



COUNTY OF DURHAM HEALTH DEPARTMENT

***Salmonella* Outbreak Associated with Bullock's Bar-B-Que Restaurant in Durham County, NC**

Facility Name: Bullock's Bar-B-Que/ 3303 Quebec Drive, Durham, N.C. 27705

Facility Contact's Name: Tommy Bullock

Date of Final Report: July 14, 2010

Background:

On Friday, April 23, 2010, Durham County Health Department (DCHD) Environmental Health staff received a call from a manager at a local business, who reported that eight employees had become ill as of April 22, 2010 after eating food included in a catering order from Bullock's Restaurant on April 20th. An investigation was initiated by DCHD Environmental Health and Communicable Disease staff. Over the weekend, calls were received through the DCHD On-Call pager from Durham Regional Hospital Emergency Department reporting that four individuals from a second group that picked up food at Bullock's on April 22nd and ate at home that same day had been hospitalized with a gastrointestinal illness. One individual from the initial group of ill employees was also hospitalized. Environmental Health staff visited Durham Regional on Sunday afternoon and collected food history information from the affected individuals.

On Monday, April 26, 2010, the Durham Epi-Team was convened and Incident Command System (ICS) structure was initiated. Initial reports from Durham Regional Hospital suggested that the suspected etiologic agent was *Salmonella* species based on stool testing from hospitalized patients. The N.C. Division of Public Health Communicable Disease Branch was notified by the DCHD Medical Director that morning, and several conference calls were subsequently scheduled throughout the week. David Bergmire-Sweat, MPH, (Foodborne Disease Epidemiologist, NC Division of Public Health), Larry D. Michael, RS, MPH, (Branch Head, Food Protection Branch NC Division of Environmental Health), Christopher Harris, (NC Department of Agriculture and Consumer Services), Durham Epi-Team members and Gayle Harris, Health Director were among those participating in the conference calls. On April 26th, a message was sent via the NC Health Alert Network to local health departments and a blast fax was sent to local medical providers to alert them of the suspected outbreak and the need to report suspected cases.

Information obtained from Bullock's indicated that they had a large volume of restaurant patrons per day, and provided several catered events per day. Notification of contact persons for several of the catered events from April 20-25th was conducted to identify other ill persons. A press release was issued on April 27, 2010 for additional case finding, and Gayle Harris, Health Director, was interviewed by several local news outlets. A hotline was established by DCHD to receive calls from individuals who had concerns or symptoms related to the investigation. Through the end of business on May 13, 2010, seventy five calls were received. There were several reports of symptomatic individuals who fit the case definition of salmonellosis who ate at the restaurant, in addition to those who reported symptoms in association with take-out or catered events. A foodborne questionnaire was developed by DCHD and reviewed by NC Communicable Disease staff. DCHD staff obtained food history and contact information from callers to the hotline including the ill and non-ill using these questionnaires.

Environmental Health staff interviewed and obtained food histories from employees at the initial business reporting the outbreak. Staff also interviewed each Bullock's employee for the presence of symptoms, and obtained food histories and hours worked from April 20- 24th as the potential exposure period. Although no illnesses were reported by Bullock's staff, employee stool samples were collected for processing to determine potential asymptomatic infections.

No food prepared from the April 20-24th time period remained in the restaurant. However, DCHD Environmental Health was able to collect a few food samples from symptomatic individuals who had saved food from the time period in question. These samples were sent to the State Lab for processing.

DCHD Communicable Disease staff interviewed all reported cases with suspected salmonellosis to obtain food histories and facilitate the shipment of stool samples obtained by their primary medical providers to the State Lab for confirmation and PFGE analysis. Line listings were developed and compiled for cases and specimen testing. As cases were confirmed at the State Lab as *Salmonella enteritidis*, DCHD Communicable Disease staff reported the information through NCEDSS. A second press release was issued by DCHD on May 6, 2010 to notify the public regarding the exact cause of the outbreak.

Epidemiologic Investigation:

Descriptive epidemiology:

Total # Meeting Case Definition:	65
Total # Cases Confirmed by State Lab:	22
Total # of hospital admissions:	8
Total # of deaths related to outbreak:	0

Knowledge of this outbreak began with communication from an employer whose employees became ill after a catered event. Information about these employees food history was used in a cohort analysis to find out if any particular food or beverage might be associated with illness. Fifteen ill employees were included in this analysis. Of the 15 employees, 10 met the case definition of having experienced vomiting or diarrhea after having consumed food at the catered event between 4/20/10 and 4/24/10. Symptom onset had to begin within seven days of food consumption. The age range was 27 – 68 with a median of 40. Five (71%) of the ill employees were male and two (29%) were female. Three were unknown. The date of consumption was 4/20/10 for all 10 of these employees and the date of illness onset ranged from 4/20/10 – 4/22/2010.

Initial analysis of this cohort of 15 employees showed that those who consumed banana pudding were 2.62 times more likely to become ill than those not consuming banana pudding. No other food items produced such a strong association.

As more interviews for cases and controls were completed, a case-control analysis was initiated. Selection of cases and controls was based on what was known at the time regarding the incubation period for Salmonella and dates of consumption for known ill individuals. There were 65 subjects meeting the case definition of having been ill with vomiting or diarrhea within seven days of consuming food from a Bullock's BBQ restaurant. Dates of consumption had to be between 4/20/10 and 4/24/10 to meet the case definition. If a positive *Salmonella enteritidis* result was received for a patient, he/she was classified as a case even if dates of consumption and/or onset were slightly out of range. Controls were well meal companions to cases. Additional cases and controls were obtained from a hot line that was established by DCHD to receive calls from individuals who had concerns or symptoms related to the investigation. Knowledge of the hotline was made available though media outlets. Nurses answering calls completed questionnaires with these individuals.

106 questionnaires were received, entered, and analyzed by the state department of health. The final dataset contained 65 cases and 41 controls. Ages of cases ranged from 9 to 87 with a median of 51 years. There were 30 males (52%) and 28 females (48%). Analysis was completed using SAS 9.1 to obtain odds ratios and p-values using the Fisher's Exact test.

The symptom profile of the 65 cases is as follows:

Symptom	# of People Reporting	% of Ill
Nausea	50	76.9%
Vomiting	40	61.5%
Diarrhea	61	93.8%
Bloody Diarrhea	7	10.8%
Abdominal Cramps	54	83.1%
Fever	37	56.9%
Chills	40	61.5%
Headache	34	52.3%
Body Aches	31	47.7%
Fatigue	39	60.0%
Constipation	3	4.6%
Other Symptom	5	7.7%

Based on menu items collected from the restaurant, the following items were included in the questionnaire and statistically tested for association with illness. Banana pudding and chocolate pie were combined to create a new variable, dessert, which was found to be significantly associated with illness. A table listing each food item exposure, the odds ratio, confidence intervals and p values is included below. In calculating p values, Fisher's Exact p values were selected due to the small number of occurrences in some cells and a desire to be consistent. Fisher's Exact is a more conservative test than the usual Mantel-Haenszel chi-square test.

	Odds Ratio	Lower Limit	Upper Limit	p-value (Fisher's Exact)
Brunswick Stew	1.24	0.56	2.72	0.69
Barbeque Pork	0.75	0.34	1.65	0.55
Fried Chicken	1.28	0.53	3.12	0.66
Fried Shrimp	1.60	0.56	4.57	0.45
Coleslaw	1.02	0.47	2.23	1.00
Macaroni and Cheese	1.59	0.59	4.27	0.47
Breen Beans	0.58	0.20	1.69	0.40
Hushpuppies	0.78	0.35	1.71	0.55
Banana Pudding	1.82	0.74	4.48	0.27
Chocolate Pie	3.89	0.80	18.90	0.11
Dessert	3.01	1.27	7.12	0.01
Tea	1.08	0.48	2.46	1.00
Sweet Tea	0.73	0.16	3.38	1.00
Unsweetened Tea	0.52	0.07	3.70	0.64
Ice	2.13	0.64	7.14	0.27
Dinner Rolls	0.63	0.04	10.28	1.00
Other	2.10	0.90	4.89	0.09

The above table reveals that dessert is the only category of food that is statistically significant in its association with illness. There are other items listed with odds ratios above 1, but none are statistically significant.

Analysis results for the case-control study were consistent with results from the initial cohort analysis of 15 employees where banana pudding was the item most associated with illness. Of note is that the employee

cohort did not have chocolate pie on their menu. The common ingredient in the banana pudding from the employee cohort and the chocolate pie from the case-control study is meringue.

Meringue containing desserts were found to be associated with case status in this outbreak. Evidence between the cohort and the case-control studies both implicate desserts containing meringue as being associated with illness.

This epidemiologic analysis helped to narrow the focus of the investigation and move it forward appropriately.

Eating location (i.e. dine-in, take out, or catered) was not found to be associated with illness.

NC Division of Public Health staff entered data from food histories and compiled a statistical analysis of the case-control study. As a result of the preliminary findings and the odds ratios, focus was directed to the banana pudding and the chocolate pie. Further statistical analysis of food histories indicated that the outbreak was strongly associated with the meringue which topped both of these dessert items. Environmental Health staff reviewed all steps of Bullock's production process for these items, and samples of an egg white product used in the meringue production were collected and sent to the North Carolina Department of Agriculture (NCDA) for testing. A whole (commercially prepared) chocolate pie was also obtained from Bullock's and submitted for testing. Bullock's agreed to not serve these two dessert items during the investigation period.

Environmental Health Assessment:

Environmental Health staff reviewed Bullock's general production processes and food handling practices during sampling and investigative site visits. A subsequent review of inspection history revealed that the four previous (quarterly) inspection grades ranged from 93 to 96 percent (excluding the 2 point ServSafe certification bonus). Inspection reports indicated certain areas of the operation needing more proactive supervision by the management. These items included proper hot and cold storage practices for food, proper hand washing procedures, and cleaning/ sanitizing procedures. Best professional food safety practices were reviewed with Bullock's management during each of the investigatory visits.

Additional visits by Environmental Health and State staff were made to Bullock's BBQ to examine equipment used in the production of the meringue. Swab samples were taken from the mixer. In a subsequent visit, Brett Weed, Food Defense Coordinator, NC Department of Agriculture and Consumer Services, and Larry D. Michael, REHS, MPH, visited the establishment with Environmental Health staff to conduct a "Swirl" test of the mixing machine. Additional samples were taken for testing to assist in identification of the source of the salmonella outbreak. All environmental tests conducted on surfaces and equipment in the restaurant were negative for Salmonella species.

Federal and Other State Agency Response:

The Centers for Disease Control and Prevention identified similar outbreaks of Salmonella enteritidis in other locations throughout the country. Specifically, restaurant associated outbreaks of Salmonella enteritidis were reported in Arkansas, Louisiana, Minnesota, West Virginia and Ohio in the weeks before, during or after the Durham County outbreak. Pulsed field gel electrophoresis (PFGE) testing in the national PulseNet system showed patients with indistinguishable PFGE patterns in Ohio and North Carolina in restaurants where the epidemiologically implicated food vehicle involved a common ingredient (commercially distributed pasteurized egg whites) sold by the same restaurant supplier, and manufactured in the same plant.

Laboratory Findings:

The confirmed etiology of the outbreak was *Salmonella enteritidis* Group D (serotyped by the State Lab). *Salmonella enteritidis* was confirmed among 22 individuals, but another 43 cases were identified with probable illnesses based on epidemiological data and their clinical symptoms. Two of those 43 cases also had *Salmonella* spp. identified from their stool specimens by a local hospital laboratory, but were not

confirmed by the State Lab. These cases were identified among an estimated 2000 individuals served by Bullock's during the three day exposure period. One positive stool sample was identified from an asymptomatic Bullock's employee. This employee was not working with food production or during the April 20-24 time period.

A sample of leftover chocolate pie, saved by a probable case, tested positive for *Salmonella enteritidis*. All other food samples were negative for *Salmonella*. Swab test samples from the mixer were also negative. Laboratory testing of pasteurized egg whites was conducted by the North Carolina Department of Agriculture and Consumer Services, the US Department of Agriculture, the US Food and Drug Administration, the Ohio Department of Agriculture, and the Minnesota Department of Agriculture. No product samples tested positive for *Salmonella* species. USDA Food Safety Inspection Service and the FDA sent a joint investigation team to the egg white manufacturing facility to evaluate manufacturing processes and found no violations. It was noted that although the egg white product used to make the meringue tested negative, it was from a different production lot from that used by the restaurant during the time period under investigation. None of the original production lot remained for testing.

Conclusions:

Analyzed data supports the assumption that the *Salmonella enteritidis* outbreak was probably not introduced through improper food handling practices by Bullock's staff or through faulty or contaminated equipment, although opportunities to improve sanitation and food handling practices in the restaurant were identified during this investigation. No obvious sanitation deficiencies related to the meringue production at Bullock's were identified that would explain this outbreak, however. The likely source appears to be from a commercially manufactured egg white food product, used to make meringue, which was delivered to the establishment. Product testing by the NC Department of Agriculture and other laboratories of this product has not conclusively proven that this wholesale ingredient was contaminated with salmonella. No additional cases of illness associated with this outbreak have been reported as of June 23, 2010.

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