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| **Fiscal Year:** | FY 2018 | **Task Last Updated:** | FY 01/29/2018 |
| **PI Name:** | Rithidech, Kanokporn Ph.D. | | |
| **Project Title:** | Effects of Space Flights on the Proteome of Astronauts' Plasma | | |
| **Division Name:** | Human Research | | |
| **Program/Discipline:** | | | |
| **Program/Discipline--Element/Subdiscipline:** | HUMAN RESEARCH--Biomedical countermeasures | | |
| **Joint Agency Name:** | | **TechPort:** | No |
| **Human Research Program Elements:** | (1) **HHC**:Human Health Countermeasures | | |
| **Human Research Program Risks:** | (1) **Immune**:Risk of Adverse Health Event Due to Altered Immune Response | | |
| **Space Biology Element:** | None | | |
| **Space Biology Cross-Element Discipline:** | None | | |
| **Space Biology Special Category:** | None | | |
| **PI Email:** | Kanokporn.Rithidech@sbumed.org | **Fax:** | FY (631) 444-3424 |
| **PI Organization Type:** | UNIVERSITY | **Phone:** | (631) 444-3446 |
| **Organization Name:** | State University New York at Stony Brook | | |
| **PI Address 1:** | Department of Pathology | | |
| **PI Address 2:** | BHS T9 Health Sciences Center | | |
| **PI Web Page:** | | | |
| **City:** | Stony Brook | **State:** | NY |
| **Zip Code:** | 11794-8691 | **Congressional District:** | 1 |
| **Comments:** | | | |
| **Project Type:** | FLIGHT | **Solicitation / Funding Source:** | 2014-15 HERO NNJ14ZSA001N-MIXEDTOPICS. Appendix E: Behavioral Health & Human Health Countermeasures Topics |
| **Start Date:** | 04/01/2016 | **End Date:** | 03/31/2019 |
| **No. of Post Docs:** | 0 | **No. of PhD Degrees:** | 0 |
| **No. of PhD Candidates:** | 0 | **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:** | NASA JSC |
| **Contact Monitor:** | Norsk, Peter | **Contact Phone:** | |
| **Contact Email:** | Peter.norsk@nasa.gov | | |
| **Flight Program:** | | | |
| **Flight Assignment:** | Flight definition | | |
| **Key Personnel Changes/Previous PI:** | | | |
| **COI Name (Institution):** | Martin, Dwight Ph.D. ( State University of New York, Stony Brook ) | | |
| **Grant/Contract No.:** | NNX16AH80G | | |
| **Performance Goal No.:** | | | |
| **Performance Goal Text:** | | | |

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| **Task Description:** | NOTE: This is an integrated project consisting of Dr. Brian Crucian's "Functional Immune Alterations, Latent Herpesvirus Reactivation, Physiological Stress, and Clinical Incidence Onboard the International Space Station" directed research; and Dr. Richard Simpson's "The Impact of an ISS Mission on the Anti-Viral and Functional Properties of NK-cells, T-cells, B-cells and Dendritic Cells," Dr. Kanokporn Rithidech's "Effects of Space Flights on the Proteome of Astronauts' Plasma," and Dr. Honglu Wu's "DNA Damage in the ISS Astronaut's Lymphocytes and Their Association with Stress-Induced Immune Dysfunction" solicited research.<br>Space flight results in exposure of astronauts to several stressors, such as space radiation, microgravity, and physiological stress, that could exacerbate the risks of adverse health effects. To protect astronauts, we must improve our understanding of molecular changes that influence immunological conditions associated with increased astronaut health risks. The in vivo response to the space environment is complex, involving multiple proteins associated with various signal transduction cascades, resulting in different outcomes. Molecular mechanisms responsible for such diverse consequences are poorly understood. It is, therefore, essential to characterize the protein signatures of responses to the space environment in blood plasma samples from astronauts, collected at pre-, in-, and post-flights. Such analyses should help to reveal a particular set of proteins causing adverse immunological changes and to develop methods that help to prevent, or at least to counteract, these effects.<br><br>In this flight definition project, we will use cutting age proteomic technology to determine protein alterations, qualitatively and quantitatively, in plasma samples collected from astronauts before, during, and after space flights. Our findings will help to provide an understanding of the time course and etiology of immune changes induced by the space environment. Furthermore, since pre- and post-flight samples, in addition to the in-flight samples, will be evaluated in the same astronaut, the direct effects of the space environment can be determined. Hence, our findings will provide high-priority and highly relevant information to NASA. We will further correlate protein expression profiles to the available data on immune dysfunction detected in each astronaut. This approach makes it possible to determine potential predictive biomarkers for space-flight-induced immune dysregulation. Consequently, effective countermeasures against such harmful effects of the space environment can be identified. |
| **Rationale for HRP Directed Research:** | |
| **Research Impact/Earth Benefits:** | Our findings will deliver important information that should advance our understanding of the time course and etiology of immune changes induced by the space environment. Hence, our findings will provide high-priority and highly relevant information to NASA. Importantly, we will correlate protein expression profiles to the available data on immune dysfunction detected in each astronaut. This approach makes it possible to determine potential predictive biomarkers for space-flight-induced immune dysregulation. Such knowledge is important for assessment of health risks and will facilitate the development of appropriate countermeasures that can help astronauts, space travelers, and people on Earth with the impairment of the immune system. |
| **Task Progress:** | We have completed our experiments on stability testing of plasma samples received from NASA Functional Immunology that were kept at room temperature (RT) for different times prior to storage at -80oC for proteomic analyses, i.e., 0 (immediately) hour (hr), day (d) 1, d2, and d3. These samples were collected using two types of anticoagulants, i.e., anticoagulant citrate dextrose (ACD) and ethylenediamine tetra acetic acid (EDTA), which may create variability in proteome yield both quantitatively and qualitatively. Additional variation can be introduced by downstream due to the necessary manipulations of sample preparation. It’s important to understand the level of variability. Hence, since the last report our effort has been to focus on understanding the variability of the observed proteome within and between the samples.<br>Our data on protein concentrations show no effects of time in keeping samples at room temperature prior to storage at -80oC. Additionally, there was no clear difference between the ACD and EDTA samples. We also optimized the procedures for sample preparation prior to mass spectrometry analyses. Such optimal conditions will be used to study the proteome of astronauts’ plasma samples which will be the focus of our project in the next fiscal year. |
| **Bibliography Type:** | Description: (Last Updated: 05/17/2023) |