FACULTY DEVELOPMENT ENDOWMENT FUNDS

Faculty Research Fund

Award Date: Fall 2023

Proposal Title: Using Peracetic Acid to Control Nitrification in Chloraminated Drinking Water Distribution Systems

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ABSTRACT

Opportunistic pathogens are the leading disease-causing microbes in drinking water distribution systems and threaten public health. Monochloramine is effective and long-lasting in killing microbes, with low production of harmful disinfection byproducts. Therefore, many water authorities maintain a monochloramine residual throughout the pipelines to suppress the growth of opportunistic pathogens. However, monochloramine releases free ammonia and induces nitrification, which produces toxic nitrite/nitrate and promotes the growth of opportunistic pathogens. Chlorine burn is a common practice for nitrification control, which is a short-period switch to free chlorine as the disinfectant in a chloraminated distribution system. Chlorine burn elevates the formation of harmful disinfection byproducts and has only temporal effects on opportunistic pathogens. Peracetic acid is an emerging, green, strong disinfectant that forms no disinfection byproducts, has a long-lasting effect on inhibiting opportunistic pathogens, and can oxidize free ammonia. However, the performance of peracetic acid in controlling nitrification has not been evaluated. In this project, the PI plans to determine if peracetic acid is effective in controlling nitrification (i.e., eliminating free ammonia and killing opportunistic pathogens). This project has three tasks: 1) To test the baseline efficiency of peracetic acid (0, 1, 3, 5, 7, and 10 mg/L) in killing opportunistic pathogens (such as *Legionella*, *Pseudomonas aeruginosa*, *Mycobacterium*, and *Vermamoeba vermiformis*) in tap water. 2) To build a simulated drinking water distribution system. 3) To determine the effectiveness of peracetic acid in controlling nitrification in the system (focus: free ammonia and opportunistic pathogens). The extensive research experience of the PI in safe drinking water supply will be a substantial asset to the project. The PI plans to disseminate the project results through conference presentations, publications, and outreach activities. Building upon the project, the PI will craft compelling proposals to secure funding from the NSF ERI Program and the NSF CAREER.