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Quantitative and Qualitative Differences in Neurocognitive Impairment Induced by 1 GeV 56Fe Ions and X-Rays[1] R. BRITTEN, S. MITCHELL, B. PARRIS, A. JOHNSON, Eastern Virginia Medical School, S. SINGLETARY-BRITTEN, National Institutes of Aging, G. LONART, R. DRAKE, Eastern Virginia Medical School — During the planned mission to Mars, Astronauts will be exposed to heavy charged particles (Hze). Our group has been determining the relative biological effectiveness (RBE) of Hze (1 GeV 56Fe, LET = 150 kev/um) with respect to neurocognitive impairment, specifically spatial memory, short-term working memory and attentional set shifting. Our current data suggest that Hze have RBE values of about 7 for hippocampal-dependent spatial memory tasks (Barnes Maze) and possibly even higher for certain attentional processes. We have also used MALDI-TOF serum profiling analysis to identify several proteins that are biomarkers of both the level and LET of the radiation exposure, and biomarkers of cognitive performance. Our data suggest that Hze particles have a distinctly different impact upon neurocognitive function in rats than do X-rays. From a mission perspective, attentional set shifting is the neurocognitive function most likely to be impacted by the predicted Hze exposure; unfortunately Set shifting underlies our ability to execute complex plans. The proteins identified could be used to monitor the Astronauts for radiation exposure and any associated loss of neurocognitive function, and some may actually give an insight into the complex processes that lead to radiation-induced cognitive impairment.

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