

Fiscal Year:	FY 2023	Task Last Updated:	FY 02/13/2023
PI Name:	Edwards, John Ph.D.		
Project Title:	Countermeasures to Radiation Induced Cardiomyopathy		
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) Cancer :Risk of Radiation Carcinogenesis		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	10595-1554	Congressional District:	17
Comments:			
Project Type:	Ground	Solicitation / Funding Source:	2017-2018 HERO 80JSC017N0001-BPBA Topics in Biological, Physiological, and Behavioral Adaptations to Spaceflight. Appendix C
Start Date:	02/01/2019	End Date:	01/31/2023
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	1
No. of Master's Candidates:	3	No. of Bachelor's Degrees:	0
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
Contact Monitor:	Zawaski, Janice	Contact Phone:	
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Flight Program:			
Flight Assignment:	NOTE: End date changed to 1/31/2023 per NSSC information (Ed., 2/7/22) NOTE: End date changed to 1/31/2022 per NSSC information (Ed., 8/12/21)		
Key Personnel Changes/Previous PI:	2021 report: Research Assistant no longer on the project. December 2020 report: No Changes.		
COI Name (Institution):	Eisenberg, Carol Ph.D. (New York Medical College) Rota, Marcello Ph.D. (New York Medical College)		
Grant/Contract No.:	80NSSC19K0436		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>These projects seek to study the consequences of galactic cosmic radiation (GCR) exposure. Space travel increases solar and cosmic particle radiation exposure, which is significantly elevated once travel moves beyond low Earth orbit. This includes a combination of high-energy protons and heavy ions such as Fe56, Si28, and O16. Low dose radiation induced damage is observed months or years after exposure. Our preliminary findings observed that GCR induced degradation of cardiac function with a phenotype that was similar to that observed following doxorubicin treatment. Although there are significant differences from GCR, survivors of cancer that have undergone low-LET (linear energy transfer) radiotherapy are also at risk for several adverse health outcomes including abnormal pulmonary function, endocrine disorders, neurocognitive impairment, and heart failure. All these organ systems are characterized by a low turnover of cells and it is possible that an accelerated cell death and/or the failure of regeneration by progenitor cells may be the underlying cause of organ failure. Although this project initially focused on protection from cardiomyopathies, our findings have implications across all organ systems.</p> <p>These projects have focused on developing countermeasures to GCR using small molecules from a FDA (Food & Drug Administration) approved library, as well as additional molecules identified by NASA personnel as high priority compounds. These drugs are part of other ongoing investigations and their inclusion will be useful in making comparisons across platforms. With regard to the Map to Human Research, this project primarily addresses two Risks. All are designated as High LxC for longer endurance missions or long-term health and wellbeing.</p> <p>Countermeasures fall into three categories; radio protectors are given prophylactically or concurrently to prevent damage. Radiation therapeutics are those that stimulate repair or regeneration processes. Radionuclide eliminators disincorporate or block absorption of internalized radionuclides. This project will focus on radio protectors and radiation therapeutics with the hope of developing protocols that will diminish the need for radiation therapeutics.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>The focus of this NASA funded research project is to develop countermeasures to cosmic radiation exposure with the goal of protecting flight crews on long duration missions. However, the findings of this project will also benefit those with more Earth-bound problems. We know that airline pilots and flight attendants have a small but significantly higher risk of cancer that is directly attributable to the chronic exposure to cosmic radiation during their careers. Radiation therapy has been used for the treatment of cancer for many years, and it has long been known that these survivors are at risk for other illnesses related to their treatment. Proton Therapy is an increasingly popular radiation protocol for cancer treatments. This protocol generates similar types of radiation and energy levels that are part of the solar radiation spectrum. And unfortunately, we live in an age when terrorists might eventually gain access to weapons that will generate very high radiation exposures. Hopefully this won't happen but the lessons learned from the present investigation will have overlap to the nuclear countermeasures that others are studying. The results from the current project will hopefully contribute to the knowledge base that other fields will find useful.</p>
Task Progress:	Ed. Note: Project has closed. Per NASA Johnson Space Center (JSC) no final performance report or data deliverables forthcoming (Ed., 2/13/23)
Bibliography Type:	Description: (Last Updated: 07/05/2023)
Articles in Peer-reviewed Journals	<p>Weiss M, Nikisher B, Haran H, Tefft K, Adams J, Edwards JG. "High throughput screen of small molecules as potential countermeasures to galactic cosmic radiation induced cellular dysfunction." Life Sci Space Res. 2022 Nov 1;35:76-87. https://doi.org/10.1016/j.lssr.2022.06.006 ; PMID: 36336373 , Nov-2022</p>