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The importance of water quality



Special Report
International Cruise Ship Industry

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Larry Rumbol, Marine Condition Monitoring Manager at Parker Kittiwake explains the need to test for proper water quality on board a cruise vessel.



'Crown Princess', 'Explorer of the Seas', 'Ruby Princess', 'Queen Mary 2', 'Coral Princess', 'Voyager of the Seas', and 'Sun Princess' - what do these cruise ships have in common? They've all had passengers and crew fall ill with gastrointestinal conditions in the last six years that could be linked to poor water quality

The most common of these, Norovirus (see *Innovations Norovirus Report*), is a deeply unpleasant gastro-intestinal disease that spreads easily in crowded spaces where people are sharing common facilities, such as cruise ships. Outbreaks on these vessels are big news because health officials are required to track illnesses on ships according to rules set down by the US Center for Disease Control and Prevention.

Given the nature of these outbreaks, the ease at which they spread and the impact they have on people, this can easily create hysteria, which can have a significant impact on the reputation of not only the vessel operator itself, but the cruise industry as a whole. It's often not the fault of the cruise operator in question, but a reputation for poor hygiene or disease prevention standards will soon become widespread, potentially having a swift and significant impact on the cruise operator's commercial success.

Without evidence that operators are taking all reasonable precautions to protect the health and safety of passengers and crew, commercial success could be at risk.

Water is important to the functioning of our bodies. They can't work without it, just as cars can't run without oil. At sea, ships must use safe water for drinking, sanitary purposes, preparing food, fire control, dishwashers, laundry, air conditioning, boilers and deck washing, to protect the health of everyone on board.

Despite this, since 1970 more than 100 disease outbreaks¹ involving ships have been reported, with about 40% of these reported as food-related. It is quite possible that this number is an underestimation, because such outbreaks often involve only small numbers of crew and may not be reported because of fear of quarantine or delays in ports.

In addition, one third of the outbreaks not associated with specific exposure routes are likely to have been caused by unsafe levels of bacteria or contaminants in the water used on board.

Water facilities on board vessels haven't changed much over the years. Fresh water can be taken on board whilst a vessel is in port and stored, or potable water can be made on board using desalination techniques. Much like on land, before water is delivered to our homes, it is treated to remove chemicals, particulates and bacteria. However, the challenges of life at sea can increase the likelihood of contamination or spoiling.

Contamination

How can water become contaminated on board a ship? The two most common ways are via sewage or bilge, if storage or waste disposal systems are not properly designed, constructed and maintained. The proximity of a bilge area to piping systems of potable water can often be the prime suspect in cases of pollution, given the increased likelihood of cross-contamination. In other cases, issues can often arise as a result of air gaps that facilitate the entry of contaminants. Even water produced directly on board via desalination, reverse osmosis, or distillation, isn't free from the risk of contamination.

Maintaining the quality of fresh water on board is critical, not only to ensure that the health of the crew and passengers is protected, but also in mitigating the risk of a possible detention, as a result non-compliance with strict international regulations governing the standards of health and safety that must be met on board ships, such as under SOLAS Annex 1's Principles of Safe Manning, that requires "provision of proper food and drinking water".

In addition, ships not only need to be inspected and certified regularly under the Maritime Labour Convention (MLC) 2006, they are required to continue to demonstrate compliance or risk delays or detentions by Port State Control (PSC).

A survey conducted in 2005² on 950 potable water samples and 48 pool water samples collected from



342 ships revealed that 8.6% of these samples contained coliforms agents, such as *Escherichia coli* or *Enterococci*.

The presence of these bacteria in potable water is a marker of faecal contamination. This suggests the potential presence of water-borne pathogens, arising from either the original contamination of source waters, or the contamination of water supplies during loading, storage or distribution. A range of improper practices on ships related to storage, repairs, cross-connection between potable and non-potable water, and insufficient residual disinfection of water supplies are the most common causes of these contaminations.

Proactive measures

The complexity of the potential contamination chain highlights the importance of taking proactive measures to monitor the condition of water supplies on board every vessel, thereby protecting the health of everyone on board. By taking sensible measures, it is possible to protect passengers, crew and the public at large from disease transmission related to ships. The focus should be on proactive

and preventive measures, rather than reactive and curative.

One such step is the Parker Kittiwake HPC Water Test kit. The simple to use kit provides an indication for on board personnel of the overall microbiological cleanliness of a vessel's system, quickly alerting them to potential safety risks before further contamination occurs. Seafarers are able to use the kit to establish the presence of harmful bacteria and confirm the efficiency of a vessel's water disinfection system, without the need to undertake additional training often bordering on scientific technician levels.

The kit also provides assurance to ship operators and regulatory authorities that the microbiological cleanliness of potable and recreational water systems meets the required standards, and that safety risks are being carefully managed. No additional equipment is needed to use the test, and it can form an integral part of the vessels Water Safety Plan (WSP), that forms a core part of the World Health Organisation's (WHO) favoured approach to mitigate the risks and hazards from waterborne pathogens.

Moreover, this kit provides unequivocal and easily defined visual references as to the safety of the water and at far higher accuracy levels than conventional dipslides can offer.

Water systems on ships endure different operational conditions and restrictions, presenting a different set of challenges than land-based water transportation. Water will likely be subjected to prolonged storage times during long journeys, which can create the optimal environment for microbial growth. Stagnation of water in tanks or pipes, the likelihood that vessels could be in port and not operational for significant periods of time, and even a ship's movement whilst at sea, can all greatly increase the risk of contamination through the surge and back-siphonage of sediments in tanks, which are being re-suspended and dispersed.

Reputational risk is a hidden danger that can pose a threat to the survival of even the biggest and best-run companies. It can wipe out billions of dollars in market capitalisation or lost revenues in minutes, and can result in changes at the uppermost levels of management. However, fundamentally, risk comes from not having the right information to hand at the right time. With the right tools and a proactive attitude to monitoring the condition of vital water management systems, the elimination of hazards, activities and exposures that can negatively affect an organisation become routine.

As the shipping industry evolves and reacts to increasingly challenging market conditions and regulations, successful operators capitalise on the opportunity to retain a competitive edge. It is the leaders of the pack that tackle these issues head on, realising that destiny is not a matter of chance, but of choice.

¹ <https://www.ncbi.nlm.nih.gov/books/NBK310823/#>

² Grenfell P, Little CL, Surman-Lee S et al. The microbiological quality of potable water on board ships docking in the UK and the Channel Islands: an association of Port Health Authorities and Health Protection Agency Study. J Water Health 2008; 6: 215–224.

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