Fiscal Year:	FY 2010	**Task Last Updated:**	FY 03/05/2010
PI Name:	Rabin, Bernard M. Ph.D.		
Project Title:	Individual Differences in the Neurochemical and Behavioral Response to Exposure to Protons		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Radiation health		
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		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	21250-0001	**Congressional District:**	7
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2007 Space Radiation NNJ07ZSA001N
Start Date:	05/18/2008	**End Date:**	05/17/2012
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:**	2
No. of Bachelor's Candidates:	3	**Monitoring Center:**	NASA JSC
Contact Monitor:	Cucinott1a, Francis	**Contact Phone:**	281-483-0968
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Flight Program:			
Flight Assignment:	NOTE: new end date is 5/17/2012 per NSSC information (Ed., 5/31/2011)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Joseph, James (USDA, HNRCA at Tufts University) Shukitt-Hale, Barbara (USDA, HNRCA)		
Grant/Contract No.:	NNX08AM66G		
Performance Goal No.:			
Performance Goal Text:			
Task Description:	Long-term exploratory class missions will increase the risk that astronauts will be exposed to significant doses of protons resulting from solar flares. Evaluating these risks requires knowledge of the potential effects of proton irradiation on a variety of endpoints, including central nervous system (CNS) functioning. However, the effects of exposure to protons on CNS function and on behavior have not been the subject of significant amounts of research. Limited research has produced equivocal results about the consequences of exposure to protons on neurochemical and behavioral endpoints, with some data suggesting an effect of exposure to protons on these endpoints and other data indicating no effect following exposure. The objectives of the experiments detailed in this proposal are to describe and evaluate the effects of exposure to protons on CNS function and behavior and to characterize the role of individual differences, such as gender and age, in modulating the effects of exposure on neurocognitive endpoints.		

Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	The key findings are: 1. The neurobehavioral effects of exposure to different heavy particles from both acute and late degenerative effects of irradiation on CNS function may differ as a function of particle energy, fluence and the specific endpoint under consideration 2. Age may be a risk factor for the behavioral effects of exposure to heavy particles and the effects are not necessarily linear 3. Estrogen may not function as a neuroprotectant for exposure to HZE particles. The pattern of HZE effects on cognitive performance in ovariectomized female rats with/without estrogen replacement may vary as a function of the specific task. 4. Genes that directly or indirectly interact in the regulation of growth and differentiation of neurons were changed following irradiation; genes that regulate apoptosis were up-regulated whereas genes that modulate cellular proliferation were down-regulated, possibly to eliminate damaged cells and to stop cell proliferation to prevent DNA damage caused by radiation to new cells. These changes in gene expression may result from HZE particle-induced oxidative stress.
Bibliography Type:	Description: (Last Updated: 10/16/2023)
Abstracts for Journals and Proceedings	Rabin BM, Joseph JA, Shukitt-Hale B. "Reliability of neurocognitive deficits following exposure to HZE particles: A preliminary analysis of operant performance." Presented at the 2009 NASA Human Research Program Investigators' Workshop, League City, TX, 2-4 Feb. 2009. 2009 NASA Human Research Program Investigators' Workshop, League City, TX, 2- 4 Feb. 2009. , Feb-2009
Abstracts for Journals and Proceedings	Rabin BM, Joseph JA, Shukitt-Hale B, Carrihill-Knoll K. "Effects of age on the disruption of object recognition memory in rats." 5th International Workshop on Space Radiation Research. Cologne, Germany, 6-10 July, 2009. 5th International Workshop on Space Radiation Research. Cologne, Germany, 6-10 July, 2009. , Jul-2009
Abstracts for Journals and Proceedings	Shukitt-Hale B, Willis LM, Luskin K, Carrihill-Knoll, K, Rabin BM, Joseph JA. "Effects of oxygen radiation on inflammation and cognition." 5th International Workshop on Space Radiation Research. Cologne, Germany, 6-10 July, 2009. 5th International Workshop on Space Radiation Research. Cologne, Germany, 6-10 July, 2009. , Jul-2009
Abstracts for Journals and Proceedings	Rabin BM, Carrihill-Knoll KA, Joseph JA, Shukitt-Hale B. "Effects of exposure to HZE particles on habituation of the acoustic startle response." Presented at the 55th Annual Meeting of the Radiation Research Society, Savannah, GA, 4-7 Oct 2009. 55th Annual Meeting of the Radiation Research Society, Savannah, GA, 4-7 Oct 2009. , Oct-2009
Abstracts for Journals and Proceedings	Rabin BM, Joseph JA, Shukitt-Hale B, Carrihill-Knoll K. "Age as a factor influencing cognitive impairment following exposure to HZE particles." Presented at the 2010 NASA Human Research Program Investigators' Workshop, Houston, TX. 3-5 Feb. 2010. 2010 NASA Human Research Program Investigators' Workshop, Houston, TX. 3-5 Feb. 2010. , Feb-2010
Articles in Peer-reviewed Journals	Rabin BM, Carrihill-Knoll K, Hinchman M, Shukitt-Hale B, Joseph JA, Foster BC. "Effects of heavy particle irradiation and diet on object recognition memory in rats." Advances in Space Research, 2009 Apr 15;43(8):1193-9. http://dx.doi.org/10.1016/j.asr.2009.01.015 , Apr-2009