NASA OMICS ARCHIVE PROJECT

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The space environment consists of a complex set of hazards including altered gravity, radiation, psychological/physiological stress, isolation, and confinement leading to complex biological responses. Advances in biotechnology capabilities offer considerable potential to provide novel insight into those responses as well as innovative diagnostic, treatment, and countermeasure solutions for astronauts as NASA begins to travel beyond low Earth orbit. Omics data (genomics, transcriptomics, proteomics, etc.) is one example that can provide NASA with critical knowledge of how a crewmember's genetics, environment, and lifestyle can be used to develop individualized approaches for disease prevention, advance diagnostics, and improve treatment strategies.

NASA ventured into the field of omics on human subjects with the successful completion of the NASA Twins Study which was the first step in mapping the multi-omic profile of astronauts to understand and mitigate the health consequences of spaceflight. The Human Research Program aims to build upon the success of the Twins Study with the NASA Omics Archive flight study, establishing a longitudinal biospecimen archive and efficiently generating a comprehensive high-quality multi-omic dataset from astronauts for the purpose of studying molecular, metabolic, and microbial changes associated with long-duration spaceflight missions. The goal is to facilitate scientific and medical research community efforts to characterize and mitigate spaceflight health and performance risks.

In this presentation, we will review details regarding the biospecimen and data archive to be generated by the NASA Omics Archive flight study. Data generated as part of this project will be archived in the NASA Life Sciences Portal (NLSP) and be made available for future hypothesis-driven research efforts or occupational surveillance through Institutional Review Board-approved data sharing and retrospective data requests submitted to the Life Sciences Data Archive (LSDA) team. We will also present results of a ground study performed to evaluate in-house procedures, new sample collection hardware, and vendor capabilities.

The data repository generated and the samples to be archived by this study will enable future research efforts to assess an astronauts' unique molecular and genetic profile with respect to individual spaceflight responses. Results of which will be instrumental in enabling precision health capabilities to better assess and mitigate spaceflight risks, detect disease states earlier, and actively monitor countermeasure treatments, ultimately improving clinical outcomes during future exploration class missions.