Fiscal Year:	FY 2006	**Task Last Updated:**	FY 05/25/2006
PI Name:	Burma, Sandeep Ph.D.		
Project Title:	Molecular and Cellular Effects of Heavy Ion Fragmentation due to Shielding		
Division Name:	Human Research		
Program/Discipline:	HUMAN RESEARCH		
Program/Discipline--Element/Subdiscipline:	HUMAN RESEARCH--Radiation Biology		
Joint Agency Name:		**TechPort:**	No
Human Research Program Elements:	(1) **SR**:Space Radiation		
Human Research Program Risks:	(1) **ARS**:Risk of Acute Radiation Syndromes Due to Solar Particle Events (SPEs) (2) **Cancer**:Risk of Radiation Carcinogenesis (3) **CNS**:Risk of Acute (In-flight) and Late Central Nervous System Effects from Radiation Exposure (4) **Degen**:Risk of Cardiovascular Disease and Other Degenerative Tissue Effects From Radiation Exposure and Secondary Spaceflight Stressors		
Space Biology Element:	None		
Space Biology Cross-Element Discipline:	None		
Space Biology Special Category:	None		
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PI Organization Type:	UNIVERSITY	**Phone:**	210-450-8981
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City:	San Antonio	**State:**	TX
Zip Code:	78229	**Congressional District:**	21
Comments:	NOTE: Formerly at University of Texas Southwestern Medical Center at Dallas until fall 2019.		
Project Type:	GROUND	**Solicitation / Funding Source:**	2004 Radiation Biology NNH04ZUU005N
Start Date:	10/01/2005	**End Date:**	09/30/2009
No. of Post Docs:		**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 ARC
Contact Monitor:		**Contact Phone:**	
Contact Email:			
Flight Program:			
Flight Assignment:	NOTE: Changed Division and Discipline/Program to HRP as of FY2006, per program changes at that time, per JSC/A. Chu-ARC (jvp 4/2009)		
Key Personnel Changes/Previous PI:			
COI Name (Institution):	Chen, David (University of Texas Southwestern Medical Center at Dallas)		
Grant/Contract No.:	NNA05CS97G		
Performance Goal No.:			
Performance Goal Text:			

Task Description:	Galactic cosmic rays (GCRs) represent a major risk to human crews on long-term missions outside the Earth's magnetic field. The GCR consists of protons, helium nuclei and HZE (High Z and Energy) particles such as iron. Understanding the radiobiology HZE particles is of enormous interest as the energy of these particles can be sufficient in many cases to penetrate the spacecraft hull and interior materials. While traversing through matter, high energy radiation fragments into a large number of secondary particles with generally lower energy but with higher ranges and biological effects than the incident cosmic rays. Therefore, an exact knowledge of the biological effects of shielding is important not only for understanding the risks to humans on space flights but also for determining optimal shielding for space crafts. Previous studies have used relatively late end points such as chromosome aberrations and cells survival to elucidate the biological consequences of fragmentation due to shielding. The early response of a mammalian cell to ionizing radiation has recently been very clearly elucidated at the molecular level in the context of the relocation and modification of damage-responsive factors and these very early events have a very important bearing on the repair of DNA damage and the ultimate fate of the cell. In this proposal we aim to study the biological effects of shielding using these pertinent early molecular responses as end points. Specific Aims are: 1) To test the hypothesis that shielded heavy ions may result in more complex DNA damage to the cells as compared to unshielded heavy ions, 2) To test the hypothesis that the molecular response to shielded radiation is different from that induced by unshielded radiation, and 3) To test the hypothesis that shielded radiation may have more deleterious effects on the cell as compared to unshielded radiation and to elucidate the mechanisms involved in repair of DNA damage. Preliminary studies carried out during the first experimental run at Brookhaven National Laboratory (NSRL-6A) indicate that significant differences exist between DNA damage caused by unshielded Fe particles versus particles that have passed through different shielding materials. Future studies will be aimed at elucidating the molecular and cellular consequences of HZE-induced DNA damage of differing complexities.
Rationale for HRP Directed Research:	
Research Impact/Earth Benefits:	
Task Progress:	This is a new grant for the FY2006 year. For more information on this project, please contact the help desk at taskbook@nasaprs.com.
Bibliography Type:	Description: (Last Updated: 04/27/2023)