Outbreaks of *Escherichia coli* O157:H7 Infections Among Children Associated With Farm Visits—Pennsylvania and Washington, 2000

**DURING THE SPRING AND FALL OF 2000,** outbreaks of *Escherichia coli* O157:H7 infections among school children in Pennsylvania and Washington resulted in 56 illnesses and 19 hospitalizations. Illness was associated with school and family visits to farms where children came into direct contact with farm animals. This report summarizes the findings of investigations of these outbreaks and includes strategies to reduce the transmission of enteric pathogens from farm animals to children.

**Pennsylvania**

During September-November 2000, the Montgomery County Health Department (MCHD) identified 51 persons who had diarrhea within 10 days of visiting a dairy farm (farm A) in Montgomery County. Fifteen (29%) persons had either *E. coli* O157 isolated from stool specimens or hemolytic-uremic syndrome (HUS); patients ranged in age from 1-52 years (median: 4 years), 26 (51%) were male, and dates of illness onset ranged from September 4 to November 8. Symptoms reported by the 51 patients included bloody diarrhea (37%), fever (45%), and vomiting (45%); 16 (31%) patients were hospitalized and eight (16%) developed HUS. *E. coli* O157 isolates were indistinguishable by pulsed-field gel electrophoresis (PFGE) and produced both Shiga toxins 1 and 2.

To identify risk factors, CDC, the Pennsylvania Department of Health, and MCHD conducted a case-control study among farm visitors during November 12-19. A confirmed case was defined as diarrhea in a person within 10 days of visiting farm A on or after September 1, with either *E. coli* O157 isolated from stool or HUS. A probable case was defined as diarrhea in a person within 10 days of visiting farm A on or after September 1. Controls also had visited farm A after September 1 but did not develop diarrhea within 10 days of the visit. Two controls per case were sought by sequential digit dialing and frequency matched by age group (i.e., <1 year, 1-4 years, 5-8 years, 9-12 years, 13-20 years, and ≥21 years). Fifty-one case-patients, or a parent or guardian for young children, and 92 controls were interviewed in the case-control study.

Case-patients were more likely than controls to have had contact with cattle (summary odds ratio [OR]=10.9; 95% confidence interval [CI]=1.7-70.7), an important farm animal reservoir for *E. coli* O157. Activities that promoted hand-mouth contact, such as nailbiting (summary OR=2.5; 95% CI=1.1-5.7) and purchasing food from an outdoor concession (summary OR=2.5; 95% CI=1.1-5.7), were more common among patients. Handwashing before eating was protective (summary OR=0.2; 95% CI=0.1-0.7). All 216 cattle on farm A were sampled by rectal swab, and 28 (13%) yielded *E. coli* O157 with a PFGE pattern indistinguishable from that isolated from patients. The same strain also was isolated from a railing surface. *E. coli* O157 was not isolated from 43 of the other animal species on the farm.

Among the 75,600 persons who visited farm A during the outbreak, most were preschool-aged or school-aged, groups at risk for serious *E. coli* O157 infection.1 No separate area was designated for interaction between visitors and farm animals. Visitors could touch cattle, calves, sheep, goats, llamas, chickens, and a pig and could eat and drink while interacting with animals. Handwashing facilities lacked soap and disposable towels, were out of children’s reach, were few in number, and were unsupervised.

A total of 19,698 telephone calls were made to identify controls; 3497 household members were available. Household members were asked whether they had visited farm A since September 1 and whether they developed diarrhea within 10 days of the visit; 134 visited the farm during the outbreak, and 22 (16.4%) reported onset of diarrhea within 10 days of the visit. The expected rate of diarrhea from any cause in the general population during a 10-day period is approximately 7% (FoodNet Population Survey, unpublished data, 1998-1999). Because approximately 75,600 persons visited the farm during the outbreak, an estimated 7000 (9.4%) may have developed diarrhea associated with their visit. No further illness was reported after public access to animals was discontinued at farm A.

**Washington**

During May-June 2000, five persons with culture-confirmed *E. coli* O157 infection were reported to the Snohomish Health District (SHD). Isolates from these persons were indistinguishable by PFGE. Dates of illness onset were May 21-31, and patients ranged in age from 2 to 14 years (median: 7 years); three were male. All five patients reported abdominal cramping and diarrhea, and four reported bloody diarrhea. Three patients, aged 2-6 years, were hospitalized, and one developed HUS. Four patients attending three elementary schools had visited a dairy farm (farm B) on May 18 or 24. The fifth patient had not visited farm B but had developed diarrhea after a sibling became ill following a farm B visit. Approximately 300 persons visited farm B during the outbreak, primarily preschool- and kindergarten-aged children accompanied by adults.

On May 31 and June 1, an investigation of farm B by SHD and the Washington Department of Health revealed...
that children were allowed to handle young poultry, rabbits, and goats. Goats, chickens, and a calf were kept in pens and could be touched through a fence. Children brought their own lunches and ate approximately 50 feet from the penned animals. Five animal stool samples collected from the farm were tested for E coli O157; all were negative.

Farm B recommended that visitors bring antibacterial wipes to wash their hands; the farm also provided a communal rinse basin. No signs were posted instructing visitors to wash their hands after touching the animals. No further illness was reported after prevention measures were instituted, including distribution of instructional material and installation of handwashing stations with soap and running water.

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CDC Editorial Note: The outbreaks described in this report were the first reported in the United States to be associated with direct transmission of E coli O157 from farm animals to humans. An estimated 73,500 cases of illness, 2000 hospitalizations, and 60 deaths occur in the United States each year as the result of E coli O157 infection; many E coli O157 illnesses are associated with ingesting contaminated food or drink. However, during 1996 and 1997, visiting a farm with cows was identified as an important risk factor for E coli O157 infection; 8% of persons aged ≥6 years with E coli O157 infection reported visiting a farm with cows during the preceding 7 days compared with 1% of controls.3

Two random-digit-dial telephone surveys of 9000 persons were conducted during 1996-1997 and 1998-1999; 2% reported having visited a petting zoo during the preceding 5-7 days.5 In 1999 in Ontario, Canada, an E coli O157 outbreak among visitors to a petting zoo resulted in 159 illnesses.5 In the United Kingdom, farm visit-related outbreaks of E coli O157 infections have been reported among children.7 Such outbreaks have led to the development of guidelines to prevent E coli-related illnesses in these countries.6 8

Of the 44 state and territorial public health departments responding to a national CDC survey in June 2000, none had laws to control exposure of humans to enteric pathogens at venues where the public has access to farm animals, and no federal laws exist that address this public health issue. Following these U.S. farm-associated outbreaks, CDC, in collaboration with the Zoonoses Working Group, National Association of State Public Health Veterinarians, U.S. Department of Agriculture, Animal and Plant Health Inspection Services, and other groups, drafted measures to reduce the risk for farm animal-human transmission of enteric infections (see box).

Before July 1, 2001, comments about prevention measures can be mailed to Strategies, Foodborne and Diarrheal Diseases Branch, Division of Bacterial Infections, CDC, at P.O. Box 340237, Atlanta, GA 30334-0237. Comments can also be e-mailed to zoonoses@aphis.aphis.usda.gov.
Cluster of Tuberculosis Cases Among Exotic Dancers and Their Close Contacts—Kansas, 1994-2000


As of April 2001, the TB control staff of WSCDCH and KDHE had identified 18 TB cases in this cluster that had been diagnosed from 1994 to 2000. Of these, 14 (78%) were culture confirmed; all Mycobacterium tuberculosis isolates were susceptible to first-line anti-TB drugs. Eight patients were women (seven exotic dancers), seven were men, and three were children. Of the 15 adult patients, 14 were aged <45 years at the time of diagnosis. All dancers had cavitary pulmonary disease, an indication of increased infectiousness. All adult patients were voluntarily tested for human immunodeficiency virus infection and one was seropositive. Twelve (80%) of the 15 adult patients reported using cocaine, crack cocaine, or amphetamines, and 10 (67%) had been incarcerated at some time during 1994-2000. All 18 patients were started on directly observed therapy (DOT), and 17 completed treatment.

Evidence linking these cases included common occupation or known exposure to exotic dancers. Of the 11 nondancer patients, six were exposed to dancers outside of the clubs exclusively. Although dancer patients identified six clubs in which they worked during their potential infectious periods, no single club could be confirmed as the site of transmission to all other dancers. Shared drug-related activities may have linked the adult patients; however, no specific location of drug use was identified. Of the nine M. tuberculosis isolates tested, all had matching IS6110 fingerprints, including isolates from six dancers.

Contact investigations of the nine infectious TB patients identified 344 contacts. Of 302 contacts with a tuberculin skin test (TST) placed and read, 76 (25%) were TST positive. Among 243 contacts eligible for 10- to 12-week postexposure TST, 32 (13%) had follow-up TST placed and read. Of these, 14 (44%) had TST conversion indicating recent M. tuberculosis infection. Among 72 contacts eligible for latent TB infection (LTBI) therapy, 54 (75%) initiated therapy. Of the 54 contacts who should have completed therapy by January 2001, six (11%) had documented completion.

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CDC Editorial Note: The findings in this report indicate the need for local health departments to have sufficient resources for ongoing surveillance for TB and capacity to rapidly respond during a time of increased demand. The cluster in Kansas occurred over a 7-year period and encompassed 18 patients.

The WSCDCH TB control staff consists of a full-time TB control nurse, a part-time physician consultant, and a full-time assistant. The nurse is primarily responsible for TB case management including DOT. In addition, in collaboration with the WSCDCH Health Surveillance Unit, the nurse is responsible for contact investigations and screening high-risk persons for TB with TST. Health departments in low incidence states such as Kansas (2.9 per 100,000 population during 2000) may have limited resources to respond to outbreaks while maintaining the essential components of TB control, thus hampering efforts to eliminate TB.

Outbreaks of TB among persons who use illegal drugs and/or have been incarcerated can be difficult to investigate. Illegal drug users often belong to complex social networks, and members of these networks may be reluctant or unable to provide the names of their contacts to public health officials. Special techniques for exploring chains of transmission among members of complex social networks have been developed.

In this cluster investigation, follow-up rates of 10- to 12-week postexposure TST and completion rates of LTBI therapy were low. New approaches beyond traditional methods of TB contact investigations are necessary to follow-up contacts discovered through social network analysis. These approaches must assure that all contacts are assessed for LTBI and that those with LTBI complete therapy. This may require DOT for LTBI in an outbreak to prevent further M. tuberculosis transmission. The findings in this report underscore that all states, including those with very low TB incidence, should maintain TB control capacity and have outbreak response plans that include methods to augment this capacity during unexpected increases in M. tuberculosis transmission.