

Outbreak of *Clostridium perfringens* Food Poisoning in a Topeka Correctional Facility, Shawnee County, June 2014



Background

On Thursday, June 19, 2014, at 9:21am the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) was notified of a possible foodborne illness outbreak involving residents at the Topeka Correctional Facility (TCF). The facility reported that 77 residents sought medical attention due to gastrointestinal symptoms on or after June 18, 2014. In response to this report, an outbreak investigation was initiated at 9:30am by KDHE, the TCF, and the Kansas Department of Agriculture (KDA), in cooperation with the Shawnee County Health Agency and the Kansas Department of Corrections, to determine the cause and scope of illness among residents and to recommend prevention and control measures.

Methods

Epidemiologic Investigation

A cohort study was conducted to determine the number of individuals affected and to assess for specific food exposures. Paper questionnaires were distributed to all residents and staff at the facility. A case was defined as diarrhea (three or more loose stools in 24 hours) in residents or staff at least 4 hours and not longer than 26 hours after eating the dinner served on June 18, 2014 at the TCF.

Data from completed questionnaires were entered into a Microsoft® Access database and analyzed using SAS® 9.3. Relative risk (RR) and 95% confidence intervals (CI) were calculated to assess the association between food and drink items and subsequent illness.

Laboratory Analysis

Four stool specimens were collected from ill residents and sent to Kansas Health and Environmental Laboratories (KHEL) to be tested for norovirus, *Campylobacter*, *Salmonella*, Shiga toxin-producing *Escherichia coli*, and *Shigella*. The four stool specimens were forwarded to the Centers for Disease Control and Prevention (CDC) to be tested for *Clostridium perfringens*, *Staphylococcus aureus*, and

Bacillus cereus. Positive bacterial colonies were then tested for toxin-producing genes by polymerase chain reaction (PCR). Stool specimens were also tested for the presence of toxin using Oxoid's Perfringens Enterotoxin - Reversed Passive Latex Agglutination test kit (Remel, Lenexa, KS) (PET-RPLA)

Environmental Assessment

KDA conducted a courtesy inspection of the facility kitchen on June 24, 2014.

Results

Epidemiologic Investigation

On June 19, 2014 there were 744 inmates at the TCF and 314 (42%) completed surveys. In addition, 15 staff completed surveys. Of the 329 respondents, 194 (59%) (187 inmates and 9 staff) reported illness and 167 (51%) (159 residents and 8 staff) met the case definition and were included in the analysis. Of those persons who did not meet the case definition, eight reported gastrointestinal symptoms that did not include diarrhea, and 19 reported incubation periods either less than four hours before or more than 26 hours after eating dinner at the TCF on June 18, 2014.

The most commonly reported symptoms among ill persons were diarrhea, abdominal cramps, nausea, and headache. Additional symptoms included vomiting, muscle aches, bloody stools, and fever (Table 1). One hundred individuals sought care from the medical staff at TCF, and no hospitalizations were reported. Ages of ill individuals ranged from 19-61 years (median = 33 years) and 165 (98.8%) were female.

Table 1: Clinical Information for Cases (n=167)

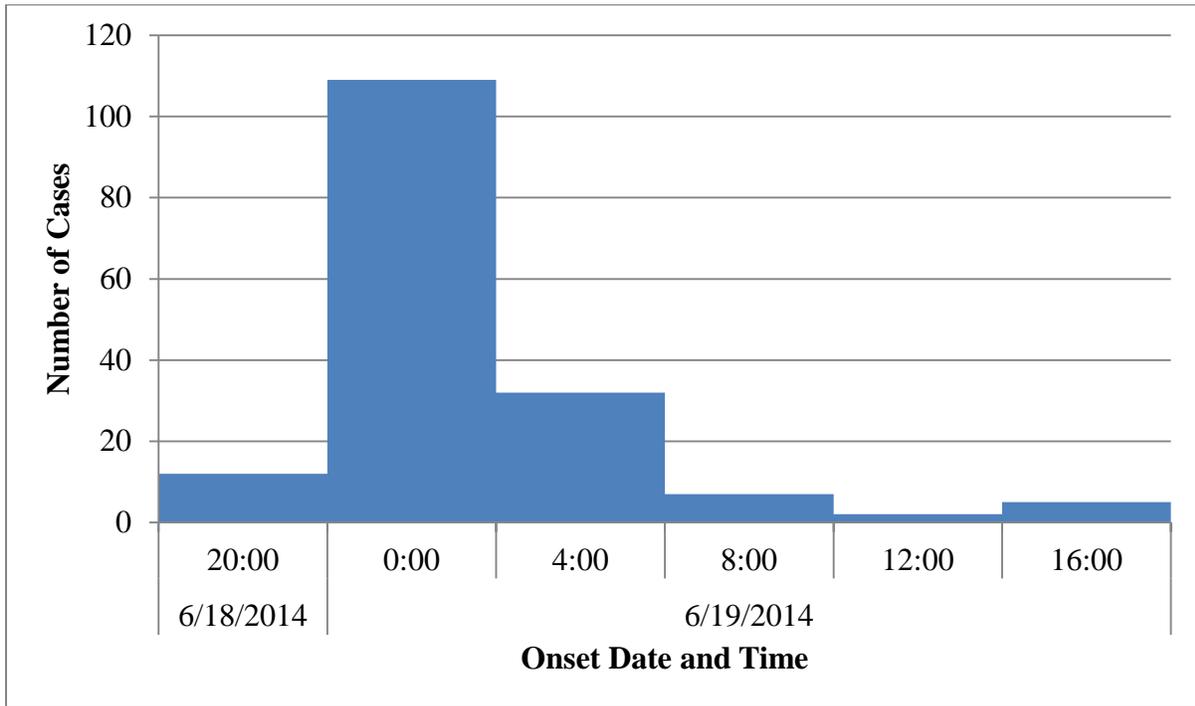
Symptom	Number with Symptom/ Total Reporting* (%)
Diarrhea	167/167 (100)
Abdominal cramps	158/165 (95.8)
Nausea	133/161 (82.6)
Headache	108/159 (67.9)
Muscle aches	88/153 (57.5)
Vomiting	31/167 (18.6)
Blood in stools	24/132 (18.2)
Fever	12/117 (10.3)

**"Total Reporting" represents the total number of persons for whom a response to the interview question was obtained.*

Onset dates and times of illness ranged from June 18 at 9:30 pm to June 19 at 7:00 pm (Figure 1). The incubation period ranged from 4.5 to 26 hours with a median of 10 hours.

Recovery date and time was reported by 106 persons, and duration of illness ranged from 3 hours to 53 hours with a median of 27 hours. Forty-nine persons reported still being ill when completing the questionnaire.

Figure 1: Onset Date and Time for Ill Residents and Staff at TCF (n=167)



Food items served for dinner on June 18 were analyzed for association with illness. Of those food items, eating rotini with meat sauce was associated with illness (Table 2). No other food items or meals were statistically associated with illness.

Table 2: Exposure Information

<i>Food Item</i>	<i>Relative Risk</i>	<i>95% Confidence Interval</i>
<i>Rotini with meat sauce</i>	<i>15.30</i>	<i>2.28 – 102.91</i>
Rotini with sauce - vegetarian	0.077	0.0052 – 1.12
Mixed vegetables	1.10	0.94 – 1.29
Cole slaw	1.05	0.89 – 1.24
Roll	1.18	0.95 – 1.45
Lemon square	0.85	0.73 – 0.98

Laboratory Analysis

The four stool specimens tested by KHEL were negative for *Salmonella*, *Shigella*, *Campylobacter*, and Shiga toxin-producing *Escherichia coli*. The four stool specimens were then sent to CDC to be tested. *S. aureus* and *B. cereus* were not isolated from the stool specimens. *C. perfringens* was isolated from all four specimens, and three stool specimens were positive for *C. perfringens* enterotoxin by PET-RPLA.

Environmental Assessment

KDA conducted an inspection of the facility's kitchen on June 24. The inspector observed five priority foundation violations and three priority violations. (A priority violation is a violation of something that directly eliminates or reduces hazards associated with food borne illness or injury. A priority foundation violation is something that supports or enables a priority violation.)

The following priority violations were cited: 1) inadequate hot holding temperatures (barbeque beef at 111°F on individual trays in hot box); 2) inadequate cold holding temperatures; and 3) no backflow prevention device.

The following priority foundation violations were cited: 1) unplugged hand dryer by hand washing sink; 2) dirty food contact surfaces; 3) cleaning and sanitizing products not labeled; 4) walk-in cooler not maintaining proper temperature (ambient air temperature 48.6 °F); and 5) cracked plastic food trays still in use.

Discussion

This outbreak of an acute onset of gastrointestinal symptoms was caused by *C. perfringens*. The rotini with meat sauce that was served for dinner on June 18 was associated with illness. During the courtesy inspection performed by KDA hot and cold holding temperature violations were observed. The outbreak was likely caused by the temperature abuse of the meat sauce that allowed *C. perfringens* to proliferate.

In addition, during this investigation, 19 individuals reported becoming ill with acute gastrointestinal illness less than four hours after or more than 26 hours after the dinner that was served on June 18. These individuals were excluded from this analysis. However, given the consistency of their symptoms with *C. perfringens* intoxication and the temperature abuse identified during the inspection, food from a previous or later meal could have also been contaminated prior to consumption.

C. perfringens is an anaerobic, gram-positive, spore forming rod. These spores have the ability to survive at high temperatures. When food products contaminated with *C. perfringens* are cooled too slowly or are reheated insufficiently, enterotoxin-producing vegetative cells can increase rapidly during the period when ambient temperatures are between 104°F and 122°F (40°C and 50°C)¹. Once the bacteria are ingested, an enterotoxin is produced in the gastrointestinal tract causing nausea, diarrhea, and acute abdominal cramps within 6-24 hours. The illness is usually self-limiting and individuals usually recover within 24 hours but less severe symptoms may persist in some individuals for 1 to 2 weeks. Poisoning with *C. perfringens* is usually associated with the temperature abuse of cooked foods¹

KDHE recommends that this facility undergoes routine food safety based inspections to help identify potential issues with equipment and food handling practices. Additionally, residents and kitchen staff should be trained in food safety to include a basic overview of food safety hazards, preparing, cooking, serving food, and proper cleaning and sanitizing. KDA does not have the regulatory authority to inspect facilities of this type², but does provide inspection services when requested and staff is available.

There were several limitations of this study. Not all inmates and staff completed a survey which led to a low response rate and could have affected the conclusions of this study. Additionally, a tray of food

¹ Brynstad S, Granum PE. Clostridium perfringens and foodborne infections. Int J Food Microbiol 2002;74:195--202.

² KSA 36-503b http://kansasstatutes.lesterama.org/Chapter_36/Article_5/36-503.html

should be set aside for every meal but no tray was set aside from the dinner served on June 18, 2014 so testing of rotini with meat sauce was not able to be conducted.

Conclusion

This outbreak of *C. perfringens* intoxication at the TCF was likely due to the temperature abuse of the meat sauce that was served with pasta for dinner on June 18, 2014. A food safety based inspection revealed malfunctioning equipment and temperature abuse of foods prepared at TCF. Three stool specimens were positive for the *C. perfringens* enterotoxin, and epidemiological evidence indicated that the rotini with meat sauce was significantly associated with illness.

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