AN OUTBREAK OF ENTEROTOXOGENIC *ESCHERICHIA COLI* ASSOCIATED WITH A CATERED EVENT

BACKGROUND

On October 4, 2004, the Acute Communicable Disease Control Program (ACDC) of the Los Angeles County Department of Health Services (LACDHS) received a foodborne illness (FBI) complaint associated with an event held at a local Buddhist temple on September 26th. The complainant was the event organizer, who had received several calls from attendees who reported becoming ill with diarrheal disease in the days following. An investigation was opened to establish the extent of the outbreak, the source of the infection, and to implement prevention measures if necessary.

METHODS

General Investigation: ACDC contacted the organizer of the event to ascertain details regarding the menu, food delivery, food set-up, and identification of attendees. The caterer, based in Orange County, was contacted to verify the menu items and inquire about other catered events from that weekend. On October 6, 2004 ACDC inspected the grounds where the event took place. A referral was made to Orange County Health Care Agency/Environmental Health to inspect the restaurant/caterer.

Case-control study: A case was defined as a person who attended the event at the temple, ate food provided by the caterer, and reported diarrhea (>2 loose stools/24 hrs) within 6–72 hours after eating or had other symptoms and a positive stool culture for E. coli O169:nonmotile. Individuals who attended the event but were asymptomatic were selected as controls.

Case finding: A list of attendees was obtained from the event coordinator. After conducting five preliminary interviews, a standardized questionnaire was developed that included demographics, information on attendees or household members sick prior to the investigation, food items eaten, illness onset after attending the function, symptoms and symptom duration, medical treatment, and specimens collected. Attendees were contacted by telephone to administer the questionnaire.

Frequency and distribution of symptoms were calculated and an incubation curve was constructed using Epi Info version 3.3. An unmatched case-control study was conducted using questionnaire data. Odds ratios (OR) and 95% confidence intervals (CI) were calculated using Epi Info 2000 to determine the source of the illness.

Laboratory analyses: Ill attendees were asked if they would be willing to provide a stool sample. Stool specimens were tested in the Public Health Laboratory for the following: *Salmonella* species, *Shigella* species, *Campylobacter* species, *Vibrio* species, *E. coli* O157, presence of Shiga toxin, *Cryptosporidium* species, *Cyclospora* species, *Isospora* species, and Norovirus. One sample of leftover food, a vegetable dish that had been frozen, was submitted by an ill attendee for testing. No other food samples were available.

Orange County Environmental Health Inspections: On October 5, 2004 Orange County Environmental Health (OCEH) inspected the catering facility/restaurant. On October 19 OCEH and Orange County Health Care Agency/Epidemiology Unit returned to the restaurant for follow-up interviews regarding food preparation.

RESULTS

Approximately 600 individuals attended an anniversary celebration at a Buddhist temple in LAC. The attendees came from the following locations: Japan (56), Panama (2), Argentina (1), France (1), New York (20), Illinois (7), Georgia (7), Colorado (1), Washington State (2), Utah (2), Washington

D.C/Maryland (24), Hawaii (13), and Northern California (42), with the remaining from the Southern California area. The event coordinator provided ACDC with a partial list of attendees. The list contained 144 names. ACDC was able to contact and administer the questionnaire to 69 attendees (66 from Southern California, 2 from New York, and 1 from Utah). An epidemiologist from California Department of Health Services contacted 3 individuals from Northern California and 2 from Washington State.

Descriptive Analysis: In total, 76 interviews were completed, of whom 56 were ill cases and 20 were non-ill controls. The mean age for cases and controls was 44.4 years and 54.3 years, respectively. Among the 29 male interviewees, 22 were cases (75.9%) and among the 47 female interviewees, 34 were cases (72.3%) (See Table 1). No one reported illness themselves or in household members prior to the event. The main symptom presentations were as follows: non-bloody diarrhea (98.2%), abdominal cramps (85.7%), nausea (51.8%), fatigue (48.2%), headache (44.6%), body aches (30.4%), fever (26.8%), and vomiting (19.2%) (Table 2). The average duration of symptoms was 5.2 days with a range of <1 day to 11 days. The incubation period ranged from 10-67 hours with most onsets occurring 27 hours after the event (Figure 1). Six (10.7%) individuals sought medical care and none was hospitalized.

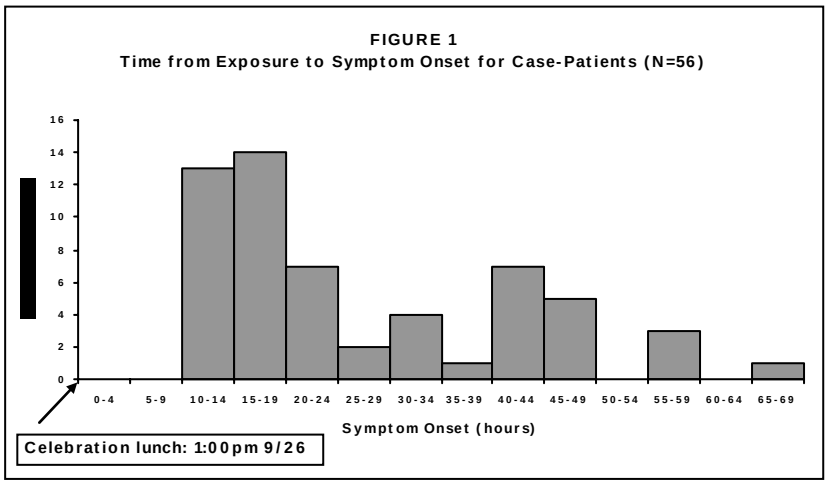

Table 1. Demographic Characteristics of Case-Patients and Controls

Characteristic	Case Patients (N=56)	Controls (N=20)	All (N=76)
Age			
Mean	44.4 years	54.3 years*	46.8 years
Range	---	---	3–77 years
Gender			
No. (%) Males	22 (75.9%)	7 (24.1%)	29
No. (%) Females	34 (72.3%)	13 (27.7%)	47

* Excludes three case-patients

Table 2. Frequency of Symptoms among Case-Patients		
	Case-Patients (N=56)	
Symptoms	no.	%
Diarrhea	55	98%
Abdominal Cramps	48	86%
Nausea	29	52%
Fatigue	27	48%
Headache	25	45%
Chills	19	34%
Body aches	17	30%
Fever	15	27%

Laboratory Analysis: Nine symptomatic individuals provided stool specimens. Six clinical specimens were positive for *Escherichia coli* with matching phenotypic profiles. Isolates were subsequently sent to the California Microbial Diseases Laboratory (CA-MDL) for toxin testing and forwarded to CDC for serotyping. Laboratory analysis revealed all six isolates were enterotoxigenic *E. coli* (ETEC), serotype O169:non-motile, ST positive. PFGE of the 6 isolates showed 3 isolates had indistinguishable patterns and 3 isolates had patterns that differed by 1-3 bands.

At the request of the CDC, a second specimen was collected from 7 of the 9 previous ill donors and an additional 4 specimens were collected from attendees who were not ill. None of the additional specimens grew *E. coli* with the outbreak phenotypic profile.

The frozen leftover food provided by an attendee consisted only of a vegetable dish. The frozen vegetable dish was negative for *E. coli*.

General Investigation

The event involved a ceremony followed by a catered lunch. The food was provided by a catering company located in Orange County specializing in Asian cuisine. The caterers prepared the food at an associated restaurant, also located in Orange County. Additional information on the inspection of the caterer was obtained through Orange County Environmental Health.

The food was delivered on two separate trucks. The first truck, containing beverages, set-up equipment, and supplies, arrived at the temple at 8:30am. The second truck, containing the hot and cold food items, arrived at 12:00pm. The cold food was temperature controlled with ice bags. The hot food was left at ambient temperature. The food was set up buffet-style in the temple parking lot. The luncheon was scheduled to begin at 12:00pm, but was delayed until 1:00-1:30pm due to late guest arrivals. Several attendees and the temple coordinators recalled that the hot food dishes were served in chaffing dishes without heating elements and were lukewarm or cold when served.

On October 6, an inspection of the temple grounds found that bathrooms were clean and in good working condition. At the time of the visit, there were two open dumpsters in the parking lot where the food was served on the day of the event. All food service took place in the parking lot. No electrical outlets for electric chafing dishes were observed.

An outbreak with similar characteristics was reported to the Orange County Health Care Agency during the same time period. On September 25, a wedding with approximately 150 guests took place in Orange County, catered by the same company. Following the event, many attendees complained of diarrhea and abdominal cramps. Of the 55 attendees Orange County interviewed, 31 reported illness. Two other events catered by this company on the same weekend did not result in illness. Orange County's investigation found that the food served at their event was Korean dishes. Foods served at the three other events were Korean foods and were prepared separately, according to the caterer.

Environmental Health Investigation: The catering company prepared all the food with the exception of cream puffs and moon pies, which were prepared by a separate facility in Orange County. Most of the food was prepared the morning of the event at the Orange County restaurant. However, the beef for the dishes was cooked the day before the event and final preparation for those dishes was completed the following morning (see Table 3 for listing of food items).

Table 3. Case-Control Study Results—Food Item Specific Risk Factors for Illness

Food Item Consumed	Case-Patients (N=56)		Controls (N=20)		Odds Ratio	(95% CI)
	no.	%	no.	%		
Any Beef **	45	80%	5	25%	**12.3**	**(3.7–41)**
Beef/mushrooms	31	55%	2	10%	**11.2**	**(2.3– 105)**
Any Dessert***	50	89%	9	45%	**10.2**	**(3.0– 35)**
Any Drinks	52	93%	13	65%	**7.0**	**(1.5–36)**
Beef/Bean Curd	27	48%	3	15%	**5.3**	**(1.3–31)**
Fruit	38	68%	6	30%	**4.9**	**(1.6–15)**
Eggrolls	37	66%	6	30%	**4.5**	**(1.5–14)**
Any Chicken****	39	70%	7	35%	**4.3**	**(1.5–13)**
Creampuff	37	66%	7	35%	**3.6**	**(1.2–11)**
Gailan (green vegetable)	36	64%	7	35%	**3.3**	**(1.2–10)**
White Rice	36	64%	7	35%	**3.3**	**(1.2–10)**
Any Rice	43	77%	10	50%	**3.2**	**(1.1–10)**
Teriyaki Chicken	23	41%	3	15%	**3.9**	**(1.0–23)**
Any Vegetable	54	96%	16	80%	6.8	(0.9–79)
Chicken/cashew	18	34%	2	10%	4.3	(0.9–41)
Chicken/mushrooms	20	36%	3	15%	3.1	(0.8–19)
Any Pork	38	68%	9	45%	2.6	(0.9–7)
Ice	41	73%	11	55%	2.2	(0.7–6)
Cabbage/shrimp	14	25%	3	15%	1.9	(0.4–11)
Tempura Vegetables	25	45%	6	30%	1.9	(0.6–6)
Eggplant	30	54%	8	40%	1.7	(0.6–5)
Moon pie	11	20%	3	15%	1.4	(0.3–9)
Chow Mein	31	55%	10	50%	1.2	(0.5–3)
Cucumber salad	22	40%	7	35%	1.2	(0.4–3)
Fried Rice	10	18%	5	25%	0.7	(0.2–2)
Assorted Vegetarian	8	14%	0	0%	Ø*	(Ø*)

*Ø=undefined.
** Includes beef with mushrooms, beef with bean curd
*** Includes cream puff, moon pie
**** Includes chicken cashew, chicken with mushrooms and teriyaki chicken

Orange County Health Care Agency (OCHCA) made their first inspection visit to the restaurant on October 5. They found no major violations. OCHCA made a second inspection on October 19. Workers were questioned about food preparation for the Buddhist temple event and the wedding that took place in Orange County. OCHCA collected stool specimens from 11 employees of the catering company and restaurant on November 12. No specimens had the outbreak strain of *E. coli.*

Case Control Study: A case control study was performed using 56 cases and 20 controls. Statistical analyses of the food items indicate the strongest association of illness was with eating any beef dish (OR=12.27, p<.0001) (Table 3). However, several food items were significantly associated with illness.

Orange County Outbreak: Orange County Health Care agency concluded that 31 persons became ill after attending an event catered by Dragon Palace catering. No etiologic agent was identified, but investigators

suspected a bacterial toxin may have been the etiology. From their case control study, the foods most strongly associated with illness were zucchini patties and fish patties. Neither of these dishes was served at the LAC event.

DISCUSSION

An outbreak of ETEC was associated with eating at a catered event on September 26, 2004. Symptom duration, incubation and low vomit/diarrhea ratio as well as laboratory results support ETEC as the etiology. Based on statistical analyses, consuming any dish containing beef was strongly associated with illness. However, because several other foods were also significantly associated with illness, the beef dishes may not have been the sole source of the outbreak. Other possibilities include cross-contamination between other foods, surfaces at the restaurant, or utensils. Exposure by food handlers or other uninvestigated sources also cannot be ruled out. The beef was prepared ahead of time at the restaurant and was held at the luncheon site within the bacterial danger zone of 40 to 140 degrees Farenheit. This outbreak was likely caused by improperly stored beef.

There was no common dish served at both the Orange County and LAC outbreaks, but overall foodhandling at the restaurant/caterer may have been suboptimal as they were cooking many different foods for 4 large parties, as well as serving regular restaurant patrons that weekend.

From 1975 through 2003, only 26 outbreaks of ETEC have been reported in the US. This is the second outbreak of ETEC reported by LAC. ETEC is recognized as a cause of diarrheal illness in developing countries and in travelers to those countries.

LIMITATIONS

Limitations of this investigation include a possible sampling bias caused by the limited number of attendees interviewed, the large proportion of ill versus non-ill, and poor recall by interviewed attendees regarding food items eaten, as food was set out buffet-style. Limited information was also collected on the food handlers and their stool specimens were not collected in a timely manner, almost 6 weeks after the event occurred. This limited our ability to rule out a food handler as the source of contamination.

RECOMMENDATIONS

The Los Angeles Department of Health Services recommends that the restaurant and caterer make all corrections as advised by Orange County Environmental Health. In addition, all restaurants should adhere to the following food handling practices: (1) Hot food should be held at 140 °F or warmer; (2) Cold food should be held at 41 °F or colder; (3) When serving food at a buffet, keep food hot with chafing dishes, slow cookers, or warming trays and keep food cold by nesting dishes in bowls of ice or use small serving trays and replace them often; and (4) Potential hazardous food should not be left out more than 2 hours at room temperature. ETEC is not detected by routine stool culture, so if suspected, specific testing of both clinical and environmental specimens must be requested from a public health reference laboratory.

REFERENCES

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