Fiscal Year:	FY 2020	**Task Last Updated:**	FY 08/13/2020
PI Name:	Cromer, Walter Ph.D.		
Project Title:	The Effect of Simulated Space Radiation on the Interaction of the Metabolome, Immune System, and Lymphatic Anatomy of the Gastrointestinal Tract		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:			
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **SR**:Space Radiation		
Human Research Program Risks:	(1) **Cancer**:Risk of Radiation Carcinogenesis (2) **Immune**:Risk of In Mission Impacts, Adverse Health Events or Long-Term Health Impacts due to Altered Immune Response		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	wcromer@tamu.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	254-421-1530
Organization Name:	Texas A&M University		
PI Address 1:	Department of Medical Physiology		
PI Address 2:	2121 W. Holcombe		
PI Web Page:			
City:	Houston	**State:**	TX
Zip Code:	77030	**Congressional District:**	7
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	2019 HERO 80JSC019N0001-FLAGSHIP & OMNIBUS: Human Research Program Crew Health. Appendix A&B
Start Date:	08/01/2020	**End Date:**	07/31/2022
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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:	Zawaski, Janice	**Contact Phone:**	
Contact Email:	janice.zawaski@nasa.gov		
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Endsley, Mark Ph.D. (University of Texas, Galveston)		
Grant/Contract No.:	80NSSC20K1436		
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Task Description:	We will examine the changes that space relevant radiation have on the immune system, vascular architecture, and metabolome (bacterial products of metabolism) of the gastrointestinal (GI) tract. We know that each of these factors interact with each other to create a balanced system that ensures normal function of the digestive tract (digestion, nutrient absorption, protection from pathogens, tolerance of commensal bacteria) and promote the health of the whole organism. We believe that space radiation is the primary driving factor in imbalances between these factors which leads to system dysfunction. We will assess each of these factors (metabolome, immune, and vascular) in a manner that allows us to make conclusions about not only the state of each component individually but how it could impact the other systems. We will use standard metabolomic analysis of cecal contents (mass spectroscopy) accompanied by RNA deep sequencing to examine the pathways associated with those changes. This will allow us to determine if there are changes in metabolites that impact immune and GI function (indole, butyrate, etc.) and why. We will use immunofluorescent staining of sections of the bowel wall, Peyer's patches, and mesenteric lymph node to determine changes in the number and distribution of immune cells in the tissue. We will pair this with RNA sequencing of those tissues to determine the activation status of the cells and in the cases of the Peyer's patches and mesenteric nodes the production of factors (IL-7, CCL19, CCL21, etc.) by the stromovascular fraction that maintain a normal environment for the immune cells within. Finally, we will stain the aforementioned tissues for vascular markers (CD31, Lyve-1, etc.) to determine if there are changes in the vascular structures of the tissue. We will deliver a number of products from this proposal including the data listed as well as broad genomic and metabolomic data that will be archived for use by other investigators. More specifically we will provide data pertaining to degenerative effects of simulated space radiation on the interlocking systems of the metabolome, immune, and vascular system of the GI tract. The significance of this proposal is that it will be the first proposal to address the 3 listed components, metabolome, immune, and vasculature as a single system. We will also determine mechanistically how simulated space radiation interferes with each component individually and how that impacts the other linked systems.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2020.
Bibliography Type:	Description: (Last Updated: 10/23/2024)