

Shigellosis Outbreak Associated with a Daycare Center – Sedgwick County, 2017



Background

On January 26, 2017, the Sedgwick County Division of Health (SCDH) notified the Kansas Department of Health and Environment's Infectious Disease Epidemiology and Response Section (KDHE) of an outbreak of shigellosis. SCDH was notified on January 26, 2017 of a single shigellosis case through FirstWatch, an early warning system that monitors 911 and hospital emergency departments for disease. Upon initial investigation, SCDH learned this ill person attended daycare and that other attendees were experiencing similar symptoms.

An outbreak investigation was initiated on January 26, 2017 to determine the cause and scope of the outbreak and to provide prevention resources.

Methods

SCDH contacted the daycare center to identify any additional ill individuals. A confirmed case was defined as laboratory confirmation of *Shigella* via culture testing between January 20, 2017 and February 12, 2017 in an attendee or worker at the daycare center. A probable case was defined as diarrhea in an attendee or worker that was epidemiologically linked to a person with a confirmed case of shigellosis.

Per K.A.R. 28-1-16, children or employees of the daycare with diarrhea or those who tested positive for *Shigella* are required to be excluded until two negative stool cultures are obtained at least 24 hours apart and no sooner than 48 hours following the discontinuation of antibiotics. Between January 23 and March 14, 2017, cases were required to have two negative stool cultures to lift the exclusion; however, on March 15, the SCDH Health Officer determined that one negative specimen would be sufficient to lift the exclusion.

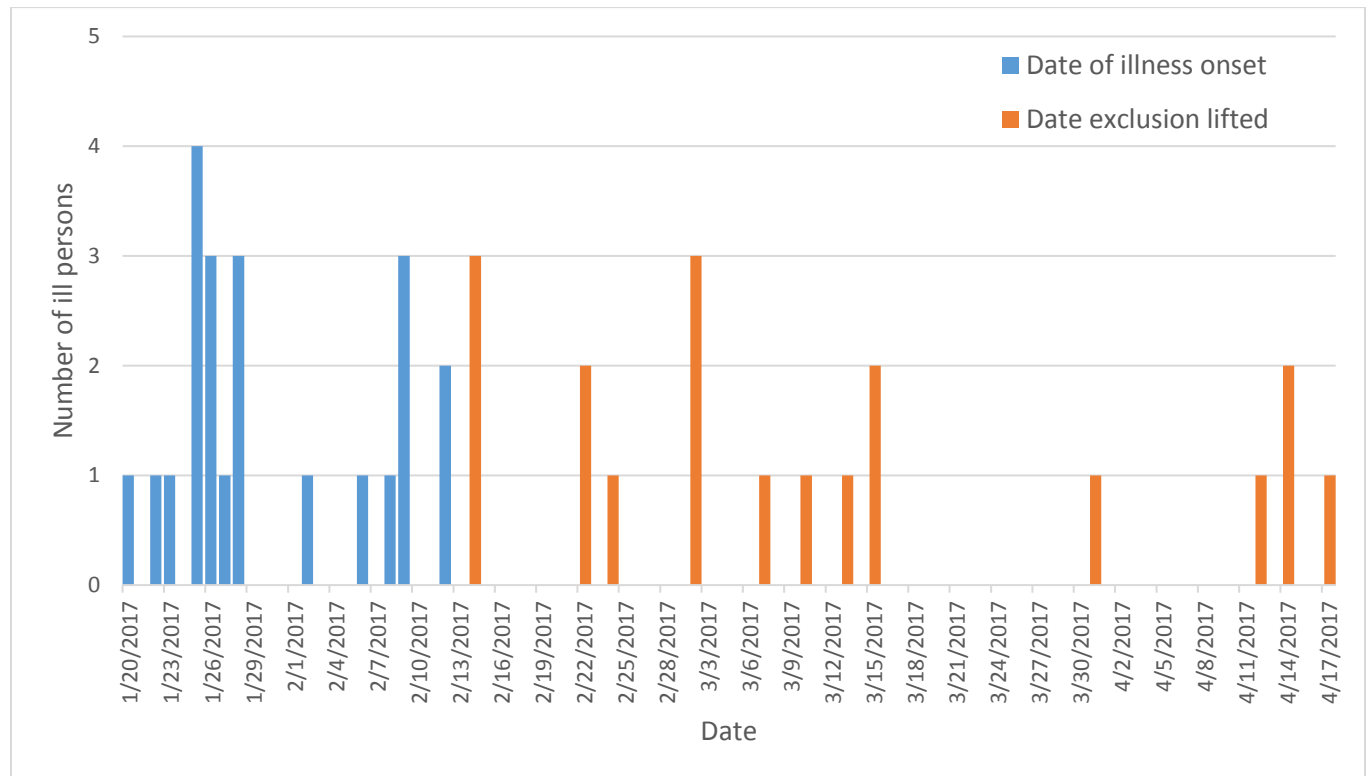
The child care licensing programs at KDHE and Sedgwick County were notified of the outbreak. Sedgwick County Child Care Licensing performed three inspections at the implicated daycare center on January 31, February 9, and February 27, 2017.

A total of 93 stool specimens were submitted for testing; 78 to the Kansas Health and Environmental Laboratories (KHEL) and 15 to private laboratories. Eighteen specimens were tested for diagnostic purposes and 75 specimens were tested to lift exclusion on persons with shigellosis cases to allow those persons to return to either work or attend the daycare. Pulsed-field gel electrophoresis (PFGE) was conducted on the specimens that tested culture positive at KHEL.

Results

The outbreak investigation identified 22 cases of shigellosis; 18 were classified as confirmed and four as probable in 21 children and one adult. The median age of those ill was three years with a range from one to 26 years. Fifteen (68%) cases of shigellosis were male. Onset dates ranged from January 20 to February 12, 2017 and dates of exclusion lifted ranged from February 14 to April 17, 2017 (Figure 1).

Figure 1: Ill persons by onset date and date exclusion lifted* (n=22)



*Dates exclusion lifted is provided for 19 ill persons. Three ill persons were lost to follow-up or pulled out of daycare indefinitely.

All ill persons experienced diarrhea. Other symptoms included fever, abdominal pain, and fatigue (Table 1). Three (14%) shigellosis cases were hospitalized for their illness.

Table 1: Symptoms reported among ill persons (n=22)

Clinical Information	# Ill Persons with Symptom	# Ill Persons Reporting	% Ill Persons with Symptom
Diarrhea	22	22	100%
Fever	15	22	68%
Abdominal Pain	13	22	59%
Fatigue	9	22	41%
Nausea	7	22	32%
Bloody Stool	5	22	23%
Headache	3	22	14%

Five children shed *Shigella* in their stool for longer than one week following onset of symptoms (range, 1.5 to 5 weeks). The duration of illness for these five children ranged between two and seven days and none were treated with antibiotics. Two shed *Shigella* for three and four weeks after onset of symptoms which prompted families to seek antimicrobial treatment. The remaining three ill persons with shedding longer than one week were never treated, one of which remained positive for five weeks following the onset of illness. A total of 16 ill persons were treated with antibiotics.

The daycare inspections revealed several violations including staff not using a three compartment sink for washing, rinsing, and sanitizing; only washing and rinsing were used for table service. Proper diapering procedures were not followed in a particular room of the daycare. The same mop head was used to clean the kitchen, bathroom, and classroom floors. At this inspection, meal service, cleaning, and handwashing procedures were reviewed.

Ninety-three individual stool specimens were tested for shigellosis during this outbreak (Table 2). Eighty-seven stool specimens were tested via culture and the remaining six were tested by multiplex polymerase chain reaction. Of the 93 stool specimens, 33 (35%) were positive and 25 (27%) were determined to be inconclusive because of no bacterial growth.

Of the 22 ill persons, 18 were culture positive for *Shigella sonnei* and 20 were tested to lift the K.A.R. 28-1-16 exclusion. Of the 20 that were tested to lift the exclusion, one had two inconclusive specimens before the parent decided to discontinue daycare services, therefore, exclusion was no longer applicable. The two remaining ill persons were considered lost to follow up and did not submit any specimens.

Twelve persons with shigellosis had between one and four inconclusive culture results at KHEL before finally testing negative which indicates a slow return of normal intestinal flora. A three year-old male who recovered after five days remained positive for five weeks following the onset of illness and submitted 14 positive stool cultures before obtaining a negative culture to return to daycare.

PFGE was performed on 17 specimens; seven similar CDC PFGE patterns were identified.

Table 2: Number of stool specimens per ill person by test result (n=93)

<i>Ill person ID</i>	<i># Positive Specimens</i>	<i># Inconclusive Specimens</i>	<i># Negative Specimens</i>
A	0	0	0
B	0	0	0
C	1	3	0
D	1	2	1
E	1	2	1
F	0	3	1
G	1	1	1
H	0	4	1
I	1	0	2
J	1	2	2
K	1	0	2
L	1	2	2
M	0	2	2
N	0	0	2
O	2	0	2
P	1	1	2
Q	2	0	2
R	1	2	2
S	1	0	2
T	3	1	2
U	1	0	2
V	14	0	4

Indicates lost to follow-up or discontinued daycare indefinitely

Conclusions

Twenty-two cases of shigellosis were identified among attendees and an employee at a daycare center in Sedgwick County between January 20 and February 12, 2017. *Shigella sonnei* was confirmed as the causative agent for this outbreak. Eighteen ill persons tested positive and all ill persons had a clinical presentation of symptoms consistent with shigellosis. Improper environmental cleaning and person-to-person transmission contributed to this outbreak.

Shigella sonnei has historically been associated with developing countries; however, there has been an increased prevalence among industrialized nations.¹ This highly contagious bacteria only requires 10 to 200 organisms to cause infection. In 2013, there was an average of 4.82 cases of shigellosis per 100,000 individuals in the United States.² Secondary attack rates can be as upwards of 40% among household or close contacts. Symptoms of shigellosis include diarrhea, fever, nausea, vomiting, and abdominal pain. The incubation period is typically one to two days after infection by *Shigella* bacteria and may last for five to seven days in persons with healthy immune systems.² Many outbreaks of shigellosis are associated with daycares and

schools with illness commonly spread among young children to family members and outward into the community. Transmission is frequently through fecal-oral route, either by consumption of fecally contaminated food or water or by direct person-to-person spread. Environmental and fomite contamination may also act as a source of infection.

Many challenges made this investigation difficult. Twelve cases had between one and four inconclusive specimens. One reason for this could be that there was a significant time lapse between specimen collection and submission to KHEL for testing. Therefore, a recommendation was made to SCDH to advise parents to return the collected stool specimens to SCDH as soon as possible to reduce the time between collection and testing. Another reason could be that there was a slow return of normal intestinal flora because of treatment with antibiotics. A second challenge was the unusually long shedding of *Shigella* in stool specimens. Diarrhea caused by *Shigella* usually resolves without antibiotic treatment in 5 to 7 days. Therefore people with mild disease usually do not require antibiotics but this could have contributed to a longer shedding period and a longer exclusion period for those persons that either were not treated with antibiotics or were treated after they had recovered because of continued shedding of *Shigella*. Lastly, three ill persons were lost to follow-up due to lack of specimen submission. These ill individuals or their guardians stopped responding to specimen requests and SCDH spent a significant amount of time trying to locate said persons.

Despite these challenges, there were many efforts that were successful during this outbreak. SCDH, KDHE, and KHEL maintained daily communication to deliver results of stool specimens. Many families were awaiting these results so their child/children could return to daycare. In addition, the SCDH courier service ensured prompt delivery of stool specimens to KHEL for testing. Multiple home visits were made by SCDH epidemiologists to encourage stool specimen collection. The daycare center corrected issues found upon inspection including the use of improper disinfectants, cleaning techniques, and diapering procedures. These factors contributed to the success in stopping the spread of *Shigella* in this facility.

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¹*The Rising Dominance of Shigella sonnei: An Intercontinental Shift in the Etiology of Bacillary Dysentery.*
Thomas, Corinne N.6, s.l.: PLOS Neglected Tropical Diseases, 015, Vol. 9.

²Centers for Disease Control and Prevention. "Shigellosis: Technical Information", Accessed on
November 15, 2016 at: <http://www.cdc.gov/nczved/divisions/dfbmd/diseases/shigellosis/technical.html>.