

Fiscal Year:	FY 2009	Task Last Updated:	FY 07/10/2009
PI Name:	Platts, Steven H. Ph.D.		
Project Title:	Gender Differences in Bedrest: Autonomic and Neuroendocrine Changes and Vascular Responses in Lower and Upper Extremities		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Physiology		
Joint Agency Name:		TechPort:	No
Human Research Program Elements:	(1) HHC: Human Health Countermeasures		
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	NASA CENTER	Phone:	281-483-8177
Organization Name:	NASA Johnson Space Center		
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PI Address 2:	Biomedical Research and Environmental Sciences Division		
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City:	Houston	State:	TX
Zip Code:	77058	Congressional District:	36
Comments:			
Project Type:	GROUND	Solicitation / Funding Source:	2003 Biomedical Research & Countermeasures 03-OBPR-04
Start Date:	12/01/2006	End Date:	06/30/2010
No. of Post Docs:	0	No. of PhD Degrees:	
No. of PhD Candidates:	1	No. of Master' Degrees:	
No. of Master's Candidates:	0	No. of Bachelor's Degrees:	
No. of Bachelor's Candidates:	0	Monitoring Center:	NASA JSC
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Flight Program:			
Flight Assignment:	NOTE: Changed end date to 6/30/2010 per PI information (jvp 8/19/10) NOTE: Changed end date to 6/1/2010 due to PI information on hurricane delays in project; end date may change later (jvp 7/10/09)		
Key Personnel Changes/Previous PI:	PI Steven Platts became PI 12/2006; see J. Meck for previous years' information on this project.		
COI Name (Institution):			
Grant/Contract No.:			
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Women astronauts are more susceptible to postflight orthostatic hypotension and presyncope than are men. The reasons are not defined. Most bedrest studies that seek mechanisms of cardiovascular changes in response to microgravity have not included women. As a result, many conclusions about the effects of simulated microgravity on humans are flawed, in that they fail to describe mechanisms in the very people who have the most serious problems. We propose to determine how differences in strategies of arterial pressure control in men and women affect orthostatic tolerance both before and after bedrest. We will study endothelium-dependent, endothelium-independent and adrenergic receptor responses in both arteries and veins, before and after bedrest. In addition, we will measure plasma volumes, and hemodynamic and neuroendocrine responses to arterial and cardiopulmonary baroreceptor inputs, in women versus men, before and after bedrest. We also intend to pursue in humans the recent animal data which shows that different vascular beds respond differently to simulated microgravity. Hindlimb-suspended rats show hypertrophic remodeling of the vessels in their forelimbs and atrophic remodeling in the vessels of their hindlimbs. This is thought to occur because changes in transmural pressures and shear forces with hindlimb suspension occur in opposite directions in the upper and lower extremities. These studies have not been repeated in female rats, and nothing like this has been performed in humans of either gender. Since humans are bipedal, bedrest would greatly reduce transmural pressures and shear forces in the legs but not the arms. If vessel remodeling follows the patterns in humans as in the rats, large changes could occur which might contribute to orthostatic hypotension after bedrest. Accordingly, we plan to repeat the vascular measurements mentioned above in both upper and lower extremities before and after bed rest and relate the findings to the occurrence of orthostatic hypotension.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	During this research new protocols have been developed to study vascular responses. These new protocols will help determine the components of acetylcholine-mediated vasodilation in both normal and disease states. This protocol will also help determine the importance of the renin-aldosterone system in male and female responses to dehydration.
Task Progress:	To date, 32 subjects (12 females, 20 males) have been enrolled in the study. Of those, only 15 subjects (5 females, 10 males) have completed the full protocol. Those subjects who did not complete the full protocol were, by in large, released early due to Hurricane Ike (2008). As such, the results are based on data analyzed to date on 5 females and 10 males. These initial results, while not complete and underpowered, do appear to support our general hypothesis that there are many cardiovascular differences with bedrest between males and females.
Bibliography Type:	Description: (Last Updated: 03/01/2018)