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Review Article

A *Salmonellosis* Heidelberg Outbreak Traced to Roast Beef Served By Caterer -

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ABSTRACT

In July 2017, the Orleans County Health Department investigated a report of gastrointestinal illness from a corporate picnic that was catered. An environmental and epidemiological investigation identified 28 individuals who met the outbreak case definition. A detailed questionnaire based on the food that was served at the picnic was administered to the corporate employees that attended the picnic and respondent data was statistically analyzed. It was hypothesized from the statistical results that consuming roast beef ($P < .05$) was associated with becoming ill. An environmental investigation indicated that it was probable that the roast beef was potentially cross-contaminated at the caterer's kitchen by a strain showing similarities with a raw chicken isolate. A roast beef sample and two stool samples from ill attendees were collected and sent for laboratory testing. *Salmonella* Heidelberg was identified in all of the samples by the New York State Department of Health (NYSDOH) Wadsworth Laboratory. This outbreak demonstrates the importance of food service employees following proper preparation techniques in order to prevent cross-contamination.

INTRODUCTION

The bacterium *Salmonella* is the most common cause of bacterial foodborne illness in the United States [1,2]. Common food sources for *Salmonella* include poultry, beef, eggs, raw milk, vegetables, fruits and contaminated products such as low-moisture food products [3-5]. Illness occurs when contaminated foods are ingested. Once *Salmonella* is ingested, it typically takes 6-72 hours for a gastrointestinal illness (fever, abdominal cramps, diarrhea, nausea, vomiting) to develop [6]. Fatalities are rare but can occur amongst the very young, elderly or immunosuppressed [6].

On the afternoon of August 4, 2017 the Orleans County Health Department (OCHD) was notified of illness among patrons of a company picnic from The New York State Dept. of Public Health Western Regional Office. A catering company provided food for the company picnic on July 28, 2017. This article details the outbreak investigation conducted and highlights the importance of food safety.

MATERIALS AND METHODS

On Friday July 28, 2017, a business was having their corporate picnic at a rented party hall. There was 64 people in attendance, 28 reportedly became ill with gastrointestinal illness after the picnic. This indicated a possible foodborne outbreak associated with this corporate picnic. OCHD initiated an epidemiological investigation into this matter. An outbreak definition was developed and was defined as an attendee of the corporate picnic who ate food at the party hall on July 28 or contact who consumed leftovers and who became ill with gastrointestinal illness in the following 7 days.

OCHD used a standard questionnaire that included demographics and consumption of food items at the party hall on July 28. The picnic members were also asked about symptoms, hospitalization and household illness. The food items in the questionnaire were based on the menu items that the caterer and the corporation provided.

OCHD collaborated with the corporation's Human Resource (HR) department to administer the questionnaire to the list of employees that were in attendance at the picnic. The HR department distributed and collected the questionnaires, OCHD then picked up the completed questionnaires from the corporation. There were 9 attendees to the picnic that were retirees; the OCHD mailed these individuals questionnaires to be completed and included a self-addressed envelope so the retirees could easily return it completed. Two questionnaires were completed by spouses of employees who did not attend the company picnic but consumed leftover food from the event.

From the completed questionnaires, an analysis was performed using Epi Info Version 7.2 and Microsoft Excel 2007. Two tailed-

Fisher's exact tests and two-by-two tables were developed to determine P - values associated with food items that were available at the picnic. Two picnic attendees had stool specimens collected from their doctor. A leftover frozen food specimen was collected by OCHD from an ill patron for laboratory testing.

Stool cultures collected from two picnic attendees were collected and analyzed at two local commercial laboratories. Stool cultures were also collected from the employees of the catering company and submitted for enteric testing. Leftover roast beef from the picnic was submitted to the New York State Department of Health's (NYSDOH) Wadsworth Laboratory for culture.

The Erie County Department of Health (ECDOH) conducted two visits to the catering company which is located in Erie County. A full inspection of the kitchen, facilities, food handling and storage practices, and the health of staff were assessed.

RESULTS

Out of the 64 individuals that attended the picnic, 58 responded to the questionnaire. The median age of the respondents was 53 years, with a range of 23-75. Thirty-one males and 27 females responded. Twenty eight people (48%) indicated that they had gastrointestinal symptoms, consisting of diarrhea (86%), abdominal cramps (86%), fever (50%), nausea (50%) and vomiting (14%).

The onset of the gastrointestinal illness occurred between July 28 - August 4, 2017 among the 28 individuals. The majority, 17 individuals (61%), became ill within 1-3 days after consuming food at the corporate picnic (Figure 1). Two spouses of employees also became ill within seven days after consuming leftovers that were brought home by an employee. In addition, one employee did develop symptoms associated with salmonellosis on the eighth day after the picnic. Although this does not meet the case definition it is worth noting. No additional illnesses occurred after this time period.

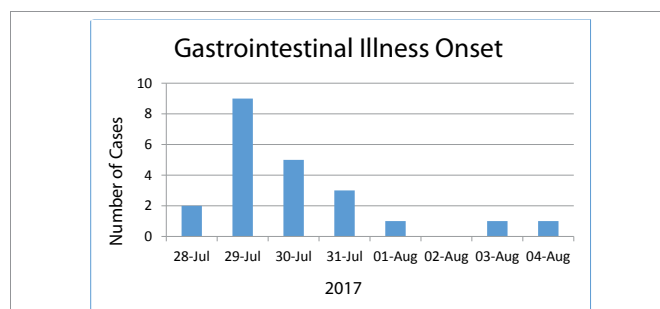


Figure 1: Epidemiological curve for onset of illness of employees and spouses that consumed food from caterer.



Of the food items most consumed at the picnic, a ‘two tailed-Fisher’s exact test and two-by-two tables identified two items as having a value of $P < .05$ and of being statistically significant in potentially causing the outbreak (Table 1). The roast beef provided by the catering company had a value of $P (.041)$ and the brownies provided by a local bakery had a value of $P (.048)$.

During the initial inspection, preparation, cooking and transporting all foods on the menu for the company picnic was discussed. No employees reported being ill. The sanitarian reported that the beef is cooked, cooled, sliced and packaged for reheat by the caterer. The majority of the food prepared by the company is done by one or two individuals. The company prepares a large volume of food each week. It concerned the sanitarian that only a few food handlers are tasked to prepare multiple food items at once. Specifically, cross-contamination could have occurred due to improper glove use or other factors by staff. The manager of the company stated that despite written glove policies being posted at the facility he has personally observed habits conducive to potential cross contamination.

The laboratory results indicated that the two stool cultures collected from the ill patrons were positive for *Salmonella* sp. from the commercial laboratories. The positive *Salmonella* cultures were submitted to Wadsworth Laboratory to confirm the results, identify serotypes, conduct Pulse-Field Gel Electrophoresis (PFGE) testing and Whole Genome Sequencing (WGS). PFGE is a technique used to generate a DNA fingerprint to identify common isolates. WGS is a technique used to capture the complete DNA sequence of the bacterium. *Salmonella* Heidelberg was identified by Wadsworth Laboratory and PFGE patterns matched each stool culture. The leftover roast beef cultured as *S. Heidelberg* and showed an indistinguishable PFGE pattern to *S. Heidelberg* stool isolates. The PFGE pattern was JF601.0022 for this outbreak. This finding disassociated the likelihood of the brownies to be a contributing factor to the outbreak. The PFGE pattern results were uploaded to the PulseNet (the molecular subtyping network for foodborne disease surveillance) database [7]. WGS analysis revealed that the two clinical samples and one food sample were highly related. The four stool cultures from the catering employees were negative for *Salmonella*.

Based on the outbreak strain of *S. Heidelberg*, PulseNet indicated that this pattern had been associated with chicken in

the past. The sanitarian suspected that cross contamination of raw chicken occurred. After the PFGE result, a secondary inspection was completed by ECDOH. This allowed the sanitarian to assess the preparation of the roast beef and potential cross contamination concerns with raw chicken. The sanitarian observed where food preparation was conducted and noted that the preparation area had separate tables for raw chicken and raw beef. The preparation of ready to eat foods is conducted in a separate room from where uncooked foods are prepared. The sanitarian reiterated the importance of proper hand washing and glove changes since at times one employee may be responsible for handling both raw and ready to eat foods. The sanitarian reviewed the company’s glove policy which was posted on the kitchen wall. A review of the policies regarding adequate cooling, refrigerated storage, disinfection, and cleaning was also completed. The sanitarian noted that the cleaning and sanitizing procedures were appropriate. The kitchen had adequate hand washing facilities and food storage was in compliance. The manager of the catering company indicated to the sanitarian during this review that they observed one employee not following the posted glove use policies and observed potential cross contamination. In addition, the ECDOH did not receive proof that the employee had participated in a food safety training program. The manager intervened and the employee was terminated from the catering company.

DISCUSSION

This outbreak indicates the significance of food service employees following company handwashing and glove use policies to prevent cross contamination. Employees must follow strict hand hygiene and glove changes when handling raw meats and ready to eat foods such as roast beef. Practicing proper glove use has been shown to reduce the transfer of pathogens from hands to food. A study by Green et al. indicates that only 23% of the time food handlers wash their hands when handling raw meats [8]. The employee that was terminated did not have food safety training such as ServSafe. ServSafe training provides food safety training and certification for the food service industry. A study by York et al. indicate that providing staff with food safety training such as ServSafe, increased compliance with handwashing [9]. Having employees become certified in a food safety training program such as ServSafe could reduce future incidents of cross contamination.

Table 1: Attack rate for food item consumed at company Picnic on July 28, 2017

Common Food Items	Ate				Common Food Items	Did not eat				P - Value
	ill	Not ill	Total	Attack Rate (%)		ill	Not ill	Total	Attack Rate (%)	
Apple/Honey Glazed Chicken	23	20	43	53.5	Apple/Honey Glazed Chicken	6	6	12	50.0	1
Roast Beef	29	20	43	59.2	*Roast Beef	1	6	7	14.3	0.041*
Sandwich Roll	27	17	44	61.4	Sandwich Roll	4	8	12	33.3	0.11
Horseradish	16	10	26	61.5	Horseradish	14	16	30	46.7	0.30
Macaroni and Cheese	27	23	50	54.0	Macaroni and Cheese	3	3	6	50.0	1
Pasta Penne and Meatballs	23	18	41	56.1	Pasta Penne and Meatballs	7	8	15	46.7	0.56
Parsley & Butter Potato	25	18	43	58.1	Parsley & Butter Potato	5	6	11	45.5	0.51
Chef Salad	14	10	24	58.3	Chef Salad	16	16	32	50.0	0.60
Italian Salad Dressing	3	3	6	50.0	Italian Salad Dressing	27	22	49	55.1	1
Ranch Salad Dressing	9	6	15	60.0	Ranch Salad Dressing	21	19	40	52.5	0.76
Rolls with Butter	7	4	11	63.6	Rolls with Butter	23	20	43	53.5	0.74
Brownies	14	4	18	77.8	*Brownies	20	21	41	48.8	0.048*

*Statistically significant.

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