



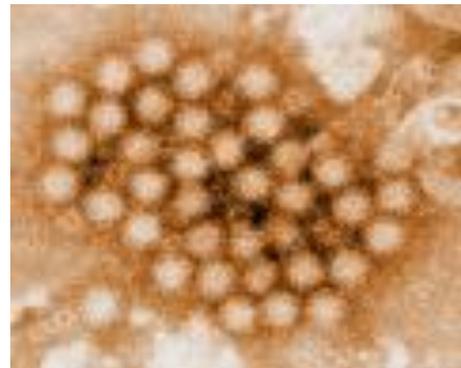
## Norovirus and Chlorine Bleach: The Perfect Pathogen Meets its Match

By Linda Golodner

Is there such a thing as a “perfect” human pathogen? If by perfect we mean a disease-causing microorganism that is highly contagious; quickly and profusely shed in the environment by its hosts; and able to evolve rapidly to both avoid widespread human immunity and ensure a large pool of susceptible hosts, then norovirus comes very close. Norovirus expert Dr. Aron Hall of the Centers for Disease Control and Prevention’s (CDC’s) Division of Viral Diseases cleverly entertained the notion that noroviruses could be the perfect human pathogens in a 2012 editorial commentary.<sup>1</sup>

### *Notorious Norovirus*

Sometimes referred to as “the stomach bug,” and infamous for spreading through cruise ships, norovirus is responsible for some 19-21 million cases of gastrointestinal illness in the US annually.<sup>2</sup> The very young, the very old and the immunocompromised are especially vulnerable to norovirus. It is the most common cause of foodborne illness in the US—responsible for at least 50,000 hospitalizations and between 570 and 800 deaths annually.<sup>3</sup> But norovirus respects no borders. It is a global player. Found in both developed and developing countries, it is the main cause of half of all gastroenteritis outbreaks worldwide. A 2016 analysis<sup>4</sup> estimated the virus’ global economic burden at \$60 billion, the largest share of which (\$56 billion) is lost productivity.



*Colorized transmission electron micrograph of norovirus particles  
Courtesy of CDC/ Charles D. Humphrey*

### *Means of Transmission*

Norovirus is spread in three main ways: (1) close personal contact with an infected individual; (2) ingesting contaminated food or water; and (3) contact with contaminated surfaces. Norovirus can be

<sup>1</sup> Hall, A.J. (2012). Noroviruses: The Perfect Human Pathogens? *Journal of Infectious Diseases*, 205: 1622-1624. <http://iid.oxfordjournals.org/content/205/11/1622.full>.

<sup>2</sup> CDC (2015). Norovirus: U.S. Trends and Outbreaks, <http://www.cdc.gov/norovirus/trends-outbreaks.html>.

<sup>3</sup> CDC (2015). Prevent the Spread of Norovirus, <http://www.cdc.gov/features/norovirus/>.

<sup>4</sup> Bartsch, S.M., Lopman, B.A., Ozawa, S., Hall, A.J., and Lee, B.Y. (2016). Global Economic Burden of Norovirus Gastroenteritis, *PLOS ONE*, DOI:10.1371/journal.pone.0151219. <http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0151219>.

transmitted by ingesting food contaminated at the source (e.g., fruits and vegetables) or by infected food handlers. (Food handlers who return to work sooner than 48 hours after they no longer have symptoms can still spread norovirus.<sup>5</sup>) Norovirus has remarkable staying power on environmental surfaces where it can persist for up to two weeks. It can survive freezing and withstand heating to 140 degrees. To destroy norovirus in drinking water, CDC recommends<sup>6</sup> bringing water to a rolling boil (212 degrees Fahrenheit) for one minute. Astonishingly, only 18 norovirus particles are required to infect a human host. For perspective, there are billions of particles in the stool and vomit of infected individuals.

### *Outsmarting Norovirus*

Efforts to develop a vaccine for norovirus are still in their infancy,<sup>7</sup> so proper hygiene and surface disinfection practices must be employed to control the spread of the perfect pathogen. People infected with norovirus are advised to limit their contact with others for at least two days after symptoms have ended. Disinfecting surfaces contaminated with the persistent norovirus can go a long way to curtailing outbreaks. Properly prepared chlorine bleach solutions (see below) destroy norovirus on surfaces. **Simply cleaning surfaces with soap and water or other cleaning product can actually spread virus particles.** In the City of Albuquerque, for example, restaurant staff are encouraged to switch from quaternary ammonium disinfectants to chlorine bleach disinfectants when a norovirus outbreak occurs.<sup>8</sup>

### *Communicating a Disinfection Strategy*

In 2012, the Water Quality and Health Council participated in a partnership with public health experts, including the New Jersey Somerset County Department of Health, the CDC, the National Environmental Health Association and others, to develop a series of downloadable posters featuring directions for preparing bleach solutions to destroy noroviruses on surfaces. For example, the posters include detailed directions on how to clean and disinfect an area affected by a vomiting or diarrhea incident. Posters are available in English, Spanish and French and can be found at <http://www.disinfect-for-health.org/tools-reduce-spread-norovirus>.

So when it comes to combatting the nearly perfect pathogen norovirus, remember:

- the [right way to wash your hands](#);
- do not prepare food or care for others when you are sick;
- wash fruits and vegetables and cook seafood thoroughly;
- clean and disinfect contaminated surfaces using chlorine bleach or other disinfectant registered as effective against norovirus by the EPA; and

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<sup>5</sup> CDC (2014). Norovirus and Working with Food, <http://www.cdc.gov/norovirus/food-handlers/work-with-food.html>.

<sup>6</sup> CDC (2015). Noroviruses and Drinking Water from Private Wells, <http://www.cdc.gov/healthywater/drinking/private/wells/disease/norovirus.html>.

<sup>7</sup> CDC (2015). Making a Norovirus Vaccine a Reality, <https://blogs.cdc.gov/publichealthmatters/2015/03/making-a-norovirus-vaccine-a-reality/>.

<sup>8</sup> "Norovirus Kitchen/Dining Room Response Procedures, City of Albuquerque Environmental Health Department handout at 4<sup>th</sup> Annual Norovirus Conference, August 4, 2016.

- launder clothes thoroughly.

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