Fiscal Year:	FY 2015	**Task Last Updated:**	FY 04/01/2015
PI Name:	Lemere, Cynthia Ph.D.		
Project Title:	Impact of Space Radiation on Cognition, Synapses and Biomarkers in Aging and Alzheimer's Disease		
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) **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:	clemere@bwh.harvard.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	617-954-9697
Organization Name:	Brigham and Women's Hospital/Harvard Medical School		
PI Address 1:	75 Francis Street		
PI Address 2:			
PI Web Page:			
City:	Boston	**State:**	MA
Zip Code:	02115-6110	**Congressional District:**	7
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	2013 Space Radiobiology NNJ13ZSA001N
Start Date:	06/01/2014	**End Date:**	05/31/2018
No. of Post Docs:	1	**No. of PhD Degrees:**	1
No. of PhD Candidates:	0	**No. of Master' Degrees:**	0
No. of Master's Candidates:	0	**No. of Bachelor's Degrees:**	1
No. of Bachelor's Candidates:	0	**Monitoring Center:**	NASA JSC
Contact Monitor:	Simonsen, Lisa	**Contact Phone:**	
Contact Email:	lisa.c.simonsen@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: change in period of performance to 6/1/2014-5/31/2018 (from 4/29/14-4/28/18) per PI and NSSC information (Ed., 3/17/2015)		
Key Personnel Changes/Previous PI:	0		
COI Name (Institution):	O'Banion, Kerry M.D., Ph.D. (University of Rochester)		
Grant/Contract No.:	NNX14AI07G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The goal of our work is to identify early and late effects of space radiation on the connections between nerve cells in the brain (i.e., synapses), inflammation, and cognition so that one can assess the central nervous system (CNS) risk to future astronauts involved in long-duration lunar missions and/or a mission to Mars. These early changes, along with changes in brain inflammation that may relay signals between cells in the brain and blood flow, may help define those individuals at risk for developing long-term learning and memory problems. Our studies will utilize normal, wildtype mice and a genetic mouse model of Alzheimer's disease. Female and male 4 month-old mice will be irradiated once with varying doses of heavy ions or protons and examined 2 or 10 months later. Chronic dosing will be compared with a single dose for long-term effects as well. Mice will undergo positron emission tomography (PET) imaging for brain inflammation and blood flow, and behavioral testing before being sacrificed. We will perform a close-up inspection of synapses, Alzheimer’s amyloid plaques, neuron loss, and inflammation in the brain.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	The goal of our work is to identify early and late effects of space radiation on the connections between nerve cells in the brain (i.e., synapses), inflammation, and cognition so that one can assess the Central Nervous System (CNS) risk to future astronauts involved in long-duration lunar missions and/or a mission to Mars. These early synaptic changes, along with changes in brain inflammation that may relay signals between cells in the brain and blood flow, may help define those individuals at risk for developing long-term learning and memory problems. Our studies will utilize normal wildtype mice and two genetic mouse models of Alzheimer's disease that develop some of the same lesions in the brain and cognitive changes seen in people with Alzheimer’s disease. In our first series of experiments, female and male 4 month-old wildtype and Alzheimer’s mice will be irradiated once at Brookhaven National Laboratories with varying doses of heavy ions or protons and examined 2 or 10 months later. In our second set of experiments, 12 month-old male Alzheimer’s and wildtype mice will be exposed to either a single dose or six doses of smaller amounts of radioactivity over a two week period. For all studies, a subset of mice will undergo MRI (magnetic resonance imaging) to look at the structure of the brain and PET imaging for blood flow and inflammation in the brain immediately prior to transfer to Brookhaven and again after behavioral testing, just before being sacrificed at the end of each study. Changes in synapses, Alzheimer’s amyloid plaques, neuron loss, and inflammation in the brain will be determined in all study mice by pathological and biochemical examination of mouse brain tissues. Our project was funded in June 2014. Since that time, we have completed all of the necessary training, proposals, approvals, and paperwork to begin our first experiment in April 2015. We have bred and aged a large number of mice for our first experiment in April and are in the process of breeding mice for our second experiment, which will take place in October 2015. We have performed baseline MRI imaging on a subset of mice and will begin PET imaging for cerebral blood flow and neuroinflammation for the first experiment next week. Our mice will be shipped to Brookhaven National Laboratory on April 16th and irradiated on April 23rd. The mice will be returned to our facility on April 27th after which time they will rest for a month before undergoing behavioral testing and further imaging studies. We expect to have a large volume of data for the next Task Report due in 2016.
Bibliography Type:	Description: (Last Updated: 11/20/2024)