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Effects of chronic and fractionated space radiation on behavioral and cognitive performance

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Abstract

Project 4 of the NASA Specialized Center of Research on Carcinogenesis is focused on neurobehavioral characterization following space radiation exposure and testing potential countermeasures against the detrimental effects of space radiation exposure on the brain. The space radiation environment consists of multiple species of charged particles that may impact brain function during and following missions. In mouse studies, C57BL/6J and C57BL/6Jx DBA/2J F1 (B6D2F1) wild-type mice are often used for assessing effects of ²⁸Si irradiation on cognition. The marked differential effects of ²⁸Si ion irradiation on contextual fear memory in the hybrid strain and the pure C57BL/6J strain underline the importance of considering strains with distinct genetic backgrounds when evaluating the effects of space irradiation on the brain. As part of Project 4, we are also behaviorally and cognitively testing mice following exposure to fission spectrum neutron irradiation (²⁵²Cf neutrons at 1 mGy per day) to simulate the chronic, low dose rate exposures to high LET radiation that will be experienced by spaceflight crew beyond low Earth orbit. In the Fall of 2019, we assessed the effects of acute neutron exposure and the effects of long term, low dose aspirin on behavioral and cognitive performance on mice exposed to chronic neutron irradiation. Finally, we will behaviorally and cognitively tested C3H male mice irradiated with 0.4 Gy GCRsim in a single fraction or delivered in 19 fractions over 1 month, along with sham-irradiated C3H male mice. This presentation will provide a progress report of the ongoing work as part of Project 4.

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