

Fiscal Year:	FY 2017	Task Last Updated:	FY 04/29/2017
PI Name:	Rithidech, Kanokporn Ph.D.		
Project Title:	Effects of Space Flights on the Proteome of Astronauts' Plasma		
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		
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Zip Code:	11794-8691	Congressional District:	1
Comments:			
Project Type:	FLIGHT	Solicitation / Funding Source:	2014-15 HERO NNJ14ZSA001N-MIXEDTOPICS. Appendix E: Behavioral Health & Human Health Countermeasures Topics
Start Date:	04/01/2016	End Date:	03/31/2019
No. of Post Docs:	0	No. of PhD Degrees:	0
No. of PhD Candidates:	0	No. of Master's 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:			
Flight Assignment:	Flight definition		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Martin, Dwight Ph.D. (State University of New York, Stony Brook)		
Grant/Contract No.:	NNX16AH80G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>NOTE: This is an integrated project consisting of Dr. Brian Crucian's "Functional Immune Alterations, Latent Herpesvirus Reactivation, Physiological Stress, and Clinical Incidence Onboard the International Space Station" directed research; and Dr. Richard Simpson's "The Impact of an ISS Mission on the Anti-Viral and Functional Properties of NK-cells, T-cells, B-cells and Dendritic Cells," Dr. Kanokporn Rithidech's "Effects of Space Flights on the Proteome of Astronauts' Plasma," and Dr. Honglu Wu's "DNA Damage in the ISS Astronaut's Lymphocytes and Their Association with Stress-Induced Immune Dysfunction" solicited research.</p> <p>Space flight results in exposure of astronauts to several stressors, such as space radiation, microgravity, and physiological stress, that could exacerbate the risks of adverse health effects. To protect astronauts, we must improve our understanding of molecular changes that influence immunological conditions associated with increased astronaut health risks. The in vivo response to the space environment is complex, involving multiple proteins associated with various signal transduction cascades, resulting in different outcomes. Molecular mechanisms responsible for such diverse consequences are poorly understood. It is, therefore, essential to characterize the protein signatures of responses to the space environment in blood plasma samples from astronauts, collected at pre-, in-, and post-flights. Such analyses should help to reveal a particular set of proteins causing adverse immunological changes and to develop methods that help to prevent, or at least to counteract, these effects.</p> <p>In this flight definition project, we will use cutting age proteomic technology to determine protein alterations, qualitatively and quantitatively, in plasma samples collected from astronauts before, during, and after space flights. Our findings will help to provide an understanding of the time course and etiology of immune changes induced by the space environment. Furthermore, since pre- and post-flight samples, in addition to the in-flight samples, will be evaluated in the same astronaut, the direct effects of the space environment can be determined. Hence, our findings will provide high-priority and highly relevant information to NASA. We will further correlate protein expression profiles to the available data on immune dysfunction detected in each astronaut. This approach makes it possible to determine potential predictive biomarkers for space-flight-induced immune dysregulation. Consequently, effective countermeasures against such harmful effects of the space environment can be identified.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>Our findings will help to provide an understanding of the time course and etiology of immune changes induced by the space environment. Hence, our findings will provide high-priority and highly relevant information to NASA. We will further correlate protein expression profiles with to the available data on immune dysfunction detected in each astronaut. This approach makes it possible to determine potential predictive biomarkers for space-flight-induced immune dysregulation. Importantly, the information obtained from this project will have a significant impact on the future development of a novel mechanism-based therapeutic strategy to prevent or mitigate the acute or long-term effects on the immune system due to space flight, as well as immunological diseases found on Earth.</p>
Task Progress:	<p>Currently, we are testing the stability of plasma samples that were prepared and kept at room temperature (RT) for different times prior to storage at -80oC for proteomic analyses, i.e., 0 (immediately) hour (hr), day (d) 1, d2, and d3. Our preliminary results suggested that the duration of storage at RT prior to plasma preparation and storage at -80oC influences protein expression profiles, as compared to those immediately kept at -80oC (0 hr) after plasma collection. A reduction in the numbers of observed proteins was detected among samples stored at d1, d2, and d3 at RT prior to plasma preparation and stored at -80oC, as compared to that observed in samples immediately kept at -80oC (0 hr) after blood collection. Our data also indicated a trend of a reduction in the numbers of observed proteins among samples stored at d1, d2, or d3 at RT prior to storage at -80oC. Moreover, since two types of anti-coagulant were used in blood collection, testing the effects of anti-coagulants on proteomic analyses is underway.</p>
Bibliography Type:	Description: (Last Updated: 05/17/2023)