

<b>Fiscal Year:</b>	FY 2023	<b>Task Last Updated:</b>	FY 05/02/2023
<b>PI Name:</b>	Jacob, Naduparambil K Ph.D.		
<b>Project Title:</b>	Predictive Biomarkers for Space Radiation Induced Cancer and Cardiovascular Injury Risk Assessment		
<b>Division Name:</b>	Human Research		
<b>Program/Discipline:</b>			
<b>Program/Discipline--Element/Subdiscipline:</b>			
<b>Joint Agency Name:</b>	<b>TechPort:</b>	No	
<b>Human Research Program Elements:</b>	(1) <b>SR</b> :Space Radiation		
<b>Human Research Program Risks:</b>	(1) <b>Cancer</b> :Risk of Radiation Carcinogenesis (2) <b>Cardiovascular</b> :Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes		
<b>Space Biology Element:</b>	None		
<b>Space Biology Cross-Element Discipline:</b>	None		
<b>Space Biology Special Category:</b>	None		
<b>PI Email:</b>	<a href="mailto:naduparambil.jacob@osumc.edu">naduparambil.jacob@osumc.edu</a>	<b>Fax:</b>	FY
<b>PI Organization Type:</b>	UNIVERSITY	<b>Phone:</b>	614-685-4246
<b>Organization Name:</b>	Ohio State University		
<b>PI Address 1:</b>	Department of Radiation Oncology		
<b>PI Address 2:</b>	410 W, 12th Ave, 351 Wiseman Hall		
<b>PI Web Page:</b>			
<b>City:</b>	Columbus	<b>State:</b>	OH
<b>Zip Code:</b>	43210	<b>Congressional District:</b>	3
<b>Comments:</b>			
<b>Project Type:</b>	GROUND	<b>Solicitation / Funding Source:</b>	2017 HERO 80JSC017N0001-Crew Health and Performance (FLAGSHIP1, OMNIBUS). Appendix A-Flagship1, Appendix B-Omnibus
<b>Start Date:</b>	07/02/2018	<b>End Date:</b>	12/31/2023
<b>No. of Post Docs:</b>	0	<b>No. of PhD Degrees:</b>	0
<b>No. of PhD Candidates:</b>	0	<b>No. of Master' Degrees:</b>	0
<b>No. of Master's Candidates:</b>	0	<b>No. of Bachelor's Degrees:</b>	0
<b>No. of Bachelor's Candidates:</b>	0	<b>Monitoring Center:</b>	NASA JSC
<b>Contact Monitor:</b>	Elgart, Robin	<b>Contact Phone:</b>	281-244-0596 (o)/832-221-4576 (m)
<b>Contact Email:</b>	<a href="mailto:shona.elgart@nasa.gov">shona.elgart@nasa.gov</a>		
<b>Flight Program:</b>			
<b>Flight Assignment:</b>	NOTE: End date changed to 12/31/2023 per NSSC information (Ed., 10/29/23) NOTE: End date changed to 7/1/2023 per NSSC information (Ed., 4/3/23) NOTE: End date changed to 7/1/2022 per NSSC information (Ed., 6/22/21) NOTE: End date changed to 7/1/2021 per NSSC information (Ed., 9/25/20)		
<b>Key Personnel Changes/Previous PI:</b>	April 2021 report: Dr. Peter Lee is no longer CoInvestigator on the project.		
<b>COI Name (Institution):</b>			
<b>Grant/Contract No.:</b>	80NSSC18K1691		

<b>Performance Goal No.:</b>	
<b>Performance Goal Text:</b>	
<b>Task Description:</b>	To reduce the uncertainty in estimates of cancer and cardiovascular risks from space radiation, we will evaluate changes in molecular biomarkers in rodents and rabbits exposed to ions relevant to exposures of astronauts in the space environment. Serum, heart, liver, and lung tissues collected from exposed animals and matching controls (as available) will be used for biomarker discovery following systems-biology approaches. The study will use modern analytic technologies and rigorous statistics for assessing changes in expression of microRNAs (miRNAs) associated with clinical endpoints for mechanistic understanding of disease initiation and progression. Analysis of samples from patients receiving radiation therapy and organ targeted and organ protected low-linear energy transfer (LET) irradiation model studies have shown changes in circulating miRNAs originating from organ systems as a function of dose exposed and time. Circulating miRNAs collected from mice exposed to low doses of neutrons will be compared with gamma rays and sham controls of changes in cancer endpoints. Cellular and molecular mechanisms involved in space radiation-induced cardiovascular disease, and cancer will be studied, which will contribute to risk assessment and developing effective countermeasures.
<b>Rationale for HRP Directed Research:</b>	
<b>Research Impact/Earth Benefits:</b>	The goal is to develop blood test for early detection of delayed cardiovascular complications and cancers resulting from high-LET radiation exposure to astronauts during long duration space travel.
<b>Task Progress:</b>	In the reporting period, lung and liver specimens collected from mice exposed to relevant doses of high-LET radiation were compared for the discovery of long non-coding RNAs (lncRNAs) as biomarkers and potential regulators of radiation carcinogenesis. Samples collected from NASA-sponsored animal studies were evaluated for lncRNAs in mice irradiated with various low doses (sham, 118mGy and 400mGy) of neutrons at chronic dose rates and euthanized ~800 days post-exposure for tissue sampling.
<b>Bibliography Type:</b>	Description: (Last Updated: 06/02/2023)
<b>Abstracts for Journals and Proceedings</b>	Liu J, Yadav M, Jacob NK. " Identification of long non-coding RNA altered in lung after exposure to chronic low-dose space relevant radiation." NASA Human Research Program Investigators' Workshop, February 2023. Abstracts. NASA Human Research Program Investigators' Workshop, Galveston, Texas, February 7-9, 2023. , Feb-2023
<b>Articles in Peer-reviewed Journals</b>	Yadav M, Liu J, Song F, Mo X, Jacob NR, Xu-Welliver M, Chakravarti A, Jacob NK. "Utility of circulating microRNA-150 for rapid evaluation of bone marrow depletion after radiation, and efficiency of bone marrow reconstitution." Int J Radiat Oncol Biol Phys. 2022 Mar 15;112(4):964-974. <a href="https://doi.org/10.1016/j.ijrobp.2021.10.150">https://doi.org/10.1016/j.ijrobp.2021.10.150</a> ; PubMed <a href="https://pubmed.ncbi.nlm.nih.gov/34767935/">PMID: 34767935</a> , Mar-2022