

REPPERGER RESEARCH INTERN PROGRAM

RESEARCH PROJECT #: AFRL-RHB-21-04

ASSESSING THE VIROME OF WARFIGHTER MICROBIOMES

PROJECT DESCRIPTION: Air Force Research Laboratory scientists, researchers and professionals re-imagine what's possible, creating tomorrow's technology, TODAY. This pursuit of innovation delivers solutions for our warfighter's urgent needs, creating innovative new capabilities for the Air Force. When others say it's impossible, we find a way!

AFRL leads the discovery, development and delivery of warfighting technologies for our air, space and cyberspace forces. We're pushing the boundaries and creating a new tomorrow through unparalleled research.

Learn about our initiatives, technologies, careers and events at AFResearchLab.com.

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. An increasing number of ailments, from inflammatory bowel disease to performance deficits include an altered and aberrant microbiome. The vast majority of microbiome studies have focused on the bacterial component; the microbial ecology of the virome has been largely ignored. In this project, we will characterize the viral component of Warfighter fecal microbiome to identify their associations with host performance metrics. As such, we are looking for a student that has a strong background in microbial ecology and the analysis of large data sets.

ACADEMIC LEVEL: Bachelors, Masters, PhD

DISCIPLINE NEEDED:

- Life Health and Medical Sciences
 - Infectious Diseases and Zoonoses
 - Microbiology
 - Population and Community Ecology
 - Virology

RESEARCH LOCATION: Wright-Patterson AFB Dayton, OH

RESEARCH ADVISER: Michael Goodson, PhD
Host-microbe symbioses, University of York, UK, 2000

Dr. Michael Goodson serves as a Research Scientist within the Airman Biosciences Division, Airman Systems Directorate at the 711th Human Performance Wing, Air Force Research Laboratory. Dr. Goodson is a molecular biologist and microbial ecologist with 20 years post-doctoral experience, the most recent 12 years of which have been working on AFRL projects. His 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. Dr. Goodson's principle area of research is assessing and augmenting human health and performance through microbiome analysis and synthetic biology of probiotic microbes. Dr. Goodson is currently the technical lead of projects determining how the gut microbiome of deployed personnel affects human health, Vice Chair of the Tri-Service Microbiome Consortium, an Office of the Undersecretary of Defense (Research and Engineering) Laboratory-University Collaboration Initiative (LUCI) Fellow, and the technical lead for the Office of the Secretary of Defense-funded Synthetic Biology for Military Environments (SBME) - Human Performance project involving the design and generation of 'smart probiotics' that can sense and respond to maintain optimum human performance.