

## Norovirus: General Information, Hand Hygiene and Contact Precautions

Norovirus is the most common cause of viral gastroenteritis. The virus is widespread and the disease affects all populations<sup>i,ii,iii,iv</sup>. ” *Norovirus is transmitted by hands contaminated through the fecal-oral route, directly from person to person, through contaminated food or water, or by contact with contaminated surfaces or fomites. Aerosolized vomitus also has been implicated as a transmission mode. Because of high infectivity and persistence in the environment, transmission of noroviruses is difficult to control through routine sanitary measures.*”<sup>v</sup> Although gastroenteritis cause by Norovirus is usually self-limited, elderly persons, young children, and those with severe underlying medical conditions are at increased risk for complications because of volume depletion and electrolyte disturbances.

The incubation time of Norovirus is typically 24-48 hours but ranges from 10 to 72 hours, with illness usually resolving with 48 hours, although symptoms in some cases last up to three days. Symptoms include any or all of the following: abdominal cramps, nausea, vomiting, diarrhea, headache, joint pain, and low-grade fever. Norovirus infection in healthy adults typically requires ingestion of at least 100 organisms; however, in experimental situations, symptoms have occurred after ingestion of as few as 10 organisms.<sup>vi</sup> It is estimated that as many as 30% of persons with Norovirus in their stools are asymptomatic. In addition, post-symptomatic shedding of the virus can continue for up to 14 days after the resolution of symptoms.

The organism is an enveloped virus and thus is resistant to low concentrations of chlorine, such as would be found in swimming pools and drinking water, and is also relatively heat resistant, surviving temperatures up to 60 degrees centigrade. The virus is inactivated by bleach at a 1:50 concentration<sup>vii</sup> (note: for comparison purposes regarding the hardness of Norovirus, viruses such as HIV and Hepatitis B are inactivated by concentrations of 1:100 bleach). Similarly, members of the calcivirus family, including Norovirus, are more difficult to kill with ethanol than are vegetative bacteria and non-enveloped viruses. Ethanol in concentrations of 60 – 70% (the usual concentration in commercially available hand sanitizers), if correctly applied to all surfaces of the hands will eradicate >99% of the vegetative bacteria and non-enveloped viruses after 30 seconds of contact time. A full minute of contact time with 70% ethanol is required to inactivate Norovirus. Only 30 seconds of contact time with 85% ethanol is required to inactivate caliviruses, but this concentration is not commercially available in a hand sanitizer.<sup>viii</sup>

Hand hygiene is the most important means of preventing the spread of infection. This statement is true for Norovirus as well as for most other communicable diseases. However, hand hygiene to prevent the spread of enveloped viruses and spore-forming bacteria requires more than the usual effort.

The CDC recommends that handwashing consist of a minimum of 20 seconds of washing using soap and warm water. This 20 seconds should include friction to all hand surfaces<sup>ix</sup>. Sanitizing alcohol gels can be used as an alternative for handwashing, provided that the hands are “socially clean,” are free of organic matter, and adequate contact time is observed.<sup>x</sup> Alcohol based hand sanitizers ARE NOT effective against spores and therefore should not be utilized as the primary means of hand hygiene when dealing with organisms such as *Clostridium difficile*.<sup>xi,xii,xiii</sup>

Studies of hand hygiene reveal that healthcare workers on average wash their hands 6 -10 seconds. Similarly, healthcare workers typically apply 3cc or less of alcohol based hand sanitizers, and this volume may be insufficient to permit the 30 seconds of contact time required for >99% kill of vegetative bacteria and non-enveloped viruses. It is definitely an insufficient volume for inactivation of calciviruses such as Norovirus. Opportunities for hand hygiene versus actual follow-through with handwashing or use of gel are also a problem in healthcare settings. Healthcare workers average 8 to 20 contacts with patients per hour; by contrast, the average healthcare worker washes or sanitizes hands less than 30 times per shift.<sup>xiv</sup>

Artificial nails have been identified as another problem with maintaining adequate hand hygiene for two reasons. First, healthcare workers with artificial nails tend to avoid friction/scrubbing of these surfaces during the handwashing or hand sanitizing episode. Studies have also shown that the pores of the “glue” used to adhere artificial nails has served as a “hiding place” for microbes and therefore is implicated in the spread of infection.<sup>xv,xvi</sup> Thus, artificial nails are inadvisable for anyone having patient contact or providing services to the patient, including not only direct care givers but also housekeepers and, in some situations, dietary workers.

The 1996 CDC guidelines for standard and transmission based precautions indicated that contact precautions should be implemented empirically with patients having acute gastroenteritis, until symptoms are resolved or the organism is identified and appropriate therapy has been in place for a sufficient time to render the patient non-contagious.<sup>xvii</sup> Similarly, the Current CDC guidelines for controlling Norovirus in healthcare facilities recommend the use of gloves and gowns when cleansing a patient after an episode of vomiting or incontinent stool.<sup>xviii</sup> If a patient is actively vomiting, a mask should be worn by the staff member in order to avoid the inhalation of aerosols.<sup>xix</sup>

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<sup>i</sup> Atmar RL, Estes MK. Diagnosis of noncultivable gastroenteritis viruses, the human caliciviruses. Clin Microbiol Rev. 2001;14:15–37

<sup>ii</sup> de Wit MA, Koopmans MP, Kortbeek LM, Wannet WJ, Vinje J, van Leusden F, et al. Sensor, a population-based cohort study on gastroenteritis in the Netherlands: incidence and etiology. Am J Epidemiol. 2001;154:666–74.

<sup>iii</sup> Hale A, Mattick K, Lewis D, Estes M, Jiang X, Green J, et al. Distinct epidemiological patterns of Norwalk-like virus infection. J Med Virol. 2000;62:99–103.

<sup>iv</sup> Lindesmith L, Moe C, Marionneau S, Ruvoen N, Jiang X, Lindblad L, et al. Human susceptibility and resistance to Norwalk virus infection. Nat Med. 2003;9:548–53.

<sup>v</sup> CDC (January 2003). Outbreaks of Gastroenteritis Associated With Noroviruses on Cruise Ships - United States, 2002. MMWR.

<sup>vi</sup> Centers for Disease Control (CDC), February, 2004. Accessed online at: [http://www.cdc.gov/ncidod/diseases/submenus/sub\\_norwalk.htm](http://www.cdc.gov/ncidod/diseases/submenus/sub_norwalk.htm)

<sup>vii</sup> CDC Facts Sheet (2006) Norovirus in Healthcare Facilities Facts Sheet. Accessed online 1/26/2007 at [http://www.cdc.gov/ncidod/dhqp/id\\_norovirusFS.html](http://www.cdc.gov/ncidod/dhqp/id_norovirusFS.html).

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- <sup>ix</sup> CDC (2007) Handwashing on Cruise Ships. Accessed online 1/30/2007 at <http://www.cdc.gov/nceh/vsp/pub/Handwashing/handwashingtips.pdf>
- <sup>x</sup> CDC(2002). Guideline for Hand Hygiene in Healthcare settings. MMWR, 51. RR-16.
- <sup>xi</sup> . Larson E, Bobo L (1992). Effective hand degerming in the presence of blood. Journal of Emergency Medicine 10. 7—11.
- <sup>xii</sup> Larson EL, Eke PI, Laughon BE.(1986) Efficacy of alcohol-based hand rinses under frequent-use conditions. Antimicrob Agents Chemother . 30:542--4.
- <sup>xiii</sup> Weber DJ, Sickbert-Bennett E, Gergen MF, Rutala WA. (2003). Efficacy of selected hand hygiene agents used to remove *Bacillus atrophaeus* (a surrogate of *Bacillus anthracis*) from contaminated hands. JAMA, 289(10). 1274-7.
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- <sup>xv</sup> Foca M, Jakob K, Whittier S, Della Latta P, Factor S, Rubenstein D, Saiman L (2000). Endemic *Pseudomonas aeruginosa* infection in a neonatal intensive care unit. New England Journal of Medicine. 343(10):695-700
- <sup>xvi</sup> Gupta A, Della-Latta P, Todd B, San Gabriel P, Haas J, Wu F, Rubenstein D, Saiman L. (2004). Outbreak of extended-spectrum beta-lactamase-producing *Klebsiella pneumoniae* in a neonatal intensive care unit linked to artificial nails. Infect Control Hosp Epidemiol. 25(3):210-5.
- <sup>xvii</sup> CDC(1996) Guidelines for Isolation Precautions in Hospitals. Accessed online 2/2/2007 at [http://wonder.cdc.gov/wonder/prevguid/p0000419/p0000419.asp#Table\\_2](http://wonder.cdc.gov/wonder/prevguid/p0000419/p0000419.asp#Table_2).
- <sup>xviii</sup> CDC(2006) Norovirus in Healthcare Facilities, Facts Sheet. Access on 2/8/2007 at [http://www.cdc.gov/ncidod/dhqp/id\\_norovirusFS.html](http://www.cdc.gov/ncidod/dhqp/id_norovirusFS.html).
- <sup>xix</sup> *Ibid.*