Fiscal Year:	FY 2013	Task Last Updated:	FY 04/23/2013
PI Name:	Hunter, Jean Ph.D.		
Project Title:	Effects of Retronasal Smelling, Variety and	d Choice on Appetite and Satiety	
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline Element/Subdiscipline:	HUMAN RESEARCHSpace Human Fac	etors Engineering	
Joint Agency Name:		TechPort:	No
Human Research Program Elements:	(1) SHFH:Space Human Factors & Habita	bility (archival in 2017)	
Human Research Program Risks:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	14853-5701	Congressional District:	22
Comments:			
Project Type:	Ground	Solicitation / Funding Source:	2009 Crew Health NNJ09ZSA002N
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No. of Post Docs:	1	No. of PhD Degrees:	1
No. of PhD Candidates:	1	No. of Master' Degrees:	
No. of Master's Candidates:		No. of Bachelor's Degrees:	1
No. of Bachelor's Candidates:	4	Monitoring Center:	NASA JSC
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Flight Program:			
Flight Assignment:	NOTE: New end date is 8/31/2014, per PI and NSSC information (Ed., 4/23/14) NOTE: New end date is 4/30/2014, per NSSC information (Ed., 1/31/13)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Binsted, Kim (University of Hawaii, Hor Spies, Rupert (Cornell University) Halpern, Bruce (Cornell University)	nolulu)	
Grant/Contract No.:	NNX11AE53G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Menu fatigue and its sequelae, lower food intake and weight loss, have been documented in military, polar exploration, and space settings, and among subjects in bed rest studies. Isolation, confinement, stress, and low acceptability of available foods amplify menu fatigue. Adequate levels of acceptability, variety, and usability are required to maintain food intake and crew health and performance. We wish to use isolated and confined subjects at the NASA bed rest facility, and different subjects in a Mars analog environment, to explore three issues: 1) the relationship between nasal patency and smelling (orthonasal and retronasal) in the microgravity analog of bed rest and in the isolation/confinement setting of a Mars-like habitat, 2) the effect of orthonasal and retronasal smelling on appetite under conditions of menu fatigue, and 3) the hypothesis that a bulk ingredient based food system, with crew-prepared foods, will improve crew food satisfaction and mitigate menu fatigue. The last study will include an ESM cost comparison of crew-prepared and prepackaged food systems. Study #1 on smelling and nasal patency roopens an earlier finding (Vickers et al, 2001) that taste, olfaction and trigeminal response are unaffected by fluid shifts resulting from bed rest. We have returned to the olfaction angeet of that question with objective measurements of nasal cavity dimensions and nasal airway resistance, with a broader and more closely food-related set of odorants, and by adding tests of retronasal smelling which is more representative of odorant perception during eating. Study #2 seeks to link odorant acceptability ratings for pure, food-related odorants to bed-rested subjects' appetite, or desire to eat the meal. These measurements are taken during the pre-bed rest anbulatory period, during the period of dynamic adaptation to fluid shift in early bed rest, in late bed rest when fluid shifts have stabilized and menu fatigue is increasing, and during the recovery period. Odorants used include the vapor phase odoras		
Rationale for HRP Directed Research:			
Research Impact/Earth Benefits:	Our investigation of nasal patency, olfaction, and appetite in bed rested subjects is generally relevant to the care and nutrition of patients confined to bed for medical reasons. Our research on foods and cooking for long term planetary surface missions is relevant to the provisioning of small isolated groups on Earth such as scientific field stations, and also generally relevant to the adventure tourism industry.		
Task Progress:	Task Progress: Bed rest data has been acquired for seven subjects. As measured by acoustic rhinometry for the first 5 cm of distance behind the nasal entrance, nasal cavity volume is reduced on average 15% within an hour of the start of bed rest, then fluctuates through day 5 of bed rest. Thereafter, weekly nasal patency testing during bed rest reveals a characteristic profile: a ~10% reduction in nasal volume except for an apparent return to baseline at day 30. Nasal volume briefly increases to 15% over baseline during the first few hours of recovery from bed rest with a gradual return toward baseline during rehabilitation. A data sharing agreement under negotiation with another researcher is expected to give us access to confirmatory MRI data of the pre-, during, and post-bed rest anatomy of the nasal passages. The clinical literature on nasal patency observes that patients' self-assessed degree of nasal congestion is poorly correlated with objective measures of congestion. 3 of the 6 subjects tested so far are able to self-assess changes in nasal tissue swelling and nasal airflow 77 to 86% of the time (P < 0.05). The remaining subjects' ratings are poorly correlated. Half of the bed rest subjects report nasal congestion during bed rest even though all experience nasal congestion. The 2010 Integrated Medical Model indicates that 60% of astronauts report nasal congestion. It is possible to conjecture that more astronauts may be undergoing changes in nasal patency but are not sensitive to it. Menu fatigue is measured by asking the subjects to indicate their interest in eating each food served to them, the pleasantness of its odor, the acceptability of the food when consumed, and hunger and satiety ratings before and after the meal. Two out of six subjects have demonstrated significant menu fatigue coupled with diminished ratings of intensity, pleasantness, and "interest in eating" for odors sourced from the FARU meals. This association requires further analysis which will begin in the next year. The analog phas		

Abstracts for Journals and Proceedings Caldwell BJ, Halpern BP, Binsted K, Hunter JB. "Transient and Long Term Nasal Tissue Swelling in 70-day 6° Head-Down Tilt." 2013 NASA Human Research Program Investigators' Workshop, Galveston, TX, February 12-14, 2013. 2013 NASA Human Research Program Investigators' Workshop, Galveston, TX, February 12-14, 2013. /hrp2013_abstract_Caldwell_Hunter.pdf , Feb-2013