Fiscal Year:	FY 2020	**Task Last Updated:**	FY 06/14/2020
PI Name:	Martin, Bryn Ph.D.		
Project Title:	Ophthalmic and Intracranial Structural Changes in Head-Down Tilt Bedrest: Potential Countermeasures and Comparison to SANS Findings in Astronauts (OPTICS study)		
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 (SANS)		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	Bryn@alcyonetx.com	**Fax:**	FY
PI Organization Type:	INDUSTRY	**Phone:**	330-475-9747
Organization Name:	Alcyone Therapeutics, Inc.		
PI Address 1:	116 John St #300		
PI Address 2:			
PI Web Page:			
City:	Lowell	**State:**	MA
Zip Code:	01852-1124	**Congressional District:**	3
Comments:	PI moved to Alcyone Therapeutics, Inc., in late 2020 from University of Idaho (Ed., December 2021)		
Project Type:	Ground	**Solicitation / Funding Source:**	2018-2019 HERO 80JSC018N0001-SANS: Spaceflight Associated Neuro-ocular Syndrome Countermeasures. Appendix C
Start Date:	04/08/2020	**End Date:**	10/12/2020
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:	Norsk, Peter	**Contact Phone:**	
Contact Email:	Peter.norsk@nasa.gov		
Flight Program:			
Flight Assignment:	NOTE: End date changed to 10/12/2020 per JSC Grants Admin/NSSC information, due to PI move and new grant established (Ed., 12/10/21)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Fu, Qiuyan Ph.D. (University of Idaho, Moscow) Kramer, Larry M.D. (University of Texas Health Science Center at Houston) Laurie, Steven Ph.D. (KBR/NASA Johnson Space Center) Macias, Brandon Ph.D. (NASA Johnson Space Center) Marshall-Goebel, Karina Ph.D. (KBR/NASA Johnson Space Center) Williams, Michael M.D. (University of Washington, Seattle) Loerch, Linda Ph.D. (NASA Johnson Space Center)		
Grant/Contract No.:	80NSSC20K0920		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Spaceflight associated neuro-ocular syndrome (SANS) is a combination of pathological ophthalmic findings that have been documented in a subset of astronauts that participated in long duration missions (6+ months) to the International Space Station. The leading hypothesis for SANS is that the lack of a gravitational vector acting on the body results in a headward body fluid shift that can lead to damage to the eye. Recent findings from our research team show that multiple structural changes in the eye and brain occur in astronauts with SANS. To help mitigate these structural changes, we need to validate a ground-based analog for spaceflight. Strict head-down tilt bedrest has been investigated extensively as a spaceflight analog. However, we do not know if the chronic headward fluid shift that occurs during bedrest results in similar ocular and brain structural changes observed during spaceflight. The objective of our proposal is to use non-invasive magnetic resonance imaging to quantify structural and physiologic changes in the brain and eye that occur in prolonged 6 degree head down tilt bedrest (HDT) and understand if these alterations can be mitigated using countermeasures. Our central hypothesis is that ophthalmic and intracranial alterations will be similar in prolonged bed rest compared to long-duration astronauts with SANS, and these alterations will be reduced by countermeasures applied during HDT. We will test this hypothesis by a) quantification of ophthalmic and intracranial alterations in HDT subjects and ambulatory control subjects compared to pre-HDT (Aim 1), b) determination if countermeasures can prevent and/or reduce HDT-induced alterations (Aim 2), and c) comparison of alterations in HDT subjects to those already quantified in astronauts that developed SANS (Aim 3). Our approach to accomplish these aims will include a total of 48 participants that are randomly assigned to four groups, each with 12 people in total. All participants will be imaged by magnetic resonance imaging and optical coherence tomography at a baseline time point, 30 days after the study start, and 1 to 3 days following study completion. During the 30-day period, Group 1 will be seated in the daytime and supine at night, and Group 2 will adhere to a strict 6 degree HDT. Group 3 and 4 will both adhere to a strict 6 degree HDT, but they will also undergo a mechanical and other countermeasure (to be determined). Using the imaging data collected in each group, we will quantify changes in the eye and brain at each time point. These alterations will be statistically compared across Group 1 through 4 to accomplish Aim 1 and 2. To accomplish Aim 3, we will compare alterations in Group 1 and 2 to alterations that we previously quantified in astronauts with SANS (Group 5). Upon completion of the research, we will begin to validate what degree of HDT is suitable as a spaceflight analog. Ultimately, this research will provide valuable information to support countermeasure optimization and implementation. The research uniquely addresses the related Program Requirements Document (PRD) risk SANS GAPs 1 (SANS1: We do not know the etiological mechanisms and contributing risk factors for ocular structural and functional changes seen in-flight and postflight), 12 (SANS12: We do not know whether ground-based analogs and/or models can simulate Space Associated Neuro-ocular Syndrome), and 13 (SANS13: We need to identify preventative and treatment countermeasures (CMs) to mitigate changes in ocular structure and function and intracranial pressure during spaceflight.). A unique value of our research plan is that we will use identical methods to compare structural changes in the eye and brain in bed rest subjects to changes in these structures that our group has already obtained in astronauts with SANS. In addition, the study team includes multiple personnel with extensive experience working with NASA investigators, bed-rest studies, countermeasure development and testing, and all aspects of the imaging methods to be applied.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2020.
Bibliography Type:	Description: (Last Updated: 05/27/2025)