

REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHB-24-05

Assessing the Role of the Microbiome in Warfighter Performance

PROJECT DESCRIPTION: The gut microbiome is the collection of microorganisms (mostly Bacteria, but also Archaea, fungi and viruses) that are the normal constituents of the human gastrointestinal tract. These microbial cells reach levels of billions per milliliter in the large intestine. Each person carries their own personalized mix of different microbes that have been acquired over a lifetime and whose diversity was built up from birth via exposure to family members, food, and other environmental exposures. Collectively, these microbes outnumber the body's own cells, and encode 300 times more genes than the human genome. These microbes interact closely with the host immune system, and perform critical services for the human host, such as enhanced degradation of dietary components, production of vitamins, degradation of xenobiotics, and protection from pathogen invasion. In this project we will characterize the Warfighter fecal microbiome to identify its association with host performance metrics. As such, we are looking for a student that has a strong background in microbial ecology and in the analysis of large data sets.

The successful applicant will:

- learn to process and analyze complex microbial community data in order to pull out patterns that relate to human health and performance
- interact with researchers from a range of fields and service laboratories
- hone their presentation skills through meetings within the lab, with collaborators meetings, and at oral and poster presentations

ACADEMIC LEVEL: Doctoral; Masters; Undergraduate

DISCIPLINE NEEDED:

- Biology
- Microbiology
- Computational Biology

RESEARCH LOCATION: Wright-Patterson Air Force Base, Dayton, Ohio

RESEARCH MENTOR: Michael Goodson, PhD

Host Microbe Interactions, University of York, UK, 2000



I am a molecular biologist and microbial ecologist with 23 years post-doctoral experience, the most recent 15 years of which have been working on AFRL projects. My areas of expertise involve analyzing and manipulating microbes, their communities, and their genetic structure. This involves techniques such as DNA amplification, genetic circuit construction, molecular cloning, and spectrophotometric and bioinformatics analyses. My principle area of research is assessing and augmenting human health and performance through microbiome analysis and synthetic biology of probiotic microbes. I am currently the technical lead for projects to determine how the gut microbiome of deployed personnel affects human health and performance, the Chair of the Tri-Service Microbiome Consortium, the Chair of the NATO 'Microbiome for Human Health and Performance' Research Task Group, and the technical lead for the AFRL 'Grand Challenge' project involving the design and generation of 'smart probiotics' that can maintain optimum human performance. *Photo courtesy of the U.S. Air Force Research Laboratory.*

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