Fiscal Year:	FY 2011	**Task Last Updated:**	FY 02/28/2011
PI Name:	Goukassian, David A M.D., Ph.D.		
Project Title:	Evaluation of Space Radiation-induced Myocardial and BM-derived EPC Damage and Assessment of Associated Long-term Degenerative Cardiovascular Risks		
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) **Cardiovascular**:Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	New York	**State:**	NY
Zip Code:	10029	**Congressional District:**	12
Comments:	NOTE: PI moved to Icahn School of Medicine at Mount Sinai from Temple University in October 2018.		
Project Type:	GROUND	**Solicitation / Funding Source:**	2010 Space Radiobiology NNJ10ZSA001N
Start Date:	01/01/2011	**End Date:**	12/31/2013
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:**	
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):	Yan, Xinhua (Caritas St. Elizabeth's Medical Center Of Boston, Inc.)		
Grant/Contract No.:	NNX11AD22G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The main objectives of our proposal is to determine space radiation-dependent short- and long-term degenerative cardiovascular (CV) risks on the molecular, cellular, and tissue levels in the heart as the primary organ and bone marrow (BM)-derived endothelial progenitor cells (EPC) first, as a primary space radiation target and second, as a possible significant contributor to degenerative CV risks, later on in life. Our central hypothesis is that low-dose space radiation-induced DNA damage repair is inefficient in BM-derived EPC and this may lead to increased mutagenesis with subsequent long-term loss of endothelial function of BM-derived EPCs. This may then pose significant degenerative CV risk on physiologic homeostasis in the aging heart and on the regeneration and neovascularization processes in the heart under pathologic conditions such as acute myocardial infarction (AMI). Comparisons will be made between two types of low-dose radiation - proton versus iron and single versus fractionated exposures. In short-term in vitro studies (minutes, hours, and up to 30 days after exposure) will evaluate in ex-vivo expanded EPCs and cardiomyocytes DNA damage and repair as well as radiation-induced bystander effects (irradiated cells emit signals to "un-hit" cells), angiogenic gene expression in EPCs. In short-term in vivo studies in the heart we will evaluate acute damage (inflammation and cell death), DNA damage, and repair kinetics. In our long-term studies (3, 6, 9, and 12 months after exposure) we will evaluate oxidative stress and antioxidant defense in BM-derived EPCs, alterations in several EPC endothelial functions, number of circulating peripheral blood EPCs, and cardiomyocyte contractility. In the last part of our studies we will assess CV risks as a result of low-dose radiation plus aging and CV risks under pathological condition -- radiation plus aging plus adverse CV event (i.e., AMI). Here we will evaluate post-AMI survival, alterations in cardiac physiology (echocardiography), infarct size, inflammation, cardiac regeneration, neovascularization, and mobilization of EPCs from BM. Our studies will address two high-priority research topics of this specific solicitation and NASA research interests for degenerative risks to the heart -- (1) development of murine models to estimate risks for degenerative heart diseases; (2) determine the progression rates and latency periods for space radiation-related degenerative CV risks as a function of radiation type (proton vs. heavy ion), exposure frequency (single vs. fractionated), age, and age plus adverse CV event.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2011.
Bibliography Type:	Description: (Last Updated: 03/06/2024)