Synthetic Fungal Strains for Solar System Exploration and Colonization.

Jonathan M. Galazka[1] and Masood Z. Hadi[1]

[1]Synthetic Biology Program, Space Biosciences Division, NASA Ames Research Center, Moffett Field, CA 94035.

Solar system exploration and eventual colonization efforts are constrained by limits on the mass of material that can embark from Earth. Thus, creative use of the resources available *in situ* could reduce mission costs and extend the scope of such activities. To that end, we are developing synthetic fungal strains to produce specialized materials from the resources found throughout the solar system. A primary goal is to develop a suite of *Saccharomyces cerevisiae* strains to serve as generic production chassis for synthetic metabolic pathways. These strains must perform consistently upon challenge by unique conditions including exposure to microgravity, cosmic radiation, the rigors of launch and re-entry, and long-term stasis.

Presently, we are establishing systematic datasets profiling epigenetic, transcriptional, translational and metabolic states of *S. cerevisiae* under relevant operating conditions. These will deepen our understanding of the physiological changes associated with space travel and enable rational engineering of optimal production strains.