

# Table of Contents

CONTENTS.....	1
COLLABORATING DEPARTMENTS AND INSTITUTIONS .....	4
ACKNOWLEDGEMENT OF SUPPORT.....	5
RELATED WEB SITES .....	5
A NOTE FROM OUR DIRECTOR.....	6
STAFF NEWS .....	7
THE WELDON MEMORIAL PRIZE.....	8
LABORATORY COLLOQUIA AND SEMINARS .....	9
STAFF LISTING .....	10
STAFF PHOTO .....	11
RESEARCH REPORTS	
<i><b>MICROBEAM DEVELOPMENT AND SINGLE CELL STUDIES</b></i>	
<b>Development of the Super Microbeam at RARAF</b>	
Gerhard Randers-Pehrson, Andrew D. Harken, Guy Garty, and David J. Brenner .....	13
<b>Super Resolution Stimulated Emission Depletion Microscopy at the RARAF Microbeam</b>	
Andrew D. Harken, Gerhard Randers-Pehrson, and David J. Brenner.....	14
<b>Flow Cytometry for Microfluidic Fluorescence-Activated Cell Sorting (microFACS) at RARAF</b>	
Andrew D. Harken, David Welch, Gerhard Randers-Pehrson, and David J. Brenner .....	15
<b>Analyses of Microbeam-induced ROS in Single Cells</b>	
Brian Ponnaiya, Manuela Buonanno, Alan Bigelow, and Doug Spitz .....	16
<b>A Bead-based Microfluidic Approach to Integrated Single-cell Gene Expression Analysis</b>	
Hao Sun, Jing Zhu, Tim Olsen, Jianguo Tao, Brian Ponnaiya, Sally A. Amundson, David J. Brenner, and Qiao Lin.....	19
<b>Radiation-induced Differential Expression of p53 Responsive Genes is Influenced by their Cellular Localization: A Single-cell Study</b>	
Brian Ponnaiya, Manuela Buonanno, Sally A. Amundson, and David J. Brenner.....	21
<b>Targeted Cytoplasmic Irradiation and Autophagy</b>	
Jinhua Wu, Bo Zhang, Mercy M. Davidson, and Tom K. Hei .....	24
<i><b>BYSTANDER STUDIES</b></i>	
<b>Glioblastoma Stem Cells: Radiation Response and Radiation-induced Bystander Signaling Effects</b>	
Vladimir N. Ivanov and Tom K. Hei .....	27
<b>An Application of a Mouse Orthotopic Prostate Cancer Model for Radiation-induced Non-targeted Response</b>	
Hongning Zhou, Enyuan Shang, Kevin M. Hopkins, and Tom K. Hei .....	30
<b>RAD9 Deficiency Enhances Bystander Signaling in Human Prostate Cancer Cells</b>	
Sunil K. Panigrahi, Constantinos G. Broustas, and Howard B. Lieberman .....	31
<b>Radiation Bystander Effect on Gene Expression in RAD9 Deficient Cells</b>	
Shanaz A. Gandhi, Kevin M. Hopkins, Sunil K. Panigrahi, Howard B. Lieberman, and Sally A. Amundson .....	34
<i><b>CELLULAR AND MOLECULAR STUDIES</b></i>	
<b>The Importance of Filters for Biological Applications of Far-UVC Excilamps</b>	
Manuela Buonanno, Alan W. Bigelow, Gerhard Randers-Pehrson, and David J. Brenner.....	36

<b>Effects of Radiation Type and Delivery Mode on the Radioresistant Eukaryote <i>Cryptococcus neoformans</i></b> Igor Shuryak, Ruth A. Bryan, Jack Broitman, Stephen A. Marino, Alfred Morgenstern, Christos Apostolidis, and Ekaterina Dadachova.....	38
<b>Antitumor Activity of Pamidronate in a Breast Cancer Model by Targeting Rho-A Gene Expression</b> Richard Ponce-Cusia and Gloria M. Calaf .....	41
<b>High Dose Gamma Radiation and the Human Endothelial Barrier: Collapse of Live Vessels</b> Preety Sharma and Peter Grabham .....	44
<b>RAD9 Silencing Suppresses Prostatosphere Formation</b> Constantinos G. Broustas and Howard B. Lieberman .....	46
<b>RAD9 Modulates Secretion of the Tissue Inhibitors of Metalloproteinases (TIMP) in Prostate Cancer Cells</b> Constantinos G. Broustas and Howard B. Lieberman .....	49
<b>RAD9 Enhances Base Excision Repair by Regulating Neil1 Glycosylase</b> Sunil K. Panigrahi, Kevin M. Hopkins, and Howard B. Lieberman .....	51
<b>Effects of BET Bromodomain Inhibitor JQ1 on Radiosensitivity of Prostate Cancer Cell Lines</b> Enyuan Shang, Hongning Zhou, and Tom K. Hei.....	55
<b>Knockdown of DNA Repair Gene Expression in Mouse Embryonic Stem Cells Proficient or Deficient in mRad9</b> Li Wang, Kevin M. Hopkins, and Howard B. Lieberman.....	57
<b>Expression and Purification of the hRAD9(1-272 aa) Flag –hHUS1-hRAD1 Protein Complex</b> Li Wang and Howard B. Lieberman.....	58
<b>Regulation of Death in Human Melanoma Cells Carrying Stem Cell Biomarkers: Apoptosis versus Necroptosis</b> Vladimir N. Ivanov and Tom K. Hei .....	60
<b><u>TRANSLATIONAL STUDIES</u></b>	
<b>High-Dose and Fractionation Effects in Stereotactic Radiation Therapy: Analysis of Tumor Control Data from 2,965 Patients</b> Igor Shuryak, David J. Carlson, J. Martin Brown, and David J. Brenner .....	65
<b>Far UVC (~200 nm) as a Safe and Low-cost Tool for Reducing Surgical Site Infections: In Vivo Studies</b> Manuela Buonanno, Alan W. Bigelow, Gerhard Randers-Pehrson, Henry M. Spotnitz, and David J. Brenner.....	68
<b>Determining Key Pathways Sensitizing Lung Cancer to Combined Chemoradiation Therapy by Exploiting Synthetic Lethal Relationships in an RNAi High-throughput Screen</b> Kunal R Chaudhary and Simon Cheng.....	70
<b><u>CENTER FOR HIGH-THROUGHPUT MINIMALLY-INVASIVE RADIATION BIODOSIMETRY</u></b>	
<b>Anatomically Accurate Mouse Phantoms for Radiation Dosimetry Studies</b> David Welch, Andrew Harken, Gerhard Randers-Pehrson, and David J. Brenner .....	72
<b>First Irradiations with a Novel Capillary Irradiator</b> Guy Garty, Helen C. Turner, Maria Taveras, and David J. Brenner .....	74
<b>Accelerator-Based Biological Irradiation Facility Simulating Neutron Exposure from an Improved Nuclear Device</b> Yanping Xu, Gerhard Randers-Pehrson, Stephen A. Marino, Guy Garty, Andrew Harken, and David J. Brenner.....	76

<b>Depletion and Recovery Kinetics of Long-term and Short-term Hematopoietic Stem Cells in C57BL/6 Mice Irradiated with <math>\gamma</math>-rays</b>	
Erik F. Young and Lubomir B. Smilenov .....	78
<b>Automated FISH on the RABiT System</b>	
Mikhail Repin, Sergey Pampou, Helen C. Turner, Guy Garty, and David J. Brenner .....	80
<b>Automated Scoring of Dicentric Chromosomes</b>	
Guy Garty, Mikhail Repin, and David J. Brenner .....	81
<b>Development of an Automated High-throughput System for Detection of Intrachromosomal Rearrangements</b>	
Alan W. Bigelow, Guy Garty, Adayabalam S. Balajee, Yanping Xu, Charles R. Geard, and David J. Brenner .....	83
<b>Analysis of Partial Body Irradiation using <math>\gamma</math>-H2AX Foci</b>	
Guy Garty, Manuela Buonanno, and David J. Brenner .....	86
<b><math>\gamma</math>-H2AX Kinetic Profile in Mouse Lymphocytes Exposed to the Internal Emitters Cesium-137 and Strontium-90</b>	
Helen C. Turner, Igor Shuryak, Waylon Weber, Melanie Doyle-Eisele, Raymond Guilmette, Dunstana Melo, Sally A. Amundson, and David J. Brenner .....	87
<b>Assaying Hematopoietic Responses of Mice Following Partial Body Irradiation</b>	
Brian Ponnaiya, Jay Perrier, Lubomir Smilenov, and David J. Brenner .....	90
<b>Whole Blood Immunoassay using Gamma-H2AX Phosphorylation with Minimal Sample Preparation</b>	
Erik F. Young, Matthew L. Johnston, and Kenneth L. Shepard .....	91
<b>Human Pattern of Radiation-induced Gene Expression Restored in Humanized Mice</b>	
Sally A. Amundson, Shanaz A. Ghandhi, Mashkura Chowdhury, Erik Young, and Lubomir B. Smilenov .....	93
<b>Gene Expression Effects of Neutron Irradiation on Human Whole Blood</b>	
Shanaz A. Ghandhi, Yanping Xu, Guy Garty, Lubomir B. Smilenov, and Sally A. Amundson .....	95
<b>Correlation of Radiation-induced Micronuclei and Radiosensitivity among Inbred Mouse Strains</b>	
Brian Ponnaiya, Jay Perrier, and David J. Brenner .....	96
<b>THE RADIOLOGICAL RESEARCH ACCELERATOR FACILITY – an NIH-Supported Resource Center</b>	
Dir., David J. Brenner, PhD, DSc; Assoc. Dir. Gerhard Randers-Pehrson, PhD; Mgr., Stephen A. Marino, MS	
<b>Research using RARAF</b> .....	98
<b>Development of Facilities</b> .....	101
<b>Singletron Utilization and Operation</b> .....	105
<b>Training</b> .....	105
<b>Dissemination</b> .....	107
<b>Personnel</b> .....	108
<b>Recent Publications of Work Performed at RARAF</b> .....	108
<b>PUBLICATIONS</b> .....	109