

Fiscal Year:	FY 2006	Task Last Updated:	FY 09/13/2006
PI Name:	Geard, Charles Ray Ph.D.		
Project Title:	Human endothelial cells in 2-D and 3-D systems; non-cancer effects and space-related radiations		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Radiation health		
Joint Agency Name:		TechPort:	No
Human Research Program Elements:	(1) SR: Space Radiation		
Human Research Program Risks:	(1) Cardiovascular: Risk of Cardiovascular Adaptations Contributing to Adverse Mission Performance and Health Outcomes		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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Zip Code:	10032-3702	Congressional District:	15
Comments:			
Project Type:	GROUND	Solicitation / Funding Source:	2004 Radiation Biology NNH04ZUU005N
Start Date:	10/01/2005	End Date:	09/30/2009
No. of Post Docs:	2	No. of PhD Degrees:	
No. of PhD Candidates:		No. of Master' Degrees:	
No. of Master's Candidates:		No. of Bachelor's Degrees:	
No. of Bachelor's Candidates:		Monitoring Center:	NASA JSC
Contact Monitor:		Contact Phone:	
Contact Email:			
Flight Program:			
Flight Assignment:			
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Jenkins-Baker, Gloria (Columbia University) Grabham, Peter (Columbia University) Hu, Burong (Columbia University) Ponnaiya, Brian (Columbia University)		
Grant/Contract No.:	NNJ05HI37G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	<p>Though not prone to carcinogenic change the endothelial cell is of critical importance to the normal functioning of all tissues and organs of the body. Endothelial cells constitute the linings of the blood circulatory system, and disruption of this function can lead to multiple changes, from minor to catastrophic. Cardio-vascular diseases are the leading cause of death in developed societies. Endothelial cells have been studied in monolayers [2-dimensional] for many years, however it is clear that cell behavior in the third dimension [tissue-like structures] is not necessarily well represented by such studies. Recognizing the crucial role of the endothelial cell we studied the radiation sensitivity of the chromosomes of normal human umbilical vein endothelial cells [HUVEC] to low LET radiation. It was determined that chromatid-type aberrations in late G2 cells were exquisitely linearly sensitive to radiation doses in the range 0.0125 to 0.8 Gy. This response was ~ 3 times more sensitive than that of early-mid G2 cells, and ~15 times more sensitive than for chromosome-type aberrations in non-cycling G1 cells [dose range, 0.5-8.0 Gy]. Recently we have obtained 3-dimensional capillary like tubular structures from the culture of HUVECs in collagen gel matrices. We propose to irradiate 2D [cell monolayers] and 3D [capillary-like cell structures] with Fe ions at 1GeV with doses where a bystander effect may apply [< 0.1 Gy] to doses where multiple traversals are expected [up to 1Gy]. We will compare responses to low LET X-rays and to alpha particles at the same LET as the Fe ions, where delta rays are less likely to be influential. Chromosomal changes using G2-PCC's and state of the art m-FISH, micronuclei, apoptosis and cell-cell, cell-matrix interacting proteins will be quantified. We hypothesize that 2D versus 3D culture results in no difference in the responsiveness of human endothelial cells. We further hypothesize that space related radiations are not more effective than low LET radiations for these cells with their crucial role in the maintenance of normal bodily functions.</p>
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	<p>Understanding the effects of ionizing radiation on the human endothelial cell and its consequences may aid in assessing the impact of diseases involving the circulatory system in general.</p>
Task Progress:	<p>In this first year of this grant the first irradiations of normal human endothelial cells with 1Gev iron ions and 1 GeV protons was undertaken during the summer run at the NASA sponsored facility at the Brookhaven National Laboratory. Evaluations of radiation induced chromosomal exchanges as a function of dose and time are in progress and no conclusion can be drawn at this time.</p>
Bibliography Type:	Description: (Last Updated: 06/03/2013)
Abstracts for Journals and Proceedings	<p>Geard C, Jenkins-Baker G, Grabham P, Hu B, Ponnaiya B. "Human endothelial cells in 2-D and 3-D systems; non-cancer effects and space-related radiations." International Space Radiation Health Meeting and Space Radiation Health Investigators Workshop, Moscow and St. Petersburg, Russia, June, 2006. Space Radiation Health Investigators Workshop, Moscow and St. Petersburg, Russia, June, 2006. , Jun-2006</p>