

Multi-jurisdictional Norovirus Outbreak at a Swimming Pool

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Summary

On Saturday June 1, 2013, the Galveston County Health District's (GCHD) epidemiology program received a report that 50 members of an area swim team "A" had developed a gastrointestinal illness. However, after further investigation we learned that pool users who became ill were residents of both Galveston County and Harris County. The swimming pool these swimmers used is located in, Galveston County, Texas, in city "A" and is inspected and issued its permit by the GCHD. However, part of city "A's" boundaries are within the southern part of Harris County. The pool is an eight-lane pool with a maximum pool depth of 5 feet and pool capacity of 235 patrons; this pool also has a baby pool attached.

INTRODUCTION

Given the reported murkiness of the pool water, it is likely that a contamination event, such as fecal incontinence, occurred on or about May 25, 2013. Previous outbreaks of enteric infections associated with recreational water have occurred with no obvious contamination event.^{3,7}

Norovirus remains the most common cause of epidemic gastroenteritis in the United States, causing an estimated 23 million cases each year.³ Challenges to prevention of norovirus-associated outbreaks include the low infectious dose, the multiple modes of transmission (e.g., person-to-person, foodborne, and waterborne), the absence of long-lasting immunity, and the diversity of strains that do not confer heterotypic protection. Although waterborne outbreaks of norovirus gastroenteritis are much less commonly reported than foodborne outbreaks⁴, the recorded incidence of norovirus-associated waterborne disease is likely an underestimate because of the lack of simple diagnostic technology. However, norovirus outbreaks associated with swimming pools are rarely reported.¹⁻⁵

Norovirus causes inflammation of the stomach or intestines or both. This is called acute gastroenteritis. The most common symptoms are diarrhea, vomiting, nausea, stomach pain, fever, body ache and headache.⁸ Individuals can protect themselves from norovirus by practicing healthy swimming behaviors, including not swimming when experiencing diarrhea, not swallowing pool water, and practicing good hygiene.

METHODS

Epidemiologic

On Saturday June 1, after receiving the report, a GCHD epidemiology program staff member contacted the president of area swim team "A" to get more information and request a line list of the members of the team who were ill. The president sent an email to the parents of all members of the swim team.

The GCHD staff member was also informed about a different group of ill children from elementary school "B", which is located in city "A" but under Harris County's jurisdiction. These ill children attended a pool party at the pool in city "A" on Wednesday May 29, 2013. This information was forward to Harris County Public Health and Environmental Services (HCPHES) for further investigation.

Once HCPHES received the report, they contacted the school nurse and requested a line list of the students from her school who attended the school swim party on May 29. HCPHES also contacted the pool manager and was informed that there had been a swim meet was held

there on May 25 and on June 1 a private pool party was held there. HCPHES contacted the swim team coordinator and the host of the private party and requested contact information on the participants. HCPHES called participants, and all who were reached completed a questionnaire.

Upon notification of the outbreak on June 1, 2013, GCHD epidemiology staff notified the Galveston County Health Authority who then notified the County Judge and the GCHD's environmental department. The on-call environmental inspector was sent to the pool the same day. Pool authorities voluntarily closed the pool upon the inspector's arrival.

Late in the afternoon of June 1, 2013, the GCHD epidemiology team began receiving emails from parents of the ill swimmers. Based on preliminary data from the emails received by GCHD, and phone calls made by HCPHES, a case definition and hypothesis were established. The case definition is as follows: a person experiencing diarrhea (three or more stools within a 24-hour period) or vomiting, with or without any of the following: fever, abdominal cramps, chills, body aches or headache; with symptom(s) lasting 12-72 hours; and, who swam in the city pool between 5/25/2013 and 6/1/2013 or is a close contact of someone who did. The hypothesis is that an organism in the pool was the source of the illness.

Upon further investigation, a swimmer reported "the pool water was so cloudy that you could not see the person swimming in front of you, even while wearing goggles". A few parents and other swimmers reported that the pool appeared to be cloudy as far back as Monday, May 27, 2013. Swim team "A" has 297 members, and during the week of May 25, 2013 to June 1, 2013 only about 150 members swam in that pool.

Environmental

A comprehensive inspection of the pool was conducted by GCHD environmental services on June 1, 2013. The assessment included an evaluation of chlorine and pH checks, a review of previous chemical levels from available records, a review of training records of pool operator staff, the general condition of the equipment, and the operational status of filters, pumps and chlorinators. This pool is inspected annually, and there have been no reports of previous issues with the pool.

Key findings: Although the equipment appeared to be operating properly, the pool water was cloudy even after hyperchlorination. The drains at the bottom of the pool could not be seen clearly. The chlorine level was at 5 ppm and the pH level showed 7.21. The facility has an Automatic Chemical Feed for chlorine and pH. Chemical test records from March 5, 2013 to June 1, 2013 were available, and all readings were acceptable. The cause of the cloudiness was not identified, and the pool was clear when a water sample was taken on June 3, 2013.

There are numerous postings around the pool directing users to avoid unsanitary practices such as spitting and urinating in the pool. Babies are required to wear swim diapers, which are available for purchase at the pool.

Laboratory

Three ill individuals from Galveston County and seven from Harris

County submitted stool specimens to the City of Houston Department of Health and Human Services Bureau of Laboratory for testing.

Water samples were submitted to the GCHD public health laboratory for testing.

RESULTS

Epidemiologic

One-hundred-eighty-five Galveston County families, representing a total of 297 swimmers, were contacted via email with a short questionnaire for parents of the swimmers to complete. Of those 185 emails sent, 64 families (35%) responded to the email. A total of 71 questionnaires were completed by the parents of the swimmers, which includes an additional 7 household contacts. Sixty-eight of the 71 questionnaires reported someone in the household, swimmer or contact, was ill. Of those reporting illness, sixty-five met the case definition. There were 58 primary cases and 7 secondary cases.

These sixty-five individuals were residents of GCHD’s jurisdiction with ages ranging from 3-42 years of age. There were slightly fewer females than males. The attack rate was 38.6% for swim team “A” participants who swam that week.

The Harris County Public Health & Environmental Services (HCPHES) Epidemiology program conducted gastrointestinal illness investigations of residents in Harris County’s jurisdiction. These residents were exposed to the city “A” swimming pool by participating in three different activities on May 25, 29 and June 1, 2013. HCPHES identified 79 primary cases in these three groups and 15 secondary cases among household contacts.

Vomiting and diarrhea were the most common symptoms reported, with 135 of 159 ill persons vomiting and 81 of 159 ill persons experiencing diarrhea, followed by abdominal cramps, fever, nausea, head ache/ body ache, fatigue and chills. No one was hospitalized. Of the 159 cases, 22 cases were likely due to secondary transmission. The incubation period in most primary cases ranged from 12 to 24 hours, and the duration of illness ranged from 12 hours to 6 days. The range of illness was May 24, 2013 through June 11, 2013. Approximately 31.4% of the cases included persons who reported that the onset of illness started on May 30, 2013. On May 29, 59.8% of the primary cases had exposure to the pool.

The most exposures to the pool were on Wednesday May 29, 2013, with some swimmers experiencing multiple days of exposure.

Figure 1. Epidemic Curve of Norovirus Outbreak for Galveston and Harris Counties’ cases

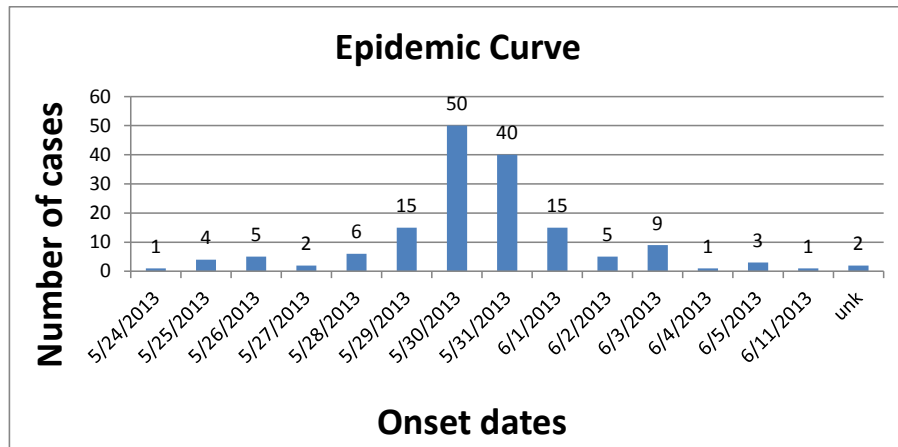
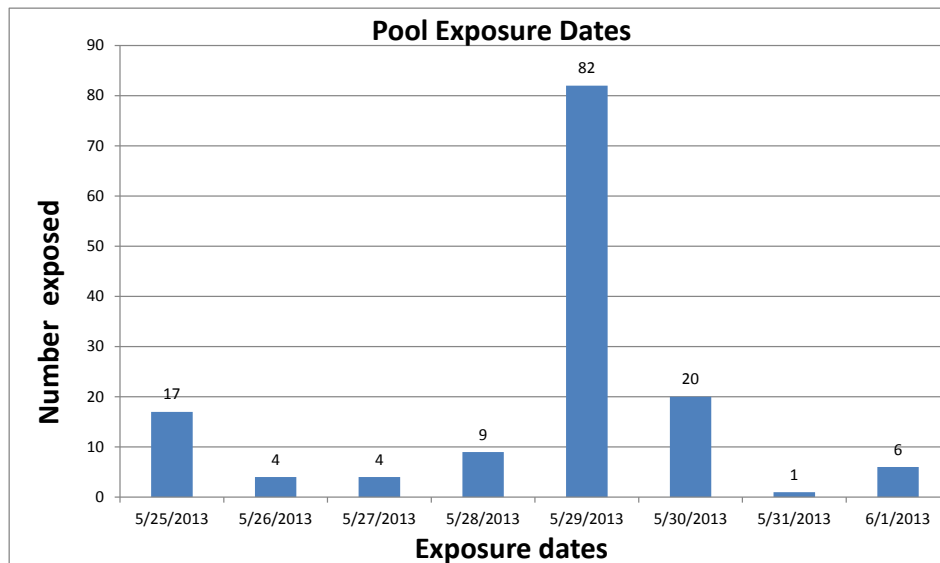


Figure 2. Pool exposure dates for Galveston County and Harris County ill swimmers



Environmental

The pool was closed and remained closed until a water sample could be taken and results obtained. Water samples were taken by the environmental department on Monday morning (June 3) and brought to the lab for testing.

Water sample results, on June 4, 2013, indicated no bacterial contamination. City officials were notified that the pool could be re-opened.

Laboratory

Overall, ten stool specimens were tested for norovirus, three from Galveston County and seven from Harris County. Nine of the specimens came back positive for norovirus, three from Galveston County and six from Harris County.

CONCLUSION

This outbreak of Norovirus was associated with a swimming pool in Galveston County, Texas. The total ill from both Galveston and Harris Counties was 159 individuals, 58 primary and 7 secondary cases from Galveston County and 79 primary and 15 secondary cases from Harris County. Water sample results on June 4, 2013 indicated no bacterial contamination, most likely due to the delay in notification and the pool being hyperchlorinated before the samples were collected. There were no fecal or vomiting episodes reported at the swimming facility during the week in question, May 25, 2013—June 1, 2013.

The investigation of this outbreak reflects the collaboration of two health departments with different jurisdictions, GCHD and HCPHES, working toward the common goals of implementing interventions that would stop further spreading of the outbreak, preventing additional illnesses and collecting sufficient information to prevent similar outbreaks from occurring in the future. Several conference calls were held, and emails and data were exchanged regularly.

Whereas epidemiologic methods identified the cause and characterization of this outbreak, appropriate monitoring, operation, and response protocols could have prevented this outbreak or reduced the duration of virus transmission.¹ It was reported that the pool water was murky for six days prior to the outbreak. Additionally, the pool operator hyperchlorinated the water after illnesses were reported and before health inspectors could assess the situation. This prevented the direct testing of the murky pool water samples, and consequent determination of the cause.

Best practices for environmental controls include: Adequate monitoring of water quality by the pool staff to avoid delays in detecting chlorinator-tube malfunction; when pool staff and patrons notice cloudy, turbid water in the pool, swimming should be prohibited until pool water is determined to be safe; when illnesses are reported, pool operators should contact a health inspector for testing of the pool water prior to hyperchlorination; maintenance staff should be promptly notified to institute control measures such as hyperchlorination¹; pool staff should have formal training in pool disinfection; signage should include a statement that asks persons with symptoms of current or history of recent gastrointestinal illness not to enter the pool until symptoms subside or they are released by a healthcare provider.

Lessons learned:

1. Email is not always the best way to communicate when an outbreak of this magnitude occurs. There were several delays in responding to emails, which may have resulted in the development of some secondary cases.
2. Water samples should be collected at the first sign of cloudy pool water. Early detection of contamination could have prevented the occurrence of the outbreak.

3. Maintain an accurate, up-to-date 24/7 after-hours emergency call tree. This proved to be a valuable tool for beginning investigation of this outbreak. Each jurisdiction has its own 24/7 after-hours emergency number that is answered by different answering services. Operators in both jurisdictions are trained to triage calls using an algorithm.

4. In Texas Health Service Region 6/5South, we have a Regional Epidemiology Coordination Plan that describes how to handle outbreaks. The plan has proven to be a valuable tool for this outbreak.

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