Fiscal Year:	FY 2020	**Task Last Updated:**	FY 11/15/2019
PI Name:	Ronca, April Elizabeth Ph.D.		
Project Title:	VNSCOR: Oxidative Stress and the Neuroconsequences of Spaceflight Environment -- Immune Dysregulation and Antioxidant Dietary Countermeasure Efficacy		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	(1) **Bmed**:Risk of Adverse Behavioral Conditions and Psychiatric Disorders (2) **CNS**:Risk of Acute (In-flight) and Late Central Nervous System Effects from Radiation Exposure (IRP Rev G) (3) **Sensorimotor**:Risk of Altered Sensorimotor/Vestibular Function Impacting Critical Mission Tasks (Revised as of IRP Rev M)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	april.e.ronca-1@nasa.gov	**Fax:**	FY
PI Organization Type:	NASA CENTER	**Phone:**	650.604.3595
Organization Name:	NASA Ames Research Center		
PI Address 1:	Space Biosciences Research Branch, NASA Human Research Program (HRP)/Human Health Countermeasures (HHC)		
PI Address 2:	MS 236-7		
PI Web Page:			
City:	Moffett Field	**State:**	CA
Zip Code:	94035	**Congressional District:**	18
Comments:	November 2019: PI is located at NASA Ames Research Center and remains affiliated with Wake Forest University School of Medicine		
Project Type:	GROUND	**Solicitation / Funding Source:**	2018 HERO 80JSC018N0001-Crew Health and Performance (FLAGSHIP, OMNIBUS). Appendix A-Flagship, Appendix B-Omnibus
Start Date:	10/01/2019	**End Date:**	09/30/2023
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:**	
No. of Bachelor's Candidates:		**Monitoring Center:**	NASA JSC
Contact Monitor:	Williams, Thomas	**Contact Phone:**	281-483-8773
Contact Email:	thomas.j.will1@nasa.gov		
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:	Update as per PI: Ruth Globus, Ph.D. and Sharmila Bhattacharya, Ph.D. left the project before the investigation began (Ed., 5/26/22).		
COI Name (Institution):	Tahimic, Candice Ph.D. (NASA Ames Research Center) Paul, Amber Ph.D. (NASA Ames Research Center) Mhatre, Siddhita Ph.D. (NASA Ames Research Center) Iyer, Janani Ph.D. (NASA Ames Research Center) Guttmann, Linda Ph.D. (NASA Ames Research Center) Globus, Ruth Ph.D. (NASA Ames Research Center) Bhattacharya, Sharmila Ph.D. (NASA Ames Research Center)		

Grant/Contract No.:	Internal Project
Performance Goal No.:	
Performance Goal Text:	
Task Description:	The proposed project will test the hypothesis that Ionizing Radiation (IR), microgravity, and social isolation combine synergistically to trigger an oxidative stress response that alters immune homeostasis, brain structure and function, and neurobehavioral and cognitive performance. Specific Aims for this project are: (1) Determine dose-response curves for acute 'Five-Ion GCR (galactic cosmic ray) Simulation' exposure for immune, brain, and performance responses in crew age-matched adult male and female mice; (2) Determine effects of acute 'Five-Ion GCR Simulation' exposure singly and in combination with simulated microgravity and social isolation, on immune, brain, and performance responses in crew age-matched male and female mice mimicking deep space missions; and (3) Determine efficacy of the dietary antioxidant, Nicotinamide Mononucleotide (NMN), a key intermediate in nicotinamide adenine dinucleotide (NAD+) biosynthesis. The project relies on established and highly translatable ground-based mouse models and assays with IR exposures to be performed at the NASA Space Radiation Laboratory (NSRL). The experimental approach will provide definitive data on the timing and mechanisms involved in the oxidative stress response, immune, and brain changes, and ensuing functional (behavioral/cognitive) impairments expected during human transit to Mars. This project will identify potential immune biomarkers for, and mechanisms underlying, structural and functional changes in the immune and nervous systems leading to behavioral/cognitive performance deficits, and its potential application to develop effective countermeasures to mitigate negative health effects of long duration space habitation. This proposal addresses NASA's efforts to rapidly advance the characterization of risks and identifying appropriate countermeasures in anticipation of future deep space missions. Ensuring crew health and performance during extended transits necessitates that sensorimotor and cognitive abilities remain strong to avoid potentially catastrophic health and safety outcomes. Further, despite historically low numbers of females astronauts, the two most recent NASA Astronaut Corps class selections, comprised of 50% and 40% women as compared to men, signal the need to understand how sex and gender differences affect physiological adaptation and health in the space environment. This integrative project, developed by a cross-disciplinary team highly experienced in spaceflight and radiation research, utilizes established space biosciences research protocols and variables, and time-honored, as well as modern, research methodologies. We will address major risks and associated gaps: (1) Risk of Acute (In-flight) and Late Central Nervous System Effects from Radiation (CNS), (2) Risk of Impaired Control of Spacecraft/Associated Systems and Decreased Mobility Due to Vestibular/Sensorimotor Alterations Associated with Spaceflight (SM), and Risk of Adverse Cognitive or Behavioral Conditions and Psychiatric Disorders that have been combined into the NASA CNS, BMed, and SM Integrated Research Plan. Here we have adhered to primary goals set forth in Human Exploration Research Opportunities (HERO) Appendix A to determine how key features of the deep space environment may interact to increase risk to a crew by negatively impacting health and performance, and identify and develop strategies to characterize and mitigate the potential risks via countermeasures.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2020.
Bibliography Type:	Description: (Last Updated: 05/24/2022)