

**Outbreak of Gastrointestinal Illness in a Juvenile Correctional Complex,
Shawnee County, May 2011**



Background

Kansas operates two juvenile correctional facilities in Topeka and one in Larned. The Kansas Juvenile Correctional Complex (KJCC) East building in Topeka houses the male residents and the KJCC West building in Topeka houses the female residents. The KJCC accepts residents from 10 to 22 ½ years of age. Food services for the KJCC facilities in Topeka are provided on contract by Aramark. The food preparation facility is located at the KJCC East building and is inspected on a quarterly basis by a third party vendor. Food prepared at this location is transported to the West building. Health services are provided by Correct Care Solutions.

On Thursday, May 26, 2011, the Bureau of Epidemiology and Public Health Informatics at the Kansas Department of Health and Environment (BEPHI-KDHE) was notified of a possible foodborne illness outbreak involving both KJCC facilities in Topeka, Kansas. Correct Care Solutions reported that 48 residents sought medical attention due to gastrointestinal symptoms on or after May 25, 2011. In response to this report, an outbreak investigation was initiated by Shawnee County Health Agency (SCHA), BEPHI-KDHE, and the Kansas Department of Agriculture (KDA) in cooperation with KJCC and the Juvenile Justice Authority (JJA) to determine the cause of illness and to implement prevention and control measures.

Methods

Epidemiologic Investigation

Staff from SCHA and BEPHI-KDHE conducted preliminary in-person interviews of ill residents and staff on May 27, 2011. In order to assess specific food exposures a cohort study was conducted to include the remaining residents and staff. Paper questionnaires were distributed to all residents and staff at the facility.

A case was defined as an individual who experienced vomiting or diarrhea at least 5 hours after eating the lunch served on May 25, 2011 at the KJCC.

Data from completed questionnaires were entered into a Microsoft® Access database and analyzed using SAS® 9.2. Relative risk (RR), chi-square (P-value), and 95% confidence intervals (CI) were calculated to assess the association between food and drink items and subsequent illness.

Laboratory Analysis

On May 26, 2011, food samples were collected from the KJCC kitchen. The kitchen holds two trays from each meal served at the facility for three days in the walk-in-cooler in order to have the food tested in the event of illnesses that are suspected to be associated with a particular meal. BEPHI-KDHE collected rice and chili macaroni from the lunch tray and rice, a chicken patty, a cookie, and baked beans from the dinner tray that was served on May 25.

The chili macaroni and rice served at lunch and dinner were sent to Midwest Laboratories Inc. to test for *Bacillus cereus* and *Clostridium perfringens* by culture.

Two stool specimens were collected and submitted to the Kansas Health and Environment Laboratories (KHEL) for testing.

Environmental Assessment

KDA conducted a courtesy inspection of the facility kitchen on June 3. A follow-up request was made by KJCC for an unannounced kitchen inspection that was conducted on July 28 by KDA.

Results

Epidemiologic Investigation

On May 26, 218 staff members were working at the facility and both the East and West buildings housed 233 residents. A total of 175 individuals were interviewed; 53 were conducted in person and 122 were self administered. Of those, 152 (89%) individuals reported illness and 115 met the case definition (six staff and 109 residents). The response rate among residents was 72.5%, while only ill staff that ate a meal prepared at KJCC on May 25 completed the questionnaire.

The most commonly reported symptoms were diarrhea, abdominal cramps, nausea, and headache. Additional symptoms included vomiting, muscle aches, bloody stools, and fever (Table 1). Forty-three (37.2%) residents sought care from the medical staff at KJCC, and no hospitalizations were reported. Ages of case-patients ranged from 14 - 64 years (median = 17 years) and 105 (91.3%) were male.

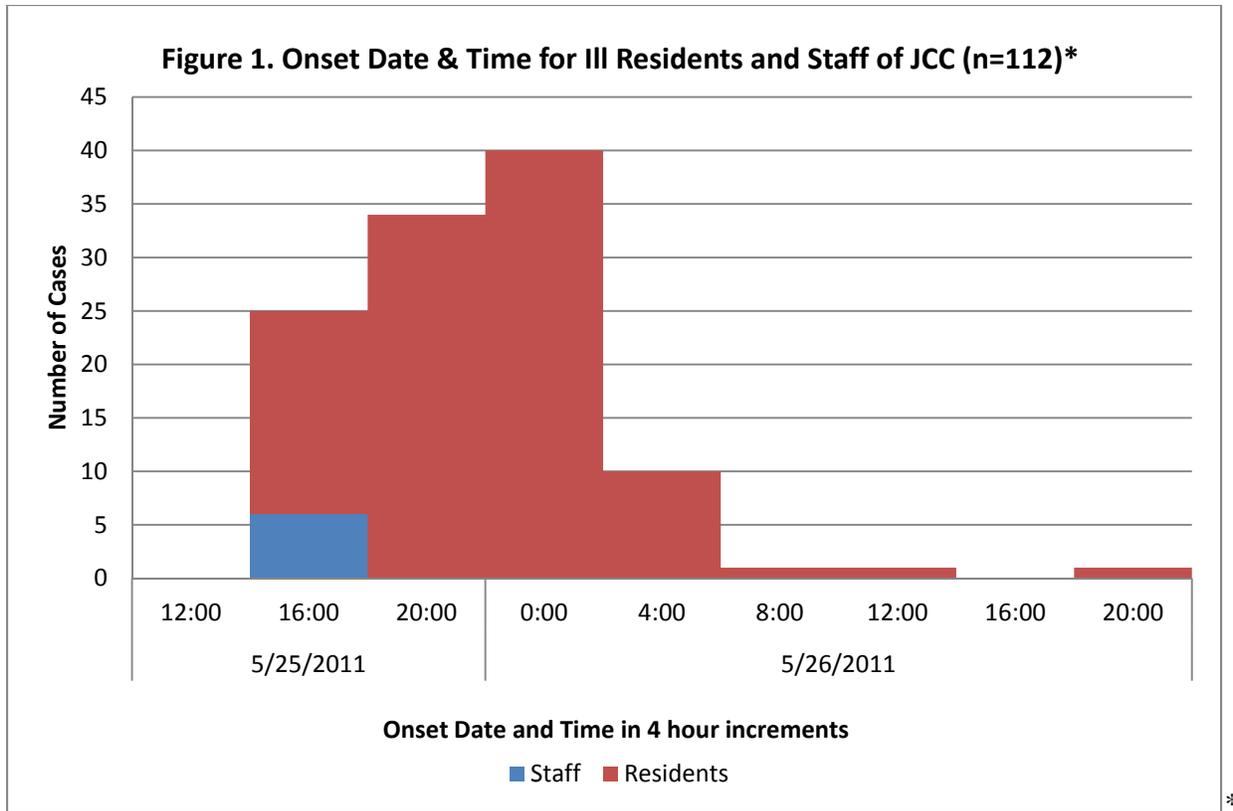
Table 1: Clinical Information of Cases

Symptoms	Number with Symptoms/ Total Reporting* (%)	
Diarrhea	115/115	(100)
Abdominal cramps	86/106	(81.1)
Nausea	62/104	(59.6)
Headache	51/104	(49.0)
Vomiting	35/104	(33.7)
Muscle aches	34/101	(33.7)
Blood stools	6/100	(6.0)
Fever	6/100	(6.0)

*"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 May 25 at 5:00 pm to May 26 at 11:50 pm (Figure 1). The incubation period ranged from 5 to 35.8 hours with a median of 11.5 hours.

Recovery date and time was reported by 85 individuals, and duration of illness ranged from 3 hours to 144 hours with a median of 20.5 hours. Ten individuals reported still being ill at the time of the interview. Twenty individuals reported that they were no longer ill, but did not record a date and/or time that they had recovered.



Food items served for lunch and dinner on May 25 were analyzed for association with illness. Of those food items, eating the chili macaroni that was served for lunch was associated with illness (relative risk [RR] = 3.64, 95% confidence interval [CI] = 1.10-12.11, P- value < 0.0001) (Table 2).

Table 2: Exposure Information

<i>Food Item</i>	<i>Relative Risk</i>	<i>95% Confidence Interval</i>
<i>Chili Macaroni</i>	<i>3.64</i>	<i>1.10 – 12.11</i>
Rice	1.23	0.88 – 1.73
Green Beans	1.14	0.95 – 1.37
Corn Bread	1.53	0.95 – 2.49
Pineapple	1.14	0.89 – 1.44
Milk	2.68	0.86 – 8.33

Laboratory Analysis

Both the rice that was served for lunch and the chili macaroni yielded positive culture results for *C. perfringens* (20 and 140 cfu/g respectively).

The two stool specimens tested by KHEL were negative for *Salmonella*, *Shigella*, *Campylobacter* and Shiga toxin *Escherichia coli*. These specimens were not cultured for *B. cereus* or *C. perfringens* nor were they tested for any bacterial toxins.

Environmental Assessment

KDA conducted an inspection of the facility's kitchen on June 3. Seven critical violations were observed: 1) inadequate hot water sanitation; 2) dirty food contact surfaces; 3) inadequate hot holding temperatures; 4) inadequate cold holding temperatures; 5) items in the walk in cooler were not properly dated; 6) toxic substances were not properly stored; and 7) the reach-in cooler ambient air temperature was 53°F. One noncritical violation was observed; no hand towels were available at two sinks. The following foods were found out of temperature either due to improper cold holding or hot holding temperatures: grilled cheese at 128°F and 129°F and milk at 48°F, 46°F, and 47°F. All violations were corrected on site.

KDA conducted an unannounced inspection of the facility's kitchen on July 28. Eleven critical violations were observed: 1) six or more critical violations present at the time of inspection; 2) seven cans had sharp dents along the top and side seams and the condition of the food inside could have been adulterated; 3) inadequate chemical sanitization; 4) dirty food contact surfaces; 5) inadequate sanitation of dishes and equipment; 6) improper cooling of potentially hazardous foods within 2 hours; 7) improper cooling of potentially hazardous foods within 6 hours; 8) inadequate hot holding temperatures; 9) inadequate cold holding temperatures; 10) items not properly dated; and 11) improper cooling methods used for potentially hazardous foods. One noncritical violation was observed: missing hand towels at the hand sink by the 3-vat sink. The following foods were found out of temperature either due to improper cooling, inadequate hot holding or cold holding temperatures: Salisbury steak at 96°F; baked potatoes at 132°F; gravy at 101°F, 106°F, and 100°F; rice at 46°F; bologna sandwiches at 59°F, 61°F and 62°F. The out of temperature foods were reheated, cooled or discarded. All other violations were corrected on site.

Discussion

This outbreak of an acute onset of gastrointestinal symptoms was likely caused by *C. perfringens*. The chili macaroni that was served for lunch on May 25 was significantly associated with illness. A sample of the chili macaroni and rice was collected and subsequently tested positive for *C. perfringens*; however, the culture yielded a much lower concentration than thought to cause illness¹. The food items collected for the trays that are required to be saved could have been refrigerated prior to the meal service. This could account for the low numbers of *C. perfringens* detected in the chili macaroni and rice that was collected from the food that was saved. If this was the case, the remaining chili macaroni and rice that remained on the serving line could have been subjected to temperature abuse.

During both of the courtesy inspections performed by KDA, hot and cold holding temperature violations as well as cooling procedure violations were observed. These violations could have led to the potential temperature abuse of the chili macaroni and allowed *C. perfringens* to proliferate causing the illness that was reported in this facility.

At the time of this outbreak, Aramark provided staff for the food service operation at the facility but also utilized residents in the food preparation process. KJCC also contracted with a third-party company to perform their quarterly food service inspections. These inspections focused on menu variety, dietary requirements, and food safety. This company does utilize portions of the 2005 Kansas Food Code. However, inspections are performed by dietitians and may not be performed to the same standards as inspections conducted by KDA food inspectors.

¹ Bad Bug Book: Introduction Foodborne Pathogenic Microorganisms and Natural Toxins Handbook. <http://www.fda.gov/Food/FoodSafety/FoodborneIllness/FoodborneIllnessFoodbornePathogensNaturalToxins/BadBugBook/default.htm>.

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 range between 104°F and 122°F (40°C and 50°C)². 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

During the initial report of the outbreak, the medical staff from the facility reported that another outbreak of a diarrheal illness had occurred on April 3, 2011, affecting 67 residents. This previous incident was not reported to the local health department or KDHE, as required by law. In addition, during the current outbreak investigation, sixteen individuals reported becoming ill within three hours of the lunch that was served on May 25. Although there have been a few outbreaks in the literature reporting shorter incubation periods than three hours, physiologically this is not likely. Therefore, those individuals with incubation periods within three hours were excluded from this analysis. However, given the consistency of their symptoms with *C. perfringens* intoxication and the repeated temperature abuse problems identified during both inspections it is possible that food from a previous meal could have been contaminated prior to consumption.

Given the temperature abuse of foods served at the facility that was identified during the two courtesy inspections, the 16 individuals reporting illness within a few hours of the implicated meal, and a similar outbreak affecting 67 residents that occurred in April 2011, it is likely that repeated temperature abuse issues with foods served to the residents and staff was a major cause of this outbreak. It was recommended that this facility undergo 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 type³, but does provide inspection services when requested and staff is available.

There were several limitations of this study. Food items served for dinner on May 25 were different than what was reported by the facility and on the questionnaire; therefore, association with illness could not be assessed. Information was collected by both self-administered questionnaires and in person interviews utilizing the same form. A simpler form should have been used for the questionnaires that were filled out by the residents in order to ensure complete understanding as to the questions that were asked. Currently, KHEL is unable to culture for *C. perfringens* or identify the bacterial toxin in clinical specimens. Therefore, the two stool specimens that were collected were unable to be tested, so the verification of the etiologic agent of this outbreak could not occur.

Conclusion

This outbreak of gastrointestinal illness at KJCC was likely due to the temperature abuse of the chili macaroni served for lunch on May 25, 2011. Food safety based inspections revealed malfunctioning equipment and temperature abuse of food items prepared at KJCC. Sample analysis detected *C. perfringens* in two food items, and epidemiological evidence indicated that the chili macaroni was significantly associated with illness.

² Brynstad S, Granum PE. Clostridium perfringens and foodborne infections. Int J Food Microbiol 2002;74:195--202.

³ KSA 36-503b http://kansasstatutes.lesterama.org/Chapter_36/Article_5/36-503.html

Report author: Jamie DeMent and Sheri Anderson (Kansas Department of Health and Environment, Bureau of Epidemiology and Public Health Informatics)

Investigated by:

Shawnee County Health Agency

1615 SW 8th Ave
Topeka, KS 66606
<http://shawneehealth.org/ha/>

**Kansas Department of Agriculture
Food Safety and Lodging**

109 SW 9th Ave
Topeka, KS 66612
<http://www.ksda.gov/>

**Kansas Department of Health & Environment
Bureau of Epidemiology and Public Health Informatics**

1000 SW Jackson St., Suite 210
Topeka, KS 66612
Epidemiology Hotline: (877) 427-7317
epihotline@kdheks.gov
<http://www.kdheks.gov/epi>

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