What’s worse—finding out the beach is closed due to high levels of pathogens when you arrive at your hotel for a long-awaited vacation, or finding out the beach is closing on your way out of town after swimming all weekend?

Minimizing risk and exposure requires being aware of what is in the water. Backpackers assume that all streams and lakes are contaminated and boil, filter, or otherwise treat water from these sources for cooking and drinking. However, recreational water bodies, where people swim and fish, are assumed to be safe for those activities until tests show pathogens are present. Irrigation water is also of concern—the presence of microbes in irrigation water on leafy greens or other produce can cause people to get sick when these goods are consumed.

Researchers in the field of microbial water quality address these issues and others. They work on identifying sources of contamination, developing mitigation strategies, predicting high levels of bacteria based on precipitation, tides, and temperatures to name a few. Microbial water quality is a global issue and is the basis of a new special section in the Journal of Environmental Quality (JEQ), “Microbial Water Quality—Monitoring and Modeling.” This special section includes papers from 12 countries and provides a global perspective on microbial water quality research.

Yakov Pachepsky, a researcher with the USDA who investigates microbes in irrigation water, worked with a group of guest editors from Canada, Korea, France, Spain, the Netherlands, and the U.S. to put together this special section. Pachepsky, a member of the ASA and SSSA, says there are four facets of microbial water quality—diagnostics, monitoring, modeling, and management—and researchers are working to improve each one. The most common diagnostic tools to detect fecal contamination use the presence of E. coli as an indicator. While E. coli is a common indicator organism, important complementary information on microbial water quality can be obtained using other organisms, genes, or DNA sequences as indicators. Using additional indicators becomes possible with advances.
Microbes in drinking, recreational, and irrigation water pose a risk to human health. Microbial water quality is a global issue, impacting developing and developed nations. JEQ has published a collection of papers from more than 10 countries that address microbial water quality research topics.

So even with daily sampling, there is a lag between the time pathogens arrive at a site and the time that test results show the water is not safe. This lag time can expose people who are drinking or swimming in water that contains harmful microbes. While new methods are being developed, they may not be implemented quickly due to the potential expense involved in adopting new technology.

Modeling tools used to predict when and where microbes may be present in drinking, irrigation, or recreational water are being improved. As data sets increase and modeling tools are improved, researchers are testing new ways to predict outbreaks. Improved models are used to compare and select the mitigation measures, management decisions, and interventions that are geared to minimizing exposures before there is a problem.

Management requires identifying sources of contamination. It could be from agricultural land, industry, or aging urban stormwater systems overwhelmed by heavy precipitation. Once the source is identified, management actions can be developed. This can include fencing livestock out of streams, improving filtration in the water system, or improving urban water flow. Pachepsky explains that the search is under way for more cost-efficient new management processes.

Pachepsky says that microbial water quality, and minimizing citizen exposure to pathogens through drinking water, recreation, and fresh produce, is a topic that has widespread support. Both citizens and governments agree that there is a need for standards and even regulation. Publishing these papers together also demonstrates that the challenges in studying microbial water quality are universal.

Dig Deeper
This special section will be published in its entirety in an upcoming issue of The Journal of Environmental Quality. A number of papers are currently available in the “Just Published” section of the journal: https://bit.ly/1U5yldx.

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