Fiscal Year:	FY 2011	**Task Last Updated:**	FY 10/06/2010
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) **Bone Fracture**:Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (2) **Food and Nutrition**:Risk of Performance Decrement and Crew Illness Due to Inadequate Food and Nutrition (3) **Immune**:Risk of Adverse Health Event Due to Altered Immune Response (4) **Nutrition**:Risk of Inadequate Nutrition (5) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight (6) **Renal Stone**:Risk of Renal Stone Formation		
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:	Goodwin, Thomas	**Contact Phone:**	
Contact Email:	thomas.j.goodwin@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) Booth, Sarah (Tufts University)		
Grant/Contract No.:			
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.		
Task Progress:	Sample and data collection continue, with 15 of 24 subjects having completed all collection sessions, and with flight samples returned to Earth. One manuscript was published, highlighting the relationship between fish intake during flight and bone loss. A second manuscript is in revision, documenting effects of spaceflight on vitamin K status. Preliminary data were presented at the 2010 HRP Investigator Workshop in February 2010, and were also reviewed with Human Health and Countermeasures Element Scientist and other Scientific Discipline Leads in May 2010.		
Bibliography Type:	Description: (Last Updated: 05/24/2023)		
Abstracts for Journals and Proceedings	Smith SM, Pierson DL, Mehta SK, Zwart SR. "Intake of fish and omega-3 (n-3) fatty acids: effect on bone during actual and simulated weightlessness." Experimental Biology 2010, Anaheim, CA, April 24-28, 2010. FASEB J. 2010 Apr;24:323.2. http://www.fasebj.org/cgi/content/meeting_abstract/24/1_MeetingAbstracts/323.2?maxtoshow=&hits=10&RESULTFORMAT=&fulltext=zwart&andorexactfulltext=and&searchid=1&FIRSTINDEX=0&sortspec=relevance&volume=24&resourcetype=HWCIT , Apr-2010		
Articles in Peer-reviewed Journals	Zwart SR, Pierson D, Mehta S, Gonda S, Smith SM. "Capacity of omega-3 fatty acids or eicosapentaenoic acid to counteract weightlessness-induced bone loss by inhibiting NF-kappaB activation: From cells to bed rest to astronauts." J Bone Miner Res. 2010 May;25(5):1049-57. PMID: 19874203 , May-2010		
Articles in Peer-reviewed Journals	Mathew G, Zwart SR, Smith SM. "Stability of blood analytes after storage in BD SST tubes for 12 months." Clin Biochem. 2009 Nov;42(16-17):1732-4. Epub 2009 Jul 23. PMID: 19631634 , Nov-2009		
Articles in Peer-reviewed Journals	Zwart SR, Booth SL, Peterson JW, Wang Z, Smith SM. "Vitamin K status in spaceflight and ground-based models of spaceflight." J Bone Miner Res (in revision), September 2010. , Sep-2010		
Books/Book Chapters	Smith SM, Zwart SR, Kloeris V, Heer MA, eds. "Nutritional Biochemistry of Space Flight." New York : Nova Science Publishers, Inc., c2009. (ISBN 978-1-60741-641-8), Sep-2009		
Books/Book Chapters	Agureev AN, Kloeris V, Zwart SR, Smith SM. "Food and nutrition issues for spaceflight." in "U.S. and Russian Cooperation in Space Biology and Medicine: Space Biology and Medicine, Volume 5." Ed. A.E. Nicogossian et al. Washington, DC : American Institute of Aeronautics and Astronautics, 2009. Chapter 5 (Section 6), p. 313-324., Dec-2009		