Fiscal Year:	FY 2021	**Task Last Updated:**	FY 07/05/2021
PI Name:	Zanello, Susana Ph.D.		
Project Title:	Multimodal Modeling towards Noninvasive Assessment of Intracranial Pressure in Weightlessness and Biomarker Identification of Predisposition to VIIP Syndrome		
Division Name:	Human Research		
Program/Discipline:			
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:	susana.b.zanello@nasa.gov	**Fax:**	FY
PI Organization Type:	NASA CENTER	**Phone:**	832-576-6059
Organization Name:	KBR/NASA Johnson Space Center		
PI Address 1:	Human Research Program Chief Scientist Office		
PI Address 2:			
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77058	**Congressional District:**	36
Comments:	NOTE (January 2021): PI now at KBR/NASA JSC as of December 2020. Previously at imec USA from June 2019-November 2020; NASA JSC (KBRwyle) from August 2017 until spring 2019. Prior to August 2017, PI was with Universities Space Research Association.		
Project Type:	FLIGHT	**Solicitation / Funding Source:**	2013-14 HERO NNJ13ZSA002N-ILSRA. International Life Sciences Research Announcement
Start Date:	04/01/2016	**End Date:**	07/05/2021
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:	Stenger, Michael	**Contact Phone:**	281-483-1311
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Flight Program:	ISS		
Flight Assignment:	NOTE: End date changed to 7/5/2021 per R. Schulte/HRP HHC element, due to PI move to KBR/NASA JSC management (Ed., 12/15/21) NOTE: End date changed to 9/02/2025 per NSSC and R. Schulte/HRP (Ed., 7/14/2020) NOTE: End date changed to 1/1/2026; note also with PI move to imec USA-Florida, PI's 3 projects were combined into one grant, 80NSSC19K1666 ; however, reporting will be required individually, per HRP (Ed., 11/4/19) NOTE: End date changed to 9/30/2025 per HRP (Ed., 11/19/18)		
Key Personnel Changes/Previous PI:	NOTE: This project has been combined with "Invasive and Noninvasive ICP Monitoring and SANS (previously VIIP) Biomarker Identification" (PI Dr. Michael Williams). The 2021 report constitutes a final report for this task. Dr Zanello now supports the Human Research Program (HRP) Chief Scientist Office and is no longer able to act as Principal Investigator (PI). Transfer of this role has been done to Dr Michael Williams. [November 2019: Xiao Hu, Ph.D. is only CoInvestigator per HRP. February 2017 report: Dr. James Fiedler (previous CoInvestigator) and Dr Jessica Scott moved to other positions and are no longer working on the project.]		

COI Name (Institution):	Hu, Xiao Ph.D. (University of California, San Francisco)
Grant/Contract No.:	80NSSC19K1666 ; Internal Project ; NNX16AH78G
Performance Goal No.:	
Performance Goal Text:	
Task Description:	There is a clear need to investigate whether there is an association between intracranial pressure (ICP) increase and the Visual Impairment and Intracranial Pressure (VIIP) syndrome [Ed. note July 2020: now referred to as Spaceflight Associated Neuro-ocular Syndrome (SANS)]. The Non-Invasive ICP Framework (NICF) is a general approach for inferring ICP using noninvasive signals that are related to ICP. Leveraging multimodal noninvasive data from crew members to be collected in planned longitudinal experiments in flight will significantly improve the accuracy of this noninvasive ICP measurement tool. In addition, we will evaluate biomarkers in blood and urine of crew members, with the aim of investigating the molecular bases and genetic predisposition of developing VIIP syndrome. Overall, this study proposes the use of noninvasive measures plus biomarker discovery and validation as input to build a predictive model that will inform the likelihood of a given crew member of developing vision/neurological complications post flight.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Investigating the propensity and molecular mechanisms associated with ICP increase in microgravity will yield valuable information applicable to similar conditions on Earth, contributing to the knowledge of why conditions such as idiopathic intracranial hypertension develop, and how to manage elevated ICP. Moreover, the improvement of the non-invasive algorithm for ICP estimation will be of utmost importance for the diagnosis and management of neurologic conditions with high ICP and traumatic brain injury.
Task Progress:	Since the start of the project, efforts have been dedicated towards the integration of this task with its companion study (PI Dr. Michael Williams, "Zero G and ICP"). The resulting study is named "Direct ICP" (Williams/Zanello). The team has since carried through processes of feasibility assessment, flight selection, Institutional Review Board (IRB) protocol approval and TRR. With regards to this specific task, activities completed two pilot phase studies: a) optimization of protocols for exosome and RNA isolation and RNA sequencing of all biofluids (cerebrospinal fluid-CSF, plasma, and urine) and b) a study of the compatibility of flight-certified tubes for urine collection with the established bioanalytical methods. Both pilot mini-studies were successful. NOTE: Due to Dr Zanello's recent transition to the Human Research Program (HRP) Office of the Chief Scientist, she is no longer able to continue the role of PI for her study; however, she will remain as a participant in an advisory role. Her study and Dr. Williams' study have been combined into a single study with a single budget, for which Dr. Williams is the sole PI. We have recruited Dr. David Furman from the Buck Institute in California to assume the co-investigator role for the biomarkers portion of the Direct ICP study. Dr. Furman's unique expertise in human immunology and data science brings a great deal of knowledge in predictive modeling, biomarker discovery, and identification of interventions aimed at normalizing immune dysregulation associated with clinically relevant phenotypes. As part of the transition, we have been able to retain the original biomarker methods and aims from Dr. Zanello's study, and to expand upon them with the addition of new hypotheses and analyses under the direction of Dr. Furman, using the same biofluids and fluid volumes as originally approved. Subsequent progress on this aspect will be reported with Dr. Williams's study.
Bibliography Type:	Description: (Last Updated: 09/04/2023)