

A public health need for source-tracking of wastewater-derived protozoan enteropathogens in engineered wetlands

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Demand for high quality drinking and recreational waters rises exponentially due to global demographic growth in the human population, reinforcing an urgent need for microbiologically safe reclaimed waters. However, constructed wetlands, implemented into municipal wastewater treatment, may not provide substantial remediation for such human protozoan enteropathogens as *Cryptosporidium*, *Giardia*, and human-virulent microsporidia.

Sewage wastewater discharges are worldwide risk factors for the introduction of human protozoan enteropathogens into surface waters. Pathogen source-tracking research in sewage treatment wetlands is deficient, due to the lack of available molecular technology in the past.

Current technology allows for multiplexed species-specific identification, enumeration, viability assessment, and source-tracking of human protozoan pathogens. Such advances can benefit public health in developing and developed regions of the world by changing the conceptual research framework for constructed wetlands from "pathogen removal" to "pathogen source-tracking" efforts. "Removal" assumes that "survived pathogens" originate from pathogens delivered to that wetland from the sewage treatment process, while "source tracking" evaluates the complexity of pathogen ecological interactions in engineered wetlands and also its seasonal dynamics.