Outbreak of Gastroenteritis Associated with a Catered Dinner — Sherman County, March 2015

Background

On March 4, 2015 at 2:27 pm, the Sherman County Health Department (SCHD) 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 20 members of a high school athletic team and their families became ill with gastrointestinal symptoms after a team dinner on March 3, 2015 at 6:00 pm catered by an unlicensed person. An outbreak investigation was initiated on March 4 at 2:45 pm to determine the cause and scope of illness and to determine appropriate prevention and control measures.

Methods

Epidemiologic Investigation

SCHD obtained a list of dinner attendees and their contact information. KDHE conducted a retrospective cohort study among those who either attended the team dinner or ate leftovers from the meal. A questionnaire was developed and administered via telephone to obtain attendees' demographic information, symptom history, and foods consumed. Questionnaire administration began on March 5, 2015 and was completed on March 9, 2015. A case was defined as diarrhea (three or more loose stools in a 24-hour period) in a person within 24 hours of eating food served at or from the team dinner on March 3, 2015.

Descriptive analyses were conducted using SAS® 9.3. Relative risk and 95% confidence intervals were calculated to assess the association between food exposures and subsequent illness.

Environmental Assessment

SCHD contacted the caterer to obtain a list of menu items, ingredients, and method of preparation for all items served. Proper food handling procedures were reviewed and a timeline for food preparation, pickup, and transportation was obtained.

Laboratory Analysis

Food samples collected on March 5, 2015 from the complainant were sent to a private laboratory for *Clostridium perfringens* and *Bacillus cereus* testing on March 12, 2015. No stool specimens were submitted for testing.

Results

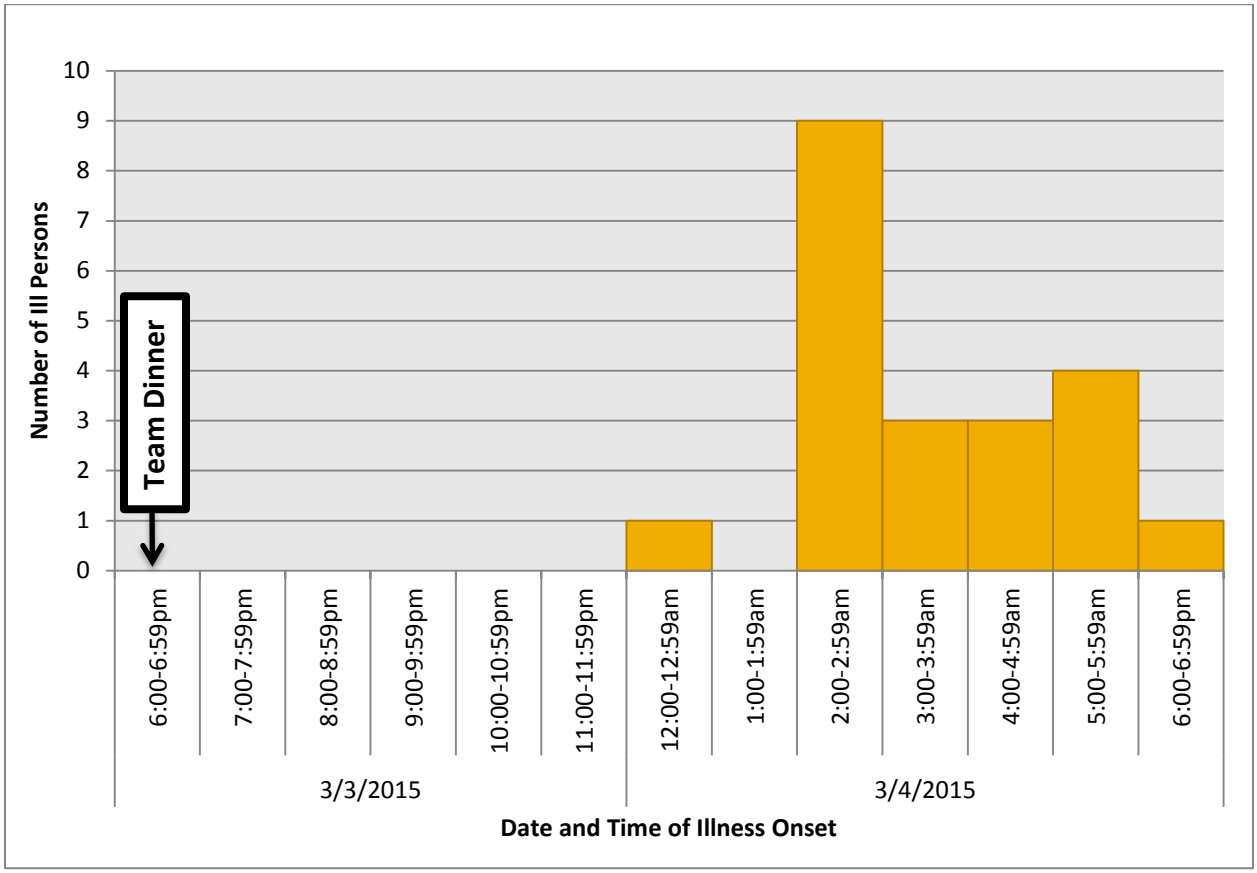
Epidemiologic Investigation

Twenty-six people consumed food served at the team dinner; 26 (100%) completed the questionnaire. Twenty-two (84.6%) respondents reported illness and all met the case definition. Nineteen (86.4%) of the individuals reporting illness were male. Ill individuals ranged in age from 14 to 54 years (median: 17 years). Diarrhea and abdominal pain were experienced by all (100%) individuals reporting illness [Table 1]. No other symptoms were reported. The incubation period ranged from six hours to twelve hours (median: 9 hours) [Figure 1]. One person reporting illness did not attend the team dinner but ate leftovers later that evening at an unknown time. The incubation period for this individual is unknown. Duration of illness ranged from four hours to 22 hours (median: 13 hours); all who reported illness had recovered at time of interview.

Table 1: Symptoms Reported Among Ill Persons (n=22)

Symptom	# of Ill Persons	% of Ill Persons
Diarrhea	22	100%
Abdominal Cramping	22	100%

Figure 1: Number of Ill Persons by Illness Onset Date and Time (n=21*)



** Time of exposure was unknown for one of the 22 persons reporting illness*

Relative risk was calculated for each item served at the team dinner to determine statistical association with illness. Attendees who reported consuming either the taco shells or the taco meat were almost 4 times more likely to have become ill than those who did not report consuming these items (Relative Risk = 3.82, p-value < 0.001, 95% Confidence Interval = 0.70 – 20.90). Taco shells, the taco meat, cheese, and lettuce were the only items served that were significantly associated with illness ($p<0.05$) [Table 2].

Table 2: Relative Risk by Food Item

Food	Relative Risk	p-value	95% Confidence Interval
Taco Shell	**3.82**	**<0.001**	**0.70 – 20.90**
Taco Meat	**3.82**	**<0.001**	**0.70 – 20.90**
Cheese	**1.90**	**0.01**	**0.85 – 4.26**
Lettuce	**1.43**	**0.03**	**0.95 – 2.14**
Chocolate Cake	1.27	0.11	0.97 – 1.67
Tomato	1.20	0.26	0.98 – 1.48
Rice	1.13	0.41	0.83 – 1.55
Salsa	1.11	0.50	0.82 – 1.49
Milk	1.06	0.74	0.75 – 1.49
Spice Cake	1.05	0.79	0.75 – 1.47
Chips	0.97	0.87	0.70 – 1.35
Ice Water	0.85	0.32	0.61 – 1.20
Cheese Enchilada	0.81	0.30	0.66 – 1.00

Environmental Assessment

SCHD discussed possible sources of contamination and proper food handling practices with the caterer for the event. All menu items except for the rice, chips, taco meat, and taco shells were prepared on Monday, the day before the event took place. All hot foods prepared Tuesday morning were subsequently placed in the refrigerator until the team dinner coordinators picked up the food at 4:00 that afternoon. After the food was delivered to the team dinner, the taco meat and the rice were placed in the oven to heat up. When the coordinator felt the meat was not heating up quickly enough, the meat was microwaved on a separate platter then returned to the oven pan before guests arrived.

Laboratory Analysis

Samples from the catered dinner, including cheese enchiladas, taco meat, salsa, and the rice, were tested by for *Clostridium perfringens* and *Bacillus cereus* on March 18 and March 20. *Clostridium perfringens* was not detected, and *Bacillus cereus* was found in the cheese enchilada and the salsa at low levels [Table 3]. No other food samples were tested.

Table 3: Levels of Bacteria Found in Foods Served at Catered Dinner

Organism	Sample	Level Found (cfu/g)*
Clostridium perfringens	Cheese Enchilada	Not Detected
	Taco Meat	Not Detected
	Salsa	Not Detected
	Mexican Rice	Not Detected
Bacillus cereus	Cheese Enchilada	10
	Taco Meat	Not Detected
	Salsa	60
	Mexican Rice	Not Detected

cfu/g = colony-forming units of C. perfringens and B. cereus per gram of food sample tested

Discussion

Twenty-two cases of gastroenteritis were associated with an event held on March 3, 2015, catered by an unlicensed individual. Although no clinical specimens were collected, the clinical history reported by ill individuals was consistent with *B. cereus* intoxication.

Bacillus cereus is a type of Gram-positive bacteria that is often found in prepared foods that have been temperature abused, some strains of which can produce a toxin that causes gastrointestinal symptoms when consumed. *B. cereus* is estimated to cause approximately 63,400 cases of illness each year[1]. This is most likely an underestimation because most people infected with *B. cereus* have fairly mild, brief symptoms, so they may not seek medical attention. *B. cereus* food poisoning can cause two distinct types of illness depending on the toxin the bacteria produces either diarrheal illness or vomiting illness. For diarrheal type illness, symptoms typically develop within six to fifteen hours of consuming contaminated food. For vomiting type illness, symptoms typically develop within half an hour to six hours after consumption of contaminated foods. Both types of illnesses usually last fewer than twenty-four hours. Complications and severe illness are rare, and the disease is not spread person-to-person[1].

Outbreaks of *B. cereus* often occur when foods are prepared in large quantities and then kept warm for long periods of time before serving and consumption. Since the *B. cereus* 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, *B. cereus* spores germinate and the bacteria multiplies[2]. If food continues to be held at improper temperatures, particularly between 82.4°F and 95°F, the bacteria concentration will rise rapidly. *B. cereus* produces a toxin in the contaminated food, oftentimes in rice and other starchy foods, which can cause illness within thirty minutes and fifteen hours after ingestion. Ingestion of at least 10^6 *Bacillus cereus* cells is considered to be sufficient to cause illness[1].

In this outbreak, while *B. cereus* was found in two of the food items tested, the amount found was not at high enough levels to constitute an infective dose. Although there is no conclusive evidence to prove *B. cereus* as the causative agent responsible for the outbreak; incubation period, symptoms experienced, and duration of illness all suggest infection with *B. cereus*.

The meal preparation included periods of sub-optimal temperature control which could have contributed to the growth of *B. cereus.* After the food was prepared at the home of the caterer on the day of the event, the food was placed in a refrigerator until it was sent to the organizer's house at 4:00 pm that day. When the food was received by the dinner organizer, the taco meat, cheese enchiladas, and Mexican rice were placed in the oven until the dinner began at 6:00 pm. These cooling and reheating periods may not have been sufficient and could have allowed bacterial growth. The foods that were significantly associated with illness tested negative for *B. cereus* and the foods that tested positive for *B. cereus* were not significantly associated with illness. This could be due, in part, to the bacteria being unevenly distributed in foods. Also, a specific menu was served and a majority of attendees ate similar food items which may have masked the statistical association.

The epidemiological investigation was limited by several factors. Clinical specimens from ill individuals were not obtained for testing. Additionally, not all foods were submitted by the dinner organizers and were tested for toxin-producing bacteria. 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 SCHD, KDHE, and the individual who catered the event, which allowed for timely initiation of the outbreak investigation. The use of a telephone questionnaire allowed for a good response rate among team dinner attendees while minimizing the staff time required for the investigation.

Report by: Charles Cohlmia, MPH, Kansas Department of Health and Environment
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Investigation by:
Cheryl Lee
Sherman County Health Department
1622 Broadway
Goodland, Kansas 67735

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] Food and Drug Administration. Bad Bug Book: Bacillus Cereus. October 2014. Retrieved April 2015 from http://www.fda.gov/downloads/Food/FoodborneIllnessContaminants/UCM297627.pdf.

[2] FoodSafety.gov. Bacillus cereus. April, 2015. Retrieved April 2015 from http://www.foodsafety.gov/poisoning/causes/bacteriaviruses/bcereus/index.html