Fiscal Year:	FY 2015	**Task Last Updated:**	FY 06/19/2015
PI Name:	Hienz, Robert D. Ph.D.		
Project Title:	Countermeasures for Neurobehavioral Vulnerabilities to Space Radiation		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	NSBRI--Neurobehavioral and Psychosocial Factors Team		
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 Cognitive or Behavioral Conditions and Psychiatric Disorders		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	bhienz@jhmi.edu	**Fax:**	FY 410-550-2780
PI Organization Type:	UNIVERSITY	**Phone:**	410-550-2788
Organization Name:	The Johns Hopkins University School of Medicine		
PI Address 1:	Department of Psychiatry & Behavioral Sciences		
PI Address 2:	5510 Nathan Shock Drive		
PI Web Page:			
City:	Baltimore	**State:**	MD
Zip Code:	21224-6823	**Congressional District:**	7
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	2013 HERO NNJ13ZSA002N-Crew Health (FLAGSHIP & NSBRI)
Start Date:	06/01/2015	**End Date:**	05/31/2017
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:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:	NOTE: Change in period of performance per NSBRI (formerly 7/1/15-6/30/17)--Ed., 7/7/15		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Davis, Catherine Ph.D. (Johns Hopkins University) Roma, Peter Ph.D. (Institutes For Behavior Resources, Inc.)		
Grant/Contract No.:	NCC 9-58-NBPF04201		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Risk assessment of the biological consequences of living in the space radiation environment represents one of the highest priority areas of NASA radiation research. Our astronauts will be spending more time in space and ultimately will venture to the Moon, Mars, and other destinations outside of the protection of Earth's magnetosphere. As spelled out in NASA's Integrated Research Plan, it is essential that methods are developed to detect behavioral changes induced by radiation exposures and that potential strategies and countermeasures are developed for ameliorating radiation damage, with the long term goal being the prevention of those sequelae that impact on astronaut health and mission success. To this end, the proposed research will focus on determining the effectiveness of biomedical countermeasures for mitigating the effects of space radiation on human CNS function. The proposed studies will assess the effectiveness of a number of pharmacologic compounds in ameliorating the deleterious effects of radiation exposure on neurobehavioral function. This work will provide animal performance data obtained with an animal analog of the human Psychomotor Vigilance Test (PVT) that is currently employed for human risk assessments via quantification of sustained attention (e.g., 'vigilance' or 'readiness to perform' tasks). The proposed research will thus use an animal model that employs neurobehavioral tests identical or homologous to those currently in use in human models of risk assessment. Within this framework, the first aim of this research will be to assess the degree to which likely biomedical countermeasures can mitigate the known effects of space radiation on cognitive neurobehavioral functions relevant to astronaut mission performance. Rodents will be trained in tests analogous to human neurobehavioral tests (e.g., a rodent version of the human PVT). Performance measures will include assessments of general motor function and speed, inhibitory control ("impulsivity"), attention, motivation, and basic sensory function. Separate groups of rats will be trained until stable performances are obtained, following which they will be transferred to NASA's Space Radiation Laboratory (NSRL) at Brookhaven National Laboratory (BNL) for radiation exposure to protons (25 and 100 cGy, 150 MeV/n) encountered in the space radiation environment, and then returned to Johns Hopkins for extended post-exposure testing to 1) identify neurobehavioral performance deficits over durations similar to a long-term exploratory mission, and 2) assess the effectiveness of a number of pharmacologic compounds to mitigate the deficits. The second aim will be to assess the mechanisms of action of effective radioprotective countermeasures on the CNS by employing different types of potential mitigating and protective compounds. These will include compounds that directly alter dopaminergic (DA) signaling by binding to the dopamine transporter protein (DAT; e.g., amphetamine), compounds that directly alter dopaminergic signaling by binding to one or more receptors from the D2 receptor family (e.g., aripiprazole), and compounds that indirectly alter dopamine levels through another mechanism (e.g., norepinephrine reuptake inhibition, atomoxetine). Two FDA-approved radioprotective compounds that have mechanisms of action not specifically DA-related will also be employed (the putative DNA repair targeting drug cholorquine, and the hemopoietic growth factor erythropoietin) to provide assessments of alternative mechanisms of action.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2015.
Bibliography Type:	Description: (Last Updated: 01/12/2021)