

Fiscal Year:	FY 2016	Task Last Updated: FY 08/21/2015	
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 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:	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:	09/30/2019
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:	
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Flight Program:	ISS		
Flight Assignment:	NOTE: End date changed to 9/30/2019 due to revised research plan with Ground and Flight work, per HRP (Ed., 8/24/16) 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:			

	<p>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.</p> <p>Primary Aims:</p> <p>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:</p> <ol style="list-style-type: none"> 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. <p>Secondary Aims</p> <ol style="list-style-type: none"> 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:	<p>Updated rationale August 2016: This research is directed because it contains highly constrained research, which requires focused and constrained data gathering and analysis. This new task is proposed as a directed/solicited study that will engage multiple external and/or international collaborators. Specific rationale for the directed portion of the study is included in the below updated Task Description.</p> <p>Rationale Feb. 2015: 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.</p>
Research Impact/Earth Benefits:	
Task Progress:	<p>The Directed component passed peer review and the study was granted Authority to Proceed on November 4, 2014. NASA Institutional Review Board (IRB) for the flight component of the study was achieved in March 2015. The solicitation was released in July 2015, and final selection of external science content is anticipated in December 2015.</p>
Bibliography Type:	Description: (Last Updated: 05/15/2025)