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Introductory Editorial: Water Microbiology

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INTRODUCTORY EDITORIAL: WATER MICROBIOLOGY

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Supplement Aims and Scope

This supplement is intended to focus on water microbiology. Control of microorganisms, antimicrobial resistance and health implications are included within the supplement's scope.

Microbiology Insights aims to provide researchers working in this complex, quickly developing field with online, open access to highly relevant scholarly articles by leading international researchers. In a field where the literature is ever-expanding, researchers increasingly need access to up-to-date, high quality papers on areas of specific contemporary interest. Thus, this supplement will allow readers to distinguish the signal from the noise. The editor in chief hopes that through this effort, practitioners and researchers will be aided in finding answers to some of the most complex and pressing issues of our time.

Articles should focus on water microbiology and may include the following topics:

- Control of microorganisms
  - Water source and contamination
  - Engagement and implementation of monitoring programs
  - Alternate indicators of water quality
- Antimicrobial resistance
  - Assessing risk
  - Novel molecular methods
  - Impacts from animal agriculture
  - Pathogen dynamics
- Improved microbiological water treatments
  - Fighting microbes with microbes
  - Reuse of municipal/industrial wastewater
  - Removing microbiology hazards

At the discretion of the guest editors other articles on other relevant topics within the scope of the supplement may be included.

The title of this supplement, Water Microbiology, is a broad term. After all, every microbe, as far as we know, depends on water. The research in this supplement is focused on the microbiology of water systems where microbes either have an unwelcome presence (such as in municipal drinking water treatment systems) or conversely, have a welcome presence with an integral function (such as in municipal wastewater treatment systems).

The microbiology of water systems is a rapidly developing field. With increasingly affordable metagenomic analysis along with other meta-analysis, an explosion of microbial data are at researchers' fingertips like never before. This explosion of microbial data is well exemplified in the review article presented in the supplement by Venkiteshwaran et al,[1] which summarizes the state of knowledge between microbial community structure and function in anaerobic digesters used for wastewater treatment. Furthermore, microbiology in water systems is intimately connected with emerging contaminants which are being measured with greater geospatial resolutions,[2] and with greater detection resolutions.[3] For example, concerns with antimicrobials, pharmaceuticals, and surfactants in ecological systems[4–6] are spurring research into how these chemicals trace through wastewater treatment systems. Research at the interfaces between these chemicals and water microbial communities is not just a topic of intrigue. Rather, this research at the nexus is an attempt to understand ways in which these chemicals negatively impact the microbial structure and function of wastewater treatment systems,[7] and understand how the microbial community can have a positive impact through degradation of these chemicals before they are released into the environment.[8] In this supplement, McNamara et al present a study in which the surfactant perflourooctane sulfonate (PFOS) can exacerbate the impacts of triclosan on methane production and methanogenic community structures.[9] Additionally, Smith et al investigate the abundances of microbial communities in anaerobic digesters that have the greatest potential for degrading chlorinated emerging contaminants.[10] Future research on the interaction between microbial communities and emerging contaminants will undoubtedly look towards improving the resiliency of wastewater treatment systems and perhaps using such systems to improve degradation of these contaminants.

In drinking water systems, the removal of microbes may be the goal, and chemical treatment is a popular means to disinfect drinking water. Concerns with disinfection by products (DBPs) such as haloacetic acids and halomethanes continue to persist, and these concerns have led to the investigations of other disinfection technologies such as advanced oxidation.[11] In this supplement, Mayer et al investigate the mechanism of virus degradation from such advanced oxidation technologies.[12] Additionally, Aggarwal et al look in broader terms on the amazing strength of biofilms, which corresponds to the difficulty in controlling and removing biofilms from engineered and natural systems.[13] Future directions in research will continue to seek tools and technologies to better understand the evolutionarily-developed defenses of microbes.

Microbiology and water systems, whether natural or engineered, will always be intertwined. As population increases and more stress is put on microbial communities and water systems by anthropogenic pollutants, it will become increasingly important to understand the ever-changing dynamic between pollutants, microbes, and water systems. By pursuing research to strengthen our core understanding of these relationships, engineers and scientists will be better suited to meet one of the Grand Challenges put forth by the National Academy of Engineering: provide access to clean water.

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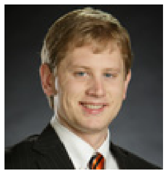

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