

## STOMACH FLU, WINTER VOMITING DISEASE OR NOROVIRUS: WHICH IS IT?

Winter and its frigid temperatures means more than the season for colds and influenza: it also means the season for norovirus illness, otherwise known as Winter Vomiting Disease. This issue of the *CD Summary* reviews noroviral illness, transmission, control measures and outbreaks.

Norovirus causes an estimated 19–21 million cases of acute gastroenteritis (AGE) in the United States each year, leading to 56,000–71,000 hospitalizations and 570–800 deaths, mostly among young children and older adults.<sup>1</sup> Norovirus is the leading cause of severe AGE among medical care-seeking U.S. children <5 years of age, and a principal cause of AGE outbreaks on cruise ships and in preschools, hospitals, and long-term care facilities.<sup>2</sup>

### NOROVIRUS BACKGROUND

Norovirus was first identified after an outbreak at an elementary school in Norwalk, Ohio in 1968. The investigators dubbed it “Norwalk virus,” but the name was formally changed to “norovirus” in 2002. Norovirus belongs in the *Caliciviridae* family of small, non-enveloped viruses. There are six genogroups (G) of norovirus, of which GI, GII, and GIV afflict humans. Norovirus is highly contagious due to its low infectious dose, prolonged shedding following infection, lack of durable immunity in humans, and environmental stability.

### NOROVIRUS SIGNS AND SYMPTOMS

Norovirus symptoms begin a median of 33 (range, 24–48) hours after exposure. Symptoms may include:

- vomiting,
- diarrhea, not bloody,\*

\* Unfortunate cases find themselves spewing out of both ends.

- nausea,
- abdominal cramps,
- malaise,
- chills and
- low-grade fever.

In some cases, dehydration may occur. The illness is self-limiting, and most people start to feel better within a day or two.

### NOROVIRUS TRANSMISSION

Human beings are the only known reservoir for norovirus. An infected person begins to shed norovirus a few hours before symptoms begin and can continue to shed for more than two weeks. Peak viral shedding occurs at 2 to 3 days after symptom onset, with a median of 95 billion noroviral genomic copies per gram of feces.<sup>3</sup>

Norovirus is commonly spread from person to person by the fecal-oral route. This type of transmission is common in norovirus outbreaks in nursing homes, schools and day care centers. Point-source transmission may be seen when a person vomits in a crowded area.<sup>†</sup>

One common question is “how close do you have to be to the vomiter to get norovirus?” It so happens that there are researchers who are trying to figure out the answer to that very question, and they have done so by constructing vomiting machines (yes, more than one). “Vomiting Larry” demonstrated that the splash zone in an act of “projectile vomiting” was >3 m by >2.2 m.<sup>4</sup> Another simulated vomiting machine built in 2015 showed that norovirus can be aerosolized during a vomiting event.<sup>5</sup> Given the large splash zone and aerosolization of norovirus, it’s not surprising that a vomiting incident in a public area can cause an outbreak.

† The common story is that someone vomited in a cafeteria and then there were 10 people sick the next day. When questioned, the 10 people that got sick later were sitting close to the vomiter.

Norovirus can also be spread via food or water (including ice) that is contaminated by a food handler who is shedding norovirus. Filter-feeding oysters can collect and concentrate norovirus from human feces, should it manage to reach the oyster bed. Regardless of how it gets into the food, foodborne norovirus outbreaks can rapidly sicken many partygoers or restaurant patrons. Onsets usually are clustered in time and typically associated with foods that had been handled by a food handler who worked while sick, and that were not cooked afterwards. Salads, sandwiches, fruits, and frostings are commonly implicated vehicles.

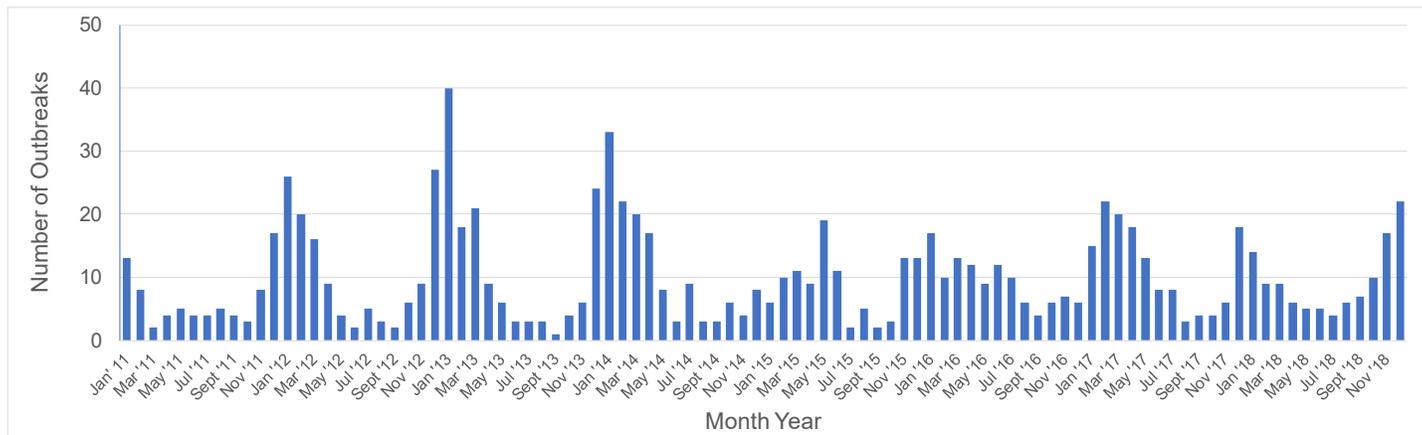
### NOROVIRUS TESTING

Individual cases of noroviral AGE are clinically indistinguishable from those caused by other viral or bacterial agents. On the other hand, presumptive diagnosis of noroviral etiology may be made with a high degree of certainty given a *cluster* of cases in which more than half have vomiting, and more than half have diarrhea. Norovirus can be confirmed by testing a stool sample using real-time reverse-transcriptase polymerase chain reaction (RT-PCR). Some commercial lab scan test for norovirus; and increasingly, locally available multiplex gastroenteritis PCR panels can also detect it.

### NOROVIRUS TREATMENT

There is no specific treatment for norovirus. Antibiotics will not help. Hydration is the key to managing it. Nor is a commercial norovirus vaccine currently available. A promising bivalent vaccine, developed by Takeda, has reached the randomized trial stage, but no data are available on the duration of antibody persistence or clinical efficacy. One oral vaccine in tablet form, under development by Vaxart, recently completed phase 1 studies.

**Figure 1. Laboratory-confirmed norovirus and noro-like outbreaks by month, Oregon: 2011–2018**



## NOROVIRUS OUTBREAKS IN OREGON

While individual cases of noro-like illness are not reportable, clusters of illness are reportable to public health authorities so we can implement control measures to hopefully stop transmission.

The Oregon Health Authority (OHA) receives hundreds of noroviral and noro-like outbreak reports each year. An outbreak is defined as cases with compatible symptoms occurring in at least two different households clustered in space and time or following a common exposure. We further define a “confirmed” norovirus outbreak as having norovirus detected in specimens from at least two patients. Noro-like outbreaks are those with a similar symptom profile but without the requisite noro-positive specimens.

From 2011 through 2018, 949 confirmed noroviral and noro-like outbreaks were reported in Oregon. Of these, 657 (69%) were confirmed as noroviral. The winter seasonality of the outbreaks can be appreciated in Figure 1.

Norovirus outbreaks were reported in a variety of settings including nursing facilities, fairs, restaurants, schools, private parties, hospitals, and camps. Six hundred forty-three (68%) of the confirmed and noro-like outbreaks were in nursing homes. The next most common setting was schools (n=71, 7%) and restaurants (n=65, 7%).

Of the 949 outbreaks, 500 (53%) had at least one specimen with norovirus genotyping. Most of these proved to be in norovirus genogroup 2 (n=424, 85%). Among these GI.2 norovirus outbreaks, the most common genotype was GI.2 Sydney

(n=238, 56%), followed by GI.1 New Orleans (n=42, 10%) and GI.1 (n=34, 8%). Only 76 (18%) of the outbreaks with genotyping data were genogroup 1, of which the most common genotype was GI.3B (n=24, 32%), followed by GI.6A (n=15, 20%).

## NOROVIRUS OUTBREAK CONTROL MEASURES

In congregate settings such as nursing homes, ill residents should be put on enteric contact precautions as soon as an outbreak begins. These precautions include gowns, gloves, masks, and washing hands with soap and water. Other control measures (e.g., stopping communal activities) should also be instituted promptly. Ill staff members should stay at home while ill and for 48 hours after symptoms resolve — and not work at any other facility during this time. Similar control measures and work restrictions should be employed in schools and day care facilities.

## HAND HYGIENE

Alcohol-based hand sanitizers are ineffective against the non-enveloped norovirus. We will have to wash our hands the old-fashioned way.

## NOROVIRUS CLEANING AND DISINFECTING

Proper cleaning and disinfection is important in stopping transmission of norovirus. First, wear the proper personal protective equipment (gowns, masks and gloves) before cleaning and disinfecting. “Cleaning” means removing foreign materials from surfaces or objects; it is done with water, a detergent and elbow grease. “Disinfection” is the killing of pathogens on surfaces or objects. The Environmental Protection Agency (EPA) maintains a [list](#) of registered disinfectants effective at killing norovirus. If you don’t have an EPA-

registered disinfectant on hand, plain old bleach is also highly effective. We recommend using a 3500-ppm bleach solution — which can be prepared by mixing 1 cup of household bleach in a gallon of water. If you use bleach solution, prepare a fresh batch each day.

As far as potentially contaminated food goes: when in doubt, throw it out, and then wash your hands.

## FOR MORE INFORMATION

- List G: EPA’s Registered Antimicrobial Products Effective Against Norovirus. April 2018. Available at [www.epa.gov/sites/production/files/2018-04/documents/list\\_g\\_disinfectant\\_list\\_3\\_15\\_18.pdf](http://www.epa.gov/sites/production/files/2018-04/documents/list_g_disinfectant_list_3_15_18.pdf). Accessed 14 Feb 2019.
- OHA. Norovirus Outbreak Detection and Management: Instruction for long-term care facilities. January 2018. Available at <http://bit.ly/noro-ltcf-toolkit> (pdf) Accessed 14 Feb 2019.
- OHA. Norovirus Outbreak Detection and Management: Instruction for schools and day care centers. September 2016. Available at <http://bit.ly/norovirus-school-toolkit> (pdf) Accessed 14 Feb 2019.

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3. Atmar, RL, Apekun, AR, Gilger, MA, et al. Norwalk virus shedding after experimental human infection. *Emerg Infect Dis.* 2008;14: 1553–7.
4. Booth CM. Vomiting Larry: A simulated vomiting system for assessing environmental contamination from projectile vomiting related to norovirus infection. *J Infect Prev.* 2014: 15:176–80.
5. Tung-Thompson G, Libera DA, Koch KL, et al. Aerosolization of a human norovirus surrogate, Bacteriophage MS2, during simulated vomiting. *PLoS ONE.* 2015 10: e0134277.



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