

# Outbreak of Gastroenteritis Associated with Tabor College — Marion County, March 2014

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## Background

On March 28, 2014 at 1:45 pm, the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response section (KDHE) was notified of gastroenteritis outbreak at Tabor College in Marion County. The report indicated that over 80 people had become ill. KDHE notified the Marion County Health Department (MCHD), and an outbreak investigation was initiated that day at 3:30 pm to determine the cause and scope of illness and to implement appropriate prevention and control measures.

## Methods

### *Epidemiologic Investigation*

An online questionnaire was developed to obtain demographic information, symptoms, and food history among individuals affiliated with the college as well as those in the surrounding community. A link to the survey web page was distributed to Tabor College students and staff via e-mail. Individuals in the community who contacted MCHD regarding gastrointestinal illness were also invited to participate in the survey. Questionnaire administration began on April 2, 2014 and was completed on April 15, 2014. A case-control study was conducted to determine statistical associations with illness. An outbreak case was defined as diarrhea or vomiting experienced any time between 10:00 pm on March 24, 2014 and 10:00 am on April 1, 2014 in a person completing the questionnaire. Two controls per case were chosen from those persons who reported no illness. Statistical analysis was conducted using SAS® 9.2.

### *Laboratory Analysis*

One stool specimen was submitted for testing at the Kansas Health and Environmental Laboratories (KHEL).

### *Environmental Assessment*

The Kansas Department of Agriculture (KDA) conducted a routine inspection of the college's cafeteria on March 24, 2014, and another inspection on April 3, 2014 in response to the outbreak.

## Results

### *Epidemiologic Investigation*

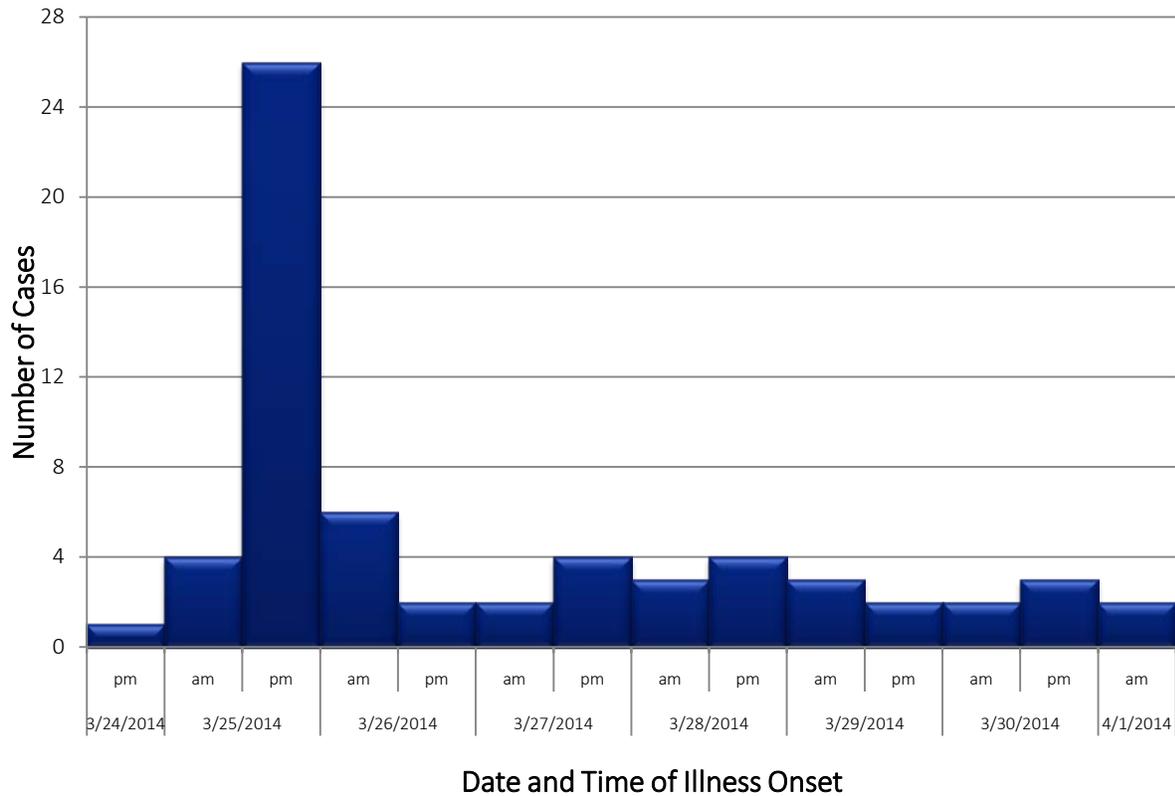
#### *Survey Analysis and Case Finding*

The survey was completed by 223 persons. Sixty-one percent of survey respondents were students at Tabor College, 37.2% were affiliated with the school but were not students (faculty, staff, or other), and 1.8% of respondents reported no affiliation with Tabor College. Illness was reported by 74 (33.8%) survey respondents; of those 64 persons met the outbreak case definition. Nausea and vomiting were the most common symptoms reported (Table 1). Most persons who became ill (46.8%) experienced an onset of symptoms on the afternoon of March 25, 2014 (Figure 1). For those whose symptoms had resolved at the time of questionnaire completion, duration of illness ranged from three to 154 hours (median 37 hours).

**Table 1: Symptoms reported among outbreak cases (n=64)**

	Number reporting symptom	Total reporting	Percent
Nausea	61	63	96.8
Vomiting	57	62	91.9
Abdominal Pain	52	61	85.2
Diarrhea	51	61	83.6
Chills	46	61	75.4
Muscle Aches	45	62	72.6
Fever	34	60	56.7
Bloody stool	1	55	1.8

**Figure 1: Number of cases by illness onset date and time (n=64)**



### Case-Control Study

Two controls per case were randomly selected for statistical analysis from those individuals who reported experiencing no illness. Demographic characteristics of the study population are in Table 2.

**Table 2: Characteristics of the study population**

	Cases (n=64)	Controls (n=128)	Total (n=192)
<b>Sex</b>			
<b>Female</b>	42 (66%)	77 (60%)	119 (62%)
<b>Male</b>	21 (33%)	48 (38%)	69 (36%)
<b>Age in years</b>			
<b>Age range</b>	18 – 90	8 – 72	8 – 90
<b>Median age</b>	22	22	22

Eating any meal at the Tabor College cafeteria during the surveyed time period was significantly associated with illness (odds ratio = 2.6; 95% Confidence Interval = 1.076-6.293; p = 0.029). Individual analysis results for selected meals are shown in Table 3; cases were included in the analysis for each meal that was served during their incubation period (12 to 48 hours prior to onset of illness). All meals served on March 24, 2014 were significantly associated with illness.

**Table 3: Individual meal analysis, 3/23/2014 – 3/24/2014**

Date	Meal	Odds Ratio	95% Confidence Interval	Fisher's p-value
<b>3/23/2014</b>	Breakfast	10.33	0.87 – 122.47	0.1447
	Lunch	1.22	0.13 – 11.07	1.0000
	Dinner	1.79	0.69 – 4.6	0.2939
<b>3/24/2014</b>	Breakfast	4.84	2.22 – 10.58	<0.0001
	Lunch	5.83	2.13 – 15.91	<0.0001
	Dinner	3.32	1.5 – 7.33	0.0025

### Laboratory Analysis

The stool specimen submitted to the Kansas Health and Environmental Laboratories (KHEL) tested positive by polymerase chain reaction (PCR) for norovirus genogroup II.

## *Environmental Assessment*

The [March 24, 2014 routine inspection](#) of the cafeteria revealed three priority violations and three priority foundation violations. The priority violations included a missing plumbing backflow device and food stored in a non-food-grade container. The priority foundation violations included food-contact surfaces not being clean to sight and touch, containers with toxic materials such as soap and bleach not being appropriately labeled, and no dispensing utensils available at some self-service food bars. Additional failures noted during the inspection included make tables without thermometers, food and beverage containers improperly stored on the floor, wet wiping cloths stored without sanitizer, improper storage of clean dishes and food scoops, incorrect dispensing tube on the bulk milk dispenser, dust on non-food-contact surfaces, and improperly cleaned and supplied restrooms.

The [April 3, 2014 inspection](#) of the cafeteria revealed two priority violations and one priority foundation violation. The priority violations included food being held for serving past the date by which it should have been discarded, and an improperly installed plumbing backflow device. The priority foundation violation pertained to a lack of paper towels or other hand drying devices at a handwashing sink. These violations were corrected while the inspector was on-site.

## Discussion

An outbreak of suspected norovirus affected 64 persons and was associated with eating in the Tabor College cafeteria. One clinical specimen was available for laboratory testing and tested positive for norovirus; although one positive result is insufficient to confirm norovirus as the etiologic cause of the outbreak, the clinical data is consistent with an outbreak of norovirus.

Norovirus is a highly contagious pathogen with a very low infectious dose, estimated to be between 10-100 viral particles<sup>i</sup>. Transmitted primarily through the fecal-oral route, norovirus particles may be spread through direct contact or through consuming fecally-contaminated food or water. Spread via aerosolized vomitus is also possible. Multiple routes of transmission can occur within a single outbreak. Person-to-person transmission in community settings, which peaks during winter months, can lead to foodborne illness outbreaks when a food handler becomes infected<sup>ii</sup>.

Infected persons can shed norovirus particles prior to the onset of symptoms, and shedding can persist for weeks after clinical symptoms have ceased. Norovirus has been detected in fecal specimens 3 to 14 hours before the onset of clinical symptoms and for 13 to 56 days after

exposure to the virus<sup>iii</sup>. Approximately 20% of norovirus-infected individuals do not have clinical symptoms<sup>iv</sup>. However, these individuals can still shed norovirus and can be potential sources of contamination. Simple prevention measures, including thorough handwashing after using the bathroom and before handling food items and excluding individuals with gastrointestinal illness from food handling can substantially reduce transmission of norovirus<sup>v</sup>.

The majority of cases in this outbreak experienced illness onset on the evening of March 25, suggesting a point-source outbreak that may have resulted from a contamination event on March 24. Violations noted during the routine inspection on March 24, including improper storage of utensils, the lack of scoops in self-service areas, and wet wiping cloths without measurable sanitizer, could have contributed to environmental contamination by ill or recently ill persons. Because most students reported eating most meals in the cafeteria, and because of the variable incubation period for norovirus, it was not possible to determine whether a single meal or a range of meals led to the outbreak; however, contamination was likely present in the cafeteria for multiple meals.

The person who tested positive for norovirus did not complete the survey, so that individual's association with Tabor College is unknown. However, this positive laboratory result for norovirus combined with anecdotal evidence of gastrointestinal illness circulating locally at the time supports the hypothesis that person-to-person spread of norovirus was occurring in the community and may have led to the point-source outbreak at the college.

The epidemiological investigation was limited by several factors. Only one clinical specimen was obtained from an ill person for laboratory testing. Inaccuracies may exist in interviewees' food and symptom histories due to recall bias. Additionally, while the survey was open to individuals not affiliated with Tabor College, the survey was not widely publicized, leading to a low participation rate among community members.

This investigation was aided by the quick response of and cooperation between MCHD and KDHE which allowed for timely initiation of the outbreak investigation. The use of an online questionnaire minimized the staff time required for the investigation, and the cooperation of Tabor College officials in allowing the distribution of the survey link to all students, faculty, and staff, allowed for a high number of responses from persons affiliated with the college.

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<sup>i</sup> Teunis PFM, Moe CL, Liu P, et al. Norwalk virus: how infectious is it? J Med Virol 2008; 80:1468-76.

<sup>ii</sup> Centers for Disease Control and Prevention. Updated Norovirus Outbreak Management and Disease Prevention Guidelines. MMWR 2011; 60:RR03.

<sup>iii</sup> Atmar RL, Opekum AR, Gilger MA, et al. Norwalk virus shedding after experimental human infection. Emerg Infect Dis 2008; 14:1553-1557.

<sup>iv</sup> Moe CL. Preventing norovirus transmission: How should we handle food handlers? Clin Infect Dis 2009; 48:38-40.

<sup>v</sup> Centers for Disease Control and Prevention. Updated Norovirus Outbreak Management and Disease Prevention Guidelines. MMWR 2011; 60:RR03.