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| <b>Fiscal Year:</b>                                    | FY 2012                                                                                                                                                                                                                                                                                                    | <b>Task Last Updated:</b>                 | FY 11/17/2011                 |
| <b>PI Name:</b>                                        | Lorenzi, Hernan Ph.D.                                                                                                                                                                                                                                                                                      |                                           |                               |
| <b>Project Title:</b>                                  | Study of the Impact of Long-term Space Travel on the Astronaut's Microbiome                                                                                                                                                                                                                                |                                           |                               |
| <b>Division Name:</b>                                  | Human Research                                                                                                                                                                                                                                                                                             |                                           |                               |
| <b>Program/Discipline:</b>                             | HUMAN RESEARCH                                                                                                                                                                                                                                                                                             |                                           |                               |
| <b>Program/Discipline--<br/>Element/Subdiscipline:</b> |                                                                                                                                                                                                                                                                                                            |                                           |                               |
| <b>Joint Agency Name:</b>                              |                                                                                                                                                                                                                                                                                                            | <b>TechPort:</b>                          | No                            |
| <b>Human Research Program Elements:</b>                | (1) <b>HHC:</b> Human Health Countermeasures                                                                                                                                                                                                                                                               |                                           |                               |
| <b>Human Research Program Risks:</b>                   | (1) <b>Medical Conditions:</b> Risk of Adverse Health Outcomes and Decrements in Performance Due to Medical Conditions that occur in Mission, as well as Long Term Health Outcomes Due to Mission Exposures<br>(2) <b>Microhost:</b> Risk of Adverse Health Effects Due to Host-Microorganism Interactions |                                           |                               |
| <b>Space Biology Element:</b>                          | None                                                                                                                                                                                                                                                                                                       |                                           |                               |
| <b>Space Biology Cross-Element<br/>Discipline:</b>     | None                                                                                                                                                                                                                                                                                                       |                                           |                               |
| <b>Space Biology Special Category:</b>                 | None                                                                                                                                                                                                                                                                                                       |                                           |                               |
| <b>PI Email:</b>                                       | <a href="mailto:hernan.lorenzi@nih.gov">hernan.lorenzi@nih.gov</a>                                                                                                                                                                                                                                         | <b>Fax:</b>                               | FY                            |
| <b>PI Organization Type:</b>                           | NON-PROFIT                                                                                                                                                                                                                                                                                                 | <b>Phone:</b>                             | 301-480-0648                  |
| <b>Organization Name:</b>                              | National Institute of Health                                                                                                                                                                                                                                                                               |                                           |                               |
| <b>PI Address 1:</b>                                   | Laboratory of Biochemistry and Genetics, Cell Cycle Regulation and Nuclear Structure Section                                                                                                                                                                                                               |                                           |                               |
| <b>PI Address 2:</b>                                   | 9000 Rockville Pike                                                                                                                                                                                                                                                                                        |                                           |                               |
| <b>PI Web Page:</b>                                    |                                                                                                                                                                                                                                                                                                            |                                           |                               |
| <b>City:</b>                                           | Bethesda                                                                                                                                                                                                                                                                                                   | <b>State:</b>                             | MD                            |
| <b>Zip Code:</b>                                       | 20892                                                                                                                                                                                                                                                                                                      | <b>Congressional District:</b>            | 8                             |
| <b>Comments:</b>                                       |                                                                                                                                                                                                                                                                                                            |                                           |                               |
| <b>Project Type:</b>                                   | FLIGHT                                                                                                                                                                                                                                                                                                     | <b>Solicitation / Funding<br/>Source:</b> | 2010 Crew Health NNJ10ZSA003N |
| <b>Start Date:</b>                                     | 10/01/2011                                                                                                                                                                                                                                                                                                 | <b>End Date:</b>                          | 09/30/2014                    |
| <b>No. of Post Docs:</b>                               |                                                                                                                                                                                                                                                                                                            | <b>No. of PhD Degrees:</b>                |                               |
| <b>No. of PhD Candidates:</b>                          |                                                                                                                                                                                                                                                                                                            | <b>No. of Master' Degrees:</b>            |                               |
| <b>No. of Master's Candidates:</b>                     |                                                                                                                                                                                                                                                                                                            | <b>No. of Bachelor's Degrees:</b>         |                               |
| <b>No. of Bachelor's Candidates:</b>                   |                                                                                                                                                                                                                                                                                                            | <b>Monitoring Center:</b>                 | NASA ARC                      |
| <b>Contact Monitor:</b>                                | Bhattacharya, Sharmila                                                                                                                                                                                                                                                                                     | <b>Contact Phone:</b>                     |                               |
| <b>Contact Email:</b>                                  | <a href="mailto:Sharmila.Bhattacharya@nasa.gov">Sharmila.Bhattacharya@nasa.gov</a>                                                                                                                                                                                                                         |                                           |                               |
| <b>Flight Program:</b>                                 | ISS                                                                                                                                                                                                                                                                                                        |                                           |                               |
| <b>Flight Assignment:</b>                              | ISS                                                                                                                                                                                                                                                                                                        |                                           |                               |
| <b>Key Personnel Changes/Previous PI:</b>              |                                                                                                                                                                                                                                                                                                            |                                           |                               |
| <b>COI Name (Institution):</b>                         | Peterson, Scott ( J Craig Venter Institute, Inc. )<br>Williamson, Shannon ( J Craig Venter Institute, Inc. )                                                                                                                                                                                               |                                           |                               |
| <b>Grant/Contract No.:</b>                             | NNX12AB02G                                                                                                                                                                                                                                                                                                 |                                           |                               |
| <b>Performance Goal No.:</b>                           |                                                                                                                                                                                                                                                                                                            |                                           |                               |
| <b>Performance Goal Text:</b>                          |                                                                                                                                                                                                                                                                                                            |                                           |                               |

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| <b>Task Description:</b>                    | <p>Our goal is to determine how the composition of the human microbiome changes during long-term space exploration and to evaluate its potential impact on crew member's health. Some microbial species from the human microbiome have a beneficial or protective effect on health; the loss of these species can lead to an altered metabolic function and, in conjunction with reduced immune response, may increase the chance of infection by opportunistic pathogens. In our proposal we will elaborate the notion of the microbiome as harbingers or sentinels to monitor a variety of aspects of the human host, including associations with health status, environmental stress, and exposure to space conditions. By sampling the microbiome of astronauts on earth while in peak physical health and during subsequent times of stress, including long-term exposure to microgravity, g-forces, radiation and changes in health status, we will be able to define signatures of human response to a variety of relevant aspects of space travel. We propose to characterize the prokaryotic and viral microbiome from various body sites of up to six astronauts who travel to space and three control astronauts from the backup crew at several time points before, during, and after a space mission as well as gastrointestinal/fecal collection before and after the mission. Also we will assess the astronauts' immune function before, during, and after the mission by analyzing their collected saliva samples for reactivated latent viruses and cortisol levels, two indicators commonly evaluated during spaceflight immune studies and cytokines from blood samples. Finally, we will correlate the microbiome and immune function data collected with other measured metadata including astronaut health and hygiene as well as environmental factors such as temperature, humidity and environmental metagenomic sequence samples that will be collected, depending upon availability, from various surfaces on the International Space Station and Soyuz spacecraft.</p> |
| <b>Rationale for HRP Directed Research:</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Research Impact/Earth Benefits:</b>      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Task Progress:</b>                       | New project for FY2012.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Bibliography Type:</b>                   | Description: (Last Updated: 04/10/2021)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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