Astronauts on long term missions in deep space will be placed at risk from a variety of hazards. Some of these are known while others may be anticipated. Damage to hematopoietic stem cells as a result of radiation exposure is an example of the latter. Our long term goal is to identify and quantitate the risks of deep space radiation to the human hematopoietic system, with particular emphasis on the hematopoietic stem cell. Stem cells are the ultimate source of both the blood and immune systems and damage to these cells could have grave immediate, and long term consequences. At the same time, because these cells can be readily removed from the body, manipulated, and stored, they are also unique candidates for countermeasures that might obviate, or totally negate, damage incurred to them. Accordingly, this project will have three specific aims which support our long term goal and these are to: 1] Investigate the cellular consequences of exposing human hematopoietic stem (HSC) and progenitor (HPC) cells to an environment which simulates the radiation environment of deep space; 2] Examine the molecular consequences of exposing human
### Task Description:

Hematopoietic stem cells to an environment which simulates the radiation environment of deep space. This aim has two purposes. If radiation leads to degradation of hematopoietic cell function it will clearly be of interest to look for the molecular lesions potentially responsible for such damage. Alternatively, more long term, but initially occult damage may also be induced. The consequences of such damage could lead either to a complete failure of hematopoiesis (aplastic anemia) or the development of hematologic malignancies. Identification of such damage is therefore important; and 3) Design potential countermeasures to obviate or negate cellular and molecular damage discerned during the course of carrying out Aims 1 and 2. We propose both simple and more complex solutions to problems that might be identified during the course of this study. We suggest that prophylactic (pre-flight) harvest and storage of astronaut stem cells might be a safe, effective, and relatively inexpensive mechanism for countering long term damage to cells of the hematopoietic systems. Countermeasures which might prove effective in combating damage encountered during flight will also be developed and explored for their utility.

### Rationale for HRP Directed Research:

### Research Impact/Earth Benefits:

### Task Progress:

No progress report this period.

### Bibliography Type:

Description: (Last Updated: 04/12/2011)