Fiscal Year:	FY 2020	**Task Last Updated:**	FY 12/26/2019
PI Name:	Goel, Namni Ph.D.		
Project Title:	Biomarkers as Predictors of Resiliency and Susceptibility to Stress in Space Flight		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **HFBP**:Human Factors & Behavioral Performance (IRP Rev H)		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	60612	**Congressional District:**	7
Comments:	NOTE: Formerly at the University of Pennsylvania until July 2019.		
Project Type:	GROUND	**Solicitation / Funding Source:**	2013 HERO NNJ13ZSA002N-Crew Health (FLAGSHIP & NSBRI)
Start Date:	10/23/2019	**End Date:**	10/22/2020
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:	Williams, Thomas	**Contact Phone:**	281-483-8773
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Basner, Mathias M.D., Ph.D. (University of Pennsylvania) Bhatnagar, Seema Ph.D. (Children's Hospital of Philadelphia) Dinges, David F. Ph.D. (University of Pennsylvania) Kirkpatrick, James M.D. (University of Washington) Weljie, Aalim Ph.D. (University of Pennsylvania)		
Grant/Contract No.:	80NSSC20K0243		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	NOTE: Continuation of "Biomarkers as Predictors of Resiliency and Susceptibility to Stress in Space Flight," grant NNX14AN49G, due to Principal Investigator (PI) move to Rush University from University of Pennsylvania in summer 2019, requiring issue of new grant. This proposal is responsive to the NASA Behavioral Health and Performance gap (BMed5) to find individual characteristics that predict successful adaptation and performance in an isolated, confined, and extreme environment, especially for long duration missions. The project also relates to Human Research Program (HRP) Sleep Gap 4 to identify indicators of individual susceptibilities and resiliencies to sleep loss and circadian rhythm disruption, to aid with individualized countermeasure regimens, for autonomous, long duration, and/or distance exploration missions. The proposal is also responsive to BMed 1 and BMed 2, and Sleep Gap 2 and Sleep Gap 9. To address these gaps, this proposal will assess biomarkers as predictors of resiliency and susceptibility (individual differences) to performance stress and sleep loss using the HRP Human Exploration Research Analog (HERA) and the Hawaii Space Exploration Analog and Simulation (HI-SEAS) high fidelity space analog facilities. We will conduct a ground-based experiment—strongly anchored in our previous laboratory-based research—on N=32 healthy men and women (ages 26-55) in the HERA facility (short-duration analog) and on N=6 healthy men and women (ages 21-65) in the HI-SEAS facility (long-duration analog) to determine the predictive validity of a set of relevant, valid, and reliable biomarkers for distinguishing those who are more resilient versus those who are more susceptible to the adverse neurobehavioral effects of the combination of high performance demands and total sleep deprivation (TSD) stressors—two conditions commonly experienced in space flight. These biomarkers include the following: cardiovascular measures (blood pressure, heart rate and heart rate variability, stroke volume, and cardiac output), salivary cortisol, catecholamines (dopamine, noradrenaline, and adrenaline), an inflammatory marker (C-reactive protein; CRP), metabolomic markers (via unbiased metabolomics), and microRNAs (epigenetic markers). The project deliverable will be a countermeasure (set of diverse biomarkers) for distinguishing those who are more resilient versus those who are more susceptible to the adverse neurobehavioral effects of high performance demands and sleep loss stressors. If valid markers of such susceptibility can be found, it will be possible to optimize and individualize crew resources, and mitigate stress and other behavioral health and performance risks autonomously during long-duration space flight. The SIRIUS (Scientific International Research In a Unique terrestrial Station) missions are the first time NASA’s Human Research Program (HRP) partners with Russia’s IBMP (Institute for Biomedical Problems) Ground-based Experimental Complex NEK (Nezemnyy Eksperimental’nyy Kompleks) to conduct a series of analog missions. Dr. Goel's project will be part of the 2019 mission as well as the upcoming 2020 mission.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The project's research will deliver a countermeasure (set of diverse biomarkers) for distinguishing those who are more resilient versus those who are more susceptible to the adverse neurobehavioral effects of high performance demands and sleep loss stressors. If valid markers of such susceptibility can be found, it will be possible to optimize and individualize crew resources, and mitigate stress and other behavioral health and performance risks autonomously during long-duration space flight. This information would also be of use on Earth in applied occupations that demand similar risks and stressors.
Task Progress:	New project for FY2020. NOTE this is continuation of "Biomarkers as Predictors of Resiliency and Susceptibility to Stress in Space Flight," grant NNX14AN49G, due to Principal Investigator (PI) move to Rush University from University of Pennsylvania in summer 2019, requiring issue of new grant. See that project for previous reporting.
Bibliography Type:	Description: (Last Updated: 09/28/2023)