Outbreak of *Clostridium perfringens* Intoxication Associated with a Rehearsal Dinner Catered by Bambino's Italian Restaurant — Douglas County, June 2013

Background

On June 5, 2013 at 12:08 pm, the Kansas Department of Agriculture (KDA) notified the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) of a foodborne illness complaint. The complainant stated that at least 30 out of 50 attendees at a wedding rehearsal dinner became ill with gastrointestinal symptoms after eating a catered dinner on May 31, 2013 by Bambino's Italian Restaurant (1540 Wakarusa Drive, Lawrence, KS 66047). KDHE notified the Lawrence-Douglas County Health Department (LDCHD), and an outbreak investigation was begun at 1:05 pm that day to determine the cause and scope of illness and to determine appropriate prevention and control measures.

Methods

Epidemiologic Investigation

LDCHD worked with representatives from the rehearsal dinner to obtain a list of attendees and their contact information. KDHE conducted a retrospective cohort study among those who attended the rehearsal dinner. An online questionnaire was developed and distributed via e-mail to obtain attendees' demographic information, symptom history, and food history. Questionnaire administration began on June 7, 2013 and was completed on June 20, 2013. A case was defined as any individual experiencing diarrhea (three or more loose stools in a 24-hour period) within 24 hours of eating food at the rehearsal dinner on May 31, 2013.

Analysis was conducted using SAS® 9.2. Relative Risks (RR) and 95% confident intervals were calculated to assess the association between food exposures and subsequent illness.

Laboratory Analysis

Food samples collected on June 6, 2013 from the complainant were sent to a private laboratory for *Clostridium perfringens* testing via bacterial culture on June 18, 2013. No stool specimens were submitted for testing.

Environmental Assessment

KDA conducted an inspection of Bambino's on June 6, 2013 in response to the foodborne illness complaint. On August 22, 2013, KDA returned to conduct a Hazard Analysis and Critical Control Points (HACCP) inspection on the preparation of the take-out lasagna with meat sauce.

Results

Epidemiologic Investigation

Thirty-five people attended the rehearsal dinner; 26 (74%) completed the online questionnaire. Nineteen (73%) respondents were ill and all met the case definition. Eleven (58%) of the cases were female and eight (42%) of the cases were male. Ill individuals ranged in age from 12 to 89 years (median: 30 years). The most common symptom was diarrhea, which was experienced by all (100%) cases [Table 1]. Abdominal cramping and nausea were also reported. The incubation period ranged from seven hours to thirteen hours (median: 10.5 hours) [Figure 1]. Duration of illness ranged from three hours to 98 hours (median: 15.5 hours); all who were ill had recovered at time of interview.

Table 1: Symptoms Reported Among Cases (n=19)

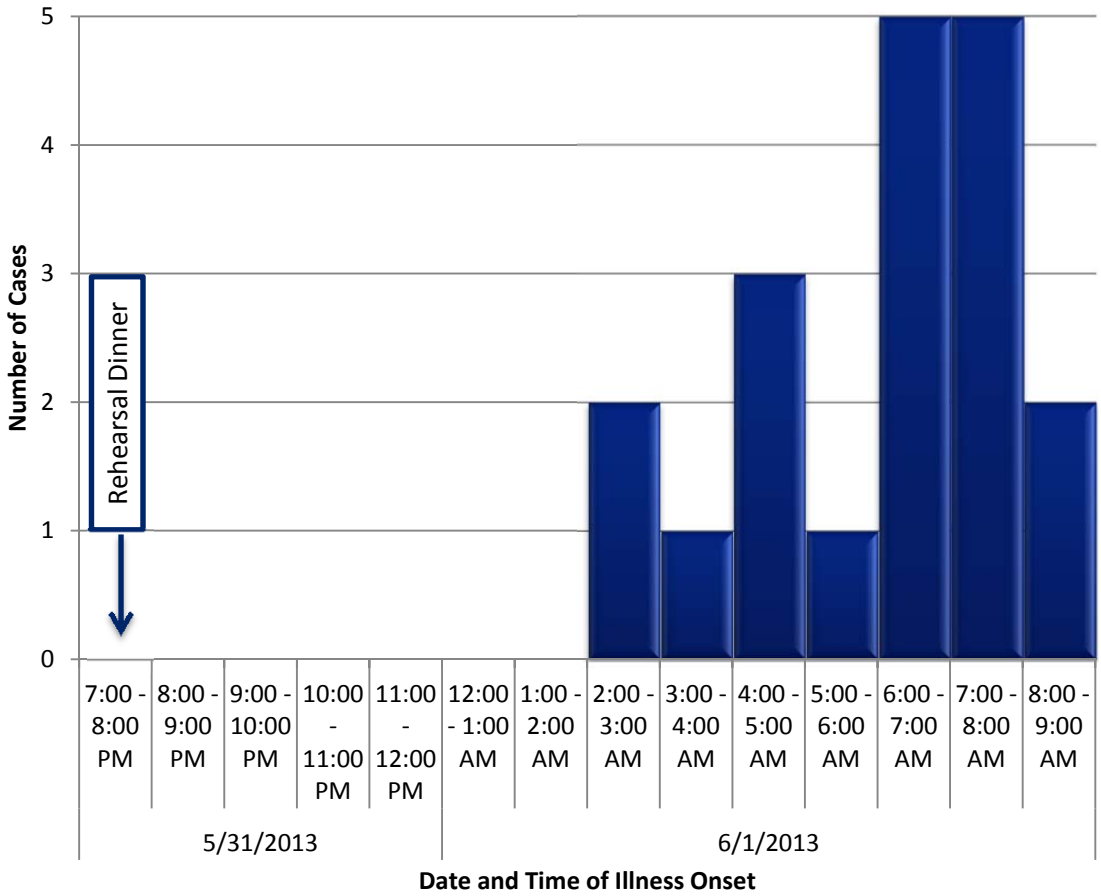
Symptom	# of Cases	% of Confirmed Cases
Diarrhea	19	100%
Abdominal Cramping	15	79%
Nausea	2	11%

Each item served at the rehearsal dinner was analyzed for statistical association with illness. Attendees who reported consuming the lasagna with meat sauce were 13 times more likely to have become ill than those who did not report consuming the lasagna (Relative Risk = 13.0, p-value < 0.0001, 95% Confidence Interval = 0.9 – 188.4). Lasagna was the only item served that was significantly associated with illness. All other foods, including salad, chicken Alfredo, beverages, and desserts, were not found to be associated with illness [Table 2].

Table 2: Exposure Information

Food	Relative Risk	p-value	95% Confidence Interval
Salad	1.38	0.28	0.70 – 2.73
Ranch Dressing	1.15	0.60	0.67 – 1.95
House Dressing	1.47	0.26	1.10 – 1.95
Chicken Alfredo	1.50	0.45	0.37 – 6.11
Spaghetti	1.36	0.39	0.66 – 2.83
Lasagna	13.0	<0.001	0.90 – 188.40
Cheesecake	1.38	0.28	0.70 – 2.73
Water	0.95	0.84	0.60 – 1.52
Mixed Drink	0.99	0.97	0.57 – 1.71

Figure 1: Illness Onset Dates by Number of Cases



Laboratory Analysis

Samples from two trays of lasagna with meat sauce tested positive for *Clostridium perfringens* bacteria by culture on June 20. The samples and concentrations are shown in Table 3. No other food samples were tested.

Table 3: Levels of *Clostridium perfringens* Bacteria Found in Lasagna with Meat Sauce

Lasagna Pan	Sample	Level Found (cfu/g)*
Tray X	A1 – Top Left	3,200
	A2 – Top Middle	4,600
	A3 – Top Right	6,400
	B1 – Bottom Left	930
	B2 – Bottom Middle	6,200
	B3 – Bottom Right	120
Tray Y	A1 – Top Left	1,230
	A2 – Top Middle	16,300
	A3 – Top Right	860
	B1 – Bottom Left	690
	B2 – Bottom Middle	18,600
	B3 – Bottom Right	960

**cfu/g = colony-forming units of C. perfringens per gram of lasagna with meat sauce*

Environmental Assessment

The June 6, 2013 inspection of the restaurant by KDA revealed three priority violations and three priority foundation violations. The priority violations included dried food debris on the food contact surfaces of the meat saw, improper cold holding temperatures of potentially hazardous foods, and storage of employee medication alongside food knives and utensils. These violations were corrected while the inspector was on-site. The priority foundation violations included not having soap at a hand washing sink; accumulation of dried food debris on food contact surfaces of a can opener, pizza paddles and pans, a pizza knife, and cutting knives; and inadequate equipment for temperature control of potentially hazardous foods. The first two priority foundation violations were corrected while the inspector was on-site. The inspector distributed educational material on proper hand washing as well as on hot and cold food holding to the restaurant operator.

On August 22, the HACCP inspection was conducted. The inspector observed the employees of the restaurant preparing the take-out lasagna with meat sauce. Each catered order is prepared as a single batch and therefore there is no cooling and no reheating when the lasagna is

prepared for a catered event. When completely cooked, these foods are kept in hot hold until delivered. KDA made the following suggestions to enhance food safety:

- Document the method for preparation of lasagna and marinara sauce to create consistency and enhance the process for food safety.
- Document food temperatures and times throughout the food preparation process, especially at critical control points. Management should oversee and review the critical control points.
- Continue to prepare lasagna as a single batch so that no reheating and no cooling are required between the time that the lasagna is prepared and served.
- Work with customers to enhance, educate, and inform about temperature control and food safety practices after the food has left the caterers' custody and before the food is consumed.

Discussion

Nineteen cases of gastroenteritis were associated with consuming lasagna prepared by Bambino's restaurant at a wedding rehearsal dinner held on May 31, 2013. Although no clinical specimens were collected, the clinical history reported by ill individuals was consistent with *C. perfringens* infection. Consuming lasagna with meat sauce at the rehearsal dinner was statistically associated with illness. All ill persons reported eating the lasagna and all samples of lasagna with meat sauce tested positive for *C. perfringens* bacteria.

Clostridium perfringens is a type of bacteria that is often found on raw meat and poultry, some strains of which can produce a toxin that causes gastrointestinal illness when consumed. *C. perfringens* is estimated to cause nearly a million cases of illness each year, making it one of the most common causes of foodborne illness in the United States[1]. The most common symptoms of *C. perfringens* food intoxication are diarrhea and abdominal cramps, which typically develop within six to twenty-four hours of consuming contaminated food and usually last fewer than twenty-four hours. Complications and severe illness are rare, and the disease is not spread person-to-person[2].

Outbreaks of *C. perfringens* often occur when foods are prepared in large quantities and then kept warm for long periods of time before serving and consumption. Since the *C. perfringens* spores that produce the bacteria can withstand cooking temperatures, food must be held at appropriate temperatures between preparation and consumption to prevent bacterial growth. When food is held between 40°F and 140°F, *C. perfringens* spores germinate and the bacteria multiplies[3]. If food continues to be held at improper temperatures, particularly between 109°F

and 117°F, the bacteria concentration will rise rapidly. After consumption, the bacteria inside the intestine can produce a toxin that causes gastrointestinal illness[4].

In this outbreak, *C. perfringens* spores were likely present in an ingredient of the lasagna with meat sauce prior to preparation, and temperature abuse that occurred between preparation and consumption allowed for growth of the bacteria. After the lasagna was prepared at Bambino's, it was transported to the rehearsal dinner location, which took approximately thirty minutes. The food was then held for an additional hour prior to serving. In the time between preparation and consumption, the lasagna with meat sauce was most likely not held at appropriate temperatures to prevent bacterial growth. Ingestion of at least 10^8 *Clostridium perfringens* cells is considered to be sufficient to cause illness[2]; the levels of bacteria found in the samples of lasagna with meat sauce in conjunction with the clinical presentation suggest that the lasagna was the source of this outbreak.

The epidemiological investigation was limited by several factors. Clinical specimens from ill individuals were not obtained for testing. Additionally, not all individuals who attended the rehearsal dinner were available for interview. Inaccuracies may exist in interviewees' food and symptom histories due to recall bias.

This investigation was aided by the quick response of and cooperation between LDCHD, KDHE, and KDA, which allowed for timely initiation of the outbreak investigation. The use of an online questionnaire allowed for a good response rate among rehearsal dinner attendees while minimizing the staff time required for the investigation. The initial inspection of Bambino's was completed by KDA within twenty-four hours of receiving the foodborne illness complaint.

Report by: Lindsey Martin Webb, MPH, Kansas Department of Health and Environment
On: 19 September 2013

Investigation by:
Lawrence – Douglas County Health Department
200 Maine Street
Lawrence, Kansas 66044
http://ldchealth.org

Kansas Department of Agriculture
Division of Food Safety and Lodging
109 SW 9th Street, 3rd Floor
Topeka, Kansas 66612
http://www.ksda.gov/food_safety

Kansas Department of Health & Environment
Bureau of Epidemiology and Public Health Informatics
1000 SW Jackson Street, Suite 075
Topeka, Kansas 66612
http://www.kdheks.gov

---

[1] Centers for Disease Control and Prevention. Clostridium perfringens. May 2013. Retrieved September 2013 from http://www.cdc.gov/foodsafety/clostridium-perfingens.html.

[2] Federal Department of Agriculture. Bad Bug Book: Clostridium perfringens. August 2013. Retrieved September 2013 from http://www.fda.gov/food/foodborneillnesscontaminants/causesofillnessbadbugbook/ucm070483.htm.

[3] FoodSafety.gov. Clostridium perfringens. September 2013. Retrieved September 2013 from http://www.foodsafety.gov/poisoning/causes/bacteriaviruses/cperfringens.

[4] Centers for Disease Control and Prevention. Clostridium perfringens. May 2013. Retrieved September 2013 from http://www.cdc.gov/foodsafety/clostridium-perfingens.html.