National Research Council Postdoctoral Fellowship Opportunities at the National Institute of Standards and Technology in Gaithersburg, MD

1. **Advanced Methods for Measuring Microbial Viability (RO# 50.64.41.C0605)**

The success of any antibiotic or antimicrobial approach rests in the developer’s ability to demonstrate it can effectively kill bacteria or severely retard their growth. In addition, the success of a microbial therapeutic or probiotic product relies on knowing viable count. Correctly determining bacterial viability, in other words whether an individual cell is alive or dead, is a critical and challenging measurement. Our goal is to develop advanced methods for rapidly, accurately and quantitatively measuring the viability of mixed microbial populations. This project will focus on the development of systematic, reliable methods for measuring viability of individual cells in a population. Understanding the effect of sublethal dosing chemical, antibiotic or UV antimicrobial treatments on viability and pathogenicity is critical insight that will help drive the success of real-world antimicrobial technologies. General approaches may include advanced imaging modalities, high-throughput technologies, standards and reference material development, and validation against existing compendial methods. The development of techniques to quantify viability will provide the means to reliably screen mixed microbial populations *in vitro*.

2. **Chemical and Spatial Distribution of Biofilms (RO# 50.64.41.B7316)**

Biofilms are complex, heterogeneous, three-dimensional structures. Novel techniques to evaluate the spatial distribution of chemical signatures and three-dimensional structure within a biofilm would provide information and insight into biofilm behaviors. This research opportunity involves using advanced imaging techniques coupled with quantitative bioassays to measure variations found within biofilms and to determine the effects of the underlying substratum on the biofilm chemical and physical structure. In addition, biofilms can be composed of multiple species. These techniques have the potential to elucidate the spatial distribution of individual species within multi-species biofilms in a nondestructive manner.

3. **Mapping Responses in Complex Microbial Systems using Advanced Imaging (RO# 50.64.41.B8452)**

Quantifying composition and function of complex microbial systems is key to progress in understanding the important role that bacteria play in human health, from the gut microbiome to the global problem of anti-microbial resistance. Traditional microbial characterization approaches are often destructive, insufficient in resolution and sensitivity, and are subject to bias inherent in the measurement process. New methods for quantitative, *in situ* characterization are essential for gaining insight into microbial communities in their unperturbed state.

This project will use *in situ* advanced imaging techniques such as broadband coherent anti-Stokes Raman (BCARS), quantum cascade laser infrared (QCL-IR), and fluorescence microscopies to obtain quantitative characterization of bacteria identity and location, metabolic state, and signaling molecules in commercially and clinically relevant mixed microbial communities and biofilms and compare the findings to traditional microbial analytical tools.

Two year fellowships are open to US citizens with February 1 and August 1 application deadlines. Current stipend is $72,750 plus benefits, relocation expenses included. For more information, please visit the [NIST NRC information page](https://www.nist.gov/nrc).

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