Fiscal Year:	FY 2020	**Task Last Updated:**	FY 03/23/2020
PI Name:	Neelam, Srujana Ph.D.		
Project Title:	Effect of Altered Gravity on the Nucleus		
Division Name:	Space Biology		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	None		
Human Research Program Risks:	None		
Space Biology Element:	(1) Cell & Molecular Biology		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	(1) Cell Culture		
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Zip Code:	53706	**Congressional District:**	2
Comments:			
Project Type:	GROUND	**Solicitation:**	2016-17 Space Biology (ROSBio) NNH16ZTT001N-MS, PS, AB. App D,E,F: Research Using Microgravity Simulation Devices, Parabolic and Suborbital Flights, and Antarctic Balloons
Start Date:	02/01/2020	**End Date:**	01/31/2021
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 KSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Ullrich, Oliver M.D., Ph.D. (Universitat Zurich, Switzerland) Lele, Tanmay Ph.D. (University of Florida, Gainesville)		
Grant/Contract No.:	80NSSC20K0423		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Altered gravity is known to influence various cell functions like cell proliferation, signal transduction, and gene expression, in addition to the changes in cell morphology, focal adhesion, and cytoskeletal organization across a wide range of cell types. Such wide range of phenotypic changes in altered gravity is linked to various abnormalities observed in astronauts returning from space but the biological mechanisms resulting in these changes are not yet understood. Our preliminary results suggest that simulated microgravity significantly alters nuclear morphology. Changes in nuclear shape can alter gene expression because the nucleus houses the genome, and changes in nuclear shape can alter chromatin conformation. Therefore, we propose to understand the mechanisms by which true altered gravity impacts nuclear morphology. Our hypothesis is that the LINC (Linker of Nucleoskeleton to Cytoskeleton) complex, a nuclear envelope complex which links the cytoskeleton to the nucleus, is sensitive to altered gravity mediated effects on the nuclear structure, nuclear tension, and subsequently on gene expression. We propose to identify the effects of altered gravity on nuclear morphology and cytoskeletal organization in fibroblasts flown in parabolic flight. Cells flown will be cultured in a specially designed hardware to control for temperature and humidity, and the cells will be fixed on flight at different timepoints. High resolution imaging of cell shape and nuclear shape will be carried out using a laser scanning confocal microscope. Image analysis software will be used for three-dimensional shape reconstruction and quantification of shape parameters. We will characterize the mechanical forces acting on the nucleus using a Fluorescence Resonance Energy Transfer (FRET) probe biosensor to investigate the effect of altered gravity on the nuclear tension. Finally, we will identify the genes that are differentially expressed in LINC disrupted cells to understand the mechanotransduction pathway in sensing altered gravity.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2020.
Bibliography Type:	Description: (Last Updated:)