

Waterborne Pathogens Group

Michigan State University

About us:

The Waterborne Pathogens Group (WPG) at MSU investigates the interplay between water quality and health.

Representing scientists from five colleges, including Agriculture and Natural Resources, Engineering, Natural Science, Social Science and Veterinary Science, this group addresses;

- i. fundamental knowledge about the wide range of bacterial, parasitic and viral pathogens,
- ii. characterization of these waterborne hazards and their ecology,
- iii. an understanding of their transport and fate in the built and natural water environment,
- iv. technological requirements for rapidly detecting these waterborne pathogens, and
- v. the potential for abatement and control of disease risks.



Water Quality Laboratory at Michigan State University

investigations of waterborne outbreaks (eg. Put-In-Bay) or contamination events (Hurricane Katrina).

The development and use of molecular tools, qPCR, novel detection technologies (biosensors and microarrays) and models is seen as integral to the investigations of WPG. Laboratory but particularly field work is paramount to creating a “real” world understanding of the distribution of pathogens.

Working with the Center for Water Sciences both social and natural science are merged to understand the health of water systems and impacts on humans and the drivers of disruption and change. Modern approaches are used including molecular microbial source tracking and GIS for understanding waterborne disease spread and risk. Teams work directly with communities and public health during

Key areas of study:

- Emerging and zoonotic pathogens
- Genomics and the study of waterborne pathogens
- Climate influences on waterborne disease
- Land use impacts on waterborne pathogens
- Global health and waterborne disease (Safe Tap initiative, IC Sewage program)
- Fate and Transport Modeling and Quantitative Microbial Risk Assessment
- Biosensor development to support near-time on-site diagnosis of waterborne pathogens in drinking water and recreational water

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between water quality and health.**

WPG faculty:

Name	Contact information	Area of expertise	Website
Evangelyn C. Alocilja, PhD Associate Professor Department of Biosystems and Agricultural Engineering College of Engineering and College of Agriculture and Natural Resources	Michigan State University 213 Farrall Hall East Lansing, MI 48824 517-355-0083 (office) 517-432-8672 (lab) 517-432-2892 (fax) alocilja@msu.edu	Development of nanostructured biosensors for rapid on-site detection of microbial pathogens and toxins	http://www.egr.msu.edu/~alocilja
Asli Aslan, PhD Postdoctoral Fellow Department of Fisheries and Wildlife College of Agriculture and Natural Resources	Michigan State University 303 Manly Miles 1405 South Harrison Road East Lansing, MI 48824 517-353-8524 (office) 517-355-0271 x256 (lab) 517-353-9807 (fax)	Aquatic molecular microbial ecology, water quality monitoring, microbial source tracking in global waters	http://www.fw.msu.edu/~rosejo/Asli_Aslan-Yilmaz.htm
Syed A. Hashsham, PhD Professor Department of Civil and Environmental Engineering Center for Microbial Ecology College of Engineering	Michigan State University A126 Engineering Research Complex East Lansing, MI 48824 517-355-8241 (office) 517-355-0250 (fax) hashsham@egr.msu.edu	Development of parallel detection tools, understanding how complex microbial communities work, and development/evaluation of processes relevant to environmental biotechnology.	http://www.egr.msu.edu/~hashsham
Phanikumar S. Mantha, PhD Associate Professor Department of Civil and Environmental Engineering College of Engineering	Michigan State University A130 Engineering Research Complex East Lansing, MI 48824 517-432-0851 (office) phani@msu.edu	Modeling the fate and transport of indicators and pathogens in the environment	http://www.msu.edu/~phani
Joan B. Rose, PhD Homer Nowlin Chair in Water Research Department of Fisheries and Wildlife and Department of Crops and Soil Sciences College of Agriculture and Natural Resources	Michigan State University 13 Natural Resources East Lansing, MI 48824 517-432-4412 (office) 517-432-8185 (lab) 517-432-1699 (fax) rosejo@msu.edu	Public health environmental microbiology; Quantitative Microbial Risk Assessment; monitoring for enteric viruses and <i>Cryptosporidium</i> and <i>Giardia</i> ;	http://www.fw.msu.edu/~rosejo
Chris M. Waters, PhD Assistant Professor Department of Microbiology and Molecular Genetics College of Osteopathic Medicine and College of Natural Sciences	Michigan State University 5180 BPS East Lansing, MI 48824 517-884-5360 (office) 517-884-5336 (lab) 517-353-8957 (fax) watersc3@msu.edu	Chemical signaling and biofilm formation in <i>Vibrio cholerae</i>	http://www.msu.edu/~watersc3
Irene Xagorarakis, PhD Assistant Professor Department of Civil and Environmental Engineering College of Engineering	Michigan State University A124 Engineering Research Complex East Lansing, MI 48824 517-353-8539 (office) 517-355-0250 (fax) xagorara@egr.msu.edu	Viruses in the Environment, Antibiotic Resistant Bacteria in the Environment, Water and Wastewater Treatment	http://www.egr.msu.edu/~xagorara/

Recent publications:

- Kuo, D., F. Simmons, and I. Xagorarakis. 2009. A New Set of PCR Assays for the Identification of Multiple Human Adenovirus Species in Environmental Samples. *Journal of Applied Microbiology*, 107:1219-1229.
- Wong, M., L. Kumar, T.M. Jenkins, I. Xagorarakis, M.S. Phanikumar, and J.B. Rose. 2009. Evaluation of public health risks at recreational beaches in Lake Michigan via detection of enteric viruses and a human-specific bacteriological marker. *Water Res.* 43:1137-1149.
- Wong, K., I. Xagorarakis, J. Wallace, W. Bickert, S. Srinivasan, and J.B. Rose. 2009. Removal of Viruses and Indicators by Anaerobic Membrane Bioreactor Treating Animal Waste. *Journal of Environmental Quality*. 38:1694-1699.
- Miller, S.M., D.M. Turlousse, R.D. Stedtfeld, S.M. Baushke, A.B. Herzog, L.M. Wick, J.M. Rouillard, E. Gulari, J.M. Tiedje, and S.A. Hashsham. 2008. An *In Situ* Synthesized Virulence and Marker Gene (VMG) Biochip for the Detection of Waterborne Pathogens. *Applied and Environmental Microbiology*, 74: 2200-2209.
- Rose, J.B., and E.A. Dreelin, (Eds) 2008. *Effective Cross-Boarder Monitoring Systems for Waterborne Microbial Pathogens, A Plan for Action*, IWA Publishing, London, UK
- Shen, C., M.S. Phanikumar, T.T. Fong, I. Aslam, S.L. Molloy, and J.B. Rose. 2008. Evaluating Bacteriophage P22 as a Tracer in a Complex Surface Water System: The Grand River, Michigan. *Environmental Science & Technology*. 42(7):2426-2431, doi: 10.1021/es02317t
- Stedtfeld, R.D., S.W. Baushke, D.M. Turlousse, S.M. Miller, T.M. Stedtfeld, E. Gulari, J.M. Tiedje, S.A. Hashsham. 2008. Development and experimental validation of a predictive threshold cycle (Ct) equation for quantification of virulence and marker genes using high-throughput nanoliter PCR on OpenArrays. *Applied and Environmental Microbiology*, 74(12).
- Waters, C.M., W. Lu, J.D. Rabinowitz, and B.L. Bassler. 2008. Quorum Sensing Controls Biofilm Formation in *Vibrio cholerae* Through Modulation of Cyclic Di-GMP. *Journal of Bacteriology*. 190:2527-36.
- Hashsham, S.A., E. Gulari, and J.M. Tiedje. 2007. Microfluidic Systems Being Adapted for Microbial and Molecular Biological Analysis. *Microbe*, 29(11):531-536.
- Xagorarakis I., D. Kuo, K. Wong, M. Wong, and J.B. Rose J.B. 2007. Occurrence of Human Adenoviruses in Two Great Lake Recreational Beaches. *Applied and Environmental Microbiology*. 73 (24):7874-7881.
- Liu, L., M.S. Phanikumar, S.L. Molloy, R.L. Whitman, M.B. Nevers, D.A. Shively, D.J. Schwab, and J.B. Rose. 2006. Modeling the Transport and Inactivation of *E. coli* and Enterococci in the Nearshore Region of Lake Michigan, *Environmental Science & Technology*. 40(16):5022-5028. doi: 10.1021/es060438k (2006)

Collaborators:

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CWS
Center for Water Sciences

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WQEMM
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