Washington State Department of Health

DOH 420-180

Norovirus Background

Clinical Syndrome of Norovirus

Symptoms

Norovirus can cause acute gastroenteritis in persons of all ages. Symptoms include acute onset non-bloody diarrhea, vomiting, nausea, and abdominal pain, sometimes accompanied by low-grade fever, body aches, and headache.[2,3] Some individuals may only experience vomiting or diarrhea. Dehydration is a concerning secondary outcome.[2] Symptoms typically resolve without treatment in 1-3 days in healthy individuals. Illness can last 4-6 days and may manifest more severely in young children elderly persons, and hospitalized patients.[2,3] Diarrhea is more common in adults, while vomiting is more common among children.[4] Up to 30% of norovirus infections are asymptomatic.[2]

Incubation

The incubation period for norovirus is 12-48 hours.[2]

Transmission

The only known reservoir for norovirus is humans. Transmission occurs by three routes: person-to-person, foodborne, or waterborne.[2] Individuals can be infected by coming into contact with infected individuals (through the fecal-oral route or by ingestion of aerosolized vomitus or feces), contaminated foods or water, or contaminated surfaces or fomites.[1,2] Viral shedding occurs for 4 weeks on average following infection, with peak viral shedding occurring 2-5 days after infection.[2] Norovirus is extremely contagious, with an estimated infectious dose as low as 18 viral particles, indicating that even small amounts of feces can contain billions of infectious doses.[2] The period of communicability includes the acute phase of illness up through 48 hours after conclusion of diarrhea.

Treatment

Treatment of norovirus gastroenteritis primarily includes oral rehydration through water, juice, or ice chips. Antibiotics are not effective against norovirus, as it is a virus.[1] Approximately10% of cases seek medical attention, which might include hospitalization and treatment of dehydration through oral and intravenous routes.[2]

Immunity

Protective immunity from norovirus is incompletely understood, with susceptibility hypothesized to be determined by both acquired immunity and innate characteristics of the individual.[2] Infection with norovirus does not provide long-term immunity.[2]

Outbreak Characteristics

Norovirus outbreaks may be foodborne, waterborne, or person-to-person.

Foodborne Outbreak Definition

A foodborne disease outbreak, including norovirus, is defined as an incident in which (1) two or more persons experience a similar illness after exposure to the same food source and (2) epidemiologic evidence implicates food as the likely source of the illness. Outbreaks can be laboratory-confirmed, probable, or suspected.[5]

- Laboratory-confirmed: An outbreak of foodborne disease with laboratory evidence confirming norovirus as the pathogen.
- Probable: An outbreak of foodborne disease with observational evidence and contributing factors without laboratory evidence.
- Suspected: A group of cases linked by time or place (also known as a cluster) but without evidence linking illnesses to a common food. Suspected outbreaks of foodborne disease may lead to public health activities, including heightened oversight of a facility, but do not require submission of a summary report to the Washington State Department of Health.

Settings

Outbreaks of norovirus occur throughout the year, with increased activity during winter months,[2] and are generally limited to 1-2 weeks.[4] Outbreaks occur in a wide range of settings, such as long-term care and other health-care facilities, restaurants and catered events, schools, institutional settings, and cruise ships and other transportation settings.[2] Crossover between settings does occur, such as when there is a kitchen (food service setting) in a nursing home (long-term care facility setting).

Healthcare Settings and Long-Term Care Facilities

Healthcare settings are the most common sites of norovirus outbreaks in the United States,[2] composing 62.7% of U.S. norovirus outbreaks reported to the National Outbreak Reporting System (NORS) 2009-2012.[6] Heightened challenges to norovirus outbreak control are shared between healthcare settings and long-term care facilities (nursing homes, skilled nursing facilities, and assisted living facilities). The virus can be introduced through incubating or symptomatic patients/residents, visitors, or staff, or through contaminated food products.[2] Outbreaks in these settings can occur for relatively long periods of time (e.g., months), with more severe illness, including deaths, among hospitalized patients.[2] Strict control measures, including isolation, exclusion of infected staff members, and restriction of transfers may thus be required to curb outbreaks in healthcare settings and long-term care facilities.[2]

Schools, Child Care Centers, and Other Institutional Settings

Norovirus outbreaks occur in a variety of institutional settings, such as schools, child care centers, colleges, prisons, and military encampments. Outbreaks at colleges have led to campus closures.[2,6] Gastroenteritis outbreaks in child care centers are also caused by other pathogens, such as rotavirus, sapovirus, astrovirus, calicivirus, and adenovirus.[2,4] Improved hand hygiene and surface disinfection in elementary schools can lead to lower rates of absenteeism caused by nonspecific gastroenteritis and reduced surface contamination with norovirus.[7]

Restaurants/catered events

Norovirus is the leading cause of foodborne disease outbreaks in the U.S., with contamination possible at any point during production, processing, distribution, and preparation.[2] A variety of different types of foods have been implicated in outbreaks; consumption of raw foods (e.g., vegetables, fruits, shellfish) and infected food worker handling of ready-to-eat foods are frequently implicated as the outbreak source.[2,6] Foods are sometimes also contaminated by fecal matter at their point of origin, e.g., oysters harvested from contaminated water.[2,6] In addition to infection by food consumption, norovirus outbreaks then often spread by secondary person-to-person transmission.[2]

Cruise ships and camps

Cruise ships, bus tours, air travel, and camp dormitories are particularly conducive to norovirus outbreaks because of proximity to ill passengers, dormitory residents, and staff; exposure of newly-arriving individuals to existing environmental contamination after ill individuals leave the setting every few weeks; and exposure of newly-arriving individuals to infected staff.[2,4] The virus initially may be

introduced by food contaminated before loading or by passengers, crew, or camp residents infected before arrival.[2] When cruise ships dock in countries where sanitation may be inadequate, norovirus may be introduced through food, water, or passengers who become infected while the ship is docked.[2] Because of the threat of repeat outbreaks, it is important that proper control measures be implemented when an outbreak occurs in these settings.

Outbreak control and management

Refer to the included outbreak control checklists for key components of controlling a norovirus outbreak.

Identification

In the absence of or pending laboratory confirmation, an outbreak of norovirus gastroenteritis may be identified using the clinical and epidemiologic signs of Kaplan's Criteria:[8]

1. Vomiting in more than half of symptomatic cases, and
2. Mean (or median) incubation period of 24 to 48 hours, and
3. Mean (or median) duration of illness of 12 to 60 hours, and
4. No bacterial pathogen isolated from stool culture.

Laboratory Diagnostics

Facilities should consult clinical labs to see if they offer testing. Specimens should only be collected under the direction of the Local Health Jurisdiction (LHJ) or the Washington State Department of Health (DOH) Office of Communicable Disease Epidemiology (CDE). Once the LHJ has used the Kaplan Criteria to determine that there is a possible norovirus outbreak, the LHJ should call CDE to ask for an outbreak number and report the possible number of cases from whom stool samples could be collected at the time. If there are at least 3 stool samples, CDE will coordinate testing with the Washington State Public Health Laboratories (PHL). The LHJ should then send to CDE the information in the table below from all the cases from whom the LHJ is trying to collect stool samples. CDE will prepare and provide an illness manifest to the PHL.

Requesting LHJ
Submitter
Method of transport
Expected specimen arrival
Patient initials
DOB
Specimen collection date
Type of specimen(s) expected
Pertinent test results from commercial labs

Taqman-based reverse transcription-polymerase chain reaction (RT-PCR) assays are the most widely used assays to detect norovirus, though they have not been cleared by the Food and Drug Administration (FDA) for this purpose.[2,9] RT-PCR can be used to test stool, vomitus, and environmental specimens; the best time to detect norovirus is when a person has acute illness (within 48 to 72 hours of developing symptoms).[9] Because of RT-PCR's extreme sensitivity, low titer results should be interpreted with caution.[2] Positive samples are sometimes typed subsequently by DNA sequencing at the CaliciNet Lab. Environmental sampling may be available commercially or through the FDA.

Specimen Collection

When specimens are collected for diagnostic or outbreak detection testing, they should be individually bagged, sealed, and kept on ice or frozen refrigerant packs at 4 °C (range 2-8 °C) in a waterproof container while being transported to the lab. If testing is to occur within 2-3 weeks, whole stool specimens or vomitus should be kept stored at 4 °C (range 2-8 °C).

If testing occurs at PHL, the stool must be collected in a sterile plastic screw-top container with no preservatives, the container must be sealed with parafilm if available, and the container individually bagged. The minimum volume is a walnut-sized stool sample – at least 2 grams of fresh stool. Testing must be approved through the LHJ. The Requisition Form for Serology/Virology/HIV must accompany the sample. Information on submitting samples and the Requisition Form can be found by searching norovirus at www.doh.wa.gov/PHLMicroLabTests.

Rejection criteria for samples include leaky specimen, not enough volume, use of inappropriate method for collecting norovirus samples (i.e., sample size too small, stool placed in transport media), inappropriate container (specimens must be individually bagged), inappropriate storage conditions, failure to obtain LHJ approval, and failure to follow specific shipping and handling requirements. Specimens will not be processed without all of the following information on the requisition form: patient name, county of residence, and date of onset; two matching identifiers on the tube and the requisition form; specimen type, date of collection, and test requested; and submitter name, address, and telephone/fax numbers.

Testing of food, water, and environmental samples is not routinely recommended for norovirus outbreaks except for when oysters are the suspected source and in other special circumstances, in which case the DOH should be contacted. Testing samples of suspected food or water sources, when appropriate, should occur as early as possible. Samples should be stored at -4°F (-20°C).[2] Environmental sampling, when done, may be available commercially or through the FDA.

Reporting and Surveillance

Norovirus is not a notifiable condition, but health care providers should report outbreaks of acute gastroenteritis to the LHJ.[10] LHJs should report suspected and confirmed norovirus outbreaks to CDE. The department then may report suspected and confirmed outbreak through the NORS and CaliciNet, a National Norovirus Outbreak Network.