



**Identification/Significance of Innovation:**

- Deep-space exploration flights carry with them a high risk to human health, particularly from exposure to space radiation (even low doses)
- Diagnosis of exposure, development of protectants/countermeasures depend on the ability to accurately identify and separate rare genetically altered and damaged cells
- Current methods for identification and separation of these cells are manual labor intensive and require central laboratories. There is a clear need for, using novel, non-destructive surface markers, a miniaturized, automated device to sort radiation damaged cells

**Work Plan:**

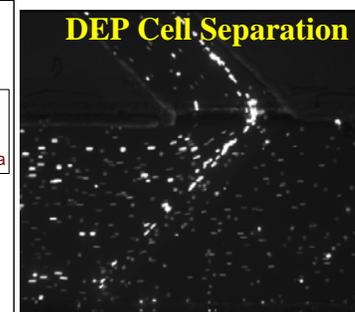
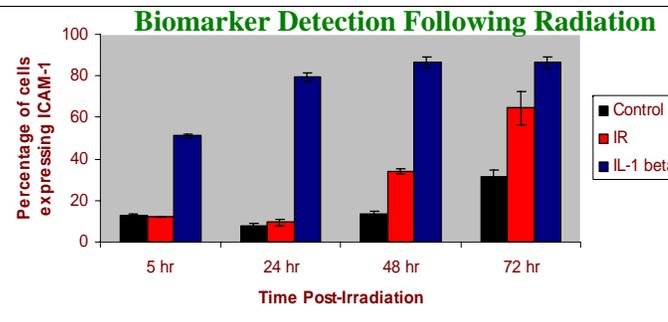
Approach:

- Cells (endothelial) will be radiated with dose of 1 to 10cGy.
- Gene expression studies will be performed at 30min, 4 & 24 hr post radiation to identify expression levels and patterns
- Fluorescent antibody assays will be used to verify biomarker
- Radiation-damaged cells will be separated from a population of undamaged cells with antibody-coated beads as a tag, using the CFDRC DEP sorter. The time for separation and efficiency will be studied.
- Phase II effort will focus on (a) further selection and optimization of biomarker (b) integration and development of the miniaturized automated platform for sorting.

**Technical Objectives:**

Our overall objective is to identify and rapidly separate radiation damaged cells, including those with < 1Mbp damage, from cell/tissue samples, in a miniaturized, microfluidic platform

- Identify novel cell surface markers indicating radiation damage using a combination of microarray (gene expression) and fluorescent antibody (protein upregulation) techniques
- Use CFDRC's proprietary Dielectrophoretic (DEP) sorter device for automated separation of damaged cells from overall population of cells.



**NASA and Non-NASA Applications:**

- The proposed approach will benefit both NASA and medical applications such as automated separation of rare cell population (tumors, blood biomarkers, stem cells, etc.)

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