

## Clinical characteristics and viral shedding of children with norovirus gastroenteritis

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### Abstract

**Background:** Norovirus (NoV) is an emerging enteric pathogen worldwide. NoV plays an increasingly important role in enteric infections. The rapid transmission of NoV via person-to-person contact makes infection control difficult. A quantitative method is even more important in the management of NoV infection in immunocompromised hosts, including transplant and cancer patients. **Materials & Methods:** Fecal specimens were collected from previously healthy children with NoV gastroenteritis confirmed by RT-PCR. The transcript of VP2 gene was reverse transcribed into cDNA and dissolved in DNase-free distilled water. The cDNA quantity was equivalent, approximately, to  $4.12 \times 10^{12}$  copy numbers according to EndMemo number calculation. The standard curve using 10-fold serial dilution of the cDNA was obtained (10<sup>-1</sup>-10<sup>-10</sup>). The equivalent copy numbers in 53 fecal samples from NoV-infected patients were counted. The clinical presentations of the patients were retrospectively collected and analyzed by GraphPad Prism 6.0 (GraphPad Software, Inc.). The NoV was also genotyped using methods as described earlier. Fisher exact test was used to determine differences between clinical features. Statistical significance was analyzed using a nonparametric Mann-Whitney U test for two independent samples.

**Results:** A total of 53 fecal samples from NoV-infected hospitalized children age range, 8 months to 5 years were collected for analysis of viral load with the time for sample collection varied from day 1 to day 19 after the onset of the illness. We identified a longer shedding period in 21 febrile patients ( $6.75 \pm 3.14$  days after disease onset) than in 32 afebrile ones ( $5.7 \pm 3.4$  days after disease onset) ( $p=0.03$ ); however, there is no significant difference between the 37 older patients ( $\geq 1$  years old,  $6.5 \pm 3.9$  days after illness onset) and the 16 younger ones in terms of viral shedding. Furthermore, we found a significantly longer shedding period in patients infected by NoV GII.4 Sydney strain (30 cases;  $6.9 \pm 3.1$  days after illness onset) than those infected by non-GII.4 Sydney strains (23 cases;  $5.7 \pm 3.7$  days after disease onset) ( $p < 0.01$ ).

**Discussion:** In this study, we used the SYBR green-based real-time RT-PCR to measure NoV viral load in the feces of patients with NoV infection. SYBR green real-time RT-PCR showed a higher sensitivity in viral load calculation as the detection limit of the technique was at 50 RNA copies/ml in a previous study. With this method, we found febrile NoV GII.4 Sydney strain-infected children have a longer viral shedding. In the previous study indicate that Norovirus infection induced immune response in the patients, and inflammation may drive viral replication, leading to a longer shedding period following the onset of the illness. **Conclusion:** In conclusion, we devised a sensitive method for quantification of NoV viral load in patients and successfully established the model of NoV viral shedding. This method is useful for devising efficient infection control measures for NoV infection, investigating outbreaks, and monitoring viral transmission and evolution.

**Keywords:** Norovirus infection; gastroenteritis; RNA copies

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## Introduction

In both developing and developed countries, infections of the gastrointestinal tract are common. These infections are important causes of child mortality in developing countries, whereas in developed countries, their impact is typically felt in terms of economic loss and morbidity. Community-based studies have shown that, in developed countries, 20%–25% of individuals have an episode of gastroenteritis annually. Noroviruses (previously known as “Norwalk-like viruses” and “small, round-structured viruses”) have been shown to be the most common etiological agent in cohort analyses involving Dutch and English communities. It has been estimated that 650,000 cases of norovirus gastroenteritis occur in England and Wales annually [1].

Noroviruses are small (diameter, 35–40 nm), single-stranded RNA viruses that belong to the Caliciviridae family. Because of their low infectious dose and environmental stability, they are transmitted by a number of routes. Spread by means of food and water consumption and person-to-person contact can occur by the fecal-oral route, and airborne transmission can occur when an affected individual vomits. Vomitus spread is most commonly recognized in semiclosed communities, such as nursing homes, hospitals, and cruise ships [2].

The syndrome resulting from norovirus infection has historically been described as mild and self-limiting. These descriptions originate from studies performed in the 1970s that involved human volunteers, as well as from numerous outbreak investigations. Such reports were the basis for the criteria used by Kaplan et al. to discern outbreaks with a viral etiology. These criteria included a short incubation period (24–60 h), a short infection duration (12–60 h), and a high frequency of vomiting (50% of cases). However, these analyses were based on infection in otherwise healthy adults and, therefore, may not be representative of the range of symptoms in the community at large. The recent analysis by Rockx et al. of a community-based cohort of patients with norovirus infection revealed a median duration of infection of 6 and 3 days in infants <1 year of age and children 1–4 years of age, respectively.

It is well known that persons in health care settings, such as hospital staff and patients and nursing home staff and residents, are at high risk for outbreaks of infectious diseases [3]. More than one-half of the 5257 reports collected during broad-based surveillance of gastroenteritis outbreaks in England and Wales occurred in residential homes or hospitals. However, detailed descriptions of outbreaks of norovirus infection in these communities of (principally) older individuals are lacking. Here, we analyze case series' from a prospective study of outbreaks of gastroenteritis in hospitals and nursing homes in the county of Avon, England.

## Methods

Population, follow-up, and clinical definitions. The study design is briefly summarized below; a detailed description is published elsewhere (BA Lopman et al., unpublished data). Cases were

ascertained in an active prospective study of gastroenteritis outbreaks in hospitals and nursing homes. Four major acute care hospitals and 11 community hospitals that operate in the county of Avon, England, were monitored in the gastroenteritis surveillance network from April 2002 through March 2003. Combined, there were 2900 beds allocated for acute care in these hospitals. Nursing homes were defined as institutions that provide inpatient care for people whose infirmity, illness, or injury requires nursing care on a regular basis. In England and Wales, such care can only be provided by a qualified nurse or under the direct supervision of a nurse, and institutions must be registered with the local health authority. All such nursing homes (n = 152) registered in Avon were invited to join the surveillance system. A total of 135 nursing homes (89%) agreed to participate and completed the full 1-year follow-up period. Including beds in these nursing homes, 4500 beds were covered by the surveillance system. Ethical approval for this work was obtained from the South West Multi-Centre Research Ethics Committee (Bristol, United Kingdom).

The surveillance system was designed to detect outbreaks of gastroenteritis, and, therefore, a 2-tiered definition of cases and outbreaks was employed. Cases were defined as illness in hospital patients, nursing home residents, and health care staff that was associated with (1) episodes of vomiting, (2) ≥3 episodes of diarrhea, or (3) both (1) and (2) during a 24-h period. Persons with illness that was believed to meet this definition were excluded from the study if the symptoms were due to incontinence or ingestion of laxative drugs. An outbreak was defined as the occurrence of cases in a hospital functional care unit (i.e., a ward) with dates of onset within 7 days of each other.

Outbreak investigation and diagnostic evaluation. Staff who were managing outbreaks were recommended to obtain specimens from the first 10 patients with an outbreak-associated case for virological analysis and from the first 3 patients for bacterial analysis. Recovery of a such a large number of specimens was suggested because of the low sensitivity of viral diagnostic tests [4]. Explicit instruction on how to obtain and send samples for analysis was based on standard operating procedure published by the Health Protection Agency (London). Specimens were tested for viral pathogens at the regional public health laboratory using an in-house norovirus ELISA, followed by RT-PCR and then by electron microscopy

Case data were recorded on dedicated forms on a daily basis, ensuring a high level of accuracy. As an outbreak progressed, forms were completed by infection-control nurses in hospitals and by environmental-health officers in nursing homes. Information, including date of onset, first symptom-free day, and presence of vomiting and/or diarrhea, was collected. The duration of illness was defined as the number of days (inclusive) between the first and final dates of symptoms. Therefore, whole days, instead of hours, were counted. Individuals were considered to be “symptom free” when they had no episodes of vomiting or diarrhea during a 1-day period.

Biography Shih Yen Chen is currently a Chief of Department of Pediatrics, Taipei Medical University, Shuang Ho Hospital, Taiwan. He received his Doctor of Medicine degree from Taipei Medical College, and Doctor of Philosophy degree from Chang Gung University College of Medicine.

The design philosophy for the radiation barriers will depend on the legal dose limits in force. At the present time the BSS prescribe the dose limits. Government bodies have incorporated these standards in legislation [5].

## References

1. Khalil AA, Rahman U, Khan MR, Sahar A, Mehmood T, et al. (2017) Essential oil eugenol: sources, extraction techniques and nutraceutical perspectives. *RSC Adv* 7: 32669-32681.
2. Marchese A, Barbieri R, Coppo E, Orhan IE, Daglia M, et al. (2017) Antimicrobial activity of eugenol and essential oils containing eugenol: A mechanistic viewpoint. *Crit Rev Microbiol* 43: 668-689.
3. Pramod K, Ansari SH, Ali J (2010) Eugenol: A natural compound with versatile pharmacological actions. *Nat Prod Commun* 5: 1999-2006.
4. Xu JS, Li Y, Cao X, Cui Y (2013) The effect of eugenol on the cariogenic properties of *Streptococcus mutans* and dental caries development in rats. *Exp Ther Med* 5: 1667-1670.
5. Moon SE, Kim HY, Cha JD (2011) Synergistic effect between clove oil and its major compounds and antibiotics against oral bacteria. *Arch Oral Biol* 56: 907-916.