

**FOODBORNE OUTBREAK INVESTIGATION REPORT
WORLD'S FAIR PARK
KNOXVILLE, TN
JULY 30, 2005**

This is a report of an investigation of a foodborne outbreak originating at World's Fair Park during a benefit entitled "Ribs, Rides, N Rock" in Knoxville, TN. The event took place on Saturday July 30, 2005 to benefit children's charities. As part of the event, a \$7-plate lunch was offered under a covered tent on the west lawn of the park. The lunch consisted of pulled Boston pork, buns, barbeque sauce, chicken thighs, cole slaw, baked beans, and drinks.

BACKGROUND

First notification: On July 30, 2005 Mark Jones, the Knox County Health Department (KCHD) director received notification that several individuals who had eaten the \$7-plate lunch at the event had reported to an on site Knoxville Fire Department paramedic unit with symptoms of nausea and vomiting. Patients were subsequently transported to several local emergency departments.

Preliminary investigation: Mr. Jones contacted the KCHD on-call staff member, Dr. Martha Buchanan, and our Public Health Officer, Dr. Stephanie Hall to begin a preliminary investigation. Drs. Hall and Buchanan reported to various local emergency rooms to conduct interviews of known cases.

Don Coram, Environmental Specialist, inspected the facilities at the park and obtained extensive food samples for testing.

METHODS

Food Preparation Review and Environmental Inspection

Interviews of sponsors and parties responsible were conducted to ascertain procedures followed and facilities used for cooking, storing, and transporting food items.

The pork butts, baked beans, and cole slaw for the event were purchased at a Food City grocery store in Knox County. This facility was inspected on Monday August 1st.

The pork barbeque was cooked and pulled at Pop's Texas Barbeque in Caryville, TN. An inspection of this facility was conducted on Tuesday, August 2nd by staff from the East Tennessee Regional Health Office (the restaurant was closed Saturday afternoon to Tuesday morning).

Case-Control Study

Case Identification: Cases were identified from persons who became ill after eating the \$7-plate lunch served under the tent on the west lawn of the World's Fair Park. Media coverage prompted many cases to call KCHD, and these cases were subsequently interviewed. Contacts of cases who ate the lunch but did not become ill served as controls. Additional controls were identified through volunteer rosters if they met enrollment criteria (i.e., they ate the \$7-plate lunch).

Case Definition: Persons who ate the lunch served under the tent on the west lawn of the World's Fair Park from 11:00 am to 3:00 pm who subsequently became ill with nausea and vomiting within 2-6 hours of eating.

Data Collection: A questionnaire was developed from the menu offered at the event. Demographic and symptom history information were also collected. Some cases were initially interviewed in person at local emergency departments. Additional cases and controls were telephoned and asked about foods they consumed at the event.

Data Analysis: Comparisons between the proportion of cases and controls that reported eating specific menu items were performed. Data were captured using a Microsoft Access database and analyzed using SAS V.9.1 software to calculate odds ratios for each of the menu items. In instances where tables contained a zero cell (i.e., no one reported exposure to the food item), a logit estimator using a correction of 0.5 was added to each cell prior to calculating an odds ratio. Microsoft Excel software was used to generate tables and graphs.

Laboratory Analysis

Food item samples and stool specimens from ill persons were collected for laboratory analysis. Screenings for enteric pathogens and *Staphylococcus aureus* were requested.

Medical Examination

A medical examination of the individuals involved in pulling the pork was conducted by Tupper Morehead, MD and Gail Baird, RN to check for open sores or other medical conditions that may have resulted in food contamination.

RESULTS

Food Preparation Review and Environmental Inspection

Pork butts (n = 64, or approximately 515 pounds) were purchased from a local Food City grocery store and transported to Pop's Texas Barbeque for cooking and pulling. The butts were picked up on Thursday July 28th and transported by air-conditioned van to the restaurant. The butts were stored overnight in a refrigerator. The butts were then cooked on Friday morning. Pork was pulled from the butts after they had cooked and cooled by the restaurant manager and a helper. Both reported wearing gloves to pull the pork. The cooked meat was stored overnight in an upright refrigerator. According to the food service establishment inspection report, storage

temperature was not adequate for storage, preparation, display, service, or transportation. Six of the butts were retained by the restaurant, and the remainder of the pulled pork was delivered to the event site on the morning of Saturday July 30th. The manager of Pop's reported that he packed the meat in coolers with ice prior to transport.

Cole slaw and baked beans were also purchased at Food City. The cole slaw was made on Friday, and stored overnight in a cooler. Temperature in the cooler was adequate for storage. The cole slaw was delivered to the event site on Saturday along with the baked beans, which were in sealed containers. Chicken thighs were prepared at the event site. No violations were noted that could explain possible contamination.

Descriptive Epidemiology

Approximately 50 ill persons and 44 well persons were identified as patrons of the benefit who had eaten the meal in question. Interviews were not completed on all ill individuals once a suitable number of ill and well persons had been obtained for analysis.

Case-Control Study

A total of 71 persons were enrolled in the case-control study, including 29 cases and 42 controls. Some cases were not included in the initial analysis to facilitate a suitable case-to-control ratio. Two controls were not included since they were interviewed after the analysis was completed.

Table 1 lists demographic and symptom history among case-control study enrollees. Median age was 33 years among cases and 28 years among controls. Figure 1 displays a graph of the incubation period among ill persons. Mean incubation period was 3.7 hours. Table 2 compares menu items among cases and controls who ate at the benefit.

Consumption of pork (Table 2, $p < 0.05$) and consumption of buns ($p < 0.05$) were significantly associated with illness in this analysis. All 29 of the cases reported consumption of pork; 32 of the 42 controls (76%) reported consumption of pork. Only one case did not report consumption of buns, and 31 (74%) of controls reporting eating buns.

Laboratory Analysis

Eight of nine patient specimens submitted for testing were positive for *Staphylococcus aureus*. Specimens were negative for other enteric pathogens.

Food items tested at the laboratory included pork, chicken, baked beans, and cole slaw. Pork specimens tested positive for *Staphylococcus aureus*, ranging from 2.2×10^4 cfu/gram to 1.0×10^7 cfu/gram. Chicken also tested positive for *Staphylococcus aureus* at 70 cfu/gram.

Medical Examination

Medical staff from the Campbell County Health Department examined individuals from Pop's restaurant who were involved in pulling the pork butts. Examiners reported no breaks in skin

aside from a superficial cut on the restaurant owner's left middle finger, which was bandaged. No other infections were identified. The owner reported that the cut had occurred after the pork had been pulled. Apart from an uninfected burn on the helper, no other breaks in the skin or infections were noted.

DISCUSSION

Epidemiologic evidence indicates that the pulled pork was the likely source of this *Staphylococcus aureus* outbreak. All 29 of the cases reported pork consumption, and nearly all additional ill persons who were interviewed also reported pork consumption. The association between pork consumption and illness was statistically significant. Although illness was also significantly associated with consumption of buns, bread is not typically a vehicle for illness associated with *Staphylococcus aureus*.

Environmental evidence also supports pork as the source of the outbreak. Environmental inspectors indicated that cooling storage facilities at Pop's were likely inadequate to cool over 500 pounds of cooked, pulled pork. Given sufficient time (> 4 hours), *Staphylococcal* toxin can develop from organisms at temperatures between 42 and 130 degrees Fahrenheit. It is estimated that approximately 15 hours elapsed between the time the pork was stored and the time it was delivered to the event site. If the pork was stored or transported for any length of time greater than 4 hours at a temperature above 40 degrees Fahrenheit, conditions would support the development of toxin.

Additional epidemiologic evidence lends further credibility to pork as the source. An Ohio family traveling through Campbell County stopped at Pop's on Tuesday August 2nd and purchased pork barbeque and chicken. It is likely that the pork was prepared and served from the six leftover butts that were not transported to the event on Saturday since staff at the event site reported that the restaurant manager did not return from the event with any pork. The family (six adults, six children) consumed the meal at approximately 8:00 pm Tuesday evening. All ate some of the pork. Six adults and one child became ill at about 2-4 am with symptoms of nausea, vomiting, and diarrhea. Leftover food samples from the family were tested for *Staphylococcus aureus*, and the pork tested positive. The restaurant was again inspected on Wednesday August 3rd. The owner voluntarily closed the restaurant and disposed of any unused pork.

Laboratory evidence also supports pork. All pork samples tested positive for *Staphylococcus aureus*. Though one sample of chicken also tested positive, colonization was greatest in the pork. Cross-contamination of the chicken may explain the laboratory results. Further, no other epidemiologic or environmental evidence supports chicken as the source.

After re-inspection on Monday August 8th, the restaurant re-opened.

CONCLUSION

A foodborne outbreak originating at the World's Fair Park event site on July 30th resulted in at least 50 ill persons. *Staphylococcus aureus* was detected in laboratory tests of pork samples and case-patient specimens. Epidemiologic and environmental evidence supports the hypothesis that

inadequate storage of cooked, pulled pork facilitated toxin development sufficient to cause illness after consumption.

ACKNOWLEDGEMENTS

We gratefully acknowledge the hard work of staff at the East Tennessee Regional Office and the Tennessee Department of Health for assistance with this outbreak.

ADDENDUM/CORRECTION (added Tuesday August 23rd, 2005)

The following was added after the final draft had been submitted. Some details related to the Ohio residents were based on an early summation that was incorrect; however, these new details do not alter the conclusion of the report.

There were three families from Ohio vacationing at Deerfield on the lake, including 6 adults and 8 children. Five adults and one child had signs and symptoms. All 14 had one common meal which was barbeque pork and chicken from Pop's in Caryville. The meat was purchased from Pop's at approx. 1:30 - 2:00 pm on Tues, August 2nd. They put the meat in a cooler with ice for transport to where they were staying on the lake. It took approximately 45 minutes to arrive at the house. The meat was then refrigerated. The group ate dinner somewhere between 8:00 - 9:00 pm on August 2nd. In addition to the pork and chicken they also had instant mashed potatoes with brown gravy from a can, watermelon, canned pineapple, grapes, homemade brownies, soft drinks from a can and /or beer in bottles.

Five adults and one child experienced signs and symptoms. The first was the child at around 1:20 am on August 3rd. The others range with onset times beginning at approximately 2:00 - 2:30 am up until 5:00 am. Four out of the six had vomiting and three had diarrhea. Seven of the family members had pork only, four had chicken only, and three had both pork and chicken. Ten used sauce on the meat, and four did not use sauce.

Other details related to the Ohio families and the products they purchased (e.g., the laboratory result for the pork positive for *Staphylococcus aureus*) are correct.

TABLES AND FIGURES

Table 1: Demographic and Symptom History Among Persons Enrolled in the Case-Control Study

	# CASES	%	# CONTROLS	%
Number enrolled in case-control study	29	40.9	42	59.1
Gender				
Male	16	55.2	20	48.8
Female	13	44.8	21	51.2
Age (years)				
Median	33.0	--	27.8	--
Mean	36.5	--	28.8	--
SD	17.2	--	16.3	--
Range	5.0 – 69.9	--	2.0 – 59.0	--
Symptom Frequency				
Nausea	28	96.5	--	--
Vomiting	28	96.5	--	--
Diarrhea	25	86.2	--	--
Cramps	18	62.7	--	--
Onset (First Symptom)				
Nausea	28	96.5	--	--
Cramps	1	3.5	--	--
Incubation Period (hours)				
Median	3.5	--	--	--
Mean	3.7	--	--	--
SD	0.8	--	--	--
Range	2.3 – 6.2	--	--	--

Figure 1: Incubation Period (Hours) of Cases Who Consumed Food Items at the World's Fair Park Benefit, Knox County, 2005 (N = 29)

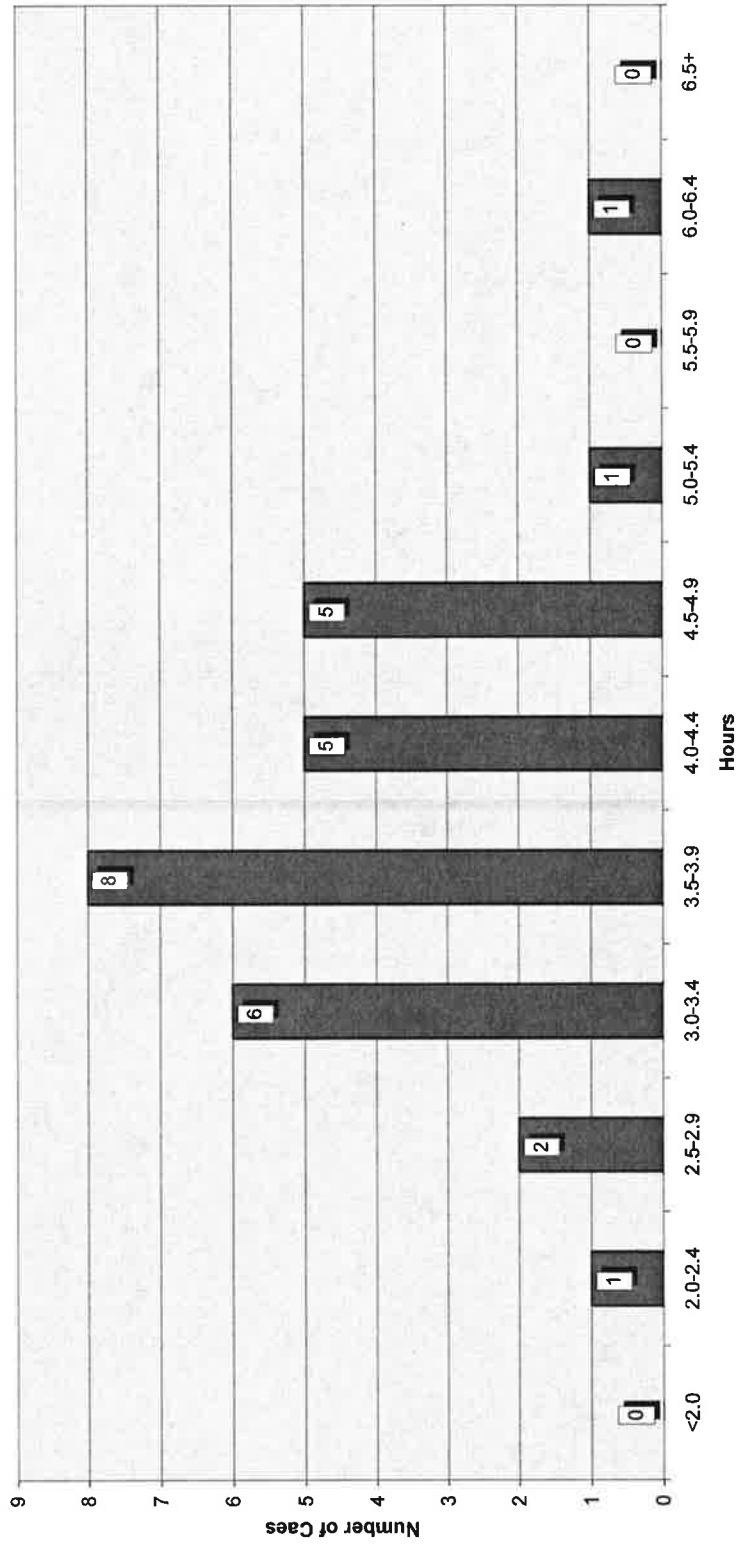


Table 2: Comparison of Consumption of Menu Items by Cases and Controls Who Ate at World's Fair Park Benefit, July 2005

MENU ITEM	# Cases (n=29)	%	# Controls (n=42)	%	ODDS RATIO	95% CI
Pork*	29	100.0	32	76.2	19.1**	1.1 – 339.7
BBQ Sauce	29	100.0	33	78.6	16.7**	0.9 – 300.0
Buns*	28	96.6	31	73.8	9.9	1.2 – 81.9
Baked Beans	28	96.6	36	85.7	4.7	0.5 – 41.0
Cole Slaw	24	82.8	32	76.2	1.5	0.5 – 5.0
Chicken Thighs	0	0.0	13	31.0	0.0	0.0 – 0.7
Bottled Water	6	20.7	15	35.7	0.5	0.2 – 1.4
Canned Soda	21	72.4	26	61.9	1.6	0.6 – 4.5
Beer	2	6.9	5	11.9	0.5	0.1 – 3.0

* p < 0.05

** These Odds ratios were calculated using a logit estimator that uses a correction of 0.5 in every cell of those tables that contain a zero.