



**Salmonella Gastroenteritis Outbreak
Among Patrons of Firefly on Paradise Restaurant – Las Vegas, Nevada
Interim Report 2**

Linh Nguyen, PhD, MPH, Epidemiologist
May 10, 2013

BACKGROUND

On April 26, 2013, the Southern Nevada Health District (SNHD), Office of Epidemiology (OOE) received reports of gastrointestinal illness from 8 independent groups of patrons of Firefly on Paradise or the adjacent affiliated restaurant Dragonfly on Paradise (Firefly) located at 3900 Paradise Road, Las Vegas, NV 89109. All patrons from these groups ate at the restaurant during April 21-24, 2013. Ill patrons reported symptoms of diarrhea and/or vomiting after they consumed food from Firefly restaurant, and many sought medical care for their illness. In response to these illness reports, the SNHD initiated an investigation.

On April 26, 2013, the SNHD performed investigative inspections and closed Firefly and Dragonfly restaurants to minimize ongoing risk of illness. The SNHD OOE, Environmental Health (EH) and Southern Nevada Public Health Laboratory (SNPHL) have been collaborating on the investigation and response to this outbreak. The Centers for Disease Control and Prevention (CDC) and the Nevada State Health Division were also notified of the outbreak investigation.

METHODS

Epidemiology

A probable case is defined as illness in a person who consumed food served by Firefly restaurant during April 21-26, 2013 and experienced diarrhea (defined as ≥ 3 bouts of loose stools) and/or ≥ 1 episodes of vomiting during a 7-day period after eating. A confirmed case met the probable case definition and had *Salmonella* infection that was confirmed by PCR or bacterial culture of a stool specimen. We extended the incubation time originally selected for the case definition from 72-hours to 7-days after eating to accommodate possible longer incubation periods for *Salmonella*, which may occur from ingesting a low dose of the pathogen.

On April 26, 2013, OOE and EH staff visited the restaurant. OOE staff interviewed restaurant management and other employees regarding their illnesses in the past 2 weeks, their knowledge of other recent illnesses in restaurant staff and patrons, whether the restaurant had a sick employee policy, and if there were other customer complaints of illness.

OOE staff performed telephone interviews with ill restaurant patrons to obtain more information regarding their symptoms, food history, and illnesses. The SNHD foodborne illness complaint database was searched to identify other complaints against the restaurant in the 30 days prior to these complaints.

OOE staff performed surveillance for additional cases. Contact information of restaurant patrons who ate at Firefly during April 21-26, 2013 (the first and last meal dates of known ill persons) was obtained from telephone and oral interviews of ill people, electronic foodborne illness reports, confidential morbidity reports, notifications of illness by healthcare providers, and OpenTable, an online restaurant reservation system.

On April 29, 2013, OOE staff posted a notification on Epi-X, the CDC's web-based, national communications system for public health professionals, asking other health departments to report to us salmonellosis case-patrons with histories of travel to Las Vegas during the April 21-26 time period.

A preliminary case-control study was performed, using 32 case-patrons and 38 controls (restaurant patrons who ate at Firefly during April 21-26, 2013 but did not subsequently become ill) for whom we had food/drink consumption histories to try to identify statistical associations between having consumed specific food or drink items and subsequently developing illness. Univariate analysis (odds ratio (OR) and 95% exact confidence intervals (CI)) was also performed for each food item eaten by case-patrons or controls. Food items with CI ranges not including the value 1.0 were considered significant.

Among the food items collected on April 26 by EH staff (Table 1), those with the highest OR (Table 2) and/or associations with past *Salmonella* outbreaks were selected for laboratory testing.

Environmental Health

EH staff performed inspections of Firefly and Dragonfly restaurants on April 26, 2013 and an assessment of foodborne illness transmission.

EH staff collected various food items (Table 1) during the inspection for possible testing to determine whether one or more food item(s) could have been the source of the illness. On April 26, 2013 *Salmonella* had not yet been identified as the source of the outbreak; thus, the selection of these food items was based on EH staff's on-site assessment of the likelihood of the food being a source of contamination.

Inspections were also conducted on April 29, 2013 of the two other Firefly restaurant outlets located in Clark County.

EH staff met with Firefly representatives on May 2, 2013 and notified them of the actions that are necessary for the restaurant to re-open. Firefly management has fully cooperated with SNHD staff during the investigation.

Laboratory

Fifteen stool collection kits were dispensed to ill restaurant guests and staff to collect stool specimens for bacterial culture (*Salmonella*, *Shigella*, *Campylobacter*, *Escherichia coli* O157, *Yersinia*, and *Vibrio*), Shiga toxin-producing *E. coli* (STEC) testing, and norovirus RT-PCR testing.

SNPHL received additional microbial samples that had been identified as *Salmonella*-positive by local diagnostic laboratories for additional testing.

SNPHL staff performed *Salmonella* serotyping and pulsed field gel electrophoresis (PFGE, commonly known as “molecular fingerprinting”) on samples that tested positive for *Salmonella* to determine the outbreak patterns. These PFGE patterns were also submitted to PulseNet, a CDC database that enables rapid comparison of the PFGE patterns to facilitate identification of common source outbreaks. The SNPHL also received Firefly outbreak-related PFGE results from other states’ public health laboratories.

SNPHL submitted *Salmonella* cluster isolates to the CDC National Antimicrobial Resistance Monitoring System (NARMS) for antimicrobial sensitivity testing.

SNPHL stored the 35 food specimens collected by EH staff, and shipped 19 of these food specimens to the Nevada State Public Health Laboratory (NSPHL) for pathogen testing (Table 1).

RESULTS

Epidemiology

The epidemic curve as of May 5, 2013 is presented in the figure below and shows a total of 200 people (16 confirmed and 184 probable) whose illnesses met the case definition. All identified ill persons ate at Firefly during April 21 through April 26, 2013. Illness onset dates occurred within the April 22 to May 1, 2013 time frame.

The onset date with the peak number of ill restaurant patrons was April 24, 2013. Because the incubation period for *Salmonella* is usually 12-36 hours, this might suggest that patrons who ate at Firefly on April 22-23, 2013 had the highest risk of exposure to the pathogen.

A total of 33 Firefly employees were interviewed on April 26, 2013. Three employees were identified as having been recently ill with gastrointestinal symptoms after having eaten at Firefly within the previous 7 days of their illness; these workers submitted stool specimens. The OOE staff identified an additional ill staff member at a later interview, but stool testing was not offered to this employee. The onset dates of the 4 ill staff members are included in the figure below, and the timing of their illness onset dates suggests that none of these 4 restaurant workers was the source of the illness. The restaurant has a sick employee policy and employees may call-in sick when necessary.

We were notified of one customer complaint of illness made to the restaurant.

Thus far, surveillance for additional cases revealed 200 people who became ill after eating at Firefly during April 21-26, 2013. The Epi-X posting resulted in reports of salmonellosis from five public health agencies outside of NV. From various surveillance data sources, we have received reports of illness from restaurant patrons who normally reside in twenty states (AZ, CA, CO, HI, IL, MA, MN, MS, NC, NE, NV, NY, OH, OK, OR, PA, SC, TX, UT, WA) and two foreign countries (Canada, United Kingdom) who ate at Firefly during their visits to Las Vegas.

Initially, suspicions were directed at the raw unpasteurized egg-based aioli sauce served at Firefly, because many ill patrons had reported eating it and the historical association between eggs and *Salmonella*. However, epidemiologic analysis showed that aioli was not associated with illness. The OR and 95% CIs for food items eaten by case-patrons and controls, presented in Table 2, show that case-patrons were significantly more likely than controls to have consumed a number of menu items. No single menu item appeared to be the likely source for the outbreak. Additionally, no common factors or ingredients were identified among the statistically significant menu items. We also looked for associations between illness and several

common ingredients such as parsley, aioli, and grated hard cheeses (parmesan and manchego). Of these, only the grated hard cheeses showed a statistical association with illness. However, many of the statistically significant menu items contained none of that cheese.

Environmental Health

The Firefly on Paradise restaurant used two adjacent permitted kitchens, Firefly on Paradise (SNHD Permit Number PR0013375) and Dragonfly on Paradise (SNHD Permit Number PR0015008), to prepare food for their customers. During the inspections, observed violations that could have contributed to an outbreak of a foodborne disease included employees not washing their hands properly, employees using bare hands to dispense ready to eat foods, foods contaminated by debris-filled liquid, improper cooling practices of potentially hazardous foods, improper holding temperatures of numerous potentially hazardous foods, improper food storage that included raw animal products stored above ready to eat foods, improper storage of in-use utensils, and inadequate cleaning and sanitizing of preparation surfaces.

The results of the inspection were 44 demerits for Firefly and 47 demerits for Dragonfly on Paradise. Both facilities were closed by SNHD on April 26, 2013 because of the investigation into the reports of illness (SNHD Regulations Governing the Sanitation of Food Establishments 8-304.11) and the excessive number of violations noted at each facility that resulted in > 40 demerits (SNHD Regulations Governing the Sanitation of Food Establishments 8-303.11B).

Thirty-five samples of various foods (Table 1) were collected during the inspection and submitted to the SNPHL for possible testing to determine which food item(s) could have been the source of the illness.

Inspections of the two other Firefly restaurant outlets located in Clark County showed Firefly Westside (9560 W. Sahara Ave., Las Vegas) received 30 demerits and Firefly on Eastern (11261 S. Eastern Ave., Henderson) received 6 demerits. Both of these restaurants remained open because neither establishment received > 40 demerits, and were required by SNHD to rectify their respective infractions within 15 business days of the inspection. On May 1, 2013 Firefly Westside restaurant was re-inspected and found to be in compliance and received 0 demerits. Since Firefly on Eastern retained an "A" rating after the first inspection, it did not receive any further inspection.

We have begun tracebacks of some food products that either arrived raw to the restaurant or served uncooked to patrons to try and identify how the food may have become contaminated at its source, during delivery, storage or preparation.

Firefly on Paradise and Dragonfly on Paradise remain closed at this time. Before the facilities will be permitted to be re-opened by SNHD, the following requirements must be met:

1. A Person-In-Charge (PIC) who has completed a Certified Food Safety Manager (CFSM) training program must be present and responsible at the facility at all times including evenings, weekends, and breaks. The designated PIC staff must be knowledgeable of all food safety measures associated with the operation and be actively supervising to assure the food-handling staff performs duties in compliance with SNHD Regulations. SNHD may request a schedule that verifies that a CFSM is onsite during all operating hours.
2. The SNHD will verify that the facility owner has obtained the services of a Food Safety Consultant who will assist the facility in implementing measures to assure ongoing active managerial control of risk factors for foodborne illness. This would include Standard

Operating Procedures, employee training, and methods to verify ongoing safe food-handling practices by facility management.

3. The facility shall actively monitor all food products during cooling and maintain cooling logs until further notice by SNHD. These logs are required to be kept on-site for a minimum of one year.
4. Any menu items including sauces/dips that contain raw or undercooked animal products must have a consumer advisory statement and proper disclosure next to the item.
5. Facility must be cleared pending foodborne illness outbreak investigation by SNHD OOE.
6. The facility must pay the associated closure fee and pass a scheduled inspection with <10 demerits with no repeat critical or major violations.

Laboratory

Fourteen of 15 stool specimens requested of ill patrons and employees were received and tested by the SNPHL. Of the 14 returned specimens (which included specimens from 3 employees), 12 were positive and 2 were negative for *Salmonella* species.

Local microbiology laboratories submitted to the SNPHL 17 additional *Salmonella* isolates that were obtained at community clinics from ill Firefly patrons. Serotyping and PFGE were completed on 8 of these samples and those PFGE patterns all match the outbreak pattern. Nine samples are pending serotyping and PFGE analyses.

Serotyping of the isolates indicated that the outbreak strain was *Salmonella* (assigned with the antigenic code "1:4,5,12:i:-"). Thus far, all *Salmonella* serotypes and PFGE patterns processed by the SNPHL have matched each other. These PFGE patterns have been submitted to PulseNet to determine if they are related to other common source outbreaks in the U.S.

Three outbreak *Salmonella* isolates were sent to NARMS for antimicrobial sensitivity testing.

The SNPHL sent 19 food items (selected because of their high OR and/or associations with past *Salmonella* outbreaks) from the 35 collected from Firefly restaurant on April 26, 2013 (Table 1) to the NSPHL for analysis. Of the 19 food items that were sent, 11 (including the aioli) were negative and 8 are pending for *Salmonella* by RT-PCR. Eight food samples were negative and 11 food items are pending for *Salmonella* cultures.

CONCLUSIONS

As of May 5, 2013 at least 196 patrons and 4 employees who consumed food and/or drinks at Firefly restaurant during April 21-26, 2013 have been determined to be confirmed or probable cases of *Salmonella* infection.

FUTURE SNHD ACTIONS

1. Firefly should rectify faulty food storage equipment and practices to ensure that food will be produced in a safe manner for consumption.

2. The SNHD OOE staff will continue to characterize the outbreak through case finding, investigative, and data analyses activities.
3. The SNHD OOE staff will continue to monitor for additional complaints of illness to determine whether the outbreak is limited to this establishment or has spread to the general community.
4. The SNHD OOE will report out-of-jurisdiction confirmed cases of salmonellosis to the Nevada State Health Division, which will notify the appropriate public health agencies of their respective ill residents.
5. The SNHD EH staff will continue to monitor and enforce corrective actions required of the Firefly restaurant management prior to the re-opening of the restaurant.
6. The SNHD EH staff will continue to conduct tracebacks of some food products to try and identify how the food may have become contaminated at its source, during delivery, storage or preparation.
7. The SNPHL will continue to perform serotyping and PFGE on the submitted specimens that were positive for *Salmonella* and to continue to submit these PFGE patterns to PulseNet to determine if illnesses among patrons from the different groups were linked.
8. The SNPHL will further analyze the collected *Salmonella* isolates by submitting them to PulseNet for multiple-locus variable number tandem repeat analysis (MLVA), a method used to perform molecular typing of particular microorganisms to study possible transmission routes and sources of infection.
9. The SNPHL will continue to facilitate the testing of food collected from the restaurant.

RECOMMENDATIONS

1. Food-service workers who test positive for *Salmonella* must be excluded or restricted from work per the FDA Food Code and will require approval from the SNHD to return to work.
2. Restaurant employees should be cautioned about how *Salmonella* is transmitted and be made aware of the heightened importance of hand hygiene through washing with soap and water. Information about salmonellosis can be found at the SNHD website <http://www.southernnevadahealthdistrict.org/health-topics/salmonellosis.php>
3. Food service workers should also be educated to the ways to clean and sanitize food preparation surfaces. Types of acceptable sanitizer solutions for use in a food establishment are located at the SNHD website <http://www.southernnevadahealthdistrict.org/ferl/sanitizer-fact-sheet.php>
4. Restaurants are advised to monitor and log all food products during cooling, and to cook all potentially hazardous foods thoroughly. All foods including ingredients that contain raw or undercooked foods must have a consumer advisory.
5. All suspected cases of *Salmonella* infection related to this outbreak should be reported to SNHD. Illness clusters (e.g. restaurants, schools, hotels) are reportable under Nevada Administrative Code sections 441A.525 and the SNHD Regulations Governing

the Reporting of Diseases, Exposures, and Sentinel Health Events section 4.9. Reports should be made to the SNHD Office of Epidemiology at (702) 759-1300, option 3, and can be made 24 hours a day, 7 days a week.

TABLES AND FIGURES

Table 1. Food samples collected (n=35) by Southern Nevada Health District Environmental Health Division from Firefly on Paradise and Dragonfly on Paradise restaurants on April 26, 2013.

Firefly on Paradise Restaurant	Dragonfly on Paradise Restaurant
Tetilla*	Aioli sauce*
Calamari*	Blanched fries
Chorizo 1*	Calamari*
Chorizo 2, cooked*	Chorizo*
Cooked pasta	Eggplant
Cooked rice*	Heavy whipping cream
Cut cooked potatoes	Parmesan*
Cut cooked potatoes 2	Rice
Garlic cream sauce*	Shrimp
Garlic cream sauce 2*	Stuffed mushroom*
Garlic in oil	Tartar sauce*
Lentils	Tempura batter*
Macaroni and cheese*	Tuna*
Mussel sauce*	Tuna 2
Mussel sauce 2*	Tuna skewer
Potato bravas	
Salsa verde	
Shrimp, raw	
Stuffed mushroom*	
Tomato sauce	

*Sample sent to the Nevada State Public Health Laboratory as of May 9, 2013.

Table 2. Illness association with selected food exposures at Firefly restaurant. Interviews conducted on patrons eating on April 21–25, 2013.

Food Item	Ill Exposed (N=32)		Not Ill Exposed (N=38)		Odds Ratio	95% Confidence Interval	
	No.	%	No.	%			
White Sangria*	9.5	28.8%	0.5	1.3%	31.1	1.7	560.0
Thai Beef Salad*	7.5	22.7%	0.5	1.3%	22.6	1.2	414.1
Crispy Duck Roll	8	25.0%	1	2.6%	12.3	1.4	105.0

Petite Filet	11	34.4%	2	5.3%	9.4	1.9	46.7
Parmesan or Manchego Cheese on Dish (12 dishes)	30	93.8%	25	65.8%	7.8	1.6	37.9
Fried Calamari	12	37.5%	4	10.5%	5.1	1.4	18.0
Steamed Mussels	7	21.9%	2	5.3%	5.0	1.0	26.3
Fish Sticks	8	25.0%	3	7.9%	3.9	0.9	16.2
Firefly Fries	18	56.3%	10	26.3%	3.6	1.3	9.8
Manchego Mac N Cheese	11	34.4%	5	13.2%	3.5	1.1	11.4
Chicken and Chorizo Stuffed Mushrooms	15	46.9%	9	23.7%	2.8	1.0	7.9

Table only includes food items with statistically significant odds ratios, or food items which at least 20% of ill-persons ate with odds ratios ≥ 3.0 .

Bolded food items show a statistically significant odds ratio.

*0.5 added to all cells for odds ratio calculations to approximate the OR and CI values where they otherwise could not be calculated, because no non-ill patrons had eaten the food item.

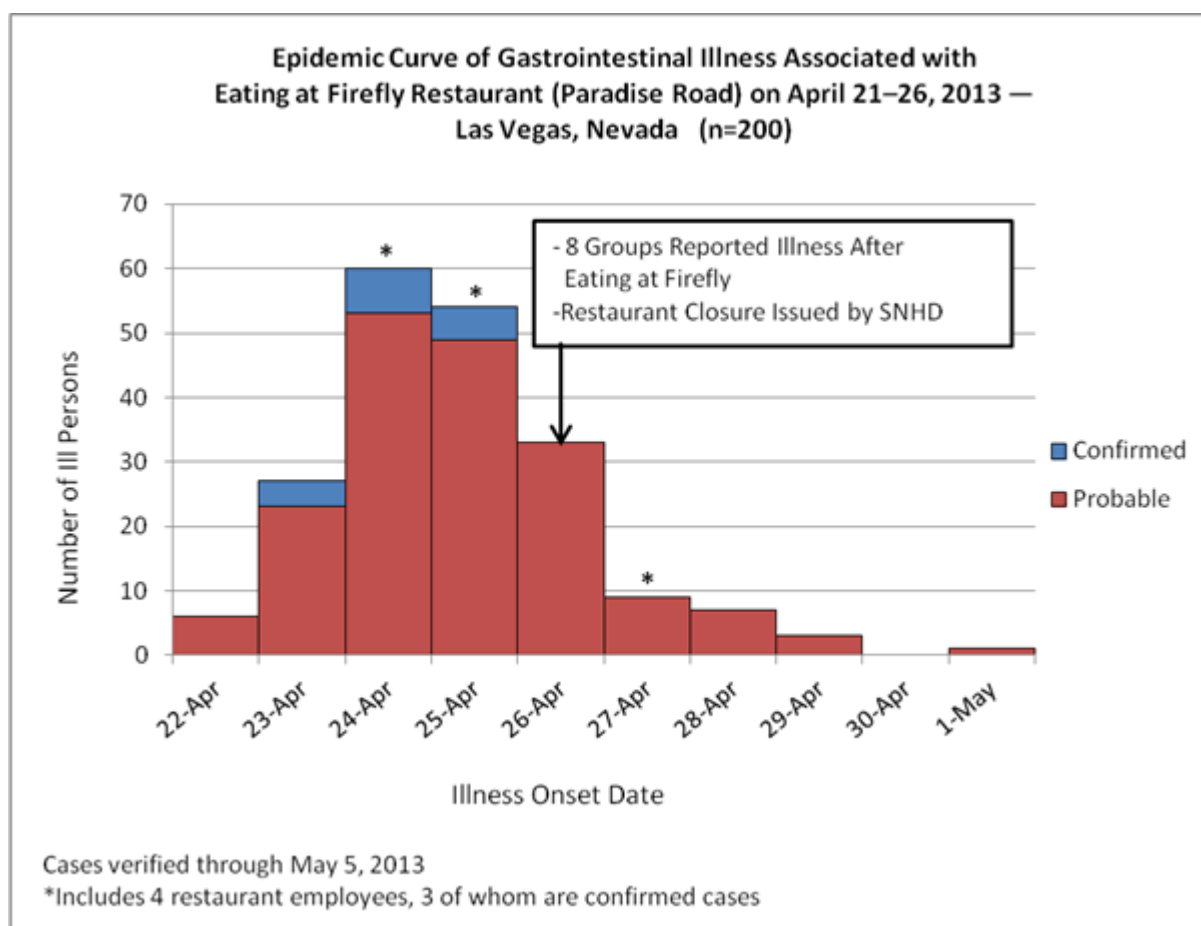


Figure. The number cases (n=200; Confirmed=16 and Probable=184) by illness onset date reported through May 5, 2013. Ill persons ate between April 21–26, 2013. Illness onset dates occurred between April 22 – May 1, 2013. Firefly on Paradise restaurant. Las Vegas, Nevada.

* Illness onset dates of restaurant employees.