BIOGRAPHICAL SKETCH

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NAME	POSITION TITLE
Ramasamy **Paulmurugan**	Assistant Professor, Radiology
eRA COMMONS USER NAME (credential, e.g., agency login): paulmur8	

EDUCATION/TRAINING:

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	MM/YEAR(s)	FIELD OF STUDY
Madurai Kamaraj University, Madurai, India	B.Sc	May/1989	Zoology
University of Madras, Madras, India	M.Sc	Sep/1991	Bio-Medical Genetics
National Environmental Engineering Research Institute (NEERI), Nagpur, India	Ph.D.	Nov/1997	Environmental Biotechnology (Molecular virology)

A. Personal Statement

The main goal of my lab (Cellular Pathway Imaging Laboratory) is to develop new therapeutics for treating breast cancers that are triple negative, and receptor positive tamoxifen resistant phenotypes. Specifically, we are interested in developing a combinatorial therapeutic approach in which we will use estrogen receptor beta (ERβ) specific ligands, after down-regulating the functions of some specific microRNAs (miR21, miR10b, miR335, miR155, miR373 and miR520c) that are over expressed in triple negative breast cancers. As ERβ and its roles are not explored in these sub-types of tumors, the outcome of this strategy will have huge potential as a new anti-estrogen therapy (β-specific) for triple negative breast cancers. The use of anti-sense microRNAs will block the functions of microRNAs that are over expressed. As the therapeutic efficiencies will be evaluated in tumor xenografts of receptor negative breast cancer cells in living mice, every functional stages in the study (anti-sense microRNA delivery, binding to target microRNAs and the upregulation of their target genes) will be monitored by developing non-invasive molecular imaging assays. In addition my lab is also working on developing new *in vivo* imaging assays for monitoring different epigenetic processes (DNA-methylation, histone methylation/acetylation, and microRNA expressions) that are critical for maintaining cellular homeostasis. I have vast experience in molecular biology, and applied them for developing *in vivo* imaging strategies for monitoring basic cellular processes include protein-protein interactions and protein foldings, modulated by small molecule drugs in living animals. I have developed split-reporter protein complementation systems for optical (Renilla and Firefly luciferases), and PET-reporter (Thymidine Kinase) genes and used them for imaging cellular protein-protein interactions and protein foldings in living animals. We are planning to extend the use of complementation systems to develop sensors that can be used to evaluate ERβ-status and its response to different ligands *in vitro* in cells and imaging in living animals. The complementation system will also be used for developing sensors that can image different epigenetic processes mentioned above. I am confident that we will develop a new strategy from this study that can be applied for treating the triple-negative and tamoxifen resistant breast cancers. I have more than nine years of experience in the use of different *in vivo* imaging modalities (Bioluminescence, Fluorescence, PET, SPECT and CT) for monitoring different cellular events in mice and rat. I am currently Assistant Professor in the department of Radiology at Stanford University, and working under molecular Imaging Program at Stanford (MIPS). I am leading a group of people to work on imaging basic cellular processes. We are also confident that the imaging assays we are developing to monitor epigenetic process can be potentially applied for the high-throughput screening of new small molecule drugs that targets different epigenetic processes, and is currently considered as new therapeutic targets for drug development in treating cancer and other cellular diseases.

B. Positions and Honors.

Positions and Employment

1991-1993	Junior Project Fellow, NEERI, Nagpur, India
1993-1996	Senior Research Fellow, Council for Scientific and Industrial Research (CSIR), New Delhi, India
1996-1999	Scientist B, Rajiv Gandhi Centre for Biotechnology, Trivandrum, Kerala, India
1999-2003	Scientist C, Rajiv Gandhi Centre for Biotechnology, Trivandrum, Kerala, India
2001-2003	Post Doctoral Visiting Scientist, UCLA, Los Angeles, USA
2003- 2009	Research Scientist, Stanford University, Stanford, USA
2009-	Assistant Professor

Other Experience and Professional Memberships

2001- Member, Academy of Molecular Imaging
2002- Member, Society of Molecular Imaging
2009- American Society of Gene and Cell Therapy (ASGCT)

Honors

1991	Best Research Fellow, NEERI, CSIR, Nagpur, India
1999	Young Scientist Award, Government of Kerala, India
2003	Travel Award, Academy of Molecular Imaging for Best Paper Presentation, San Diego, California, USA
2005	Travel Award, Academy of Molecular Imaging for Best Paper Presentation, Orlando, Florida,
2005	Travel Award, Society of Molecular Imaging for Best Paper Presentation, Cologne, Germany
2006	Travel Award, Academy of Molecular Imaging for Best Paper Presentation, Orlando, Florida

C. Selected peer-reviewed publications (Selected from 45 peer-reviewed publications).

1) **Paulmurugan R**, Padmanabhan P, Ahn BC, Ray S, Willmann JK, Massoud TF, Biswal S, Gambhir SS. 2009. A Novel Estrogen Receptor Intramolecular Folding-based Titratable Transgene Expression System. Mol Ther. 2009 Aug 4. [Epub ahead of print].

2) Willmann JK, **Paulmurugan P**, Rodriguez-Porce MI, Stein W, Brinton TJ, Connolly AJ, Nielsen CH, Lutz AM, Lyons J, Ikeno F, Suzuki Y, Rosenberg J, Chen IY, Wu JC, Yeung AC, Yock P, Robbins RC, Gambhir SS, 2008. Imaging Gene Expression in Human Mesenchymal Stem Cells: A Further Step Towards Clinical Translation. Radiology. 2009 Jul;252 (1):117-27. Epub 2009 Apr 14.

3) Ray R, **Paulmurugan P**, Patel MR, Wu L, Carey M, Gambhir SS. 2008. Noninvasive Imaging of Therapeutic Gene Expression from the Weak Tumor Specific Human Survivin Promoter Using a Bi-directional TSTA System**.** Mol Ther. Nov;16(11):1848-56.

4) **Paulmurugan R**, Tamrazi A, Katzenellenbogen JA, Katzenellenbogen BS, Gambhir SS. 2008. A Human Estrogen Receptor-{alpha} Mutation with Differential Responsiveness to Non-Steroidal Ligands: Novel Approaches for Studying Mechanism of ER Action. Molecular Endocrinology, Jul;22(7):1552-64.

5) Willmann JK, **Paulmurugan R**, Chen K, Gheysens O, Rodriguez-Porcel M, Lutz AM, Chen IY, Chen X, Gambhir SS. 2008. Ultrasonic Imaging of Tumor Angiogenesis with Contrast Microbubbles Targeted to Vascular Endothelial Growth Factor Type 2 Receptor, Radiology, Feb 246(2): 508-18.

6) Chan, C.T., **Paulmurugan, R.,** Gheysens, O.S., Kim J., Chiosis, G., and Gambhir, S.S. (2008). Molecular Imaging of the Efficacy of Heat Shock Protein 90 Inhibitors in Living Subjects. Cancer Research 68(1):216-226.

7) Ramnarain DB, **Paulmurugan R**, Park S, Mickey BE, Asaithamby A, Saha D, Kelliher MA, Mukhopadhyay P and Habib AA. 2008. RIP1 links inflammatory and growth factor signaling pathways by regulating EGFR. Cell death and differentiation, Feb, 15(2): 344-53.

8) **R. Paulmurugan,** S.S. Gambhir. 2007. Combinatorial Library Screening for Developing an Improved–Split-Firefly Luciferase Fragment-Assisted Complementation System for Studying Protein-Protein Interactions. Analytical Chemistry, 79(6): 2346-53.

9) **R. Paulmurugan**, S.S. Gambhir. 2006. Imaging estrogen receptor intramolecular folding as a molecular sensor for distinguishing agonists and antagonists in living animals. Proceedings of the National Academy of Science (USA), 103(43): 15883-15888.

10) **R. Paulmurugan**, S.S. Gambhir. 2005. Novel fusion protein approach for efficient high throughput screening of small molecule drugs mediating protein-protein interactions in cells and living animals. Cancer Research, 65: 7413-7420.

11) Massoud TF, **Paulmurugan R** and Gambhir SS. 2004. Molecular Imaging of Homodimeric Protein-Protein Interactions in Living Subjects. FASEB Journal, 18(10): 1105-7.

12) **Paulmurugan R**, Massoud TF, Huang J, and Gambhir SS. 2004. Molecular Imaging of Drug-Modulated Protein-Protein Interactions in Living Subjects. Cancer Research, 15; 64(6): 2113-9.

13) **R. Paulmurugan**, S.S. Gambhir. 2003. Monitoring Protein-Protein Interactions Using Split Synthetic Renilla Luciferase Protein Fragment Assisted Complementation. Analytical Chemistry, 75: 1584-1589.

14) **R. Paulmurugan**, Y. Umezawa, S.S. Gambhir. 2002. Noninvasive Imaging of Protein-Protein Interactions in Living Subjects by Using Reporter Protein Complementation and Reconstitution Strategies. Proceedings of the National Academy of Science (USA), 99(24): 15608-15613.

15) Ray P, Pimenta H, **Paulmurugan R**, Berger F, Phelps, ME, Iyer M, Gambhir SS. 2002. Noninvasive quantitative imaging of protein-protein interactions in living subjects. Proceedings of the National Academy of Science (USA) 99(5): 3105-3110.

International patents filed:

1. **R. Paulmurugan**, S.S. Gambhir: Ligand-regulable transactivation systems, methods of use thereof, methods of detecting ligands, and methods of detecting estrogen receptor agonists and antagonists.

2. **R. Paulmurugan**, S.S. Gambhir: Estrogen receptor intramolecular folding systems, Estrogen receptor intramolecular folding sensors, Methods of use thereof, methods of detecting ER ligand, and methods of detecting ER agonists and antagonists.

3. **R. Paulmurugan**, S.S. Gambhir: Protein phosphorylation imaging systems, and methods of use thereof.

4. **R. Paulmurugan**, S.S. Gambhir: Self complementing firefly luciferase enzyme fragments for studying cellular events in living animals .

5. Tarik F Massoud, **R. Paulmurugan**, S.S. Gambhir: Split Herpes Simplex Virus Type 1 Thymidine Kinase for Noninvasive PET Reporter Complementation Imaging of Protein-Protein Interactions.

6. Byeong-Cheol Ahn, **Ramasamy Paulmurugan** and Sanjiv Sam Gambhir. Pluripotent stem cells imaging

D. Research Support (NIH and Foundations)

P50 CA114747 [Gambhir (PI)] 08/01/05 - 06/30/10
NIH/NCI
Role: Research Scientist
Title: *In Vivo Cellular and Molecular Imaging Center@Stanford (ICMIC)*
Major goals of project: Developing *in vivo* imaging methods for measuring fundamental cellular process like protein-protein interactions, protein folding and protein trafficking in living animals.

R01 CA082214 [Gambhir (PI)] 9/30/09 – 11/30/14
NIH
Role: Research Scientist
Title: *Reporter Imaging of Protein-Protein Interactions*
Major goals of project: New strategies for high throughput screening of drugs using molecular imaging with split reporter complementation and bioluminescence resonance energy transfer.

Multimodality Imaging [GE, Gambhir (PI)]
Role: Research Scientist
Title: *Imaging Apoptosis*
Major goals of project: Developing new imaging agents for measuring apoptosis in living animals by targeting cellular transporters.

Imaging Cellular Signal Transduction Pathways 10/02/09 – 09/30/12
Radiology, Stanford
Role: PI
Title: *Reporter gene Imaging of different cellular targets involved in signal transduction pathways for drug development*
Major goals of project: Developing *in vivo* imaging strategies for high throughput screening of drugs targeting different epigenetic process (microRNA, DNA methylation and Histone methylation/acetylation), developing new treatment strategies for receptor negative breast cancers.