Camden Outbreak

May 22, 2005

Investigation conducted by

Department of Health and Environmental Control (DHEC) Region 4
Division of Food Protection, Columbia
Division of Acute Disease Epidemiology, Columbia
DHEC Bureau of Laboratories, Columbia

Summary

Kershaw County Medical Center alerted Department of Health and Environmental Control (DHEC) Region 4 about a possible foodborne outbreak related to "OS" restaurant at 12:36 p.m. on Sunday, May 22, 2005. OS is a family owned restaurant located in Camden. The environmental, epidemiological analysis and the laboratory results from the outbreak investigation identified Salmonella enteritidis as the illness causing agent and also, that the source of common exposure was related to OS restaurant. While a number of food items were identified as possible vehicles for the transmission of Salmonella enteritidis, roasted turkey seems to be the likely vehicle based on investigation results. One food sample (roasted turkey) and 64 stool isolates were positive for Salmonella enteritidis and were indistinguishable (identical) by pulsed field gel electrophoresis analysis. The stool specimens/isolates sent to the Centers for Disease Control (CDC) were also of the same phage type (13 a). DHEC Region 4 staff conducted 486 interviews, and a total of 304 confirmed and suspected cases were identified during the course of the investigation. No major operational violations were observed at the time of inspection of OS on May 23. The owners of OS voluntarily closed the facility until the investigation was completed. The owners and key staff personnel attended food safety training prior to the re-opening of the restaurant on June 10.

Background

Camden is a historic town located in Kershaw County, South Carolina.

The outbreak occurred in Restaurant "OS", a family owned restaurant located in the town. The restaurant had previously been inspected on August 25, 2004 and had an "A" grade. No outbreaks had been reported from the facility for the two years prior to the outbreak.

Description of outbreak

One deceased patient was transported to the Kershaw County Medical Center (KCMC) by the county coroner on Sunday morning, May 22, 2005. Initial interview of the deceased patient's wife by the coroner led him to report, suspected food poisoning from a particular restaurant (OS) to the doctor on call in the emergency room. A look at the emergency room log also revealed admission of one case on Friday, May 20 and three cases on Saturday, May 21 that had an association with restaurant OS. All cases had symptoms consistent with a gastrointestinal illness, possibly food poisoning. KCMC alerted Department of Health and Environmental Control (DHEC) Region 4 about a possible foodborne outbreak at 12:36 pm on Sunday, May 22.

Sara Wells, after being informed about the possible outbreak, contacted Kershaw County Environmental Health staff and Dr. Gil Potter, Medical Director for Region 4 at 1:30 pm. Dr. Potter, in turn, spoke with Dr. Norris, Emergency Room Director at KCMC. After discussing this potential foodborne outbreak with Dr. Norris, Dr. Potter informed Derrick Mims, Health Director for the region, about the outbreak. He also spoke with Dixie Roberts, Director of Acute Disease Epidemiology and Thom Berry in Media Relations. Brad Collier, Environmental Health Director, was also informed about this outbreak.

At 2:30 pm, the outbreak team assembled in Camden to begin outbreak investigation, and at 2:45 pm, James Arthur, Food Supervisor, went to the OS restaurant just as it was closing for the afternoon.

The outbreak team reached the hospital and started interviewing people with gastrointestinal illness. The emergency room doctors and nurses used chief complaints to triage patients for the DHEC outbreak team to interview.

Methods

Environmental

James Arthur, Food Supervisor, visited OS at 2:45 pm on May 22 after first conferring with the outbreak team at KCMC emergency room as they began completing case histories. The facility had closed for the day, and the owner stated that product from any meals served the previous week would have been discarded. The owner was informed of the possibility of a foodborne illness involving food from Thursday, May 19.

On Monday, May 23, James Arthur performed a food borne illness complaint investigation at OS. The inspection was not a graded inspection, but all areas of the operation were reviewed. Environmental staff also performed surface swabs, interviews with restaurant staff and owners concerning food preparation procedures, and case histories of staff who ate at OS during the suspect timeframe for use as control cases. A family with symptoms had received food catered from the Thursday menu and contacted the health department. This food was collected for testing at the Bureau of Laboratories (BOL), DHEC. The foods collected were sweet potato soufflé, green beans and roasted turkey.

On Tuesday, May 24, samples of raw turkey and several raw eggs from the same lot as used in the meals for May 19 and May 22 were collected for testing. Additional interviews with the family/owners of OS indicated that the son and daughter managed the operation of the kitchen, but they were not in the facility the afternoon of May 19 and May 22 during meal preparation. The mother's preparation procedures usually involved cooking for a set time at an established set oven temperature. She indicated that she did not usually check internal temperatures as part of the normal cooking process.

Susan Best collected a raw frozen turkey from OS restaurant for testing. Simeon Garner, Enforcement, Investigations, and Analysis Officer (EIAO), Food Safety and Inspection Service (FSIS), United States Department of Agriculture (USDA) laboratory picked up the raw frozen turkey from the Kershaw County Health Department on June 3 and hand delivered it to the FSIS Athens Laboratory. This raw frozen turkey was part of batch of six turkeys that were bought from a distributor "IFH" on May 16 and cooked at OS restaurant during the time of outbreak. The sole supplier of turkeys to IFH was "CT", a processing plant located in Mt. Olive, North Carolina.

Epidemiology

Initial investigation pointed to source as a Camden restaurant with suspected date of exposure being May 19. Environmental Health contacted the restaurant and obtained menu items by day for May 17 through May 20 to use in development of interview tool. In addition to restaurant patrons, a second cohort of cases was identified from a catered event on Thursday, May 19: An individual purchased a large quantity of food to serve approx 40-50 individuals after a funeral. The "menu" for this cohort was not as extensive as the full restaurant menu. By late afternoon/early evening, May 22, 25 possible cases had been identified including the fatal case. Food history of the deceased was obtained from the spouse. Five controls were also interviewed. There was limited capacity to identify controls because the restaurant did not accept credit cards and the receipt system could not identify if customers paid by cash or check. One of the stool specimens from a case related to the outbreak was also found to be positive for Salmonella

DHEC Region 4 outbreak investigative team contacted hospitals in surrounding communities to identify possible cases related to the OS restaurant outbreak. A health alert was also sent to the region.

The initial case definition for the investigation was limited to cases that frequented the OS restaurant on May 18. It was later expanded to include subsequent days. The case definition was as follows: A case is an individual with onset of diarrhea with or without fever, vomiting, abdominal cramps, or nausea OR with at least 3 of 4 non-diarrheal symptoms with onset of symptoms after May 18 and who ate at OS between Thursday, May 18 and Sunday, May 22.

Specimen isolates from the Kershaw County Medical Center were sent to DHEC BOL for further characterization.

DHEC Region 4 staff conducted 486 interviews, and a total of 304 confirmed and suspected cases were identified during the course of the investigation.

Central office staff conducted initial analyses of OS diners on May 19. The cases and controls selected for the case-control study were diners who had eaten only one meal at OS on May 19 and had not consumed any other meal at OS from May 17 through May 22. Both cases and controls were randomly selected from the interviews that had already been conducted by the Region 4 staff.

After the initial analysis yielded roasted turkey and dressing to be significantly associated with illness, a second round of interviews were conducted among OS diners who had eaten on May 22. These interviews were conducted on Thursday, May 26.

A third analysis was conducted using the combined datasets from May 19 and May 22 diners.

Epi Info™ Version 3.3.2 and Epi Info™ Version 6 were used to conduct the analysis.

Basic descriptive analyses were conducted for all variables. Further associations were analyzed using unconditional logistic regression.

Laboratory

The laboratory received the following food samples, environmental swabs and stool specimens for testing.

Food samples

Sweet potatoes, green beans and roasted turkey from the home of the complainant (catered event)
Additional samples of raw turkey and shell eggs from the restaurant
Dressing, macaroni and cheese, corn, collard green (delivered to the office)

Environmental swabs

Eleven environmental swabs collected from different surfaces in the restaurant including swabs from the hands of two employees.

Stool specimens

Sixty-four stool specimens/isolates.

All food samples, environmental swabs and stool specimens were cultured for the presence of salmonella. The roasted turkey sample from the catered event and the stool specimens were also tested using pulsed field gel electrophoresis (PFGE). Nine stool specimens were sent to Centers for Disease Control and Prevention (CDC) for phage typing.

Results

Environmental

No major operational violations were observed at the time of inspection on May 23. Food temperatures for stored and prepared foods were within acceptable ranges. Some construction, maintenance, and cleaning violations were observed, however if a grade were assigned to the inspection, the facility would have scored an "A" rating.

The owners of OS voluntarily closed the facility until the investigation was completed.

On June 8, the owners and key staff personnel attended National Restaurant Association's ServSafe Training conducted by Clemson Extension Services and the S.C. Restaurant Association. Everyone passed the certification test given at the end of training.

On June 9, James Arthur conducted additional risk based training with the staff and owners on recognizing risk factors in the preparation process and control measures. A full site inspection was performed with a sanitation score of 98 percent; an "A" rating was posted on the restaurant.

The restaurant opened on June 10 with Susan Best and James Arthur performing multiple surveys of the food preparation and handling procedures. During the weeks following reopening, in cooperation with the OS restaurant management, several daily surveys were performed all revealing good sanitation levels and food safety practices. On June 26, James Arthur performed risk-based training in Spanish with assistance from Carl Sosa, Information Resource Consultant, and a DHEC qualified translator.

Epidemiology

A total of 23 cases and 23 controls were used in the initial analyses for the OS diners on May 19. The results of food analyses are attached in appendix 1. Roasted turkey and dressing were found to be significantly associated with illness. Roasted turkey had an odds ratio of 24 (5.00 CI 114.97) with a p-value of 0.0000089. Dressing had an odds ratio of 3.55 (1.05 CI 12.05) with a p-value of 0.038. None of the other 24 food items were found to be significantly associated with illness.

For the May 22nd case control study, data from 29 cases and 27 controls was analyzed. The detailed demographic and clinical information is attached in appendices 2 and 3.

The gender distribution amongst cases was skewed with most of the cases being women (92.9%). The age distribution of the cases varied from 1 year to 86 years with the majority being above 50 years (56 percent).

The incubation period varied between 6 hours to 30 hours with a median incubation period of 11.5 hours. The duration of illness varied from 2.5 hours to 50 hours with a median duration of 17.25 hours. The predominant symptoms were diarrhea (96.6 percent) and cramps (89.3 percent).

Bivariate analysis of the food items (45) suggested multiple foods to be significantly associated with illness (Appendix 4). Roast Beef, roasted turkey, dressing, giblet gravy and biscuits were the implicated food items. Unconditional logistic regression was used to further evaluate these associations. The initial model (Model 1 – Appendix 5) consisted of all the significant items in the bivariate analysis. Two of the five variables were not significantly associated with illness in this model. Backward elimination was used to drop these variables (dressing and giblet gravy) for Model 2 (Appendix 5). The three remaining variables (roasted turkey, roast beef and biscuits) continued to remain significantly associated with illness.

A final analysis was conducted by combining datasets from the May 19 and May 22 diners. The results from this logistic regression model implicated roasted turkey ($p = 0.0001$) and biscuits ($p = 0.01$) as the likely foods that caused illness among the diners at OS. (Appendix 6).

Laboratory

Of the food samples received for testing, only the roasted turkey sample received from the complainant (catered event) was positive for Salmonella Enteritidis. All the stool specimens were confirmed to be positive for Salmonella Enteritidis. The DNA fingerprint patterns of all the isolates were indistinguishable with both the Xba I enzyme and the Bln I enzyme. The nine stool specimens sent to CDC for phage typing were identified to be Phage type 13a.

FSIS Athens laboratory reported that the raw turkey sample collected from OS restaurant by Susan Best tested negative for Salmonella. FSIS processed the sample according to FSIS protocol (MLG Chapter 4, section 4.5.7).

Discussion

The environmental and epidemiological analysis and the laboratory results from the outbreak investigation support the initial hypothesis that the source of common exposure was related to OS restaurant.

Multiple food items were found to be statistically significant in the analyses. The initial analyses implicated roasted turkey and dressing to be significantly associated with illness. As discussed in the methods section, the cases and controls for this analysis were selected from the interviews already conducted by Region 4 staff. The food histories in these interviews were obtained without the use of a menu. In order to get better recalls, some of the cases and controls related to the outbreak were re-interviewed using a menu obtained from the OS restaurant. Analysis of these food histories suggested multiple food items to be significantly associated with illness. Logistic regression models helped narrow down these associations but still three food items (biscuits, roast beef and roasted turkey) were statistically significant. Combining both these datasets for analysis suggested roasted turkey and biscuits to be significantly associated with illness. The only food item that was significantly associated with illness in all the different datasets was roasted turkey. It also had the strongest statistical association among the food items. Further, the occurrence of Salmonella enteritidis in poultry is well documented. Cross contamination may have resulted in other food items being statistically significant in the analyses.

The laboratory results documented the presence of Salmonella enteritidis in the roasted turkey sample collected from the catered event. All the isolates of Salmonella were indistinguishable by PFGE testing using both the Xba I enzyme and the Bln I enzyme. The phage typing of nine isolates from the outbreak by the CDC also identified all of them to be identical.

While the environmental investigation results did not show any critical violations, some construction, maintenance and cleaning violations were observed. It was also noted that cooking thermometers to check internal temperatures were not used as part of the normal cooking process. In addition, a malfunction in cooking equipment was detected by the operator during the course of the investigation.

Given this body of evidence, it is plausible that the outbreak at OS restaurant was related to improper cooking and/or improper handling of roasted turkey.

This outbreak investigation has some limitations. A number of patrons frequented this restaurant numerous times during the course of a week. As a result, it was not possible to analyze food histories from these patrons and implicate a particular meal. While patrons who had eaten more than once had been excluded from the analysis, being a frequent customer could also have likely resulted in poor or improper recall. Buffet style service at the OS restaurant also meant that recall might not have been optimal. This was further complicated by the lack of use of credit cards and a receipt system that could not identify if the patron had paid by cash or check.

Recommendations

The owners and key staff personnel attended National Restaurant Association's ServSafe Training conducted by Clemson Extension Services and the S.C. Restaurant Association. James Arthur conducted additional risk identification and control training with the staff and owners on recognizing risk factors in the preparation process. James Arthur also conducted the same training in Spanish with assistance from a DHEC qualified translator. The malfunctioning cooking equipment was fixed prior to the reopening of the restaurant.

Appendices

Appendix 1 – Food specific attack rate table (Thursday diners)
Appendix 2 – Demographic information of cases (Sunday diners)
Appendix 3 – Clinical information of cases (Sunday diners)
Appendix 4 – Food specific attack rate table (Sunday diners)
Appendix 5 – Multivariate analysis of foods (Logistic regression – Sunday diners)
Appendix 6 – Multivariate analysis of foods (Logistic regression – Combined dataset)

Acknowledgments

DHEC Division of Media Relations
DHEC Office of General Counsel
Centers for Disease Control (CDC)
Food Safety and Inspection Service (FSIS), United States Department of Agriculture (USDA)

Appendix 1 – Food specific attack rate table (Thursday diners)

	CASES		CONTROLS					
FOOD	ATE	DID NOT EAT	ATE	DID NOT EAT	ODDS RATIO	Lower Limit 95% CI	Upper Limit 95% CI	P Value
Fried Chicken	14	9	8	15	2.9167	0.8794	9.6738	0.076565414
Roasted Turkey	20	3	5	18	24	5.0099	114.9724	0.000008911
Dressing	16	7	9	14	3.5556	1.049	12.0519	0.038263205
Giblet Gravy	5	16	3	20	2.08	0.35	13.31	0.355
BBQ Pork Ribs	3	20	5	18	0.54	0.11	2.58	0.43
Pepper Steak	0	23	3	20	undefined			
Black eye peas and rice with bacon	1	22	2	21	0.47	0.04	5.66	0.55
Collard Greens	8	15	7	16	1.21	0.35	4.19	0.75
Creamed Corn	0	23	0	23	0			
Broccoli Cass	1	22	0	23	undefined			
Mac & Cheese	10	13	11	12	0.8392	0.26	2.68	0.76
Coleslaw	0	23	2	21	0			
Peas	2	21	0	23	undefined			
Rice	2	21	3	20	0.6349	0.09	4.2	0.63
Gravy	2	21	2	21	1	0.12	7.77	1
Sweet Pot	5	18	5	18	1	0.24	4.06	1
Okra	3	20	2	21	1.57	0.2377	10.4372	0.63
Veg Soup	2	21	0	23	undefined			
Mashed Pot	4	19	3	20	1.4	0.2768	7.1157	0.68

	CASES		CONTROLS					
FOOD	ATE	DID NOT EAT	ATE	DID NOT EAT	ODDS RATIO	Lower Limit 95% CI	Upper Limit 95% CI	P Value
Biscuits	6	17	8	15	0.66	0.18	2.34	0.52
Cornbread	1	22	2	21	0.47	0.04	5.66	0.55
Choc Pudding	0	23	1	21	undefined	0	17.14	0.3
Banana Pudding	2	21	6	16	0.25	0.03	1.71	0.13
Choc Cake	0	23	0	23	undefined			
Peach Cobbler	4	19	6	17	0.59	0.14	2.47	0.47
Salad	7	16	3	20	2.91	0.64	13.12	0.15

Appendix 2 – Demographic Information of cases

# Cases			
ILL	Frequency	Percent	Cum Percent
Yes	29	51.8%	51.8%
No	27	48.2%	100.0%
Total	56	100.0%	100.0%

CASE BY GENDER			
Gender	Frequency	Percent	Cum Percent
Female	26	92.9%	92.9%
Male	2	7.1%	100.0%
Total	28	100.0%	100.0%

CASES BY AGE			
Age	Frequency	Percent	Cum Percent
Under 1 Yr	1	4.0%	4.0%
1-4 Yrs	2	8.0%	12.0%
5-19 Yrs	5	20.0%	32.0%
20-49 Yrs	3	12.0%	44.0%
Over 50 Yrs	14	56.0%	100.0%
Total	25	100.0%	100.0%

Appendix 3 – Clinical Information of cases

Symptoms of ILL Students N=29		
Symptoms	Frequency	Percent
Bloody Diarrhea	0	0.0%
Body Aches	10	35.7%
Chills	8	28.6%
Cramps	25	89.3%
Diarrhea	28	96.6%
Fatigue	5	17.9%
Fever	0	0.0%
Headache	8	28.6%
Nausea	14	50.0%
Vomiting	0	0.0%

	Incubation Period
Shortest	6 Hours
Median	11.25 Hours
Longest	30 Hours

	Duration
Shortest	2.5 Hours
Median	17.25 Hours
Longest	50 Hours

Appendix 4 – Food specific attack rate table (Sunday diners)

	CASES		CONTROLS					
FOOD	ATE	DID NOT EAT	ATE	DID NOT EAT	ODDS RATIO	Lower Limit 95% CI	Upper Limit 95% CI	P Value
Fried Chicken	19	19	10	8	0.8	0.26	2.47	0.69
Roast Beef	13	5	16	22	3.6	1.05	12.42	0.05
Pork BBQ	6	7	22	20	0.78	0.19	3.19	0.69
Baked Ham	12	8	16	19	1.78	0.51	6.32	0.3
Roasted Turkey	15	5	11	22	4.71	1.4	15.8	0.009
Dressing	21	10	8	18	3.2	1.02	9.99	0.04
Giblet Gravy	15	6	13	21	4.8	1.44	15.97	0.01
Fatback	2	1	27	26	1.93	0.16	22.54	0.6
String Beans	17	14	12	13	1.31	0.46	3.78	0.61
Lima Beans	10	7	18	20	0.65	0.21	2.01	0.4
Creamed Corn	15	11	14	16	1.56	0.54	4.49	0.41
Collard Greens	11	9	18	18	1.22	0.41	3.66	0.71
Fried Squash	8	7	21	20	1.08	0.33	3.56	0.88
Mac & Cheese	20	16	9	10	1.39	0.4	4.91	0.56
Sweet Potato	14	16	15	20	3.11	0.84	11.88	0.05
Mashed Pot	6	3	22	23	2.09	0.39	12.27	0.47
Rice	9	5	20	22	1.98	0.59	6.9	0.27
Gravy	8	4	21	23	2.19	0.57	8.34	0.24
Biscuit	20	10	9	17	3.77	1.21	11.8	0.01
Corn Bread	3	2	26	25	1.44	0.22	9.37	0.7

	CASES		CONTROLS					
FOOD	ATE	DID NOT EAT	ATE	DID NOT EAT	ODDS RATIO	Lower Limit 95% CI	Upper Limit 95% CI	P Value
Butter	4	1	25	26	4.1	0.43	39.83	0.19
Lemon M. Pie	6	6	23	21	0.91	0.25	3.27	0.88
Banana Pudding	12	7	17	20	2	0.65	6.27	0.22
Cherry Cobbler	8	2	21	25	4.76	0.91	24.9	0.04
Peach Cobbler	5	5	24	21	0.88	0.18	4.17	0.85
Lettuce	4	6	25	21	0.56	0.14	2.25	0.41
Coleslaw	2	4	26	23	0.44	0.05	3.23	0.42
Pot. Salad	2	0	26	27	undefined			
Tomato	2	4	26	23	0.44	0.05	3.23	0.42
Cucumbers	6	4	21	23	1.64	0.34	8.24	0.48
Cheese	3	2	24	25	1.56	0.19	14.92	0.63
Peppers	0	1	27	26	undefined			
Onions	2	3	25	24	0.64	0.07	5.35	1
Carrots	2	3	26	24	0.62	0.06	5.13	0.66
Bacon bits	2	1	26	26	2	0.13	59.64	1
Croutons	2	0	26	27	undefined			
Beets	2	1	26	26	2	0.13	59.64	1
Ranch Dressing	3	0	25	27	undefined			
1000 Island	2	4	26	23	0.44	0.05	3.23	0.42
French Dressing	0	2	28	25	undefined			
Italian Dressing	1	0	27	27	undefined			
Coffee	2	3	26	24	0.62	0.06	5.13	0.66
Iced Tea	26	18	2	4	2.89	0.39	25.86	0.38

	CASES		CONTROLS					
FOOD	ATE	DID NOT EAT	ATE	DID NOT EAT	ODDS RATIO	Lower Limit 95% CI	Upper Limit 95% CI	P Value
Ice	23	22	5	5	1.05	0.22	4.98	1
Lemonade	2	0	27	26	undefined			