

Foodborne Disease Outbreak Investigations

Foodborne disease outbreaks are reportable to the Department of Public Health (DPH). Outbreak investigations can result in the identification of specific contributing factors that lead to control of the immediate situation and in the development of practical and effective methods of preventing future outbreaks.

Outbreak of *Clostridium perfringens* Gastroenteritis, Connecticut, 2001

In May 2001, the DPH was notified by a local health department (LHD) of several persons who became ill with gastrointestinal symptoms after attending a dinner 3 days earlier. Because of the possibility of a foodborne outbreak, staff from the LHD and the DPH conducted epidemiologic and environmental investigations.

Telephone interviews were conducted among 158 (14%) of the 1,100 attendees. These included questions about demographics, illness history, and foods eaten. A case was defined as an attendee who experienced diarrhea (≥ 2 loose stools in a 24 hour period) following the event.

Of the 42 (27%) persons who met the case definition, 23 (55%) were male; the median age was 50 years (range 25 – 81 years). All 42 persons had diarrhea, 28 (67%) had gas or bloating, 25 (60%) had cramps, and 13 (31%) had nausea. Most people became ill within 12 hours after eating (range 5 to 28 hours) and recovered within 24 hours.

Persons who consumed steak (risk ratio [RR]=5.6; 95% confidence interval [CI]=0.82-38.42) and mashed potatoes (RR=6.0; 95% CI=0.88-41.4) were more likely to have become ill. Most persons who consumed steak also ate mashed potatoes.

Cultures of stool specimens from 3 of 6 ill persons yielded $\geq 10^5$ colonies of *C. perfringens* per gram. Samples of steak or mashed potatoes were not available for testing.

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Interviews with dietary staff revealed no ill food workers; however, the large volume of foods served for this event required advanced preparation and additional staff not routinely used by this food service operation.

The environmental investigation found that mashed potatoes were cooked appropriately. Although food handling was not directly observed, the potential for inadequate cooking, cooling, and reheating of the steaks existed. One thousand 4 oz. steaks were heat-treated (scored) more than 24 hours in advance of service. They were then packed in large pans (approximately 100 per pan), covered with plastic wrap, and stored in a two-door upright refrigerator.

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Editorial Note: The symptoms, incubation period, duration of illness, and significant levels of spore counts found in stools of 3 of 6 ill persons strongly suggest that *C. perfringens* was the organism responsible for this outbreak.

The storage process for the steaks may not have provided adequate spacing to promote rapid cooling. This may have resulted in the product remaining at temperatures ideal for the germination and multiplication of *C. perfringens*. On the day of the event, inadequate cooking of the product would have allowed the *C. perfringens* bacteria to survive. The combination of slow cooling in addition to inadequate re-heating of the

steaks may have resulted in levels of *C. perfringens* sufficient to cause illness.

This outbreak highlights the need for food service facilities to notify the LHDs when they intend to provide food services beyond what is routinely provided. Local health department food service sanitarians are available to review proposed menus and food preparation practices with the goal of preventing foodborne illness.

In 1998, *C. perfringens* accounted for 9% of all laboratory confirmed bacterial foodborne outbreaks in the United States (1). *Clostridium perfringens* are spore-forming, heat-resistant bacteria that can cause foodborne illness. The illness, which is characterized by profuse diarrhea and acute abdominal pain, usually resolves within 24 hours.

Most outbreaks of *C. perfringens* are associated with inadequately heated or re-heated meats. The product is usually cooked at a temperature that enables the spores to survive, and if cooled improperly, spore germination and growth can occur. In general, outbreaks of *C. perfringens* gastroenteritis are traced to food catering firms, restaurants, cafeterias, and schools that have inadequate cooling and refrigeration facilities for large-scale service (2).

References

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Outbreak of Norwalk-Like Virus Illness Gastroenteritis, Connecticut, 2002

In January 2002, the Connecticut Department of Public Health (DPH) was notified of employees from several companies who were ill with gastrointestinal symptoms after attending training sessions or meetings 3-days earlier. Attendees received meals from a single caterer consisting of a variety of sandwiches, salads, chips, cookies, and soft drinks.

Because of the possibility of a foodborne outbreak, staff from two local health departments (LHDs) and the DPH conducted an investigation

among employees of the two largest companies (X and Y).

Epidemiological Investigation. Three groups of persons who worked for Company X (Groups A, B, and C) and one group employed by Company Y (Group D) were asked to complete event-specific questionnaires. Questionnaires were administered by telephone for Groups A, B, and C and were self-administered for Group D. All included questions concerning demographic information, illness history, and foods eaten.

A case was defined as an attendee who developed diarrhea (≥ 3 loose stools in a 24-hour period) or vomiting following the catered event.

Questionnaires were completed for 170 (80%) persons. Twenty-one persons were excluded from analysis: 20 with a history of gastrointestinal illness in themselves or a family member the week before the events and one person who had not eaten any food at the events. Of 113 (76%) attendees who met the case definition, 95 (84%) reported vomiting, 94 (83%) diarrhea, 90 (80%) cramps, 89 (79%) chills, and 73 (65%) muscle aches. Sixty-one (54%) were male; the mean age was 43.5 years (range 18-63 years). For cases with diarrhea, the median incubation period was 24 hours (range 12-60 hours), and the median duration of illness was 3 days (range 1-5 days). Secondary illness in household members was reported in 10 (9%) cases.

Because groups were served separate menus, food-specific data were initially analyzed for each group. Sandwiches with lettuce were statistically associated with illness among Group D attendees only (risk ratio [RR]=1.82, 95% confidence interval [CI]=0.92-3.61). When data were combined for all four groups, several food items were statistically associated with illness (Table 1). However, stratified analysis of sandwich vs. non-sandwich items shows that only consumption of sandwiches with lettuce and potato chips was significantly associated with illness (RR = 1.58, 95% CI 1.02-2.0).

Environmental Investigation. The caterer had the capacity for a large volume of food preparation, including a banquet facility that seats 400, off-site catering for up to 10,000 persons per week, and provision of food items for 6 vending trucks and 2 cafeterias 5 days per week.

The catering establishment and food handling practices were assessed by the local sanitarian and DPH Food Protection Program staff. It was found that bare hand contact with ready-to-eat foods was reported to occur on occasion and that a hand washing sink was not conveniently located for use by the sandwich makers.

Six individuals were responsible for all food preparation: 3 prepared sandwiches for vending trucks, 1 made sandwiches and salads for catered events, and 2 prepared hot foods and other non-sandwich items. None of the 6 reported illness.

Sandwiches were made in a common area. Sandwich meat was sliced as needed by each sandwich maker. Leaf lettuce used in sandwiches was obtained as pre-washed whole heads and was placed into a common bowl from which leaves were pulled by each sandwich maker. Potato chips were purchased in bulk as individual serving bags.

Sandwiches were brought to the meeting locations by the caterer and served on large platters. Additional leaf lettuce and tomato was provided on platters. Potato chip bags were set out unopened.

Laboratory Investigation. Stool specimens obtained from all 6 food preparation staff and 4 ill members of Group B were negative for *Salmonella*, *Shigella*, *Campylobacter*, and *Escherichia coli* O157:H7. Three of the 6 food preparation staff and 2 of the Group B attendees tested positive for Norwalk-like virus (NLV) by polymerase chain reaction. Stool specimens collected from all 6 persons one week later were negative for NLV.

Foods were not tested since no standard method exists for testing food for NLV.

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Editorial Note: The clinical syndrome and epidemiologic picture of persons who became ill after consuming food that required manual handling prepared by a single caterer and served at 4 different events was consistent with a NLV infection. Norwalk-like virus was identified in the stools of 2 ill attendees and 3 food handlers.

This caterer prepared a large volume of cold foods on a weekly basis. Both sandwiches made with lettuce and potato chips were statistically associated with illness after stratified analysis. It is unlikely that the pre-packaged chips contributed to this outbreak since they were served at the event unopened, and no other outbreaks due to pre-packaged chips were reported.

The precise manner in which the sandwiches may have become contaminated could not be identified. None of the food preparation staff reported gastrointestinal illness, but 3 were positive for NLV. Lettuce for the sandwiches was handled in a common preparation area by all 6 food handlers, including those identified

Table 1. Selected food-specific attack rates, gastrointestinal illness, Connecticut, January 2002.

Food item	Persons eating item				Persons not eating item				RR	95% CI	p-value
	Ill	Not ill	Total	AR(%)	Ill	Not ill	Total	AR(%)			
Any sandwich	109	29	138	79%	4	7	11	36%	2.19	0.99-4.77	0.001
Any sandwich w/ lettuce	98	22	120	82%	15	14	29	52%	1.58	1.10-2.27	<0.001
Coleslaw	35	6	41	85%	77	30	107	72%	1.58	1.00-1.41	0.089
Potato salad	97	22	119	82%	16	14	30	53%	1.55	1.08-2.16	0.001
Chips	101	25	126	80%	12	11	23	52%	1.54	1.03-2.29	0.004

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with NLV. In addition, 2 significant environmental risk factors were noted during the environmental assessment: bare hand contact with sandwich ingredients, including the lettuce, and the lack of a conveniently located hand washing sink in the sandwich making area.

To comply with the Connecticut Public Health Code, the caterer was required to increase the frequency of food employee hand washing and to minimize bare-hand contact with ready-to-eat foods. The LHDs will continue to evaluate the adequacy of hand washing sink locations. As an additional control measure, and to help prevent future outbreaks, the caterer hired a trainer associated with a national restaurant association to provide food safety training for the food employees.

Norwalk-like viruses are a common cause of outbreaks of acute gastroenteritis. In 1998, 78% of all outbreaks of gastrointestinal illness with a known viral etiology were due to NLV (1). This virus can be spread through contaminated food or water and is frequently spread by food contaminated by infected food handlers. Ready-to-

eat foods that require handling but no subsequent cooking (e.g., salads and deli sandwiches) pose a greater risk of virus transmission.

The exclusion of ill food handlers for 48-72 hours after resolution of gastrointestinal illness is recommended to prevent outbreaks caused by food handlers (2). However, data from recent studies demonstrate that viral antigen shedding can be prolonged and occur in the absence of clinical disease (2). Although data are limited regarding whether detectable viral antigen represents infectious virus, food handlers should be required to maintain strict personal hygiene at all times (2).

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