Fiscal Year:	FY 2021	**Task Last Updated:**	FY 03/08/2021
PI Name:	Tahimic, Candice Ginn Ph.D.		
Project Title:	Cardiovascular Responses to Simulated Spaceflight: Molecular Signatures and Surrogate Outputs to Measure CVD Risk		
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) **Cardiovascular**:Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes (2) **Immune**:Risk of Adverse Health Event Due to Altered Immune Response		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	32224	**Congressional District:**	4
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2019 HERO 80JSC019N0001-FLAGSHIP & OMNIBUS: Human Research Program Crew Health. Appendix A&B
Start Date:	01/28/2021	**End Date:**	01/27/2023
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:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA JSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Goukassian, David M.D., Ph.D. (ICAHN School of Medicine at Mount Sinai) Ronca, April Ph.D. (NASA Ames Research Center)		
Grant/Contract No.:	80NSSC21K0548		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	In this ground-based rodent study, we aim to systematically define molecular signatures of cardiovascular performance across doses of acute simulated galactic cosmic radiation (Five-ion GCR) at early and late timepoints post-exposure. We also will determine the contribution of biological sex and the combined effects of GCR and microgravity on clinically relevant and emerging measures of cardiovascular health. We hypothesize that exposure to space radiation alone or in combination with microgravity results in early and late changes in the structure, transcriptome, redox signaling, and cytokine milieu of cardiovascular tissue, some of which have known links to decreased performance, aging, and increased cardiovascular disease (CVD) risk. We further posit that other less invasive clinically relevant measures of immune, behavior, and neuromotor function will be informative towards extrapolating the effects of deep space missions on human cardiovascular health. To achieve the project goals and test the hypothesis, we will take advantage of a rare tissue sharing opportunity from a recently funded Human Research Program (HRP) study. The experiment design of this funded investigation includes a GCR dosing study on crew age-matched female and male mice (6 months old) as well as combined exposure study with simulated microgravity. A comprehensive panel of outcomes will be assessed in the funded study and includes measures of immune health, brain molecular and structural changes, behavior, anxiety, cognition, and neuromotor function. Our proposed approach is to measure clinically relevant indicators of cardiovascular performance and perform transcriptomic profiling by RNAseq to determine dose and time-dependency of cardiovascular responses. To further facilitate extrapolation of results to humans, rodent RNAseq data will be compared to publicly available human RNAseq datasets from aging and CVD progression studies. The results from analysis of rodent cardiovascular tissue also will be compared to corresponding blood data to link immune and cardiovascular changes. Further, cardiovascular findings will be interpreted in light of behavioral testing results to gain insight on any relationships between cardiovascular outcomes and changes in neuromotor, anxiety levels, and cognitive performance. The significance/impact of this study is that it contributes to increased understanding on the mechanisms of degenerative changes in cardiovascular tissue and the clinical endpoints they suggest. This study also is expected to provide insight on the latency period for radiation-induced cardiovascular changes and any sex differences in these outcomes. Lastly, our findings are expected to generate testable hypotheses for the development of countermeasures and less invasive surrogate biomarkers to monitor cardiovascular health in-flight and after return.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2021.
Bibliography Type:	Description: (Last Updated:)