

Fiscal Year:	FY 2019	Task Last Updated:	FY 04/02/2019
PI Name:	Romaniello, Stephen Ph.D.		
Project Title:	Evaluating Resistive Exercise as a Long-term Countermeasure for Spaceflight-induced Bone Loss Using Calcium Isotopes		
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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Zip Code:	85287-1404	Congressional District:	9
Comments:			
Project Type:	FLIGHT	Solicitation / Funding Source:	2017-2018 HERO 80JSC017N0001-BPBA Topics in Biological, Physiological, and Behavioral Adaptations to Spaceflight. Appendix C
Start Date:	03/28/2019	End Date:	06/12/2020
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
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Flight Program:	ISS		
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Anbar, Ariel Ph.D. (Arizona State University) Smith, Scott Ph.D. (NASA Johnson Space Center) Zwart, Sara Ph.D. (University Of Texas, Galveston)		
Grant/Contract No.:	80NSSC19K0519		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>We have previously demonstrated that variations in naturally-occurring stable isotopes of calcium (Ca) in blood and urine can be used to monitor changes in net bone mineral balance (BMB) during bed rest and spaceflight, including crewmembers using resistive exercise and pharmaceutical interventions to prevent bone loss aboard the International Space Station (ISS). Here, we propose to build on our established dataset of Ca isotope variations and BMB in ISS crewmembers to include future crewmembers participating in the One-Year Mission Project. This proposal builds on a successful existing collaboration between researchers at Arizona State University (ASU) and Johnson Space Center (JSC) to study and apply the Ca isotope method as a bone biomarker.</p> <p>The data to be obtained in the proposed project will characterize the trajectory of changes in crewmember BMB resulting from 2-12 months of spaceflight aboard the ISS and will provide a basis for extrapolation of expected changes in BMB and whole-body bone mineral content during missions extending 2-3 years in duration. Existing data from 6-month ISS missions suggest that crewmembers using the Advanced Resistive Exercise Device (ARED) experience rapid net bone loss during the first 60 days of flight, but that the rate of bone loss slows during flight days 60-180. If this trend continues, little additional cumulative bone loss might be expected during extended missions, consistent with the principle of non-inferiority. Ca isotopes are uniquely suited to answer this question, since they are the only technique currently capable of providing a time series of quantitative estimates of net BMB from samples returned from a single spaceflight mission.</p> <p>Our proposal falls under the "Musculoskeletal system" and "Food and nutrition" Human Research Program (HRP) research emphases, and specifically addresses Integrated Research Plan (IRP) Gap N7.1: "We need to identify the most important nutritional factors for musculoskeletal health," which states that "calcium isotope studies will help develop analytical tools to quantitate net calcium balance changes during and after flight."</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2019.
Bibliography Type:	Description: (Last Updated:)