Environmental Science Graduate Program Seminar Series

Model of Tap Water Microorganism's Effects on *Legionella pneumophila*

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Smith Laboratory, Room 3150

Abstract

Legionella pneumophila has become a significant public health issue due to its growth in water distribution systems. Although in natural water systems *L. pneumophila* is often found in relatively low concentrations. in distribution systems it is able to survive and thrive through the use of biofilms and invasion of larger host organisms such as protozoa. Additionally, the altered microbial ecology of water distribution systems, in contrast to that of *L. pneumophila's* natural environment, seems to play a role in facilitating its ability to proliferate and persist. Because of its ability to grow to high concentrations in distribution system water, *L. pneumophila* can pose an increased risk in water exiting from plumbing fixtures. *L. pneumophila* can cause infection when contaminated water is aerosolized as it exits from distribution systems and is then inhaled into human lungs.

A systematic literature review was conducted to gather relevant information regarding *L. pneumophila's* interactions with tap water biofilm microbial ecology. From the resulting information a stochastic model has been produced to simulate these interactions within a tap water biofilm and their inhibitory or commensal effects on *L. pneumophila* concentrations. The model simulates *L. pneumophila's* interaction within a tap water biofilm. The biofilm is composed of randomly assigned species of bacteria and amoeba, commonly found in tap water systems. The effects on L. pneumophila is determined through the makeup of the dominant organisms in specific locations of interaction in the biofilm and the degree and type of effects (inhibition or commensal) that these organisms have on L. pneumophila. These interactions are used to calculate the resulting *L. pneumophila* concentrations in the biofilm and bulk water. Theses concentrations are then used in a quantitative microbiological risk analysis (QMRA) of a 15-minute showering event and used to determine the risk of L. pneumophila infection based off this novel ecological base modeling method.

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