Fiscal Year:	FY 2011	**Task Last Updated:**	FY 10/07/2011
PI Name:	Puttlitz, Christian Ph.D.		
Project Title:	Fracture Healing in Haversian Bone under Conditions of Simulated Microgravity		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
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) **Fracture**:Risk of Bone Fracture due to Spaceflight-induced Changes to Bone (IRP Rev F)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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City:	Fort Collins	**State:**	CO
Zip Code:	80523-1374	**Congressional District:**	4
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2010 Crew Health NNJ10ZSA003N
Start Date:	08/24/2011	**End Date:**	08/23/2014
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 JSC
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Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Browning, Raymond (Colorado State University) Haussler, Kevin (Colorado State University) McGilvray, Kirk (Colorado State University) Ryan, Stewart (Colorado State University) Santoni, Brandon (Foundation for Orthopaedic Research and Education)		
Grant/Contract No.:	NNX11AQ81G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Ground-based models of weightlessness and microgravity have provided valuable insights into how dynamic physiological systems adapt or react to reduced loading. Almost all of these models have used rodent hind limb suspension as the means to simulate microgravity on isolated physiological systems. Unfortunately, results derived from these studies are significantly limited when one tries to translate them to the human condition due to significant anatomical and physiological differences between rodents and humans. This is especially relevant with regard to studying orthopaedic issues related to bone maintenance and fracture healing during spaceflight. Therefore, it is clear that a novel animal model of ground-based weightlessness that is directly translatable to the human condition needs to be developed in order for substantial progress to be made in our knowledge of how microgravity affects fracture healing. In light of this, we propose the following four specific aims: (1) develop a ground-based, ovine model of bone unloading in order to simulate full weightlessness, (2) interrogate the effects of a simulated microgravity environment on bone fracture healing using this large animal model, (3) develop a computational model of weightbearing in ovine bone under different experimental conditions in order to characterize the loads experienced by the fracture site, and (4) develop treadmill protocols that enhance bone fracture healing in the presence of simulated microgravity. Successful completion of this project will substantially elevate our understanding of how fracture site loading affects the subsequent healing cascade in the presence of microgravity and will form the foundation for designing future rehabilitation protocols to facilitate bone healing during long-duration spaceflight.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	0
Task Progress:	New project for FY2011.
Bibliography Type:	Description: (Last Updated: 03/25/2020)