Fiscal Year:	FY 2012	**Task Last Updated:**	FY 10/26/2011
PI Name:	Mellor, Liliana F. Ph.D.		
Project Title:	Induction of Early Stages of Osteoarthritis After Exposure to Microgravity		
Division Name:	Human Research		
Program/Discipline:	NSBRI		
Program/Discipline--Element/Subdiscipline:	NSBRI--Musculoskeletal Alterations Team		
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) **Osteo**:Risk Of Early Onset Osteoporosis Due To Spaceflight		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	lfmellor@ncsu.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	208-426-2238
Organization Name:	North Carolina State University		
PI Address 1:	Department of Biomedical Engineering		
PI Address 2:	Cell Mechanics Laboratory		
PI Web Page:			
City:	Raleigh	**State:**	NC
Zip Code:	27695-7115	**Congressional District:**	4
Comments:	NOTE: formerly at Boise State University until fall 2013 (Ed., Jan 2014)		
Project Type:	GROUND	**Solicitation / Funding Source:**	2011 NSBRI-RFA-11-01 Postdoctoral Fellowships
Start Date:	11/01/2011	**End Date:**	10/31/2013
No. of Post Docs:	1	**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:**	NSBRI
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Oxford, Julia (MENTOR/ Boise State University)		
Grant/Contract No.:	NCC 9-58-PF02601		
Performance Goal No.:			
Performance Goal Text:			
	POSTDOCTORAL FELLOWSHIP The health of space crews during and after space missions has become a major concern of NASA. Several physiological changes have been associated with long-term exposure to microgravity, including skeletal muscles atrophy, immune system dysfunction, decreased nutrient intake, cardiovascular anomalies and bone density loss. One field that has yet to be explored is the possible effects of microgravity on the health of articular cartilage health, which is constantly exposed to mechanical forces under normal gravitational conditions on Earth. Disruption of cartilage homeostasis leads to pathological conditions such as arthritis, which according to the Center for Disease Control is the leading cause of disability in the United States.		

Task Description:	Osteoarthritis (OA) is a degenerative joint disease that limits mobility of the affected joint due to the degradation of articular cartilage, and in advanced stages, can expose the highly innervated bone tissue, producing excruciating pain in the affected joint. Because of the limited regenerative capacity of articular cartilage, it is very important to detect early changes in the catabolic and anabolic rates that can lead to cartilage degradation. This project's goal is to investigate the effects of microgravity on cartilage homeostasis by exposing two chondrocyte cell lines to a modeled microgravity environment using a rotating wall vessel bioreactor. Cells exposed to microgravity will be compared to cells incubated under normal gravitational conditions as a control, as well as an arthritic-like cell model induced by treating chondrocytes with pro-inflammatory cytokines such as IL-1B and oncostatin M (OSM). Disruptions in cell-matrix interactions, changes in cytoskeletal morphology and gene up-regulation will be evaluated to determine changes in chondrocyte metabolism. Hypothesis. Similar to bone, cartilage homeostasis can be compromised during exposure to microgravity, resulting in osteoarthritic-like conditions in astronauts after space missions. This study will give a better insight to whether exposure to microgravity can make astronauts more prone to develop early osteoarthritis. In addition, since early stages of OA are hard to diagnose due to the lack of symptoms, the researchers also plan to investigate potential markers in the synovial fluid that can help detect early stages of OA. Due to the limited capacity of regeneration in articular cartilage, early detection and treatment are key components to prevent the advanced stages of cartilage degradation, which is the leading cause of disability in the U.S., limiting the activities of nearly 21 million adults.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2012.
Bibliography Type:	Description: (Last Updated: 11/12/2020)