtyping methods. This report summarizes the preliminary findings of the outbreak investigations. Michigan

During June 1-July 31, a total of 60 persons with E. coli O157:H7 infection were reported to the Michigan Department of Community Health (MDCH) from 16 counties throughout southern and central Michigan; in comparison, during the same period in 1996, a total of 31 infections were reported throughout the state. Of the 60 persons reported in June and July 1997, isolates from 40 (67%) persons were indistinguishable from each other by pulsed-field gel electrophoresis (PFGE) subtyping performed at the molecular laboratory of MDCH; 14 (23%) had isolates with various other PFGE patterns, and six (10%) had isolates that were unavailable for subtyping. Among the 46 persons whose isolates were indistinguishable by PFGE (40 (87%) or unavailable for subtyping (six {13%}), the median age was 35 years (range: 2-79 years), and 29 (63%) were female. Bloody diarrhea was reported by 44 (96%) persons, and 25 (54%) were hospitalized. Two persons developed hemolytic uremic syndrome, and one had thrombotic thrombocytopenic purpura; no one died. To assess potential risk factors for infection, a case-control study of 30 case-patients with either the outbreak strain or whose isolates were unavailable was performed, using two age-, sex-, and telephone exchange-matched controls per case; the remaining case-patients could not be contacted to participate, were the second case in a household, or were reported after the study had begun. Of 30 case-patients, 18 (60%) reported eating alfalfa sprouts within 7 days of illness onset, compared with three (5%) of 59 controls during a similar time (matched odds ratio {MOR}=32.1; 95% confidence interval {CI}=5.8-678). No other food items were significantly associated with illness.

All implicated alfalfa sprouts were produced by a single sprouter, who supplied approximately 30%-50% of the alfalfa sprouts marketed in Michigan during the outbreak period. Inspection of the sprouting facility did not identify unsanitary sprout-manufacturing practices. Environmental swabs from this grower's facility did not yield E. coli O157:H7; microbiologic examination of seed samples is under way. Virginia
During June 1-July 28, the Virginia Department of Health received reports of 48 cases of E. coli O157:H7 infection. In comparison, during the same period in 1996, a total of 20 infections were reported throughout the state. Of the 48 persons reported, 26 (54%) had isolates available. PFGE analysis of these isolates at CDC found that 24 (92%) had indistinguishable PFGE patterns. Among these 24 persons, the median age was 31 years (range: 6-67 years), and 13 (54%) were female. Bloody diarrhea was reported for all persons, and 11 (46%) were hospitalized. To assess potential risk factors for infection, a case-control study of 20 case-patients with the outbreak strain was performed, using one, two, or three age-, sex-, and telephone exchange-matched controls per case. Thirteen (68%) of 19 case-patients with definite responses reported either definitely or probably eating alfalfa sprouts within 7 days of illness onset, compared with six (13%) of 45 controls during a similar time (MOR=24.6; 95% CI=4.1-537). No other food items were significantly associated with illness.

All implicated alfalfa sprouts were produced by a single sprouter. Inspection of the sprouting facility did not identify obvious unsanitary sprout-manufacturing practices. Environmental swabs from this facility also did not yield E. coli O157:H7; microbiologic examination of seed samples is pending.

E. coli O157:H7 isolates from Michigan and Virginia were compared at CDC. Outbreak-associated isolates from both states had indistinguishable PFGE patterns and were phage type 32. Follow-Up Investigation

In Michigan, implicated sprouts were grown from either of two seed lots that were used interchangeably. In Virginia, implicated sprouts were grown from only one lot, and this lot was the same as one of the lots used in Michigan. The seed lot common to both sprouters was supplied by one seed distributor and was sent to three sprouting facilities; two were the implicated sprouters in Michigan and Virginia, and the third, also in Michigan, reportedly had sprouted only a small amount of the seeds. No tracebacks implicated the third sprouter, none of the sprouts from this sprouter remained on the market, and the remaining seeds from this lot were returned to the distributor. At the Michigan facility implicated by traceback, no sprouts grown from this lot remained on the market, and no seed remained from this lot. In Virginia, the sprouter was still using seeds from the implicated lot; a voluntary recall of sprouts grown from this facility was initiated on August 1, and the remaining seeds were returned to the distributor. No other seed remained unaccounted for from the implicated lot. The mode of contamination of the alfalfa seeds is being investigated.

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Editorial Note

Editorial Note: These are the first reported outbreaks of E. coli O157:H7 infection associated with eating alfalfa sprouts. Since 1995, four outbreaks of Salmonella infection have occurred in the United States because of consumption of contaminated alfalfa sprouts (1,2; CDC, unpublished data, 1997). In 1996 in Japan, radish sprouts were associated with the largest recorded outbreak of E. coli O157:H7 infection, in which approximately 6000 cases occurred (3).

As in previous alfalfa sprout-associated outbreaks of infection with Salmonella serotype Stanley (1) and Salmonella serotype Newport (2), the Michigan and Virginia outbreaks of E. coli O157:H7 infection probably were caused by contaminated alfalfa seeds, rather than contamination during the sprouting process. Because alfalfa seeds are a raw agricultural commodity, they can become contaminated with animal feces that may harbor pathogens such as Salmonella or E. coli O157:H7 during growth, harvest, processing, storage, shipping, or sprouting. The recurrent implication of alfalfa sprouts as a vehicle for foodborne illness highlights the need for strengthened prevention and control measures to ensure the safety of this product. Studies of alfalfa seed inoculated with low numbers of Salmonella suggest that the number of organisms present on seeds may increase up to 10,000-fold during the sprouting process (4). The effect of the sprouting process on the growth of E. coli O157:H7 is unknown. In April 1996, representatives of the sprout industry met with the Food and Drug Administration (FDA) and CDC to discuss research needs to identify effective methods of alfalfa seed decontamination. However, research has not identified such a method; treatments, such as soaking seeds in water with chlorine concentrations of 2000 ppm (the highest allowable concentration), reduce the level of contamination but can leave viable microorganisms that may then be amplified during the sprouting process (4). Further efforts are needed to evaluate seed and sprout disinfection strategies.

In addition to seed decontamination, prevention of future alfalfa sprout-related outbreaks will depend on identification of critical control points to reduce the likelihood of contamination during seed production and distribution. Additional prevention approaches could include categorizing sprout growers as food service workers rather than agricultural harvesters, along with systematic inspection and certification of sprouting facilities. As with all fresh produce, consumers should thoroughly rinse alfalfa sprouts before eating; however, the effectiveness of rinsing to reduce contamination is unknown. Persons at higher risk for severe complications of E. coli O157:H7 or Salmonella infection, such as infants and young children, the elderly, pregnant women, or immunocompromised persons, can reduce their risk by not eating raw alfalfa sprouts.

The Michigan and Virginia E. coli O157:H7 outbreaks demonstrate the value of molecular subtyping in the investigation of foodborne outbreaks. In both states, an increase in the number of reported cases of E. coli O157:H7 infection was suggested by PFGE analysis to be a common-source outbreak rather than an increase in sporadic cases. In addition, molecular subtyping of isolates from both states by PFGE and phage typing at CDC
demonstrated that these outbreaks were linked by a common strain, corroborating the epidemiologic and traceback findings. CDC has established a National Network for Molecular Subtyping (5), with four area laboratories in Massachusetts, Minnesota, Texas, and Washington serving as reference PFGE laboratories; other state laboratories also have begun using the same method. Standardized laboratory procedures and electronic links to share data among laboratories and CDC make this network a key element of the recently announced President's Food Safety Initiative (6) and an important aspect of outbreak detection and coordination.

References


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