Norovirus Gastroenteritis in US Marines in Iraq

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(See the article by Crum et al. on pages 511–8 and the article by Thornton et al. on pages 519–25)

In this issue of Clinical Infectious Diseases, Thornton et al. [1] report the findings of a cross-sectional laboratory study of gastroenteritis that affected a military unit operating during the first portion of the 2003 invasion in central Iraq. The new findings of this report are most evident for norovirus—also known as “Norwalk virus,” “Norwalk-like virus,” and “small, round-structured virus”—a virus for which the known impact among humans has markedly increased since 1990, when the viral genome was first characterized and new diagnostic reagents were designed [2]. Norovirus is and deserves to be listed by the National Institute of Allergy and Infectious Diseases as category B among pathogens of importance to biodefense.

The lead author of this study [1] is part of a group that has been investigating infectious diseases in the US military during recent deployments [3–8]. This report represents an important advancement in their investigations, because they established field testing for norovirus infections during combat, with attendant better catchment of the study population and more prompt pathogen recognition; they used better primers for RT-PCR detection of norovirus; and, consequently, they identified a broader spectrum of infecting strains. They also provided evidence that antimicrobial prophylaxis reduced the impact of bacterial gastroenteritis pathogens commonly observed in prior studies.

In these studies of gastroenteritis during military deployments, successive studies have observed the frequent occurrence of bacterial pathogens among cases of gastroenteritis and an increasing frequency of norovirus detection. During Operation Desert Shield in 1990, numerous outbreaks of diarrhea occurred among the US forces, and a bacterial enteric pathogen was identified in 50% of the troops with gastroenteritis [3]. Vomiting, which is usually a prominent feature of norovirus disease in adults, was infrequently reported as a primary symptom, but of 11 military personnel among whom vomiting was a major symptom, 9 (82%) had serologic evidence of infection with norovirus. Outpatient surveillance of 21,000 US troops deployed during the first 8 weeks of Operation Restore Hope in Somalia revealed bacterial pathogens in 49%. Additionally, 3 (27%) of 11 paired serum samples collected from persons with nausea, vomiting, and watery diarrhea demonstrated a >4-fold increase in antibody titer to norovirus [4]. Among US military personnel deployed to South America and West Africa, an enteropathogen was identified in 51% of those with acute cases of diarrhea; norovirus infection was detected in 10% [5]. Other studies have reported outbreaks of norovirus infection in encampments, in deployments of ground troops, and on Navy ships [6–8]. Some of these outbreaks of infection have been large, with ~10% of cases receiving intravenous rehydration, leading to exhaustion of this resource in a battle group, and with sufficient cases to impede force readiness, including stand-down of a battle group’s air wing. In the study in this issue of the journal, Thornton et al. [1] report that 26% of cases of gastroenteritis were caused by norovirus, this time determined on the basis of direct pathogen detection. The multiple norovirus genomic types detected indicate that exposure was associated with local resources and not with materials provided through military supply. In addition, microbial characterization suggested that routine antimicrobial prophylaxis taken by the troops might have been effective against bacterial enteric pathogens. If this latter observation is true, then the possibility of development of routine prophylaxis against norovirus infection and illness would be enhanced.

Cumulatively, these studies have led to the general assessment that outbreaks of norovirus infection among ship- and land-based forces are common, are occasionally extremely severe, and are still not sufficiently understood. An example of the yet-unknown impact is provided by the notable outbreak of norovirus gastroenteritis that occurred with the onset of combat in Afghanistan [9]. In that out-

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break, after a short incubation period, 29 British soldiers and staff of a field hospital in Afghanistan became acutely ill with vomiting, diarrhea, and fever. Clinical evolution included disseminated intravascular coagulation and mental status changes that suggested a biological attack. With transport of the affected soldiers to a hospital back home, nosocomial cases were such as to require that hospital to be closed. The report about this outbreak in the combat theater, some reports of norovirus infection in the elderly population, and anecdotal reports of pediatric gastroenteritis cases suggest that the full spectrum of clinical presentation for norovirus disease has not yet been described. It seems probable from these reports that persons who are already dehydrated due to daily activity, although they may otherwise be in robust health, have an increased risk of severe outcome when infected with norovirus.

The study designs that were used to document cases of gastroenteritis in the military also deserve comment. Although there are compelling reasons that might so dictate, these study designs were weaker than those undertaken to document the intensity of norovirus-associated illness in the general public. Even in this highly advanced study, given the setting, standardized clinical data collection was incomplete, the denominator from which the numerator of laboratory samples were derived was unknown, and patterns of clinical illness and associated morbidity were not described. These shortcomings are in contrast to robust, similar information provided in nonmilitary studies of this pathogen. From discussions with military personnel, it is apparent that field commanders may resist reporting “trivial” illnesses, even when they impede force readiness, because of a perception that such reports will affect judgments of their field competence. If true, such impediments should be weighed at a higher command level against the need to more accurately assess the impact of norovirus infection on troop health and force effectiveness, with the resulting more-accurate allocation of resources for development of effective countermeasures. Furthermore, the repeated outbreaks of norovirus gastroenteritis that predictably occur in the military are an opportunity to gain knowledge that otherwise would need to be obtained in the private sector, with associated redundant costs.

These latter comments should not detract from the bold approach taken by Thornton et al. [1] to document the impact and cause of gastroenteritis among troops in combat. I expect that our imaginations cannot fathom the problems attendant from the absolute urgency for relief from explosive vomiting and diarrhea when experienced within an armored vehicle under fire and at ambient temperature of >40°C.

Acknowledgments


References