MedicalXpress

Norovirus is tragically common

April 27 2016, by Ben Lopman

Noroviruses are among the most common pathogens causing disease in humans. They are the most common cause of gastroenteritis globally and gastroenteritis is one of the most common ailments afflicting humans. Their role as a common cause of disease is also true among certain risk groups. Currently, in developed countries with routine rotavirus vaccination, noroviruses are the most common cause of severe pediatric gastroenteritis requiring medical care. The burden of norovirus disease is great in developing countries, as well. According to one well-designed multisite study of children in Africa and Asia, noroviruses are second only to rotavirus as a cause of diarrheal disease in the first few years of life. Globally, noroviruses are understood to be the most common cause of foodborne disease.

There is tragedy in this commonness: noroviruses are estimated to cause over 200,000 deaths per year globally, almost all of which are in developing countries where noroviruses are an important cause of child mortality. In developed countries, most outbreaks of norovirus occur in healthcare facilities, such as nursing homes (no, not cruise ships, like you might think from news reports). In these settings, where vulnerable populations reside, infection can result in severe disease, hospitalization or death.

If you can remember your most recent norovirus episode, you'd probably take issue with the old description that it's a 'mild and self-limiting' disease, even if you are an otherwise healthy adult. The vomiting, diarrhea and resulting dehydration may be short-lived but it is intense. It's not hard to imagine how a malnourished child in a community with

limited healthcare access or an elderly person with other underlying health conditions could be severely affected by norovirus infection.

Incomplete Scientific Understanding, Insufficient Tools for Control

I'd argue there are two overarching barriers keeping us from making more progress in controlling norovirus. The first barrier is the range of technical issues that has slowed progress. Chief among these is the inability to efficiently grow norovirus in cell culture. Without a cell culture system, it's been difficult to develop diagnostics, infectivity assays and vaccines. Fortunately, we've seen important advances in the last decade in these areas including more sensitive diagnostics and even cultivating norovirus in cell culture. As we write in our Collection Review, these advances have the potential to accelerate control efforts. The second main barrier is norovirus's ubiquity, in so many domains. Is norovirus an issue of child survival, a food safety problem, a healthcare associated infection? Well, it's all of these, which may have hampered our community of researchers and public health workers from coalescing around a central problem.

Progress

It is for these reasons that last year, CDC and the Gates Foundation and other partners convened a scientific meeting in Atlanta, GA, USA bringing together representatives of government, academia, industry and philanthropy. The group was charged with reviewing the most up-to-date research on norovirus, identifying key gaps and detailing the studies needed to address them. The ultimate goal of the symposium was to orient the development of a norovirus vaccine for the populations that stand to benefit most: children in the developing world. The papers in this *PLOS* Collection represent some of the outcomes and new data

called for at this meeting. Papers in this Collection offer new data on the epidemiology and burden of disease in Africa, the United States, and military populations, further highlighting how common norovirus is even as it affects geographically and demographically diverse groups. Another set of papers within the collection demonstrate how genetically diverse these viruses are, but that similar patterns are seen globally: genogroup II type 4 strains predominate; novel GII.4 strains serially replace each other every two to four years; and viral 'sex' (i.e. gene swapping through recombination) is the norm, not the exception. We also see progress in understanding immunity to norovirus, even in the absence of cell culture systems that could be used to raise neutralizing antibodies. Advances in all of these areas provide important information as we—hopefully—move closer toward a safe and effective norovirus vaccine. Finally, we knew norovirus was a big, global problem, with a lot of open scientific questions. And now, thanks to an economic analysis published as part of this Collection, we know just how big that question is: it's a $60 billion question, every year, globally.

More information: Sarah M. Bartsch et al. Global Economic Burden of Norovirus Gastroenteritis, *PLOS ONE* (2016). DOI: 10.1371/journal.pone.0151219

Sasirekha Ramani et al. Correlates of Protection against Norovirus Infection and Disease—Where Are We Now, Where Do We Go?, *PLOS Pathogens* (2016). DOI: 10.1371/journal.ppat.1005334

Kun Lee Lim et al. A Multi-Site Study of Norovirus Molecular Epidemiology in Australia and New Zealand, 2013-2014, *PLOS ONE* (2016). DOI: 10.1371/journal.pone.0145254

Tulio Machado Fumian et al. Norovirus Recombinant Strains Isolated from Gastroenteritis Outbreaks in Southern Brazil, 2004–2011, *PLOS ONE* (2016). DOI: 10.1371/journal.pone.0145391

Brian Rha et al. Incidence of Norovirus-Associated Medical Encounters among Active Duty United States Military Personnel and Their Dependents, *PLOS ONE* (2016). DOI: 10.1371/journal.pone.0148505

Benjamin A. Lopman et al. The Vast and Varied Global Burden of Norovirus: Prospects for Prevention and Control, *PLOS Medicine* (2016). DOI: 10.1371/journal.pmed.1001999