UNIVERSITY of HOUSTON

CULLEN COLLEGE of ENGINEERING

Department of Civil & Environmental Engineering

Distinguished Lecture Series

Lutgarde Raskin, Ph.D.
University of Michigan

Biological Drinking Water Treatment – Opportunities and Challenges

Monday, March 4, 2013

10:30 to 11:30AM
Seminar Room D3 W122

Abstract

The co-existence of multiple contaminants (e.g., nitrate, perchlorate, arsenic, uranium, chromium, and chlorinated organics) in drinking water sources often results in the closure of wells or the need for expensive treatment schemes. Advanced physico-chemical processes, such as reverse osmosis and ion exchange are capable of removing multiple contaminants simultaneously, but are often cost-prohibitive due to the requirement of treatment of generated concentrated wastes or regeneration of exhausted materials. Microbial processes provide opportunities to the drinking water field as attractive treatment alternatives since several common contaminants can be converted to innocuous compounds through microbial conversions. In addition, microbes often can mediate the conversion of contaminants to less toxic and easily separable solid phases in the same treatment system. For the past decade, we have capitalized on these opportunities by developing and optimizing fixed-bed anaerobic bioreactor systems to simultaneously remove several co-existing contaminants, including nitrate, perchlorate, arsenic, and uranium, from drinking water sources. For several of these studies, we characterized microbial community structure and function to help with system optimization.

Challenges related to biological drinking water treatment include the need to develop appropriate post-treatment strategies to eliminate residual organics from the finished drinking water to limit the generation of disinfection byproducts and the regrowth of microbes in the distribution system. In addition, post-treatment, including disinfection, may be important to limit "seeding" of the distribution system with microbes from biofiltration systems. This challenge will be illustrated with results from a study using high throughput DNA sequencing results to evaluate how biofiltration and other water treatment steps impact the bacterial community structure in a full-scale drinking water system. In addition, results from a disinfection study in which the use of conventional microbiological techniques and culture-independent molecular methods were compared will be shown to provide insights in how disinfection impacts the bacterial community structure in the distribution system.

About the speaker

Dr. Lutgarde Raskin, Professor of Environmental Engineering at the University of Michigan, is a pioneer and an internationally recognized scholar in the application of molecular techniques to characterize and study the dynamics of complex microbial communities in a variety of water quality control processes. She has published more than 100 papers in high impact, peer-reviewed journals in her field, seven book chapters, and over 250 abstracts and papers in conferences proceedings. Her work is well cited, receiving over 500 citations a year for the past five years. She further has made an impact through numerous collaborations she developed throughout the United States and Europe in academia and with industrial partners, consulting firms, and engineers at several municipalities, and through the contributions of her former students and postdoctoral researchers.

Raskin has served as the research advisor and mentor of approximately 60 graduate students (including 18 Ph.D. Students) and 12 postdoctoral researchers. Dr. Raskin and her students have received numerous awards that recognize the impact of her research on the field. Most noteworthy, she is an elected Fellow of the American Academy of Microbiology (since 2009) and the Water Environment Federation (since 2012). She further received the 2007 Association of Environmental Engineering and Science Professors (AEESP) Frontier Award in Research, the 2006 American Society of Civil Engineers Walter L. Huber Civil Engineering Research Prize, the 2002 Paul L. Busch Award (Water Environment Research Foundation Endowment for Innovation in Applied Water Quality Research), and a 1997 National Science Foundation CAREER Award.

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