Shiga Toxin-Producing *Escherichia coli* O157 Outbreak in South Central Kansas — May 2014

Kansas
Department of Health and Environment
Division of Public Health

Background

On May 13, 2014, the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) was notified by a county health department of two children with illness caused by Shiga toxin-producing *Escherichia coli* (STEC) who reported attending a house party on May 5, 2014. The individuals' exposure was identified during routine disease investigations by the county health department. Additional ill individuals were reported among the party attendees; ill persons resided in two Kansas counties. KDHE notified the second county health department, and an outbreak investigation was initiated to determine the cause and scope of illness and to implement appropriate prevention and control measures.

Methods

Epidemiologic Investigation

The families of all ill individuals were interviewed in person by KDHE and investigators from the two county health departments. A special standardized questionnaire was utilized in order to obtain demographic information, clinical information, and exposure history.

For this investigation, a confirmed case was defined as laboratory evidence of STEC serotype O157 with a pulsed-field gel electrophoresis (PFGE) pattern indistinguishable from the other confirmed cases. A probable case was defined as diarrhea in an individual who was epidemiologically linked to a person with a confirmed case. A person with a primary case attended the house party on May 5, 2014; persons with secondary cases became symptomatic with diarrhea one to ten days after having contact with an ill person.

Laboratory Analysis

Initial testing on stool specimens was performed at hospital and reference laboratories; results on all specimens were confirmed by culture at the Kansas Health and Environmental Laboratories (KHEL). Toxin testing, serotyping and Pulsed-field gel electrophoresis (PFGE) were performed at KHEL on the bacterial isolates to determine the PFGE pattern of the outbreak strain of STEC O157.

Environmental Assessment

Stool samples were collected from the calf that was present at the house party and were tested for STEC O157 by the United States Department of Agriculture's Agricultural Research Service in Lincoln, Nebraska.

Results

Epidemiologic Investigation

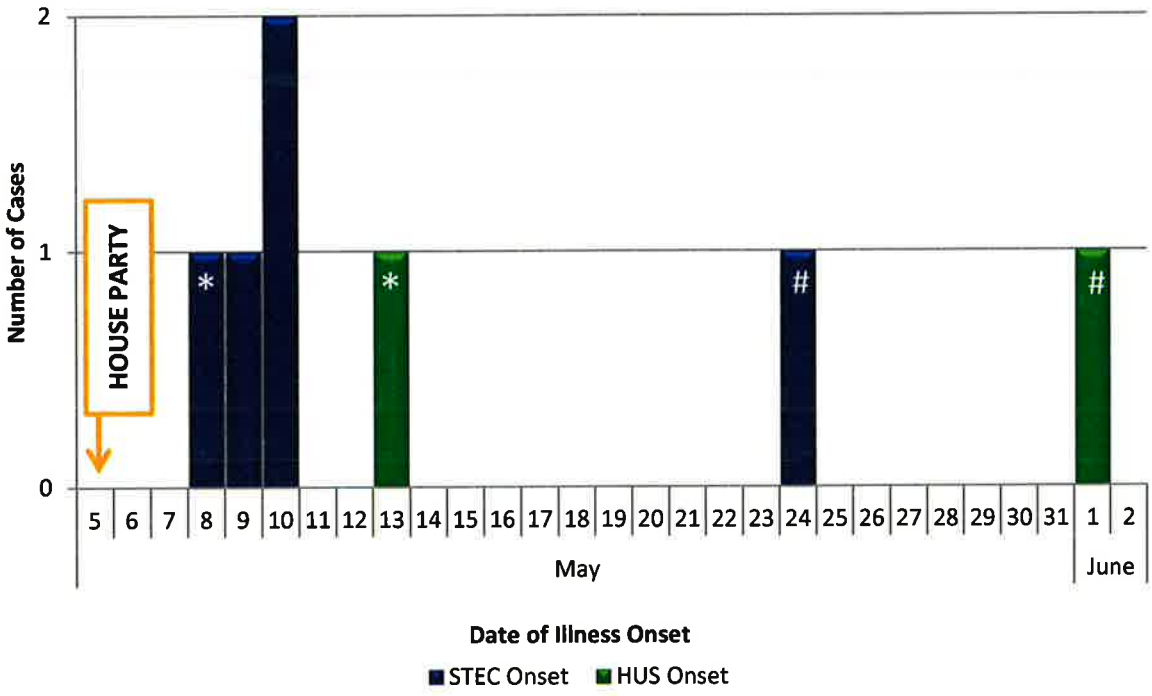
Multiple families with children attended the house party; no other common exposures were identified among primary cases during the exposure period. Four children who were present at the house party tested positive for STEC O157 and had confirmed primary cases; one child who did not attend the house party but later had contact with a confirmed case tested positive for STEC O157 and had a confirmed secondary case. Two (40%) of the ill persons were female and three (60%) were male. Individuals with confirmed STEC infection ranged in age from 2 to 3 years (median: 2 years).

The most common symptom was diarrhea, which was experienced by all (100%) confirmed cases [Table 1]. Bloody stool and vomiting were also reported. Three (60%) children were hospitalized, and two (40%) developed hemolytic uremic syndrome (HUS). The incubation period for primary confirmed cases ranged from three days to five days (median: 4.5 days) [Figure 1]. Four probable secondary cases were identified during case-patient interviews.

Table 1: Symptoms reported among confirmed cases (n=5)

Clinical Information	# of Confirmed Cases	% of Confirmed Cases
Diarrhea	5	100%
Bloody Stool	4	80%
Vomiting	3	60%
Fever	1	20%
Hemolytic Uremic Syndrome (HUS)	2	40%

Figure 1: Number of confirmed cases by illness onset date (n=5)



*HUS illness onset was 5/13/2014 for the case with STEC illness onset 5/8/2014

#HUS illness onset was 6/1/2014 for the case with STEC illness onset 5/24/2014

Laboratory Analysis

Stool specimens were submitted by five individuals. All tested positive for Shiga toxin-producing *Escherichia coli* serotype O157 and Shiga toxin type 2. The five STEC O157 isolates from each of the ill children were indistinguishable by PFGE.

Environmental Assessment

No STEC O157 was isolated from the calf fecal samples.

Conclusions

Four confirmed primary cases of STEC O157 were associated with attendance at a house party held on May 5, 2014 in south central Kansas. One confirmed and four probable secondary cases were identified among contacts of primary cases. Three children were hospitalized, and two developed hemolytic uremic syndrome (HUS).

Multiple families with children, including all individuals who had primary cases, attended the house party. Many of the children present were less than 5 years old. Reported activities at the event included playing with baby chicks, bottle feeding a calf that was being kept in a pen in the yard during the house party, and playing in a small "kiddie" pool that was purchased and filled the day of the event. Attendees ate a picnic lunch; each individual ate food that was brought to the party by his or her own family. Parents of the ill children reported that not all of them had direct contact with the calf. However, attendees did report that there was calf manure in the yard where the children were playing, outside of the pen where the calf was held for the duration of the party. The four primary cases all reported playing in the "kiddie" pool and getting splashed in the face and mouth.

Contact with calves or their feces is a known risk factor for STEC infection[1,2,3]. In this outbreak, the four primary cases were among the children at the house party with exposure to water in the pool. The ill children did not all report having direct contact with the calf, did not eat the same foods at the party, and had no other commonalities during their exposure period. Therefore, the investigators hypothesize that accidental ingestion of water that was contaminated with calf feces could have caused this outbreak. STEC infection can cause severe illness including diarrhea that is often bloody, vomiting, and stomach cramps[4]. The toxin produced by this particular strain of STEC O157, toxin 2, is more likely to lead to hemolytic uremic syndrome (HUS) than are strains of STEC that produce only toxin 1; this could account for the severity of illness experienced by affected individuals in this outbreak[5].

The investigation was limited by several factors. Not all party attendees were interviewed; individuals who were less severely ill may not have been reported or sought medical care. Also, separate interviews were not conducted for all reported secondary outbreak cases of STEC as they were known contacts or family members of primary cases. Therefore, additional cases may exist. The environmental investigation was limited by the difficulty in isolating STEC O157 from bovine fecal samples and due to intermittent shedding of STEC in feces[6]. The calf was moved to pasture shortly after the house party and investigators were not able to obtain additional environmental samples.

This epidemiological investigation was aided by quick response of and cooperation between the county health departments and KDHE, which allowed for timely initiation of the outbreak investigation. The use of in-person interviews allowed for a good response rate among families of ill individuals and improved quality of information collected by investigators. Families of ill children were provided illness prevention education and recommendations to prevent future transmission of STEC in person-to-person and animal contact settings.

Discussion

STEC was first identified as a pathogen in 1982, and is a type of bacteria that causes disease by producing a toxin; one serotype of STEC is O157[7]. STEC O157 accounts for approximately 36% of the 265,000 STEC infections annually in the United States, and most of the identified STEC outbreaks in the United States have been caused by STEC O157. About 20% of reported STEC cases are associated with a recognized outbreak[8]. Infection with STEC O157 can cause serious illness characterized by severe and often bloody diarrhea. Vomiting may also be present; fever occurs less often. Symptoms occur one to ten days (usually three to five days) after exposure; duration of illness is usually about one week[9].

Hemolytic uremic syndrome (HUS) is a complication of STEC infection that occurs when the toxin produced by the bacteria causes damage to the red blood cells leading to kidney injury[10]. HUS develops in about 5% of sporadic STEC cases, but in up to 20% of infections with outbreak strains of STEC[11]. If HUS develops, symptoms usually begin about one week following the onset of illness, often when diarrheal symptoms are beginning to resolve. HUS is characterized by acute onset of anemia (destruction of red blood cells) and renal injury or failure. Symptoms include low or no urine output, fatigue, unexplained bruising, and decreased consciousness. Young children who become infected with STEC are most at risk for developing HUS[12]. Many patients with HUS require blood transfusions (about 70% of cases) or dialysis (50%); up to a quarter have neurological symptoms including stroke, seizure, or coma[13]. Kidney function

returns in up to 70% of HUS cases, but some individuals can experience permanent kidney failure. HUS is fatal in about 5% of cases[14].

STEC is spread through fecal-oral transmission[15]. STEC lives in the intestines of cattle and other animals including deer, goats, and horses. Animals can carry the bacteria and shed it in their feces without being ill. People become exposed to STEC by having contact with infected animals or their feces, ingesting contaminated food or beverages, or coming into contact with fecal matter from other people who are infected[16,17,18]. People who have experienced illness caused by STEC, especially children less than five years of age, can shed the bacteria in their feces for several weeks following the resolution of symptoms[19]. High risk exposures include contact with cattle, changing diapers of an infected child, and consuming unpasteurized (raw) milk, cheese, or apple cider[20]. Outbreaks of STEC have been caused by a variety of exposures[21].

Following these guidelines can help to prevent STEC infections:

- WASH YOUR HANDS thoroughly after using the bathroom or changing diapers and before preparing or eating food.
- WASH YOUR HANDS after contact with animals or their environments (at farms, petting zoos, fairs, your own backyard).
- COOK meats thoroughly. Ground beef and meat that has been needle-tenderized should be cooked to a temperature of at least 160°F/70°C. It's best to use a thermometer, as color is not a very reliable indicator of "doneness."
- AVOID raw milk, unpasteurized dairy products, and unpasteurized juices (like fresh apple cider).
- AVOID swallowing water when swimming or playing in lakes, ponds, streams, swimming pools, and backyard "kiddie" pools.
- PREVENT cross contamination in food preparation areas by thoroughly washing hands, counters, cutting boards, and utensils after they touch raw meat[22].

Reported by:

Lindsey Martin Webb, MPH
Sheri Tubach, MPH, MS
Kansas Department of Health and Environment
6 November 2014

Investigated by:

County Health Departments

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

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Investigation of a Gastroenteritis Outbreak — Johnson County, May 2014

Kansas
Department of Health and Environment
Division of Health

Background

On May 19, 2014, at 12:18 p.m., the Kansas Department of Agriculture (KDA) notified the Kansas Department of Health and Environment's Bureau of Epidemiology and Public Health Informatics (KDHE) of a foodborne illness complaint. The complainant stated that he and two others became ill with gastrointestinal symptoms after eating at a Johnson County restaurant. The three individuals were part of a party of fifteen who had eaten at the restaurant the evening of May 12, 2014. KDHE notified the Johnson County Health Department (JCHD) at 1:00 p.m. and began the outbreak investigation within one hour by interviewing the out-of-state complainant, who provided contact information for one additional affected individual. In response to this report, an outbreak investigation was also initiated by staff from KDA.

Methods

Suspect cases were interviewed by telephone. A case was defined as vomiting in an individual within 8 hours of eating food purchased at the restaurant the evening of May 12, 2014.

The inspection of the restaurant was conducted on May 21, 2014, at 9:50 a.m. by KDA. A food sample was collected and tested at a private laboratory.

Results

Two suspect cases were identified and interviewed; a third individual was not able to be interviewed. The two individuals were from New Jersey and Minnesota, and both met the case definition. Both cases were male.

Both individuals reported vomiting with nausea, and one also reported experiencing diarrhea with abdominal cramps. The median incubation period was 4 hours from the time of meal (range, 3 to 5 hours). The duration of illness ranged from 8 to 32 hours.

Neither individual sought care from a healthcare provider. No stool specimens were collected.

At the restaurant, both individuals consumed fried chicken with gravy. No other common foods were consumed.

Additional commonalities other than the restaurant were reported by the two individuals. Prior to the evening meal, both had spent the afternoon in meetings with others that were in the dinner party. Prior to the meeting, both individuals ate salad lunches and cookies. An interview with a chief executive officer of the company hosting the meeting did not reveal information on additional illnesses or the source of the salads and cookies.

The restaurant inspection by KDA revealed four priority violations: improper cooling of large batches of gravy and hot sauce after preparation; improper cold holding of cooked turkey on the salad make table; failure to wash hands after handling dirty utensils prior to touching clean utensils; and use of cutting boards with pits and chips on the food contact surfaces. All violations were corrected during the inspection. The gravy and hot sauce that had been prepared the previous day and stored in the walk-in cooler were nearly 10 degrees above the required proper 41°F temperature and were discarded after samples were collected for testing. A follow-up inspection occurred on June 2, 2014 and revealed that the restaurant had successfully implemented the use of cooling logs and had been using them properly.

A sample of gravy collected on May 20th was shipped to a private laboratory. The sample was negative for staphylococcal enterotoxin via visual assay on May 27th.

Conclusions

Two individuals with gastroenteritis were associated with consuming food purchased at a Johnson County restaurant on May 12, 2014. Although no clinical specimens were collected, the clinical data reported among cases was consistent with staphylococcal food intoxication, but no definitive diagnosis was obtained for the two persons.

Intoxication by *Staphylococcus aureus* is characterized by an abrupt onset of vomiting or diarrhea, with symptoms occurring within one to eight hours after ingestion of the toxin contaminated food. The incubation period and severity of symptoms depends on the amount of toxin consumed as well as an individual's susceptibility to the toxin[1]. Staphylococcal food intoxication is the most common type of food intoxication. *S. aureus* contamination can occur when someone handles food with bare hands, especially after touching the face or mouth, or has an exposed sore on the hands or arms. Staphylococci may be present in the nasal passages, colonized with *S. aureus* at any given time[2].

In order for staphylococcal food poisoning to occur, the following criteria must be present: (1) a food must be contaminated with enterotoxin-producing S. aureus; (2) the food must have the necessary requirements for bacterial growth; (3) adequate time and temperature must be

present for the bacteria to multiply and produce enterotoxin; and (4) a sufficient amount of enterotoxin must be consumed[3]. Staphylococci thrive in protein-rich foods with high-salt content and grow in the temperature range of 45°F and 118°F. Heat -resistant enterotoxins are produced between the temperature range of 68°F and 99°F4[4].

The inspection of the restaurant did identify temperature abuse of a suspected food item that would have allowed adequate time and temperature for bacteria to multiply and produce enterotoxin, but no enterotoxin was detected in the food samples collected. Neither the etiology of the outbreak nor the vehicle of transmission could be conclusively determined.

The strength of this investigation was the identification and elimination of a harmful practice that may cause foodborne illness. The follow-up inspection was appropriately scheduled to ensure that the priority violations had been corrected including the establishment of proper cooling procedures.

The investigation could have been improved by identification of other ill individuals and the reporting of the incident in a timelier manner to allow the potential collection of stool specimens and food items served the night of May 12th. Interviewed individuals were provided with information on contacting KDHE to share with any other ill individuals but no additional calls were received.

Report by: M. Ella Vajnar (Kansas Department of Health and Environment)
On: June 5, 2014

Investigation by:

Kansas Department of Health & Environment
Bureau of Epidemiology and Public Health Informatics
1000 SW Jackson St., Suite 210
Topeka, KS 66612
http://www.kdheks.gov/

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/

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Outbreak of Gastroenteritis Associated with Tabor College — Marion County, March 2014

Kansas
Department of Health and Environment
Division of Public Health

Background

On March 28, 2014 at 1:45 pm, the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) was notified of gastroenteritis outbreak at Tabor College in Marion County. The report indicated that over 80 people had become ill. KDHE notified the Marion County Health Department (MCHD), and an outbreak investigation was initiated that day at 3:30 pm to determine the cause and scope of illness and to implement appropriate prevention and control measures.

Methods

Epidemiologic Investigation

An online questionnaire was developed to obtain demographic information, symptoms, and food history among individuals affiliated with the college as well as those in the surrounding community. A link to the survey web page was distributed to Tabor College students and staff via e-mail. Individuals in the community who contacted MCHD regarding gastrointestinal illness were also invited to participate in the survey. Questionnaire administration began on April 2, 2014 and was completed on April 15, 2014. A case-control study was conducted to determine statistical associations with illness. An outbreak case was defined as diarrhea or vomiting experienced any time between 10:00 pm on March 24, 2014 and 10:00 am on April 1, 2014 in a person completing the questionnaire. Two controls per case were chosen from those persons who reported no illness. Statistical analysis was conducted using SAS® 9.2.

Laboratory Analysis

One stool specimen was submitted for testing at the Kansas Health and Environmental Laboratories (KHEL).

Environmental Assessment

The Kansas Department of Agriculture (KDA) conducted a routine inspection of the college's cafeteria on March 24, 2014, and another inspection on April 3, 2014 in response to the outbreak.

Results

Epidemiologic Investigation

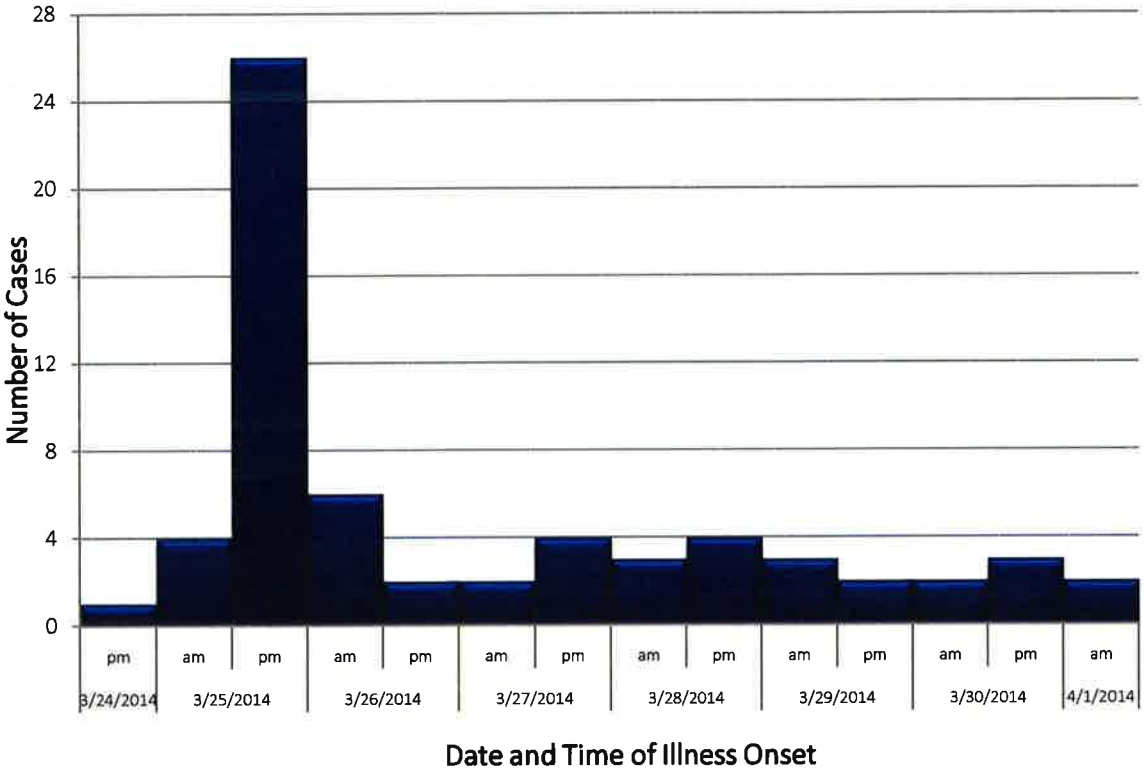
Survey Analysis and Case Finding

The survey was completed by 223 persons. Sixty-one percent of survey respondents were students at Tabor College, 37.2% were affiliated with the school but were not students (faculty, staff, or other), and 1.8% of respondents reported no affiliation with Tabor College. Illness was reported by 74 (33.8%) survey respondents; of those 64 persons met the outbreak case definition. Nausea and vomiting were the most common symptoms reported (Table 1). Most persons who became ill (46.8%) experienced an onset of symptoms on the afternoon of March 25, 2014 (Figure 1). For those whose symptoms had resolved at the time of questionnaire completion, duration of illness ranged from three to 154 hours (median 37 hours).

Table 1: Symptoms reported among outbreak cases (n=64)

	Number reporting symptom	Total reporting	Percent
Nausea	61	63	96.8
Vomiting	57	62	91.9
Abdominal Pain	52	61	85.2
Diarrhea	51	61	83.6
Chills	46	61	75.4
Muscle Aches	45	62	72.6
Fever	34	60	56.7
Bloody stool	1	55	1.8

Figure 1: Number of cases by illness onset date and time (n=64)



Case-Control Study

Two controls per case were randomly selected for statistical analysis from those individuals who reported experiencing no illness. Demographic characteristics of the study population are in Table 2.

Table 2: Characteristics of the study population

	Cases (n=64)	Controls (n=128)	Total (n=192)
Sex			
Female	42 (66%)	77 (60%)	119 (62%)
Male	21 (33%)	48 (38%)	69 (36%)
Age in years			
Age range	18 – 90	8 – 72	8 – 90
Median age	22	22	22

Eating any meal at the Tabor College cafeteria during the surveyed time period was significantly associated with illness (odds ratio = 2.6; 95% Confidence Interval = 1.076-6.293; p = 0.029). Individual analysis results for selected meals are shown in Table 3; cases were included in the analysis for each meal that was served during their incubation period (12 to 48 hours prior to onset of illness). All meals served on March 24, 2014 were significantly associated with illness.

Table 3: Individual meal analysis, 3/23/2014 – 3/24/2014

Date	Meal	Odds Ratio	95% Confidence Interval	Fisher's p-value
3/23/2014	Breakfast	10.33	0.87 – 122.47	0.1447
	Lunch	1.22	0.13 – 11.07	1.0000
	Dinner	1.79	0.69 – 4.6	0.2939
3/24/2014	Breakfast	4.84	2.22 – 10.58	<0.0001
	Lunch	5.83	2.13 – 15.91	<0.0001
	Dinner	3.32	1.5 – 7.33	0.0025

Laboratory Analysis

The stool specimen submitted to the Kansas Health and Environmental Laboratories (KHEL) tested positive by polymerase chain reaction (PCR) for norovirus genogroup II.

Environmental Assessment

The March 24, 2014 routine inspection of the cafeteria revealed three priority violations and three priority foundation violations. The priority violations included a missing plumbing backflow device and food stored in a non-food-grade container. The priority foundation violations included food-contact surfaces not being clean to sight and touch, containers with toxic materials such as soap and bleach not being appropriately labeled, and no dispensing utensils available at some self-service food bars. Additional failures noted during the inspection included make tables without thermometers, food and beverage containers improperly stored on the floor, wet wiping cloths stored without sanitizer, improper storage of clean dishes and food scoops, incorrect dispensing tube on the bulk milk dispenser, dust on non-food-contact surfaces, and improperly cleaned and supplied restrooms.

The April 3, 2014 inspection of the cafeteria revealed two priority violations and one priority foundation violation. The priority violations included food being held for serving past the date by which it should have been discarded, and an improperly installed plumbing backflow device. The priority foundation violation pertained to a lack of paper towels or other hand drying devices at a handwashing sink. These violations were corrected while the inspector was on-site.

Discussion

An outbreak of suspected norovirus affected 64 persons and was associated with eating in the Tabor College cafeteria. One clinical specimen was available for laboratory testing and tested positive for norovirus; although one positive result is insufficient to confirm norovirus as the etiologic cause of the outbreak, the clinical data is consistent with an outbreak of norovirus.

Norovirus is a highly contagious pathogen with a very low infectious dose, estimated to be between 10-100 viral particles[i]. Transmitted primarily through the fecal-oral route, norovirus particles may be spread through direct contact or through consuming fecally-contaminated food or water. Spread via aerosolized vomitus is also possible. Multiple routes of transmission can occur within a single outbreak. Person-to-person transmission in community settings, which peaks during winter months, can lead to foodborne illness outbreaks when a food handler becomes infected[ii].

Infected persons can shed norovirus particles prior to the onset of symptoms, and shedding can persist for weeks after clinical symptoms have ceased. Norovirus has been detected in fecal specimens 3 to 14 hours before the onset of clinical symptoms and for 13 to 56 days after

exposure to the virus[iii]. Approximately 20% of norovirus-infected individuals do not have clinical symptoms[iv]. However, these individuals can still shed norovirus and can be potential sources of contamination. Simple prevention measures, including thorough handwashing after using the bathroom and before handling food items and excluding individuals with gastrointestinal illness from food handling can substantially reduce transmission of norovirus[v].

The majority of cases in this outbreak experienced illness onset on the evening of March 25, suggesting a point-source outbreak that may have resulted from a contamination event on March 24. Violations noted during the routine inspection on March 24, including improper storage of utensils, the lack of scoops in self-service areas, and wet wiping cloths without measurable sanitizer, could have contributed to environmental contamination by ill or recently ill persons. Because most students reported eating most meals in the cafeteria, and because of the variable incubation period for norovirus, it was not possible to determine whether a single meal or a range of meals led to the outbreak; however, contamination was likely present in the cafeteria for multiple meals.

The person who tested positive for norovirus did not complete the survey, so that individual's association with Tabor College is unknown. However, this positive laboratory result for norovirus combined with anecdotal evidence of gastrointestinal illness circulating locally at the time supports the hypothesis that person-to-person spread of norovirus was occurring in the community and may have led to the point-source outbreak at the college.

The epidemiological investigation was limited by several factors. Only one clinical specimen was obtained from an ill person for laboratory testing. Inaccuracies may exist in interviewees' food and symptom histories due to recall bias. Additionally, while the survey was open to individuals not affiliated with Tabor College, the survey was not widely publicized, leading to a low participation rate among community members.

This investigation was aided by the quick response of and cooperation between MCHD and KDHE which allowed for timely initiation of the outbreak investigation. The use of an online questionnaire minimized the staff time required for the investigation, and the cooperation of Tabor College officials in allowing the distribution of the survey link to all students, faculty, and staff, allowed for a high number of responses from persons affiliated with the college.

Reported by:

Lindsey Martin Webb, MPH
Kansas Department of Health and Environment
5 November 2014

Investigated by:

Marion County Health Department
230 E Main Street
Marion, Kansas 66861
http://www.marioncoks.net/Departments/HealthDepartment/tabid/6043/Default.aspx

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

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Outbreak of Gastrointestinal Illness Associated with Buffalo Bob's Smokehouse — Douglas County, March 2014

Kansas Department of Health and Environment

Background

On March 31, 2014 at 2:52 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 six out of seven individuals from four different households became ill with gastrointestinal symptoms after eating at Buffalo Bob's Smokehouse (719 Massachusetts, Lawrence, KS 66047) on March 29, 2014. KDHE notified the Lawrence-Douglas County Health Department (LDCHD), and an outbreak investigation was initiated at 3:15 pm to determine the cause and scope of illness and to determine appropriate prevention and control measures. The response expanded into a multi-county effort as complainants resided in Douglas, Shawnee, and Coffey counties.

Methods

Epidemiologic Investigation

LDCHD interviewed seven of eight individuals to obtain demographic information, symptom history, and food history. 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 restaurant on March 29, 2014.

Laboratory Analysis

Two stool specimens were collected from two complainants who resided in different households, and were submitted for testing to the Kansas Health and Environmental Laboratories (KHEL). One was collected on 4/1/2014; a second was collected on 4/2/2014.

Food samples were collected by the KDA food inspector at the restaurant on April 1, 2014, and leftover food saved by two cases was collected by Shawnee County Health Agency (SCHA) and LDCHD. On April 17, 2014, samples were shipped to a private laboratory for *Clostridium spp.* testing via bacterial culture.

Environmental Assessment

KDA conducted an inspection of Buffalo Bob's Smokehouse on April 1, 2014 in response to the foodborne illness complaint. Previously, a routine inspection had occurred on February 17, 2014 which had automatically resulted in a follow-up inspection on March 19, 2014.

Results

Epidemiologic Investigation

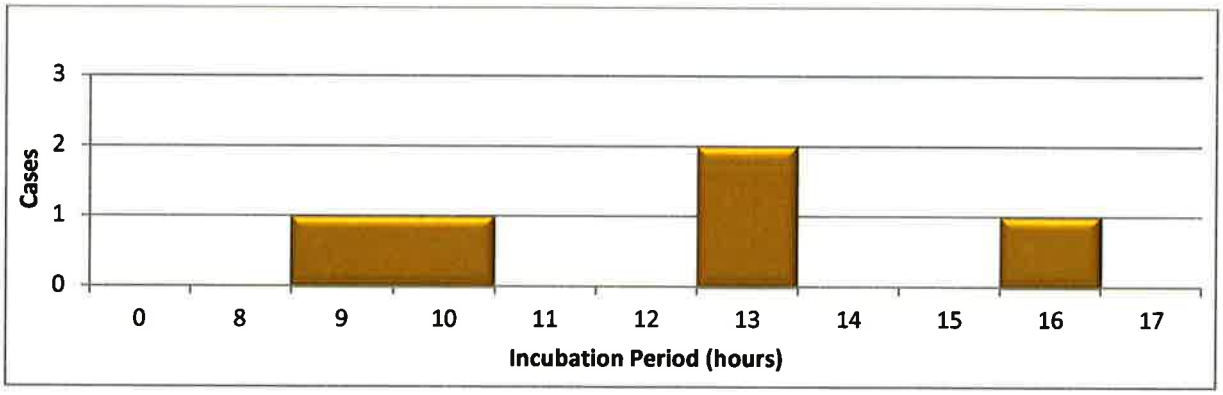
Eight people dined at the restaurant on March 29th; seven (88%) were interviewed by phone. Five (72%) respondents were ill and all met the case definition. Three (60%) of the cases were male. The most common symptoms were diarrhea and abdominal cramping, which was experienced by all cases [Table 1]. Nausea was reported in two cases (40%). No physician visits or hospitalizations were reported.

Table 1: Symptoms reported among cases (n=5)

Symptom	*# of Cases*	*% of Cases*
Diarrhea	5	100%
Abdominal Cramping	5	100%
Nausea	2	40%

The incubation period ranged from 9.5 hours to 16.3 hours (median: 12.5 hours) [Figure 1]. Duration of illness ranged from 19 hours to 28 hours (median: 24 hours); four of five individuals had recovered at time of interview.

Figure 1: Illness incubation time of gastrointestinal illness cases associated with March 29, 2014 dinner at Buffalo Bob's Smokehouse (n=5)



No common exposures other than the restaurant were reported. Patrons reported eating either sandwiches of ham or turkey served with fries, or a combo platter that consisted of servings of brisket, chicken, sausage, and ribs served with baked beans, coleslaw, and fries. With only a

limited number of food histories from five cases and two other individuals, the cause of illness could not be conclusively linked to a food item by statistical analysis.

Laboratory Analysis

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

Samples of chicken from the restaurant and ribs, chicken and brisket from takeout containers tested positive for *Clostridium spp.* bacteria by culture on April 22, 2014 [Table 2]. No other food samples were tested.

Table 2: Levels of *Clostridium spp.* bacteria found in food items served at Buffalo Bob's Smokehouse on March 29, 2014

Food Item	*Collected by*	*Disposition*	*Level Found (cfu/g)**
Brisket	*SCHA*	refrigerated	230
Ribs	*SCHA*	refrigerated	20
	LDCHD	frozen	not detected
Smoked Sausage	*SCHA*	refrigerated	20
Chicken	*KDA*	refrigerated	10
	LDCHD	frozen	not detected

**cfu/g = colony-forming units of Clostridium spp. per gram of food*

Environmental Assessment

The initial KDA inspection on February 17, 2014 revealed ten priority violations and two priority foundation violations. The follow-up inspection on March 19th was a scheduled inspection to ensure that two initial priority violations with plumbing and backflow issues were corrected; that inspection identified five unrelated priority and two priority foundation violations. The complaint inspection of April 1, 2014 revealed four priority violations, which were all corrected on site, and no priority foundation violations.

Three of the initial priority violations concerning the separation and protection of food and the proper sanitation of utensils were not observed during the follow-up and complaint inspections. Two initial priority foundation violations concerning proper cleaning and sanitation of food contact surfaces were still noted on the follow-up inspection but the establishment was found to be in compliance during the complaint inspection on April 1st.

The most frequent non-compliance issues with all inspections were priority violations involving the storage of chemicals in or around food and the failure to follow manufacture's guidelines with sanitizer use. Storage violations were observed two times in the initial routine inspection and were observed three times on the preceding follow-up and complaint inspections. An

additional observation during the follow-up and complaint inspections was the priority violation involving the use of improper concentrations of bleach for sanitizing purposes.

Observations made during the three inspections related to maintaining proper food temperatures are outlined in Table 3.

Table 3: Potentially Hazardous Food Time/Temperature Observations made by KDA inspectors during three inspections of Buffalo Bob's Smoke House, 2014

Observation	*Routine Inspection 2/17/2014*	*Follow-up Inspection 3/19/2014*	*Complaint Inspection 4/1/2014*
Proper cooking time and temperatures	Not observed.	Observed in compliance with grilling of hamburger.	Not observed.
Proper reheating procedures for hot holding	Baked beans, BBQ pork, turkey, ham and ribs were not properly reheated to the 165°F or hotter for hot holding.	Observed in compliance with brisket and baked beans.	Observed in compliance with ribs, chicken, sausage, beef, turkey, and pork.
Proper cooling temperatures	Not observed.	Not observed.	Not observed.
Proper hot holding temperatures	Observed in compliance for brisket, turkey, and ham.	Cooked beef maintained at lower than 135°F during hot holding.	Observed in compliance.
Proper cold holding temperatures	Observed in compliance with ribs, baked beans, and raw burger.	Observed in compliance for ham, turkey, beef, coleslaw, pork, and baked beans.	Observed in compliance for turkey, ham, beef, sausage, chicken, ribs, coleslaw, and baked beans.

During the initial inspection, the inspector interviewed the person in charge concerning the cooking, cooling and reheating of food items. The person in charge indicated that items such as pork, baked beans, turkey, and brisket were cooked, cooled and then held in a walk in cooler overnight prior to being reheated for serving the next day.

The inspector distributed educational material on proper hand washing, hot and cold holding, reheating temperature logs, daily self-inspection checklist, storing food, and food temperatures during the course of the three inspections. Violations other than the two violations requiring maintenance were corrected on site during the inspections with the reheating of food or discarding of potentially hazardous food.

Discussion

Five cases of gastroenteritis were associated with consuming food prepared by Buffalo Bob's Smokehouse restaurant on March 29, 2014. These illnesses may be the result of *C. perfringens* intoxication. The clinical specimens collected during the investigation were negative for common enteric agents and the clinical history reported by ill individuals was consistent with *C.*

perfringens intoxication. All ill persons reported eating a type of meat product that would have been cooked and cooled 24 hours prior to reheating and serving at the restaurant. Improper reheating of cooked meats was documented in a recent restaurant inspection. *Clostridium spp.* was detected in low levels in the chicken, smoked sausage, and ribs and was found in moderate levels in the brisket .

Clostridium spp. is a type of bacteria that is often found on raw meat and poultry, some strains can produce a toxin that causes gastrointestinal illness when consumed. One type *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 such as meats, poultry, or other pre-cooked foods are prepared in large quantities and then kept warm for long periods of time, or are improperly cooled and then reheated, before serving and consumption. *C. perfringens* spores can withstand cooking temperatures, therefore,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].

Guidelines for the microbiological quality of ready-to-eat foods suggest that while the identification of 20 - <100 cfu/g of *C. perfringens* may be acceptable for sale, amounts greater than 100 cfu/g are unsatisfactory and those above 1000 cfu/g are potentially injurious to health and unfit for human consumption[5,6]. Amounts between 10-1000 cfu/g can also be viewed as evidence of poor processing of foods, particularly in the cooling stages[7]. During this investigation and in previous recent inspections, the cooling practices at the establishment were not observed, but the levels of colony forming units present in the food may suggest evidence of poor processing.

It should be noted that the levels of colony forming units detected may not represent the levels present at the time of consumption. In examining foods for *C. perfingens*, the colony forming units will lose their viability when foods are frozen or held under prolonged refrigeration. Such losses may make it difficult to establish that *C. perfingens* as the specific cause of a food poisoning outbreak[8]. In our investigation the foods had been refrigerated for nearly 20 days before testing. Those foods that were frozen did not have any detectible colony forming units.

The epidemiological investigation was limited by several factors. Clinical specimens from ill individuals were obtained for testing, but KHEL is unable to culture for *C. perfingens* or identify the bacterial toxin in clinical specimens. Additionally, one complainant was not interviewed, and the restaurant's cooking and cooling of the implicated foods was not observed. Buffalo Bob's Smokehouse restaurant voluntarily closed permanently on April 29, 2014; therefore, KDA was not able to conduct a Hazard Analysis and Critical Control Points (HACCP) inspection on the preparation and handling of the implicated products.

This investigation was aided by the quick response of and cooperation between LDCHD, CCHD, SCHA, KDHE, and KDA, which allowed for timely initiation of the outbreak investigation. The initial inspection of the restaurant was completed by KDA within twenty-four hours of receiving the foodborne illness complaint.

Report by: M. Ella Vajnar, Kansas Department of Health and Environment
On: 25 April 2014

Investigation by:

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

Shawnee County Health Agency
1615 SW 8th Ave.
Topeka, KS 66606
http://www.shawneehealth.org/

Coffee County Health Department
110 South 6th Street
Burlington, Kansas 66839
http://www.coffeycountyks.org/health.html

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 Laboratories
6810 SE Dwight Street
Topeka, Kansas 66620
http://www.kdheks.gov/labs/

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

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Norovirus Outbreak Associated with a Fast Food Restaurant, Shawnee County, January 2014

Kansas
Department of Health and Environment
Division of Health

Background

On January 3, 2014, at 10:15 a.m., the Kansas Department of Agriculture (KDA) notified the Kansas Department of Health and Environment (KDHE) of a foodborne illness complaint. The complainant stated that eight individuals from three separate households ate food from a fast food restaurant on January 1, 2014, and six subsequently became ill with vomiting and diarrhea. The Shawnee County Health Department (SCHD) was notified at approximately 10:30 a.m., and immediately began an outbreak investigation. An investigation was also initiated immediately by staff from the KDA.

Key Findings

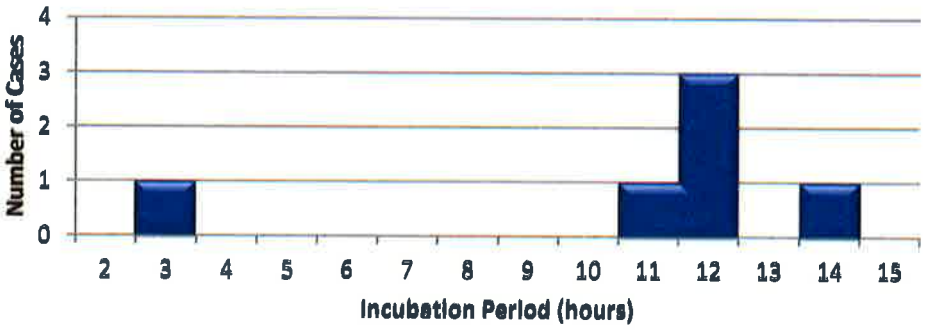
- The Kansas Foodborne Outbreak Questionnaire was used to interview all eight individuals.
- Six individuals reported being ill and met the case definition. A case was defined as an individual who consumed food purchased at the restaurant on January 1, 2014 and became ill with diarrhea (three or more loose stools in a 24-hour period) and vomiting within 48 hours of dining.
- All ill individuals reported diarrhea and vomiting with abdominal pain and nausea (Table 1). One patient reported visiting a health care provider and a second visited an emergency department. No one was hospitalized.

Table 1: Symptoms Reported among Cases (n=6)

Symptom	# of Cases with Symptom	% of Cases
Diarrhea	6	100
Vomiting	6	100
Abdominal Pain	6	100
Nausea	6	100
Muscle Aches	3	50
Fever	3	50

- The incubation period (Figure 1) was available for all six individuals and ranged from 3 to 14 hours (median incubation period, 12 hours).

Figure 1: Illness incubation time of cases associated with a fast food restaurant, Shawnee County, January 2014 (n=6)



- All individuals were interviewed on January 3, and none had fully recovered from their illness. The duration of illness was not determined.
- The ages of individuals ranged from 5 to 50 years (median age, 28 years). Three (50%) of the ill individuals were female.
- Food purchased at the restaurant had been taken to a private residence where it was consumed by the eight individuals, with bottled water or soda and ice provided at the private residence.
- The only common exposure for these individuals other than the restaurant's food was spending three or more hours at the private residence that same day.
- Two stool specimens were collected and both tested positive for norovirus, genotype II.
- An environmental assessment was performed by KDA, and no violations were found. The KDA inspector inquired about employee illness. No employees reported illness. One employee had recently missed work do to ill children but had not worked during the time of their illness and had not developed any symptoms of illness.

Discussion

This was an outbreak of norovirus possibly associated with a fast food restaurant in Shawnee County. Six individuals from three different households became ill after eating together on January 1, 2014. The only commonality among the three households was sharing the meal at a private residence. One case reported an unusually short incubation period, considering the norovirus incubation period usually ranges from 12 to 48 hours[I]. No other illnesses associated with this restaurant have been reported and no employees that worked at the restaurant reported any illness. Therefore, it is uncertain whether this restaurant was the source of transmission.

Norovirus is a highly contagious pathogen with a very low infectious dose, estimated to be between 10-100 viral particles[II]. Transmitted primarily through fecal-oral route, norovirus particles may be spread through direct contact or through consuming fecally-contaminated food or water. Spread via aerosolized vomitus is also possible. Once infected, norovirus shedding can begin prior to the onset of symptoms and can persist for weeks after clinical symptoms have ceased. Norovirus has been detected

in fecal specimens 3 to 14 hours before onset of clinical symptoms and can be detected for 13 to 56 days after exposure to the virus[iii]. Approximately 20% of norovirus infected individuals do not have clinical symptoms[iv]. However, these individuals can still shed norovirus and can be potential sources of contamination.

Simple measures, including strict hand washing after using the bathroom and before handling food items, and excluding employees with gastrointestinal illness from food handling may substantially reduce foodborne transmission of noroviruses[v].

Report by: M. Ella Vajnar (Kansas Department of Health and Environment), Deanne Mauk (Shawnee County Health Department)
On: 01/24/2014

Investigation by:
Shawnee County Health Department
1615 SW 8th
Topeka, Kansas 66606
http://www.shawneehealth.org/index.aspx

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

Kansas Department of Health & Environment
Bureau of Epidemiology and Public Health Informatics
1000 SW Jackson St., Suite 210
Topeka, Kansas 66612
http://www.kdheks.gov/

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One death linked to Norovirus outbreak

Posted: Tuesday, January 13, 2015 9:12 pm

One death linked to Norovirus outbreak 0 comments

JOSHUA VAIL

Tribune reporter

The Kansas Department of Health and Environment has received a report of a possible Norovirus-related death in its ongoing investigation of a Norovirus outbreak in the Neosho County area connected to Meals on Wheels in southeast Kansas.

KDHE Public Health Public Information Officer Aimee Rosenow said KDHE does not have an autopsy report confirming the cause of death as Norovirus infection and cannot release the name of the deceased.

"We do know that the patient was ill and has been served by this program," she said.

Rosenow said there have been more illnesses confirmed beyond the 29 ill reported Friday, but the KDHE is waiting to finish more interviews to release a new count. Interviews with those who may have been exposed is a major part of KDHE disease investigations. In this case, KDHE investigators must interview everyone who received a Jan. 6 Meals on Wheels delivery in Allen, Woodson and Neosho counties. Rosenow said the agency has finished about 60 percent of those interviews.

Interviews are part of the epidemiologic investigation, which will also include gathering clinical data on all patients and program staff who may have been sick with a case of Norovirus infection. The investigation will also include laboratory tests of food and stool samples and an environmental analysis, which in the case of this investigation included an inspection of the Chanute facility by the Kansas Department of Agriculture Food Safety Division Jan. 8.

Meals on Wheels is administered by Senior Services of SEK, which is based in Coffeyville, but the organization has facilities in several other counties including Neosho and Woodson counties where illnesses have been reported. Rosenow said KDHE is still trying to determine in which Senior Services of SEK facility the infection originated. Norovirus infections can be spread by food service workers who are or were sick until about 48 hours after recovery from symptoms. The Chanute facility is the only facility that has a food inspection report released by the KSDA since the investigation began. The Yates Center facility serving Woodson County is a satellite site with meal prep and dishwashing done at Chanute.

The final report on the outbreak investigation, when finished, will be released by the KDHE Bureau of Epidemiology and Public Health Informatics and will be available online at http://www.kdheks.gov/epi/outbreaks.htm.

Source: http://www.chanute.com/news/article_2f6f3c58-9b9b-11e4-a8bf-fbaad00300ed.html