Fiscal Year:	FY 2010	**Task Last Updated:**	FY 12/20/2010
PI Name:	Smith, Scott M Ph.D.		
Project Title:	Characterization of Oxidative Damage During a Saturation Dive		
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:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	scott.m.smith@nasa.gov	**Fax:**	FY 281-483-2888
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:	GROUND	**Solicitation / Funding Source:**	Directed Research
Start Date:	10/01/2008	**End Date:**	09/30/2010
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:	Goodwin, Thomas	**Contact Phone:**	
Contact Email:	thomas.j.goodwin@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: End date changed back to 9/30/2010 per discussions with PI (Ed., 2/8/2012) NOTE: Change in end date to 5/20/2011 per HRP Master Task List information dtd 11/11/11 (Ed., 1/30/2012)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Zwart, Sara (USRA/NASA Johnson Space Center) Jessup, J. Milburn (NIH/National Cancer Institute/Cancer Diagnosis Program)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	It is well understood that living in an environment with an increased partial pressure of oxygen will result in oxidative damage to the body – this is supported by our published data from NEEMO (NASA Extreme Environment Mission Operations) V, XII, and XIII saturation dive missions. Similar types of oxidative damage are evident after long-duration space flight. In this study, we propose to expand the number of markers of oxidative damage measured in the earlier NEEMO missions to better characterize observed effects, and to also include biomarkers suggested by the National Cancer Institute and other members of the NIH at a joint NCI/NASA workshop on oxidative damage assessment. Additionally, markers of folate status and metabolism will be evaluated because they were affected in earlier NEEMO and ISS crewmembers, possibly through a mechanism that relates to oxidative insult. Measurements will also include markers used to determine whether the increase in body iron storage during NEEMO missions is due to destruction of red blood cells, which would be a mechanism similar to what happens during space flight. On the basis of numerous studies of subjects at different altitudes, we expect that neocytolysis occurs upon exposure to the increase in pressure; however, this has not been measured directly in the NEEMO model.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Better characterization of oxidative damage along with iron and folate metabolism will have significant effects on our understanding of the human adaptation to microgravity. This will not only help drive changes to the defined nutritional requirements for spaceflight, but will also provide a better understanding of human physiology in altered environments, which enhances scientific and medical knowledge, with potential impact across the population.
Task Progress:	The NEEMO mission was conducted in May 2010, with final post-dive sample collections in August. Sample analysis has been completed, and data analysis, interpretation, and manuscript preparation are underway. The decrease in folate status during the dive suggests that folate requirements may be higher in oxidative environments such as NEEMO. Further studies need to be conducted to determine whether folate supplementation can prevent the decrease in status. This study shows that many of the abnormal markers of oxidative damage are already normalized by the end of the dive. Some markers, however, remained changed from baseline after 13 days of diving. NEEMO provides an excellent model to study iron metabolism and resulting changes in oxidative damage. Longer duration NEEMO missions need to be done in order to know if these markers of oxidative damage eventually normalize
Bibliography Type:	Description: (Last Updated: 05/24/2023)
Articles in Peer-reviewed Journals	Zwart SR, Jessup JM, Jiuping J, Smith SM. "Saturation diving alters folate status and biomarkers of DNA damange and repair." PLoS One. 2012 Feb;7(2):e31058. http://dx.doi.org/10.1371/journal.pone.0031058 , Feb-2012