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Real-Time sensing of microbial contaminants in potable water

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Abstract

Potable waters in distribution systems are vulnerable to contamination from accidental or deliberate intrusion events. Contaminants can be chemical and/or microbial, and result in adverse health effects. Therefore the time required for the detection of the contaminant determines the magnitude of the adverse public health effect. We utilized real-time sensors to detect both *Escherichia coli* (*E.coli*) and *Bacillus* spores in a potable water distribution system. The study was conducted at The University of Arizona Real-Time Sensor Lab within the UA Water Village. Two different sensors were utilized. One sensor utilized multi-angle laser light scattering (MALS) to detect particulates. The other sensor used light scattering plus fluorescence emission from nicotinamide adenine dinucleotide phosphate (NADP) and riboflavin. The bacterium *E.coli* could be detected in distilled water or tap water in real-time over a concentration range of 10^6 CFU per ml -10^3 CFU per ml. In contrast, *Bacillus thuringiensis*, a surrogate for *Bacillus* anthracis was used as a source of bacterial spores, which wouldbe detected in real time over a concentration range of 10^5per ml - 10^2 per ml. The sensors were also utilized to document the absence of viable *E.coli* cells following advanced oxidation treatment of the water via ultraviolet light and hydrogenperoxide. Thus, these sensors could be utilized in real-time to either detect microbial contaminants, or document the destruction of microbial contaminants. In either case, such sensors could verify the safety of potable water, with respect to potential microbial contaminants

Biography

Dr. Ian Pepper obtained his Ph.D. at the Ohio State University. He is currently a professor of environmental microbiology at The University of Arizona where he also serves as co-director of the UA Water and Energy Sustainable Technology (WEST) Center. He has published over 170 peer review publications and 8 textbooks. Dr. Pepper is a Fellow of the American Association for the Advancement of Science (AAAS); the American Society for Microbiology; the Soil Science Society of America; and the American Society of Agronomy.

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