Fiscal Year:	FY 2014	**Task Last Updated:**	FY 12/26/2013
PI Name:	Anbar, Ariel Ph.D.		
Project Title:	Stable Calcium Isotopes in Urine as a Biomarker of Bone Mineral Balance in Spaceflight		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Bone Fracture**:Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (2) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	UNIVERSITY	**Phone:**	480-965-0767
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City:	Tempe	**State:**	AZ
Zip Code:	85287	**Congressional District:**	9
Comments:			
Project Type:	FLIGHT	**Solicitation / Funding Source:**	2012 Crew Health NNJ12ZSA002N
Start Date:	12/01/2013	**End Date:**	11/30/2016
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
Contact Monitor:	Gilbert, Charlene	**Contact Phone:**	
Contact Email:	charlene.e.gilbert@nasa.gov		
Flight Program:	ISS		
Flight Assignment:	NOTE: End date changed to 11/30/2016 (original end date was 11/30/2015) per PI and NSSC information (Ed., 12/14/15)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Gordon, Gwyneth (Arizona State University) Skulan, Joseph (Arizona State University)		
Grant/Contract No.:	NNX14AB78G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Long duration human spaceflight leads to loss of bone mass. As a consequence, there is a need for techniques to sensitively detect changes in the net rate of bone formation or resorption (i.e., changes in "bone mineral balance") and to assess the effectiveness of countermeasures. We have documented, in bed rest experiments, that measurements of the Ca isotope composition of urine using mass spectrometry can be used to monitor rapid changes in net bone mineral balance that are not directly observable by other means (1, 2). We propose to extend these experiments to the International Space Station (ISS), in order to demonstrate the utility of Ca isotopes as a tool for monitoring bone mineral balance and countermeasures to bone resorption in space. 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 (2, 3). The proposed project paves the way for future development of capability to measure Ca isotopes in-flight, to monitor bone health during exploration-class space missions where in situ evaluation of countermeasure effectiveness will be required to assure crew health and safety. The project will also have broad clinical application for Earth-based populations. Our proposal falls under the Spaceflight Biochemical Profile Human Research Program (HRP) research emphasis, and addresses Integrated Research Plan (IRP) Gap N3: How do nutritional status/nutrition requirements change during spaceflight? References: (1). Morgan JL, Skulan JL, Gordon GW, Romaniello SJ, Smith SM, Anbar AD (2012). Rapidly assessing changes in bone mineral balance using natural stable calcium isotopes. Proc. Natl. Acad. Sci. USA 109, 9989-9994; (2). Skulan J, Bullen T, Anbar AD, Puzas JE, Shackelford L, LeBlanc A, Smith SM (2007). Natural calcium isotopic composition of urine as a marker of bone mineral balance. Clin. Chem. 53,1155-1158; (3). Morgan JLL, Skulan JL, Gordon GW, Romaniello SJ, Smith SM, Anbar AD (2011). High-precision measurement of variations in calcium isotope ratios in urine by multiple collector inductively coupled plasma mass spectrometry. Anal. Chem. 83, 6956–6962.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2014.
Bibliography Type:	Description: (Last Updated: 10/09/2019)