

## HEMORRHAGIC ESCHERICHIOSIS FROM A COUNTY FAIR

ON WEDNESDAY, August 21st, a Eugene pediatrician called the Lane County Health Department to report a 4-year girl with an *Escherichia coli* O157:H7 infection. She also e-mailed other physicians in her practice, alerting them to the case. The next morning, another pediatrician in the group called to say he was admitting a 7-year-old boy with bloody diarrhea. Around 1 pm, lab reports of two other culture-positive children arrived by fax.

These were the first confirmed O157 cases reported from Lane County in over a year. So while the first report was more or less routine, the second report raised immediate concern about a possible connection. With the arrival of the third and fourth reports, that concern became a certainty. Health department staff cancelled their weekend plans.

In Oregon, O157 cases are routinely interviewed about a number of possible exposures, including consumption of various high-risk foods; swimming, travel, and contact with high-risk people. We also ask about animal contacts, including petting zoos and fairs.\* The first four patients who were contacted all said they went to the county fair.

The Lane County Fair is held every summer—a colorful collage comprising carnival rides, hucksters and handicrafts, food vendors and fun. Like most county and state fairs, the Eugene event also has livestock and other animal exhibits. This year the fair ran from August 13–18, attracting 170,000 visits from ~120,000 people.

### STUDY METHODS

O157 is spread by the fecal-oral route, so at a fairgrounds the usual suspects include food, water, and animal exposures. Based on interviews with fair organizers and others, we developed a questionnaire to ask about potential exposures at the fair and, for those who became sick, details of their illness. Over 35 vendors sold food or beverages at the Fair from a variety of

mobile and sessile units. To help subjects recall where they had eaten, interviewers were armed with exhibitor and vendor layout maps, as well as vendor lists and their fair fare.

We conducted a case-control study, with cases identified through routine surveillance reports, which began to pour in over the weekend. Local hospitals, clinics, and labs were asked to speed reporting of both confirmed and suspect cases. Other local health departments in Oregon and state health departments around the country were alerted through regular e-mail channels. Given the surfeit of reports, we used only lab-confirmed primary cases in the study. We identified potential control households through two mechanisms. First, we matched names from credit card receipts to Eugene-area residents using Internet search engines, with an overall success rate of about one-third. Other households were identified from a list of children who entered an art competition. In each control household, we interviewed an age-stratified sample.

### RESULTS

Cases were no more likely to eat food from concessionaires than controls, and no single concessionaire was named by even a suggestive plurality of cases. Drinking water—the source of a huge outbreak at a New York fair in 1999,<sup>1</sup> was likewise not associated with illness. (The fairgrounds are on city water.) Visiting the cattle and horse areas was if anything protective, but cases were much more likely than controls to have visited the “small” animal exhibition hall (summary odds ratio for age-weighted strata =7.6; 95% C.I. 2.4–24). These buildings housed goats, sheep, pigs, chickens and other birds, rabbits, and cavies.\*\* The most likely exposure area was around the goats and sheep; virtually all cases were there, whereas other areas were less frequented. Few cases recalled touching any of these animals. Cases were a bit more likely to have touched the ground in the sheep/goat/pig area than

controls, and a bit less likely to have washed their hands after leaving the animal area, but neither difference was statistically significant. Actually, hand washing was disappointingly infrequent among both cases and controls (31% and 36%, respectively, reported washing after leaving the animal areas).

Among the confirmed cases, 42 visited the fair only once, allowing us to identify their presumptive exposure date. The apparent attack rate was very low on the first 2 days of the fair (1 case each on Tuesday and Wednesday), then increased sharply, tapering off again by the last day. A clue, certainly, but hard to interpret. Environmental samples collected in the exhibition hall 10 days after the fair ended (after the facility was cleaned) will be tested later this month. A note of caution: data analysis is ongoing, and all numbers are preliminary.

### CLINICAL SUMMARY

In addition to the 56 primary cases (who attended the fair and were first in the household to become ill), at least 14 presumptively secondary, lab-confirmed, cases have been identified to date, making this (by far) the largest identified O157 outbreak in Oregon history, and a good-sized one anywhere. The number of confirmed cases and number of patients who developed hemolytic uremic syndrome (HUS)\* suggest that the number of people sickened may have been several times higher.

Of the 70 confirmed cases, 46 (66%) were < 6 years old; 56 (80%) were <19. No confirmed cases were identified among any of the employees or exhibitors, many of whom were in the animal exhibit area for hours every day. Among these culture-confirmed patients, 21 were hospitalized, 11 with HUS. As of September 12, all but one case had been discharged. For the 42 primary cases with a unique fair visit date, the incubation period averaged 4 days until the first onset of vomiting or diarrhea (range, 1–10 days; see figure, *verso*).

\* See genuine facsimile surveillance report forms as used by real epidemiologists on our web page: <http://www.ohd.hr.state.or.us/cdpe/guideln/forms/index.htm>

\*\* You probably already know that cavies are members of the family Caviidae (aka Cavidae), which include capybaras, agoutis, and guinea pigs.

\* HUS is a constellation of acute renal failure, hemolytic anemia, and thrombocytopenia—and the most common complication of O157 infection.



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### PERSPECTIVES

Although a controversial issue, most experts do not recommend antibiotic therapy for O157 infections.<sup>2,3</sup> There is no demonstrated benefit, and patients who are treated may have an increased risk of developing HUS. Five (7%) of 68 confirmed outbreak cases for whom information is available were given antibiotics; none developed HUS. In general, a stool specimen should be collected, cultured, and interpreted prior to starting a patient with acute gastroenteritis on antibiotics.

While this is the first O157 outbreak related to farm animal exposure in Oregon, such clusters have been reported with increasing frequency in Britain, Canada, and other parts of the United States.<sup>4-9</sup> Most outbreaks have involved petting zoos or similar exhibits. Although bovines are often implicated as the putative source, sheep and goats are also on the roster of documented sources; all of these animals are typically asymptotically colonized. And O157 is only one of several pathogens

that can attack the unwary in such settings: salmonellosis, cryptosporidiosis, and other infections are spread in a similar manner.<sup>10</sup>

A common thread running through most of these outbreaks has been inadequate hand washing following exposure to grossly fecally contaminated environments. While not a panacea, thorough hand washing with soap and water remains the best defense for those who venture into the animal kingdom. (The jury is still out on alcohol-based hand cleansers in these environments.) Given the ability of O157 to survive for weeks to months in contaminated soil, the exposure may be somewhat indirect: Boy Scouts camping in an old sheep pasture,<sup>11</sup> rock fans at a music festival held in a cow pasture,<sup>12</sup> or square dancers in a dusty barn (CDC, unpublished report).

Contact with farm animals in any setting—be it a fairgrounds, a barnyard, or your own living room—elevates the risk of zoonotic infection. For some people, animal contact is unavoidable, and for many it is even highly desirable. For such individuals the goal is to minimize if not totally eliminate these risks. Guidelines to reduce the risk of transmission at petting zoos and similar venues have been published by a number of agencies.<sup>13</sup> The guidelines all stress designing traffic flows to minimize gratuitous fecal exposure and to maximize exposure to hand washing stations, providing (and using) those hand washing facilities, discouraging hand-to-mouth activities (e.g., eating, smoking, thumbsucking) in areas of animal contact, and segregating areas of intentional contact (e.g., petting zoos) into restricted areas that merit special attention.

More can be done to maintain a safer environment at fairs and petting zoos. Already, the number of hand washing stations had been increased at this year's fair because of general concern about exactly this kind of risk. The challenge is to gain the public's cooperation in effective control measures without unduly compromising the fun of the experience. We'll see you at the fair.

### REFERENCES

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13. CDC. Outbreaks of *Escherichia coli* O157:H7 infections among children associated with farm visits—Pennsylvania and Washington, 2000. *MMWR* 2001;50:293-7. *Other good guidelines from public health agencies (e.g., from Britain, New York, Washington, South Australia) can be found on the web.*

Distribution of Incubation Periods for Primary Cases with Single Fair Visits (N=42)

