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Evaluation of new, rapid microbiological methods for measuring recreational water quality

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ABSTRACT

Public health officials routinely measure fecal indicator bacteria to assess beach water quality, but present laboratory methods require about 24 hours to obtain a result, delaying issuance of health warnings until the day following sampling. New, more rapid measurement methods that would allow for same day warnings are under development, but have not yet undergone independent testing. Here we evaluate four of these new methods: immunomagnetic separation coupled with ATP bioluminescence, flow cytometry, quantitative polymerase chain reaction (Q-PCR) and dual-wavelength fluorimetry (DWF). Testing was conducted in two phases. In the first phase, developers of each new method processed 54 blind samples. Results were then compared to those produced by five laboratories using two traditional methods of analysis. Samples included both natural and laboratory-created samples, ensuring method evaluation over a range of concentrations, matrices and interferences. None of the new methods performed well enough to replace existing methods at present, but there were encouraging results for two methods. Q-PCR produced results within the range of the reference labs for two-thirds of the samples, but overestimated others, particularly those with complex matrices. DWF had the best precision among the new methods and was more precise than some of the laboratories using traditional methods, but also produced results that were generally higher than existing methods, especially for samples that contained urban runoff. In the second phase of testing, practitioners of traditional culture-based methods were trained in the new methods and asked to process nine blind samples. These practitioners produced results comparable to those produced by the method developers. While there is need for performance improvement in each of the new methods, technology transfer does not seem to be an important impediment to their adoption.

Full Text

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