

## **Preventing Foodborne Illness: Norovirus<sup>1</sup>**

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### **What are noroviruses?**

"Norovirus" was recently designated as the official genus name for the group of viruses previously described as "Norwalk-like viruses" (NLV). Noroviruses (family *Caliciviridae*, genus *Norovirus*) are a group of non-enveloped, single-stranded RNA viruses found worldwide, with humans being the only known host. Norovirus, similar to Norwalk virus, causes an illness called gastroenteritis, which is commonly referred to as "the stomach flu" (no relation to the common flu, which is a respiratory illness caused by the influenza virus).

### **What causes norovirus induced foodborne illness?**

A norovirus infection often originates from the ingestion of contaminated food or water, or from person-to-person contact. Contamination with small numbers of norovirus particles can be enough to cause disease, with only approximately 100 particles needed. Infected individuals shed the virus in stool as well as orally. Aerosolized vomitus droplets have also been implicated as a mode of transmission.

Noroviruses (like all viruses) require a living host in order to replicate and are therefore incapable of multiplying in food, unlike other pathogens. The Centers for Disease Control and Prevention, or CDC, has estimated that 23 million cases of acute gastroenteritis due to a norovirus infection occur every year, which is nearly 60% of all reported foodborne illnesses. Preventing contamination by proper food handling, sanitation, and hygiene is very important in the control of foodborne norovirus illness.

### **What are the symptoms associated with the norovirus virus?**

Gastroenteritis causes inflammation of the stomach and the large and small intestines. Although most symptoms begin within 12 hours of ingestion of the contaminated food or beverage, some may manifest as late as 48 hours after exposure. Symptoms associated with gastroenteritis include nausea, vomiting, diarrhea, abdominal cramps, headaches, fever/chills, and muscle aches. Although these symptoms only last about one or two days, individuals with weakened immune systems may

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require hospitalization for dehydration and electrolyte abnormalities. Laboratory diagnosis is usually difficult because symptoms of norovirus gastroenteritis are non-specific and can be a manifestation of another disease.

### Who is at risk?

Noroviruses can affect anyone. An infection may result from ingestion of contaminated food products or from contact with an infected person. It takes only a small amount of viral particles to cause an illness. Noroviruses can spread quite rapidly in public facilities such as hospitals, day care centers, and schools. Symptoms usually last only a few days and the majority of infected persons recover without any long term health risks.

The possibility of immunity to norovirus is unlikely. Individuals can suffer from a norovirus infection more than once, as each norovirus strain is constantly undergoing genetic mutation. For this reason, it is difficult to develop immunity or a vaccine against norovirus.

### What foods have been commonly associated with norovirus?

Among the 232 outbreaks of norovirus illness reported to the CDC from July 1997 to June 2000, 57% were foodborne, traced to restaurants or catered meals. The majority of norovirus outbreaks are from oral-fecal transmission or via contaminated food or water. Most foodborne outbreaks of norovirus illness arise from direct contamination of food by a food handler, immediately before consumption.

Shellfish, such as oysters and clams, present an elevated hazard because they are filter-feeders, and as a result they can concentrate any viral particles present in their environment. If raw sewage is either dumped or leaked into waters where shellfish are present, they are likely to become contaminated. Many oyster-related outbreaks of intestinal illness linked to noroviruses have been reported in Louisiana, Florida, Maryland, and other states.

Raw fruits and vegetables, as well as water and ice, present a potential hazard. Ready-to-Eat (RTE) foods, such as sandwiches, salads, and baked

products, may also be contaminated due to poor food handling practices. Liquid items, such as cake icing or salad dressing, often cause large outbreaks because the virus becomes evenly mixed into such foods, which are not further processed.

### Spread of noroviruses

Infection and spread may occur by:

- Eating or drinking contaminated foods or beverages;
- Touching surfaces or objects contaminated with norovirus, and then using unsanitary hands in food preparation; and/or
- Direct contact with a person who is infected (for example, when caring for someone who is ill, or sharing the food or utensils).

### What sanitation methods are used to prevent infection?

Prevention of foodborne norovirus infection is based on the provision of safe food and water. Noroviruses are relatively resistant to environmental challenge: they are able to survive freezing temperatures as well as temperatures as high as 140°F (60°C), and have even been associated with illness from steamed shellfish. Noroviruses can survive in up to 10 ppm chlorine solution, which is well in excess of levels routinely present in municipal water (~1 ppm). Despite these resistances, relatively simple measures, such as correct handling of cold foods and frequent hand washing, may substantially reduce foodborne transmission of noroviruses. **While such practices are easily achievable, they are ineffective if not enforced.**

The following are examples, according to the CDC, of how to prevent infection caused by the virus:

- Since norovirus is found in the feces and fluids of infected individuals, it is imperative that proper hand washing techniques (see below) be followed after using the restroom and before preparing, handling, or consuming foods.

- Infected persons should not prepare or handle food.
  - Food, clothing, or other surfaces potentially exposed to noroviruses should be immediately disinfected.
  - Raw fruits and vegetables should be properly washed before consumption or use in food preparation.
  - Raw sewage, including soiled diapers, should be properly and sanitarily disposed off.
  - Shellfish should be properly cooked prior to consumption. According to the National Fisheries Institute (NFI) and the Food and Drug Administration (FDA), to prevent norovirus infection shucked shellfish (clams, mussels, and oysters without shells) should be boiled for three minutes, fried in oil at 375°F (191°C) for 10 minutes, or baked at 450°F (232°C) for 10 minutes.
  - Many local and state health departments require that food handlers with gastroenteritis not work until two or three days after their symptoms improve—be aware of your local regulations.
  - Businesses should keep sick children or children in diapers away from food preparation areas.
  - Wash hands, utensils, and food contact surfaces (FCSs) with hot soapy water after they contact raw meat or seafood, before food preparation, and after using the bathroom.
- Before handling, preparing, or serving food.
  - Before handling clean utensils, or dishware.
  - After using the restroom.
  - After touching your face, cuts, or sores.
  - After smoking, eating, or drinking.
  - After handling raw meat—especially poultry.
  - After touching unclean equipment, working surfaces, soiled clothing, soiled wiping cloths, etc.
  - After collecting and taking out the garbage.
  - Before and after assisting someone with diarrhea, after cleaning the bathroom, and after changing diapers.

### **What is the proper procedure for hand washing?**

1. Wet your hands with warm water
2. Apply soap and wash your hands for 20 seconds.
  - Pay attention to hard-to-reach areas like knuckle creases, between fingers and under finger nails
  - Include the forearm past the wrist as you wash.
3. Rinse and then dry with a single-use paper towel. Some other hygienic tips are:
  - Do not share food, drinks, spoons, or straws.
  - If you have a child in day-care who has diarrhea, inform the day-care providers; they can make sure germs are not spread to other children.
  - Do not let anyone who has diarrhea use a pool or swim in a pond while they are sick.

## **Why is norovirus infection important for food handlers?**

### **Personal hygiene**

The #1 method of avoiding contamination of food with viral, bacterial and parasitic disease is for all food handlers to regularly and properly wash their hands. While regular hand washing is recommended, some events that should always be followed by thorough washing with soap and warm water for 20 seconds include:

## References

- CDC/NCIRD Division of Viral Diseases. January 21, 2005. *Norovirus: Food Handlers*. Last date of access: 29 September 2005. <http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-foodhandlers.htm>
- CDC. September–October 1999. Food-Related Illness and Death in the United States. *Emerging and Infectious Diseases* (5)5, 607–625. Last date of access: 29 September 2005. <http://www.cdc.gov/ncidod/eid/vol5no5/pdf/mead.pdf>
- CDC/NCIRD Division of Viral Diseases. January 21, 2005. *Norovirus: Technical Fact Sheet*. Last date of access: 29 September 2005. <http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-factsheet.htm>
- Community Health Services. May 25, 2005. *Norwalk Virus*. Last date of access: 29 September 2005. <http://www.lambtonhealth.on.ca/communicable/norwalk.asp>
- FDA/CFSAN Bad Bug Book. January 1992. *The Norwalk Virus Family*. Last date of access: 29 September 2005. <http://www.cfsan.fda.gov/~mow/chap34.html>
- FDA/CFSAN Bad Bug Book. January 1992. *Other Gastroenteritis Viruses*. Last date of access: 29 September 2005. <http://www.cfsan.fda.gov/~mow/chap35.html>