



# Environmental Control of *Norovirus* Fact Sheet

February 2009 Version 3

**What is it?** Noroviruses (NVs) are a common cause of gastroenteritis in humans. Outbreaks have occurred in restaurants, schools, health care facilities, cruise ships and other settings.<sup>1,2</sup>

**What are the symptoms?** Symptoms include sudden onset of nausea, vomiting, abdominal cramps and diarrhea 12-48 hours after exposure. It can also cause headache, fever, and muscle aches and occasionally, severe dehydration. Persons usually recover within 2-3 days without serious health effects. A person is contagious from onset of symptoms until 72 hours after recovery and maybe longer. There are several NV strains and repeated infections can occur.<sup>3</sup>

**How is it spread?** NVs are highly contagious and as few as 10 viral particles may be enough to infect someone. NVs are spread through the fecal-oral route by contaminated hands, directly from person to person, through ingestion of contaminated food or water, or by contact with contaminated surfaces or fomites. Aerosolized vomitus also has been implicated as a transmission mode.

Several characteristics of NVs facilitate their spread during outbreaks. The low infectious dose (<100 viral particles) allows spread through multiple routes e.g. by droplets, person-to-person and fomites. The virus can be shed in feces for long periods after symptoms resolve. NVs can survive in high levels of chlorine and varying temperatures (from freezing to 60° C) facilitating spread through recreational and drinking water and food items.

Cruise-ship outbreaks demonstrate how easily NVs can be spread from person-to-person in a closed environment. The continuation of these outbreaks on consecutive cruises with new passengers and the resurgence of outbreaks caused by the same virus strains during previous cruises on the same ship, or even on different ships of the same company, suggests that environmental contamination and infected crew members can serve as sources of infection for passengers.<sup>10</sup>

**How is it treated?** No specific treatment is available. Fluids, including intravenous fluids, may be necessary to prevent dehydration.<sup>2,3</sup>

**What is the role of the environment?**

Vomiting, which may be projectile, and diarrhea, which may be explosive, increases the likelihood of environmental contamination. Hands may become contaminated with NV by touching contaminated surfaces resulting in hand-to-oral transmission.

**What disinfectants are effective against NV?**

At the present time little is known about the survival of NV in the environment or disinfection procedures needed to remove NVs from contaminated settings. This is because NVs cannot be grown in cultures. Currently, feline calicivirus (FCV) is considered the surrogate virus to assess efficacy of disinfectants and survival of NVs in the environment. There is however some debate on how well data on inactivation of FCV reflects efficacy against NVs, because FCV has different physio-chemical properties to norovirus.<sup>7,8</sup>

The CDC recommends either chlorine bleach or U.S. Environmental Protection Agency (EPA) approved disinfectants to control norovirus outbreaks. All disinfectants should be used on clean surfaces for maximum performance and staff should wear the appropriate protective barriers. If using chlorine bleach, it should be applied to hard, non-porous, environmental surfaces at a minimum concentration of 1,000 ppm (1:50 dilution standard household bleach). In areas with high levels of soiling and resistant surfaces, up to 5000 ppm chlorine bleach may be used. In recent studies, phenols have been found to be effective against FCV (the surrogate for NV) only at twofold to fourfold higher concentrations than recommended by the manufacturers.<sup>1</sup>

Always follow the manufacturers' instructions for use. If using an EPA-approved disinfectant, check the manufacturer's label claims for activity against norovirus (or its surrogate FCV). The EPA website also has a list of hospital use disinfectants registered by the EPA with specific claims for activity against norovirus.<sup>1</sup>

The following 3M™ products have been tested, and have received EPA approval, using the Feline Calicivirus for Norovirus:

3M™ Quat Disinfectant Cleaner Concentrate  
3M™HB Quat Disinfectant Cleaner Concentrate  
3M™ TB Quat Disinfectant Cleaner

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### **What are the environmental control measures?**

Although person-to-person spread might extend NV outbreaks, the initial event is usually a common source e.g. food or water. Efforts to prevent the initial contamination (e.g. food and water sanitation) and subsequent person-to-person transmission (e.g. restricting ill staff from work and sick persons to their room, hand hygiene) are necessary to prevent spread of NV. The high infectivity and persistence in the environment

make NV difficult to control through routine sanitary measures. Control measures may vary depending on the setting (e.g. hospital vs. cruise ship) and the number of cases.

Some general measures are<sup>1,2,3,5</sup>:

- Wash hands after using the toilet, vomiting or contact with contaminated objects or surfaces.
- Wear gloves when cleaning up feces or vomitus. Wear a gown if contamination of clothing possible. Consider wearing a mask if there is a large amount of contamination because spattering or aerosols of infectious material may occur.
- Handle soiled linens and cloths as little as possible and with minimum agitation. Launder with detergent at the maximum cycle length and machine dry.
- Promptly clean surfaces soiled with feces or vomit with a disinfectant according to manufactures instructions. (See above section: **What disinfectants are effective against Norovirus?**)
- Rapid implementation of control measures at the first sign of an outbreak is critical in preventing additional cases. In an outbreak situation, more extensive cleaning may be necessary. Consult with your state health department for further information.

### **Resources for Norovirus**

1. Center's for Disease Control Norovirus in Health Care Fact Sheet, December 2006.  
[http://www.cdc.gov/ncidod/dhqp/id\\_norovirusFS.html](http://www.cdc.gov/ncidod/dhqp/id_norovirusFS.html)
2. Center's for Disease Control Norovirus Q & A; August 2006  
<http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-qa.htm>
3. Center's for Disease Control Norovirus Technical Fact Sheet; August 2006  
<http://www.cdc.gov/ncidod/dvrd/revb/gastro/norovirus-factsheet.htm>
4. L Jimenez, M Chaing, Virucidal Activity of Quaternary Ammonium Compound

- Formulations Against Feline Calicivirus, a Surrogate of Norovirus, American Journal of Infection Control 2006;34:269-73.
5. CDC Guideline for Environmental Control of Infection in Health Care Settings; 2003 [http://www.cdc.gov/ncidod/dhqp/gl\\_enviroinfection.html](http://www.cdc.gov/ncidod/dhqp/gl_enviroinfection.html)
  6. Norovirus Activity – 2002. Morbidity and Mortality Weekly Report. Jan. 24 2003; Vol. 52 (03):pp41-45.
  7. Gulati BR, Allwood PB, Hedberg CW, Goyal SM. Efficacy of Commonly Used Disinfectants for the Inactivation of Calicivirus on Strawberry, Lettuce, and a Food-Contact Surface. Journal of Food Production 2001, 64(9):1430-4.
  8. University of MN College of Veterinary Medicine Press Release. Most Disinfection Solutions Don't Work Well for Norwalk Virus, According to U of MN Study. 12-20-02. Contact - Meta Gaertner, 612 624-4752.
  9. Chadwick PR, Beards G, Brown D, Caul EO, et al. Management of Hospital Outbreaks of Gastroenteritis Due to Small, Round Structured Viruses. Journal of Hospital Infections, May 2000, 45(1):1-10. <http://www.harcourt-international.com/journals>
  10. Outbreaks of Gastroenteritis Associated with Noroviruses on Cruise Ships -- United States 2002. Morbidity and Mortality Weekly Report. December 1`3, 2002/ 51 (49); 1112-1115. <http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5149a2.htm>.

**Additional Resources for Cruise Ships:**

Centers for Disease Control and Epidemiology. Vessel Sanitation Program (800 323-2132) <http://www.cdc.gov/nceh/vsp/default.htm>

Vessel Sanitation Program Operations Manual 2000 from the CDC. 244 pages. p 7-46 Sanitizing Concentrations. P 9-1 Housekeeping <http://www.cdc.gov/nceh/vsp/manual>

**Important:**

The information provided in this report is believed to be reliable; however, due to the wide variety of intervening factors, 3M does not warrant that the results will necessarily be obtained.



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February 2009