CREATING A PIPELINE FOR EMERGING WATER TESTING TECHNOLOGIES

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WHY DID WE DO THIS RESEARCH?

Fecal contamination of water is currently assessed by culturing fecal indicator bacterial such as *Escherichia coli* (*E. coli*), because indicator organisms are simpler to detect than pathogens. However, these methods do not provide information about source contamination or the presence of microbial pathogens. They are also slow to produce results and may have inaccuracies. In comparison, molecular tests are a rapid and sensitive method of directly detecting pathogens, yet are rarely used in public and private laboratories for assessing water quality. The DNA or RNA of indicator organisms can be detected with a high degree of sensitivity and specificity, and results can be available in hours, rather than days. The goal of this project (2011-2014) was to narrow the gap in the adoption of molecular tests by public and private laboratories.

HOW WAS THE RESEARCH CONDUCTED?

Validation guidelines were drafted to help end users critically assess molecular methods for assessing water quality. Four laboratories were asked to apply the validation guidelines to a molecular test of their choice to trial the validation guidelines. The laboratories then provided feedback in order to improve the validation guidelines.

WHAT WERE THE RESULTS?

While the validation guidelines were easy to follow, the experimental design for some criteria was cumbersome. The number of validation samples and replicate tests required was too high, given the challenges associated with collecting and processing water samples. Most of the tested assays underperformed in the laboratory compared to peer-reviewed publication. Upfront processing of water samples to remove decomposing plant material was cumbersome.

WHAT ARE THE IMPLICATIONS FOR TEST DEVELOPERS AND LABORATORIES?

Environmental water samples are challenging to work with, as they are complex and dynamic. Current molecular methods, while sensitive and specific in a research laboratory-setting, do not perform "as advertised" on real water samples. Validation data provided in peer-reviewed publications often provide insufficient evidence for test adoption, in part because there are no established guidelines for validation.

Evidence generated by the validation guidelines is needed by end users to feel confident that the test can perform as promised. The validation guidelines developed in this project provide a rigorous assessment of these tests and a framework for researchers to develop better molecular tools.

A final caveat — while molecular water quality tests have come a long way, they are still not perfect and ongoing research is needed to develop better molecular water quality tests.