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Discipline: None Space Biology Special Category: None PI Enail: modeom@illuc.du Fax: FY 909-558-4035 PI Organization Type: UNVERSIT Quality Phone: 9090-558-4304 Organization Type: Loma Lindu Huiversity Phone: 90558-8364 PI Address 1: Basic Sciences, Div. Radiation Research 11175 Campus Street Technology Technology PI Address 2: Chan Shun Pavilion, Room A-1024 Technology Technology Technology PI Address 2: Loma Linda Campus Street CA Technology Technology PI Address 1: Orma Linda State: CA CA Zip Code: Q2350-1700 Congressional District: 31 Technology Appendix E: Space Radiobiology and Human Health Start Date: O4/15/2018 End Date: 11/02/2022 Technology Appendix E: Space Radiobiology and Human Health Start Date: O4/15/2018 End Date: 11/02/2022 Technology Appendix E: Space Radiobiology and Human Health Start Date: No. of Bachelor's Dargeres: No. of Mas	Space Biology Element:	None		
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Contact Email:thomas.j.willl@nasa.govFlight Program:Flight Assignment:Key Personnel Changes/Previous PI:Coll Name (Institution):Hartman, Richard Ph.D. (Loma Linda University) Mao, Xiao Wen M.D. (Loma Linda University) Rosi, Susanna Ph.D. (University of California San Francisco) Vikolinsky, Roman Ph.D. (Loma Linda University) Wroe, Andrew Ph.D. (Loma Linda University) Wroe, Andrew Ph.D. (Loma Linda University)Grant/Contract No::80NSSC18K0785Performance Goal No::	No. of Bachelor's Candidates:		Monitoring Center:	NASA JSC
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Task Description:	gamma rays. All proposed work will use wild type mice and will be performed under Institutional Animal Care and Use Committee (IACUC) approved protocols in Association for Assessment and Accreditation of Laboratory Animal Care (AAALAC)-certified facilities at Loma Linda University (LLU), the University of California (UCSF), and Brookhaven National Laboratory (BNL). For all three specific aims the species is Mus musculus, strain C57BI/6J. Ages are 5 - 6 months at acquisition and the beginning of 42 day irradiation procedures. Sexes are males and females. Scheduled sacrifices are at 1 week, 30 days, 90 days, 6 months, and 12 months post-irradiation. Behavioral testing will occur prior to the use of the same animals for terminal assays. All outcome measures will be quantified in males (N=960) and a subset of measures less prone to sex-dependent variability will be quantifies in females (N=220) for a total of N = 1180. ORIGINAL PROPOSAL DESCRIPTION: Evidence has accumulated from animal studies that the central nervous system (CNS) undergoes deleterious changes after exposure to charged particle radiation such as protons and high atomic number atomic nuclei that are found in space as galactic cosmic rays and solar particle events. Observed changes include inflammation, oxidative stress, loss of heuron (dendrite) branches and connections (synapses), altered signaling molecules, altered electrical properties, loss of blood vessels, and impaired behavioral performance. If humans respond to charged particles in the same way as animals, then it is possible that deleterious changes may be sufficient to cause cognitive and other behavioral impairments that could compromise spaceflight missions and astronaut health. The current evidence is based primarily on short exposures to single radiation types. However, space radiation is a complex mixture of these particles and exposures accumulate gradually over the course of missions. It is well established in radiation biology that reduction of the dose rate can have a profound ef
	We will test both male and female animals as their responses are not identical and the astronaut population is of mixed sex. For each of the exposure regimens we will conduct a battery of behavior tests, measure electrophysiological properties in tissue slices, and quantify changes in the structure and composition of the tissue using state of the art biochemical, histochemical, and microscopy methods. This will allow us to identify the underlying physiological changes most sensitive to dose rate and radiation quality and how they combine to produce behaviors that are adaptive or maladaptive. Together the data generated by the project will enhance NASA's ability to translate animal assessments of CNS structure and function to humans, and to update risk estimates based on single radiation species, high dose rate irradiation protocols, to higher fidelity space-like exposures of charged particle mixtures delivered at dose rates approaching those observed in space.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2018.
Bibliography Type:	Description: (Last Updated: 03/19/2025)