Not a copy of the signature page

20 citations of the 2 papers

Form Approved Through 09/30/2007

OMB No. 0925-0001

Department of Health and Human Services
Public Health Service

Grant Application

Do not exceed character length restrictions indicated.

LEAVE BLANK—FOR PHS USE ONLY.		
Type	Activity	Number
Review Group		Formerly
Council/Board (Month. Year)		Date Received

1. TITLE OF PROJECT *(Do not exceed 81 characters, including spaces and punctuation.)*
Effects of nonuniform distributions of radioactivity

2. RESPONSE TO SPECIFIC REQUEST FOR APPLICATIONS OR PROGRAM ANNOUNCEMENT OR SOLICITATION ☒ NO ☐ YES
(If "Yes," state number and title)
Number: Title:

3. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR

New Investigator ☒ **No** ☐ **Yes**

3a. NAME (Last, first, middle)
Howell, Roger W.

3b. DEGREE(S)
PhD

3h. eRA Commons User Name

3c. POSITION TITLE
Professor

3d. MAILING ADDRESS *(Street, city, state, zip code)*
Department of Radiology
MSB F-451
185 South Orange Ave.

Newark, NJ 07101-1709

3e. DEPARTMENT, SERVICE, LABORATORY, OR EQUIVALENT
Radiology

3f. MAJOR SUBDIVISION
Radiation Research

3g. TELEPHONE AND FAX *(Area code, number and extension)*
TEL: 973-972-5067 FAX: 973-972-6474

E-MAIL ADDRESS:
rhowell@umdnj.edu

4. HUMAN SUBJECTS RESEARCH
No ☒ Yes ☐

4b. Human Subjects Assurance No.
FWA00000036

4c. Clinical Trial ☐ No ☐ Yes

4d. NIH-defined Phase III Clinical Trial ☐ No ☐ Yes

4a. Research Exempt
No ☐ Yes ☐

If "Yes," Exemption No.

5. VERTEBRATE ANIMALS ☐ No ☒ Yes

5a. If "Yes," IACUC approval Date
Pending

5b. Animal welfare assurance no.
A3518-01

6. DATES OF PROPOSED PERIOD OF SUPPORT *(month, day, year—MM/DD/YY)*		7. COSTS REQUESTED FOR INITIAL BUDGET PERIOD		8. COSTS REQUESTED FOR PROPOSED PERIOD OF SUPPORT	
From	Through	7a. Direct Costs ($)	7b. Total Costs ($)	8a. Direct Costs ($)	8b. Total Costs ($)
07/01/06	06/30/10	225,000	361,250	900,000	1,403,375

9. APPLICANT ORGANIZATION
Name: UMDNJ - New Jersey Medical School
Address: 185 South Orange Avenue
PO Box 1709

Newark, NJ 07109-1709

10. TYPE OF ORGANIZATION
Public: → ☐ Federal ☐ State ☐ Local
Private: → ☐ Private Nonprofit
For profit: → ☐ General ☐ Small Business
☐ Woman-owned ☐ Socially and Economically Disadvantaged

11. ENTITY IDENTIFICATION NUMBER
1221775306A2
DUNS NO. 62-394-6217 Cong. District 10

12. ADMINISTRATIVE OFFICIAL TO BE NOTIFIED IF AWARD IS MADE
Name: Frank Cangelosi
Title: Acting Associate Controller
Address: Stanley S. Bergen Building
65 Bergen Street, 5th Floor

Newark, NJ 07107
Tel 973-972-6465 FAX 973-972-3425
E-Mail grants_newark@umdnj.edu

13. OFFICIAL SIGNING FOR APPLICANT ORGANIZATION
Name: Martin Schwarz
Title: Interim Director for Research &
Address: 185 South Orange Avenue, MSB
PO Box 1709

Newark, NJ 07109-1709
Tel 973-972-7090 FAX 973-972-3585
E-Mail njms-research@umdnj.edu

14. PRINCIPAL INVESTIGATOR/PROGRAM DIRECTOR ASSURANCE: I certify that the statements herein are true, complete and accurate to the best of my knowledge. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. I agree to accept responsibility for the scientific conduct of the project and to provide the required progress reports if a grant is awarded as a result of this application.	SIGNATURE OF PI/PD NAMED IN 3a. *(In ink."Per" signature not acceptable.)*	DATE
15. APPLICANT ORGANIZATION CERTIFICATION AND ACCEPTANCE: I certify that the statements herein are true, complete and accurate to the best of my knowledge, and accept the obligation to comply with Public Health Services terms and conditions if a grant is awarded as a result of this application. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties.	SIGNATURE OF OFFICIAL NAMED IN 13. *(In ink."Per" signature not acceptable.)*	DATE

DESCRIPTION: See instructions. State the application's broad, long-term objectives and specific aims, making reference to the health relatedness of the project (i.e., relevance to the **mission of the agency**). Describe concisely the research design and methods for achieving these goals. Describe the rationale and techniques you will use to pursue these goals.

In addition, in two or three sentences, describe in plain, lay language the relevance of this research to **public** health. If this application is funded, this description, as is, will become public information. Therefore, do not include proprietary/confidential information. **DO NOT EXCEED THE SPACE PROVIDED.**

It is recognized that there are many variables that can dictate biological response of tissues that contain radioactivity. Among the many variables are tissue radiosensitivity, distribution of radioactivity at the macroscopic and cellular levels, radiations emitted (e.g. alpha, beta, Auger electrons), and bystander effects. We have a limited understanding of how these variables correlate with biological effects that result from nonuniform distribution of radioactivity. There is mounting evidence that bystander effects play an important role in determining biological response. These are current issues of major importance to human health as it relates to diagnostic and therapeutic nuclear medicine. They have become increasingly urgent to resolve in light of the likelihood of radiological terrorism involving radioactive materials. Over the last several years we have been working toward correlating biological response of tissues containing radioactivity with cellular absorbed dose and variables relating to the bystander effect. We have made substantial progress during our first grant period, including the revelation of important insights into the phenomenology and mechanisms of bystander effects caused by intracellular radioactivity. Our progress will have considerable impact on our capacity to predict the biological effects of incorporated radioactivity. Indeed, our contributions are recognized in the ICRU report on dose specification in nuclear medicine. Our work has also raised important new questions regarding the prediction of response to nonuniform distributions of radioactivity that are addressed in the present proposal. Overall, we hypothesize that the biological response of tissues containing incorporated radionuclides can be correlated with cellular absorbed dose and variables relating to the bystander effect. We will test this hypothesis using a step-wise approach with models of increasing complexity. We will use our orginal three dimensional (3D) multicellular cluster model to resolve fundamental and significant questions related to the shape of survival dose response curves. Recognizing the limitations of our original model, we have devoted considerable effort toward transitioning our studies on multicellular dosimetry and bystander effects to a new *in vitro* Cytomatrix model that mimics normal human tissue *in vivo*. This new 3D model will be used to assess cell cycle alterations, DNA damage, and cell killing caused by nonuniform distributions of radioactivity in both tumor and normal human cell types. Complementing this new model will be development of a theoretical multicellular dosimetry model that blends 3D μCT imaging and stylized analytical models of the cell. This will enable us to test whether our multicellular dosimetry approaches can predict responses in this more complex system. Finally, to initiate transition of our multicellular dosimetry approach to *in vivo*, we will carry out bystander studies in mouse testis.

PERFORMANCE SITE(S) *(organization, city, state)*

UMDNJ - New Jersey Medical School	Newark	NJ
University of Florida	Gainesville	FL

Principal Investigator/Program Director (Last, first, middle): Howell, Roger W.

KEY PERSONNEL. See instructions. Use continuation pages as needed to provide the required information in the format shown below.
Start with Principal Investigator. List all other key personnel in alphabetical order, last name first.

Name	eRA Commons User Name	Organization	Role on Project
Howell, Roger W.		UMDNJ - New Jersey	Principal Investigator
Azzam, Edouard I.		UMDNJ - New Jersey	Co-Investigator
Narra, Venkat R.		UMDNJ - Robert Wood	Co-Investigator
Neti, Prasad VSV		UMDNJ - New Jersey	Research Associate
Pinto, Massimo		UMDNJ - New Jersey	Post-doctoral
Bolch, Wesley E.		University of Florida	Co-Investigator
Rajon, Didier		University of Florida	Co-Investigator

OTHER SIGNIFICANT CONTRIBUTORS

Name	Organization	Role on Project

Human Embryonic Stem Cells ☒ No ☐ Yes

If the proposed project involves human embryonic stem cells, list below the registration number of the specific cell line(s) from the following l
http://stemcells.nih.gov/registry/index.asp. *Use continuation pages as needed.*
If a specific line cannot be referenced at this time, include a statement that one from the Registry will be used.

Cell Line

Disclosure Permission Statement. Applicable to SBIR/STTR Only. See SBIR/STTRInstructions. ☐ Yes ☐ No

The name of the principal investigator/program director must be provided at the top of each printed page and each continuation page.

RESEARCH GRANT

TABLE OF CONTENTS

Appendix *(Five collated sets. No page numbering necessary for Appendix.)*

Check if Appendix is Included

Appendices NOT PERMITTED for Phase I SBIR/STTR unless specifically solicited ☒

Number of publications and manuscripts accepted for publication *(not to exceed 10)* 10

Other items (list):

Principal Investigator/Program Directory (Last, first, middle): Howell, Roger W.

BUDGET JUSTIFICATION PAGE
MODULAR RESEARCH GRANT APPLICATION

	Initial Period	2nd	3rd	4th	5th	Sum Total (For Entire Project Period)
DC less Consortium F&A	$225,000 (Item 7a, Face Page)	$225,000	$225,000	$225,000		$900,000 (Item 8a, Face Page)
Consortium F&A	$11,375	$11,375	$11,375	$11,375		$45,500
Total Direct Costs	$236,375	$236,375	$236,375	$236,375		$945,500

Personnel

See following continuation page.

Consortium

The University of Florida has been contracted to carry out Specific Aim 4 on dosimetry modeling for the Cytomatrix model . This modeling requires the use of radiation transport calculations. Dr. Wesley Bolch, a world leader in radiation transport based dosimetry modeling, will be the PI on the subcontract. Details are provided in the Subcontract Proposal which is attached as an Appendix. Briefly, one module ($25,000) of direct costs per year have been requested to support their effort. The total direct and indirect costs per year for UF is $36,374.

Fee (SBIR/STTR Only)

Personnel:

Roger W. Howell, Ph.D., Prinicpal Investigator. 20% effort. Dr. Howell will continue as PI on this g has 20 years of experience on the dosimetry and biological effects of incorporated radionuclides. His leadership in this field was recently acknowledged by his being awarded the 2004 Loevinger Berman Award from the Society of Nuclear Medicine.

Edouard I. Azzam, Ph.D., Co-Investigator. 4% effort. Dr. Azzam has 25 years of experience in radiation biology. He is internationally recognized as a leader in bystander and adaptive responses to ionizing radiation. He has extensive experience in elucidating molecular pathways involved in the cellular response to low-doses of ionizing radiation. Accordingly, Dr. Azzam will assist in the design and interpretation of the bystander studies.

Venkat R. Narra, Ph.D., Co-Investigator. 4% effort. Dr. Narra has 20 years of experience with the effects of incorporated radionuclides on mouse testis, occupational health physics, and medical physics in radiation oncology. Dr. Narra has personally carried out hundreds of experiments in the mouse testis. He will direct the mouse testis experiments outlined in this proposal.

Prasad V.S.V. Neti, Ph.D., Research Associate. 100% effort. Dr. Neti joined our group in Winter 2002 with a background in nuclear physics. He has extensive experience with the multicellular cluster model and computer programming. He will be responsible for carrying out the studies with the multicellular clusters and will assist Dr. Narra on the mouse testis experiments.

Massimo Pinto, Ph.D., Research Associate. 100% effort. Dr. Pinto earned his PhD in Radiobiology from the Gray Lab under the direction of Kevin Prise. He has developed our new 3D tissue model that mimics the in vivo environment and he has two years of intensive experience with flow cytometry. Dr. Pinto will carry out the studies with the Cytomatrix model. Dr. Pinto is the recipient of a New Jersey Cancer Commission Post-doctoral award from July 2004 through June 2006. His fellowship involves the design and use of his 3D tissue model for bystander studies with incorporated radionuclides. Finally, Dr. Pinto will also assist with the flow cytometry required for the mouse testis model.

Wesley E. Bolch, Ph.D., Co-Investigator. 5% effort. Dr. Bolch will lead the University of Florida effort to develop a theoretical radiation dosimetry model for the Cytomatrix culture experiments. Dr. Bolch has 20 years of experience developing complex radiation dosimetry models that utilize the EGS4 Monte Carlo radiation transport code.

Didier A. Rajon, Ph.D., Co-Investigator. 10% effort. Dr. Rajon will work directly with Dr. Bolch to develop the radiation dosimetry model for the Cytomatrix culture. He has 8 years experience with the EGS4 radiation transport code with particular emphasis on dosimetry for trabecular bone. This prior experience relates directly to modeling the Cytomatrix culture. Dr. Rajon will be responsible for writing the computer codes.

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Howell, Roger W.	Professor of Radiology Chief, Division of Radiation Research
eRA COMMONS USER NAME RHOWELL	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Massachusetts, Amherst, MA	B.S.	1982	Physics
University of Massachusetts, Amherst, MA	Ph.D.	1987	Physics

A. Positions and Honors

Positions:

2001 Professor, UMDNJ - New Jersey Medical School
Chief, Division of Radiation Research, Department of Radiology
1995-2001 Associate Professor, UMDNJ - New Jersey Medical School
1989-1995 Assistant Professor, UMDNJ - New Jersey Medical School
1987-1989 Instructor, UMDNJ - New Jersey Medical School

Honors:

Outstanding Dosimetry Manuscript Award by the Journal of Nuclear Medicine. S. Murty Goddu, R.W. Howell, D.V. Rao. "A generalized approach to absorbed dose calculations for dynamic tumor and organ masses". J. Nucl. Med. 36: 1923-1927 (1995).
2004 Loevinger-Berman Award, Society of Nuclear Medicine

Special Professional Service:

National Council on Radiation Protection and Measurements (NCRP) - Council Member. 2004-2010.
National Council on Radiation Protection and Measurements (NCRP) – Scientific Committee 1-13, Effect of Therapeutic medical treatment and genetic background on astronauts. Member. 2003-present.
International Commission on Radiation Units and Measurements (ICRU). Report Committee on Approaches to the Dosimetry of Low-Dose Exposures to Ionizing Radiation. 2003-present.
International Commission on Radiation Units and Measurements (ICRU). Report Committee on Conceptual Basis for Dose Specification in Nuclear Medicine. 1998 - 2002.
Society of Nuclear Medicine Medical Internal Radiation Dose Committee (MIRD), July 1992 – June 2000.
Program Committee, Second International Symposium on Biophysical Aspects of Auger Processes, July 5-6, 1991.
Scientific Program Sub-Chair, Dosimetry/Radiobiology. 1993,1994 Annual Meetings of Society of Nuclear Medicine.
Am. Assoc. Physicists in Medicine Task Group on Auger Electron Dosimetry, June 1989 - June 1994
Program Committee, 1991-1994, 1998, 2001 Annual Meetings of the Society of Nuclear Medicine.
Program Committee, 1993-1995, Annual Meeting of the American Association of Physicists in Medicine.

B. Selected peer-reviewed publications (in chronological order).

(selected from 71 articles, 1 edited book, 1 book, 2 reports, 1 patent)

1. S. M. Goddu, R. W. Howell, and D. V. Rao, Cellular dosimetry: Absorbed fractions for monoenergetic electron and alpha particle sources and S-values for radionuclides uniformly distributed in different cell compartments. *J. Nucl. Med.* **35,** 303-316 (1994).

2. S. M. Goddu, D. V. Rao, and R. W. Howell, Multicellular dosimetry for micrometastases: Dep of self-dose versus cross-dose to cell nuclei on type and energy of radiation and subcellular di of radionuclides. *J. Nucl. Med.* **35,** 521-530 (1994).
3. R. W. Howell, M. T. Azure, V. R. Narra, and D. V. Rao, Relative biological effectiveness of alpha emitters in vivo at low doses. *Radiat. Res.* **137,** 352-360 (1994).
4. R. W. Howell, S. M. Goddu, V. R. Narra, D. R. Fisher, R. E. Schenter, and D. V. Rao, Radiotoxicity of gadolinium-148 and radium-223 in mouse testes: Relative biological effectiveness of alpha particle emitters *in vivo*. *Radiat. Res.* **147,** 342-348 (1997).
5. R. W. Howell, S. M. Goddu, and D. V. Rao, Design and performance characteristics of an experimental Cs-137 irradiator to simulate internal radionuclide dose rate patterns. *J. Nucl. Med.* **38,** 727-731 (1997).
6. R. W. Howell, S. M. Goddu, A. Bishayee, and D. V. Rao, Radioprotection against lethal damage caused by chronic irradiation with radionuclides *in vitro*. *Radiat. Res.* **150,** 391-399 (1998).
7. A. Bishayee, D. V. Rao, and R. W. Howell, RAPID COMMUNICATION: Evidence for pronounced bystander effects caused by nonuniform distributions of radioactivity using a novel three-dimensional tissue culture model. *Radiat. Res.* **152**, 88-97 (1999).
8. S. M. Goddu, A. Bishayee, L. G. Bouchet, W. E. Bolch, D. V. Rao, and R. W. Howell, Marrow toxicity of ^{33}P- versus ^{32}P-orthophosphate: Implications for therapy of bone pain and bone metastases. *J. Nucl. Med.* **41,** 941-951 (2000).
9. A. Bishayee, D. V. Rao, L. G. Bouchet, W. E. Bolch, and R. W. Howell. Protection by DMSO against cell death caused by intracellularly localized iodine-125, iodine-131 and polonium-210. *Radiat. Res.* **153,** 416-427 (2000).
10. A. Bishayee, D. V. Rao, S. C. Srivastava, L. G. Bouchet, W. E. Bolch, and R. W. Howell. Marrow-sparing effects of Sn-117m(4+)DTPA for radionuclide therapy of cancer in bone. *J. Nucl. Med.* **41,** 2043-2050 (2001).
11. M. Lenarczyk, S. M. Goddu, D. V. Rao, and R. W. Howell. Biological dosimetry of bone marrow: Induction of micronuclei in reticulocytes following exposure to P-32 and Y-90. *J. Nucl. Med.* **42**, 162-169 (2001).
12. A. Bishayee, H. Z. Hill, D. Stein, D. V. Rao, and R. W. Howell. Free-radical initiated and gap junction-mediated bystander effect due to nonuniform distribution of incorporated radioactivity in a three-dimensional tissue culture model. *Radiat. Res.* **155,** 335-344 (2001).
13. A. Bishayee and R. W. Howell. Bystander effects caused by nonuniform distributions of DNA-incorporated ^{125}I. *Micron* **33** (2), 127-132 (2002). INVITED PAPER.
14. B. I. Gerashchenko and R. W. Howell, Flow cytometry as a strategy to study radiation-induced bystander effects in co-culture systems. *Cytometry* **54**, 1-7 (2003).
15. B. I. Gerashchenko and R. W. Howell, Cell proximity is a prerequisite for the proliferative response of bystander cells co-cultured with cells irradiated with gamma-rays. *Cytometry* **56A,** 71-80 (2003).
16. P. V. S. V. Neti and R. W. Howell, When may a nonuniform distribution of ^{131}I be considered uniform? An experimental basis for multicellular dosimetry. *J. Nucl. Med.* **44,** 2019-2026 (2003).
17. P. V. S. V. Neti and R. W. Howell, Isolating effects of microscopic nonuniform distributions of ^{131}I on labeled and unlabeled cells. *J. Nucl. Med.* **45,** 1050-1058 (2004).
18. B. I. Gerashchenko and R. W. Howell, Proliferative response of bystander cells adjacent to cells with incorporated radioactivity. *Cytometry* **60A**(2):155-64 (2004).
19. P. V. Neti, S. M. de Toledo, V. Perumal, E. I. Azzam, and R. W. Howell. A multi-port low-fluence alpha-particle irradiator: fabrication, testing and benchmark radiobiological studies. *Radiat Res* **161,** 732-738 (2004).
20. B. I. Gerashchenko, E. I. Azzam, and R. W. Howell, Characterization of cell-cycle progression and growth of WB-F344 normal rat liver epithelial cells following gamma-ray exposure . *Cytometry* **61A,** 134-141 (2004).
21. R. W. Howell and P. V. Neti. Modeling multicellular response to nonuniform distributions of radioactivity: Differences in cellular response to self-dose and cross-dose. *Radiat. Res.* **163,** 216–221 (2005).
22. B. I. Gerashchenko and R. W. Howell, Bystander cell proliferation is modulated by the number of adjacent cells that were exposed to ionizing radiation. *Cytometry* **66A,** 62–70 (2005).

C. Research Support

R01CA83838 7/1/00 to 6/30/05 (extended to 6/30/06)
NIH/NCI
Effects of nonuniform distributions of radioactivity
This study examines the biological effects of nonuniform distributions of beta, alpha, and Auger electron emitters in a three-dimensional cell culture model of normal rodent cells.
Role: Principal Investigator

R01CA92262-01 3/1/02 to 2/28/05 (extended to 2/28/06)
NIH/NCI
Damage signaling from irradiated to non-irradiated cells
This study examines bystander effects in mammalian cells that have been irradiated by low fluences of high-LET alpha particles.
Role: Co-Investigator

DE-FG02-02ER63447 1/1/03 to 12/31/05
Department of Energy
Cellular responses to low dose/very low dose rate ionizing radiation: The role of oxidative metabolism.
Role: Co-Investigator

2R44CA086568-02A1 4/1/2000 to 8/31/2004 (Extended to 8/2005)
NIH/NCI
Phosphorylatable Monoclonal Antibodies for Tumor Therapy
Role: Co-Investigator on subcontract

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Edouard I. Azzam	Associate Professor
eRA COMMONS USER NAME EAZZAM	

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Calgary, Canada	B.Sc.	1973	Microbiology
University of Manitoba, Canada	M.Sc.	1989	Physiology
University of Ottawa, Canada	Ph.D.	1995	Radiation Biology
Harvard School of Public Health, USA	Post-Doc	1995-1998	Radiation Biology

A. Positions

1994 - 1995	Research Scientist (CSE-2), Radiation Biology Branch, A.E.C.L., ON, Canada
1995 - 1998	Postdoctoral Fellow, Harvard School of Public Health, Boston, MA
1998 - 2000	Research Associate, Harvard School of Public Health, Boston, MA
2000 - 2004	Assistant Professor, New Jersey Medical School, Newark, NJ
2000 -	Visiting Lecturer, Harvard School of Public Health, Boston, MA
2004 -	Associate Professor, New Jersey Medical School, Newark, NJ

Honors

1. "New Jersey Cancer Research Award for scientific excellence", The New Jersey Commission on Cancer Research, 2003.
2. Montreal General Hospital 175th Anniversary Fellowship (June 1999).
3. University of Ottawa Supplementary Scholarship, 1991 (renewed in 1992, 1993).
4. Ontario Graduate Scholarship, 1993.
5. Natural Sciences and Engineering Research Council of Canada postgraduate scholarship, 1991 (renewed in 1992).
6. Ontario Government Scholarship, Graduate Studentship, 1991.
7. Merit Entrance Scholarship, 1990, University of Ottawa.
8. St. Boniface General Hospital Research Foundation, Graduate Studentship: 1987 (renewed in 1988).

B. Selected Peer-Reviewed Publications (from a total of 96)

1. B.N. Pandey, D.M. Gordon, S.M. de Toledo, D. Pain and **E.I. Azzam** (2005) Normal Human Fibroblasts Exposed to High or Low Dose Ionizing Radiation: Differential Effects on Mitochondrial Protein Import and Membrane Potential. *Antioxidants and Redox Signaling*, in press.
2. J.B. Little, **E.I. Azzam**, S.M. de Toledo and H. Nagasawa. (2004) Characteristics and Mechanisms of the Bystander Response in Monolayer Cell Cultures Exposed to Very Low Fluences of Alpha Particles. *Radiation Physics and Chemistry* **72**, 307-313.
3. P. Venkatachalam, S.M. de Toledo and **E. I. Azzam** (2004) Flavin Containing Oxidases Regulate Progression from G_1 to S-Phase of the Cell Cycle in Normal Human Diploid Fibroblasts. *Radiation Physics and Chemistry* **72**, 315-321.
4. B.I. Gerashchenko, **E.I. Azzam** and R.W. Howell (2004) Characterization of Cell Cycle Progression and Growth of WB-F344 Normal Rat Liver Epithelial Cells Following Gamma-Ray Exposure. *Cytometry* **61**, 134-141.
5. D.R. Spitz, **E.I. Azzam**, J.J. Li, and D. Gius (2004) Metabolic oxidation/reduction reactions and cellular responses to ionzing radiation: a unifying concept in stress response biology. *Cancer and Metastasis Reviews* **23**, 311-322

6. **E.I. Azzam** and J.B. Little (2004) The Radiation Induced Bystander Effect: Evidence and Significance. *Human and Experimental Toxicology* **23**, 61-65.
7. **E.I. Azzam**, S.M. de Toledo and J.B. Little (2004) Stress signaling from Irradiated to non-Irradiated Cells. *Current Cancer Drug Targets* **4**, 53-64.
8. **E.I. Azzam**, S.M. de Toledo and J.B. Little (2003) Expression of *CONNEXIN43* Is Highly Sensitive to Ionizing Radiation and other Environmental Stresses. *Cancer Res.* **63**, 7128-7135.
9. **E.I. Azzam**, S. M. de Toledo and J.B. Little (2003) Gap-Junctions, Oxidative Metabolism and the Ionizing Radiation Induced Bystander Effect. *Oncogene* **22**, 7050-7057.
10. H. J. Mamon, W. K. Dahlberg, H. Nagasawa, **E.I. Azzam**, M. Muto, J.B. Little (2003) Differing Effects of Breast cancer 1, Early Onset (*BRCA1*) and Ataxia Telangiectasia Mutated (*ATM*) Mutations on Cellular Responses to Ionizing Radiation. *Int. J. Radiat. Biol.* **79**, 817-829.
11. H. Schollnberger, R.E.J. Mitchel, **E.I. Azzam**, D.J. Crawford-Brown and W. Hofmann (2003) Explanation of Protective Effects of Low Doses of γ-Radiation with a Mechanistic Radiobiological Model. *Int. J. Radiat. Biol.* **78**, 1159-1173.
12. **E.I. Azzam**, H. Nagasawa, Y. Yu, C.-Y. Li and J.B. Little (2002) Cell Cycle Deregulation and XPC Cell Transformation. *J. Invest Dermatol* **119**, 1350-1354.
13. **E.I. Azzam**, S.M. de Toledo, D.R. Spitz and J.B. Little (2002) Oxidative Metabolism Modulates Signal Transduction and Micronucleus Formation in Bystander Cells from α-Particle-Irradiated Normal Human Fibroblast Cultures. *Cancer Res.* **62**, 5436-5442.
14. J.B. Little, **E.I. Azzam**, S.M. de Toledo and H. Nagasawa. (2002) Bystander Effects: Intercellular Transmission of Radiation Damage Signals. *Radiation Protection Dosimetry*, **99**, 159-162.
15. **E.I. Azzam**, S.M. de Toledo and J.B. Little. (2001) Direct Evidence for the Participation of Gap-Junction Mediated Intercellular Communication in the Transmission of Damage Signals from α-Particle Irradiated to Non-irradiated Cells. *Proc. Natl. Acad. Sci. USA*, **98**, 473-478.
16. S.M. de Toledo, **E.I. Azzam**, W.K. Dahlberg, T.B.Gooding and J.B. Little. (2000) ATM Complexes with MDM2 and Promotes its Rapid Phosphorylation in a p53-Independent Manner in Normal and Tumor Human Cells Exposed to Ionizing Radiation. *Oncogene*, **19**, 6185-6193.
17. **E.I. Azzam**, S. M. de Toledo and J.B. Little. (2000) High and low fluences of α-particles induce a G_1 checkpoint in human diploid fibroblasts. *Cancer Res.*, **60**, 2623-2631.
18. W.K. Dahlberg, **E. I. Azzam**, Y.Yu and J.B. Little. (1999) Response of Human Cells of Varying Radiosensitivity and Radiocurabitlity to Fractionated Irradiation. *Cancer Res.*, **59**, 5365-5369.
19. S.M. de Toledo, **E.I. Azzam,** S.Laffrenier, P. Keng and J.B. Little. (1998) Regulation of the Genes *CDC2, Cyclin A, Cyclin B, Topoisomerase IIα and RAD51* in Irradiated Normal Human Fibroblasts is Dependent on $p53/p21^{Waf1}$. *Cell Growth Differ.* **9**, 887-897.
20. **E.I. Azzam,** S.M. de Toledo, T.B. Gooding and J.B. Little. (1998) Intercellular Communication Is Involved in the Bystander Regulation of Gene Expression in Human Cells Exposed to very Low Fluences of α-Particles. *Radiat. Res.*, **150**, 497-504.
21. M.J. Pykett, **E.I. Azzam**, W.K. Dahlberg and J.B. Little. (1998) Differential p53, p21, mdm2 and Rb Regulation in Glioma Cell Lines that overexpress Wild-Type p53. *Int. J. Oncol.*, **13**(2), 213-216.
22. F. Wenz, **E. I. Azzam** and J. B. Little (1998) The Response of Proliferating Cell Nuclear Antigen to Ionizing Radiation in Human Lymphoblastoid Cell Lines Is Dependent on p53. *Radiat. Res.*, **149**, 32-40.
23. R.E.J. Mitchel, **E.I. Azzam** and S.M. deToledo. (1997) Adaptation to Ionizing Radiation in Mammalian Cells. In: Stress-Inducible Processes in Higher Eukaryotic Cells. (Editor TM Koval) *Plenum Press.*
24. **E.I. Azzam,** S. M. de Toledo, M.J. Pykett, H. Nagasawa and J.B. Little. (1997) *CDC2* Is down-Regulated by Ionizing Radiation in a p53-Dependent Manner. *Cell Growth Differ.* **8,** 1161-1169.
25. M.J. Pykett, **E.I. Azzam** and J.B. Little (1997) Differential Regulation of cdk2 and cyclin D1 in Irradiated Human Glioma Cells. *Int. J. Oncol.*, **10**, 93-99.
26. **E.I. Azzam,** S.M. de Toledo, G.P. Raaphorst and R.E.J. Mitchel. (1996) Low Dose Ionizing Radiation Decreases The Frequency of Spontaneous Transformation in C3H 10T2 Cells. *Radiat. Res.* **146**, 369-373.
27. S.M. de Toledo, **E.I. Azzam,** M.K. Gasmann and R.E.J. Mitchel. (1995) The Use of Semi-Quantitative Reverse Transcription-Polymerase Chain Reaction Analysis to Study Gene Expression in Normal Skin Fibroblasts Following Low Dose-Rate Irradiation. *Int. J. Radiat. Biol.* **67**, 135-143.

C. Research Support

1- US Department of Energy 05/01/05 – 04/30/08
"Mitochondrial-derived oxidants and cellular responses to low dose/low LET ionizing radiation"

The major goal is to determine the role that specific mutations in mitochondrial electron transport chain proteins play in governing genotoxic responses of mammalian cells to low dose/low dose rate ionizing radiation.

2- NIH/NCI 1RO1 (CA92262-01A1) 03./04/02-03/01/06
"Damage Signaling from Irradiated to Non-Irradiated Cells"

This project investigates the molecular mechanisms underlying the ionizing radiation induced bystander effect in human cells. Particular emphasis is on the role of gap-junction intercellular communication.

3- US Department of Energy DE-FG02-02ER63447 10/01/02 – 09/30/06
"Cellular Responses to low Dose/Very Low Dose Rate Ionizing Radiation: The Role of Endogenous Oxidative Metabolism"

The overall goal of this project is to investigate the involvement of intracellular metabolic redox reactions in the cellular responses to low dose / very low dose rate gamma rays in human cells adapted to grow in novel three dimensional tissue-like constructs that allow them to preserve their normal phenotype.

4- New Jersey Commission on Cancer Research 02-1081-CCR-S2 07/01/01 - -06/30/03
"Signaling from Irradiated to non-Irradiated Cells"

This project investigates the transmission from irradiated to non-irradiated cells of death inducing and transforming biochemical signals.

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Bolch, Wesley E.	Professor of Radiological & Biomedical Engineering
eRA COMMONS USER NAME	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Florida, Gainesville, FL	B.S.E	1984	Environ. Engineering
University of Florida, Gainesville, FL	M.E.	1986	Radiol. Health Physics
University of Florida, Gainesville, FL	Ph.D.	1988	Radiol. Health Physics

A. Positions and Honors.

Positions and Employment

1988-1994	Assistant Professor, Nuclear Engineering, Texas A&M University
1992-1994	Director, Health Physics Programs, Texas A&M University
1994	Associate Professor, Nuclear Engineering, Texas A&M University
1995-2000	Coordinator, Medical Physics Graduate Program, NRE Department, University of Florida
1995-2001	Associate Professor, Nuclear & Radiological Engineering, University of Florida
1998-2001	Associate Professor, Biomedical Engineering, College of Engineering, University of Florida
2000- Present	Coordinator, Health Physics Graduate Program, NRE Department, University of Florida
2001- Present	Professor, Radiological & Biomedical Engineering, University of Florida
2004- Present	Research Associate, Florida Institute for Nuclear Detection and Security (FINDS)

Other Experience and Professional Memberships

Health Physics Society	Associate Editor, Health Physics (2002 – Present)
ICRP	Member, Committee 2, Task Group on Dose Calculations (2002 – Present)
NCRP	Member, Main Council (2005 – Present)
	Member, Program Area Committee 6 (Radiation Measurements and Dosimetry) (2005 – Present)
	Scientific Committee 4-1 (Management of Contaminated Persons) (2004 – Present)
	Scientific Committee 6-3 (Uncertainties in Internal Dosimetry) (2005 – Present)
Society of Nuclear Medicine	Member, Radiobiological Effects of Ionizing Radiation (REIR) Committee, Appointed (1995 – Pres)
	Member, Medical Internal Radiation Dose (MIRD) Committee, Appointed (1993 – Present)
	Member, Editorial Board, The Journal of Nuclear Medicine (2002 – Present)

Professional Certification

1992 - Present	Professional Engineer, State of Texas, PE 73421
1994 - Present	American Board of Health Physics

Honors

1992	Health Physics Faculty Research Award, U.S. Department of Energy
1993	Elda E. Anderson Award (Outstanding Young Health Physicist Award), Health Physics Society
1996	Health Physics Faculty Research Award, U.S. Department of Energy
1998	University of Florida Teaching Improvement Program (TIP) Award
2003	Faculty Research Award, Dept. of Nuclear & Radiological Engineering, University of Florida

B. Selected peer-reviewed publications and Manuscripts (in chronological order).

Selected Articles (out of 82): (Graduate students of Dr. Bolch indicated by asterisk)

1. SJ Thomas*, WE Bolch, KJ Kao, F Bova, and R Tran-son-tay, "Effects of x-ray radiation on the rheological properties of platelets and leukocytes", Transfusion 43(4): 502-508 (2003).
2. AP Shah*, PW Patton, DA Rajon*, and WE Bolch, "Adipocyte spatial distributions in bone marrow: Implications for skeletal dosimetry models" J Nucl Med 44(5): 774-783 (2003).
3. DA Rajon* and WE Bolch, "Marching Cube algorithm: Review and trilinear interpolation adaptation for image-based dosimetric models" Comput Med Imag Graph 27 (5): 411-435 (2003).
4. DA Rajon*, AP Shah*, CJ Watchman*, JM Brindle*, and WE Bolch, "A hyperboloid representation of the bone-marrow interface within 3D NMR images of trabecular bone: Applications to skeletal dosimetry" Phys Med Biol 48 (12): 1721-1740 (2003).
5. LG Bouchet, WE Bolch, HP Blanco*, DA Rajon*, I Clairand*, G Sgouros, and BW Wessels "MIRD Pamphlet No. 19: Absorbed fractions and radionuclide S values for six age-dependent multi-region models of the kidney" J Nucl Med 44 (7): 1113-1147 (2003).
6. AK Jones*, DE Hintenlang, and WE Bolch, "Tissue-equivalent materials for construction of tomographic dosimetry phantoms in pediatric radiology", Med Phys 30 (8): 2072-2081 (2003).
7. TE Huston, EB Farfán*, E Bolch, and WE Bolch "Influences of parameter uncertainties within the ICRP-66 respiratory tract model: A parameter sensitivity analysis" Health Phys 85 (5): 553-566 (2003).
8. CH Huh*, MS Bhutani, EB Farfán*, and WE Bolch, "Individual variations in mucosa and total wall thickness in the stomach and rectum assessed via endoscopic ultrasound" Physiol Meas 24 (4): N15-N22 (2003).
9. CH Huh* and WE Bolch, "A review of U.S. anthropometric reference data (1970 to 2000) with comparisons to both stylized and tomographic dosimetry models" Phys Med Biol 48 (20): 3411-3429 (2003).
10. EB Farfán*, EY Han*, CH Huh*, TE Huston, E Bolch, and WE Bolch, "A revised stylized model of the extrathoracic and thoracic airways for use with the ICRP-66 respiratory tract model" Health Phys 86 (4) 337-352 (2004).
11. BW Wessels, WE Bolch, LG Bouchet, H Brietz, MG Stabin, G DeNardo, G Sgouros, R Sharkey, "Bone marrow dosimetry for radionuclide therapy: a multi-institutional comparison" J Nucl Med 45 (10): 1725-1733 (2004).
12. DR Fisher, DA Rajon*, HB Breitz, ML Goris, WE Bolch, and SJ Knox, "Dosimetry model for radioactivity localized to intestinal mucosa" Cancer Biother Radiopharm 19 (3) 293-307 (2004).
13. EB Farfán*, WE Bolch, TE Huston, DA Rajon*, CH Huh*, and WE Bolch, "Uncertainties in electron absorbed fractions and lung doses from inhaled beta-emitters", Health Phys 88 (1) 37-47 (2005).
14. AP Shah*, WE Bolch, DA Rajon, PW Patton, and DW Jokisch, "A paired-image radiation transport (PIRT) model for skeletal dosimetry" J Nucl Med 46 (2) 344-353 (2005).
15. AP Shah*, DA Rajon, PW Patton, DW Jokisch, and WE Bolch, "Accounting for beta-particle energy loss to cortical bone via paired-image radiation transport (PIRT)" Med Phys 32 (15) 1354-1366 (2005).
16. AP Shah*, DA Rajon, PW Patton, DW Jokisch, and WE Bolch, "A comparison of skeletal chord-length distributions in the adult male" Health Phys 89 (3): 199-215 (2005).
17. CJ Watchman*, DW Jokisch, PW Patton, DA Rajon, G Sgouros, and WE Bolch,, "Absorbed fractions for alpha particles in tissues of trabecular bone – considerations of marrow cellularity within the ICRP reference male" J Nucl Med 46 (7): 1171-1185 (2005).
18. KP Kim*, CY Wu, BK Birky WE Bolch,, "Effective dose scaling factors for use with cascade impactor sampling data in TENORM inhalation exposures" Health Phys 89 (4) 359-374 (2005).
19. AP Shah*, DW Jokisch, CJ Watchman, DA Rajon, PW Patton, and WE Bolch, "Chord-based versus voxel-based methods of electron transport in the skeletal tissues" Med Phys 32 (10) 3151-3159 (2005).
20. AK Jones, FD Pazik, DE Hintenlang, and WE Bolch, "MOSFET dosimeter depth-dose measurements in heterogeneous tissue-equivalent phantoms at diagnostic x-ray energies" Med Phys 32 (10) 3209-3213 (2005).
21. EY Han*, WE Bolch, and KF Eckerman, "Revisions to the ORNL series of adult and pediatric computational phantoms for use with the MIRD schema" Health Phys (in press).
22. C Lee, JL Williams, C Lee, and WE Bolch, "The UF series of tomographic computational phantoms of pediatric patients" Med Phys (in press).

C. Research Support *(grants active within the past three years)*

Projects under the UF Bone Imaging and Dosimetry (BID) Project

Advances in Skeletal Dosimetry Through Microimaging *(Active to January 2007)*
Principal Investigator: Wesley E. Bolch
Agency: National Cancer Institute (RO1 CA96441-01A1)
Type: Bioengineering Research Grant RO1 Period: February 1, 2003 to January 31, 2007
The specific aims of this research grant are to (1) to construct a detailed and comprehensive reference skeletal model for the adult male using cadavers of nominal body mass index and an age representative of radionuclide therapy patients. Information on in-vivo skeletal structure will be made via whole-body CT. Detailed dosimetry for all major skeletal structures will be accomplished through bone site harvesting, sectioning of spongiosa, imaging of the trabecular microstructure through either NMR microscopy or microCT, and radiation transport modeling; (2) similar development of a reference skeletal model for the adult female; (3) to verify methods of scaling S values to specific patients using CT analyses of skeletal structure in patients scheduled for total hip arthroplasty. Recovery and NMR microscopy of the excised femoral heads will permit final verification of scaled patient marrow dosimetry; (4) to assess the degree to which ratios of spongiosa volumes between different individual varies among different skeletal sites.; and (5) conduct advanced studies in modeling the bone-marrow interface, alpha particle transport, and the generation and interpretation of dose-volume histograms within the marrow cavities.

National Research Service Award *(Active to August 2006)*
Principal Investigator: Wesley E. Bolch Graduate Student Supported: James Brindle
Agency: National Institutes of Health, National Cancer Institute (NCI), Pre-Doctoral Fellowship for Minorities
Type: Research Grant (F31 CA97522-01), Period: August 9, 2002 to August 8, 2006
This grant supports the doctoral studies of Mr. James Brindle in the medical physics graduate program of the University of Florida. Mr. Brindle's dissertation research follows specific aims 3 and 4 of NCI grant RO1 CA96441 in Advances in Skeletal Dosimetry Through Microimaging.

An Image-Based Computational System for the Design of Radionuclide Therapies of Skeletal Tumors *(Active to June 2005)*
Principal Investigator: Wesley E. Bolch
Agency: US DOE, Nuclear Engineering Education Research (NEER) Program
Type: Research Grant (DE-FG07-02ID14327) Period: July 1, 2002 to June 31, 2005
The goal of this project is to develop 3D digital models of skeletal metastases in breast and prostate cancer patients. These models are then coupled to radiation transport codes permitting evaluations for optimal radionuclide selection and radiopharmaceutical localization in radionuclide therapies. The models are developed from fusion of NMR microscopy and microCT images of normal trabecular bone and serial images of skeletal tumor biopsy samples. Specific emphasis is placed on alpha-particle emitters.

Advances in Photon and Neutron Skeletal Dosimetry through NMR Microscopy *(Completed in 2002)*
Principal Investigator: Wesley E. Bolch
Agency: US DOE, Nuclear Engineering Education Research (NEER) Program
Type: Research Grant (DE-FG07-99ID13764) Period: July 1, 1999 to June 31, 2002
The long-term objective of this project is to investigate age and sex variations in skeletal dose received during photons and neutron irradiations in either medical or occupational exposure scenarios. The hypothesis being evaluated is that existing models of skeletal dosimetry based on a single Reference Man formulation are inadequate to predict marrow and endosteal dose to females and older patient populations. NMR microscopy is used to acquire high-resolution 3D images of human trabecular bone. These images are then coupled to radiation transport codes for detailed simulations of marrow and endosteal dose. Specific consideration of marrow cellularity and this spatial distribution of active marrow stem cell populations in the marrow cavities are explicitly considered.

Projects under the UF Pediatric Organ Dose (POD) Project

Virtual Patients for Computing Radiation Dose *(Active to August 2010)*
Principal Investigator: Wesley E. Bolch (Subcontract from Rensselaer Polytechnic Institute – George Xu, PI of primary grant)
Agency: National Institutes for Health, NCI (RO1 CA116743-01)
Type: Research Grant RO1 Period: September 1, 2005 to August 31, 2010
The major goal of this project is to develop age-dependent series of 3D tomographic computational phantoms of pediatric patients for use in assessing internal organ dose received in CT, nuclear medicine, and radiation therapy.

Tomographic Dosimetry Phantoms for Pediatric Radiology *(Completed in 2004)*
Principal Investigator: Wesley E. Bolch
Agency: National Institutes for Health, NICHD (RO1 HD38932-01/02) and NIBIB (RO1 EB00267-03)
Type: Bioengineering Research Grant RO1 Period: May 1, 2000 to April 30, 2004
The goal of this research grant is to develop anatomic models of the newborn patient for use in computational modeling of radiation doses received during pediatric fluoroscopic and CT examinations. Companion experimental studies involve the development of tomographic physical phantoms and the use of MOSFET dosimeters to assess internal organ doses in real time.

Projects in Radiological Engineering and Health Physics

Measurement-to-Activity Conversion Coefficients for Medical Emergency Response *(Active to February 2006)*
Principal Investigator: Wesley E. Bolch
Agency: Sanford Cohen & Associates, Inc.
Type: Research Contract (ACDC-S-01) Period: February 15, 2005 to February 14, 2006
The goal of this research contract is to determine, via Monte Carlo radiation transport simulation, detector responses per unit body burden in victims internally contaminated following a radiological dispersion device detonation.

Assessment of Airborne Particulate Lung Solubility and Internal Dose to Phosphate Workers *(Active to December 2005)*
Principal Investigator: Wesley E. Bolch
Agency: Florida Institute for Phosphate Research
Type: Research Grant (FIPR #03-05-064) Period: October 1, 2003 to December 31, 2005
The goals of this research grant are to quantify the in-vivo lung fluid solubility of inhaled naturally occurring radioactive aerosols within the Florida phosphate industry. An in-vitro dissolution test system is used to simulate the lung fluid environment for air particle samples acquired via a 7-stage cascade impactor sampling system. Lung and effective doses to phosphate industry workers are assessed via the LUDEP and IMBA internal dosimetry codes.

A Probabilistic Dosimetry Model for Radionuclide DCFs *(Completed in 2003)*
Principal Investigator: W. Emmett Bolch, Co- Investigator: Wesley E. Bolch
Agency: Centers for Disease Control and Prevention
Type: Research Grant (R32/CCR416743) Period: September 1, 1999 - August 31, 2003
This grant involves the development of internal dosimetry computational models for radionuclide ingestion, inhalation, and translocation in the body which utilize Latin hypercube sampling of input parameters based upon their probability density functions. The end product are distributions and percentile rankings of organ doses per unit intake of radionuclide. These models will thus permit tailored dose estimates and their uncertainties in DOE complex and nuclear weapons program dose reconstruction activities.

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Pinto, Massimo	Post-Doctoral Research Fellow
eRA COMMONS USER NAME	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
University of Naples Federico II – Italy	B.Sc..	1992-1998	Physics, Radiation Biol.
University College London / Gray Cancer Institute – London, UK	Ph.D.	1998-2002	Radiation Biology DNA damage and repair
University of Naples Federico II, Italy	Post-Doc	2002-2003	Radiation Biology – cell survival after low fluence of high-LET radiation
UMDNJ, New Jersey Medical School, NJ, USA	Post-Doc	2003-To date	Radiation Biology – radiation-induced by-stander effects in 3D in vitro culture models

A. Positions and Honors.

Positions and Employment

2002-2003 Joint lecturer in Physics, Biology BSc degree course, University of Naples Federico II, Italy
2005 Support lecturer in Physics and Radiation Biology, Radiology Residence teaching program, UMDNJ, Newark, NJ, USA

Other Experience and Professional Memberships

1999- Member, Italian Society for Radiation Research (SIRR)
2000- Member, Radiation Research Society
2001- Member, Scholar-in-Training Committee of the Radiation Research Society - chair elect for 2005-2006
2003-2005 Member, Education and Training Committee of the Radiation Research Society
2005- Member, Program Committee of the Radiation Research Society

Honors

1998 Recipient, pre-doctoral fellowship from the Gray Cancer Institute, Northwood, UK
1999 Recipient, first prize for the best *Laurea-BSc* graduation thesis in the field of radiation research in 1998, *Italian Society for Radiation Research (SIRR)*, Annual Meeting, Padua, Italy. Also gave an oral presentation.
2000 Recipient, Young Investigator Award, *Italian Society for Radiation Research* (SIRR) 10th meeting, Frascati, Italy, 19-22 November 2000. Oral Presentation.
Recipient, Young Investigator Award, *Radiation Research Society* (RRS) 47th meeting, Albuquerque, New Mexico, USA, 28 April-3 May 2000. Oral and Poster presentation.
Recipient, Young Investigator Award, *Association for Radiation research* (ARR) meeting, Bristol, UK, 10-12 April 2000. Oral and Poster presentation. Also received a prize for one of the best three poster presentations at the meeting, *ex aequo*.

2001 Recipient, Young Investigator Award, 7th International Workshop, *Radiation Damage to DNA*, Orleans, Nouans le Fuzelier, France, 2-7 September 2001. Oral presentation.
Recipient, Young Investigator Award, 13th Symposium on Microdosimetry, Stresa, Lake Maggiore, Italy, May 27-June 1, 2001. Oral Presentation.
2002 Grant for the participation to the Annual Biophysics School, Bressanone, Italy, September 10-13 2002.
2004 Recipient, New Jersey Commission on Cancer Research Post Doctoral Research Fellowship (until May 2006). Recipient, UMDNJ foundation supplementary fellowship for post-docs (until May 2006).
2005 Recipient, Young Investigator Award, 14th Symposium on Microdosimetry, Venezia, Italy, November 13-18 2005.

B. Selected peer-reviewed publications (in chronological order).

1. PINTO, M., NEWMAN, H. C., PRISE, K. M. and MICHAEL, B. D., 2000, Quantification of DNA damage by PFGE: development of an analytical approach to correct for the background distribution. International Journal of Radiation Biology, 76, 741–748.
2. PRISE, K. M., PINTO, M., NEWMAN, H. C. and MICHAEL, B. D., 2001, A review of studies of ionizing radiation-induced double-strand break clustering. Radiation Research, 156, 572–576.
3. PINTO, M., PRISE, K. M. and MICHAEL, B. D., DSB rejoining after irradiation of human fibroblasts with X-rays or alpha-particles: PFGE studies and numerical models. In: CHERUBINI, R., GOODHEAD, D. T., MENZEL, H. G. and OTTOLENGHI, A., editors, Radiation Protection Dosimetry. Microdosimetry. Proceedings of the 13th Symposium on Microdosimetry, Stresa, Lake Maggiore, Italy, May 27-June 1, 2001, volume 99 (Nuclear Technology Publishing, 2002), pages 133–136.
4. PINTO, M., PRISE, K. M. and MICHAEL, B. D., 2002, Quantification of radiation induced DNA double-strand breaks in human fibroblasts by PFGE: testing the applicability of random breakage models. International Journal of Radiation Biology, 78, 375–388.
5. PINTO, M., PRISE, K. M. and MICHAEL, B. D., 2004, A Monte Carlo model of DNA double-strand break clustering and rejoining kinetics for the analysis of pulsed-field gel electrophoresis data. Radiation Research 162(4), 453-463
6. PINTO, M., PRISE, K. M. and MICHAEL, B. D., 2005, Evidence for complexity at the nanometer scale of radiation induced DNA DSB as a determinant of rejoining kinetics. Radiation Research 164(1), 73-85

BIOGRAPHICAL SKETCH

Provide the following information for the key personnel and other significant contributors in the order listed on Form Page 2.
Follow this format for each person. **DO NOT EXCEED FOUR PAGES.**

NAME	POSITION TITLE
Narra, Venkat R	Associate Professor of Radiation Oncology
eRA COMMONS USER NAME	

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, and include postdoctoral training.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	YEAR(s)	FIELD OF STUDY
Andhra University, Visakhapatnam, India	B.Sc..	1979	Physics
Agra University, Agra, India	M.Sc.	1981	Physics
Andhra University, Visakhapatnam, India	Ph.D.	1986	Nuclear Physics
UMDNJ, New Jersey Medical School, NJ, USA	Post-Doc	1988-1991	Radiation Research

A. Positions and Honors.

Positions and Employment

2004 Associate Professor, UMDNJ – Robert Wood Johnson Medical School
1998-2004 Adjunct Associate Professor, UMDNJ - New Jersey Medical School
1992-1998 Adjunct Assistant Professor, UMDNJ - New Jersey Medical School
1990-1992 Associate in Radiology, UMDNJ – New Jersey Medical School

Other Experience and Professional Memberships

2002- Physicist, Dept of Radiation Oncology, RWJ University Hospital, New Brunswick, NJ
2000-2002 Physicist, Department of Radiation Oncology, Community Medical Center, Toms River, NJ
1994-2000 Department of Radiology and Division of Radiation Oncology, UMDNJ, Newark, NJ
1992-1994 Health/Medical Physicist, Office of Radiation Safety Services, UMDNJ, Newark, NJ.

Honors

1989-1992 Postdoctoral Fellowship, New Jersey Commission on Cancer Research, NJ
1987-1988 Research Associate, Department of Defence, Govt. of India, India
1986-1987 Senior Research Fellowship, Council of Scientific & Industrial Research, Govt. of India
1983-1986 Junior Research Fellowship, Dept. of Atomic Energy, Govt. of India, India.

B. Selected peer-reviewed publications (in chronological order).

1. D. V. Rao, V. R. Narra, R. W. Howell, G. F. Govelitz, and K. S. R. Sastry, In-vivo radiotoxicity of DNA-incorporated I-125 compared with that of densely ionizing alpha-particles. Lancet II, 650-653 (1989).
2. D. V. Rao, V. R. Narra, R. W. Howell, and K. S. R. Sastry, Biological consequence of nuclear versus cytoplasmic decays of I-125: cysteamine as a radioprotector against Auger cascades in vivo. Radiat. Res. 124, 188-193 (1990).
3. R. W. Howell, V. R. Narra, D. V. Rao, and K. S. R. Sastry, Radiobiological effects of intracellular polonium-210 alpha emissions: A comparison with Auger-emitters. Radiat. Prot. Dosim. 31, 325-328 (1990).
4. D. V. Rao, V. R. Narra, G. F. Govelitz, V. K. Lanka, R. W. Howell, and K. S. R. Sastry, In vivo effects of 5.3 MeV alpha particles from Po-210 in mouse testes: Comparison with internal Auger emitters. Radiat. Prot. Dosim. 31, 329-332 (1990).
5. D. V. Rao, V. R. Narra, R. W. Howell, V. K. Lanka, and K. S. R. Sastry, Induction of spermhead abnormalities by incorporated radionuclides: dependence on subcellular distribution, type of radiation, dose rate, and presence of radioprotectors. Radiat. Res. 125, 89-97 (1991).
6. V. R. Narra, R. W. Howell, K. L. Thanki, and D. V. Rao, Radiotoxicity of ^{125}I-iododeoxyuridine in preimplantation mouse embryos. Int. J. Radiat. Biol. 60, 525-532 (1991).

7. R. W. Howell, D. V. Rao, D.-Y. Hou, V. R. Narra, and K. S. R. Sastry, The question of relative biological effectiveness and quality factor for Auger emitters incorporated into proliferating mammalian cells. Radiat. Res. 128, 282-292 (1991).
8. R. W. Howell, V. R. Narra, K. S. R. Sastry, and D. V. Rao, eds. Biophysical Aspects of Auger Processes. American Institute of Physics, New York, 1992.
9. R. W. Howell, V. R. Narra, and D. V. Rao, Absorbed dose calculations for rapidly growing tumors. J. Nucl. Med. 33, 277-281 (1992).
10. V. R. Narra, R. W. Howell, R. S. Harapanhalli, K. S. R. Sastry, and D. V. Rao, Radiotoxicity of some I-123, I-125, and I-131 labeled compounds in mouse testes: Implications for radiopharmaceutical design. J. Nucl. Med. 33, 2196-2201 (1992).
11. V. R. Narra, R. S. Harapanhalli, R. W. Howell, K. S. R. Sastry, and D. V. Rao, Chemical protection against radionuclides in vivo: Implications to the mechanism of the Auger effect. In Biophysical Aspects of Auger Processes (R. W. Howell, V. R. Narra, K. S. R. Sastry, and D. V. Rao, Eds.), pp. 319-335. American Institute of Physics, Woodbury, NY, 1992.
12. R. S. Harapanhalli, V. R. Narra, R. W. Howell, and D. V. Rao, [^{35}S]Cysteamine: Facile synthesis, in vivo biokinetics, and subcellular distribution. Nucl. Med. Biol. 20, 117-124 (1993).
13. R. W. Howell, V. R. Narra, K. S. R. Sastry, and D. V. Rao, On the equivalent dose for Auger electron emitters. Radiat. Res. 134, 71-78 (1993).
14. V. R. Narra, R. W. Howell, K. S. R. Sastry, and D. V. Rao, Vitamin C as a radioprotector against ^{131}I in vivo. J. Nucl. Med. 34, 637-640 (1993).
15. V. R. Narra, R. W. Howell, K. S. R. Sastry, and D. V. Rao, Auger electron emitters as tools for elucidating the location of the primary radiosensitive targets. Radiat. Prot. Dosim. 52, 229-232 (1994).
16. R. W. Howell, M. T. Azure, V. R. Narra, and D. V. Rao, Relative biological effectiveness of alpha emitters in vivo at low doses. Radiat. Res. 137, 352-360 (1994).
17. V. R. Narra, R. S. Harapanhalli, R. W. Howell, K. S. R. Sastry, and D. V. Rao, Vitamins as radioprotectors in vivo. I. Protection by vitamin C against internal radionuclides in mouse testes: Implications to the mechanism of the Auger effect. Radiat. Res. 137, 394-399 (1994).
18. R. S. Harapanhalli, V. R. Narra, V. Yaghmai, M. T. Azure, S. M. Goddu, R. W. Howell, and D. V. Rao, Vitamins as radioprotectors in vivo. II. Protection by vitamin A and soybean oil against radiation damage caused by internal radionuclides. Radiat. Res. 139, 115-122 (1994).
19. V. R. Narra, K. S. R. Sastry, S. M. Goddu, R. W. Howell, S. E. Strand, and D. V. Rao, Relative biological effectiveness of ^{99m}Tc radiopharmaceuticals. Med. Phys. 21, 1921-1926 (1994).
20. V. R. Narra, R. S. Harapanhalli, S. M. Goddu, R. W. Howell, and D. V. Rao, Radioprotection against biological effects of internal radionuclides in vivo by S-(2-aminoethyl)isothiouronium bromide hydrobromide (AET). J. Nucl. Med. 36, 259-266 (1995).
21. S. M. Goddu, V. R. Narra, R. S. Harapanhalli, R. W. Howell, and D. V. Rao, Radioprotection by DMSO against the biological effects of incorporated radionuclides in vivo. Acta Oncologica 35, 901-907 (1996).
22. V. R. Narra, R. W. Howell, S. M. Goddu, and D. V. Rao, Effects of a 1.5-Tesla magnetic field on spermatogenesis and embryogenesis in mice. Investigative Radiology 31, 586-590 (1996).
23. R. W. Howell, S. M. Goddu, V. R. Narra, D. R. Fisher, R. E. Schenter, and D. V. Rao, Radiotoxicity of gadolinium-148 and radium-223 in mouse testes: Relative biological effectiveness of alpha particle emitters in vivo. Radiat. Res. 147, 342-348 (1997).
24. C.S. Cathcart, M. Schulder, V.R. Narra, S. Baredes, and J.H. Halpern, Stereotactic Radiosurgery for Tonsillar Carcinoma. Journal of Radiosurgery 2, 191-194 (1999).
25. M. Schulder, J. Vega, V.R. Narra, A. Jacobs, A. Kalnin, G. Lange and W.C. Liu, Functional Magnetic Resonance Imaging and Radiosurgical dose planning. Stereotactic Functional Neurosurgery 73, 38-44 (1999).
26. W.C. Liu, M. Schulder, V.R. Narra, A.J. Kalnin, C. Cathcart, etc., Functional Magnetic Resonance Imaging aided radiation Treatment Planning Medical Physics 27, 1563-72, 2000.