

Fiscal Year:	FY 2023	Task Last Updated:	FY 08/30/2022
PI Name:	Macias, Brandon Ph.D.		
Project Title:	Mechanical and Gravitational Countermeasures to Ocular Changes During Strict Head-Down Tilt Bedrest (PI: Macias)		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		TechPort:	No
Human Research Program Elements:	(1) HHC: Human Health Countermeasures		
Human Research Program Risks:	(1) SANS: Risk of Spaceflight Associated Neuro-ocular Syndrome (IRP Rev I)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Organization Name:	NASA Johnson Space Center		
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Comments:	NOTE: Became civil servant fall 2020; previously KBR/NASA Johnson Space Center. Prior to that until 2016, was at the University of California, San Diego.		
Project Type:	GROUND	Solicitation / Funding Source:	Directed Research
Start Date:	08/26/2022	End Date:	08/20/2024
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
Contact Monitor:	Stenger, Michael	Contact Phone:	281-483-1311
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Flight Program:			
Flight Assignment:	NOTE: Project start date updated due to P.I. change to B. Macias. Information per C. Ribeiro/NASA-JSC. (Ed. 8/29/22).		
Key Personnel Changes/Previous PI:	August 2022 report: Scott Greenwald, Ph.D. has left NASA and is no longer with the project (Ed., 8/29/22). June 2022 report: CoInvestigators Alan Hargens, Jessica Jasien, and Benjamin Levine are no longer with the project (Ed., 7/22/22).		
COI Name (Institution):	Brunstetter, Tyson O.D., Ph.D. (NASA Johnson Space Center) Huang, Alex M.D., Ph.D. (Doheny Eye Institute) Kramer, Larry M.D. (University of Texas Health Science Center at Houston) Laurie, Steven Ph.D. (KBR/NASA Johnson Space Center) Lee, Stuart Ph.D. (KBR/NASA Johnson Space Center) Lovering, Andrew Ph.D. (University of Oregon) Martin, Bryn Ph.D. (Alcyone Therapeutics Inc.) Young, Millennia Ph.D. (NASA Johnson Space Center) Lytle, Jason (KBR/NASA Johnson Space Center) Pardon, Laura (KBR/NASA Johnson Space Center)		
Grant/Contract No.:	Directed Research		
Performance Goal No.:			

Performance Goal Text:	
Task Description:	<p>The Spaceflight Associated Neuro-ocular Syndrome (SANS) is associated with structural and functional ocular and brain changes and develops in ~2/3rds of astronauts during long-duration spaceflight. Although the etiology of SANS is unknown, a weightlessness-driven headward fluid redistribution relative to the upright position on Earth is hypothesized to be a primary initiating factor. A countermeasure that can successfully reverse this headward fluid shift for multiple hours per day may be needed to prevent SANS. Exposure to 30 days of the spaceflight analog strict 6 degree head-down tilt (HDT) bedrest induces the development of optic disc edema, a hallmark sign of SANS, in 2/3 of subjects; thus, NASA will utilize this platform to test the effectiveness of various countermeasures to prevent or reduce the development of SANS findings. This study will include a control group exposed to 30 days of strict 6 degree HDT. A second group of subjects will be exposed to 6 hours of 25 mmHg lower body negative pressure (LBNP), daily, during 30 days of strict 6 degree HDT bedrest. A third group of subjects will be exposed to 6 hours of upright posture per day, and 6 degree HDT for the remaining 18 h/day. This will help determine if daily exposure to 6 hours total of upright posture, fully reversing the headward fluid for the same duration of use as the LBNP group, is sufficient to prevent SANS findings, and thus can direct future countermeasure studies with respect to the duration needed to successfully prevent SANS. We will assess multiple cerebral, vascular, and ocular outcome measures to determine the effects of 30 days strict 6 degree HDT bedrest, and the ability of daily 6 hour exposure to LBNP or upright positioning to prevent these changes.</p> <p>Specific Aims:</p> <ol style="list-style-type: none"> 1. To determine if daily exposure to actual (upright posture) and simulated (LBNP) hydrostatic pressure gradients prevents ocular and cerebral structural changes during 30 days of strict 6° head-down tilt bedrest. 2. To determine if daily exposure to actual (upright posture) and simulated (LBNP) hydrostatic pressure gradients prevents ocular functional changes during 30 days of strict 6° head-down tilt bedrest. 3. To determine if daily exposure to actual (upright posture) and simulated (LBNP) hydrostatic pressure gradients prevents vascular and cerebrospinal fluid changes during 30 days of strict 6° head-down tilt bedrest. <p>This bedrest study will be implemented in the :envihab facility at the German Aerospace Center (DLR) in Cologne, Germany.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	Continuation of " Mechanical and Gravitational Countermeasures to Ocular Changes During Strict Head-Down Tilt Bedrest" with Dr. Macias as new Principal Investigator (PI). Former PI was Dr. Marshall-Goebel.
Bibliography Type:	Description: (Last Updated: 04/12/2022)