Task Book Report Generated on: 03/29/2024

P. Name:   Schwertz, Harsjorg M.D., Ph.D.   Project Title:   Megalaryceyte Obiting in Outer Space and Near Earth: The MOON Study   Project Title:   Space Biology   Program/Discipline:   Program/Di	Fiscal Year:	FY 2022	Task Last Updated:	FY 03/25/2022
Division Name:   Space Biology   Program/Discipline:   Program/Discipline:   Program/Discipline:   Program/Discipline:   Program/Discipline:   Program/Discipline:   Program/Discipline:   Program Robine:   Pro	PI Name:	Schwertz, Hansjorg M.D., Ph.D.		
Program/Discipline:	Project Title:	Megakaryocytes Orbiting in Outer Space and Nea	r Earth: The MOON Study	
Program/Discipline-  Element/Subdiscipline-  Stement/Subdiscipline-  None   TechPort: No.   No.	Division Name:	Space Biology		
Element/Subdiscipline:  Joint Agency Name:  None  Human Research Program Elements:  None  Space Biology Cross-Element  (1) Cell & Molecular Biology  Space Biology Cross-Element  (2) Immunology  Space Biology Cross-Element  (3) Immunology  Space Biology Cross-Element  (4) Immunology  Space Biology Special Category:  None  PI Email:  Ansoiny software from your Author du  Corganization Type:  UNIVERSITY  Organization Name:  Liniversity of Utah, Salt Lake City  PI Address 2:  Department of Tamily and Preventive Medicine  PI Address 2:  191 Salt Lake City  PI Address 2:  191 Salt Lake City  PI Address 2:  191 Salt Lake City  PI Address 3:  191 Salt Lake City  PI Address 3:  191 Salt Lake City  PI Address 3:  191 Salt Lake City  PI Address 4:  191 Salt Lake City  PI Address 5:  191 Salt Lake City  PI Address 5:  191 Salt Lake City  PI Address 5:  191 Salt Lake City  PI Address 6:  191 Salt Lake City  Project Type:  192 Salt Lake City  Project Type:  192 Salt Lake City  Project Type:  191 Salt Lake City  No. of Pab Decrees  PLIGHIT  Salt January Comments  191 Salt Lake City  No. of Pab Decrees  No. of Pab Decrees  No. of Pab Decrees  No. of Master's Candidates:  No. of Master's Candidates:  No. of Master's Candidates:  No. of Master's Candidates:  No. of Bachclor's Candida	Program/Discipline:			
Human Research Program Elements: None  Human Research Program Risks: None  Space Biology Element: (1) Cell & Molecular Biology  Space Biology Cross-Element (1) Immanology  Space Biology Special Category: None  PI Email: Immanology  PI Corganization Type: None  PI Corganization Name: University of Utah, Salt Lake City  PI Address 1: Department of Family and Preventive Medicine  PI Address 2: 391 S Chipeta Way, Suite C  PI Web Page:  City: Salt Lake City State: UT  City: Salt Lake City State: UT  Comments:  Project Type: FLIGHT Solicitation / Fanding Name: District: 2  State Date: 1201/2021 End Date: History No. of PhD Degrees: No. of PhD Degrees: No. of PhD Degrees: No. of PhD Candidates: No. of PhD Degrees: No. of PhD Candidates: No. of Master's Ca				
Human Research Program Rislas:   None   Space Biology Element:   (1) Cell & Molecular Biology   Space Biology Cross-Element   (1) Immunology   Space Biology Special Category:   None   Fax: FY	Joint Agency Name:		TechPort:	No
Space Biology Element:         (1) Cell & Molecular Biology           Space Biology Cross-Element Disciplines:         (1) Immunology           Space Biology Special Category:         None           PI Email:         humsiore schwertziönZm2.utsh.edu         Fax: FY           PI Organization Type:         UNIVERSITY         Phone: 801-946-0924           Organization Name:         University of Ulab, Salt Lake City         Phone: 801-946-0924           PI Address I:         Department of Family and Preventive Medicine         P1 Address I:         P1 Address I:           PI Address I:         Department of Family and Preventive Medicine         P1 Address I:         VI           PI Address I:         Solicitation / Salt: UT         VI           July Code:         Salt Lake City         State: UT         VI           Jip Code:         84108-1263         Solicitation / Funding Particular Source: This Province of Particular Source: Pa	<b>Human Research Program Elements:</b>	None		
Space Biology Cross-Element Discipline: (1) Immunology Discipline: None  PI Email: hansiors schwertz@nu2mu utah.edu Fax: FY  PI Organization Type: UNIVERSITY Phone: 801-946-0924  Organization Name: University of Utah, Salt Lake City  PI Address 1: Department of Family and Preventive Medicine  PI Address 2: 391 S Chipeta Way, Suite C  PI Web Page:  City: Salt Lake City State: UT  Zip Code: 84108-1263 Congressional District: 2  Comments:  Project Type: FLIGHT Solicitation / Funding NILDOZDAOOIN-SB E. 12. Flight/Ground Research  Start Date: 12/01/2021 End Date: 11/30/2024  No. of Post Docs: No. of PhD Degrees:  No. of PhD Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: Monitoring Center: NASA ARC  Contact Monitor: Griko, Yuri Contact Fhone: 650-664-0519  Contact Monitor: Griko, Yuri Contact Phone: 650-664-0519  Col Name (Institution): Rondin, Matthew M.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)	Human Research Program Risks:	None		
Discipline: Space Biology Special Category: None PI Email: Inansions schwertz@uzm2.utah.edu PI Organization Type: UNIVERSITY Phone: 801-946-0924 Organization Name: University of Utah, Salt Lake City PI Address 1: Department of Family and Preventive Medicine PI Address 2: 391 S Chipeta Way, Suite C PI Web Page: City: Salt Lake City Salt Lake City Salt Lake City Salt Lake City Size Salt Lake City Solicitation / Funding Soli	Space Biology Element:	(1) Cell & Molecular Biology		
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PI Organization Type: UNIVERSITY Phone: 801-946-0924 Organization Name: University of Utah, Salt Lake City  PI Address 1: Department of Family and Preventive Medicine PI Address 2: 391 S Chipeta Way, Suite C  PI Web Page: City: Salt Lake City State: UT  Zip Code: 84108-1263 Congressional District: 2  Comments:  Project Type: FLIGHT Solicitation / Funding NNI420ZDA001N-SB E.12. Flight/Ground Research Start Date: 12/01/2021 End Date: 11/30/2024 No. of PhD Degrees: No. of PhD Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Master's Candidates: No. of Bachelor's Degrees: No. of Sachelor's Candidates: Monitoring Center: NASA ARC Contact Monitor: Griko, Yuri Contact Phone: 650-604-0519 Contact Email: Yuri, Griko/Finasa.gov Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: COI Name (Institution): Roodina, Matthew M.D. (University of Utah, Salt Lake City) Roovley, Jesse Ph.D. (University of Utah, Salt Lake City) Grant/Contract No.: 80NSSC22K0255	Space Biology Special Category:	None		
Organization Name: University of Utah, Salt Lake City  PI Address 1: Department of Family and Preventive Medicine  PI Address 2: 391 S Chipeta Way, Suite C  PI Web Page:  City: Salt Lake City State: UT  Zip Code: 84108-1263 Congressional District: 2  Comments:  Project Type: FLIGHT Solicitation / Funding Notification / Funding Notification / Funding Source: Flight/Ground Research  Start Date: 12/01/2021 End Date: 11/30/2024  No. of Post Does: No. of PhD Degrees:  No. of PhD Candidates: No. of Master' Degrees:  No. of Master's Candidates: No. of Master' Degrees:  No. of Master's Candidates: No. of Bachelor's Degrees:  No. of Bachelor's Candidates: Monitoring Center: NASA ARC  Contact Monitor: Griko, Yuri Contact Phone: 650-604-0519  Contact Email: Yuri V. Griko@nasa.gov  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution): Rondina, Matthew M.D. (University of Utah, Salt Lake City )  Rowley, Jesse Ph.D. (University of Utah, Salt Lake City )  Grant/Contract No.: 80NSSC22K0255  Performance Goal No.:	PI Email:	hansjorg.schwertz@u2m2.utah.edu	Fax:	FY
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No. of Master's Candidates:  No. of Bachelor's Candidates:  No. of Bachelor's Candidates:  Oriko, Yuri  Contact Monitoring Center: NASA ARC  Contact Email:  Yuri.V.Griko@nasa.gov  Flight Program:  Flight Assignment:  Key Personnel Changes/Previous PI:  COI Name (Institution):  Rondina, Matthew M.D. (University of Utah, Salt Lake City) Rowley, Jesse Ph.D. (University of Utah, Salt Lake City)  Grant/Contract No.:  80NSSC22K0255  Performance Goal No.:	No. of PhD Candidates:			
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Performance Goal No.:	COI Name (Institution):			
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Task Book Report Generated on: 03/29/2024

Megakaryocytes (MKs) and their progeny, platelets (PLTs), are dynamic effector cells with recently discovered novel functions, which bridge the inflammatory, immune, and hemostatic continuum. Changes in bone marrow MKs, resulting in low PLT numbers, (thrombocytopenia, which occurs in astronauts during spaceflight) are associated with dysregulated host inflammatory/immune responses. MKs and PLTs sense and respond to environmental cues. MKs also differentially invest developing PLTs with RNAs and proteins that alter functions of newly-released cells, influencing cellular and host responses. Surprisingly, there is a paucity of data regarding in-flight, long-term dynamics of MK development and function, as well as PLT function and production. Given previously identified and published space-travel associated risks on dysregulated inflammation, immune responses, thrombus formation, and hemostatic systems, filling this critical knowledge gap is important for the health of spaceflight crewmembers during and after missions. Moreover, as other blood cells (e.g., red blood cells, leukocytes, etc.) may be altered by microgravity, data generated are likely to contribute to our understanding of how spaceflight affects other hematopoietic processes. This proposal is based on our robust preliminary data demonstrating that conditions mimicking microgravity (rotating wall vessel culture, RWVC) markedly alter human MK morphology and gene expression. We hypothesize that microgravity will re-program MKs and newly-released PLTs, resulting in critical changes in their transcriptome, proteome, and alterations in PLT number and function. We will determine how microgravity and space radiation conditions on board the International Space Station (ISS) alter human MK and PLT maturation/production, gene expression (DNA, RNA, and protein), and cellular function. We will study in vitro human hematopoietic progenitor cell (HPC)-derived MKs in Earth-based experiments under standard or microgravity conditions. In parallel, human MKs will be studied on the ISS. Integrated, cutting-edge OMICS toolsets (e.g., RNA-sequencing and ribosomal footprinting [Ribo-seq]), comprehensive morphologic studies, and cell production kinetic studies will be used. They will provide unprecedented insight into adaptation processes needed for MK and PLT function under conditions experienced by humans performing spaceflights. These studies will directly address crew health concerns that currently limit human space exploration and will assist in developing targeted countermeasures.

This proposal concurs with the major National Research Council (NRC) Decadal Survey Recommendations for cellular and molecular biology studies using state- of-the-art tools coupled with systems biology, and for studies evaluating the physiological interplay of cardiopulmonary and immune functions during application of spaceflight. Furthermore, we will address goals of the NASA Space Biology Science Plan 2016-2025, including: (1) determine the effects of the space environment on DNA function, (2) develop a systems biology-based understanding of the cellular and molecular changes to explain how gravitational changes in spaceflight effects organisms and causes phenotypic changes, and (3) identify how spaceflight affects the ability of cells to generate and maintain their complex internal cyto-architecture, processes critical for MKs and PLTs.

Rationale for HRP Directed Research:

**Research Impact/Earth Benefits:** 

Task Progress:

**Task Description:** 

New project for FY2022.

**Bibliography Type:** 

Description: (Last Updated: 10/04/2023)