



# USGS NSF Internship Opportunity

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● <b>USGS Center:</b>	Upper Midwest Water Science Center
● <b>Project Title:</b>	Decoding the Microbiology of Contaminated Environments
● <b>Summary:</b>	<p>The USGS Michigan Bacteriological Research Laboratory (MI-BaRL) uses traditional and modern molecular approaches to investigate microbial pathogens and antimicrobial resistance bacteria in the environment, focusing on their source, occurrence, and distribution; transport, delivery, and fate; and survival and persistence. Much of this research is centered on animal or human-associated pathogens, the antimicrobial resistance potential of those pathogens, and the influence of these pathogens on recreational water quality, drinking-water quality, and water quality in agricultural and urban watersheds. Research explores the relations between antimicrobial resistance and the concentrations of the antibiotics and other chemical contaminants in similar environmental matrices; how exposure to antibiotics influences microbial community composition and microbial-mediated processes; and factors influencing gene transfer and maintenance in the environment. This research also extends to understanding pathogen occurrence and abundance in relation to that of fecal indicator bacteria and pollutants of emerging concern, as well as factors such as land-use, hydrology, and seasonal climatic variation. Our microbiology team continues to optimize and develop new tools to better understand and differentiate between the perceived and actual human and animal health risks associated with microbial pathogens and antimicrobial resistance pathways in the environment.</p>
● <b>Project Hypothesis or Objectives:</b>	<p>This project focuses on the need to develop tools and methods necessary to evaluate pathogens and antimicrobial resistance pathways in the environment and enhances our ability to study the occurrence, survival, transport, and fate of pathogens in the environment. This project addresses current method limitations and attempts to resolve these limitations in order to further our understanding of pathogens in the environment and risk to human and wildlife health.</p>

<b>Duration:</b>	Up to 12 months
<b>Internship Location:</b>	Lansing, MI
<b>Field(s) of Study:</b>	Geoscience, Life Science, Computing
<b>Applicable NSF Division:</b>	EAR Earth Sciences, OCE Ocean Sciences, MCB Molecular & Cellular Biosciences, DEB Environmental Biology, HPC High Performance Computing
<b>Intern Type Preference:</b>	Any Type of Intern
<b>Keywords:</b>	microbiology, microbial ecology, environmental microbiology, bacteria, virus, DNA, pathogens, antimicrobial resistance, antibiotic resistance, laboratory, PCR, qPCR, water quality
<b>Expected Outcome:</b>	The intern will not only work with microbiologists at the MI-BaRL but engage in collaborative science with USGS hydrologists, ecologists, and chemists on regional and national research studies. The intern will be an integral part of the microbiology team and project teams with the end goal of optimizing and/or developing validated and publishable experimental protocols and research results on emerging zoonotic pathogens and antimicrobial resistance pathways. The intern will also participate in laboratory discussions and program development discussions focused on identifying understudied and emerging zoonotic pathogens for subsequent assay development. This project contributes to ongoing collaborative research funded by the USGS Toxic Substances Hydrology Program and addresses multiple goals outlined in the USGS Environmental Health science strategy by improving methods for detecting pathogens and contaminants in the environment and examining the relative contributions of different sources of these microbial contaminants that could lead to adverse human and animal health outcomes.
<b>Special skills/training Required:</b>	The intern will need a background of three or more years of microbiology education or with at least one year of independent qPCR experience. Basic microbiological culturing experience and aseptic technique are essential. The intern should have experience designing and optimizing qPCR assays, interpreting qPCR analysis and maintaining lab QA/QC. Please note, laboratory work may involve prolonged standing in a laboratory environment. Work in the laboratory may involve use of equipment which can result in exposure to dust, chemicals, mechanical and laboratory hazards, and noise. Special safety precautions are required including use of gloves, coats, etc.
<b>Duties/Responsibilities:</b>	The intern will work closely with USGS scientists on multiple research projects funded by the USGS, EPA, and other agencies. Current project topics include 1) understanding the microbial ecology harmful algal blooms in the Great Lakes, 2) characterizing microbial signatures of tap water from both groundwater wells and municipal

water sources, 3) gauging the influence of large-scale animal feeding operations on groundwater quality, and 4) characterizing microbial signatures in wastewater streams from hospital and food production sources. The intern will participate in ongoing USGS discussions on emerging pathogens and antimicrobial resistance pathways and help our microbiology team prioritize which emerging microbial threats to focus on in ongoing and future research and monitoring. The intern will optimize and develop new molecular assays targeting pathogen and/or antimicrobial resistance genes based off on the team's prioritization and current project focus. Once developed, the intern will incorporate these assays into ongoing research studies. The intern will be strongly encouraged to present results on team conference calls and at team meetings in addition to a formal webinar at the study conclusion. Optimized or developed methods will be translated into not only laboratory protocols but also published either as a USGS report or as a journal article. Research study results will be published as a USGS report or peer-reviewed journal article with the intern as a primary or contributing author.

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**Internal Information - Not to be posted:**

**Center Director Name:** John Walker

**USGS Responsibilities:** Equipment, Facilities, Mentoring, On-boarding, Background Check, Volunteer Agreement Management

**Preliminary Approval:** This opportunity has my Center's approval

**I already have a student in mind:**

**Comments:**

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