

## **DELIVERY OF PROBIOTICS IN THE SPACEFOOD SYSTEM**

S. L. Castro<sup>1</sup>, C. M. Ott<sup>2</sup>, and G. L. Douglas<sup>2</sup>

<sup>1</sup>Eagle Applied Sciences, L.L.C. 2600 South Shore Boulevard League City, TX, 77573, <sup>2</sup>NASA Johnson Space Center 2101 NASA Parkway Houston, TX, 77573

The addition of probiotic bacteria to the space food system is expected to confer immunostimulatory benefits on crewmembers during spaceflight, counteracting the immune dysregulation that has been documented in spaceflight [1]. Specifically, the probiotic *Lactobacillus acidophilus* has been shown to promote health benefits including antagonism towards and inhibition of virulence related gene expression in pathogens, mucosal stimulation of immune cells, and a reduction in the occurrence and duration of cold and flu-like symptoms [2-5]. The optimum delivery system for probiotics has not been determined for spaceflight, where the food system is shelf stable and the lack of refrigeration prevents the use of traditional dairy delivery methods. This work proposes to determine whether *L. acidophilus* is more viable, and therefore more likely to confer immune benefit, when delivered in a capsule form or when delivered in nonfat dry milk powder with a resuscitation opportunity upon rehydration, following 0, 4, and 8 months of storage at -80°C, 4°C, and 22°C, and both prior to and after challenge with simulated gastric and intestinal juices. We hypothesize that the low moisture neutral dairy matrix provided by the nonfat dry milk, and the rehydration step prior to consumption, will extend probiotic viability and stress tolerance compared to a capsule during potential storage conditions in spaceflight and in simulated digestion conditions.

### **REFERENCES**

[1] Gueguinou N. et al. (2009) J. Leukoc. Biol. 86, 1027. [2] Medellin-Pena M.J. et al. (2007) Appl. Environ. Microbiol. 73, 4259. [3] Leyer G.J. et al. (2009) Pediatrics 124, e172. [4] Chen C.C. et al. (2005) Pediatr. Res. 58, 1185. [5] Bernet M.F. et al. (1994) Gut 35, 483.