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***Salmonella typhimurium* and *E. coli* O157:H7 infections among Minnesota Residents**

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This is a review of recent *Salmonella typhimurium* and *Escherichia coli* O157:H7 infections among Minnesota residents. Current Minnesota rules require that all clinical isolates of *Salmonella* and *E. coli* O157:H7 be submitted to the state public health laboratory for confirmation and surveillance purposes. Cases are interviewed by telephone with a standard questionnaire to ascertain history of diarrheal illness and potential common exposures (e.g. attendance at day care, drinking untreated water or unpasteurized milk, consumption of undercooked hamburger and restaurant exposures).

E. coli O157:H7 frequently causes bloody diarrhea and occasionally a severe sequella called hemolytic uremic syndrome (HUS). Cattle has been identified as the primary reservoir for this bacteria and the most frequently recognized foodborne source of human infection has been the consumption of undercooked hamburger. Recently other sources such as lettuce and unpasteurized milk or juices have been identified. In 1996, an outbreak was identified among residents of the Pacific Northwest who consumed unpasteurized apple juice. Another outbreak infecting thousands of Japanese residents has presumably been linked to the consumption of radish sprouts.

S. typhimurium is a common pathogen for both animals and humans. In the United States, 23% of human and 15% of animal *Salmonella* infections are due to *S. typhimurium* which is one of 2300 serotypes of *Salmonella* sp. It is the most common *Salmonella* serotype isolated from Minnesota residents. *Salmonella* infections usually cause fever and diarrhea lasting approximately five days. Rarely, *Salmonella* infections become invasive, causing septicemia or reactive arthralgia.

***Escherichia coli* O157:H7**

During 1996, 238 cases of *E. coli* O157:H7 infection were reported among Minnesota residents. This represents the largest number of cases reported annually since *E. coli* O157:H7 became reportable in 1987 (Figure 1). The number of reported cases in 1996 exceeded those reported in 1995 by 17%. Eighty-four percent of cases occurred between June and September. One hundred and eighteen (50%) cases occurred in children less than 11 years of age. This increase in cases among children is attributed to four outbreaks identified among children attending child care facilities. These child care outbreaks accounted for 65(27%) of the total number of *E. coli* O157:H7 cases.

The largest outbreak involved a child care center attended by 99 children and staffed by 29 employees. Sixty-three cases were identified, 45 among children and staff and 18 among community/family contacts. Cases were defined as persons with three or more loose stools in a

24-hour period or who had *E.coli* O157:H7 isolated from stool samples. Cases occurred among 12(86%) of 14 infants, 6(38%) of 16 toddlers, 12 (17%) of 69 older children and 15(52%) of 29 staff. Five of the 12 older children had infant or toddler siblings who attended the child care center. Of the 18 cases among family or community contacts, six were mothers of infected children. One child who did not attend the center was presumably infected by playing with an infected child care attendee. Subsequent foster placement of this child resulted in the infection of four children in the foster family and the foster mother. Forty-five (71%) cases were culture-confirmed. Two cases of hemolytic uremic syndrome (HUS) occurred: the child in the foster family and one child who attended the child care center. *E.coli* O157:H7 was also isolated from a hamburger sample obtained from the home of one of the initial cases. The molecular subtype pattern of the hamburger isolate was similar to the predominant pattern identified among the cases.

Another 20 culture-confirmed cases occurred in three unrelated day care homes. No cases of HUS were reported among these children. Another outbreak occurred in June among children swimming at a public beach. All six cases had been swimming on the same day and four of the six swam at the same beach. Routine coliform counts from water at the beaches were within normal accepted limits. Transmission likely occurred from lake water consumed by infected children.

Twenty-nine cases of HUS were reported in 1996. This represents a 181% increase over cases reported in 1995. Nineteen of 29 (66%) cases occurred in children under the age of 10. *E. coli* O157:H7 was cultured from stool in 17 individuals. This overall increase in reported HUS cases is probably directly related to the overall increase in the number of *E. coli* O157:H7 cases identified in 1996.

Salmonella typhimurium

During 1995, 737 cases of *Salmonella* were reported among Minnesota residents. Two hundred and eighty-six (39%) were *S. typhimurium*. In 1996, 656 *Salmonella* cases were reported with 198 (30%) being serotyped as *S. typhimurium*. Nearly 50% of cases occur during July through September. Males were equally infected as females, while children under the age of 10 were the most commonly affected age group.

Since 1995, five foodborne outbreaks of *S. typhimurium* infection were reported. The following are two examples of outbreaks investigated by MDH. During July and August of 1995, an outbreak of *S. typhimurium* occurred among persons who ate at a common restaurant in Hennepin County. These cases were initially identified as having a common molecular subtype pattern. A case-control study was conducted among 19 cases and 31 controls. Thirteen of 19 cases and no controls ate at the restaurant within the 7 days prior to illness onset (Odds Ratio = undefined; $p < 0.001$). Between June and September, 58 individuals had this subtype pattern of *S. typhimurium* identified. Of these, 33 had eaten at the same restaurant. Three separate clusters of cases were identified. In the first cluster, salads containing chicken were the primary menu items consumed by cases. In subsequent clusters, a greater diversity of foods were associated with illness. Initial stool cultures of cooks and managers were negative. With evidence of ongoing transmission, repeat cultures were performed on all employees and *S. typhimurium* was isolated

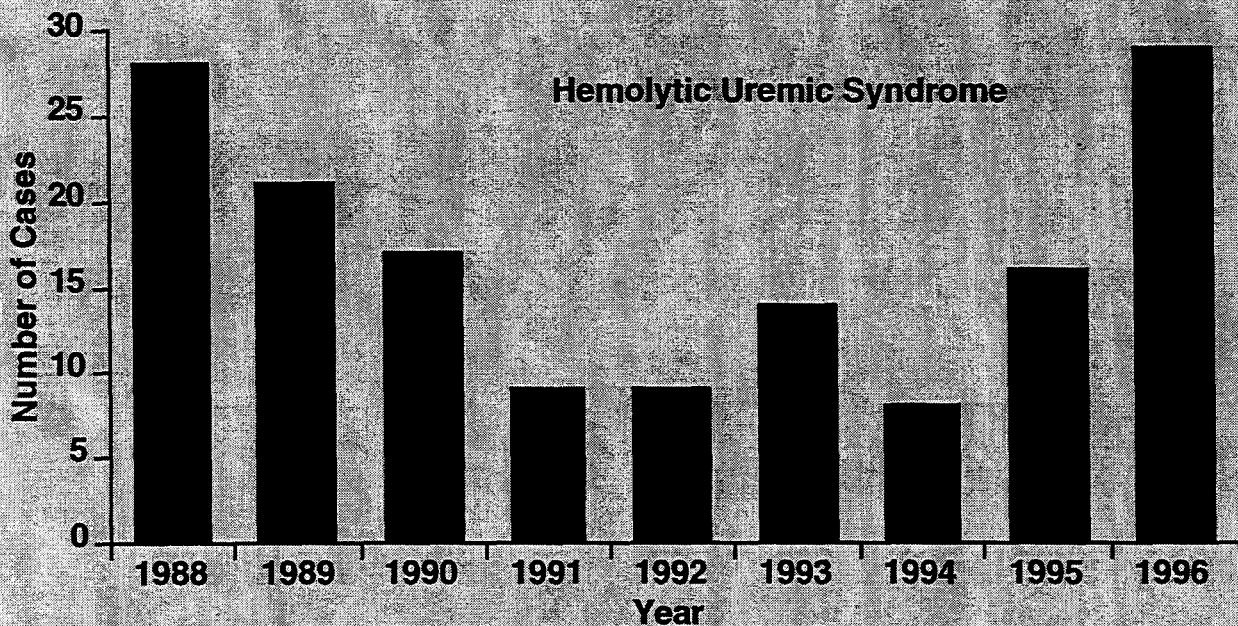
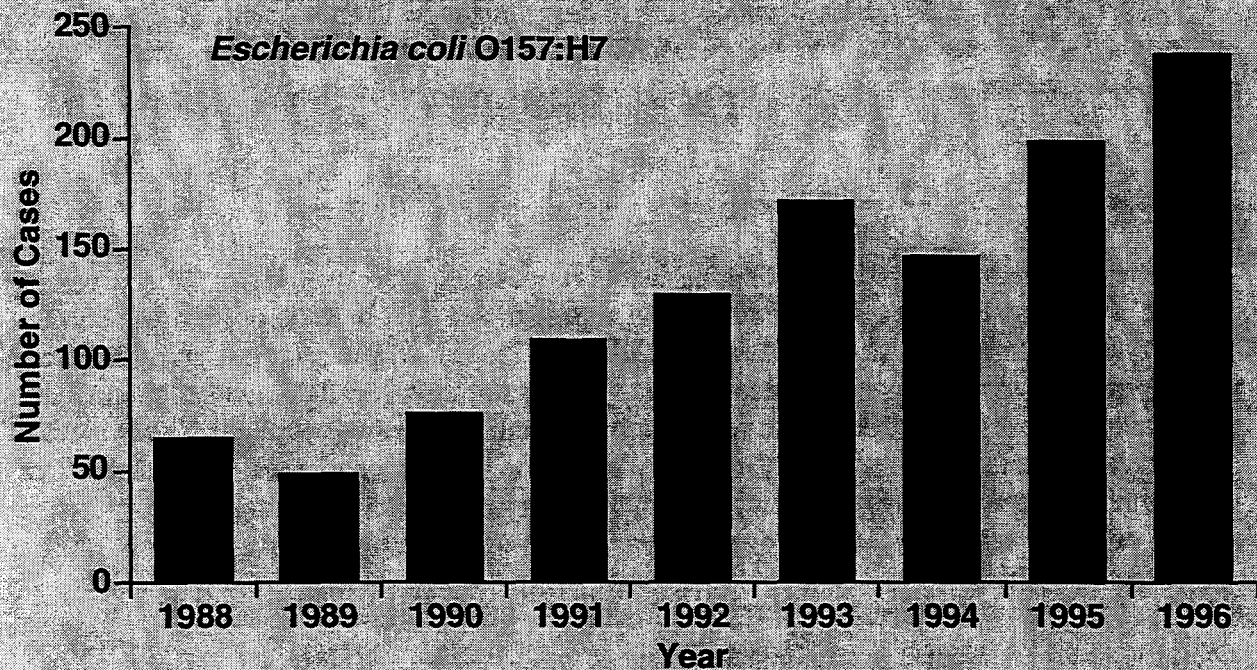
from 11 employees. After identifying these infected employees, the restaurant voluntarily closed for a thorough cleaning and exclusion of all employees until they had three negative stool cultures. The transmission of *Salmonella* to patrons and employees likely occurred from food handled by infected food handlers.

In early September, an infection control practitioner at a hospital in Blue Earth County notified MDH of 10 recently diagnosed cases of *Salmonella* occurring over a one-week period. These cases had all eaten salad items at a local restaurant. Upon notification of the outbreak, the restaurant voluntarily closed. Cases were found to have the same strain of *S. typhimurium* as defined by molecular subtyping. A case-control study was initiated. All 14 cases and 69 (73%) of 95 controls reported eating salads or food items containing raw fruits and vegetables (Odds Ratio = undefined; $p < 0.02$). Stool samples were collected from 63 employees. Sixteen (25%) employees had the outbreak-associated strain of *S. typhimurium* in their stool. These included three cooks, three managers, five waitpersons, and five dishwashers. One of the infected cooks was a salad maker.

Conclusions

Veterinarians play a crucial role in limiting foodborne disease. This role may include increasing public awareness about the risks of consuming unpasteurized milk or undercooked hamburgers, to identifying possible on-farm behaviors which allow for the spread and propagation of disease (e.g. flies, birds, bio-security, contaminated feed, etc.). This summary highlights two common human enteric pathogens among Minnesota residents and hopefully increases veterinarian awareness of how these organisms are spread in the human population. Practitioners need to remember that this summary reviews only recent outbreaks and that most infections are unrelated or sporadic. Many of these sporadic infections involve farm families who practice behaviors that put them and their families at risk.

Cases of *Escherichia coli* Infection and Hemolytic Uremic Syndrome Reported to the Minnesota Department of Health, 1988-1996



**Antibiotic Resistance patterns among human and animal
Salmonella typhimurium isolates**

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In 1995 and 1996, random samples of human *Salmonella* isolates were tested for antibiotic resistance at the Minnesota Department of Health. A specific subtype of *Salmonella typhimurium* (designated tm5b) which was shown to be multi-drug resistant. This subtype pattern accounted for 14% of the *Salmonella typhimurium* isolates among Minnesota residents during 1995 and 1996. The antibiogram was consistent with the R-type ACSSuT pattern observed among DT104 *Salmonella typhimurium* isolates from Europe. This particular resistance pattern has been documented throughout Europe among both human and animal isolates.

Additionally, the MDH requested that the Minnesota Veterinary Diagnostic Laboratory send animal derived *S. typhimurium* isolates for subtyping by PFGE. These were requested to document the subtype patterns among Minnesota food-producing animals. To date, 74 isolates have been subtyped. Of 74 isolates subtyped, 18(24%) isolates were subtype pattern tm5b. Twenty-five of the 74 isolates were susceptibility tested. Of 12 tm5b isolates tested, 11 were R-type ACSSut. Other *S. typhimurium* isolates tested displayed different antibiograms. Many of these were multi-drug resistant but different from R-type ACSSut.