Fiscal Year:	FY 2012	**Task Last Updated:**	FY 03/28/2012
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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City:	Baltimore	**State:**	MD
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:**	01/31/2013
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:	6	**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 1/31/2013 (previoulsy 5/17/2012) per NSSC information (Ed., 12/21/2011) NOTE: new end date is 5/17/2012 per NSSC information (Ed., 5/31/2011)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	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. Protons (1000 MeV/n) produce deficits in cognitive performance. The dose of protons needed to produce a performance decrement is greater than that of 16O particles. These results are in general agreement with the results of a previous experiment in which rats were exposed to 1000 MeV/n protons at the NSRL. 2. Rats were given head-only, body-only, or whole-body exposures to 16O particles (1000 MeV/n). The effects of head-only exposures to 16O particles are similar to the results of previous studies showing that exposure to these particles produces a U-shaped function for the disruption of neurocognitive performance. The results also suggest that exposures involving the body may influence the responsiveness of the organism to the disruptive effects of exposure to HZE particles on neurocognitive performance. 3. Preliminary data suggest that oxidative stress may play a role in mediating the changes in the disruption of autophagy and in the phosphorylation of tau protein following exposure to HZE particles. Because the hyperphosphorylation of tau protein gives rise to the development of neurofibrillary tangles, this data may link exposure to HZE particles to the development of neurodegenerative diseases, such as Alzheimer's Disease.		
Bibliography Type:	Description: (Last Updated: 10/16/2023)		
Abstracts for Journals and Proceedings	Rabin BM, Carrihill-Knoll KL, Luskin K, Shukitt-Hale B. "Effects of estrogen on the responsiveness to exposure to 56Fe particles." Presented at 2012 NASA Human Research Program Investigators' Workshop, Houston, TX, Feb 14-16, 2012. 2012 NASA Human Research Program Investigators' Workshop, Houston, TX, Feb 14-16, 2012. , Feb-2012		
Abstracts for Journals and Proceedings	Rabin BM, Shukitt-Hale B, Carrihill-Knoll K. "Lack of effect of exposure to 137Cs gamma rays on cognitive performance in rats." Presented at the 22nd Annual Space Radiation Investigators' Workshop, League City, TX, September 18-21, 2011. 22nd Annual Space Radiation Investigators' Workshop, League City, TX, September 18-21, 2011. http://www.dsls.usra.edu/meetings/radiation2011/pdf/7002.pdf , Sep-2011		

Abstracts for Journals and Proceedings	Lowe X, Rabin B, Marchetti F, Bhatnagar S, Snijders A, Wyrobek AJ. "Choroid plexus: a critical target of persistent CNS damage after space radiation with 56Fe and 12C." Presented at the 22nd Annual Space Radiation Investigators' Workshop, League City, TX, September 18-21, 2011. 22nd Annual Space Radiation Investigators' Workshop, League City, TX, September 18-21, 2011. http://www.dsls.usra.edu/meetings/radiation2011/pdf/7107.pdf , Sep-2011
Abstracts for Journals and Proceedings	Azzam EI, de Toledo SM, Buonanno MN, Feng D, Li M, Gonon G, Rabin BM, Barnes BJ. "Evidence for non-targeted biological effects induced by space radiation." Presented at the 22nd Annual Space Radiation Investigators' Workshop, League City, TX, September 18-21, 2011. 22nd Annual Space Radiation Investigators' Workshop, League City, TX, September 18-21, 2011. http://www.dsls.usra.edu/meetings/radiation2011/pdf/7066.pdf , Sep-2011
Abstracts for Journals and Proceedings	Rabin BM, Carrihill-Knoll KL, Poetzsch B, Dwyer D, Kahler G, Luskin K, Shukitt-Hale B. "Sex differences in the cognitive effects of exposure to cosmic rays." Presented at 41st Annual Society for Neuroscience Meeting, Washington D.C., November 12-16, 2011. 41st Annual Society for Neuroscience Meeting, November, 2011. Abstract available at http://www.abstractsonline.com/Plan/ViewAbstract.aspx?sKey=284b8d58-16d3-4ec4-b333-accf27821c11&cKey=b337c3f8-42d2-4071-9a4c-6e1c430a0de5&mKey={8334BF29-8911-4991-8C31-32B32DD5E6C8} ; accessed 3/28/2012. , Nov-2011
Articles in Peer-reviewed Journals	Poulose SM, Bielinski DF, Carrihill-Knoll K, Rabin BM, Shukitt-Hale B. "Exposure to 16O-particle radiation causes aging-like decrements in rats through increased oxidative stress, inflammation and loss of autophagy." Radiation Research. 2011 Dec;176(6):761-9. Epub 2011 Sep 30. PubMed PMID: 21962006 , Dec-2011
Articles in Peer-reviewed Journals	Rabin BM, Joseph JA, Shukitt-Hale B, Carrihill-Knoll KL. "Interaction between age of irradiation and age of testing in the disruption of operant performance using a ground-based model for exposure to cosmic rays." Age (Dordr). 2012 Feb;34(1):121-31. Epub 2011 Mar 22. PubMed PMID: 21424788 ; http://dx.doi.org/10.1007/s11357-011-9226-4 , Feb-2012