Fiscal Year:	FY 2011	**Task Last Updated:**	FY 06/09/2011
PI Name:	Urban, Randall M.D.		
Project Title:	Testosterone Supplementation as a Countermeasure against Musculoskeletal Losses during Space Exploration		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Biomedical countermeasures		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	(1) **HHC**:Human Health Countermeasures		
Human Research Program Risks:	(1) **Muscle**:Risk of Impaired Performance Due to Reduced Muscle Size, Strength and Endurance		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	77555-0569	**Congressional District:**	14
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2009 Crew Health NNJ09ZSA002N
Start Date:	07/30/2010	**End Date:**	07/29/2013
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:**	NASA JSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Durham, William J Ph.D. (University of Texas Medical Branch) Paddon-Jones, Douglas Ph.D. (University of Texas Medical Branch) Sheffield-Moore, Melinda Ph.D. (University of Texas Medical Branch) Dillon, Edgar Lichar Ph.D. (University of Texas Medical Branch)		
Grant/Contract No.:	NNX10AP86G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	The long-term goal of this proposal is to determine the therapeutic efficacy of testosterone at preserving lean muscle mass, muscle strength, and bone mineral density in healthy humans during spaceflight. We propose to examine the interactive or additive effects of the combination of testosterone and exercise on lean body mass (LBM), muscle strength and bone health. Our general hypothesis is that the maintenance of normal physiologic levels of testosterone during spaceflight will protect against the functional loss of muscle and bone, and will maximize the efficacy of existing resistance exercise protocols at preventing or reversing functional impairments that occur during bed rest. To achieve these goals we will test the following specific hypotheses before, during and after 70 days of bed rest: 1: Cycled testosterone replacement (weekly testosterone injections for 2 weeks, followed by 2 weeks off, etc.) in conjunction with exercise will have an additive effect in preventing loss of muscle mass and muscle strength in men representative of the astronaut population compared to exercise with placebo testosterone. 2: Cycled testosterone replacement (weekly testosterone injections for 2 weeks, followed by 2 weeks off, etc.) in conjunction with exercise will have an additive effect in preventing loss of bone mass and alterations in markers of bone metabolism in men representative of the astronaut population compared to exercise with placebo testosterone. To address these hypotheses we will investigate the following specific aims before, during and after 70 days of bed rest: Aim 1: To determine the effect of cycled testosterone replacement in conjunction with resistance exercise during bed rest on muscle mass, muscle strength, and fatigue in men aged 24-55 years. Aim 2: To determine the effect of cycled testosterone replacement in conjunction with resistance exercise during bed rest on markers of bone metabolism and bone mass in men aged 24-55 years Current evidence suggests that the combination of testosterone and exercise will optimize the effectiveness of the existing exercise and nutritional countermeasures. Results from this proposal will lay the ground work for the implementation of combinational countermeasures that will additively work to maintain preflight physiology of astronauts during long-term spaceflight missions. Research Impact/Earth Benefits: Results from this study will further elucidate the role of testosterone in the maintenance of skeletal muscle and bone during long term bed rest as a model for space flight. The benefits to life on earth are extensive. It is hypothesized that maintaining appropriate balance between hormonal status, nutritional status, and physical activity during spaceflight is of critical importance in preventing musculoskeletal losses. It is our contention that the restoration of physiologic levels of testosterone is essential to prevent and/or restore spaceflight- and microgravity-induced losses in the musculoskeletal system. Current evidence suggests that the combination of testosterone and exercise will optimize the effectiveness of the existing exercise and nutritional countermeasures.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	Results from this study will further elucidate the role of testosterone in the maintenance of skeletal muscle and bone during long term bed rest as a model for space flight. The benefits to life on earth are extensive. It is hypothesized that maintaining appropriate balance between hormonal status, nutritional status, and physical activity during spaceflight is of critical importance in preventing musculoskeletal losses. It is our contention that the restoration of physiologic levels of testosterone is essential to prevent and/or restore spaceflight- and microgravity-induced losses in the musculoskeletal system. Current evidence suggests that the combination of testosterone and exercise will optimize the effectiveness of the existing exercise and nutritional countermeasures.
Task Progress:	The protocol was approved by NASA CPHS (Committee for the Protection of Human Subjects) following the May 19, 2011 review and will be included in the 70 day bed rest campaign (Countermeasures and Functional Testing in Head-Down Tilt Bed Rest, CFT70). The first subject is currently scheduled for enrollment June 19, 2011.
Bibliography Type:	Description: (Last Updated: 01/11/2021)