The Value of an Innovative System to Process Large Volumes of Water (100 l) to Detect Microbial Pathogens in Sources of Water Used for Drinking, Recreational, Re-use, Agricultural and Food Production

Speakers:

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Issue Covered: Rapid, reliable monitoring of critical water resources for microorganisms can help reduce public exposure to potentially harmful pathogens. Unfortunately, the success of monitoring programs is limited by the dilution of microbial pathogens in very large volumes of water. Dilution lowers the levels of pathogens below the detection limit of currently-available methods and limits the utility of standard methods for detection of indicator organisms. Sample concentration helps overcome this limitation and enables more representative sample collection of randomly distributed pathogens. The U.S. EPA recommends a toolbox of standard methods to monitor fecal indicator bacteria (FIB), enterococci and *E. coli*, as part of its recreational water quality criteria. However, the relationship between indicators and microbial pathogens remains questionable, especially in subtropical and tropical environments like Hawaii. Monitoring water directly for pathogens is expensive, labor intensive and unreliable because of the low concentrations of pathogens in large bodies of water. Our laboratory has developed a Portable Multi-use Automated Concentration System (PMACS) that rapidly concentrates microbial pathogens from large volumes (>10 liters) of water such as potable water, recreational water, irrigation water, cooling tower water, and produce wash for subsequent identification by conventional and emerging technologies. The PMACS is a portable, fieldable dead-end hollow fiber filter system that concentrates targets at a rate of up to 4 liters/minute for recovery into a small volume (200 to 400 ml) retentate. *E. coli* O157:H7, enterococci, *Bacillus* spores, *Cryptosporidium parvum* oocysts, MS2 bacteriophage, and other types of microorganisms can be concentrated at low levels from water sources, enabling detection of microbes that may be missed by standard methods. The resulting concentrated sample is compatible with analysis by a wide range of detection methods from culture to metagenomics. The PMACS protocol not only provides a larger, more representative sample for microbial contamination testing, but also rapidly concentrates pathogens to significantly reduce the time from sample collection to specific pathogen identification and quantification.