BIOGRAPHICAL SKETCH

Kuppusamy, Periannan	**Associate Professor of Internal Medicine** **Associate Professor of Biomedical Engineering** **Director, Center for Biomedical EPR Spectroscopy & Imaging**

INSTITUTION AND LOCATION	DEGREE	YEAR(S)	FIELD OF STUDY
University of Madras, Chennai, India	B. S.	1972-75	Chemistry, Math, Physics
University of Madras, Chennai, India	M. S.	1975-77	Chemistry
University of Madras, Chennai, India	M. Phil.	1978-80	Chemistry/Spectroscopy
Indian Institute of Technology, Chennai, India	Ph. D.	1980-85	Chemistry/Spectroscopy
National Institute of Health, NIA, Baltimore, MD	Research Fellow	1986-87	Inorganic Biochemistry
Johns Hopkins University, Baltimore, MD	Research Fellow	1987-90	Mol. & Cellular Biophysics

A. Positions and Honors

1978 - 80 Lecturer, Department of Chemistry, Pachaiyappa's College, Chennai, India
1981 - 86 Assistant Professor of Chemistry, Pachaiyappa's College, Chennai, India
1990 - 92 Instructor, Department of Medicine, Johns Hopkins University, Baltimore, MD
1992 - 01 Assistant Professor, Department of Medicine, Johns Hopkins University, Baltimore, MD
2001 - 02 Associate Professor, Department of Medicine, Johns Hopkins University, Baltimore, MD
1992 - 02 Associate Director, EPR Center, Dept. Medicine, Johns Hopkins University, Baltimore, MD
2002 - Associate Professor, Department of Int. Medicine, Ohio State University, Columbus, OH
2002 - Associate Professor, Biomedical Engineering, Ohio State University, Columbus, OH
2002 - Director, Center for Biomedical EPR Spectroscopy and Imaging, Ohio State University, Columbus, OH

Established Investigator Award, American Heart Association (1996-2001)
Reviewer, NIH Study Sections: Division of Research Resources; NCI; NIBIB

B. Selected Peer-reviewed Publications (selected from a total of 165)

1. Zweier, J. L., and **Kuppusamy, P**. Electron paramagnetic resonance measurements of free radicals in the intact beating heart: A technique for detection and characterization of free radicals in whole biological tissues. Proc. Nat. Acad. Sci. USA, 85, 5703-5707 (1988).
2. Chzhan, M., Shteynbuk, M., **Kuppusamy, P.**, and Zweier, J. L. An optimized L-band resonator for EPR imaging of biological samples. J. Magn. Reson. A105, 49-53 (1993).
3. **Kuppusamy, P.**, Chzhan, M., Vij, K., Shteynbuk, M., Gianella, E., Lefer, D. J., and Zweier, J. L. Three dimensional spectral-spatial EPR imaging of free radicals in the heart: A technique for imaging tissue metabolism and oxygenation. Proc. Nat. Acad. Sci. USA, 91, 3388-3392 (1994).
4. Zweier, J. L., Chzhan, M., Ewert, U., Schneider, G., and **Kuppusamy, P.** Development of a highly sensitive probe for measuring oxygen in biological tissues. J. Magn. Reson. B105, 52-57(1994).
5. Zweier, J. L., Wang, P., and **Kuppusamy, P.** Direct measurement of nitric oxide generation in the ischemic heart using electron paramagnetic resonance spectroscopy. J. Biolog. Chem., 270, 304-307 (1995).
6. Zweier, J. L, Wang, P., Samouilov, A., and **Kuppusamy, P.** Enzyme independent formation of nitric oxide in biological tissues. Nature Medicine, 1, 804-809 (1995).
7. **Kuppusamy, P.**, and Zweier, J. L. EPR imaging of free radicals in the heart. Curr. Topic. Biophys.18, 3-13 (1995).
8. **Kuppusamy, P.**, Chzhan, M., and Zweier, J. L. Development and optimization of three-dimensional spatial EPR imaging for biological organs and tissues. J. Magn. Reson. B, 106, 122-130 (1995).
9. **Kuppusamy, P.**, Chzhan, M., Samouilov, A., Wang, P., and Zweier, J. L. Mapping spin density and lineshape distributions of free radicals in the heart using 4D spectral-spatial EPR imaging. J. Magn. Reson. B 107, 116-125 (1995).

10. **Kuppusamy, P.**, Wang, P., and Zweier, J.L. 3D spatial EPR imaging of rat heart. Magn. Reson. Med. 34, 99-105 (1995).
11. **Kuppusamy, P.**, Ohnishi, S. T., Numagami, Y., Ohnishi, T., and Zweier, J. L. Three-dimensional imaging of nitric oxide production in the rat brain subjected to ischemia-hypoxia. J. Cereb. Blood Flow Metab. **15**, 899-903 (1995).
12. **Kuppusamy, P.**, Wang, P., and Zweier, J. L. Evaluation of nitroxides for the study of myocardial metabolism and oxygenation. Magn. Reson. Chem. 33, S123-S128 (1995).
13. **Kuppusamy, P**, and Zweier, J. L. A forward subtraction procedure for removing hyperfine artifacts in electron paramagnetic resonance imaging. Magn. Reson. Med., 35, 316-322 (1996).
14. **Kuppusamy, P.**, Chzhan, M., Wang, P., and Zweier, J. L. 3D gated EPR imaging of the beating heart: Time-resolved measurements of free radical distribution during cardiac contractile cycle. Magn. Reson. Med., 35, 323-328 (1996).
15. **Kuppusamy, P.**, Wang, P., Zweier, Krishna, M. C., Mitchell, J. B., Ma, L., Trimble, C. and J. L., and Hsia, C.J. EPR imaging of rat heart with nitroxide and a polynitroxylated albumin. Biochemistry 35, 7051-7057 (1996).
16. **Kuppusamy, P.**, Wang, P., Samouilov, A., and Zweier, J. L. Spatial mapping of nitric oxide in the ischemic heart using electron paramagnetic resonance imaging. Magn. Reson. Med. 36, 212-218 (1996).
17. **Kuppusamy, P.**, Wang, P., and Zweier, J. L. High resolution electron paramagnetic resonance imaging of biological samples with a single line paramagnetic label. Magn. Reson. Med. 37, 479-483 (1997).
18. **Kuppusamy, P.**, Shankar, R. A., and Zweier, J. L. In vivo measurement of arterial and venous oxygenation in the rat using 3D spectral-spatial electron paramagnetic resonance imaging. Phys. Med. Biol. 43, 1837-1844 (1998).
19. **Kuppusamy, P.**, Wang, P., Ma, L., Trimble, C. E., Hsia, C. J. C., and Zweier, J. L. In vivo topical EPR spectroscopy and imaging of the pharmacokinetics of nitroxide and PNA in mice. Magn. Reson. Med 40, 806-811 (1998)
20. **Kuppusamy, P.**, Afeworki, M., Shankar, R. A., Deborah, C., Krishna, M. C., Hahn, S. M., Mitchell, J. B., and Zweier, J. L. In vivo electron paramagnetic resonance imaging of tumor heterogeneity and oxygenation in a murine tumor model. Cancer Research 58, 1562-1568 (1998).
21. Krishna, M. C., **Kuppusamy, P.**, Afeworki, M., Cook, J. A., Subramanian, S., Mitchell, J. B. Development of functional electron paramagnetic resonance imaging. Breast Disease, 10, 209-220 (1998).
22. Samouilov, A., **Kuppusamy, P.** and Zweier, J. L. Evaluation of the magnitude and rate of nitric oxide production from nitrite in biological systems. Arch. Biochem. Biophys. 357, 1-7 (1998).
23. Roubaud V. M., Sankarapandi S., **Kuppusamy P,** Tordo P., Zweier JL. Quantitative measurement of superoxide generation and oxygen consumption from leukocytes using electron paramagnetic resonance spectroscopy. Anal. Biochem. 257, 210-217 (1998).
24. Chzhan, M., **Kuppusamy, P.**, Samouilov, A., He, G., Zweier, J. L. A tunable reentrant resonator with transverse orientation of electric field for in vivo EPR spectroscopy. J. Magn. Reson. 137, 373-378 (1999).
25. He, G., Shankar, R. A., Samouilov, A., Chzhan, M., **Kuppusamy, P.**, and Zweier, J. L. Noninvasive measurement of anatomic structure and intraluminal oxygenation in the gastrointestinal tract of living mice with spatial and spectral EPR imaging. Proc. Natl. Acad. Sci. USA 96, 4586-4591 (1999).
26. Zweier, J. L., Samouilov, A., and **Kuppusamy, P**. Non-enzymatic nitric oxide synthesis in biological systems. Biochim. Biophys. Acta. 1411, 250-262 (1999).
27. Shankar, R. A., Hideg, K., Zweier, J. L., and **Kuppusamy, P.** Targeted antioxidant properties of N-[(tetramethyl-3-pyrroline-3-carboxamido)propyl]phthalimide, a new antiarrhythmic drug and its nitroxide-metabolite in preventing postischemic myocardial injury. J. Pharmacol. Exp. Therap. 292, 838-845 (2000).
28. Sendhil Velan, S., Spencer, R. G. S., Zweier, J. L., and **Kuppusamy, P.** Electron paramagnetic resonance oxygen mapping: Direct visualization of oxygen concentration in tissue. Magn. Reson. Med. 43, 804-809 (2000).
29. Ilangovan, G., Zweier, J. L., and **Kuppusamy, P.** Electrochemical preparation and EPR studies of lithium phthalocyanine: Evaluation of the nucleation and growth mechanism and evidence for potential-dependent phase formation. J. Phys. Chem. B. 104, 4047-4059 (2000).
30. Ilangovan, G., Zweier, J. L., and **Kuppusamy, P.** Electrochemical preparation and EPR studies of lithium phthalocyanine. Part 2: Particle size-dependent line broadening by molecular oxygen and its implications as an oximetry Probe. J. Phys. Chem. B. 104, (2000).

31. Li, H., Xu, K. Y., Zhou, L., Kalai, T., Zweier, J. L., Hideg, K. and **Kuppusamy, P.** A pyrroline derivative of mexiletine offers marked protection against ischemia/reperfusion-induced myocardial contractile dysfunction. J. Pharmacol. Exp. Therap. 295, 563-571(2000).
32. Ilangovan, G., Li, H., Zweier, J.L., and **Kuppusamy, P.** Electrochemical preparation and EPR studies of lithium phthalocyanine. 3: Measurements of oxygen concentration in tissues. J. Phys. Chem. B.105, 5323-5330 (2001).
33. Koscielniak, J., Devasahayam, N., Moni, M. S., **Kuppusamy, P.**, Yamada, K., Mitchell, J. B., Krishna, M. C., and Subramanian, S. 300 MHz continuous wave electron paramagnetic resonance spectrometer for small animal in vivo imaging. Rev. Sci. Inst. 71, 4273-4281 (2000).
34. **Kuppusamy, P.**, Shankar, R. A., Roubaud, V. M., and Zweier, J. L. Direct in-vivo detection and imaging of nitric oxide in mice. Mag. Reson. Med. 45, 700-707(2001).
35. Petryakov, S., Chzhan, M., Samouilov, A., He, G., **Kuppusamy, P.**, and Zweier, J. L. A bridged loop–gap S-band surface resonator for topical EPR spectroscopy. J. Magn. Reson. 151, 124-128 (2001).
36. He, G., Petryakov, S., Samouilov, A., Chzhan, M., **Kuppusamy, P.**, and Zweier, J.L. Development of a resonator with automatic tuning and coupling capability to minimize sample motion noise for in vivo EPR spectroscopy J. Magn. Reson. 149, 218-227 (2001).
37. Krishna, M. C., Devasahayam, N., Cook, J. A., Subramanian, S., Kuppusamy, P. and Mitchell, J. B. Electron paramagnetic resonance for small animal imaging applications. Inst. Lab. Animals Research J. 42, 209-218 (2001).
38. He, G., Samouilov, A., **Kuppusamy, P.**, and Zweier, J. L. In vivo imaging of the distribution and metabolism of nitroxide radicals in human skin. J. Magn. Reson. 148, 155-164 (2001).
39. Ellis, S., Velayutham, M., Sendhil Velan, S., **Kuppusamy, P.**, and Spencer, R.G.S. EPR oximetry in a cartilage bioreactor. Magn. Reson. Med. 46, 819-826 (2001).
40. Manivannan, A., Yanagi, H., Ilangovan, G, and **Kuppusamy, P.** Lithium naphthalocyanine as a new probe for electron paramagnetic resonance oximetry, J. Magn. Magn. Mater. 233, L131-L135 (2001).
41. Mitchell, J. B., Krishna, M. C., **Kuppusamy, P.**, Cook, J. A., and Russo, A. Protection against oxidative stress by nitroxides. Exp. Biol. Med. 226, 620-621(2001).
42. Ilangovan, G., Manivannan, A., Li, H., Yanagi, H., Zweier, J.L., and **Kuppusamy, P.** A new naphthalocyanine-based EPR oximetry and imaging probe for biological applications. Free Radic. Biol. Med. 32, 139-147 (2002).
43. Li, H., Ma, L., Hsia, J.C., Zweier, J. L., and **Kuppusamy, P.** Polynitroxyl-albumin (PNA) enhances myocardial infarction therapeutic effect of tempol in rat hearts subjected to regional ischemia-reperfusion Free Radic. Biol. Med. 32, 712-719 (2002).
44. Ilangovan, G., Li, H., Zweier, J.L., and **Kuppusamy, P.** In vivo measurement of tumor redox environment using EPR spectroscopy. Mol. Cell. Biochem. 234/235, 393-398 (2002).
45. Leonard, S. L., Mowrey, K., Pack, D., Shi, X., Castranova, V., **Kuppusamy, P.**, and Vallyathan, V. In vivo EPR measurement of asbestosis–induced changes in redox status and lung damage. Mol. Cell. Biochem. 234/235, 369-377 (2002).
46. **Kuppusamy, P.** and Krishna, M. C. EPR imaging of tissue redox status. Curr. Topics in Biophys. 26, 29-34 (2002).
47. He, G., Evalappan, S. P., Deng, Y., **Kuppusamy, P.**, and Zweier, J. L. Mapping of the B_1 field distribution of a surface coil resonator using EPR imaging. Magn. Reson. Med. 48, 1057-1062 (2002).
48. Li, H., Deng, Y., He, G., **Kuppusamy, P.**, Lurie, D., and Zweier, J. L. Proton electron double resonance imaging of the in vivo distribution and clearance of a triarylmethyl radical in mice. Magn. Reson. Med. 48, 530-534 (2002).
49. Ilangovan, G., Pal, R., Zweier, J. L. , and **Kuppusamy, P.** Electrochemical preparation and EPR studies of lithium phthalocyanine. Part 4: Effect of nitric oxide. J. Phys. Chem. 106, 11929-11935 (2002).
50. He, G., Samouilov, A., **Kuppusamy, P.,** and Zweier, J. L. In vivo imaging of free radicals: Applications from mouse to man. Mol. Cell. Biochem. 234/235, 359-367 (2002).
51. He, G., Deng, Y., Li, H., **Kuppusamy, P.**, and Zweier, J. L. EPR/NMR co-imaging for anatomic registration of whole-body free radical images. Magn. Reson. Med. 47, 571-578 (2002).

52. Ilangovan, G., Li, H., Zweier, J. L., Krishna, M. C., Mitchell, J. B., and **Kuppusamy, P.** In vivo measurement of regional oxygenation and imaging of redox status in RIF-1 murine tumor: Effect of carbogen-breathing. Magn. Reson. Med. 48, 723-730 (2002).

53. **Kuppusamy, P.**, Li, H., Cardounel, A. J., Zweier, J. L., Yamada, K., Krishna, M. C., and Mitchell, J. B. Noninvasive imaging of redox status in tumor: Effect of tissue glutathione levels in a RIF-1 tumor model. Cancer Research 62, 307-312 (2002).

54. Yamada, K., **Kuppusamy, P.**, English, S., Yoo, J., Irie, A., Subramanian, S., Mitchell, J. B., and Krishna, M. C. Feasibility and assessment of non-invasive in vivo redox status using electron paramagnetic resonance imaging. Acta Radiol. 43, 433-439 (2002).

55. Velayutham, M., Li, H., **Kuppusamy, P.**, and Zweier, J. L. Mapping ischemic risk region and necrosis in the isolated heart using EPR imaging. Magn. Reson. Med. 49, 1181-1187 (2003).

56. Pandian, R. P., Parinandi, N. L., Ilangovan, G., Zweier, J. L., and **Kuppusamy, P.** Novel particulate spin probe for targeted determination of oxygen in cells and tissues. Free Radic. Biol. Med. 35, 1138-1148 (2003).

57. Rizzi, C., Samouilov, A., Li, H., Zweier, J. L., and **Kuppusamy, P.** Application of a trityl-based radical for measuring superoxide in biological systems. Free Radic. Biol. Med. 35, 1608-1618(2003).

58. Pandian, R. P., Kutala, V. K., Parinandi, N., Zweier, J. L., and **Kuppusamy, P**. Measurement of oxygen consumption in mouse aortic endothelial cells using a microparticulate oximetry probe. Arch. Biochem. Biophys. 420, 169-175 (2003).

59. Kutala, V. K., Parinandi, N., Zweier, J. L., and **Kuppusamy, P**. Reaction of superoxide with trityl radical: Implications for the determination of superoxide by spectrophotometry. Arch. Biochem. Biophys. 424, 81-88 (2004).

60. Ilangovan, G., Liebgott, T., Kutala, V. K., Petryakov, S., Zweier, J. L., and **Kuppusamy, P.** EPR oximetry in the beating heart: Myocardial oxygen consumption rate as an index of post ischemic recovery. Magn. Reson. Med. 51, 835-842 (2004).

61. Ilangovan, G., Zweier, J. L., and **Kuppusamy, P.** Mechanism of oxygen-induced EPR line-broadening in lithium phthalocyanine microcrystals. J. Magn. Reson. 170, 42-48 (2004).

62. Kutala, V. K., Parinandi, N. L., Pandian, R. P., and **Kuppusamy, P.** Simultaneous measurement of oxygenation in intracellular and extracellular compartments of lung microvascular endothelial cells. Antiox. Redox Signal. 6, 597-604 (2004).

63. Ilangovan, G., Bratasz, A., Li, H., Schmalbrock, P., Zweier, J. L, **Kuppusamy, P.** In vivo measurement and imaging of tumor oxygenation using co-embedded paramagnetic particulates. Magn. Reson. Med. 52, 650-657 (2004).

64. Ilangovan, G., Osinbowale, S., Bratasz, A., Bonar, M., Cardounel, A. J., Zweier, J. L., and **Kuppusamy, P.** Heat-shock attenuates respiration of cardiomyocytes through upregulation of nitric oxide synthase. Am. J. Physiol. Cell Physiol. 287, C1472-1481 (2004).

C. Research Support

1. TITLE: In vivo EPR imaging of redox status and thiols in tumor
   DESCRIPTION: The goal is to investigate the role of thiols in the treatment of human ovarian cancer. Transplanted solid tumor xenografts in mice will be studied.
   AGENCY: NIH/NCI
   ROLE: Principal Investigator
   TYPE: 1R01 CA102264 PERIOD: 04/01/2004 – 03/31/2008

2. TITLE: Development of spin probes for cell-tagging and oximetry
   DESCRIPTION: The overall goal is to design, synthesize, and characterize phthalocyanine-based paramagnetic compounds for measurement of oxygen concentration
   AGENCY: NIH/NIBIB
   ROLE: Principal Investigator
   TYPE: 1R01 EB004031 PERIOD: 07/01/2004 – 06/06/2008