

Fiscal Year:	FY 2017	Task Last Updated: FY 08/01/2017	
PI Name:	Parsons-Wingerter, Patricia Ph.D.		
Project Title:	Mapping by VESGEN of Blood Vessels in the Human Retina Undergoing Bed Rest for Improved Understanding of Visual Impairments and Increased Intracranial Pressure		
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		
PI Email:	patricia.a.parsons-wingerter@nasa.gov	Fax:	FY
PI Organization Type:	NASA CENTER	Phone:	(650) 604-1729
Organization Name:	NASA Ames Research Center		
PI Address 1:	Space Biosciences Research Branch (SCR)		
PI Address 2:	Mailstop N236-7		
PI Web Page:			
City:	Moffet Field	State:	CA
Zip Code:	94035-1000	Congressional District:	18
Comments:	NOTE: Formerly at NASA Glenn Research Center until summer 2014		
Project Type:	FLIGHT,GROUND	Solicitation / Funding Source:	2012 Crew Health NNJ12ZSA002N
Start Date:	10/01/2013	End Date:	06/30/2018
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master' Degrees:	2
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	2
No. of Bachelor's Candidates:	4	Monitoring Center:	NASA JSC
Contact Monitor:	Allcorn, Aaron	Contact Phone:	281.244.8402
Contact Email:	aaron.i.allcorn@nasa.gov		
Flight Program:	Pre/Post Flight		
Flight Assignment:	<p>NOTE: End date changed to 6/30/2018 per discussion with PI (Ed., 3/26/18)</p> <p>NOTE: End date changed to 10/01/2017 per A. Allcorn/JSC and PI (Ed., 7/31/17)</p> <p>NOTE: End date changed to 4/08/2017 per PI (Ed., 1/30/17)</p> <p>NOTE: End date changed to 1/08/2017 (originally 9/30/2014 and subsequently 9/22/2015 and 10/1/2016 and 4/8/2017, which is actually supposed to be due date for final reporting), per PI (Ed., 5/17/16)</p> <p>NOTE: End date changed to 4/08/2017 (originally 9/30/2014 and subsequently 9/22/2015 and 10/1/2016), per PI (Ed., 10/20/15)</p> <p>NOTE: End date changed to 10/01/2016 (originally 9/30/2014 and subsequently 9/22/2015), per PI (Ed., 10/20/15)</p> <p>NOTE: End date changed to 9/22/2015 (originally 9/30/2014), per R. Brady/HRP (Ed., 7/17/14)</p> <p>NOTE: Gap change per IRP Rev E (Ed., 3/19/14)</p>		
Key Personnel Changes/Previous PI:	August 2017 report: Co-Investigator Dr. Rob Ploutz-Snyder is no longer with the team.		

COI Name (Institution):	Vizzeri, Gianmarco M.D. (University of Texas Medical Branch) Zanello, Susana Ph.D. (Universities Space Research Association)
Grant/Contract No.:	Internal Project
Performance Goal No.:	
Performance Goal Text:	
Task Description:	<p>Hypothesis: We hypothesize that blood vessels in the retina necessarily remodel to accommodate cephalad fluid shifts incurred in microgravity, and that vascular remodeling occurs in advance of other ocular and visual changes associated with visual impairments and increased intracranial pressure (VIIP), such as choroidal folds, cotton wool spots, and visual shifts.</p> <p>Aims: Alterations of vascular patterning in the retinas of Astronaut Crew Members and Bed Rest Subjects will be mapped and quantified by NASA's VESSEL GENERATION Analysis (VESGEN) software. For the two retrospective studies, vascular patterning will be analyzed in images acquired by Heidelberg 30 degree Spectralis infrared (IR) imaging before and after (pre and post) astronaut missions to the International Space Station (ISS), and before and after 70 days of bed rest at 6 degree head-down tilt. Results for retinal vascular patterning by VESGEN will be correlated with other ocular and cardiovascular parameters.</p> <p>Methods: A preliminary feasibility study with the Human Research Program (HRP) of vascular images acquired by the same Heidelberg IR modality demonstrated that the sensitive VESGEN analysis can detect vascular patterns of arterial and venous branching that were highly similar in two retinas, but significantly different from arterial and venous branching in a third retina.</p> <p>The design of the subsequent investigations of Crew Members (n=8) and Bed Rest Subjects (n=10) is essentially identical. During Phase 1, the pre and post status of the retinal vascular images is blinded (i.e., unknown) during the VESGEN analysis of retinal vascular pattern. During Phase 2, following communication of pre and post status to the VESGEN team, results for retinal vascular patterning are evaluated according to the pre and post status of the Crew Members and Bed Rest Subjects. Finally, results for the vascular patterning analysis are compared with other ocular and cardiovascular parameters.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Results of VESGEN research on retinal vascular remodeling in Crew Members and Bed Rest Subjects may contribute to better understanding and countermeasures development for the VIIP syndrome. The VESGEN vascular analysis is being applied to another HRP study on rodent hindlimb unloading, an experimental model of cephalad fluid shifts resulting from microgravity. The increased knowledge and innovations from our VESGEN project for astronaut health will benefit similar studies for vascular-based terrestrial diseases such as diabetic retinopathy (DR), the major blinding retinal disease of working-aged adults, and other vascular-dependent diseases.
Task Progress:	<p>Phase 1, Complete: Mapping and quantification of the retinal arterial and venous branching patterns by VESGEN analysis is complete for both the Crew Members and Bed Rest Subjects. Preliminary observations during this phase of study suggested that vascular resolution in the Crew Member and Bed Rest images was less clear (more diffuse) than in images of the feasibility study. Concerns were discussed with HRP that any changes in vascular patterning detected by the VESGEN analysis could result from two causes: 1) actual pre and post changes in vascular patterning, and/or 2) differences in imaging quality between the pre and post images. A novel automated masking method for comparing the relative presence or absence of blood vessels in the two images of the same retina was developed as an analytical tool with Matlab.</p> <p>Phase 2, In Progress: The pre and post status of the Spectralis images for Crew Members and Bed Rest Subjects has been communicated to the VESGEN team. As requested previously by HRP, assessment of vascular patterning determined by VESGEN analysis for the Bed Rest images will be completed first, and is in progress. Next other ocular and cardiovascular parameters will be compared with the VESGEN results. After completion of the Bed Rest Phase 2 analysis, the same analysis will be applied to the Crew Member images. The Final Report will follow in the near future.</p>
Bibliography Type:	Description: (Last Updated: 11/30/2021)