Fiscal Year:	FY 2022	**Task Last Updated:**	FY 07/07/2022
PI Name:	Lau, Anthony G Ph.D.		
Project Title:	Effects of Acute and Protracted Galactic Cosmic Radiation on Bone Strength		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **SR**:Space Radiation		
Human Research Program Risks:	(1) **BMed**:Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders (2) **Bone Fracture**:Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (3) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	LauA@tcnj.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	609-771-2644
Organization Name:	College of New Jersey		
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City:	Ewing	**State:**	NJ
Zip Code:	08618-1104	**Congressional District:**	12
Comments:	NOTE: As of Fall 2015, Dr. Lau is at The College of New Jersey. Previously at University of North Carolina at Chapel Hill while NSBRI postdoc.		
Project Type:	GROUND	**Solicitation / Funding Source:**	2020 HERO 80JSC019N0001-HFBP, OMNIBUS3 Crew Health: Human Factors and Behavioral Performance-Appendix E; Omnibus3-Appendix F
Start Date:	06/30/2021	**End Date:**	06/30/2023
No. of Post Docs:		**No. of PhD Degrees:**	
No. of PhD Candidates:		**No. of Master' Degrees:**	
No. of Master's Candidates:		**No. of Bachelor's Degrees:**	4
No. of Bachelor's Candidates:	5	**Monitoring Center:**	NASA JSC
Contact Monitor:	Elgart, Robin	**Contact Phone:**	281-244-0596 (o)/832-221-4576 (m)
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Flight Program:			
Flight Assignment:	NOTE: End date changed to 06/30/2023 per NSSC information (Ed., 8/5/22).		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Davis, Catherine Ph.D. (Uniformed Services University of the Health Sciences)		
Grant/Contract No.:	80NSSC21K1506		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The exposure to ionizing space radiation can lead to damage of multiple biological tissue systems. The proposed work investigates degeneration of the central nervous system (CNS) and bone tissues from exposure to different does of simulated space radiation. Radiation is known to affect biological pathways that regulate both the CNS and bone. The objective of the proposed work to is to investigate the relationship between declines in cognitive function and declines from exposure to simulated space radiation, as well as to quantify these changes. The objectives will be addressed through animal studies exposing rats to acute and protracted (or fractionated) simulated galactic cosmic radiation and investigating the relationship between neurobehavioral deficits and bone degradation 7, 30, 90, and 180 days after radiation exposure. This tissue sharing proposal is part of an on-going collaboration between Dr. Catherine Davis at Uniformed Services University, who is currently funded by NASA to investigate the cognitive degradation in rats exposed to space radiation. Our lab has been collecting the hind limbs from her studies to investigate the corresponding bone strength changes in these rats. Neurobehavioral assessments include odor recognition memory tests and sustained attention tests. A multi-length scale approach will be performed to assess the corresponding bone health changes. Bone health assessments include microstructural (microCT scans), material property (micro-indentation), and whole bone (3-point bending) evaluations of bone strength. Analysis will be performed on CNS and bone endpoint measurements to determine whether the neurobehavioral deficits are predictive of declines in bone strength. The work is significant to NASA's goal for astronaut health during long duration spaceflight. Establishing a relationship between the CNS and bone response to radiation can provide valuable information for potential mechanisms and countermeasure targets for both systems.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	This research provides new insights on how lower doses of ionizing radiation (<0.5 Gy) affects bone health and strength. The skeletal changes from these lower doses could be considered for exposure to clinical radiation for diagnostic (i.e. CT Scans) and radiation therapies.
Task Progress:	During the past reporting period, the bone analysis of the 7, 30, and 90-day cohort of animals were performed. The microCT scans and biomechanical testing for these cohorts have been completed. Quantitative microCT analysis, Finite Element analysis, and microindentation are still ongoing. The 180-day cohort of animals have all been collected and the microCT scans for these final 60 specimens are ongoing. The quantitative microCT analysis and Finite Element analysis for this cohort will begin once all the microCT scans have been completed. Biomechanical testing has been completed on the 180-day cohort of animals and microindentation has been started.
Bibliography Type:	Description: (Last Updated: 03/30/2016)