

Fiscal Year:	FY 2021	Task Last Updated:	FY 02/17/2021
PI Name:	Lee, Stuart M.C. Ph.D.		
Project Title:	Defining the Relation Between Biomarkers of Oxidative and Inflammatory Stress and Atherosclerosis Risk in Astronauts During and After Long-Duration Spaceflight		
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) Cardiovascular: Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	77058-2749	Congressional District:	36
Comments:			
Project Type:	FLIGHT	Solicitation / Funding Source:	2010 Crew Health NNJ10ZSA003N
Start Date:	03/01/2016	End Date:	08/31/2023
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
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Flight Program:	ISS		
Flight Assignment:	ISS NOTE: End date changed to 8/31/2023 per HRP HHC element (Ed., 8/12/21)		
Key Personnel Changes/Previous PI:	August 2019 report: Steven Laurie, Ph.D. is CoInvestigator. January 2017: Remove Dr. Rob Ploutz-Snyder as CoInvestigator; Add: Dr. Alan Feiveson as Collaborator.		
COI Name (Institution):	Smith, Scott Ph.D. (NASA Johnson Space Center) Feiveson, Alan Ph.D. (Collaborator: NASA Johnson Space Center) Stenger, Michael (NASA Johnson Space Center) Laurie, Steven Ph.D. (KBR/NASA Johnson Space Center)		
Grant/Contract No.:	Internal Project		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>NOTE: Continuation of "Defining the Relation Between Biomarkers of Oxidative and Inflammatory Stress and Atherosclerosis Risk in Astronauts During and After Long-Duration Spaceflight" ; previous Principal Investigator was Dr. Steven Platts, until March 2016.</p> <p>Atherosclerosis is the major contributor to cardiovascular disease-related morbidity and mortality. Research indicates that many of the risk factors commonly associated with atherosclerosis contribute to endothelial dysfunction, a process which presents early in life before angiographic evidence of disease and precedes the clinical manifestation of many cardiovascular disease-related disorders. In an effort to compensate for the initial risk factor-related disruptions to homeostasis, there is a compensatory upregulation of atheroprotective mechanisms. However, in the absence of appropriate risk factor management, these defense mechanisms may become overwhelmed and less able to reestablish normal function. Key systems that help maintain vascular homeostasis and are susceptible to differential deleterious alterations include those that help balance levels of oxidative and inflammatory stress. New evidence suggests that long-duration spaceflight may promote oxidative and inflammatory stress through mechanisms such as radiation exposure, diet, physical inactivity, and psychological stress. However, there are no data supporting a causal link between biomarkers of oxidative and inflammatory stress and indices of vascular endothelial dysfunction in spaceflight. As such, we proposed to examine the relation between biomarkers of oxidative and inflammatory stress and well-established measures of vascular endothelial dysfunction (flow mediated dilation (FMD)) and carotid intima-media thickness (cIMT) in astronauts before, during, and after long duration spaceflight.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>It is well known that inflammation is a key contributor to the development of atherosclerosis. There is also emerging work showing the link with oxidative damage. This work may contribute to general clinical science by showing the interactions of multiple stressors in a unique environment (spaceflight).</p>
Task Progress:	<p>All pre-, in-, and immediate postflight data have been collected and analyzed. A manuscript describing these results has been published (Lee SMC et al. Arterial structure and function during and after long-duration spaceflight. J Appl Physiol 129: 108-123, 2020; see also Cumulative Bibliography), and a response was published (Lee SMC et al. Reply to Greaves et al. J Appl Physiol 129: 113, 2020) to a "Letter to the Editor" (Greaves DK, Robertson AD, Patterson CA, Au JS, Hughson RL. Evidence for increased cardiovascular risk to crew during long duration space missions. J Appl Physiol 129: 1111-1112, 2020) regarding this manuscript. Additionally, the investigators continue to participate in the annual Human Research Program Investigators' Workshop.</p> <p>Most astronauts continue to participate in postflight data collections, scheduled to extend to 5 years after landing, although a few are not readily available due to retirement from the astronaut corps or limited travel opportunities coming from international partner organizations, and two have discontinued participation. Thus, we expect that a total of 11 subjects will participate in data collection through 5 years after landing. To date, 3 astronauts have completed data collection through 5 years after landing, and 9 astronauts have completed their 3-year postflight test. Results from this study and previous reports have been used to inform the design of the NASA Standard Measures Study as well Human Research Program-defined risks associated with cardiovascular disease.</p>
Bibliography Type:	Description: (Last Updated: 02/22/2024)
Abstracts for Journals and Proceedings	<p>Lee SMC, Ribeiro LC, Martin DS, Mercaldo ND, Smith SM, Zwart SR, Laurie SS, Macias BR, Stenger MB. "Indices of cardiovascular disease risk in astronauts after long-duration spaceflight in low Earth orbit." 2021 NASA Human Research Program Investigators' Workshop, Virtual, February 1-4, 2021.</p> <p>Abstracts. 2021 NASA Human Research Program Investigators' Workshop, Virtual, February 1-4, 2021. , Feb-2021</p>
Articles in Other Journals or Periodicals	<p>Lee SMC, Laurie SS, Macias BR, Zwart SR, Smith SM, Stenger MB. "Reply to Greaves et al. [Evidence for increased cardiovascular risk to crew during long duration space missions. Greaves DK, Robertson AD, Patterson CA, Au JS, Hughson RL. J Appl Physiol (1985). 2020 Nov 1;129(5):1111-2. PMID: 33197374]" J Appl Physiol (1985). 2020 Nov 1;129(5):1113. https://doi.org/10.1152/japplphysiol.00757.2020 ; PMID: 33197372; PMCID: PMC7790133 , Nov-2020</p>