



VIRGINIA EPIDEMIOLOGY BULLETIN

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OUTBREAK OF "TRAVELER'S DIARRHEA" IN VIRGINIA*

Enterotoxigenic *Escherichia coli* (ETEC), the most common cause of traveler's diarrhea, is an unusual cause of foodborne outbreaks in the United States. Watery diarrhea is the predominant symptom of ETEC infection and is usually accompanied by abdominal cramps. A small percentage of patients report vomiting. Because ETEC is not detected by standard stool culture and because symptoms of ETEC infection are relatively nonspecific, illness caused by ETEC may be incorrectly attributed to a viral etiology.¹ In contrast to illness caused by ETEC, gastroenteritis from infection with Norwalk-like viruses is more likely to be characterized by vomiting as well as diarrhea. The incubation periods for ETEC and Norwalk-like viral gastroenteritis are similar; however, duration of illness tends to be longer for ETEC infections. Because new causes of foodborne outbreaks, such as ETEC, are continually being identified, it is critical to do the appropriate epidemiologic and laboratory investigations to answer questions regarding agents for transmission, disease characteristics and prevention.

Background

On June 27, 1995, a local health department began receiving numerous telephone calls from persons who had developed a diarrheal illness and who had either eaten at a local barbecue restaurant or had attended a picnic on June 21 catered by the

same restaurant. An investigation was initiated and the restaurant voluntarily closed on June 29. Approximately one week after learning about the picnic, the health department was notified of further cases of illness among persons who had attended a luncheon catered by the restaurant on June 27.



Epidemiologic Investigation

Standardized questionnaires examining the characteristics of the illness and foods eaten were developed for each catered event. A case was defined as gastrointestinal illness characterized by one or more episodes of diarrhea, occurring in any person following attendance at either event. A secondary case was defined as diarrhea occurring in a household member during the week following the onset of the case's symptoms. A log was maintained of persons who had not attended the catered events but reported illness following a

meal at the restaurant. Restaurant workers were interviewed to obtain information about diarrheal illness, travel, and foods typically eaten at the restaurant.

1. **Picnic-6/21/95:** Sixty-nine (75%) of 92 attendees interviewed developed a diarrheal illness within two hours to 7.5 days (median=52 hours) after attending the picnic (Figure 1). Other predominant complaints included abdominal cramps, nausea and headache. Anecdotally, many persons volunteered that the diarrhea was watery and some also described the abdominal cramps as very painful. While over one-third of the ill persons reported having a fever, only nine measured their temperatures which ranged from 99.0°F to 102.0°F (median 101.1°F). Illness lasted from one to 11 days (median=5 days). Six persons visited a physician because of their symptoms but no one was hospitalized. Many (68%) treated themselves, primarily with over the counter anti-diarrheal medications. Three cases of secondary illness were reported. In addition, the husband of one attendee developed watery diarrhea and abdominal cramps six days after eating leftovers from the picnic.

The minced barbecued pork was the only food significantly associated with illness: illness occurred in 69 (82%) of 84 persons who ate pork, compared with none of four who did not (RR=undefined; $p=.0016$). Another four persons who had attended the picnic and had something to drink but ate no food did not become ill.

2. **Luncheon-6/27/95:** Thirty-three (62%) of the 53 attendees reported developing a diarrheal illness following the luncheon. The median incubation period was 68 hours (range: 1 hour - 10 days) (Figure 1). Table 1 compares symptoms reported in this outbreak with those reported by attendees of the picnic. The du-

In This Issue:

Outbreak of Travelers' Diarrhea in Virginia	1
Corrections to Control of Communicable Disease Manual	3
Flu Corner	3

ration of illness ranged from one to 12 days (median=6 days). Six persons visited a physician because of their symptoms and 22 took over the counter medications. No one was hospitalized. Five persons in four households met the case definition for secondary illness.

3. Restaurant Patrons: 119 people who had eaten at the restaurant contacted the health department to report illness. Onsets ranged from June 15 through July 2. The median incubation period was 22.5 hours (range 1.5 hours - 6 days).

4. Restaurant Workers: All but one of the ten restaurant workers reported having either loose stools or watery diarrhea with onset from June 14 to June 24. Six workers reported watery diarrhea, abdominal cramps, and nausea lasting from two to 10 days. Three workers stated that their only symptoms were loose stools lasting from a half hour to one day. Workers typically ate food prepared at the restaurant. All workers continued to do their usual food preparation and other restaurant duties while symptomatic.

Only one worker reported any foreign travel: a trip to Cancun, Mexico, during February 1995. He reported no illness associated with the trip. The worker with the earliest reported onset of symptoms had not travelled nor did he recall having eaten food brought into the U.S. by a traveller. None of his family or friends had travelled, nor were any ill prior to him.

Laboratory Investigation

Forty-seven people submitted stool specimens: 16 from the picnic, nine from the luncheon, 14 from restaurant patrons and eight from restaurant workers. Specimens were negative for *Salmonella*, *Shigella*, *Campylobacter*, *E. coli* O157:H7,

Table 1. Comparison of Illness Between Attendees of the Picnic and the Luncheon

Description of Illness	Number (Percent) of Cases Reporting	
	Picnic N=69	Luncheon N=33
SYMPTOMS		
Diarrhea	69 (100.0)	33 (100.0)
Watery stools	Not asked	31 (93.9)
Abdominal pain or cramps	58 (84.1)	27 (81.8)
Nausea	33 (47.8)	14 (42.4)
Headache	29 (42.0)	17 (53.1)
Fever (subjective)	25 (36.2)	15 (48.4)
Chills	18 (26.1)	16 (48.5)
Vomiting	7 (10.1)	2 (6.3)
Mean incubation period (range)	52 hrs (2 hrs-7.5 days)	68 hrs (1 hr-10 days)
Mean duration (range)	5 days (1-11 days)	6 days (1-12 days)

Vibrio, *Aeromonas*, *Yersinia* and viral agents. Isolates from 16 stool specimens were submitted to the Centers for Disease Control and Prevention (CDC) for ETEC testing: picnic (2), luncheon (5), restaurant patrons (2) and restaurant workers (7). Fifteen were identified as ETEC serotype O6:H16 and produced both heat labile and heat stable enterotoxins. These isolates were identical to those identified in cooked barbecued pork collected from the walk-in refrigerator, frozen barbecued pork collected from a restaurant patron's home, and coleslaw collected from the restaurant.

Environmental Investigation

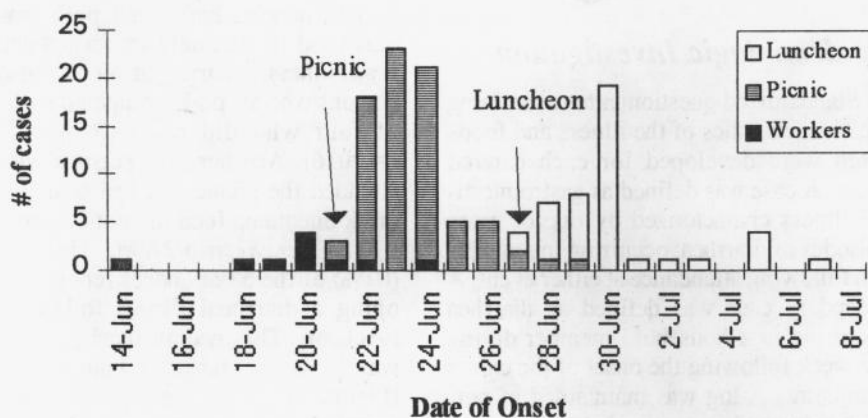
1. Restaurant Inspection: On June 20, during a routine inspection, the owner had been advised that the ambient temperature of the large walk-in refrigerator was 52.4°F (recommended is ≤40°F) and that products

in the refrigerator had a temperature of 52°F. Despite repairs made at that time, during the investigation-related inspections on June 27-28 the ambient temperature of the walk-in refrigerator was 54°F and the temperature of potentially hazardous foods stored in the walk-in was 52.8°F. In addition, the following other critical deficiencies were noted: the temperature of cooked minced pork stored at room temperature was 80°F; pork was reheated to only 110°F prior to serving (precooked foods should be reheated to ≥165°F prior to serving); and poor hygienic and food handling practices were observed or reported. The owner was informed of the deficiencies, advised to make corrections, and asked to voluntarily close the restaurant which he did on June 29. Following correction of all critical findings and participation by all workers in a training class on proper food handling, the restaurant reopened on July 7.

2. Food Preparation: The restaurant specialty was barbecued pork which was prepared approximately once a week. Meat for the picnic was cooked on June 20, cooled overnight in the oven and then transferred to the walk-in refrigerator on the morning of June 21. At about 11:00 am the pork was moved to the front warming pit for several hours. From there it was chopped and barbecue sauce was added. It is unclear whether it was reheated after this step and prior to being served at 7:00 pm. Other foods served at the picnic included fried chicken, coleslaw, baked beans, hush puppies, strawberries and a cake purchased from a local grocery store. A similar menu was served June 27 at the catered luncheon.

Because large quantities (up to 300 pounds) of meat were processed at a time,

Figure 1. ETEC: Illness by Date of Onset



it is likely that meat prepared on June 20-21 was also served at the restaurant. For restaurant use, pieces of meat were heated in a warming oven, then chopped in a meat grinder or sometimes with a knife, and mixed with barbecue sauce. Just prior to serving, the minced meat was put on a hamburger roll and briefly heated under a sandwich warmer.

Discussion

This large outbreak, characterized by a high attack rate, profuse watery diarrhea and abdominal cramps, was due to infection with enterotoxigenic *E. coli*. The identification of the same serotype of ETEC in stool specimens of attendees of both catered events, restaurant patrons and restaurant workers, as well as in food collected from the restaurant, and in leftover pork from an ill person's home, provides definitive evidence that the barbecue restaurant was the source of this outbreak.

It was not, however, possible to determine exactly how ETEC was first introduced into the restaurant. Based on this investigation, the organism may have been introduced by an ill foodhandler whose symptoms developed on June 14 and whose duties included preparing coleslaw and potato salad and mincing the barbecued pork. However, it is also possible that a contaminated food item may have been introduced into the restaurant causing illness among some workers and restaurant patrons. In the United States, at least one foodborne ETEC outbreak has been attributed to an imported contaminated food, while more recently described foodborne outbreaks may have been due to domestically grown contaminated produce.^{1,2}

Epidemiologically, the minced pork barbecue was implicated as the food vehicle in the picnic outbreak. It is likely that the meat became contaminated by the one or two workers responsible for its preparation, possibly during the transfer of the meat to the walk-in refrigerator or during the mincing process. Both of these workers had laboratory confirmed ETEC and both reported an onset of symptoms just prior to the event. The lack of proper refrigeration would have allowed bacterial growth on contaminated foods to occur. The slow reheating at a low temperature may have also contributed to bacterial multiplication. Finally, the pork was most likely not reheated to a temperature high enough to kill the bacteria.

No specific food vehicle was epidemiologically implicated from the luncheon, probably because most people ate some of all the food items that were

served, varying only in whether or not they added extra barbecue sauce. There is no indication that the barbecue sauce, a commercial product, was associated with illness. The lack of variation in what was eaten limited the statistical comparisons that could be made between ill and non-ill persons. It is also possible that due to cross contamination, multiple foods were involved in causing illness.

According to CDC, foodborne ETEC outbreaks seem to be increasingly common in the United States (Personal communication). They probably tend to go undetected because few laboratories can test for the organism. Also, because symptoms of infection are relatively nonspecific, outbreaks may be incorrectly attributed to a viral etiology. Like most foodborne outbreaks, ETEC outbreaks can be prevented by proper foodhandling: practicing good hygiene, removing ill workers from foodhandling duties, properly preparing and storing food, and paying particular attention to food temperatures.

REFERENCES

1. CDC. Foodborne outbreaks of enterotoxigenic *Escherichia coli* - Rhode Island and New Hampshire, 1993. MMWR 1994; 43:81-9.
2. MacDonald KL, Eidson M, Strohmeyer C, et al. A multistate outbreak of gastrointestinal illness caused by enterotoxigenic *Escherichia coli* in imported semisoft cheese. Journal of Infectious Diseases 1985; 151:716-20.

*Submitted by Elizabeth Barrett, DMD, MSPH.

Corrections To The New Control of Communicable Diseases Manual, 16th ed

Thanks to Fairfax Health District's own Harriet (Happy) Callaway, Virginia has been made aware of two identified errors in the brand new, 16th edition of the **Control of Communicable Diseases Manual**. The errors are:

- On page 424, in item 5, 'Management of contacts' of persons with shigellosis. The first sentence should read "...and 2 successive negative stool cultures are obtained **24 HOURS** apart."
- In the index. The page number listed for 'Enteroviral infections' should read **301** rather than 401.

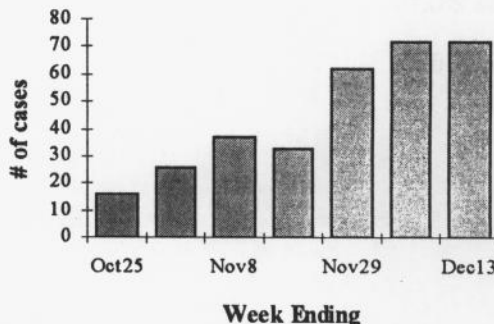
Thank you Happy!

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FLU CORNER

Influenza A virus has been isolated from five Virginia residents, all living in the north-west region of the state. Increased reports are also being seen from across the state, with activity being reported as regional (see Figure below). Anecdotal information indicates high influenza-like activity among school children with absentee rates as high as 30%.

Influenza-like Illness, Virginia Sentinel Surveillance, 95-96



Cases of Selected Notifiable Diseases, Virginia, November 1 through November 30, 1995.*

Disease	Total Cases Reported This Month						Total Cases Reported to Date in Virginia		
	State	Regions					This Yr	Last Yr	5 Yr Avg
		NW	N	SW	C	E			
AIDS	215	23	127	11	15	39	1285	1069	871
Campylobacteriosis	43	7	3	11	12	10	590	742	620
Giardiasis[§]	34	6	12	9	3	4	272	307	343
Gonorrhea	798	70	67	108	174	379	9885	12173	13715
Hepatitis A	23	1	7	2	7	6	197	174	182
Hepatitis B	8	1	4	0	1	2	103	122	173
Hepatitis NANB	0	0	0	0	0	0	18	25	35
HIV Infection[§]	124	15	66	7	6	30	1178	1037	1140
Influenza	0	0	0	0	0	0	901	883	740
Legionellosis	0	0	0	0	0	0	18	9	14
Lyme Disease	3	1	1	1	0	0	53	126	115
Measles	0	0	0	0	0	0	0	3	28
Meningitis, Aseptic	47	9	11	5	1	21	752	294	324
Meningitis, Bacterial[†]	10	3	1	2	2	2	116	73	105
Meningococcal Infections	3	0	0	1	1	1	60	65	50
Mumps	4	0	0	2	0	2	25	41	59
Pertussis	12	1	2	0	4	5	31	36	32
Rabies in Animals	37	10	8	7	7	5	410	397	305
Rocky Mountain Spotted Fever	0	0	0	0	0	0	30	19	20
Rubella	0	0	0	0	0	0	0	0	0
Salmonellosis	119	16	26	19	30	28	1121	1026	1086
Shigellosis	39	3	9	1	4	22	323	614	400
Syphilis, Early[‡]	87	1	3	3	14	66	1071	1298	1351
Tuberculosis	25	0	4	2	5	14	283	287	359

Localities Reporting Animal Rabies: Accomack 1 raccoon; Albemarle 2 raccoons; Alexandria 1 raccoon; Alleghany 1 skunk; Arlington 1 raccoon; Augusta 1 skunk; Bedford 2 raccoons, 1 skunk; Buckingham 1 raccoon, 1 skunk; Campbell 1 skunk; Chesapeake 1 cat; Fairfax 4 raccoons, 1 skunk; Franklin 1 raccoon; Grayson 1 dog; Hanover 1 fox, 1 skunk; Henrico 1 raccoon; King William 1 raccoon; Loudoun 1 raccoon; New Kent 1 raccoon; Newport News 1 raccoon; Page 1 skunk; Richmond City 1 raccoon; Rockingham 3 raccoons, 2 skunks; Spotsylvania 1 raccoon; Suffolk 1 skunk.

Occupational Illnesses: Asbestosis 19; Carpal Tunnel Syndrome 31; Coal Workers' Pneumoconiosis 8; De Quervain's Syndrome 1; Lead Poisoning 5; Loss of Hearing 13; Mesothelioma 1.

*Data for 1995 are provisional.

†Other than meningococcal. ‡Includes primary, secondary, and early latent.

§Note: Giardiasis and HIV infection have replaced Reye Syndrome and Kawasaki Syndrome in this table. This change was based on the current number of reports of these diseases and their public health significance.

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