Fiscal Year:	FY 2015	**Task Last Updated:**	FY 02/06/2015
PI Name:	Crucian, Brian Ph.D.		
Project Title:	Functional Immune Alterations, Latent Herpesvirus Reactivation, Physiological Stress, and Clinical Incidence Onboard the International Space Station		
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 Adverse Health Event Due to Altered Immune Response		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	brian.crucian-1@nasa.gov	**Fax:**	FY
PI Organization Type:	NASA CENTER	**Phone:**	281-483-7061
Organization Name:	NASA Johnson Space Center		
PI Address 1:	Immunology, SK4		
PI Address 2:	2101 NASA Pkwy		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77058-3607	**Congressional District:**	36
Comments:			
Project Type:	FLIGHT,GROUND	**Solicitation / Funding Source:**	Directed Research
Start Date:	11/03/2014	**End Date:**	09/30/2016
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:**	
Contact Email:	Peter.norsk@nasa.gov		
Flight Program:	ISS		
Flight Assignment:	NOTE: Title change to "Functional Immune Alterations, Latent Herpesvirus Reactivation, Physiological Stress, and Clinical Incidence Onboard the International Space Station" per original proposal to HRP, per L. Milstead/HRP. Title on original information provided was "Innate and Adaptive Immune Function during Long-duration Spaceflight" (Ed., 8/23/16)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Pierson, Duane Ph.D. (NASA Johnson Space Center) Mehta, Satish Ph.D. (NASA Johnson Space Center/EASI) Stowe, Raymond Ph.D. (Microgen Labs)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Some aspects of adaptive cellular immunity have been characterized during spaceflight, while many other areas of immunity (humoral, innate, cell specific functional, etc.) have not. The objective of this project is to characterize multiple diverse facets of immunoregulation during long-duration spaceflight. We hypothesize that while aspects of adaptive immune function are depressed during spaceflight, aspects of humoral or innate immune function may be unaltered or even sensitized. This would explain the observed reactivation of latent herpesviruses in astronauts, and also the elevated incidence of skin rashes and hypersensitivity reactions during International Space Station (ISS) missions. If the hypothesis is validated, it would be an important consideration for any future immunology countermeasures. For example, one would not give an immune 'booster' to address T cell function in a crewmember, if it might potentially worsen on-orbit skin rashes or allergy symptoms. We further hypothesize that there is a widely disparate post-landing recovery for various aspects of immune dysregulation following flight. Previous data have demonstrated that, surprisingly, ISS astronauts maintain shedding of latent herpesviruses at least to R+30. This study will fully characterize all relevant immune dysregulation through a post-mission recovery. Aims: The primary purpose of the study is to determine both acute and chronic alterations in crewmember immunobiology (both innate + adaptive parameters) in conjunction with relevant parameters from other disciplines (nutritional, radiation, virology, host-pathogen, stress, etc.). Parameters will be examined longitudinally in Astronauts before, during, and following spaceflight. Post-flight assessments will be extended to determine the timecourse for full recovery of any dysregulated parameters. Specific scientific aims are as follows: 1. Longitudinally examine the effect of spaceflight on previously uninvestigated aspects of immunobiology including leukocyte distribution, various aspects of innate cellular function. Examined concurrently will be several previously validated assays of adaptive cellular distribution and function, to correlate within crewmembers both innate and adaptive immune dysregulation. 2. Examine the relationship in astronauts between immune function and various markers of in-vivo immune-physiological status, including plasma, salivary and urinary markers of stress, antimicrobial activity, and latent viral reactivation. Various solicited parameters are planned to augment this specific aim, including proteomics and/or genomics. 3. Correlate findings of immune status with astronaut environmental, human, and stress factors such as sleep/wake data, crew work schedules, surveys of in-flight symptomology and/or medication use (voluntary), vehicle docking/undocking, extravehicular activity (EVA), etc. This correlative work should allow conclusions regarding environmental factors, which may potentially be modulated, on immune status. 4. Incorporate a final data analysis into specific conclusions regarding the immunobiology of spaceflight and conclusions regarding the necessity, lack thereof, or targeted aspects of, immune countermeasures for spaceflight. Develop a refined monitoring strategy encompassing innate immunity, adaptive immunity, and relevant parameters from other disciplines, which will be appropriate to validate countermeasures.
Rationale for HRP Directed Research:	This research is directed because it contains highly constrained research. In order to determine exact times of flight days and for the exact times in which the spacecraft cabin is depressed to 10.2 psia (thus creating the hypoxic condition), a researcher needs to have access to the Archive Data Retrieval (ADRIFT) subprogram inside of the Java Mission Evaluation Workstation System (JMEWS) which is only available on site here at Johnson Space Center, and requires proper clearance.
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2015.
Bibliography Type:	Description: (Last Updated: 09/15/2023)