Norovirus Outbreak among 3rd Graders at Prairie Ridge Elementary School – Johnson County, March 2015

Kansas Department of Health and Environment
Division of Public Health

Background

On March 4, 2015 the Johnson County Department of Health and Environment (JCDHE) notified the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) of an outbreak of gastroenteritis at Prairie Ridge Elementary School. The school nurse had identified an unusually increased rate of absenteeism among 3rd graders, all of whom had attended a field trip to the School of Economics in Blue Springs, MO on Monday March 2nd. There were 86 students who attended the field trip along with 24 parent chaperones and almost half of attendees later became ill with vomiting and abdominal cramps. JCDHE and KDHE immediately began an investigation to determine the cause of illness and to implement prevention and control measures. JCDHE notified the Jackson County, Missouri health department to report the illness; Jackson County subsequently inspected the facility.

The School of Economics is a non-profit organization jointly owned and operated by the City of Blue Springs, and local businesses. It provides hands-on practical experience for students in real-world economics. The third grade class that attended the School of Economics participated in a "Mini-Town" simulation where they learned about entrepreneurship by operating their own "businesses" producing and selling goods and services.

Methods

Case definition: vomiting or diarrhea in person within 60 hours of attending the field trip to the School of Economics on March 2nd. An online questionnaire was used to collect exposure history and symptom information; the questionnaire was created and distributed using Qualtrics. A unique link to the questionnaire was emailed to each parent of a 3rd grader who

attended the field trip and to parents who chaperoned the field trip. Email addresses were provided by the school.

A non-matched case control study was conducted. Proportions of ill and non-ill were compared based on individual food exposures to calculate odds ratios. Any p-value less than 0.05 was considered significant.

Two stool specimens were collected and submitted to the Kansas Health and Environmental Laboratories for testing.

The Jackson County Missouri Environmental Health (Public Works) inspected the facility on Wednesday, March 4th.

Results

Epidemiological Investigation

There were a total of 86 students and 24 parent chaperones who attended the field trip. The response rate for the survey was 75%. There were 38 persons who reported illness and 35 that met the case definition, 30 children (85.7%) and 5 parent chaperones (14.3%).

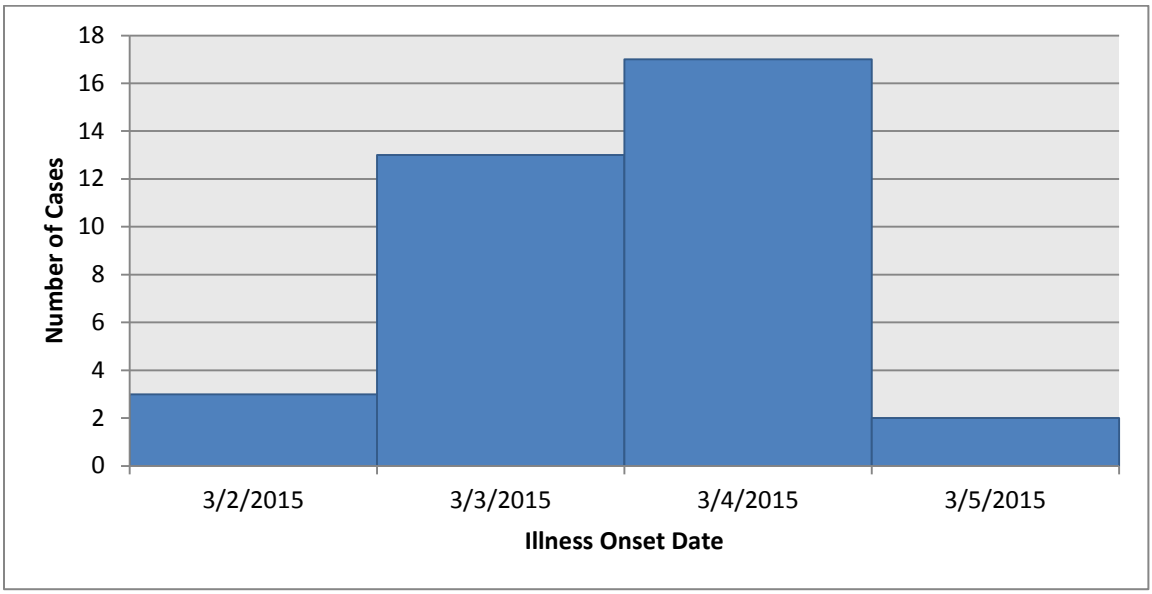
The median age was nine years with a range of eight to 45 years. The most frequently reported symptoms were vomiting, nausea, and abdominal pain (Table 1). One person sought care in an emergency room and was subsequently hospitalized (2.6%) (Table 1). There were no deaths associated with the outbreak.

Table 1: Clinical information for cases (n=35)

Symptom	***# Cases reporting***	***# Cases with information available***	***Percentage***
Vomiting	30	34	88%
Nausea	30	35	86%
Abdominal Pain	29	35	83%
Diarrhea	19	35	54%
Chills	11	32	34%
Fever	10	33	30%
Muscle Aches	8	32	25%
Complications			
Emergency Room Visit	1	38	2.9%
Visit Healthcare Provider	0	0	0%
Hospitalization	1	38	2.9%
Death	0	0	0%

The presumed exposure occurred on March 2nd, around lunchtime on the day of the field trip to the School of Economics. Median incubation time was 37 hours (range 7 to 67 hours) which is consistent with norovirus. Onset dates ranged from March 2, 2015 to March 5, 2015 and the epidemiological curve supports a point-source outbreak (Figure 1).

Figure 1: Number of cases by illness onset date (n=35)



The only food item that was significantly associated with illness was the popcorn. Of the 43 attendees who reported eating popcorn 28 (65%) became ill. No other food items were significantly associated with risk of illness (Table 3). Statistical analysis demonstrated that eating popcorn (Relative Risk = 2.1; 95% confidence interval = 1.4 – 3.1) was significantly associated with illness. No other food item was linked to illness

Table 2: Probabilities and Odds Ratios of individual food items

Food item	***Relative Risk***	***95% Confidence Interval***	***p-value***
Hotdog	1.5	0.37 – 6.35	0.56
Popcorn	**2.1**	**1.4 – 3.1**	**<0.0001**
Bun	0.35	0.080 – 1.5	0.15
Ice Cream	1.0	0.59 – 1.8	0.9
Dirt and Worms	1.2	0.68 – 2.1	0.54
Rice Krispie Treat	1.1	0.88 – 1.5	0.33
Red Kool-Aid	0.87	0.46 – 1.6	0.66
Purple Kool-Aid	0.73	0.41 – 1.3	0.27
Ice	0.56	0.26 – 1.18	0.12
Chips	0.94	0.63 – 1.4	0.75
Ketchup	0.82	0.49 – 1.37	0.45
Mustard	0.86	0.67 – 1.10	0.22

Laboratory Investigation

One vomitus sample obtained from a student who attended the field trip was positive for Norovirus Genogroup I. Vomitus is not an approved sample for norovirus testing and is used only for epidemiological investigational purposes.

Environmental Investigation

The facility was inspected on March 4 by Jackson County Missouri Environmental Health (Public Works). The facility was not licensed as a food establishment and the students prepared almost all of the food. There were inadequate hand washing facilities and no hand washing signage; students reportedly washed their hands once on arrival to the facility and were told to wear gloves during food preparation. No employee illnesses were reported before the field trip on March 2nd, although one employee who worked on March 2nd developed vomiting on March 4th.

Conclusions

This was likely an outbreak caused by norovirus and associated with a field trip to the School of Economics. Students and parents who attended the field trip became ill within 7 - 67 hours and a majority of the ill reported eating food served at the facility. Consuming the popcorn was significantly associated with risk of illness. The School of Economics was not a licensed food establishment. Subsequent inspection of the facility revealed inadequate hand washing facilities and no enforcement of hand hygiene during food preparation, both of which likely contributed to the outbreak. A review of the final list of ill students provided by the school indicated that one student who attended the field trip was sick that morning (March 2nd) with vomiting. However, the parent of this student did not participate in the online survey so exposures are unknown.

Norovirus is the most common cause of acute gastroenteritis and foodborne disease outbreaks in the United States, causing an estimated 19-21 million illnesses and 56,000 to 71,000 hospitalizations each year[1]. Transmission can occur via person-to-person routes including fecal-oral and ingestion of aerosolized vomitus; it can also be transmitted indirectly via contaminated surfaces or fomites, or by contaminated food or water[2]. Infected food workers are frequently identified as the source of outbreaks, where contamination likely occurs via bare-handed contact with ready-to-eat foods[3]. Norovirus has been detected in fecal specimens 3 to 14 hours before the onset of clinical symptoms and can be detected for 13 to 56 days after exposure to the virus[4]. Approximately 20% of norovirus infected individuals do not have clinical symptoms[5]. However, these persons can still shed norovirus and can be potential sources of contamination. Prevention includes excluding ill food workers and ensuring proper hand hygiene and proper food handling practices to reduce contamination[3].

After Jackson County Missouri Environmental Health (Public Works) inspected the School of Economics and found numerous violations, including a lack of a food establishment permit, the facility was subsequently closed for thorough cleaning and sanitation. Jackson County Health Department provided education on food handling and proper hygiene practices, including requiring hand washing of all attendees and employees prior to handling or consuming food. As of April 14, 2015, the School of Economics had reportedly obtained a food establishment permit, installed hand washing sinks in the food preparation areas, and will undergo routine compliance inspections students will continue to prepare the food after receiving instruction on the importance of hand washing.

The investigation was limited by several factors. Response rates were above 75% for both parent chaperones and parents of students who attended the field trip, but not all attendees on the field trip completed the questionnaire. Additional cases associated with this outbreak may exist as there were anecdotal reports of illness in siblings and parents who did not attend the field trip. The food histories and clinical information collected could be subject to recall bias, as not all participants could remember if they ate a particular food item. Finally, because only one specimen tested positive for norovirus it cannot be definitively determined to be the outbreak etiology. Two strengths of this investigation were the successful collaboration of health departments across state lines to contain and control the outbreak and the successful utilization of an online questionnaire to obtain exposure history and symptom information.

This was likely a norovirus outbreak associated with a field trip to the School of Economics. Consumption of the popcorn was significantly associated with illness; individuals who reported eating the popcorn were significantly more likely to develop illness than those who did not. A lack of hand washing facilities and poor hand hygiene likely contributed to the spread of illness among field trip attendees. An unidentified ill individual or a person who was asymptomatically shedding the virus may have been the source of the outbreak. The School of Economics was closed for cleaning and sanitation following the outbreak and subsequently rectified all violations found on the initial inspection.

[1]Centers for Disease Control and Prevention. *Norovirus.* Accessed March 2015 at http://www.cdc.gov/norovirus/about/overview.html
[2]Hall AJ, Vinje J, Lopman B, Park GW, Yen C, Gregoricus N, et al. (2011). Updated Norovirus outbreak management and disease prevention guidelines. *MMWR* 60(RR03):1-15.
[3]Centers for Disease Control and Prevention. *Norovirus.* Accessed March 2015 at http://www.cdc.gov/norovirus/about/transmission.html
[4]Atmar RL, Opekum AR, Gilger MA, et al. Norwalk virus shedding after experimental human infection. Emerg Infect Dis **2008**; 14:1553-1557.
[5]Moe CL. Preventing norovirus transmission: How should we handle food handlers? Clin Infect Dis 2009; 48:38-40.

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