Fiscal Year:	FY 2018	**Task Last Updated:**	FY 08/31/2017
PI Name:	Spielmann, Guillaume Ph.D.		
Project Title:	The Impact of Long Duration Spaceflight on the Function of B-cells and Biomarkers of Inflammation		
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) **Immune**:Risk of In Mission Impacts, Adverse Health Events or Long-Term Health Impacts due to Altered Immune Response		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Baton Rouge	**State:**	LA
Zip Code:	70803-0001	**Congressional District:**	6
Comments:			
Project Type:	Flight	**Solicitation / Funding Source:**	2015-16 HERO NNJ15ZSA001N-Crew Health (FLAGSHIP, NSBRI, OMNIBUS). Appendix A-Crew Health, Appendix B-NSBRI, Appendix C-Omnibus
Start Date:	11/01/2016	**End Date:**	10/31/2017
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:	Norsk, Peter	**Contact Phone:**	
Contact Email:	Peter.norsk@nasa.gov		
Flight Program:	ISS		
Flight Assignment:	Postflight sample analysis		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Campbell, John Ph.D. (Louisiana State University and A&M College) Crucian, Brian Ph.D. (NASA Johnson Space Center) Laughlin, Mitzi Ph.D. (University of Houston) Simpson, Richard Ph.D. (University of Houston)		
Grant/Contract No.:	NNX17AB16G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Long duration spaceflights have been associated with profound dysregulation of the immune system and latent viral reactivations, which could jeopardize crew safety and mission success. Although the clinical implications of such immune disruption have remained limited to mostly asymptomatic events, extending mission duration would increase crewmembers' risk for infection. Furthermore, the dearth of information regarding the impact of long duration spaceflight on humoral immunity and overall B-cell function raises legitimate concerns on crewmembers' ability to fight infections during a mission. It is therefore critical to extend the current knowledge on spaceflight-induced immune changes of B-cell function in order to evaluate the risks of crew adverse health events for successful implementation of future exploration-class missions. In this regard, recent scientific projects entitled “Salivary Markers” and “Integrated Immune” examined the impact of long duration spaceflight on markers of adaptive and innate immunity, but did not characterize humoral immunity and serological markers of B-cell function. The present project proposes to retrospectively analyze archived plasma and saliva samples from the aforementioned studies in order to evaluate B-cell function during and following long-duration missions. We will address the paucity of spaceflight data on B-cells by characterizing acute and chronic changes in polyclonal Free Light Chains and in Immunoglobulin class switching, indicative of a state of chronic inflammation and overall B-cell function. We will also assess if changes to these sensitive biomarkers are associated with altered risk of viral re-activation and subsequent inflammation. All assays will be performed on plasma and saliva samples previously collected from crewmembers throughout several International Space Station (ISS) missions, which will allow the studies described in this proposal to make a significant contribution to the “Salivary Markers” and “Integrated Immune” studies without the costs associated with classical flight-definition studies. On conclusion to this study we expect to have a better understanding of B-cell function during orbital flights which is essential to identify any clinical risks that may arise due to altered immunity during long-duration spaceflight missions.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	This project will bolster our understanding of how physical and psychological stressors impact our immune system. Furthermore, this project proposes to correlate biomarkers of immune function in blood and saliva, and thus allow the use of less invasive sampling techniques (i.e., salivary swabs) to monitor immune function in special populations (children, first responders, soldiers, elderly, etc...).
Task Progress:	The study was initiated in November 2016 and we obtained IRB (Institutional Review Board) approval for our protocol in December 2016 and February 2017 from Louisiana State University (LSU) and NASA, respectively. In May 2017, archived serum samples from a total of 23 Astronauts (15 from the "Integrated Immune" study and 8 from the "Salivary Markers" study) along with 6 ground-based controls were de-identified by the Principal Investigators of the respective studies and transferred to our laboratory at LSU. Additionally, archived saliva samples from 8 astronauts and 6 ground-based controls were de-identified by the Principal Investigator of "Salivary Markers" study and transferred to our laboratory at LSU. All samples were stored at -80°C until analysis. Assay optimization was performed in June and July 2017 to validate our plasma and saliva assays for this project. Frozen samples are currently being analyzed for all subjects. Publications and Presentations: The work supported by this research grant was presented at the Human Research Program Investigator’s Workshop in February 2016. Current and Future Work: The study protocol is ongoing. By the end of year 1, we expect to have all data processed and analyzed for all crewmembers and ground-based controls. We expect to use the remainder of FY18 to interpret data, and produce scientific papers. Applications and Acquisition of Funding: Work on this project has allowed us to apply for further research funding. We have received additional research funding from Louisiana State University to assess the impact of aerobic and resistance training on biomarkers of B-cell function and overall inflammation in patients with Type 2 diabetes. Our ideas for this project and preliminary data arose from the work performed on the present NASA project.
Bibliography Type:	Description: (Last Updated: 02/03/2020)