Fiscal Year:	FY 2023	**Task Last Updated:**	FY 05/18/2023
PI Name:	Mason, Christopher Ph.D.		
Project Title:	The Impact of Spaceflight and Radiation on Clonal Hematopoiesis		
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:	None		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
PI Email:	chm2042@med.cornell.edu	**Fax:**	FY
PI Organization Type:	UNIVERSITY	**Phone:**	203-668-1448
Organization Name:	Weill Medical College of Cornell University		
PI Address 1:	1305 York Ave, Room Y13-04, Box 140		
PI Address 2:			
PI Web Page:			
City:	New York	**State:**	NY
Zip Code:	10021-5663	**Congressional District:**	12
Comments:			
Project Type:	GROUND	**Solicitation / Funding Source:**	2019-2020 HERO 80JSC019N0001-HHCBPSR, OMNIBUS2: Human Health Countermeasures, Behavioral Performance, and Space Radiation-Appendix C; Omnibus2-Appendix D
Start Date:	05/01/2023	**End Date:**	04/30/2026
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:	Elgart, Robin	**Contact Phone:**	281-244-0596 (o)/832-221-4576 (m)
Contact Email:	shona.elgart@nasa.gov		
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Bailey, Susan Ph.D. (Colorado State University) De Vlaminck, Iwijn Ph.D. (Cornell University) Elemento, Olivier Ph.D. (Weill Medical College of Cornell University) Hassane, Duane Ph.D. (Weill Medical College of Cornell University) Levine, Ross MD (Sloan Kettering Institute for Cancer Research)		
Grant/Contract No.:	80NSSC23K0832		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Clonal hematopoiesis (CH) occurs when blood cells harboring an advantageous mutation propagate faster than others. These mutations can confer a risk for certain hematological cancers and cardiovascular disease. However, little is known about the methods for reducing these clones, nothing is known about CH in astronauts, and there is little information about the proper way to understand and stratify the risk of these mutations that are found in normal individuals. The goal of this proposal is to delineate the risk of CH for astronauts and other patients using improved, novel methods that map nucleic acids isolated from peripheral blood and urine. We hypothesize that radiation imparts a selective advantage, specifically in hematopoietic cells with DNA Damage Response mutations, and that spaceflight duration and radiation dose can drive and mediate this selection process. We will use a cohort of >1,100 patients from Weill Cornell Medicine (WCM) with both blood and urine, where 11% already show CH, as well as existing data from healthy cohorts (n=20,000) from the Englander Institute for Precision Medicine (EIPM) and Memorial Sloan Kettering Cancer Center (MSKCC) (n=25,000). We will use established methods for purifying and extracting DNA, using protocols developed for the NASA Twins Study and our published EIPM PreCISE-1 test for CH. This includes 100+ genes involved in clonal hematopoiesis, cancer, and cardiovascular diseases (CVD), sequenced to a depth of >2000x coverage (with unique molecular barcodes), giving >95% sensitivity for variant allele frequencies (VAF) > 1% (about 1/50 cells). The presence of CH can inform long-term CVD and cancer risk, and thus can serve as a useful metric for astronauts preparing for long-term missions. Also, CH confers a mutation-specific inflammatory risk, which can potentiate post-flight or post-radiation morbidity and be compared to other risk factors. Thus, identifying and managing CH represents a crucial unmet need for astronaut health, radiation risk stratification, and guiding oncology patients more broadly.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	New project for FY2023.
Bibliography Type:	Description: (Last Updated: 08/17/2023)