Task Book Report Generated on: 04/25/2024

P. Name: Boennu, Marjan Ph.D. Gamus-Tocorizola na Countermeasure against High-Encey Furtice-Induced Carcinogenesis, Cardiovascular Disease, and Central Nervous System Effects	Fiscal Year:	FY 2019	Task Last Updated:	FY 03/29/2019
Project Title: Cardiovascular Disease, and Countermousure against High-Energy Changed Particle-Induced Carcinogenesis, Cardiovascular Disease, and Central Nervow System Effects Program/Discipline: Program/	PI Name:	Boerma, Marian Ph.D.	,	
Program/Discipline:		Gamma-Tocotrienol as a Countermeasure against High-Energy Charged Particle-Induced Carcinogenesis,		
Program/Discipline- Element/Subdiscipline- Element/Subdiscipline- Element/Subdiscipline- Ilement/Subdiscipline- Ilement	Division Name:	Human Research		
Femerics Suddictipline: TechPort: No No No No No No No N	Program/Discipline:			
Human Research Program Elements ClyRC Space Radiation Human Research Program Risks: None Space Biology Element: None Space Biology Cross-Element None Space Biology Special Category: None Fax: FY Pl Organization Type: UNIVERSITY Phone: 501-686-6599 Organization Name: University of Arkansas, Little Rock Pl Address 1: 4301 W. Markham Stroet, Slot 522-10 Pl Address 2: Slot 522-10 Pl Address 2: Slot 522-10 Pl Web Page: Little Rock State: AR Align Comments: 2 Comments: 2 Comments: 2 Comments: 2 Comments: 2 Comments: 2 Comments: 301/2019 Solicitation Funding Physiological, and Physiological,				
Human Research Program Risks: None Space Biology Cross-Element Space Biology Special Category: None PI Email: mboerma@uamx.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 501-686-6599 Organization Type: UNIVERSITY Phone: 501-686-6599 Organization Name: University of Arkansas, Little Rock PI Address 1: 4301 W. Markham Street, Slot 522-10 PI Address 2: 81 of 522-10 PI Web Page: City: Little Rock State: AR Zip Code: 72205-7101 Congressional District: 2 Comments: Project Type: GROUND Solicitation / Funding Physiological, Physiological, and Source: Behavioral Adaptations to Spaceflight. Appendix Physiological, Mapendix Source: Behavioral Adaptations to Spaceflight. Appendix One of Post Does: No. of PhD Degrees: No. of Post Does: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Bachelor's Candidates: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degrees: No. of Master' Degree	Joint Agency Name:		TechPort:	No
Space Biology Element: None Space Biology Cross-Element Disciplines: None Space Biology Special Category: None PI Email: mboorma@nums.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 501-686-6599 Organization Name: University of Arkansas, Little Rock Propertion of Properties of Propert Type: Solicitation / Funding Topics in Biological, Physiological, and Source: Behavioral Adaptations to Spaceflight. Applications of Properties o	Human Research Program Elements:	(1) SR:Space Radiation		
Space Biology Cross-Element Discipline: Space Biology Special Category: None PI Email: mboerma@nums.edu PI Caganization Type: UNIVERSITY Phone: Soli-686-6599 Organization Name: University of Arkansas, Little Rock PI Address 1: 4301 W. Markham Street, Slot 522-10 PI Address 2: Slot 522-10 PI Web Page: City: Little Rock State: AR Zip Code: Comments: Comments: GROUND Solicitation / Funding Source: Bard Adaptations to Spaceflight. Appendix C Source: Bard Adaptations to Spaceflight. Appendix C Start Date: 01/31/2019 Bard Date: No. of Phot Degrees: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Bachelor's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees:	Human Research Program Risks:	None		
Discipline: None	Space Biology Element:	None		
Pl Email: mboerma@uams.edu		None		
Pl Organization Type: UNIVERSITY Phone: 501-686-6599 Organization Name: University of Arkansas, Little Rock Pl Address 1: 4301 W. Markham Street, Slot 522-10 Pl Address 2: Slot 522-10 Pl Web Page: City: Little Rock State: AR Zip Code: 72205-7101 Congressional District: 2 Comments: Project Type: GROUND Solicitation / Funding Topics in Biological, Physiological, and Source: Behavioral Adaptations to Spaceflight. Appendix C Start Date: 01/31/2019 End Date: 01/30/2021 No. of Post Does: No. of PhD Candidates: No. of Master' Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Bachelor's Candidates: No. of Bachelor's Degrees: No. of Bachelor's Candidates: No. of Master's Degrees: No. of Bachelor's Candidates: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Bachelor's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Degrees: No. of Master's Candidates: No. of Master's Degrees:	Space Biology Special Category:	None		
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Contact Email: lisa.c.simonsen@nasa.gov Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Landes, Reid Ph.D. (University of Arkansas, Little Rock) Weil, Michael Ph.D. (Colorado State University) Pathak, Rupak Ph.D. (University of Arkansas, Little Rock) Grant/Contract No.: 80NSSC19K0437 Performance Goal No.:	No. of Bachelor's Candidates:		Monitoring Center:	NASA JSC
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Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Landes, Reid Ph.D. (University of Arkansas, Little Rock) Weil, Michael Ph.D. (Colorado State University) Pathak, Rupak Ph.D. (University of Arkansas, Little Rock) Grant/Contract No.: 80NSSC19K0437 Performance Goal No.:	Contact Email:	lisa.c.simonsen@nasa.gov		
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Task Description:

Recent evidence shows that radiation encountered during deep space travel is associated with increased risks of cancer, cardiovascular disease, and adverse effects in the central nervous system. Administration of a dietary radiation countermeasure before and/or during the mission is an attractive option to reduce the risk of carcinogenesis and degenerative effects in the heart and brain. Gamma-tocotrienol is one of the strongest radiation protectors of all natural compounds tested so far. It is safe, non-toxic and well tolerated, exhibits no interactions with other medications and requires no special storage conditions. It has anti-oxidant and anti-inflammatory properties and protects against endothelial dysfunction. Moreover, studies with tocotrienol administration in human subjects and animal models have shown cancer prevention and protection against brain white matter lesions. In our preliminary studies, gamma-tocotrienol reduced radiation-induced genomic instability, as detected by studying chromosomal aberrations, in human endothelial cells and in bone marrow cells of gamma-ray exposed mice. Moreover, gamma-tocotrienol reduced changes in behavior and cardiac function in a mouse model of exposure to high-energy oxygen ions. Altogether, based on its safety profile, biological properties, and our preliminary results, gamma-tocotrienol has high potential as radiation countermeasure during space travel. Here, we aim to use a mouse model of exposure to modeled galactic cosmic rays to test whether gamma-tocotrienol protects against 1) carcinogenesis, 2) changes in behavior, dendritic morphology, and synaptic plasticity, and 3) changes in cardiac and vascular function and structure. Carcinogenesis will be assessed in genetically modified mice that show a low spontaneous cancer rate but increased tumor incidence in response to low-dose radiation. Degenerative tissue effects will be assessed in wild-type mice. Male and female adult mice will be exposed to mixed charged particle beams or gamma-rays as a reference radiation, in five once-a-day fractions at the NASA Space Radiation Laboratory. Twenty-four hours before each radiation exposure, mice will receive an oral dose of gamma-tocotrienol. Mice will be followed for 18 months after irradiation and inspected daily for tumor formation. Bone marrow cells will be collected to assess the effects of gamma-tocotrienol on genomic instability by cytogenetic analysis. Additional cohorts of mice will be used to assess cognitive and cardiovascular function. At 12 months after irradiation, mice in these subcohorts will be sacrificed to collect blood samples, and brain and heart tissue for histological analysis. These studies will advance the countermeasure readiness level of gamma-tocotrienol against risks of both carcinogenesis and degenerative tissue effects of space radiation.

Rationale for HRP Directed Research:

Research Impact/Earth Benefits:

Task Progress:

New project for FY2019.

Bibliography Type:

Description: (Last Updated: 09/01/2023)