



Clostridium perfringens
Intoxication Among Attendees of
a Luncheon Provided by an
Unlicensed Caterer
--Las Vegas, Nevada

Public Health Investigation Report

Southern Nevada Health District
Office of Epidemiology
Las Vegas, Nevada

February 2012

This document was last revised on February 1, 2012

This report represents the findings of the Southern Nevada Health District in the investigation of a gastroenteritis outbreak associated with *Clostridium perfringens* among attendees of a catered luncheon located in Las Vegas, Nevada.

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Acknowledgments

The following individuals are gratefully acknowledged for their contributions to this investigation and for their continuing collaboration.

- Tami Bruno, Patricia Rowley, Zuwen Qiu-Schultz, and Linda Verchick from the Southern Nevada Health District, Office of Epidemiology for their help in the epidemiologic and disease investigations.
- Pat Armour, Erin BATTERY, Paul Hug, Susanne Quianzon, Betsy Sapp, Sharon Johnson and Ken Stottler from the Southern Nevada Public Health Laboratory for the collection of clinical specimens and laboratory assistance.
- Mark Bergtholdt and Jessica Newberry at the Southern Nevada Health District, Environmental Health Division for the foodborne risk assessments and collection of food.
- Michele Bushnik, Jaime Frank, Robert Hoffman, and Mary Owens at the Nevada State Public Health Laboratory for laboratory testing of food and clinical specimens.

ABSTRACT

We describe an investigation of a gastroenteritis outbreak among attendees of a catered luncheon in Las Vegas, Nevada. The outbreak was suspected to be caused by *Clostridium perfringens* intoxication associated with improperly reheated food prepared in small microwave ovens by an unlicensed caterer. We conducted a retrospective cohort study, surveillance for additional illnesses, interviews regarding food preparation, and testing of food and clinical specimens. Of fifty luncheon attendees interviewed, 21 (42%) reported illness and 29 (58%) were not ill. Univariate analysis did not statistically implicate any food item. Stool samples collected from three ill luncheon attendees were positive for *C. perfringens* enterotoxin, and the same pathogen was also isolated in the ham and a plate of mixed-food that was served at the luncheon. To prevent such outbreaks, preparers of food for large catering events must re-heat food to >165°F (74°C) to kill *C. perfringens* vegetative cells, and to avoid holding potentially hazardous foods for prolonged periods at temperatures favorable for microbial growth.

BACKGROUND

On December 9, 2011, the Southern Nevada Health District (SNHD) received reports of gastrointestinal illness from attendees of a catered luncheon at Business A, located in Las Vegas, Nevada. Luncheon attendees ate on December 8, and many people reported symptoms of diarrhea after consuming food from the luncheon. In response to these illness reports, the SNHD initiated an investigation.

On December 9, 2011, the SNHD initiated a retrospective cohort study and surveillance for additional illnesses, determined the methods food was prepared by the caterer, and collected food and stool specimens for testing. The SNHD Office of Epidemiology (EPI), Environmental Health (EH), Southern Nevada Public Health Laboratory (SNPHL), and the Nevada State Public Health Laboratory (NSPHL) collaborated on the investigation and response to this outbreak. The U.S. Food and Drug Administration (FDA) was also notified of the event.

METHODS

Epidemiology

A case is defined as a person who consumed food and/or beverages at the luncheon at Business A on December 8, 2011 and experienced ≥ 3 loose stools and/or ≥ 1 episodes of vomiting during a 72-hour period after eating.

The EPI staff searched the SNHD foodborne illness complaint database to identify other complaints against the caterer in the 30 days prior to, and since, these complaints. The EPI staff attempted to identify additional ill luncheon attendees via an electronic questionnaire. All employees of Business A were recruited to complete the survey, which queried respondents on illness, symptoms, and specific food and drinks consumed at the luncheon.

Descriptive statistics (medians, ranges, and percents) were used to describe age, gender, gastrointestinal symptoms, duration of illness, and incubation periods. Univariate analysis (relative risk (RR) and 95% confidence intervals) was calculated for

each food item served during the luncheon at business A using Statcalc (Epi Info, version 6). The p-values ≤ 0.05 were considered significant.

The Food and Drug Administration (FDA) was notified that the ham served at the luncheon may have been contaminated with *Clostridium perfringens* during the Nevada Foodborne Illness/Food Defense Surveillance and Response Workgroup on January 5, 2012.

Environmental Health

The EH staff reviewed the SNHD food establishment database to determine if the caterer was permitted by SNHD to hold a catering license in Clark County. EH staff also interviewed the caterer to determine if there were reports of illness among patrons of other recent catering events by the same catering company, catering staff who were recently ill with symptoms compatible with acute gastroenteritis, staff job duties, and the methods of food preparation and service for the luncheon.

Select staff members of Business A were also interviewed regarding the caterer's methods of food preparation while on-site.

On December 9, EH staff also collected leftover food items served at the luncheon for microbial evaluations.

Laboratory

Ill luncheon attendees and the two asymptomatic employees of the catering company were asked to provide stool specimens for testing. The SNPHL performed

cultures for enteric pathogens (*Salmonella*, *Shigella*, *Campylobacter*, strain O157 of *Escherichia coli*, and *Yersinia*), and enzyme-linked immunosorbent assay for Shiga toxin-producing *E. coli* (STEC). Norovirus testing was done by real-time reverse transcriptase-polymerase chain reaction.

The SNPHL forwarded stool specimens collected from ill luncheon attendees to the NSPHL to test for the presence of *C. perfringens* enterotoxin by reverse passive latex agglutination, and select leftover food items from the lunch service for *C. perfringens* culture tests.

The SNPHL also forwarded stool specimens from ill persons to the Centers for Disease Control and Prevention (CDC) to test for the presence of caliciviruses (norovirus, astrovirus, and sapovirus).

RESULTS

Epidemiology

Approximately 150 people work at Business A. Of the 63 employees who replied to the electronic survey, 50 reported they consumed food and/or drinks at the luncheon. Of the 50 luncheon attendees, 21 (42%) people met the case definition (Figure 1). An additional 29 people who ate at the luncheon but did not become ill served as non-case study participants. No ill person sought medical attention from a healthcare provider.

Among 21 cases, the median age of ill persons was 42 (range 29-61 years). Ten (48%) were females and 11 (52%) were males. Twenty-one (100%) persons experienced diarrhea, 1 (4.8%) vomiting, and 2 (9.5%) reported having a fever.

The median incubation period was 13.5 hrs (range 5.5-44 hrs). Figure 1 shows of the 21 ill luncheon attendees, nearly all (n=20; 95%) reported illness \leq 25 hrs after eating, with only 1 (5%) person reporting illness >25 hrs after consumption of food.

The majority (n=11; 52%) of case-luncheon attendees were ill for <24 hours. The rest experienced symptoms that lasted 24-48 hrs (n=9; 43%) and 49-72 hrs (n=1; 5%).

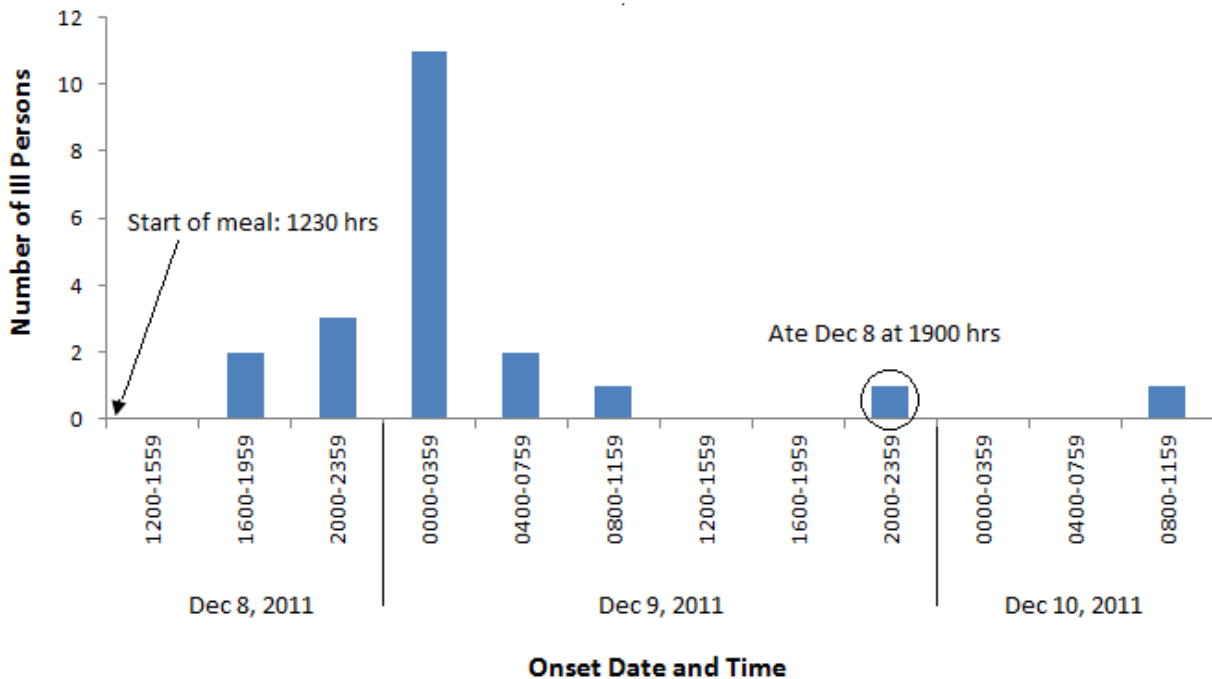


Figure 1. The number of ill persons (n=21) by onset date and time. The circle denotes a person who ate later than the other luncheon attendees. Business A. Las Vegas, NV. December 8-10, 2011.

The caterer had a health card that is issued by the SNHD to food handlers. However, the caterer did not hold a catering permit issued by the SNHD; thus, we were not able to determine if there were other reported illnesses associated with the catering business through the foodborne illness complaint database, as it only tracks complaints against licensed businesses.

A total of two catering employees worked to prepare food prior to and at the luncheon. The catering manager reported that both staff members had been asymptomatic in the week prior to working the luncheon, and both employees were not currently ill. The catering manager alleged that the catering company did not work at other catering functions in the month prior to the luncheon.

Univariate analyses of menu items did not show any statistically significant elevated risk for any food or drink item served at the luncheon (data not shown).

The FDA did not perform a food traceback or recall action of any food served at the luncheon.

Environmental Health

Both the caterer and a representative from Business A reported that the caterer arrived at 9:00 am on December 8, and lunch service started at approximately 1230 hrs (meal start time among ill persons ranged from 1130 to 1900 hrs) (Fig. 1). The duration of the luncheon was unknown.

The foods served at the party and their preparation methods are listed in Table 1.

Table 1. The risk factors, their sources and preparation methods during luncheon service at Business A. Las Vegas, Nevada. December 8, 2011.

Food	Source	Added on-site	Microwaved	Chafing
Ham	Pre-cooked, ready-to-eat	Canned pineapple	x	x
Turkey	Pre-cooked, pre-sliced, ready-to-eat	Canned gravy	x	x
Gravy	Canned	Turkey	x	x
Cranberry sauce	Canned			
Cornbread stuffing	Packaged dry mix	Hot water, butter, canned broth		x
Whipped potato	Instant flakes	Hot water		x
Sweet potato	Canned	Marshmallow, spices	x	x
Green beans	Frozen	Sliced almonds	x	
Salad	Pre-mixed, pre-washed	Watermelon, canned orange, walnut, feta cheese, bottled dressing		
Rolls	Ready-to-eat			
Pies	Ready-to-eat			
Lemonade	Powdered mix	Water, ice		

The caterer reported that all foods served were pre-cooked and ready-to-eat. The ham and turkey breasts were transported to Business A in a cooler with ice. Both meats were further sliced onsite, placed in bowls and re-heated in 5-6 batches per meat in two small non-commercial microwave ovens that were provided by Business A at the catering site. The caterer reported that food batches were stirred during heating. The caterer alleged the temperature of the meat was 170°F (76.7°C) after heating, but it was unclear where the temperature was taken in the meat. Heated ham slices were pooled in one chafing pan and canned pineapple with its juice was added. Heated turkey meat was pooled in another pan and heated canned gravy was added. The

chafing dishes containing the ham and turkey were warmed by pans of hot water that was heated with Sterno heaters. Both meats were stored in their respective chafing dishes for about 0.5 hr prior to eating, but the duration of time foods were stored in the chafing dishes was not known.

Upon collecting foods for testing, EH staff observed that leftover foods were stored in a refrigerator that displayed the temperatures of <40°F, with the bulk of the food stored in covered consumer-grade plastic containers. All remaining food in their original containers was collected for testing and included: Mashed potatoes, ham and pineapple topping, green beans, salad with fruits, and two mixed-food plates containing 1) Ham, turkey, mashed potatoes, stuffing, green beans, and 2) Stuffing, mashed potatoes, green beans.

The EH staff sent a formal notice to the caterer requiring all food operations to immediately cease and desist. They also required that the website which advertises the catering business be modified to announce that a permitted food facility will be providing the food to future events that are planned by the catering company. Additionally, EH also issued a bill to the caterer charging for the time that EH staff had spent in investigating the outbreak.

Laboratory

SNPHL: Of the five stool specimens collected, three were from ill luncheon attendees and two were collected from the catering staff. All STEC, stool cultures, and norovirus tests on specimens provided by the three ill luncheon attendees were

negative. Only cultures were performed on the stool specimens provided by the catering staff, and the results were negative.

NSPHL: *C. perfringens* enterotoxin was detected in the three stool specimens collected from ill luncheon attendees.

The following foods were tested: Mashed potatoes, ham and pineapple topping, and a mixed-food plate (ham, turkey, mashed potatoes, stuffing, and green bean). Food testing revealed ten and 60 colony forming units of *C. perfringens* per gram of food were isolated from the ham/pineapple and from the mixed food plate, respectively. No *C. perfringens* was isolated in the mashed potatoes.

CDC: Stool specimens from the three ill luncheon attendees were negative for caliciviruses.

DISCUSSION

The *C. perfringens* outbreak at Business A affected at least 21 people, with all case-luncheon attendees consuming food prepared by an unlicensed caterer on December 8, 2011. All ill people experienced diarrhea, with the duration of illness lasting ≤ 48 hrs. *C. perfringens* enterotoxin was detected in the stool of ill persons, and the pathogen was also isolated from food items served at the luncheon. The vehicle of transmission was likely the ham, resulting from improper heating and hot holding of food during the luncheon service.

The median incubation period was 13.5 hrs (range 5.5-44 hrs), with 95% of ill respondents reporting that they experience illness ≤ 25 hrs after consumption of food.

This is highly consistent with other reported incubation periods for *C. perfringens* of 10-12 hours (range 6-24 hours) [1] after ingestion of the implicated food. Also consistent with clinical characteristics of *C. perfringens* intoxication, reports of diarrhea were common while vomiting was rare [1, 2] in ill persons.

We were not able to determine any statistically significant food. Perhaps because the menu only featured a small number of items, the significance of consuming a specific food item between cases and non-ill participants were not detected as all were likely to consume the same foods at the luncheon.

Although *C. perfringens* is commonly found in soil, water, dust, food and the intestinal tract of humans and other animals [2, 3], inadequately heated or re-heated meat and gravy made for large-scale service are often implicated in *C. perfringens* outbreaks [1, 5]. The isolation of *C. perfringens* was strongly suggestive that ham was the vehicle of transmission, and an error likely occurred during its re-heating and hot holding during the luncheon service. The heat generated by a small microwave oven might be insufficient to bring all portions of the ham to above 165°F (74°C) to destroy the *C. perfringens* bacteria [6]. When the heating process is not evenly accomplished, the surviving *C. perfringens* bacteria can multiply and undergo sporulation. During the holding period where food is kept warm in covered chafing pans for extended periods of time, the spores can germinate to produce vegetative cells and multiply rapidly to large numbers [3, 4]. Ingestion of the bacteria during the luncheon may have resulted in further multiplication and sporulation in the intestine. The release of enterotoxin when *C. perfringens* sporulates can cause acute diarrhea. To prevent the proliferation of

pathogens in potential hazardous food, the US FDA Food Code 2009 [6] recommends that food that are reheated in a microwave for hot holding shall be reheated so that all parts of the food reach a temperature of at least 74°C (165°F) and the food is rotated or stirred, covered, and allowed to stand covered for 2 minutes after reheating (Section 3-403.11.B). Also, hot holding of such foods should occur at 57°C (135°F) or above (Section 3-501.16.A1).

The majority of *C. perfringens* outbreaks are often the results of improperly cooled food or food held at room temperature for extended periods [1]. Coupled with concurring epidemiological findings that the contamination and proliferation of the bacteria may have occurred at the luncheon, no further food traceback or recall action of the ham was implemented by the FDA.

There were several limitations in our investigation. One limitation was only a limited number of uneaten foods were available for testing. Also, some of the foods that were available for testing were mixed together, thus even though the composite food sample tested positive for *C. perfringens*, it was not possible to determine which component of the composite food sample (other than ham) was contaminated. Second, EH was not able to perform an environmental investigation of the caterer food preparation environment as the caterer did not hold a catering license issued by the SNHD. Unlicensed catering businesses can pose a health hazard to the public, since their food preparation facilities are not inspected, and guidelines for food cooking, storage, and re-heating methods are not enforced to ensure that food produced is safe for consumption.

The public health investigation led to the rapid identification of the outbreak. Testing of ill persons and food was instrumental in identifying an association among ill luncheon attendees and the food served by the caterer. Food catering businesses must prepare food in licensed and appropriate settings to allow for the proper cooking, cooling, re-heating, and storage of food, especially practices that concern re-heating meats for large scale events to prevent the proliferation of *C. perfringens*.

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