

ACDP Outbreak Investigation Number -- 2000- 32

Memo to File, October 18, 2000

Title of Outbreak: Outbreak of *Escherichia coli* O157 infection associated with Wendy's Restaurants, Oregon

Initial Report Date: August 22, 2000

Initial report by: Carol Ann Honeywell, RN, Marion County Health Department (MCHD)

Investigators: Nancy Beachey, RN, Pam A. Heilman, RN, MPH, Carol Ann Honeywell, RN, Mary Barrett, RS, Bob Anderson, RS, Joe Fowler, RS, MCHD; Paul R. Cieslak, MD, William E. Keene, PhD, MPH, Lore Elizabeth Lee, MPH, Teresa E. McGivern, MT (ASCP), Acute and Communicable Disease Prevention (ACDP), Oregon Health Division (OHD); James Mack, MPA, RS, Center for Environment and Health Systems (CEHS), OHD; Myra Barrows, DVM, United States Department of Agriculture (USDA)

Contacts: Paul R. Cieslak, MD, ACDP, OHD, 503/731-4024
Karen Landers, MD, MPH, Health Officer, MCHD, 503/588-5357

Background.

On Tuesday, August 22, 2000, MCHD investigators contacted OHD epidemiologists about four Marion County residents with *Escherichia coli* O157 infection. Two of the four were hospitalized. On Thursday, August 24, three more laboratory-confirmed *E. coli* O157 infections were reported to MCHD. Five of the seven cases had onsets August 18-20. On Friday, August 25, MCHD received a report of two young children hospitalized since August 23 with bloody diarrhea and symptoms of hemolytic uremic syndrome (HUS). Preliminary data collected by MCHD investigators linked eight of the nine people to a Wendy's Restaurant at 2375 Commercial Street SE, Salem, Oregon. Wendy's International, Inc. voluntarily closed the restaurant on August 25.

October 18, 2000

Methods.

Case-control study. To evaluate the putative association between *E. coli* O157 infection and eating at the Commercial Street Wendy's, OHD and MCHD investigators conducted a matched case-control study with two age-and phone-number-prefix-matched controls for each of nine laboratory-confirmed cases of *E. coli* O157 in a Polk or Marion County resident reported August 22-24. Investigators asked cases and controls if they had eaten at any restaurants or fast food places in the past week, and were prompted with a list of nine places, including Wendy's (see Attachment 1 for the Wendy's case-control study questionnaire). The questionnaire included Wendy's Restaurant menu items for those who had eaten there. Maximum likelihood matched odds ratios and p-values were calculated using EpiInfo analytic software.

Laboratory analyses. Local clinical laboratories isolated *E. coli* O157 from stool specimens and forwarded the isolates to the Oregon State Public Health Laboratory (OSPHL) for verification by latex agglutination. OSPHL sub-typed the isolates using standard methods for pulsed field gel electrophoresis (PFGE). The outbreak pattern was posted to the national PulseNet sub-typing network.

Subsequent case finding. A press release issued by MCHD on August 25¹ prompted patrons to call the health department if they became ill after eating at the Commercial Street Wendy's. MCHD investigators interviewed each caller using both the *Escherichia coli* O157 Case Investigation Form (EP42-42)² and the Wendy's case-control study questionnaire in Attachment 1. Data were submitted daily to OHD and entered into an EpiInfo database. Cases were classified as follows:

confirmed case: a person with laboratory-confirmed *E. coli* O157 infection with onset after eating at Wendy's Restaurant on SE Commercial Street in Salem (Oregon) since August 7, 2000 OR with *E. coli* O157 infection of the same molecular subtype confirmed by PFGE after eating at any other Wendy's Restaurant since August 7, 2000;

presumptive case: a person who developed bloody diarrhea within 7 days of eating at Wendy's Restaurant on SE Commercial Street in Salem between August 14 and 18, 2000 (the exposure dates of confirmed cases);

¹ Available at <http://www.ohd.hr.state.or.us/news/2000/0828acd.htm>

² Available at <http://www.ohd.hr.state.or.us/cdpe/guideln/forms/ecoli.pdf>

suspect case: a person who developed non-bloody diarrhea within 7 days of eating at Wendy's Restaurant on SE Commercial Street in Salem between August 14 and 18, 2000 (the exposure dates of confirmed cases);

secondary case: a person with bloody diarrhea or laboratory-confirmed *E. coli* O157 infection who did not eat at a Wendy's Restaurant during the week before onset of diarrhea, but who developed this illness within 7 days of the onset of laboratory-confirmed or presumptive *E. coli* O157 infection in a household member who ate at Wendy's Restaurant on SE Commercial Street in Salem between August 14 and 18, 2000, OR a household member of a case with *E. coli* O157 infection of the same molecular subtype confirmed by pulsed field gel electrophoresis after eating at any other Wendy's Restaurant between August 14 and 18, 2000.

Restaurant inspection. MCHD sanitarians inspected the Commercial Street Wendy's on Thursday, August 24. Inspectors collected ground beef, three types of salad mix and a kitchen towel from the Commercial Street Wendy's and submitted them to the Oregon Department of Agriculture for bacteriologic testing. On Friday, September 1, Washington County Health Department sanitarians inspected a Wendy's Restaurant at 7663 SE Nyberg Road, Tualatin, Oregon named by one culture-confirmed case who stated that she had not eaten at the Commercial Street Wendy's.

Food source investigations (produce). Health Division food protection staff contacted the produce distributors named by the Wendy's Restaurant managers about lettuce and other vegetables.

Food source investigations (meat). Staff from the United States Department of Agriculture (USDA) and the OHD Food Protection Program obtained records from the facilities where ground beef patties were prepared for Wendy's Restaurants and from all the distributors between the meat preparation facility and the restaurant.

Results.

Case-control study. Eight (88%) of the first nine laboratory-confirmed cases of *E. coli* O157 infection ate at the Commercial Street Wendy's compared to only three (17%) of the eighteen controls. The matched odds ratio was 7.35 ($P=0.002$).

Table 1-Matched analysis	Number of Wendy's-eating controls (two controls per case)
--------------------------	---

		2	1	0
C A S E S	Wendy's-Yes	0	2	6
	Wendy's-No	0	1	0

Case finding. MCHD received 101 reports from clinical laboratories, physicians, and the general public. A total of seventeen were laboratory confirmed (the nine used in the case-control study plus eight additional cases); all seventeen were the same molecular subtype. Fifteen of the laboratory-confirmed cases ate at the Commercial Street Wendy's on August 14-17, and one ate at the Tualatin Wendy's on August 18; one denied having eaten at Wendy's during the likely exposure period. Seven people were hospitalized; two were young children with HUS.

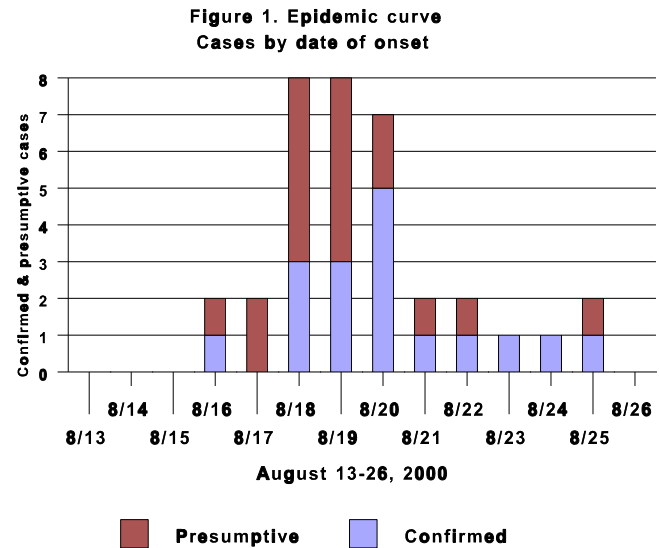
Among those who ate at the Commercial Street Wendy's during the same exposure period, 18 were presumptive cases with bloody diarrhea, 48 were suspect cases with non-bloody diarrhea and two were secondary cases. The remaining 16 were excluded because they did not eat at Wendy's August 14-18 (Table 2).

Exposure dates	Confirmed	Presumptive	Suspect	Secondary	Excluded
NA				2	2
8/02/00					1
8/06/00					1
8/13/00					2
8/14/00	4	2	6		
8/15/00	6	9	13		
8/16/00	3	3	21		
8/17/00	2	2	3		
8/18/00	1	2	5		
8/19/00					3
8/20/00					
8/21/00					1

8/22/00					2
8/23/00					3
8/24/00					1
Unknown	1				
Total	17	18	48	2	16

The following analyses include just laboratory-confirmed and presumptive cases. Onset dates ranged from August 16 through August 25 (Figure 1). Case characteristics are shown in Table 3. Incubation periods and symptom profiles of confirmed and presumptive cases are typical of infection with *E. coli* O157. Hemolytic uremic syndrome occurred in two young children; seven cases were hospitalized.

Cases reported eating a variety of menu items. Only 56% of the confirmed cases had eaten burgers, and 50% had chicken dishes. Eating lettuce was associated with the largest number of cases. Other individual produce items were eaten by <60% of confirmed cases (Table 4).



	Confirmed (n=17)	Presumptive (n=18)
<i>Incubation period</i>		
range	3-10 days	3-10 days
median	4 days	4 days
<i>Symptom profile</i>		
diarrhea	17 (100%)	18 (100%)
bloody diarrhea	15 (88%)	18 (100%)
hemolytic uremic syndrome	2	
<i>Hospitalization</i>	4	

<i>Age groups (in years)</i>		
0 to 9	2	
10 to 19	7	
20 to 39	3	12
40 to 59	4	4
60 to 79	1	1
≥ 80		1
<i>Median age</i>	19 years	37 years

Table 4. Food consumed by confirmed and presumptive cases		
	Confirmed	Presumptive
Burger	9/16 (56%)	14/17 (82%)
Chicken	8/16 (50%)	7/17 (41%)
Lettuce	13/16 (81%)	16/17 (94%)
Tomato	8/16 (50%)	10/17 (59%)
Onion	5/16 (31%)	9/17 (53%)
Cucumber	0	1/17 (6%)

Secondary cases. On September 4, 2000, investigators at the Colorado Department of Public Health and Environment notified OHD about two children with *E. coli* O157 infection of a molecular subtype that matched the outbreak strain. The two were Colorado residents who had arrived in Oregon with their father to visit their grandmother in Salem on August 15. Their grandmother ate a chicken salad at the Commercial Street Wendy's on August 15, and fell ill on August 17 with laboratory-confirmed *E. coli* O157 infection. The children had not eaten at the Commercial Street Wendy's; they developed diarrhea on August 22.

Inspection of Commercial Street Wendy's Restaurant. On Thursday, August 24, Marion County Health Department sanitarians inspected the Commercial Street Wendy's. Inspectors found that raw hamburgers at the Commercial Street Wendy's were cooked to an internal temperature of 170°F, high enough to kill *E. coli* O157. They identified, however, the following food-handling problems (Attachment 2).

- Food-preparation staff soaked lettuce in the first compartment of a three-compartment sink that was also used to rinse bloody-meat-juice-covered pans in which raw hamburger patties had been held, without cleaning and sanitizing the sink between uses.
- Food-preparation staff used a cleaning and sanitizing “wet towel, dry towel” process, whereby a shelf above the grill that held raw hamburger patties was wiped clean first with a dry towel, then with a sanitized-soaked wet towel. The dry, bloody-meat-juice-soaked towel was used for hand wiping in both the grill area and the sandwich assembly area (where raw products are placed on cooked burgers).
- Poor hand washing was observed.

They identified an ill employee (included in the above case summary) who had worked at the restaurant between August 10 and August 18 preparing food (including ready-to-eat raw food). On August 18, 2000, the employee developed bloody diarrhea; she presented to her physician and had a stool specimen examined on August 26 that was negative for *E. coli* O157.

Samples of ground beef and three kinds of salad mix collected during the August 24 inspection tested negative for *E. coli* O157, as did a bloody-meat-juice soaked towel. These were not, however, from the same batches in use at the time of the outbreak.

Restaurant inspection, Tualatin Wendy’s Restaurant. On Friday, September 1, Washington County Health Department sanitarians inspected Wendy’s Restaurant in Tualatin, Oregon and found minor violations of state food-protection regulations. The findings of this inspection were similar to findings of an inspection conducted on March 6, 2000 (Attachment 3).

Food source investigations (lettuce). Wendy’s Restaurants use both iceberg and Romaine lettuce in their salads and sandwiches. The “lettuce paths” to the two Wendy’s Restaurants implicated in the outbreak are as follows:

- 1) South Commercial Wendy's: Sayler America (grower) → Del Monte³ Foods (distributor) → McCabe's Foods (distributor) → Wendy's Restaurants in Salem, Albany, Woodburn and Corvallis, Oregon. Iceberg lettuce (three cartons) was shipped to the Commercial Street Wendy's on August 10 and 12.
- 2) Tualatin Wendy's: Amerifresh Sunridge (grower) → Food Service of America (distributor) → Wendy's Restaurants in Tualatin, Oregon. Lettuce was shipped to the Tualatin Wendy's on August 3, 6, 10, 13, 17, 20, and 24.

Food source investigations (meat). Wendy's Restaurants use uncooked 2-ounce and 4-ounce hamburger patties. The "hamburger patty paths" to the two Wendy's Restaurants implicated in the outbreak are as follows:

- 1) South Commercial Wendy's: slaughterhouse → SSI, Inc in Wilder, Idaho (meat processing plant) → McCabe's Foods (distributor) → Wendy's Restaurant in Salem
- 2) Tualatin Wendy's: slaughterhouse → SSI, Inc in Wilder, Idaho (meat processing plant) → Food Service of America (distributor) → Wendy's Restaurant in Tualatin

SSI labels each 5000-pound batch of ground beef patties with "hour code dates." USDA inspectors used hour code dates to track SSI ground beef patties produced on August 9 and August 12 to the end-point Wendy's Restaurants. Both McCabe's and Food Service America delivered cases of 4-ounce ground beef patties with the same hour code (#16) to both the Commercial Street Wendy's and the Tualatin Wendy's Restaurants on August 12, 2000 (Table 5).

Table 5. Results of hamburger patty trace-back							
Commercial Street Wendy's				Tualatin Wendy's			
Delivery dates				Delivery dates			
# cases	patty size	expiration date	production date--hour code	# cases	patty size	expiration date	production date/hour code
August 12, 2000				August 12, 2000			
<i>1</i>	<i>4 oz</i>	<i>8/17/00</i>	<i>8/9-#16</i>	<i>4</i>	<i>4 oz</i>	<i>8/17</i>	<i>8/9-#16</i>
5	2 oz	8/17/00	8/9-#22	4	2 oz	8/17	8/9-#15
August 15, 2000				August 15, 2000			
5	4 oz	8/20/00	8/12-#18	7	<i>4 oz</i>	<i>8/20</i>	<i>8/12-#02</i>
5	2 oz	8/20/00	8/12-#02	7	<i>2 oz</i>	<i>8/20</i>	<i>8/12-#02</i>

³

Formerly Graziano's Produce purchased just recently by Del Monte Food

Control Measures.

Restaurant officials moved to control the spread of *E. coli* O157 by closing the Commercial Street Wendy's for business on August 25, 2000. Changes made before the restaurant was re-opened included:

- 1) installation of a hand-washing sink in the grill/sandwich preparation area and relocation of the hand-washing sink at the baked potato station;
- 2) removal and replacement of all foods not sealed or opened before the outbreak began;
- 3) establishment of a new utensil washing system;
- 4) placement of a stainless-steel barrier to separate the grill area from the sandwich assembling area; and
- 5) intensive training and re-orientation of staff to ensure consistent and safe methods of preparing food. Especially emphasized were monitoring of cooking temperatures and hot/cold holding temperatures; regular rotation of wet-dry hand towel; and use of sanitizing solution for hand towels to decrease contamination of workers' hands and, hence, of the food.

No cases of infection caused by this strain of *E. coli* O157 with illness onset after August 25, 2000, have been detected in Oregon or elsewhere. There is, therefore, no evidence of on-going transmission of *E. coli* O157 from this or other Wendy's Restaurants.

Discussion.

The matched case-control study implicated Wendy's Restaurant at 2375 Commercial Street SE in Salem as the source of this outbreak of *E. coli* O157 infection. Molecular sub-typing linked the first nine cases to eight additional cases, including one whose only exposure to Wendy's was a restaurant in Tualatin, Oregon. One of the earlier cases (included in the case-control study) reported no exposure to Wendy's; the source of his infection remains unknown. Eighteen other persons had presumptive *E. coli* O157 infection, defined as bloody diarrhea after eating at the Commercial Street Wendy's on the same days as the confirmed cases. A total of 35 confirmed and presumptive cases were identified. This number is probably an under-estimate of the true number of cases, however. Since 12% of confirmed cases did not have bloody diarrhea, our definition of presumptive cases may not have captured some milder infections.

October 18, 2000

We were unable to associate a specific food-item with illness; cases reported eating a variety of different food items. Food collected on August 24 — six days after the last case's exposure date — was cultured, and *E. coli* O157 was not found. Thirteen of sixteen cases reported having eaten items with lettuce, suggesting that it might have been the primary vehicle for this outbreak. The case of PFGE-matching *E. coli* O157 infection in a patient who did not eat at the Commercial Street Wendy's, but who did eat at a Tualatin Wendy's, which has a different lettuce supply, argues against the possibility that lettuce arrived at Wendy's already contaminated. As observed by Marion County sanitarians, handling of food at the Commercial Street Wendy's presented opportunities for cross-contamination from other food items. In particular, soaking lettuce in the sink used to rinse pans violated both state health code and Wendy's food-handling protocol.

The source of the *E. coli* O157 that most likely contaminated the lettuce (and perhaps other food items) is not known. It was discovered that an employee of the Commercial Street Wendy's had developed bloody diarrhea on August 18, raising the possibility that this person might have introduced the organism into the facility; however, the fact that exposure dates for all confirmed cases associated with this Wendy's preceded this employee's illness onset, and the finding that seven (non-employee) cases associated with this outbreak also developed their symptoms on August 18 make it unlikely that the ill employee was the source of the contamination. Contaminated ground beef, which has been implicated in numerous previous outbreaks of *E. coli* O157 infection, cannot be ruled out as the source of the outbreak. SSI, Inc., produced ground beef for both the Commercial Street and Tualatin Wendy's. No ground beef from lots that were used during the exposure period were available for testing. In the absence of additional cases, the ultimate source of the organism that caused this outbreak will not be known with certainty.

Recommendations.

The following recommendations were made to eliminate opportunities for cross-contamination:

- 1) wash and sanitize sinks used to wash and prepare foods;
- 2) do not use the wet towel/dry towel method of cleaning the grill area; rather, use only wet towels that have been soaked in approved sanitizing solution between uses;
- 3) install a separate, properly air-gapped food preparation sink at the baked potato station; and

- 4) provide staff with intensive training to ensure compliance with both state health code food-handling practices and Wendy's International company policies.

Attachment 1

Data Collection Forms: *Escherichia coli* O157 Case Investigation Form and Wendy's Case-Control Study Questionnaire

Attachment 2.

**Restaurant inspection reports and related information, Commercial Street
Wendy's**

Attachment 3.

Restaurant inspection reports, Tualatin Wendy's