

RODENT RESEARCH DEVELOPMENT FOR LONG DURATION STUDIES ON THE INTERNATIONAL SPACE STATION

R.K. Globus¹, S. Choi^{1,2}, D. Leveson-Gower^{1,2}, C.L. Wigley¹, D. Pletcher¹, JK. Souza^{1,2} and J. Beegle¹
¹Biosciences Division, NASA-Ames Research Center, ²Intrinsyx ³Logyx,LLC

Rodent research in space is needed to advance our understanding of the health risks, consequences and possible countermeasures to protect crew during future, long duration missions. The Animal Enclosure Module (AEM) was designed originally to support habitation of rats and mice on relatively short duration, Shuttle missions (≤ 19 days). The AEM was flown previously on 27 Space Shuttle missions, and recently was modified extensively to support future long duration space biology and biomedical research on the International Space Station (ISS). In consultation with a Science Working Group comprised of veterinarians and investigators experienced in rodent spaceflight experimentation in space, the Rodent Habitat project team at Ames Research Center modified existing hardware, developed new hardware, operations, and science activities, and performed a series of ground-based operational and science habitat verification tests in preparation for the first validation flight.

The Rodent Habitat hardware is scheduled to transport mice via the SpaceX Dragon capsule to the ISS in June, 2014 on the maiden validation mission, Rodent Research-1 (RR-1). RR-1 will serve to validate the hardware and various on-orbit science operations to support both NASA and the Center for the Advancement of Science in Space (CASIS) sponsored research. In addition, ground-based verification tests using 4-mo old, female C57Bl/6J mice were completed recently. Tests included a simulation of Dragon launch conditions (vibration and steady state acceleration) using the Transporter and a long-term (32 days) biocompatibility test using the Habitat designed for the ISS. The launch simulation test demonstrated that adult mice housed in the Transporter hardware adapted well to conditions simulating Dragon launch, even if launch simulation was followed by a period of simulated weightlessness (via hindlimb unloading). Further analyses of tissues preserved by freezing or with RNA later for gene expression are in progress. The biocompatibility test demonstrated that the Habitat modified for long duration experimentation on the ISS successfully supported animal health and also provided a useful video imaging system that will enable frequent monitoring of animal health and behavior by veterinary and scientific experts on the ground, independent of ISS crew intervention. All mice at the termination of both tests were deemed healthy and suitable for conducting the cutting edge, spaceflight research that was recommended to NASA by the National Research Council [1].

REFERENCE

[1] NRC Decadal Survey on Biological and Physical Sciences in Space, (2011)
http://sites.nationalacademies.org/SSB/CompletedProjects/SSB_067720