

IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Radiation Fields, Effects and Risks in Human Space Missions (5)

Author: Dr. Fathi Karouia

National Aeronautics and Space Administration (NASA), Ames Research Center / UCSF, United States,
fathi.karouia@nasa.govCHARACTERISTICS OF CHANGES WITHIN THE MICROBIOME AND DEVELOPMENT OF
SUITABLE COUNTERMEASURES FOR LONG DURATION SPACEFLIGHT.**Abstract**

Human space travelers experience a unique environment that affects homeostasis and physiologic adaptation. Spaceflight-related changes have been reported in the musculo-skeletal, cardiovascular, neurovestibular, endocrine, and immune systems to just name a few. However, to date, radiation exposure is one of the main limiting factors for long duration space exploration missions and especially a mission to Mars.

Limited information is known about the influence of space environment in general and radiation in particular on the microbiome. Over the past few years through advances in technology, the characterization of the microbiome has revealed a large and complex community of microorganisms living in symbiosis with the human host. However, heterogeneity of the intestinal microbial spectrum in humans has been associated with a variety of diseases and susceptibility to infectious and toxic agents.

We report a study of the bacterial composition of the intestine in C57BL/6NTAC mice and the types of microbes entering the body at two time points after the LD 50/30 dose of total body irradiation using microarray-based assay and bioinformatics methods. Bacteria and archaea taxon richness was determined at the genus level. As expected, pre-exposure blood samples exhibited less bacterial and archaeal genus richness compared to all other samples. However, the study shows a significant shift in the mouse gut microbial speciation in several bacterial families and in particular Enterobacteriaceae. Multiple species within this family are known to produce disease in humans.

Finally, the use of engineered probiotics expressing IL-22 and INF- β will be discussed and preliminary results will reveal a promising venue for countermeasures development associated with astronaut's health and long duration spaceflight.