Fiscal Year:	FY 2020	**Task Last Updated:**	FY 01/04/2021
PI Name:	George, Steven Ph.D.		
Project Title:	Impact of Radiation Exposure on a 3D In Vitro Model of Human Bone Marrow		
Division Name:	Human Research		
Program/Discipline:			
Program/Discipline--Element/Subdiscipline:	TRISH--TRISH		
Joint Agency Name:		**TechPort:**	Yes
Human Research Program Elements:	None		
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:	95616	**Congressional District:**	3
Comments:			
Project Type:	Ground	**Solicitation / Funding Source:**	TRISH--Focused Investigations
Start Date:	06/01/2019	**End Date:**	08/31/2020
No. of Post Docs:	0	**No. of PhD Degrees:**	0
No. of PhD Candidates:	2	**No. of Master' Degrees:**	0
No. of Master's Candidates:	0	**No. of Bachelor's Degrees:**	0
No. of Bachelor's Candidates:	0	**Monitoring Center:**	TRISH
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Prebys, Eric Ph.D. (University of California, Davis)		
Grant/Contract No.:	NNX16AO69A-FIP0016		
Performance Goal No.:			
Performance Goal Text:			
Task Description:	Focused Investigation Project The primary goal of this project is to characterize the impact of acute ionizing radiation (at levels that mimic deep space exploration) on the health and function of a human bone marrow using a microphysiological system model of human marrow (“bone marrow-on-a-chip” or BMoaC). The high significance of this project is derived from the unique and potentially dangerous levels of ionizing radiation exposure for astronauts on deep space missions, and the highly radio-sensitive features of human bone marrow, in particular the hematopoietic stem cell. Recent reports in simple monolayer culture systems suggest that both the hematopoietic stem cells (HSCs) and the supporting stromal cells (e.g., mesenchymal stem cell, MSC) are acutely effected by ionizing radiation which not only disrupts hematopoiesis, but also increases the incidence of leukemias. Specific Aim: Determine a dose-response curve between ionizing radiation (proton) and normal biological function of		

	human bone marrow (leukocyte production) using a microphysiological system model of human bone marrow.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	The potential impact of the research lies in the use of a human bone marrow model, and the demonstration that the production and release of CD15+ (neutrophils) cells may be quite sensitive to doses that exceed 1 Gy. This is relevant as 1 Gy is the anticipated dose to astronauts on a mission to Mars and back.
Task Progress:	The primary goal of this project is to characterize the impact of acute ionizing radiation (at levels that mimic deep space exploration) on the health and function of a human bone marrow using a microphysiological system model of human marrow (bone marrow-on-a-chip or BMoaC). The high significance of this project is derived from the unique and potentially dangerous levels of ionizing radiation exposure for astronauts on deep space missions, and the highly radio-sensitive features of human bone marrow, in particular the hematopoietic stem cell. Recent reports in simple monolayer culture systems suggest that both the hematopoietic stem cells (HSC) and the supporting stromal cells (e.g., mesenchymal stem cell, MSC) are acutely effected by ionizing radiation which not only disrupts hematopoiesis, but also increases the incidence of leukemias. Specific Aim: Determine a dose-response curve between ionizing radiation (proton) and normal biological function of human bone marrow (leukocyte production) using a microphysiological system model of human bone marrow. Key Finding: We were able to demonstrate a dose-dependent decrease in CD45 and CD15 cells in the bone marrow over a dose range of 0.1 - 10 Gy. In addition, we observed a step change (decrease) in the release of CD15+ cells from the device for radiation doses exceeding 1.0 Gy.
Bibliography Type:	Description: (Last Updated:)