Fiscal Year:	FY 2017	**Task Last Updated:**	FY 02/08/2017
PI Name:	Rana, Brinda Ph.D.		
Project Title:	Identification of Functional Metabolomic Alterations During the Simulated Spaceflight Environment		
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) **Bone Fracture**:Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (2) **Cardiovascular**:Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes (3) **Muscle**:Risk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance (4) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight (5) **SANS**:Risk of Spaceflight Associated Neuro-ocular Syndrome (SANS)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	UNIVERSITY	**Phone:**	858-822-4010
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City:	La Jolla	**State:**	CA
Zip Code:	92093-5004	**Congressional District:**	49
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2014-15 HERO NNJ14ZSA001N-MIXEDTOPICS. Appendix E: Behavioral Health & Human Health Countermeasures Topics
Start Date:	03/04/2016	**End Date:**	03/03/2019
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:**	
Contact Email:	Peter.norsk@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: End date is now 3/03/2019 per NSSC information (Ed., 6/20/18)		
Key Personnel Changes/Previous PI:	N/A		
COI Name (Institution):	Patel, Hemal Ph.D. (University of California, San Diego) Sharma, Kumar M.D. (University of California, San Diego) Patel, Hemal H Ph.D. (University of California, San Diego) Saito, Rintaro Ph.D. (University of California, San Diego) Schilling, Jan Ph.D. (University of California, San Diego)		
Grant/Contract No.:	NNX16AG03G		
Performance Goal No.:			

Performance Goal Text:	
Task Description:	The goal of this proposal is to identify novel early biomarkers in plasma and urine to detect and monitor the progression of a number of physiological disturbances due to prolonged microgravity and CO2 exposure as experienced by crew members on long duration missions. These physiological manifestations include: (1) Visual Impairment/Intracranial Pressure (VIIP); (2) sub-clinical or environmentally induced cardiovascular disease; (3) muscle atrophy and decreased muscle strength; and (4) bone loss. Targeted and untargeted metabolomics will be applied to plasma and urine collected longitudinally from study participants undergoing a 30 day six-degree head-down bed rest combined with ambient 0.5% CO2. We will follow-up metabolomics with a novel cell-based metabolic mammalian organ system assay ("organs on a plate") to address how these metabolites affect physiological processes at the cellular and organ level. The proposed research will directly address the Integrated Research Plan Gaps including CV8, M6, Osteo5, VIIP3, VIIP13, CNS2.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Space Research Related Impact: This study has the potential to identify novel biomarkers in plasma and urine to detect the risk for and monitor the progression of physiological outcomes induced by the spaceflight environment. Research Impact on Earth: The study has potential to identify the sequence of metabolic events leading to disruption of metabolic pathways in individuals experiencing temporary bed rest (e.g., during pregnancy) or permanent bed rest (e.g., due to aging or disabilities). In the future, countermeasures can be developed to target these pathways. Assay Development: We are optimizing the application of a high throughput mitochondrial flux assay (Seahorse Assay) to detect circulating factors which can alter changes in mitochondrial function (glycolysis and respiration). This assay can then be applied to investigate environmental factors impacting bioenergetics of different tissue and cells for both Earth and Space related research.
Task Progress:	Results: The bed rest study participants are currently under recruitment by :envihab. In the first year, we have obtained NASA and University of California, San Diego IRB (institutional review board) approval to carry out the proposed study, developed an Integrated Data Sharing Plan, and established the blood collection and transportation protocol with :envihab. Metabolomics assays are established and ready to implement upon arrival of the samples. We currently have 86 targeted metabolomics assays developed as well as the protocol in place for conducting untargeted metabolomics. We have been optimizing the Seahorse Metabolic Flux assay to investigate longitudinal changes in circulating factors which may impact mitochondrial function at the cellular level.
Bibliography Type:	Description: (Last Updated: 07/30/2019)