Fiscal Year:	FY 2013	**Task Last Updated:**	FY 09/06/2012
PI Name:	Smith, Scott M Ph.D.		
Project Title:	Nutritional Status Assessment: SMO 016		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Immune**:Risk of Adverse Health Event Due to Altered Immune Response (IRP Rev F) (2) **Nutrition**:Risk of Inadequate Nutrition (3) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight (No longer used, July 2020)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	NASA CENTER	**Phone:**	281-483-7204
Organization Name:	NASA Johnson Space Center		
PI Address 1:	Biomedical Research and Environmental Sciences Division/SK3		
PI Address 2:	2101 NASA Pkwy		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77058-3607	**Congressional District:**	36
Comments:			
Project Type:	FLIGHT	**Solicitation / Funding Source:**	Directed Research
Start Date:	10/01/2005	**End Date:**	05/30/2014
No. of Post Docs:	0	**No. of PhD Degrees:**	0
No. of PhD Candidates:	0	**No. of Master' Degrees:**	0
No. of Master's Candidates:	0	**No. of Bachelor's Degrees:**	0
No. of Bachelor's Candidates:	0	**Monitoring Center:**	NASA JSC
Contact Monitor:	Baumann, David	**Contact Phone:**	
Contact Email:	david.k.baumann@nasa.gov		
Flight Program:	Shuttle/ISS		
Flight Assignment:	ISS NOTE: End date is 5/30/2014 per HRP Master Task List dtd 7/12/2011 (Ed., 8/9/2011)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Zwart, Sara (USRA) Heer, Martina (University of Bonn) Coburn, Stephen (Indiana University, Purdue University Fort Wayne)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	SMO 016. These studies are designed to provide information about the changes in nutritional status and calcium and bone metabolism during and after space flight. It is well known that the status of some vitamins (i.e., folate, vitamin K, vitamin D) is decreased after long-duration space flight. Never before have we been able to investigate most of these changes during flight. In-flight data will assist in the interpretation of post-flight data, and it will help to assess countermeasure efficiency during flight. The investigators will measure blood levels of vitamins, minerals, oxidative damage markers, markers of iron and calcium metabolism, bone- and calcium-regulating hormones, markers of cardiovascular risk (associated with nutritional status), stress hormones, and urinary markers of bone turnover. These will provide a complete profile of nutritional status and bone and calcium metabolism, and will be important for understanding the effects of the countermeasures under consideration as well as the mechanisms of alterations that occur during space flight. Data will be collected before, during and after flight. The main potential benefit of this research is obtaining more information about the bone loss and changes in nutritional status that occur during space flight, and knowledge of how effective bone-loss countermeasures are for extended duration space flight. The information gained here will also be important for developing new treatments for metabolic disorders in the general population. See also http://www.nasa.gov/
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Nutritional status is clearly altered after long-duration space flight. As indicated above, several nutrients demonstrate decreased status (despite adequate intake in some cases) after long-duration space flight. It is imperative that we determine the mechanism and kinetics of these changes if we are going to send crew members on exploration-class missions. The inclusion of in-flight blood/urine collections and expansion to include more parameters to better monitor nutritional status is required to better understand the role of nutrition in bone health, changes in body composition, oxidative damage, and defining nutritional requirements. Maintaining and monitoring nutritional status are important for ensuring crew health during space flight, and will be critical as we begin to embark on the longer duration exploration missions in the future. Understanding the interrelationship between nutritional status and other physiological systems inflight may also help to better understand human health for those on Earth. Several findings have arisen from this study, and resulted in publications. These contribute to the understanding of the role of nutrition in health and disease in all populations, including and well beyond astronauts.
Task Progress:	Sample collections and data analysis continue to go well. Awaiting SpaceX sample returns for next set of sample analyses and data updates. Several publications have already been completed from this study.
Bibliography Type:	Description: (Last Updated: 03/19/2022)
Articles in Peer-reviewed Journals	Smith SM, Heer MA, Shackelford LC, Sibonga JD, Ploutz-Snyder L, Zwart SR. "Benefits for bone from resistance exercise and nutrition in long-duration spaceflight: Evidence from biochemistry and densitometry." J Bone Miner Res. 2012 Sep;27(9):1896-906. http://dx.doi.org/ ; PubMed PMID: 22549960 , Sep-2012
Articles in Peer-reviewed Journals	Zwart SR, Gibson CR, Mader TH, Ericson K, Ploutz-Snyder R, Heer M, Smith SM. "Vision changes after spaceflight are related to alterations in folate- and vitamin B12-dependent one-carbon metabolism." J Nutr. 2012 Mar;142(3):427-31. Epub 2012 Feb 1. PubMed PMID: 22298570 , Mar-2012
Articles in Peer-reviewed Journals	Smith SM, Heer M, Wang Z, Huntoon CL, Zwart SR. "Long-duration space flight and bed rest effects on testosterone and other steroids." J Clin Endocrinol Metab. 2012 Jan;97(1):270-8. Epub 2011 Nov 2. PubMed PMID: 22049169 , Jan-2012
Journal/Magazine covers	Smith SM, Heer MA, Shackelford LC, Sibonga JD, Ploutz-Snyder L, Zwart SR. "Cover in Journal of Bone and Mineral Research for article, 'Benefits for bone from resistance exercise and nutrition in long-duration spaceflight: Evidence from biochemistry and densitometry.' " J Bone Miner Res. 2012 Sep;27(9):1896-906. http://dx.doi.org/ , Sep-2012