Abstract

a. Funding opportunity title and number: Exploring Linkages between Health Outcomes and Environmental Hazards, Exposures, and Interventions for Public Health Tracking and Risk Management: EPA-G2009-STAR-B1
b. Project title: Rapidly measured indicators of waterborne pathogens
c. This is a lead PI application. Principal investigator: Samuel Dorevitch Co-investigators: Li Liu, Peter A. Scheff, Salvatore Cali, Rebecca N. Bushon, King-Teh Lin. The PI can be contacted at sdorevit@uic.edu.Additional information is available at www.cheerschicago.org
d. Institution applying for assistance: The Board of Trustees of the University of Illinois, School of Public Health, Chicago, IL. Affiliations of co-investigators: PAS, LL, SC: UIC. RNB: US Geological Survey, Columbus, OH. K-T L: MycoMetrics, Inc., Monmouth Junction, NJ.
e. Project period: April 1, 2010-March 31, 2013. The work will be conducted at UIC and at a Chicago Park District beach laboratory, both in Chicago, IL
f. Project Cost: Total dollars requested from the EPA (for all years), $499,999.
g. Project summary: **Background:** Current tests for indicators of waterborne pathogens require 24 hours to produce results. Public health responses to the results of such tests, such as beach closures, are often inaccurate because of changes in water quality during the 24-hour delay. The quantitative polymerase chain reaction (qPCR) method may soon become part of water monitoring programs in order to produce same-day results. It is not known whether indicators measured by qPCR predict pathogen presence in surface waters. The research team has collected 500 water samples from lakes, rivers, and channels throughout the Chicago area during the summer of 2009. These samples are being analyzed for waterborne pathogens, and for enterococci by qPCR. We propose conducting qPCR analysis of three promising indicators in 500 archived samples linked to the pathogen samples. The primary **objectives** of this study are 1) to analyze 500 archived water samples for new indicators by qPCR 2) to compare four rapidly measured microbes as indicators of pathogen presence, 3) to identify thresholds for the rapid indicators that maximize the accurate prediction of pathogen presence, and 4) to implement a beach monitoring program using rapidly measuring indicators, and to compare beach management decisions that result for the use conventional and the rapidly measured pathogen indicators. The **experimental approach** for Phase I of the study includes performing qPCR analyses for three promising indicator bacteria in DNA extracted from the 500 samples. Results of the new qPCR results will be merged into an existing database of waterborne pathogens and indicators. Threshold values of each rapidly measured indicator will be established based on the likelihood of pathogen presence. In Phase II of the study, we will analyze indicators conventionally and using two rapid methods: qPCR and immunomagnetic separation/adenosine triphosphate. Beach water will be collected twice daily, and analyzed immediately. Threshold values for the rapid measures of the indicators established in Phase I of the study will be used to determine the need for swimming advisories. **Expected results**: This research addresses the link between indicators and hazards, and between indicators and public health action. We will compare the ability of rapidly and conventionally measured indicator bacteria to predict the presence of pathogens in recreational waters. We will describe the changes in public health actions that result from the new, rapid, pathogen indicators.
h. Supplemental key words not included in the abstract text: Scientific disciplines: biology (microbiology); Geographic areas: IL, Great Lakes, Region V