



Norovirus Outbreak Among Attendees of a Dinner Gala at Griffin Mansions --Las Vegas, Nevada

Public Health Investigation Report

Southern Nevada Health District
Office of Epidemiology
Las Vegas, Nevada

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This report represents the findings of the Southern Nevada Health District in the investigation of a gastroenteritis outbreak associated with Norovirus among attendees of a dinner gala located in Las Vegas, Nevada.

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ABSTRACT

We describe an investigation of a norovirus (NoV) outbreak among 203 attendees of a dinner gala at Griffin Mansions on May 9, 2012 in Las Vegas, Nevada. The source of the norovirus infection was not identified, but the investigation revealed an unlicensed kitchen and a domestic well that might have provided contaminated potable water. We conducted a retrospective cohort study of attendees, surveillance for additional illnesses, employee interviews regarding food preparation, and testing of well groundwater and clinical specimens. Of 108 attendees included in our study, 51 (47%) reported illness consistent with our primary-case definition. Additionally, 12 persons reported illness consistent with our secondary-case definition, including 5 (nonattendee) household contacts of ill attendees, 4 persons who attended the event with a household partner and developed symptoms of illness several days after their partners became ill, and 3 attendees whose illness symptoms began too late to have been considered primary cases but whose contact with primary-case attendees was not determined. Epidemiologic analysis identified statistical associations between consuming several food items and subsequently becoming ill, but no other evidence exists to explain their associations with the outbreak. Seven stool samples collected from ill gala attendees and an asymptomatic staff member were positive for norovirus genotype I. Fecal coliforms were isolated in potable water collected from the onsite well. Norovirus testing of well water was negative. Businesses that cater to large groups must prepare food in licensed settings and adhere to regulations regarding public water systems.

BACKGROUND

On May 12, 2012, the Southern Nevada Health District (SNHD) received a report of gastrointestinal illness among attendees of a dinner gala at Griffin Mansions, a 9,300-square foot single family property on 1 acre of land located in Clark County, Nevada that was being used as an event venue. The gala was held on May 9, 2012 from 6 pm to 9 pm. The complainant became ill with symptoms of vomiting and diarrhea after the event and reported that about a quarter of the attendees had reported similar symptoms. In response to these illness reports, the SNHD initiated an investigation. Representatives from the SNHD Office of Epidemiology (Epi), SNHD Environmental Health (EH), and the Southern Nevada Public Health Laboratory (SNPHL) collaborated on the investigation and response to this outbreak.

METHODS

Epidemiology

We performed a retrospective cohort study of attendees of the dinner gala. The link to an electronic questionnaire was distributed to all gala attendees by one of their representatives. Survey questions were designed to collect information about recent illness, consumption of specific food items at the event, and other factors. We determined the total number of attendees from the event's seating chart.

Case Definitions: A case was defined as illness in a person who consumed food and/or beverages at the gala at Griffin Mansions on May 9, 2012 and experienced ≥ 3

loose stools and/or ≥ 1 episode of vomiting 0 to 72 hours after the event. A secondary case was defined as illness in an attendee or a household or close personal contact of a case-attendee who experienced ≥ 3 loose stools and/or ≥ 1 episode of vomiting >72 hours after the event.

Case Finding: We interviewed event staff in person or by telephone to obtain information about whether they experienced symptoms of illness, their specific job duties, and food and drinks they consumed at the gala. We conducted a secondary survey to learn whether household or other close contacts of gala attendees had subsequently become ill. We attempted to identify and interview individuals from other groups that attended events at Griffin Mansions during the week prior to May 9, 2012 to determine if any of those persons had recently been ill.

We used SAS[®] 9.3 (SAS Institute Inc., Cary, NC, USA) and Excel 2007 (Microsoft, Redmond, WA, USA) to obtain descriptive statistics and SAS[®] 9.3 to perform Fisher's Exact Test to obtain relative risk (RR) and 95% confidence intervals for each food item served at the gala in relation to attendees' illness status. Relative risks with p-values <0.05 were considered significant.

Environmental Health

EH staff conducted an inspection of the facility, checked the status of the facility's health permits, obtained the menu of food served, and inquired about staff and other complaints of illness. We also asked a manager at the company that provided

transportation to all guests from a remote parking lot to Griffin Mansions on May 9, 2012 whether any emetic events occurred in their vehicle(s) that day.

EH staff collected water at Griffin Mansions to test for the presence of coliform bacteria at three locations: at the hose bib closest to the well, a sink in the kitchen area, and a sink in the bar area. The hose bib closest to the well was also used to gather water samples for testing for the concentration of nitrate, nitrite, and phosphorous, and for the presence of norovirus (NoV).

Laboratory

Clinical Testing:

Ill dinner gala attendees and event staff (whether or not ill) 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). NoV testing was performed by real-time reverse transcription polymerase chain reaction (PCR). Stool culturing and STEC testing were discontinued after NoV was detected in multiple specimens.

Environmental Testing:

The water samples from Griffin Mansions' well, kitchen sink, and bar sinks were submitted by SNHD EH to commercial Environmental Laboratory A for total and fecal coliform count and the concentration of nitrate, nitrite, and phosphorus.

The large-volume water sample collected from the well was submitted by SNPHL to commercial Environmental Laboratory B for reverse-transcription quantitative PCR testing of NoV using the Environmental Protection Agency Method 1615.

RESULTS

Epidemiology

The gala at Griffin Mansions on May 9, 2012 was attended by 203 persons. Attendees reported that no other common events occurred among their group during the days immediately before the gala. Of the 112 (55%) attendees who completed the electronic survey, 4 surveys were excluded from analysis; 3 attendees reported having had diarrhea but their illnesses did not meet our case definition and 1 attendee's symptoms were compatible with the case definition except that they began 1 day prior to the event. Of the remaining 108 people included in our analysis, 51 (47%) reported illness that met the case definition. An additional 7 attendees developed symptoms compatible with the secondary case definition. For the purpose of attempting to identify factors associated with developing primary cases of illness, these 7 attendees were included in the analysis and considered not to have been ill; their illnesses were classified as secondary cases.

Among case-attendees, the median age was 31 years (range 22–80 years) and 26 (51%) were male (Table 1). The most commonly reported symptoms among case-attendees were diarrhea and vomiting (Table 2).

Table 1. Attendee characteristics.

Characteristic	All attendees* (n=108)	Case-attendees (n=51)
Median age	31 (22–80) years	31 (22–80) years
Male	54 (50%)	26 (51%)

*Of 112 valid survey responses, 3 were excluded for having had illness not meeting the case definition and 1 was excluded for having illness onset prior to the event.

Table 2. Symptoms reported by case-attendees.

Symptom	Case-attendees (n=51)
Diarrhea	41 (80%)
Vomiting	35 (69%)
Fever	19 (37%)

The median incubation period of primary-case-attendees was 37 hours (range 6-72 hours) (Figure). Incubation periods for cases of secondary illness could not be determined. One attendee (counted in Figure but excluded from analysis) reported illness onset prior to the gala, on the morning of May 9, 2012. Many case-attendees (n=23; 45%) were ill for <24 hours. The rest experienced symptoms that lasted 24-48 hours (n=18; 35%), or 49-72 hours (n=10; 20%). No ill person sought medical attention from a healthcare provider.

We identified a total of 12 persons who developed secondary cases of illness. Through secondary-survey responses from 14 attendees, we learned about a total of 19 close contacts, 5 of whom reported illness that met the definition for a secondary case and are included in our epidemic curve (Figure). In addition, among the 7 secondary-case attendees, 4 had attended the event with a household partner who had become ill first, but contact with ill attendees was unknown for the remaining 3.

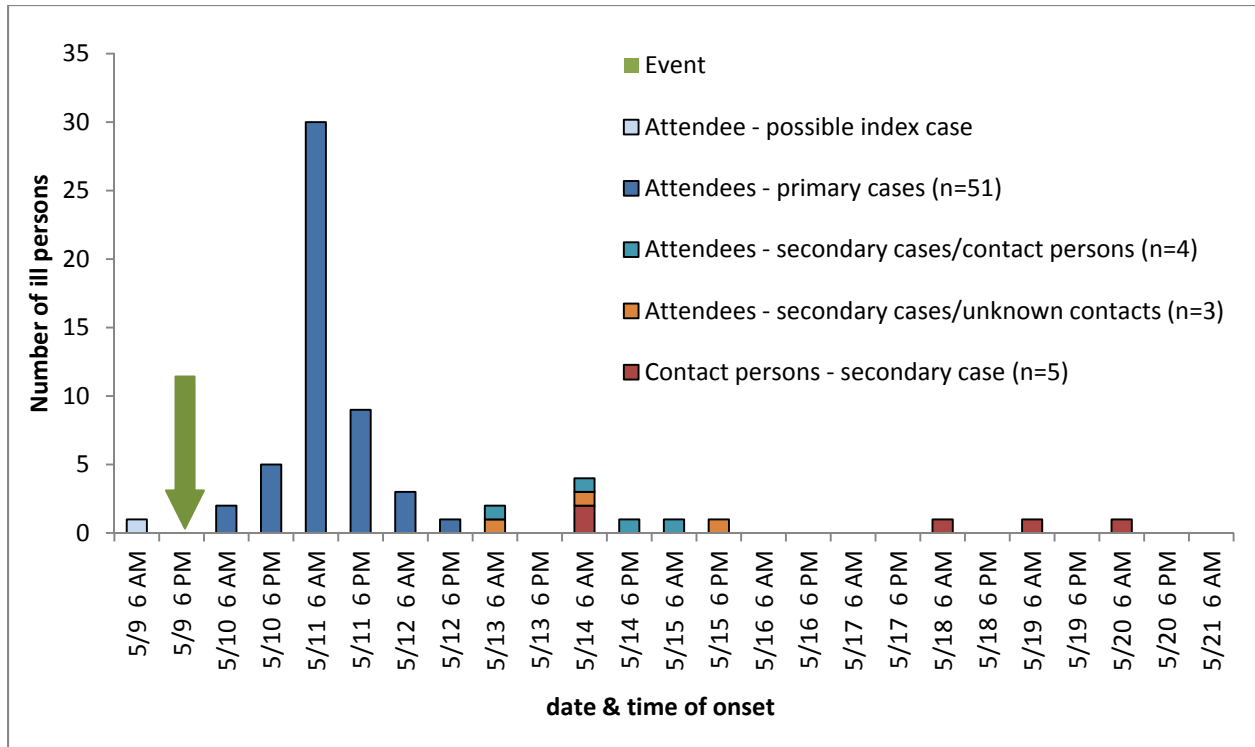


Figure. Gala attendees and their close contacts who reported symptoms compatible with the primary (n=51) or secondary (n=12) case definition or who could have been the possible index case (n=1), by onset date and time in 12-hour increments.

Seven event staff members who worked at Griffin Mansions on the day of the gala dinner were interviewed. Six denied symptoms of recent illness. The other person, who was not a food-handler, reported having had intermittent diarrhea over the previous 1-2 weeks, had sought medical attention, and was given a diagnosis of stress-induced irritable bowel syndrome. Despite numerous attempts, we were unable to reach and interview the caterer who prepared food and supervised other food-handlers at the event.

Statistical analysis showed that 4 food items were significantly associated with illness (Table 3), with rolls and butter having had the strongest associations. People who ate rolls were 2.3 times as likely to have become ill and people who ate butter

were 2.0 times as likely to have become ill than those who did not eat those food items. Many people ate both rolls and butter, but those who ate rolls but not butter were at no increased risk for becoming ill.

Table 3. Food and beverage items analyzed for association with becoming ill. **Bold text indicates statistical significance.**

Exposure	Exposed		Unexposed		RR	P value
	Cases/Total	Risk of Illness	Cases/Total	Risk of Illness		
Butter	35/57	61%	16/51	31%	1.96 (1.24 - 3.09)	.002
Rolls	43/76	57%	8/32	25%	2.26 (1.20 - 4.26)	.003
Mashed potatoes	19/29	66%	32/79	41%	1.62 (1.11 - 2.36)	.03
Chicken skewers	27/46	59%	24/62	39%	1.52 (1.02 - 2.25)	.05
Salad dressing	44/99	44%	7/9	78%	0.57 (0.39 - 0.86)	.08
Beef (main course)	32/77	42%	19/31	47%	0.68 (0.46 - 1.00)	.09
Tap water	47/94	50%	4/14	29%	1.75 (0.75 - 4.10)	.16
Pasta (main course)	4/5	80%	47/103	46%	1.75 (1.08 - 2.85)	.19
Chicken (main course)	19/33	58%	32/75	43%	1.35 (0.91 - 2.00)	.21
Potatoes 'Gilette'	31/73	43%	20/35	47%	0.74 (0.50 - 1.10)	.22
Ice	43/85	40%	7/23	35%	1.45 (0.80 - 2.64)	.24
Mixed vegetables	16/28	57%	35/80	44%	1.31 (0.87 - 1.96)	.27
Bruschetta	19/35	54%	32/73	44%	1.24 (0.83 - 1.85)	.43
Salad	49/105	47%	2/3	67%	0.70 (0.31 - 1.60)	.60
Pearl Onions	18/42	43%	33/66	50%	0.86 (0.56 - 1.31)	.55
Cheesecake	42/87	48%	9/21	43%	1.13 (0.66 - 1.93)	.81
Mixed drink	16/36	46%	35/73	48%	0.985 (.62 - 1.47)	.84
Creamed spinach	33/69	48%	18/39	47%	1.04 (0.68 - 1.58)	1.00
Rolls but no butter	9/20	45%	42/88	48%	0.94 (0.44 - 1.60)	1.00

Notes: Chicken (main course) was served with mashed potatoes and mixed vegetables. Beef (main course) was served with Potatoes Gilette, pearl onions, and creamed spinach. Pasta (main course) was served alone.

We successfully contacted one group that held a high school prom at Griffin Mansions during the week prior to this outbreak (April 29 – May 8). No food was served by Griffin Mansions at the event, but prom organizers provided their own

packaged food for attendees to eat. Prom attendees could obtain beverages at a soda bar or serve themselves water from a dispenser. The prom group reported no unusual occurrence of illness. We were aware that two other groups had held events during that time but we were unsuccessful in obtaining details.

Environmental Health

The investigation revealed that a bar and a kitchen were actively operating at the property for preparing and serving food and drink as evidenced by EH staff directly observing facility staff participating in those activities during the investigation on May 13, 2012. Review of the facility's health permits revealed that, although the bar held a permit issued by SNHD, the kitchen did not. Because the kitchen had never been permitted, no environmental inspections of Griffin Mansions' active food preparation facilities to enforce regulations for food storage, cooking, and handling methods at Griffin Mansions had ever occurred prior to the outbreak. Many structural issues were observed in the kitchen that would have prevented SNHD from issuing a kitchen permit. Because food and drink were being prepared in a facility that did not meet SNHD's permitting requirements, a cease-and-desist order was issued that required the facility to stop preparing and serving food from the present kitchen facilities. Additionally, the permit issued for the drinking bar was suspended as required by regulations because the preparation of food was outside the facility's permitted activities and because the facility received 49 demerits during the May 13, 2012 inspection. Violations of numerous environmental health standards, including five critical violations, were

observed, some of which are documented in Attachment A, Figures A1a–f (sanitation standards), Figures A2 a–e (personal hygiene standards), Figures A3 a–c (food temperature standards), and Figures A4 a–j (food storage standards). The facility’s management reported that no employee had been ill and that they had no knowledge of any emetic events having occurred at the facility during the gala.

The environmental survey of the premises revealed a private machine-drilled well with metal casing. Water from this well served plumbing fixtures that were used for handwashing, drinking, and to make ice that was served to gala participants. Based on a review of the plans on record at SNHD, the well did not appear to be located in close proximity to the Griffin Mansions’ or the neighbor’s onsite individual sewage disposal systems that consisted of septic tanks and absorption fields.

No onsite parking was available at Griffin Mansions. Six shuttles were contracted to transport gala guests from a remote parking lot to the gala venue. The company operating the shuttles reported no knowledge of any illness events having occurred on these vehicles on the day of the gala.

The facility was provided the *SNHD Guidelines for the Prevention and Control of Norovirus in Hotel/Casinos*.¹

Laboratory

SNPHL: A total of 14 stool specimens were collected from May 14–18, 2012, 7 from ill gala attendees and 7 from event staff. Eleven specimens were tested for STEC and cultured for bacterial pathogens; all were negative. Bacterial testing and culture of

the other 3 specimens were canceled after 6 of 7 gala attendees' and one event staff member's stool samples were found to be positive for NoV genotype I (GI).

Environmental Laboratory A: Total coliform tests of the kitchen and bar sink water samples were positive; fecal coliform bacteria were absent. Both total coliform and fecal coliform tests of the well water sample were positive. Chemical test results showed 7.29 mg/L of nitrate and no detectable concentrations of nitrite or phosphorous in the water sample. This level of nitrate would necessitate additional monitoring if the well were permitted as a public water system.

Environmental Laboratory B: The large volume well water sample was negative for NoV GI and GII.

DISCUSSION

The outbreak at Griffin Mansions affected at least 63 people, with all case-attendees having consumed food and drinks prepared onsite on May 9, 2012. If the attack rate calculated from the 108 analyzed surveys were representative of illness among the entire attendance of 203 persons, 118 people or more might truly have been affected by the outbreak. Ill people had symptoms of diarrhea and vomiting, and NoV GI was detected in the stools of 6 gala guests and 1 staff member. No ill persons were hospitalized, and no deaths occurred.

The 37-hour median incubation period of primary case-attendees supports the hypothesis that the gala was where exposure to the virus occurred.

The epidemiologic investigation revealed that gala attendees who reported eating butter, dinner rolls, mashed potatoes, or chicken skewers were significantly more likely to have reported illness than those who did not eat those food items. However, people who ate rolls but not butter had no increased likelihood of subsequently becoming ill. Therefore, eating rolls might not have truly increased risk of illness. Although numerous health code violations were observed on inspection, we found no specific environmental, laboratory, or other evidence to further explain the associations between consumption of any food item and illness among gala attendees.

NoV can spread via direct contact with NoV-containing fecal matter or aerosolized vomitus or by indirect contact with them via environmental surfaces.² NoV can be easily spread due to the low inoculums (≥ 18 viral particles)³ required for transmission, and the prolonged period⁴ of fecal shedding⁵ of the virus. The outbreak appeared to have been confined to this dinner gala with the only known spread having been household contacts of attendees. We learned of no illnesses associated with other events that were held at the Griffin Mansions in the week prior to the gala event.

There are several possible explanations for how NoV transmission caused this outbreak. The environmental health inspection's score of 49 demerits, based on violations related to personal hygiene, facility sanitation, food temperature, and food storage, indicates that there was ample opportunity for disease transmission at the time of the May 13, 2012 inspection. Similar unsanitary conditions could have been present at the time of the dinner gala on May 9, 2012. The spread of pathogens by an infected employee who handled numerous foods, plates, or utensils after performing inadequate

hand-washing could have explained the illnesses reported among attendees at the gala. Analysis of US nationwide data on foodborne illness outbreaks from 1998–2002 showed that 65% of the foodborne NoV illness outbreaks for which contamination factors were identified were associated with food having been handled by an infected person or carrier of the virus.⁶ However, we identified no employee who admitted to food-handling duties and whose stool sample tested positive for NoV. The fact that one employee's stool sample did test positive for NoV is difficult to interpret because that employee denied being symptomatic and denied having performed any food-handling duties associated with the event. Studies of food workers have indicated that 5–12% of restaurant employees reported having worked while experiencing either vomiting or diarrhea, and the true proportion could be higher given that people are likely to underreport socially undesirable behaviors such as working while ill.^{7,8} It is plausible that the employee whose stool tested positive for NoV was in fact asymptomatic. Presence of NoV has been demonstrated in an estimated 6% to >30% of stool samples from persons with no noticeable symptoms, depending on age^{9,10}, but it is not known how likely disease is to be transmitted by asymptomatic persons.

We considered the possibility that the attendee who reported onset of diarrheal illness the morning of the event could have been the source of illness. That person would have to have exercised poor hand hygiene and then transmitted the virus to more than 50 other people. Contact could have been direct (e.g., shaking hands), or indirect (e.g., touching object(s) or via surface(s) later touched by each of the ill persons). Vomiting in a public space could also have caused exposure to multiple

people, but as noted previously, there is no evidence that this occurred. However, the statistically significant association between illness and having eaten food items does not correlate well with the explanations that the illness was introduced by a gala attendee or that it was associated with a vomiting event that did not involve a food-handler.

We pursued NoV testing of the well water after determining that the water had fecal coliform contamination because we were concerned that other contamination, including NoV, was possible. Drinking untreated well water and ice made from groundwater contaminated with NoV has resulted in previous outbreaks in food-service settings.¹¹ Consumption of water and ice made from a fecally contaminated groundwater system can pose a serious health threat to the public. As a business that serves >25 people over a 90 day period and as a permitted food facility, Griffin Mansions is required to offer potable water to its customers. The facility has been required either to connect to the Las Vegas Valley Water District or to make improvements to the existing well that would allow it to become permitted as a transient, non-community public water system. If the facility's water system were to become a transient, non-community public water system, the facility would be required to conduct monitoring of the water as mandated by the Nevada Revised Statutes 445A.800 for water analysis. The latter choice would require the facility to apply for and receive a permit from the Nevada Division of Environmental Protection as a public water system, regularly analyze the well water for coliforms along with other water contaminants such as nitrate, and report those laboratory results to the regulating

water authority. Businesses that cater to large gatherings must fulfill their obligations to provide safe potable water to prevent the transmission of waterborne pathogens.

Griffin Mansions' not having had its kitchen permitted by the SNHD could have contributed to this outbreak. An application for a kitchen permit prior to the operation of the facility would have necessitated a plan review for the permit, which might have identified some of these health and safety issues before the opening of the facility, including the inadequate hand-washing facilities. Furthermore, continued inspections and enforcement of regulations by EH for the permitted kitchen might also have helped to continuously address violations as they were identified and prevent them from becoming critical public health problems.

There were several limitations to our investigation. Our survey was completed by a self-selected 55% of attendees; ill attendees might have been more likely than well attendees to have responded to the survey. A higher completion rate or a random sampling of the cohort could have reduced the likelihood that our results were biased. We were aware of at least three groups that had held events at Griffin Mansions during the week prior to the dinner gala, but only successfully contacted one group. Therefore, we cannot positively know that the gala dinner was the only event affected by illness around that time. Because Griffin Mansions' kitchen was not permitted by the SNHD, anyone wishing to file a foodborne illness complaint using our online reporting system would not have found the facility listed and would have had to file the complaint using free-text to describe the name, which might have made it less likely for them to file complaints and less likely for us to have been able to find the complaints in our

database. A general limitation was that our primary means of contact with the attendees was through a representative of the attendees rather than our being in direct contact with individuals, which might have delayed our receipt of completed surveys and contributed to our not having been able to get additional information about the attendee who reported via survey having had symptom onset the morning of the event. EH staff was not able to perform a facility inspection after the discovery of the outbreak focusing on how food was prepared to determine possible points of contamination during the preparation of food because the facility was no longer in operation. Importantly, despite numerous attempts, we were unable to reach a key staff member, the catering manager, who was a contractor for Griffin Mansions and who reportedly performed much of the cooking onsite, either to conduct an interview or to collect a stool sample. Therefore, we are unable to rule out that staff member as the potential source of NoV. Finally, information reported through surveys and interviews of attendees and staff was assumed to be accurate but the accuracy could not be verified.

In conclusion, once recognized, the public health investigation led to the rapid characterization of this NoV outbreak, including identifying exposures to certain food items as possible risk factors associated with illness. Laboratory testing confirmed the presence of NoV, although neither a definitive source of infection nor its method of transmission was identified. The gala was the only known event where all of the case-attendees could have been exposed. The event's timing and attendees' symptoms both support the conclusion that the gala was the source of this NoV outbreak. Importantly, this investigation also led to the identification of a business operating unsafely and

without proper permits, licenses, and inspections. Food service businesses must prepare food in licensed and appropriate settings. Lastly, facilities that provide beverages made from private groundwater sources must adhere to regulations regarding public water system to ensure the potable water is safe for consumption.

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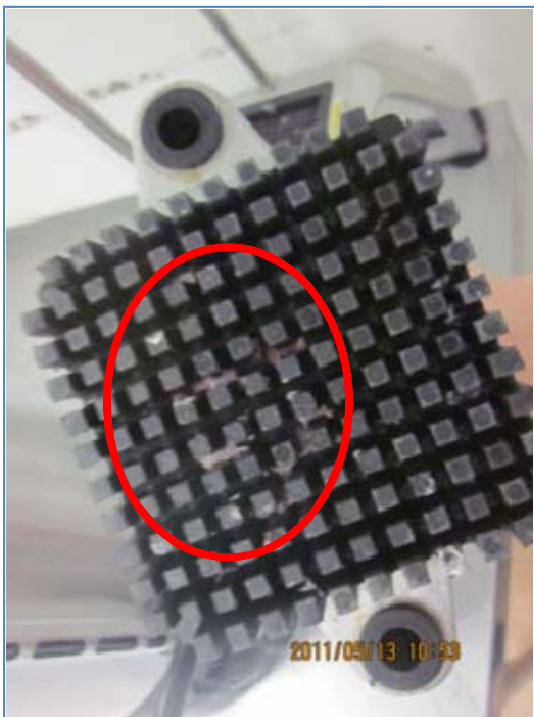
Figure A1. Violations of sanitation requirements.



A1a. Three compartment sink: faucet neck does not reach all three compartments.



A1b. Spilled food (yellow powder in front of foot) on the floor in dry storage area.



A1c. Produce dicer showing lack of proper washing as evidenced by leftover food debris on upper part.



A1d. Produce dicer showing lack of proper washing as evidenced by leftover food debris on lower part.

Figure 1, continued.



A1e. Hot holding units with debris left inside. All equipment must be properly cleaned.



A1f. Unexplained ice buildup on the beer taps with unexplained black substance.

Figure A2. Violations of personal hygiene standards.



A2a. Sole handsink in kitchen is not installed.



A2b. Handsink in bar only reached 78.8°F. Regulations require all handsinks to reach 100°F rapidly.



A2c. Hot water in bathroom sink reached only 78.8°F. Regulations require all handsinks to reach 100°F rapidly.



A2d. Hot water in bathroom sink reached only 77.4°F. Regulations require all handsinks to reach 100°F rapidly.

Figure A2, continued.



A2e. Tongs stored on splash guard of hand sink, which would allow for their contamination when employees wash their hands.

Figure A3. Violations of temperature standards.



A3a. Chicken Skewers with ice crystals, which is evidence of Time/Temperature abuse.



A3b. Raw chicken found in fridge at 64.6°F. Refrigeration was working properly at the time leading to the conclusion that the chicken had been left out at room temperature for some time and then returned to the refrigerator upon arrival of SNHD inspectors to the facility. Regulation requires raw chicken to be 41°F or colder.



A3c. Mashed Potatoes at 112.3°F. Regulation requires hot holding of potentially hazardous foods to be 135°F or hotter.

Figure A4. Violations of storage standards.



A4a. Raw chicken stored on top of raw produce. This is a critical cross-contamination problem.



A4b. Raw eggs stored above produce. Eggs should be stored below produce.



A4c. Food stored in a can for longer than 24 hours.

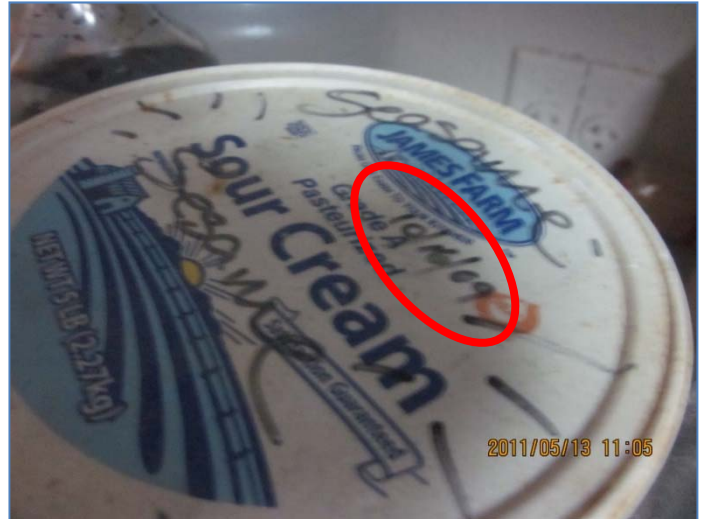


A4d. Propane being stored above spices and other dry goods.

Figure A4, continued.



A4e. Mold growing on tortillas in dry storage.



A4f. Dirty container of sesame seeds dated "10/16/2009".



A4g. Open spices in dry storage.



A4h. Open bag of sugar on the floor of unpermitted storage unit on property stored amongst construction equipment.

Figure A4, continued.



A4i. Rubbing alcohol stored among condiments.



A4j. Unlabeled chemical.