

Seth Siegel / Israel, water, and the world: how a small, dry country serves as an inspiration to nations around the globe

Israel is an unlikely role model for every country in water. It is small and, in the world's, driest region. But whether a rich country or a poor one, a large country or a small one, a landlocked country or one with a long seacoast, every country has something to learn from the Israel experience in water. Increasingly, governments and others look to Israel for guidance and inspiration in what to do with their water resource concerns. As climate change leads to significantly altered precipitation patterns, and as the water resources needed to feed a growing global population become more pinched as more crops need irrigation, Israel's model and technologies will continue to serve as a door-opener to Israel. This has had and will continue to have diplomatic and economic implications for Israel.

Prof. Pedro Alvarez / A renaissance for phage-based bacterial control

Bacteriophages (phages) are viruses that exclusively infect bacteria and utilize different life cycles to shape microbial communities through predation, transduction and reprogramming of bacterial metabolism. Phages are by far the most abundant, most diverse, and arguably the most underutilized biological resource in the biosphere. They offer opportunities for chemical-free bacterial control, which is attracting growing interest in environmental engineering due to concerns about the emergence of multidrug resistant bacteria and the need to mitigate toxicity from chemical disinfection byproducts. Examples of phage applications discussed in this seminar include mitigating the spread of multi-drug resistant superbugs from wastewater treatment plants, phage conjugation with superparamagnetic nanoparticles to enhance biofilm penetration and de-anchoring from its root under a weak magnetic field, and encapsulation for smart release. We will also discuss how recent advances in DNA sequencing, ecological network modeling and synthetic biology may provide novel opportunities for phages as highly precise agents to edit microbiomes and modulate critical bacterial activities important for sustainable development.

Prof. Jacob Moran-Gilad / Risk assessment and mitigation of legionellosis powered by genomics

Legionnaires' disease (LD) is a life threatening respiratory infection caused by waterborne strains of *Legionella*, particularly *L. pneumophila*. Molecular typing dramatically improved the investigation of Legionnaires' disease (LD) clusters and ability to link clinical cases with contaminated water systems. Microbial whole genome sequencing (WGS) is a promising modality for cluster investigations but analysis methods are neither standardized, nor agreed. Core Genome Multilocus Sequence Typing (cgMLST) has recently emerged as a phylogenomic typing approach that is portable, scalable and reproducible and could allow standardized and nomenclature-based typing for pathogens of public health importance. A cgMLST scheme for *Legionella* has first been proposed in 2015 (Moran-Gilad et al, Eurosurveillance). That scheme utilizes 1,521 core gene loci for typing and has successfully been implemented in several cluster investigations worldwide.

This talk will review the public health microbiology challenges associated with legionellosis and will focus on the use of methods and laboratory solutions such as WGS for epidemiological investigation and prevention.

Prof. Eberhard Morgenroth / Opportunities for greywater reuse at different scales

Water and wastewater treatment are key to protect humans in cities by providing safe water and urban hygiene and to protect the aquatic environment from pollutants. Over the past century, urban water management allowed for healthy and pleasant living conditions in ever-growing cities in many parts of the world. This presentation will discuss the potential for local reuse of treated greywater and drivers for implementation. What are the scientific and technological challenges? How can appropriate local water reuse be implemented in a way that it does not jeopardize today's achievements in urban water management and urban hygiene? Basic sciences for gravity driven membrane (GDM) filtration and technology development for reuse of hand washing water in informal settlements (<http://www.autarky.ch/>) or resource recovery at the building scale (<http://www.eawag.ch/waterhub>) will be discussed

Prof. Janet Hering / Overcoming the barriers to achieving the environmental Sustainable Development Goals (SDGs)

Together, 17 Sustainable Development Goals (SDGs) constitute an overarching and integrated concept for sustainability. Despite the many interlinkages across the SDGs, the complexity of addressing all 17 goals in concert is daunting. In addition, the apparent alignment of individual (or small sets of) SDGs with the mandates of various institutional actors (both in governments and civil society) works against an integrated perspective. I suggest that an integrated approach can be fostered through: promoting the appreciation of good ecological function as a necessary underpinning for human welfare and well-being, supporting multi-level (or polycentric) governance in which users can collaboratively develop feasible rules and organizations can work effectively at multiple levels, and fostering broad-ranging recognition of contributions made by diverse actors to mitigate competitive tendencies.