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Norovirus

Synonyms: Norwalk virus, Norwalk-like virus

See also separate articles [Gastroenteritis in Children](#) and [Gastroenteritis in Adults and Older Children](#).

What is norovirus?^[1] ^[2]

Noroviruses (NVs) are a genus of the *Caliciviridae* family of viruses found in 'used' water. They are concentrated in shellfish, oysters and plankton.

The *Caliciviridae* family of small, non-enveloped, positive-stranded RNA viruses is now comprised of 5 genera, including Norovirus, Sapovirus, Lagovirus, Nebovirus and Vesivirus. The Norovirus and Sapovirus genera contain the human enteric viruses of the same names as well as a number of viruses that cause primarily enteric diseases in other animals, such as murine and canine noroviruses.

Noroviruses are classified using genetic analysis due to the lack of a robust culture system, and are divided into 10 distinct genogroups (GI–GX), with genogroups GI, GII and GIV most implicated as causing gastroenteritis in humans.

Genogroups are further divided into genotypes and variants (subtypes) based on genomic sequence diversity. The majority of newly emerging variants associated with outbreaks are genogroup II genotype 4 (GII.4) noroviruses.

These variants are typically named using the geographic location where the strain was first isolated and the year in which they were detected (eg, GII.4 Sydney 2012).

Human-to-human transmission occurs via the faecal/vomit oral route, with contaminated inanimate objects, food and water playing important roles.

How common is norovirus? (Epidemiology)^[2]

- The incidence of norovirus in the UK has been estimated at 3 million cases annually, and the impact and control of norovirus gastroenteritis is associated with significant costs to global healthcare systems.
- The illness is often called winter vomiting disease, as it typically occurs between November and April. When outbreaks occur in hospitals and residential facilities this can add to the pressure on healthcare systems.^[3] However, this seasonality is not invariable. The emergence of a novel GII.4 virus in 2002/03 led to persistence of the condition into the summer.^[4]
- Noroviruses affect all age groups and are recognised to cause both outbreak-associated gastroenteritis, which typically occurs in semi-enclosed settings and may be healthcare associated (eg, on a hospital ward) or non-healthcare associated (eg, on a cruise ship), and sporadic cases of gastroenteritis in the general community.

Symptoms of norovirus (presentation)^[2]

Faecal excretion of norovirus infection in asymptomatic individuals is common, especially in children.

Symptoms

- Following an average incubation period of 24 hours, acute-onset gastroenteritis with vomiting and/or non-bloody diarrhoea typically lasts 24–48 hours, but illness may be more prolonged and severe in young infants and hospitalised patients.
- Common symptoms include fever, nausea and vomiting that may be projectile, along with watery diarrhoea without blood.
- Abdominal cramps are common.
- Most people make a full recovery in 1 to 2 days but the diarrhoea may last a little longer.
- Seizures occasionally occur. Long-term neurological sequelae are uncommon.

Signs

There are no specific signs unique to this infection and the clinical picture is very much as one would expect with gastroenteritis, viz:

- Along with a mild pyrexia, features of dehydration may appear.
- Examination of the abdomen shows no local abdominal tenderness and no guarding.
- In the very young and the very old, dehydration may be severe enough to require admission to hospital.
- Severe dehydration may lead to hypotension, electrolyte imbalances and collapse.

Differential diagnosis

- Other causes of infective gastroenteritis – eg, [salmonella](#), [amoebiasis](#) or [giardiasis](#).
- Gastrointestinal disorders, such as [irritable bowel syndrome](#), [Crohn's disease](#), [ulcerative colitis](#) or hepatitis.
- Mechanical problems, such as ischaemic colitis from torsion or thrombosis.

Diagnosing norovirus (investigations) ^[1]

- Stool samples in outbreaks help to identify bacterial or viral pathogens and sometimes locate the source of infection.
- The two main types of laboratory tests available are enzyme-linked immunosorbent assays (ELISAs) to detect norovirus antigens and polymerase chain reaction (PCR) tests to detect norovirus nucleic acid. The current gold standard test at present is PCR.
- In community cases there is little point in investigating a trivial and self-limiting condition where management is purely symptomatic.
- Antibody testing is not useful. Most people develop antibody from subclinical infection.
- In cases with complications, such as dehydration, other tests will be required, such as renal function and electrolytes.

Management of norovirus^[2]

There are no effective medical treatments other than supportive care with oral or intravenous rehydration, and replacement of lost electrolytes and nutrition.

The use of anti-emetic agents and antidiarrhoeal agents is discouraged and care must be taken to avoid adverse consequences of their use in other infective gastroenteritides (eg, *Clostridium difficile*).

Key control measures include increased frequency of cleaning, environmental disinfection and prompt clearance of soiling caused by vomit or faeces. Hygiene (especially in kitchens and bathrooms) and hand washing are important and anyone who is infected should not prepare food for others until at least 48 hours after symptoms have gone.^[5]

Prognosis

- The condition is usually self-limiting and, apart from seroconversion, leaves no lasting effects.
- There is a risk of mortality especially in the frail, the immunocompromised and at the extremes of age.^[6]
- One study of deaths associated with gastrointestinal pathogens in England and Wales in persons of 65 or over estimated that 80 deaths annually were caused by NV infection between the years 2001–2006.^[7]
- Another study in the Netherlands reported that deaths were more likely in outbreaks associated with GII.4 virus strains, independent of other factors.^[8]

Prevention of norovirus^[5]

- Person-to-person spread is by the faecal-oral route.
- Education about length of infectivity, modes of spread and hygiene help to reduce interpersonal spread of infection.
- Drinking purified water and avoiding raw unwashed produce and shellfish, especially in times of outbreaks, is important to avoid infection or re-infection.^[9]

- There is risk of infection from aerosols of projectile vomit. ^[10]
- Environmental contamination, especially of toilets, can occur and gloves should be used by cleaners.
- Anywhere that large numbers of people congregate for periods of several days provides an ideal environment for the spread of the disease. Healthcare settings tend to be particularly affected by outbreaks of NV and a study done by the Health Protection Agency showed that outbreaks are shortened when control measures at healthcare settings are implemented quickly, such as closing wards to new admissions within four days of the beginning of the outbreak and implementing strict hygiene measures. ^[11]
- Infectivity lasts for 48 hours after resolution of symptoms.
- A murine model has been used for research. ^[12] Natural immunity, as well as short-lived, is likely genogroup-specific. ^[13]
- An informal network of scientists working in public health institutes or universities has been set up in Europe (NoroNet) to share virological, epidemiological and molecular data on NV. Similar networks have been set up in other parts of the world. ^[14]

Further reading

- [Netzler NE, Enosi Tuipulotu D, White PA](#); Norovirus antivirals: Where are we now? *Med Res Rev.* 2019 May;39(3):860–886. doi: 10.1002/med.21545. Epub 2018 Dec 25.
- [Chong PP, Atmar RL](#); Norovirus in health care and implications for the immunocompromised host. *Curr Opin Infect Dis.* 2019 Aug;32(4):348–355. doi: 10.1097/QCO.0000000000000557.

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