Subject: Dissertation Defense - George Dimitrov, PHD Bioinformatics & Computational Biology
Date: Tuesday, March 25, 2025 at 9:40:09 AM Eastern Daylight Time
From: SSB Faculty List on behalf of Diane St. Germain
To: SSB-FACULTY-LIST-L@LISTSERV.GMU.EDU

Dissertation Defense Announcement
To: The George Mason University Community

Candidate: George Dimitrov

Program: PhD Bioinformatics & Computational Biology

Date: Wednesday April 9, 2025

Time: 4:00 PM Eastern Time (US and Canada)

Join Zoom Meeting:
https://gmu.zoom.us/j/91724751122?pwd=l7VgDfJoeZas043UMPM2S0ALklzKkG.1

Meeting ID: 917 2475 1122

Passcode: 243841

One tap mobile

+12678310333,,91724751122#,,,,*243841# US (Philadelphia)

+13017158592,,91724751122#,,,,*243841# US (Washington DC)

Dial by your location

+1 267 831 0333 US (Philadelphia)

+1 301 715 8592 US (Washington DC)

Meeting ID: 917 2475 1122

Passcode: 243841

Find your local number: https://gmu.zoom.us/u/aexiyWj524

Join by SIP

91724751122@zoomcrc.com

Committee chair: Dr. Iosif Vaisman

Committee members: Dr. Ancha Baranova, Dr. Saleet Jafri, Dr. Rasha Hammamieh

Title: "Effects of Microgravity on the Gut Brain Axis Interaction on Prolonged Space Missions: A Systems Biology Approach"

Abstract:

Spaceflight results in a variety of neurological abnormalities, manifesting as space motion sickness (SMS), space adaptation syndrome (SAS), body position illusions, vision disorders, neuromuscular fatigue, general weakness, imbalance and ataxia. When exposed to microgravity, central nervous system (CNS) goes through a host of physiological adaptations. Research is ongoing to understand the neural mechanisms associated with the physiological and potential cognitive changes that occur during spaceflight exposure, as well as post-flight recovery. We used an animal model (mice) exposed to gravity during prolonged stay on the ISS and ground controls. The brains of the test animals in our study were removed, dissected and RNA was extracted for differentially expressed genes analysis using microarrays. We hypothesized that we can determine the overall effect of microgravity on the subject's brain at the gene expression level. We also set to examine the differential expression changes of the gene regulatory miRNA. MiRNAs are non-coding epigenetic regulators that have numerous gene targets. One of the numerous challenges to the health of astronauts enduring prolonged space travel missions is to maintain balanced and healthy gut microbiota, the collection of all commensal microorganisms living in the GI tract of the host. Microbial dysbiosis have been linked to many diseases. Environmental stressors have been shown to affect the composition of the gut microbiota of astronauts. In the current research I aim to examine the change to the microbiota composition caused by space travel and its implications on astronaut health. This study aids in developing preventive measures for maintaining healthy microbiota and possible control of microbial organisms that astronauts being exposed to. For this purpose, fecal samples were collected and DNA sequencing and shotgun transcriptomics was performed for organismal identification. I also performed metabolomic analysis on the fecal samples to help us understand the microbiota effect on the host due to microgravity exposure. Using data from animal model we hope to dissect the bidirectional gut-brain axis regulation in the austere conditions of microgravity. Comprehensive analyses of gene expression profiles and comparing it to ground controls may provide valuable insight into the mechanisms underlying the physiological and psychological changes that occur in microgravity. We will also examine the effects spaceflight has on the gut microbiome and link it to molecular changes in the animal brain with hope to gain novel insights into the complex roles of commensal bacteria in function of the CNS during space missions.

###