Fiscal Year:	FY 2016	**Task Last Updated:**	FY 05/18/2016
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		
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PI Organization Type:	NASA CENTER	**Phone:**	(650) 604-1729
Organization Name:	NASA Ames Research Center		
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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:**	04/08/2017
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:**	1
No. of Bachelor's Candidates:	0	**Monitoring Center:**	NASA JSC
Contact Monitor:	Allcorn, Aaron	**Contact Phone:**	281.244.8402
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Flight Program:	Pre/Post Flight		
Flight Assignment:	NOTE: End date changed to 4/08/2017 per PI (Ed., 1/30/17) 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) 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) NOTE: End date changed to 10/01/2016 (originally 9/30/2014 and subsequently 9/22/2015), per PI (Ed., 10/20/15) NOTE: End date changed to 9/22/2015 (originally 9/30/2014), per R. Brady/HRP (Ed., 7/17/14) NOTE: Gap change per IRP Rev E (Ed., 3/19/14)		
Key Personnel Changes/Previous PI:	No changes to research team personnel.		
COI Name (Institution):	Vizzeri, Gianmarco M.D. (University of Texas Medical Branch) Ploutz-Snyder, Robert (Universities Space Research Association) Zanello, Susana (Universities Space Research Association)		

Grant/Contract No.:	Internal Project
Performance Goal No.:	
Performance Goal Text:	
Task Description:	Accelerated, high-priority NASA studies have established that the adverse effects of cephalad fluid shifts incurred by microgravity spaceflight, especially by long-duration missions, are associated with significant risks for ocular and visual impairments and increased intracranial pressure (VIIP), including decreased near visual acuity, choroidal flattening, and optic disc edema (papilledema). However, much remains to be learned about the etiology of VIIP to support the development of effective countermeasures. Contributions of remodeling retinal blood vessels to the etiology of VIIP have not yet been investigated, primarily due to the current lack of ophthalmic tools for precisely measuring progressive remodeling of the vascular architecture. We hypothesize that the fluid shifts resulting in VIIP ocular and visual impairments are mediated in part by the retinal blood vessels, and that such vascular involvement requires the significant, progressive remodeling of retinal vascular architecture. To test our hypothesis, retinal blood vessels will be mapped and quantified using the innovative VESsel GENeration Analysis (VESGEN), a mature, beta-level software developed at NASA as a translational and basic research discovery tool for biomedical vascular applications, particularly for retinal vascular disease. Modified retinal vascular patterning may provide early prediction of future ocular damage and decreased visual acuity. Novel insights provided by VESGEN into progressively pathological and blinding vascular remodeling in the human retina are currently guiding other NIH- and NASA-supported research on retinal disease and the VIIP risk. Our VESGEN project addresses VIIP countermeasures development with two retrospective studies that utilize previous ophthalmic clinical imaging performed on International Space Station (ISS) US Crew Members before and after spaceflight, and NASA Subjects previously undergoing Bed Rest Head Down Tilt (HDT).
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Results of VESGEN research on retinal vascular remodeling will contribute to better understanding and preventive treatments of the VIIP syndrome. Such innovations will help improve the health and well being of astronauts, and consequently their ability to successfully perform and complete future long-duration missions such as lunar and asteroid colonization and Mars explorations. Moreover, the increased medical knowledge and technical innovations required to successfully complete our VESGEN medical research 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 in industrialized countries, cancer, heart disease, and regenerative medicine. NASA’s VESGEN technology is simultaneously being developed to map and quantify vascular remodeling in major experimental organisms on the International Space Station (ISS) that also support future human space exploration and medicine. These ISS model organisms and tissues include the mouse, fruitfly (Drosophila melanogaster), and even leaf venation of the plant Arabidopsis thaliana.
Task Progress:	In consultation with NASA’s Human Research Program, our NASA National Research Award was re-designed as a retrospective study of US astronauts and NASA-approved subjects who underwent 70-day head-down tilt (HDT) bed rest. Specifically, Heidelberg Spectralis infrared (IR) images acquired during routine health monitoring of US Crew Members pre- and post- flight to the International Space Station (ISS) by Johnson Space Center (JSC) Medical Operations, and by ophthalmic imaging of NASA-approved subjects for 70-day head-down tilt (HDT) bed rest (FARU Campaign 11) will be analyzed by NASA’s VESGEN software using a masked protocol. The redesign of the study required extensive reviews and approvals by NASA’s Institutional Review Board (IRB) and Lifetime Surveillance of Astronaut Health (LSAH). The HDT images and the first data set of astronaut images were received for VESGEN analysis in later 2015. The second, final data set of astronaut images are expected to be sent to the VESGEN Laboratory in Summer 2016. The VESGEN analysis of the Crew Member and HDT images are currently in progress. The study is scheduled for completion by January 8, 2017.
Bibliography Type:	Description: (Last Updated: 11/30/2021)
Articles in Peer-reviewed Journals	Parsons-Wingerter P, Hosamani R, Vickerman MB, Bhattacharya S. "Mapping by VESGEN of wing vein phenotype in Drosophila for quantifying adaptations to space environments." Gravit Space Res. 2015 Dec;3(2):54-64. http://gravitationalandspacebiology.org/index.php/journal/article/view/693/731 , Dec-2015