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| <b>Fiscal Year:</b>                               | FY 2015   | <b>Task Last Updated:</b>             | FY 11/17/2014                     |
| <b>PI Name:</b>                                   | Levine, Benjamin D M.D.   |                                       |                                   |
| <b>Project Title:</b>                             | Effects of Microgravity on Intracranial Pressure  |                                       |                                   |
| <b>Division Name:</b>                             | Human Research  |                                       |                                   |
| <b>Program/Discipline:</b>                        | NSBRI   |                                       |                                   |
| <b>Program/Discipline--Element/Subdiscipline:</b> | NSBRI--Cardiovascular Alterations Team  |                                       |                                   |
| <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>VIIP</b> :Risk of Spaceflight-Induced Intracranial Hypertension/Vision Alterations (IRP Rev E)   |                                       |                                   |
| <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:benjaminlevine@texashealth.org">benjaminlevine@texashealth.org</a>  | <b>Fax:</b>                           | FY 214 345-4618                   |
| <b>PI Organization Type:</b>                      | UNIVERSITY  | <b>Phone:</b>                         | 214-345-4619                      |
| <b>Organization Name:</b>                         | The University of Texas Southwestern Medical Center at Dallas   |                                       |                                   |
| <b>PI Address 1:</b>                              | Institute for Exercise and Environmental Medicine (IEEM)  |                                       |                                   |
| <b>PI Address 2:</b>                              | 7232 Greenville Ave, Suite 435  |                                       |                                   |
| <b>PI Web Page:</b>                               |   |                                       |                                   |
| <b>City:</b>                                      | Dallas  | <b>State:</b>                         | TX                                |
| <b>Zip Code:</b>                                  | 75231-5129  | <b>Congressional District:</b>        | 5                                 |
| <b>Comments:</b>                                  |   |                                       |                                   |
| <b>Project Type:</b>                              | GROUND  | <b>Solicitation / Funding Source:</b> | 2011 Crew Health<br>NNJ11ZSA002NA |
| <b>Start Date:</b>                                | 10/01/2012  | <b>End Date:</b>                      | 10/31/2015                        |
| <b>No. of Post Docs:</b>                          | 5   | <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>             | NSBRI                             |
| <b>Contact Monitor:</b>                           | <b>Contact Phone:</b>   |                                       |                                   |
| <b>Contact Email:</b>                             |   |                                       |                                   |
| <b>Flight Program:</b>                            |   |                                       |                                   |
| <b>Flight Assignment:</b>                         | NOTE: End date changed to 10/31/2015 per NSBRI (Ed., 9/25/15)   |                                       |                                   |
| <b>Key Personnel Changes/Previous PI:</b>         |   |                                       |                                   |
| <b>COI Name (Institution):</b>                    | Hastings, Jeffrey ( The University of Texas Southwestern Medical Center at Dallas )<br>Whitworth, Louis ( The University of Texas Southwestern Medical Center at Dallas )<br>Williams, Michael ( Sinai Hospital of Baltimore, Inc. )<br>Zhang, Rong ( The University of Texas Southwestern Medical Center at Dallas ) |                                       |                                   |
| <b>Grant/Contract No.:</b>                        | NCC 9-58-CA02801  |                                       |                                   |
| <b>Performance Goal No.:</b>                      |   |                                       |                                   |
| <b>Performance Goal Text:</b>                     |   |                                       |                                   |

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| <b>Task Description:</b>                    | Humans have been travelling in space for more than 40 years without clear evidence of visual impairment in astronauts. However, very recently, it has been identified that some astronauts on the International Space Station seem to be at risk for visual changes that may be due to elevated pressure inside the head (intracranial pressure). It is well known that there is a relative shift in fluid towards the head in humans during space flight (microgravity) and therefore these changes may increase intracranial pressure to a greater degree than previously appreciated. Intracranial pressure may also be exacerbated or transiently elevated by small increases in the partial pressure of carbon dioxide in the International Space Station atmosphere and during strength training exercise that are employed to try and maintain astronaut's muscle mass. Therefore, the primary aim of this project will be to provide novel data about the impact of microgravity induced central fluid shifts on directly measured intracranial pressure, and the associated inflow and outflow of blood to the brain, accompanied by simultaneous assessment of structural changes in the eye. Furthermore, we will examine the above factors during small changes in atmospheric carbon dioxide and during strength training exercise in simulated microgravity. This information is entirely unknown and absolutely essential to establishing the pathophysiology of the recently identified visual impairments in some long duration astronauts, so as to develop appropriate countermeasures. |
| <b>Rationale for HRP Directed Research:</b> |  |
| <b>Research Impact/Earth Benefits:</b>      | The project will have implications for public health and will provide a better understanding of the regulation of intracranial pressure in normal healthy individuals and thus will offer an improved knowledge base to provide effective treatments for a wide range of intracranial disorders.   |
| <b>Task Progress:</b>                       | Institutional Review Board approval for this investigation has been obtained. 3 subjects have completed the bedrest protocol and 4 subjects have completed the flight experiment protocol.   |
| <b>Bibliography Type:</b>                   | Description: (Last Updated: 09/27/2021)  |