

Fiscal Year:	FY 2019	Task Last Updated:	FY 10/22/2019
PI Name:	Wang, Zheng Ph.D.		
Project Title:	Investigating the Roles of Melanin and DNA Repair on Adaptation and Survivability of Fungi in Deep Space		
Division Name:	Space Biology		
Program/Discipline:			
Program/Discipline-- Element/Subdiscipline:			
Joint Agency Name:		TechPort:	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	(1) Cell & Molecular Biology (2) Microbiology		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	20375-0001	Congressional District:	1
Comments:			
Project Type:	FLIGHT	Solicitation / Funding Source:	2018 Space Biology (ROSBio) NNH18ZTT001N-Artemis1 (EM1). App A: Orion (Artemis-1) (formerly Exploration Mission-1)
Start Date:	07/15/2019	End Date:	07/15/2022
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 KSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Schultzhause, Zachary Ph.D. (National Research Council)		
Grant/Contract No.:	NNK19OB09A IAA		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Spaceflight to regions beyond low Earth orbit involves exposure to unique environmental hazards, most notably radiation. Humans traveling to these regions will be exposed to radiation from cosmic rays, which will cause DNA damage and oxidative stress. The extent of this damage, however, is unknown, and more basic research into the genetic effects of combined cosmic ray and microgravity exposure is needed. We propose to study these effects using a type of organism that is almost certain to inadvertently accompany astronauts on all of their flights – fungi. Fungi are remarkably stress-resistant and have been isolated several times from spacecraft. The objective of this proposal is to use the well-studied mold <i>Aspergillus nidulans</i> to test two mechanisms for space adaptation – DNA repair and the production of melanin. Mutants of this organism that cannot make melanin or are defective in a type of DNA repair associated with recovering from radiation will be used. When the samples return, the spores that these strains produce will be tested for their survival, and their protein and DNA will be analyzed to find molecular signatures of adaptation to deep space. The data we collect will tell us several things: whether melanin protects from the stresses faced during spaceflight, the types of DNA damage that occur in space, and what changes occur in fungi when they are adapted to prolonged spaceflight. The results will determine characteristics of the fungi that astronauts may have to control on future missions, including pathogenic species. Because fungi share many proteins with humans, the data collected on the proteins involved in adaptation can be applicable to astronaut health. Finally, determining whether melanin assists with survival in space will provide more evidence for it to be used as a protective material for several future NASA applications.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2019.
Bibliography Type:	Description: (Last Updated: 06/06/2023)