Fiscal Year:	FY 2013	**Task Last Updated:**	FY 01/23/2013
PI Name:	Limoli, Charles Ph.D.		
Project Title:	Charged Particle Effects on Neuronal Injury, Plasticity and Neurodegeneration		
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:	Irvine	**State:**	CA
Zip Code:	92697-2695	**Congressional District:**	45
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2012 Space Radiobiology NNJ12ZSA001N
Start Date:	01/01/2013	**End Date:**	12/31/2015
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
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	George, Steven (University of California, Irvine) Hughes, Christopher (University of California, Irvine) LaFerla, Frank (Self)		
Grant/Contract No.:	NNX13AD59G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The space radiation environment poses unique hazards to astronauts since a range of potential complications can result from exposure of the CNS to these dangerous radiation fields. Damage caused by the traversal of charged particles in space through the brain is likely to elicit alterations to the structure and function of neurons and perturb the critical interactions between multiple cell types in the CNS. Irradiation also elicits a persistent increase in free radicals or "oxidative stress" that will complicate further the recovery of the CNS after exposure. Thus, we believe that exposure to the charged particles in space will cause acute and chronic alterations to the cell types in the brain that are critical for learning and memory, thereby having an adverse effect on the functionality of the CNS. To address the foregoing problems we will measure the impact of charged particle irradiation on neuronal anatomy and function using cultures of human neurons grown in the presence and absence of additional cell types known to be critical for proper neuronal function. Studies will also be performed in the presence of antioxidants that can minimize damage from reactive species, providing a useful strategy for gauging the importance of radiation-induced oxidative stress. These cell-based studies will be complemented by animal studies in which similar endpoints will be measured in brain tissue isolated from irradiated mice. One animal model genetically modified to express a neuronal fluorescent marker will be used to measure the subtle structural changes to neurons after irradiation. Another animal model genetically modified to exhibit early onset dementia will be used to gauge how exposure to charged particles found in space might impact the onset and/or severity of neurodegenerative phenotypes. Collectively, these studies will provide new data regarding the consequences of charged particle irradiation in the CNS, data that will be useful in estimating the uncertainties and risks associated with space travel.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2013.
Bibliography Type:	Description: (Last Updated: 12/13/2023)