Fiscal Year:	FY 2023	**Task Last Updated:**	FY 02/16/2023
PI Name:	Laiakis, Evagelia Ph.D.		
Project Title:	Alterations in Energy Metabolism Pathways in Skeletal Muscle in Relation to Microgravity Analog and Space Radiation		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2020 HERO 80JSC020N0001-FLAGSHIP, OMNIBUS1 Human Research Program: Crew Health Appendix A; Omnibus1-Appendix B
Start Date:	01/09/2023	**End Date:**	01/08/2024
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No. of Bachelor's Candidates:		**Monitoring Center:**	NASA JSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Beheshti, Afshin Ph.D. (NASA Ames Research Center)		
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Task Description:	Muscle atrophy is a well documented response to microgravity (μG) during short-term missions within low-Earth orbit (LEO). Recent studies have identified that low dose, charged-particle radiation characteristic of galactic cosmic rays (GCR) and high dose solar particle events (SPE) outside LEO damage skeletal muscles. This damage may deplete the energetic metabolic capacity of the tissue and impair astronaut performance. Thus, due to the combined challenges of μG and space radiation, countermeasures for muscle atrophy on long-duration missions outside LEO, other than daily exercise, need to be developed to preserve muscle mass and function. In collaboration with Jeffrey Willey, Ph.D., we analyzed muscle tissues (gastrocnemius, quadricep) from mice flown to the International Space Station, and identified significant perturbations in the tricarboxylic acid (TCA) cycle and fatty acid beta-oxidation intermediates, among others. Importantly, pantothenic acid (Vitamin B5) exhibited significantly decreased levels – affecting multiple energy related metabolic pathways, as it serves as the precursor for coenzyme CoA, an important mediator for mitochondrial related metabolism. Radiation exposure can also lead to perturbations in energy metabolism that could be additive or synergistic with μG. We hypothesize that the space environment with ground based analogs (simulated μG via hindlimb unloading/HU and simulated space radiation) will lead to exacerbated alterations in intramuscular energy metabolism in mice, such as in the TCA cycle, fatty acid beta-oxidation, and cofactors, among others.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2023.
Bibliography Type:	Description: (Last Updated:)