Fiscal Year:	FY 2011	**Task Last Updated:**	FY 03/16/2011
PI Name:	Vlkolinsky, Roman Ph.D.		
Project Title:	Functional decline in mice with Alzheimer's-type neurodegeneration is accelerated by charge-particle radiation		
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:	92350-1700	**Congressional District:**	41
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2010 Space Radiobiology NNJ10ZSA001N
Start Date:	02/01/2011	**End Date:**	01/31/2014
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
Contact Monitor:	Cucinott1a, Francis	**Contact Phone:**	281-483-0968
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Nelson, Gregory (Loma Linda University)		
Grant/Contract No.:	NNX11AE41G		
Performance Goal No.:			
Performance Goal Text:			
Task Description:	An unavoidable complication of space travel is exposure to proton and high-charge, high-energy (HZE) particle radiation. HZE radiation triggers oxidative stress, neuroinflammation and synaptic changes in the CNS that are reminiscent of those seen in aging or Alzheimer's disease (AD). We showed that irradiation with 56Fe particles in young adult mice accelerates the onset of electrophysiological decrements observed as reduced synaptic excitability in the hippocampus. The APP/PSEN1 double transgenic (tg) mouse (commercially available mouse model of AD) exhibits age-related behavioral abnormalities and deficits in synaptic transmission. We propose to expose young adult APP/PSEN1 tg mice to low doses of proton, helium, silicon and iron-particle radiation (brain-only) to quantify their detrimental effects on hippocampal functions. The effects of proton, helium and silicon-particle radiation on neurodegenerative processes in the CNS have not been tested. Moreover, we will compare single and fractionated exposures that may activate compensatory protective mechanisms in the neuronal tissue and significantly modify the		

	pathophysiological process. We will record synaptic transmission in the hippocampus at 3 months (1 month after irradiation) and then at the ages of 6, 9 and 12 months. We will use multielectrode array system (MED64) that allows electrophysiological recordings of excitatory synaptic transmission, neuronal excitability and spontaneous network activity in isolated hippocampal slices in all major neuronal fields simultaneously. These electrophysiological parameters reflect the functional status of the neuronal tissue exposed to radiation and can be extrapolated to the in vivo hippocampus. The functional endpoints will be directly correlated with expression of immunohistochemical markers of neurodegeneration, including amyloid plaque load, synaptic proteins and the presence of neuroinflammatory cytokines.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2011.
Bibliography Type:	Description: (Last Updated: 04/24/2019)