Task Book Report Generated on: 04/17/2024

Fixed Versity PV 2017 Task Last Updated: FV 90/03/2017 Pl Name: Well, Michael Ph.D. Privation Name: Human Research Program/Discipline: Program/Discipline: Program/Discipline: Program/Discipline: UMAN RESEARCH-Radiation health Joint Agency Name: TechPort: No Human Research Program Elements: (I) SRS-pace Radiation Human Research Program Risks: (I) Cameer, Risk of Radiation Carcinogenesis Space Biology Element: None Space Biology Special Category: None PI Email: michael weih@cohostate.eds Fax: FY PI Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Type: UNIVERSITY Phone: 970-491-5902 PI Address 1: Department of Environmental & Radiological Health Sciences PI Address 2: Island State University PI Address 2: Space Biology Section Colliss State University PI Address 3: Department of Environmental & Radiological Health Sciences PI Verb Page: City: For Collins State University Project Type: GROUND Solication / Funding 2013-14 HERO NNUISZSA002N-N: Solication / Punding 2013-14 HERO NNUISZSA002N-N: Solication / Punding 2013-14 HERO NNUISZSA002N-N: Solicati				
Project Title: NSCOR: NASA Specialized Center of Research on Carcinogenesis Division Name: Human Research Program/Discipline: Program/Discipline: HUMAN RESEARCH—Radiation health Joint Agency Name: TechPort: No Human Research Program Elements: (1) SR.Space Radiation Human Research Program Elements: (1) SR.Space Radiation Human Research Program Risks: (1) Cancer-Risk of Radiation Carcinogenesis Space Biology Element: None Space Biology Cross-Element Discipline: None Space Biology Special Category: None PI Email: michael-weildiscolosatate adu Fax: FY PI Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Name: Colorado Siate University PI Address 1: Department of Environmental & Radiological Health Sciences PI Address 2: 1618 Campus Delivery PI Web Page: City: Fort Collins State: CO Zip Code: 80521-2807 Congressional District: 4 Comments: Project Type: GROUND Solicitation / Funding 2013-14 HERO NNJ13ZSA002N-N: Source: Radiation Start Date: 06-001/2015 End Date: 05:500/2020 No. of Phot Decree: No. of Phot Decree: 1 No. of Phot Decree: No. of Master' Degrees: 0 No. of Master's Candidates: 1 No. of Master' Degrees: 0 No. of Master's Candidates: 1 Monitoring Center: NASA ISC Contact Email: lisa c simonsentions gov Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: Ermont, Mark Ph.D. (Colorado State University) Ermont, Mark Ph.D. (University Of Texas, Galveston) Hone, Taken, Douglas VMD, Colorado State University Degrees: 1 Flaght Assignment: HUMAN Ph.D. (University Of Texas, Galveston) Hone, Taken, Douglas VMD, Colorado State University Degrees: 1 Flaght Program: Flight Program: Flight Program: Flight Program: Ph.D. (Promage Jorgants Indiversity) Ermont, Mark Ph.D. (Colorado State University) Bacher, Left Ph.D. (Promage Jorgantian) Ph.D. (Promage	Fiscal Year:	FY 2017	Task Last Updated:	FY 04/03/2017
Division Name: Human Research Program/Discipline: Program/Discipline: HUMAN RESEARCH-Radiation health Element/Subdiscipline: Joint Agency Mane: (I) SR Space Radiation Human Research Program Elements: (I) SR Space Radiation Human Research Program Elements: (I) Caneer Risk of Radiation Carcinogenesis Space Biology Element: Space Biology Cross-Element Discipline: None Space Riology Cross-Element Discipline: Michael Accelification of Program Risks: None Pl Email: Michael Accelification of Program Risks: Pl Organization Type: UNIVERSITY Phone: Pl Organization Type: UNIVERSITY Phone: Pl Address 1: Department of Environmental & Radiological Health Sciences Pl Address 2: Department of Environmental & Radiological Health Sciences Pl Address 2: Pl Address 2: Project Type: GROUND Solicitation Funding State: Comments: Project Type: GROUND Solicitation Funding Source: Radiation Source: Radiation No. of Pab Degress: No. of Rachelor's Candidates: No. of Ra	PI Name:	Weil, Michael Ph.D.		
Program/Discipline: Program/Discipline- Element/Subdiscipline- Element/Subdiscipline- Element/Subdiscipline- Element/Subdiscipline- Joint Agency Anne: TechPort: No	Project Title:	NSCOR: NASA Specialized Center of Research	on Carcinogenesis	
Frogram Discipline- Element Subdiscipline- HUMAN RESEARCHRadiation health TechPort: No	Division Name:	Human Research		
Element/Subdiscipline: Joint Agency Name: Joint Agency Name: (I) SR-Space Radiation Human Research Program Elements: (I) Cancer-Risk of Radiation Carcinogenesis Space Biology Element: None Space Biology Special Category: None PI Email: michael-weil/Zicolostate edu Fax: FY PI Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Name: Colorado State University PI Address 1: Department of Environmental & Radiological Health Sciences PI Email: State: CO Zip Code: S0521-2807 Congressional District: 4 Commetts: Project Type: GROUND Solicitation / Funding 2013-14 HERO NNJ13Z/SA002N-N: Source: Radiation Start Date: 06-01/2015 End Date: Soloya0200 No. of PhD Degrees: No. of Master's Candidates: 1 No. of Master's Candidates: 1 No. of Bachelor's Degrees: On. of Bachelor's Contact Honito: Simonsen, Lisa Contact Honito: Simonsen, Lisa Contact Honito: Simonsen, Lisa Contact Changes: Program: Flight Assignment: Key Personnel Changes/Previous PI: Borak, Thomas Ph.D. (Colorado State University) Flowney, Marky Ph.D. (Lythersity) Flowney, Marky Ph.D. (Colorado State University) F	Program/Discipline:			
Human Research Program Elements: (1) SR-Space Radiation Human Research Program Risks: (1) Cancer:Risk of Radiation Carcinogenesis Space Biology Element: None Space Biology Special Category: None PI Email: michael-weil@colostate.edu Fax: FY PI Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Name: Colorado State University PI Address 2: 1618 Campus Delivery PI Web Page: City: Fort Collins State: CO Zip Code: 80521-2807 Congressional District: 4 Comments: Project Type: GROUND Solicitation / Funding Solicitation / Fun		HUMAN RESEARCHRadiation health		
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Space Biology Element: None Space Biology Cross-Element Discipline: None PI Email: michael weil@colostate edu PF ax: FY PH Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Name: Colorado State University PI Address 1: Department of Environmental & Radiological Health Sciences PI Address 2: 1618 Campus Delivery PI Web Page: City: Fort Collins State: CO Zip Code: 80521-2807 Congressional District: 4 Comments: Project Type: GROUND Solicitation / Funding Source: Radiation Source: Radiation Source: Radiation Source: Radiation Source: Radiation No. of Pab Degrees: 1 No. of PhD Degrees: 1 No. of Master's Candidates: 1 No. of Master's Candidates: 1 No. of Bachelor's Candidates: 1 Monitoring Center: NASA JSC Contact Monitor: Simonsen, Lisa Contact Email: Jisae simonsen@mass.gov Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: Borak, Thomas Ph.D. (Colorado State University) Emmett, Mark Ph.D. (University Of Texas, Galveston) Hywag, Taa Hyun Ph.D. (Colorado State University) Ray, F. Andrey Ph.D. (Colorado State University) Bacher, 167 Ph.D. (Promago Corporation)	Human Research Program Elements:	(1) SR:Space Radiation		
Space Biology Cross-Element Discipline: Space Biology Special Category: None PI Email: michael weil@colostate.edu Fax: FY Pl Organization Type: UNIVERSITY Phone: 970-491-5902 Organization Name: Colorado State University PI Address 1: Department of Environmental & Radiological Health Sciences PI Address 2: 1618 Campus Delivery PI Web Page: City: Fort Collins State: CO Zip Code: 80521-2807 Congressional District: 4 Comments: Project Type: GROUND Solicitation / Funding 2013-14 HERO NNJ13ZSA002N-N: Source: Radiation Source: Radiation Source: Radiation No. of PhD Degrees: 1 No. of PhD Degrees: 1 No. of PhD Degrees: 1 No. of Master's Candidates: 1 No. of Bachelor's O Degrees: No. of Bachelor's Candidates: 1 Monitoring Center: NASA JSC Contact Monitor: Simonsen, Lisa Contact Email: Issa.e. simonsen@mass.gov Flight Program: Flight Assignment: Key Personnel Changes/Previous PI: Borak, Thomas Ph.D. (Colorado State University) Emmet, Mark Ph.D. (University of Texas, Galveston Hwang, Tae Hyun Ph.D. (University of Texas, Galveston Hwang, Tae Hyun Ph.D. (Colorado State University) Ray, F. Andrew Ph.D. (Colorado State University) Thamm, Douglas V.M.D. (Colorado State University) Bacher, Jeff Ph.D. (Propega Corporation)	Human Research Program Risks:	(1) Cancer: Risk of Radiation Carcinogenesis		
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Project Type: GROUND Solicitation / Funding Source: Radiation So	Zip Code:	80521-2807	Congressional District:	4
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No. of Post Docs: No. of PhD Candidates: 5	Project Type:	GROUND		
No. of PhD Candidates: 1	Start Date:	06/01/2015	End Date:	05/30/2020
No. of Master's Candidates: 1	No. of Post Docs:		No. of PhD Degrees:	1
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Flight Assignment: Key Personnel Changes/Previous PI: Borak, Thomas Ph.D. (Colorado State University) Emmett, Mark Ph.D. (University Of Texas, Galveston) Hwang, Tae Hyun Ph.D. (University of Texas Southwestern Medical Center at Dallas) Liber, Howard Ph.D. (Colorado State University) Ray, F. Andrew Ph.D. (Colorado State University) Thamm, Douglas V.M.D. (Colorado State University) Bacher, Jeff Ph.D. (Promega Corporation)	Contact Email:	<u>lisa.c.simonsen@nasa.gov</u>		
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Raber, Jacob Ph.D. (Oregon Health & Science University) Story, Michael Ph.D. (University of Texas Southwestern Medical Center at Dallas) Ullrich, Robert Ph.D. (University of Texas, Galveston)	COI Name (Institution):	Emmett, Mark Ph.D. (University Of Texas, Galveston) Hwang, Tae Hyun Ph.D. (University of Texas Southwestern Medical Center at Dallas) Liber, Howard Ph.D. (Colorado State University) Ray, F. Andrew Ph.D. (Colorado State University) Thamm, Douglas V.M.D. (Colorado State University) Bacher, Jeff Ph.D. (Promega Corporation) Halberg, Richard Ph.D. (University of Wisconsin, Madison) Raber, Jacob Ph.D. (Oregon Health & Science University) Story, Michael Ph.D. (University of Texas Southwestern Medical Center at Dallas)		
Grant/Contract No.: NNX15AK13G	Grant/Contract No.:	NNX15AK13G		
Performance Goal No.:	Performance Goal No.:			
Performance Goal Text:	Performance Goal Text:			

Task Book Report Generated on: 04/17/2024

Abstracts for Journals and Proceedings	Barnette B, Strain S, Lichti C, Yu Y, Ullrich R, Emmett M. "The application of lipidomics to the study of Heptocellular Carcinoma (HCC) Induced by low dose, high-energy, high charge ions (HZE)." 64th Conference on Mass Spectrometry and Allied Topics, San Antonio, TX, June 5-9, 2016. 64th Conference on Mass Spectrometry and Allied Topics, San Antonio, TX, June 5-9, 2016. Abstract book., Jun-2016
Abstracts for Journals and Proceedings	Borak TB, Ray FA, Weil MM. "Status of the Neutron Radiation Facility at CSU." 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. Abstract book., Jan-2017
Abstracts for Journals and Proceedings	Ullrich RL, Story MC, Ding L, Hwang TH, Emmett MR, Yu Y, Bacher JS, Hallberg R, Raber J, Edmondson EF, Ray FA, Thamm DH, Liber HL, Borak TB, Weil MM. "NASA Specialized Center of Research on Carcinogenesis." 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. Abstract book., Jan-2017
Bibliography Type:	Description: (Last Updated: 09/27/2023)
	For Project 4, we completed neurobehavioral testing for the one month time point and collected tissues from the mice that were tested.
Task Progress:	Project 3 involves the commissioning of a neutron irradiator in a shielded vivarium that meets the animal care requirements for long term mouse housing. Over the past year we renovated the building, calculated the activity of radioactive material required, and acquired the source and the irradiator.
	Ninety Afp-mCherry mice were irradiated or sham irradiated at NSRL. These mice are used to study HCC metastasis to the lung. The mice are being monitored for circulating tumor cells, and some have been sacrificed 3 months post-irradiation to detect the earliest stages of tumorigenesis using newly developed tissue clearing and optical approaches.
	We have begun experimental metastasis studies with MMTV-PyMT and Afp-mCherry transgenic mice. MMTV-PyMT mice are a model for mammary tumor metastasis to the lungs. We have irradiated forty-four of these mice on two different strain backgrounds and followed them for mammary tumor development. We are now quantifying the extent of metastases in the mice. Viable tumors have been cryopreserved and serially transplanted for further work.
	In Project 2 we have reviewed the pathology on 208 cases of mouse hepatocellular carcinomas (HCC) from the previous Carcinogenesis NSCOR to allow correct classification of cases as metastatic and nonmetastatic. Each case has been assigned a histologic subtype and mitotic index, and semi-quantitatively scored for local invasion, vascular invasion, cellular pleomorphism, nuclear pleomorphism, degree of differentiation, and presence of fibrosis. We have also begun to look for mutations in the tumors by sequencing DNA from five of them (whole exome sequencing). We have detected mutations in these tumors that are also common in human HCC.
	In Project 1, we have irradiated all of the mice for the first two aims with 28Si ions at NASA Space Radiation Laboratory (NSRL). We have collected serum, plasma, tissue samples, and feces for the one month time point, and we have established fibroblast cultures from 300 of the irradiated F2 mice. We have designed, produced, and validated directional genomic hybridization probes for mouse chromosomes 1 to 4 and begun to use the probes to screen fibroblasts from mice previously irradiated with 28Si ions. We have optimized a lipidomic screen for use with mouse samples.
Research Impact/Earth Benefits:	Accurately determining the cancer risk from high energy, charged particle radiation exposure is of great importance for designing human spaceflight missions, but it is becoming increasingly important for cancer radiotherapy as well. Radiation oncology appears poised to transition to charged particle radiotherapy in the form of proton therapy and carbon ion therapy. However, one of the risks of treating cancer with charged particle radiation is that the treatment itself can result in a new cancers, known as a second malignant neoplasms (SMN) (commonly used photon radiotherapy also increases SMN risk). The radiotherapy equipment and the patient treatment plans are designed to minimize SMN, but the models to predict risks from various exposures rest on some of the same assumptions about how charged particle radiation causes cancer that are being tested in this NSCOR grant. The results obtained in this program can be used to improve the design of treatment protocols and thus reduce the risks of SMN in radiotherapy patients.
Rationale for HRP Directed Research	:
Task Description:	assessment of radiation risk. The NSCOR consists of four interrelated projects. Project 1 is a biomarker discovery study using integrative "omics" approaches over multiple levels of biological organization and involving multiple species. Biomarkers predictive of the outcomes of HZE (high energy) ion exposures can be used to extrapolate findings in mice to other species, including humans, that are most relevant to NASA's exploratory missions. The biomarkers are also critical for understanding underlying carcinogenic mechanisms, early disease detection, and subsequent countermeasure development. Project 2 investigates qualitative differences in tumor progression and metastasis between HZE ion- and gamma ray-induced tumors. Project 3 examines the critical question of risk from protracted exposures to high LET (linear energy transfer) radiation at low doses and dose rates. To estimate the carcinogenic effects of these scenarios, we will use chronic exposures to high LET associated neutron radiation as a surrogate for conditions of space-relevant fluence rates and total doses. Project 4 utilizes the resources (irradiated mice and "omics" results) generated in the first three projects to study the neurobehavioral consequences of HZE ion and neutron exposures and whether they are related to tumorigenesis-related outcome measures and predicted by the same or distinct biomarkers.
	The proposed Carcinogenesis NASA Specialized Center of Research (NSCOR) addresses several key questions for the

Task Book Report Generated on: 04/17/2024

Abstracts for Journals and Proceedings	Weil MM. "High LET Radiation Carcinogenesis." 62nd Annual Meeting of the Radiation Research Society, Big Island, Hawaii, October 16-19, 2016. 62nd Annual Meeting of the Radiation Research Society, Big Island, Hawaii, October 16-19, 2016. Abstract book., Oct-2016
Abstracts for Journals and Proceedings	Weil MM. "Cancer Risks to Spaceflight Crews." 62nd Annual Meeting of the Radiation Research Society, Conference on Radiation and Health, Big Island, Hawaii, October 16-19, 2016. 62nd Annual Meeting of the Radiation Research Society, Big Island, Hawaii, October 16-19, 2016. Abstract book., Oct-2016
Abstracts for Journals and Proceedings	Weil MM. "Special Lecture 'Cancer Risks from Space Radiation Exposures.' "The 3rd International Symposium of Gunma University Initiative for Advanced Research, Maebashi, Japan, October 25, 2016. The 3rd International Symposium of Gunma University Initiative for Advanced Research, Maebashi, Japan, October 25, 2016. Abstract book., Oct-2016
Abstracts for Journals and Proceedings	Raber J, Patel E, Fallgren C, Weil M. "Effects of 28Si ion irradiation on behavioral and cognitive performance of BALB/c and C3H mice one month following exposure." 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. Abstract book., Jan-2017
Abstracts for Journals and Proceedings	Barnette B, Strain S, Lichti C, Yu Y, Ullrich R, Emmett M. "An integrated omics approach to the study of Heptocellular Carcinoma (HCC) induced by low dose, high-energy, high charge ions (HZE)." 28th Annual NASA Human Research Program Investigators' Workshop Integrated Pathways to Mars, Galveston, TX, January 24, 2017. 2017 NASA Human Research Program Investigators' Workshop, Galveston, TX, January 23-26, 2017. Abstract book., Jan-2017