A CONFIRMED NOROVIRUS OUTBREAK ASSOCIATED WITH OYSTERS

OVERVIEW

From Friday, 2/27/15, to Tuesday, 3/3/15, the Los Angeles County Department of Public Health (LAC DPH) received three separate foodborne illness reports (FBIRs) via the web[4] all describing illness after at the same restaurant. All three groups reported eating the buffet that includes a variety of raw seafood, sushi rolls, and side dishes. Gastrointestinal (GI) illness symptoms included vomiting, diarrhea, stomach cramps, and nausea. The ACDC initiated an outbreak investigation to determine the extent of the outbreak, risk factors for the disease, and steps needed to prevent further spread.

METHODS

- An outbreak-associated case was defined as a person eating at the restaurant between 2/22/15 and 3/1/15 who had:
    a) a positive lab result of norovirus, or
    b) diarrhea and vomiting, or
    c) diarrhea or vomiting plus two or more additional GI symptoms including dizziness, nausea, abdominal cramps, fatigue, headaches, body aches, chills, and fever.

  An outbreak-associated control was defined as a person who ate at the restaurant during the same period of time but did not become ill with any GI symptoms.
- LAC DPH Environmental Health Services (EHS) contacted the parties on the FBIR complaints to obtain contact information for all attendees.
- EHS conducted three inspections of the restaurant on 2/27/15, 3/4/15, and 3/6/15.
- EHS requested contact information for complaints of illness made directly to the restaurant between 2/22/15 and 3/1/15.
- ACDC created food history and illness questionnaires for all FBIR and restaurant complainants.
- ACDC called all members of the parties on the FBIRs and interviewed them via telephone. ACDC also called those who complained directly to the restaurant and interviewed patrons either over the phone or via a fillable questionnaire.
- ACDC interviewed and collected stool samples from all the restaurant employees.
- Oysters were tested for norovirus by the Gulf Coast Seafood Laboratory, Dauphin Island, Alabama.
- ACDC collected data in MS Access and calculated the frequency and distribution of symptoms among cases. An analysis of food items consumed was also performed. All analyses were conducted using SAS 9.3 analysis software and MS Excel.
- The Public Health Laboratory (PHL) performed laboratory tests for all the employees and patrons who submitted stool samples, checking for norovirus, *Salmonella*, and *Shigella*.

[4] www.visualcmr.net/webvcmr/pages/public/pub_FBI_Report.aspx

RESULTS

Different groups (Groups A-D) were established to differentiate complainants based on food that was consumed and method of reporting illnesses. On Tuesday, 2/24/15, Group A gathered for a family dinner at a Los Angeles County (LAC) restaurant. This restaurant is an all you can eat buffet that includes large selections of seafood and sushi. Patrons order selected items from the menu. They then are served their chosen items and are allowed to order more food at no additional cost. Some reported food items included oysters, yellowtail, salmon, halibut, tempura, noodles, edamame, and scallops. EHS obtained a line list, and ACDC interviewed all 13 members of the group (100%) via telephone for their food and illness histories. Six cases and six controls were identified. One ill individual did not meet the case definition.

Group B dined that Saturday, 2/28/2015, and consumed items such as salmon rolls, oysters, tuna, and sashimi salad. This group comprised of friends from separate households. EHS obtained a line list, and ACDC called all the attendees. Interviews were completed for six out of ten (60%) individuals. All six interviewees met case definition. Stool samples were additionally collected from three of the patrons. Multiple attempts were made to contact the four non-respondents.

A member of Group C had reported food poisoning on Yelp.[5] ACDC contacted this individual encouraging a report to the LAC DPH. This complainant complied but chose not to cooperate further with the investigation. As a result, contact information was not provided for this party. Six out of six individuals eating with this party on Saturday evening, 2/28/15, were reported ill. Food items reported were oysters and sushi. These individuals were not included in the analysis because they could not be interviewed.

Other patrons had reported their illnesses directly to the restaurant (Group D). EHS obtained a list of names and phone numbers from the restaurant operator, and ACDC called every person on the list. Phone interviews were completed for those with valid phone numbers. These individuals were then asked to forward an electronic copy of the questionnaire to their eating companions. This method was employed due to unwillingness of patrons to give additional contact information. Nine interviews were completed from this group, and one stool sample was collected. The percentage of interviews completed cannot be calculated because the denominator for many parties were unknown. General food items reported were oysters, fish, and sushi rolls. All nine people were identified as cases.

Cases: Restaurant Patrons

There were 21 individuals who met case definition. The median age of cases was 29 years, ranging from 24 to 65 years (Table 1). Cases were both male (43%) and female (57%). The controls also included males (50%) and females (50%) with a median age of 9 years (range 2-84 years). Symptoms of cases included diarrhea (81%), nausea (86%), abdominal cramps (76%), fatigue (90%), body aches (76%), chills (67%), vomiting (67%), and other gastrointestinal symptoms (Table 2). Illness onsets occurred between 2/24/15 and 3/2/15 (Figure 1). The median incubation period was 34 hours (range 1.5–51 hours). The median duration was 1.7 days (range 1–5 days). All four stool samples submitted by cases tested positive for the norovirus strains GI (one case) and GII (three cases). Samples were collected on 3/5/2015 and 3/6/2015,

[5] www.yelp.com/la

which were two and three days after onset date (onset date for all four tested cases: 3/2/15). None of the cases tested positive for *Salmonella* or *Shigella*.

Food Analysis

The results of the analysis of food items eaten by the patrons are shown in Table 3. Food analysis was combined for all the groups because several food items were shared across parties. Additionally, since only Group A had controls, these controls could also be compared to the cases from the other groups (Groups B-D). Several food items calculated as significantly associated with illness. These included oysters, salmon, yellowtail, halibut, sea urchin, scallop, tuna, lobster roll, and water. The most significant food items were raw oysters and raw salmon. Raw oysters were consumed by all 21 cases (100%) and 0 controls (0%), and raw salmon was consumed by 20 cases (95%) and 0 controls (0%).

Restaurant A

Inspection

Restaurant A is a casual dining restaurant open seven days a week for lunch and dinner. It is a popular spot for family and friends to gather for a relatively inexpensive seafood meal. Items were consumed at the establishment. Patrons also are not able to bring leftover food out of the restaurant. The inspection by EHS on 2/27/15 revealed minor violations such as dirty equipment, improper food storage, and incorrect placement of cleaning chemicals. Two critical violations were noted. These included holding potentially hazardous food at unapproved temperatures and allowing employees to eat and drink in the food preparation area. An office hearing was also scheduled to discuss a plan for correction of violations. The oysters were voluntarily held from service and invoices were obtained for the oysters. At the inspection on 3/4/15, the restaurant voluntarily closed to do a thorough cleaning and sanitation of the restaurant. The remaining box of oysters was red tagged, and the oysters were collected for testing on 3/10/15. The restaurant met the necessary requirements to reopen on 3/6/15.

Food testing

Oysters from the suspect lot were obtained from the restaurant and submitted to the LAC PHL for norovirus testing. These were imported oysters from Korea and were shipped frozen. The PHL sent the oysters to the California Viral and Rickettsial Diseases Laboratory where a new test method was unable to detect norovirus. The oysters were then submitted to the Food and Drug Administration (FDA) Gulf Coast Seafood Laboratory where testing resulted in detection of norovirus. Two strains of norovirus, GI and GII, were found in the oysters. These are the same strains of norovirus found in the employees and patrons who tested positive for norovirus. The date and time the two employees actually became ill could not be confirmed.

Employees

There were 31 employees reported to ACDC, and ACDC made contact with all 31 employees (100%). One employee admitted to GI symptoms on 2/27/15. All other employees denied symptoms of GI illnesses in themselves and members of their household during the month preceding the outbreak. Stool samples were collected from the entire staff of 31 employees (100%). The PHL performed the laboratory tests for

all the employees. The one employee who reported illness tested negative for norovirus, *Shigella*, and *Salmonella*. For the remaining employees, two tested positive for norovirus and one for *Salmonella*. No employee tested positive for *Shigella*. ACDC and Community Health Services took the appropriate steps to temporarily remove these employees from work until they were cleared by standard procedures. All other workers yielded negative test results for norovirus, *Salmonella,* and *Shigella*.

DISCUSSION

This outbreak is consistent with an etiology of norovirus infection and was confirmed by laboratory testing. Six individuals (four patrons and two employees) tested positive for norovirus. The one employee positive for *Salmonella* was a server who did not touch food or raw fruits and vegetables. There is no evidence that this individual infected any patrons or other employees. While multiple food items were significantly associated with illness, statistical and laboratory evidence implicated the oysters. All ill individuals reported consumption of oysters, while individuals who were not sick did not eat oysters. The restaurant had also recently purchased oysters from a different distributor and started serving those oysters around the same time cases ate at the restaurant. There were no reports of illness from patrons who ate oysters prior to the switch of distributors.

The Centers for Disease Control and Prevention (CDC) cites that "norovirus outbreaks can occur from foods, such as oysters, fruits, and vegetables, which are contaminated at their source." Norovirus survives at cold temperatures and can easily be transmitted to humans via consumption of high risk foods not properly heated. People infected with norovirus can spread it through their feces and vomit when preparing food or contaminating common surfaces such as door knobs, tables, and restroom sinks. Having contact with a sick individual is another way to pick up the virus. It is highly contagious and can be transmitted even when symptoms are not present [1]. The incubation period for norovirus-associated gastroenteritis is usually between 24 and 48 hours with symptoms such as nausea, diarrhea, vomiting, and abdominal pain lasting 24-72 hours. It most commonly manifests itself from November to April but occurs year round.

LIMITATIONS

The food analysis is limited by the small number of controls included in the analysis. Having few cases and even fewer controls reduces statistical power. Having the responses of more controls would increase the chances of finding a statistically significant association between food items and illness.

PREVENTION

Wholesale Food and Safety, an EHS program, educated restaurant owners and managers about sanitization and ways to prevent future norovirus infections. Some recommendations included following guidelines for hand-washing, maintaining clean surfaces where patrons and employees frequent, and monitoring workers to ensure they are not handling food for at least 48 hours after symptoms have subsided [2]. Employees were educated on the importance of staying home from work when feeling ill. The restaurant was taught about the relationship between raw foods and norovirus as well as other

reservoirs of this virus that could be found in restaurants. ACDC additionally provided education to the restaurant managers and employees during a site visit.

CONCLUSION

This is a single outbreak that occurred among patrons who dined at Restaurant A between 2/22/15 and 3/1/15. The agent was laboratory confirmed as norovirus. The likely source of the outbreak was the frozen imported oysters, which were found to have two strains of norovirus. These two strains were also found in the patrons. No additional complaints or illnesses have been reported following this investigation. ACDC in conjunction with EHS will monitor for future reports of foodborne illness from Restaurant A.

REFERENCES

1. Centers for Disease Control and Prevention. Norovirus Overview. Website: www.cdc.gov/norovirus/about/overview.html. Last Accessed: April 1, 2015.
2. Heymann, David, et al., Control of Communicable Disease. Baltimore: United Book Press, Inc.; 2008.

Table 1. Patron Demographics

	Cases (n=21)		Controls (n=6)	
	N	(%)	N	(%)
Male	9	(43%)	3	(50%)
Female	12	(57%)	3	(50%)
Age Group (years)				
<1	0	(0%)	0	(0%)
1-4	0	(0%)	3	(50%)
5-9	0	(0%)	0	(0%)
10-19	0	(0%)	1	(17%)
20-49	15	(71%)	0	(0%)
50-74	6	(29%)	1	(17%)
>74	0	(0%)	1	(17%)
Median age	29 years		9 years	
Age range	24-65 years		2-84 years	

Table 2. Symptoms (n=21)

Symptom	N	%
Fatigue	19	90%
Nausea	18	86%
Diarrhea	17	81%
Bloody Diarrhea	1	5%
Body Aches	16	76%
Abdominal Cramps	16	76%
Dizziness	15	71%
Chills	14	67%
Vomiting	14	67%
Headache	13	62%
Fever	5	24%
Fever > 101˚F	3	14%
Median Duration=1.7 days (range 1-5 days)		
Median Incubation=34 hours (range 1.5 -51 hours)		

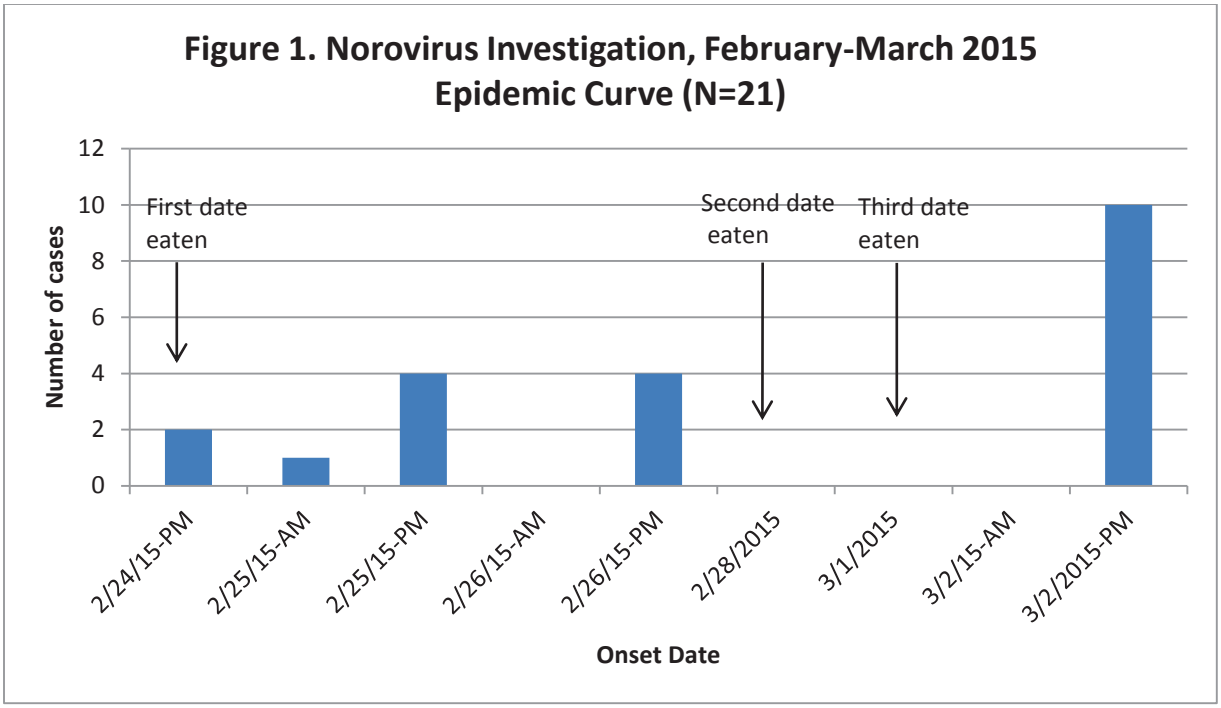
Figure 1. Norovirus Investigation, February-March 2015
Epidemic Curve (N=21)
Number of cases
12
10
8
6
4
2
0
First date eaten
Second date eaten
Third date eaten
2/24/15-PM
2/25/15-AM
2/25/15-PM
2/26/15-AM
2/26/15-PM
2/28/2015
3/1/2015
3/2/15-AM
3/2/2015-PM
Onset Date

Table 3. Food Items Eaten

	Cases (N=21)				Controls (N=6)				
Food Item	**Percent**	**n**	**unk***	**N**	**Percent**	**n**	**unk***	**N**	**p-value**
oysters	**100%**	**21**		**21**	**0%**	**0**		**6**	**<0.0001**
salmon	**95%**	**20**		**21**	**0%**	**0**		**6**	**<0.0001**
yellowtail	**76%**	**16**		**21**	**0%**	**0**		**6**	**0.0008**
halibut	**48%**	**10**		**21**	**0%**	**0**		**6**	**0.0332**
sea urchin	**57%**	**12**		**21**	**0%**	**0**		**6**	**0.0130**
scallop	**43%**	**9**		**21**	**0%**	**0**		**6**	**0.0495**
tuna	**57%**	**12**		**21**	**0%**	**0**		**6**	**0.0130**
sashimi salad	24%	5		21	0%	0		6	0.1855
avocado crab roll	52%	11		21	17%	1		6	0.1205
lobster roll	**57%**	**12**		**21**	**0%**	**0**		**6**	**0.0130**
spider roll	33%	7		21	0%	0		6	0.1003
California roll	48%	10		21	50%	3		6	0.918
eel and avocado roll	33%	7		21	0%	0		6	0.1003
caterpillar roll	5%	1	1	21	0%	0		6	0.7345
shrimp tempura	33%	7		21	50%	3		6	0.4559
veggie tempura	33%	7		21	33%	2		6	1.0000
octopus	10%	2		21	0%	0		6	0.4321
tofu	24%	5		21	50%	3		6	0.2153
seaweed	86%	18		21	67%	4		6	0.2895
rice	90%	19		21	67%	4		6	0.1477
udon	10%	2		21	100%	6		6	<0.0001
mussels	14%	3		21	33%	2		6	0.2895
eggs	10%	2		21	33%	2		6	0.1477
edamame	67%	14		21	50%	3		6	0.4559
mochi ice cream	38%	8		21	83%	5		6	0.0505
green tea ice cream	33%	7		21	0%	0		6	0.1003
water	**90%**	**19**		**21**	**50%**	**3**		**6**	**0.0244**
ice	76%	16		21	50%	3		6	0.2153
soda	10%	2		21	0%	0		6	0.4321
tea	38%	8		21	33%	2		6	0.8313

*unk=unknown: Number of respondents who cannot recall whether they consumed the food item. This number is subtracted from the denominator to calculate percent.