Task Book Report Generated on: 04/19/2024

Fixed Inverse				
Project Title: Maintaining Musculoskeletal Health in the Lunar Environment	Fiscal Year:	FY 2008	Task Last Updated:	FY 05/30/2008
Division Name: Human Research Program/Dicipline: NSBRI Program/Dicipline- Element/Subdivelpline: John Agency Name: TechPort: No Human Research Program Elements: (1) HHC-Human Health Countermeasures Human Research Program Elements: (1) HHC-Human Health Countermeasures Human Research Program Ribas: (1) HHC-Human Health Countermeasures Space Biology Element: None Space Biology Element: None Space Biology Special Category: None Pl Email: Space Biology Special Category: Pl-Address 1: Play Eddition Play Space Biology Space Biology Space Biology Special Category: Pl-Address 1: Project Type: Goldes Station State: TX Zip Code: Space Biology Spa	PI Name:	Bloomfield, Susan A. Ph.D.		
Program/Discipline: Program/Discipline- Element/Subdiscipline- Element/Subdiscipline- Joint Agency Name: None Space Biology Element: None None None None Space Biology Cross-Element None Space Biology Special Category: None Pl Email: Subcomortiumus edu Space Biology Special Category: None Pl Email: Subcomortiumus edu Pl Organization Type: UNIVERSITY Plone: Pl Address 1: Department of Health & Kinesiology Pl Address 2: Department of Health & Kinesiology Pl Address 2: Department of Health & Kinesiology Pl Address 2: Agonalization Name: Pl Email: Subcomortiumus edu Pl Web Page: City: College Station Joint Yard Yard Yard Yard Yard Yard Yard Yard	Project Title:	Maintaining Musculoskeletal Health in the I	Lunar Environment	
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Element/Subdiscipline: Joint Agency Name: Joint Agency Name: Joint Agency Name: (J) HUC-Human Health Countermeasurs: Illumin Research Program Risks: (J) Bone Fracture-Risk of Bone Fineture due to Spaceflight-induced Changes to Bone (Z) Octoe Risk Of Farly Onset Ostooporosis Due To Spaceflight-induced Changes to Bone (Z) Octoe Risk Of Farly Onset Ostooporosis Due To Spaceflight-induced Changes to Bone (Z) Octoe Risk Of Farly Onset Ostooporosis Due To Spaceflight-induced Changes to Bone (Z) Octoe Risk Of Farly Onset Ostooporosis Due To Spaceflight None None None Pleading Cross-Element: None Ple Email: Ple Email: Ple Email: Popatiment of Health & Kinesiology Ple Address 1: Department of Health & Kinesiology Pl Address 2: 400 Harvey Mitchell Pkwy, Suite 300 Pl Address 2: Oflege Station Total Agency	Program/Discipline:	NSBRI		
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The overarching purpose of this project is to determine if the usual bone and muscle loss observed during spaceflight will be mitigated by the moon's partial gravity, if radiation exposure exacerbates bone/muscle loss at this reduced loading level, and if exercise is effective in mitigating the loss under these conditions. This requires an effective model of the lunar environment that simulates conditions during lunar outpost missions.

We will use a novel, partial-gravity mouse model to first determine the independent impact of the moons 1/6 gravity on multiple bone and muscle outcomes, including direct determinations of bone breaking strength and other mechanical properties as well as muscle function in the live animal. We will then test the additional impact of low-dose radiation modeling galactic cosmic radiation during partial gravity conditions by exposing these mice to one acute dose, or four, fractionated doses on a weekly basis, of ionizing radiation.

Data from these experiments will be used to justify expanded experiments at the Brookhaven NASA Space Radiation Laboratory utilizing heavy iron ions to simulate galactic cosmic radiation. Finally, we will assess the impact of the lunar environment (partial gravity plus modeled space radiation) on the musculoskeletal response to exercise countermeasures.

Using an animal model to pursue these objectives provides for these advantages:

- 1. Direct determinations of bone quality with mechanical testing of bone at the end of each experiment;
- 2. Discovering the effect of radiation on the response to partial gravity and to exercise countermeasures, which cannot be ethically tested in human subjects; and
- 3. More rapid turn-around and much reduced cost for experiments than those involving long-duration human bed-rest studies.

These experiments will provide unique and valuable data about bone loss and impaired muscle function and determine efficacy of two different exercise countermeasures in a modeled lunar environment.

Rationale for HRP Directed Research:

Research Impact/Earth Benefits:

Task Progress:

Task Description:

New project for FY2008.

Bibliography Type:

Description: (Last Updated: 05/28/2021)