Fiscal Year:	FY 2013	**Task Last Updated:**	FY 12/17/2012
PI Name:	Smith, Scott M Ph.D.		
Project Title:	Risk of visual impairment and intracranial hypertension after space flight: Evaluation of the role of polymorphism of enzymes involved in one-carbon metabolism		
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) **SANS**:Risk of Spaceflight Associated Neuro-ocular Syndrome (SANS)		
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		
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City:	Houston	**State:**	TX
Zip Code:	77058-3607	**Congressional District:**	36
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	Directed Research
Start Date:	03/15/2012	**End Date:**	01/31/2014
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:	Norsk, Peter	**Contact Phone:**	
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Flight Program:			
Flight Assignment:	NOTE: End date changed to 1/31/2014 per 6/27/13 HRP MTL information (Ed., 10/21/13)		
Key Personnel Changes/Previous PI:	None		
COI Name (Institution):	Zwart, Sara (USRA/NASA Johnson Space Center) Gregory, Jesse (University of Florida)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The occurrence of long-term or permanent changes in vision of International Space Station crew members during and after flight has been described as “the most significant clinical issue to date” for the U.S. space program. NASA has conducted 2 workshops in which the clinical issues were characterized as the presence of choroidal folds and occurrence of papilledema, significantly elevated opening pressures after lumbar puncture, and MRI visualization showing optic nerve swelling. A primary forward focus has been evaluation of intracranial hypertension and fluid shifts. In evaluating data collected from the Nutritional Status Assessment Supplemental Medical Objective (SMO), we have identified elevations in 4 metabolites of the one-carbon metabolism pathway in affected crew members studied to date. These elevations and related data strongly suggest that polymorphism(s) of one or more of the enzymes in this pathway exist(s) in the affected crew members. The incidence of such polymorphisms in the general population is relatively high, and they have been associated on Earth with increased risk of stroke and other cardiovascular, and specifically cerebrovascular, events. Therefore it is within the realm of plausibility, given the number and ethnic background of the affected astronauts, that these polymorphisms could be causing the cerebrovascular and optical medical issues in astronauts. This evidence demands follow-up to more clearly define this relationship. The proposed study will accomplish this. We expect that, at a minimum, the results of the proposed effort will provide a guiding path for other research to be conducted that would allow this problem to be defined and resolved.
Rationale for HRP Directed Research:	This research is directed because it contains highly constrained research, which requires focused and constrained data gathering and analysis that is more appropriately obtained through a non-competitive proposal.
Research Impact/Earth Benefits:	We expect to find evidence of a relationship between polymorphism incidence, biochemical analytes, and vision and optic examination results in affected crew members. These results will guide the path for further research to define a clinical treatment plan for individuals developing symptoms during flight. The results of this effort may also have significant Earth-based applications, and may inform the understanding and treatment of idiopathic intracranial hypertension, migraine headaches, and other cerebrovascular issues.
Task Progress:	Project approval was granted on March 15, 2012. IRB approval obtained on April 19. Initial crew briefings and data collections started on April 30, 2012. There were some delays with several facets of study implementation, including: establishing protocols for contacting crewmembers, obtaining ESA and JAXA Medical Board approvals (received in September, 2012), and then in gaining IRB and ESA Medical Board approval for use of a multilateral consent form (as opposed to the NASA consent form, ongoing as of this writing). Nonetheless, recruiting has been ongoing and will continue through the project period. Samples are being analyzed in batches, and thus no data are available yet.
Bibliography Type:	Description: (Last Updated: 05/15/2025)
Books/Book Chapters	Zwart SR, Gibson CR, Smith SM. "Space flight opthalmic changes, diet, and vitamin metabolism." in "Handbook of Nutrition, Diet, and the Eye." Ed. V.R. Preedy. Waltham, MA : Academic Press, In press, as of December 2012., Dec-2012