Arvind P. Pathak, Ph.D.

ASSISTANT PROFESSOR
RUSSELL H. MORGAN DEPARTMENT OF RADIOLOGY AND RADIOLOGICAL SCIENCE
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THE JOHNS HOPKINS UNIVERSITY SCHOOL OF MEDICINE
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EDUCATION

2001 – 2003 Postdoctoral Fellow, Russell H. Morgan Dept. of Radiology and Radiological Science, Johns Hopkins University School of Medicine, Baltimore, MD.

1994 – 2001 Ph.D., Functional Imaging, Joint program between the Biophysics Dept. at the Medical College of Wisconsin and the Biomedical Engineering Dept. at Marquette University

1989 – 1993 B.S., Electronics Engineering, University of Poona, India

PROFESSIONAL EXPERIENCE

2005 – present **Assistant Professor, Russell H. Morgan Dept. of Radiology and Radiological Science, and Department of Oncology, Johns Hopkins University School of Medicine**

- Functional and molecular imaging of cancer.
- Multi-scale imaging of the tumor microenvironment.
- Development of computational and visualization tools for functional imaging.
- Novel contrast agent development.

2003 – 2005 **Instructor, Russell H. Morgan Dept. of Radiology and Radiological Science, Johns Hopkins University School of Medicine**

- Developed new molecular and functional imaging methods for understanding the role of the tumor microenvironment in cancer progression.

2001 – 2003 **Postdoctoral Fellow, Russell H. Morgan Dept. of Radiology and Radiological Science, Johns Hopkins University School of Medicine**

- Developed and validated novel MRI methods for understanding the role of the extracellular matrix and tumor lymphangiogenesis in breast cancer metastasis.

1996 – 2001 **Whitaker Functional Imaging Fellow, Dept. of Biomedical Engineering, Marquette University and Dept. of Biophysics, Medical College of Wisconsin**

- Developed new imaging methods for mapping angiogenesis in brain tumor patients with MRI.
- Investigated the biophysics of susceptibility-based MR contrast mechanisms and their efficacy in assessing angiogenesis and anti-angiogenic therapy in brain tumors.
- Developed new computations tools to elucidate the biophysics of image contrast in MRI.

1994 – 1996 Research Assistant, Dept. of Biomedical Engineering, Marquette University

- Designed and fabricated a microprocessor-based in vivo rate-controlled tissue indentor system for assessing viscoelastic properties of residual limbs of below-knee amputees.
- Research included clinical trials with US veterans at the VA hospital, Milwaukee, WI.

AWARDS AND HONORS

2010-2011	*Junior Faculty Pilot Project Award* – Johns Hopkins Institute for NanoBioTechnology
2009-2010	*Mentor for Bayer Science Scholarship* – Bayer Science and Education Foundation, Germany.
2009-2012	*Susan Komen Career Catalyst Award in Breast Cancer – Susan G. Komen For the Cure Foundation* (**<u>One of fifteen national recipients</u>**).
2007, 2008, 2010	*Mentor for Provost's Undergraduate Research Award* –Johns Hopkins University.
2007	*Chairperson,* Pre-Clinical Imaging of Tumor Function and Structure, ISMRM, Berlin.
2005-2007	*Career Development Award* – In Vivo Cellular and Molecular Imaging Center, Johns Hopkins University.
2005	*Elmer L. Lindseth Lectureship*, Dept. of Biomedical Engineering, Case Western Reserve University.
2004	*The Andrew Moissoff Young Investigator Award* – Lymphatic Research Foundation (LRF).
2004	*The Susan G. Komen Breast Cancer Foundation Young Investigator Scholarship* – LRF.
2002	*The Bill Negendank Young Investigator Award - First Place* For "**<u>Outstanding young investigators in the field of cancer MRI</u>**", Awarded by the International Society for Magnetic Resonance in Medicine (ISMRM).
2001	*Journal Publication Award* – Medical College of Wisconsin Cancer Center.
1998-2003	*Student Stipend Awards* – International Society for Magnetic Resonance in Medicine.
1997-2000	*Whitaker Foundation Functional Imaging Fellowship*, Dept. of Biomedical Engineering, Marquette University and Dept. of Biophysics, Medical College of Wisconsin.
1996	*Student Travel Award* – Bioengineering Section of the American Socty. of Mechanical Engineering.
1994-96	*Research Assistantship*, National Science Foundation, Dept. of Biomedical Engineering, Marquette University.

RESEARCH ACTIVITIES

<u>Scientific Articles</u>:

1. Kim E, Stamatelos S, Cebulla J, Bhujwalla ZM, Popel AS and **Pathak AP**. "Multiscale Imaging and Computational Modeling of Blood Flow in the Tumor Vasculature", *Ann of Biomed Eng* (accepted), 2012.

2. Rege A, Thakor NV, Rhie K, **Pathak AP**. "In vivo laser speckle imaging reveals microvascular remodeling and hemodynamic changes during wound healing angiogenesis", *Angiogenesis,* 15(1):87-98. Epub Dec 24, 2012 – **JOURNAL COVER.**

3. **Pathak AP**, Kim E, Zhang J, Jones MV. "Three-dimensional imaging of the mouse neurovasculature with magnetic resonance microscopy", *PLoS One*. 6(7): e22643. Epub Jul 27, 2011.

4. Rege A, Murari K, Seifert A, **Pathak AP**, Thakor NV. "Multiexposure laser speckle contrast imaging of the angiogenic microenvironment", *J Biomed Opt*. 16(5):056006, 2011.

5. Kim E, Zhang J, Hong K, Benoit NE, **Pathak AP**. "Vascular phenotyping of brain tumors using magnetic resonance microscopy (μMRI)", *J Cereb Blood Flow Metab*. 2011 Mar 9. [Epub ahead of print] – **JOURNAL COVER**.

6. Penet MF, Mikhaylova M, Li C, Krishnamachary B, Glunde K, **Pathak AP**, Bhujwalla ZM, "Applications of molecular MRI and optical imaging in cancer", *Future Med Chem*, 2(6):975-988, 2010.

7. **Pathak AP**, Penet M, and Bhujwalla ZM, "MR Molecular Imaging of Tumor Vasculature and Vascular Targets", *Advances in Genetics*, 69:1-30, 2010.

8. Soong TR, **Pathak AP**, Asano H, Fox-Talbot K and Baldwin WM 3rd, "Lymphatic Injury And Regeneration In Cardiac Allografts", *Transplantation*, 89(5):500-8, 2010.

9. **Pathak AP**. "Model system takes us a step closer to efficacious imaging biomarkers of angiogenesis in head and neck cancer", *Cancer Biol Ther*; 8(23):2284-5, 2010.

10. Penet M, **Pathak AP**, Raman V, Ballesteros P, Artemov D and Bhujwalla ZM, "Noninvasive Multi-parametric Imaging of Metastasis-Permissive Microenvironments in a Human Prostate Cancer Xenograft", *Cancer Research*; 69(22):8822-9. 2009.

11. Penet M, Mikhaylova M, Li C, Krishnamachary B, Glunde K, **Pathak AP**, Bhujwalla ZM, "Applications of molecular MRI and optical imaging in cancer.", Medicinal Chemistry Reviews, *Future Med Chem*. Jun;2(6):975-988.2010.

12. **Pathak AP**, "MR Susceptibility-based Perfusion Imaging of Tumors using Iron Oxide Nanoparticles", *Wiley Interdisciplinary Reviews: Nanomedicine and Nanobiotechnology*; 1(1):84-97, 2009.

13. **Pathak AP,** Hochfeld WE, Goodman SL, Pepper MS, "Circulating and imaging markers for angiogenesis", *Angiogenesis*, 11(4):321-335, 2008.

14. Glunde K, Jacobs MA, **Pathak AP**, Artemov D, Bhujwalla ZM, "Molecular and functional imaging of breast cancer", *NMR Biomed.* Sep 15. [Epub ahead of print] 2008.

15. Winnard PT, **Pathak AP**, Dhara S, Cho SY, Raman V and Pomper MG**,** "Molecular Imaging of Metastatic Potential", *J Nucl Med*, 49: 96S-112S, 2008.

16. Penet M-F, Glunde K, Jacobs MA, **Pathak AP** and Bhujwalla ZM, "MR Molecular and Functional Imaging of the Tumor Microenvironment", *J Nucl Med*, May; 49(5):687-90, 2008.

17. **Pathak AP**, Ward BD, and Schmainda KM, "A Novel Technique for Modeling Susceptibility-Based Contrast Mechanisms for Arbitrary Microvascular Geometries: The Finite Perturber Method", *NeuroImage*; 40(3):1130-1143, 2008.

18. Glunde K, **Pathak AP**, Bhujwalla ZM, "Molecular-functional imaging of cancer: to image and imagine", *Trends Mol Med*. 13(7):287-97, 2007.

19. Raman V, **Pathak AP**, Glunde K, Artemov D and Bhujwalla ZM, "Magnetic Resonance Imaging and Spectroscopy of Transgenic Models of Cancer", *NMR Biomed.* May; 20(3):186-99, 2007.

20. Raman V, Artemov D, **Pathak AP**, Winnard PT, Yudina A, Bogdanov A, and Bhujwalla ZM, "Hypoxic regions are characterized by low vascular volume and high permeability: A combined MR and optical imaging study of a human prostate cancer model", *Cancer Research,* 66(20):9929-36, 2006.

21. **Pathak AP,** Artemov D, Neeman M, and Bhujwalla ZM. "Lymph node metastasis in breast cancer xenografts is associated with increased regions of extravascular drain, lymphatic vessel area and invasive phenotype", *Cancer Research*, 66(10):5151-58, 2006.

22. **Pathak AP**. "Magnetic resonance imaging of tumor physiology", *Methods Mol Med*, 124:279-97, 2006.

23. Gimi B, **Pathak AP,** Ackerstaff E, Glunde K, Artemov D and Bhujwalla ZM. "Molecular Imaging Of Cancer: Applications of MR Methods", *Proceedings of the IEEE*, v93:784-799, 2005.

24. Mironchik Y, Winnard P, Vesuna F, Kato Y, Wildes F, **Pathak AP**, Kominsky S, Artemov D, Bhujwalla ZM, vanDiest P, Burger H, Glackin C and Raman V. "Twist overexpression induces in vivo angiogenesis and correlates with chromosomal instability in breast cancer", *Cancer Research*, 65(23):10801-9, 2005.

25. **Pathak AP,** Artemov D, Ward DB, Jackson DG, Neeman M, and Bhujwalla ZM. "Characterizing extravascular fluid transport of macromolecules in the tumor interstitium by MRI", *Cancer Research*, 65(4):1425-32, 2005.

26. **Pathak AP**, Gimi B, Glunde K, Ackerstaff E, Artemov D and Bhujwalla ZM. "Molecular And Functional Imaging Of Cancer: Advances in MRI and MRS", *Methods in Enzymology: Imaging in Biol Research, Part B*, v386: 1-58, 2004.

27. **Pathak AP**, Bhujwalla ZM and Pepper MS. "Visualizing Function in the Tumor-Associated Lymphatic System", *Lymphatic Research in Biology*, 2(4):165-72, 2004.

28. **Pathak AP**, Dmitri A, and Bhujwalla ZM. "A Novel System for Continuous In Vivo Monitoring of Contrast Dynamics in a Mouse Tumor Model", *Magnetic Resonance in Medicine*, 51(3):612-615, 2004.

29. Schmainda KM, Rand SD, Joseph AM, Lund R, Ward BD, **Pathak AP**, Ulmer JL, Baddrudoja MA, Krouwer HG. "Characterization of a first-pass gradient-echo spin-echo method to predict brain tumor grade and angiogenesis", *Am J Neuroradiol.* Oct; 25(9):1524-32. 2004

30. Glunde K, Guggino, SE, Solaiyappan M, **Pathak AP**, Ichikawa Y and Bhujwalla ZM. "Extracellular Acidification Alters Lysosomal Trafficking In Human Breast Cancer Cells", *Neoplasia*, 5(6): 533-545, 2003.

31. **Pathak AP**, Rand SD, and Schmainda KM. "The Effect of Brain Tumor Angiogenesis on the In Vivo Relationship between the Gradient Echo Relaxation Rate Change (ΔR2*) and Contrast Agent (MION) Dose", *Journal of Magnetic Resonance Imaging*, 18(4): 397-403, 2003.

32. Biswal BB, **Pathak AP**, Ulmer JL, and Hudetz AG. "Decoupling of the Hemodynamic and Activation-Induced Delays in fMRI", *Journal of Computer Assisted Tomography*, 27(2): 219-225, 2003.

33. Badruddoja MA, Krouwer HG, Rand SD, Rebro KJ, **Pathak AP**, and Schmainda KM. "Anti-Angiogenic Effects of Dexamethasone in 9L Gliosarcoma Assessed by MRI Cerebral Blood Volume Maps", *Neuro-oncology*, 5(4): 235-243, 2003 – **JOURNAL COVER.**

34. **Pathak AP**, Schmainda KM, Ward BD, Linderman JR, Rebro KJ, and Greene AS. "MR-derived Cerebral Blood Volume Maps: Issues Regarding Histological Validation and Assessment of Tumor Angiogenesis", *Magnetic Resonance in Medicine*, 46(4): 735-747, 2001.

35. Donahue KM, Krouwer HG, Rand SD, **Pathak AP**, Marszalkowski CS, Censky SC, Prost RW. "Utility of simultaneously acquired gradient-echo and spin-echo cerebral blood volume and morphology maps in brain tumor patients", *Magnetic Resonance in Medicine*, 43(6): 845-853, 2000.

36. **Pathak AP**, Silver-Thorn MB. "A Rate Controlled Indentor for *In Vivo* Analysis of Residual Limb Tissues", *IEEE Transactions on Rehabilitation Engineering*, 6(1): 16-30, 1998.

Other Publications:

1. **Pathak AP**, Artemov D, Solaiyappan M, and Bhujwalla ZM. "MRI May Permit Assessment of Tumor Growth Processes", *Diagnostic Imaging*, 25(4): 25-33, 2003.

Book Chapters (peer-reviewed):

1. Kato Y and **Pathak AP**, "Combined Contrast and Therapeutic Nanocarriers for Oncologic MRI" in *Nanoimaging*, Pan Stanford Publishing Pte. Ltd., Goins B and Phillips W Eds: 1-18, 2011.

2. **Pathak AP** and Bhujwalla ZM, "Molecular and Functional Imaging of Cancer: Advances in MRI and MRS" in *Essential Whole Animal Imaging Methods*, Elsevier Publishing, P. Michael Conn Ed: 184-229, 2010.

3. **Pathak AP** and Bhujwalla ZM, "Molecular Imaging of the Extracellular Matrix and Lymphatic Phenomena in Tumors", in *Molecular Imaging in Oncology*, Taylor and Frances Publishing Group, 2008.

4. Jacobs MA, Glunde K, Gimi B, **Pathak AP**, Ackerstaff EA, Artemov D, and Bhujwalla ZM, "Molecular And Functional MR Imaging Of Cancer", in *Molecular Imaging*, CRC Press, Modo MMJ and Bulte JWM Eds: 141-160, 2006.

5. **Pathak AP, "**Magnetic Resonance Imaging of Tumor Biology", in *Magnetic Resonance Imaging: Methods and Biological Applications*, Humana Press, Prasad P. Ed: 279-298, 2005.

6. Bhujwalla ZM, Ackerstaff E, Artemov D, Glunde K, **Pathak AP**, Raman V and Solaiyappan M, "In Vivo Cellular and Molecular Imaging of Cancer", in *Biomedical Magnetic Resonance*, Jaypee Press, Jagannathan NR. Ed: 247-256, 2005

7. Bhujwalla ZM, Glunde K, Ackerstaff E, **Pathak AP**, Gimi B, Mori N, Raman V and Artemov D, "Functional and Molecular MRI of Preclinical Cancer Models in Drug Discovery and Development", in *In Vivo MR Techniques in Drug Discovery and Development*, CRC Press, 2005.

Publications in Peer-reviewed Conference Proceedings:

1. Grossman R, Blakely J, Tyler B, Rudek MA, Zadnik P, Khan U, **Pathak AP**, Brem H, "The impact of Cediranib, a Pan-VEGF Receptor Tyrosine Kinase Inhibitor, on Intratumoral Temozolomide Concentration in U87 Gliomas", *AANS Annual Scientific Meeting*, 2011, Denver, Colorado.

2. Kakkad S, Penet M-F, **Pathak AP**, Solaiyappan M, Raman V, Glunde K and Bhujwalla ZM, "Characterization of Macromolecular Transport in Hypoxic Tumor Environments with Disrupted Collagen I Fibers", *Proc. ISMRM, 19th Annual Mtg*, 2011, Montreal, Canada.

3. Cebulla J, Kim E, Zhang J and **Pathak AP**, "Multi-Scale Imaging of Angiogenesis in a Breast Cancer Model" ", *Proc. ISMRM, 19th Annual Mtg*, 2011, Montreal, Canada.

4. Kim E, Zhang J, Hong K and **Pathak AP**, "A New Method for Phenotyping the Brain Tumor Microenvironment Using MR Microscopy", *Proc. ISMRM, 19th Annual Mtg*, 2011, Montreal, Canada.

5. Grossman R, Blakely J, Tyler B, Rudek MA, Zadnik P, Khan U, **Pathak AP**, Brem H, "The impact of Cediranib, a Pan-VEGF Receptor Tyrosine Kinase Inhibitor, on Intratumoral Temozolomide Concentration in U87 Gliomas", *AANS Annual Scientific Meeting*, 2011, Denver, Colorado.

6. Kim E*****, Zhang J, Hong K and **Pathak AP**, "A New Method for Vascular Phenotyping of Brain Tumors using Magnetic Resonance Microscopy", *ISMRM MR of Cancer Study Group Workshop on Improving Cancer Treatment with Advanced MR*, Santa Cruz, CA, USA, September 19-22, 2010. – ***RECIPIENT OF THE BILL NEGENDANK YOUNG INVESTIGATOR AWARD.**

7. Cebulla J, Kim E, Zhang J, and **Pathak AP**, "Multi-scale Imaging of Angiogenesis n a breast Cancer Model", *ISMRM MR of Cancer Study Group Workshop on Improving Cancer Treatment with Advanced MR*, Santa Cruz, CA, USA, September 19-22, 2010.

8. Kakkad S, Penet M-F, **Pathak AP**, Solaiyappan M, Raman V, Glunde K and Bhujwalla ZM, "Effect of Hypoxia on Transport of Macromolecules in Breast Cancer Xenografts", *ISMRM MR of Cancer Study Group Workshop on Improving Cancer Treatment with Advanced MR*, Santa Cruz, CA, USA, September 19-22, 2010.

9. **Pathak AP**, Donato K, Benoit NE, Kato Y, "Effect of the Tumor Microenvironment on Drug Distribution after Liposomal Release", *Proc. AACR, 101st Annual Mtg*, 2010, Washington DC.

10. **Pathak AP**, Kato Y, Benoit N, "Lectinized Liposomes for Multimodal in Vivo Molecular Imaging of the Tumor Endothelium", *Proc. ISMRM, 18th Annual Mtg*, 2010, Stockholm, Sweden.

11. Bonekamp D, Kim E, Ward BD, Zhang J, **Pathak AP**, "Microscopic Susceptibility Variation and Transverse Relaxation for the De Facto Brain Tumor Microvasculature", *Proc. ISMRM, 18th Annual Mtg*, 2010, Stockholm, Sweden.

12. Bonekamp D, Ward BD, Leigh R, Barker PB, **Pathak AP**, "Modeling Relaxation Effects During Bolus Passage Through Leaky Vasculature Using the Finite Perturber Method", *Proc. ISMRM, 18th Annual Mtg*, 2010, Stockholm, Sweden.

13. Kakkad S, Penet M, Solaiyappan M, **Pathak AP**, Raman V, Glunde K, Bhujwalla ZM, "Hypoxic Environments Disrupt Collagen I Fibers and Macromolecular Transport", *Proc. ISMRM, 18th Annual Mtg*, 2010, Stockholm, Sweden.

14. Kakkad S, Solaiyappan M, Glunde K, O'Rourke B, **Pathak AP**, Raman V, Penet M, Bhujwalla ZM, "Characterizing porosities in the fibrillar collagen mesh of the extracellular matrix of solid tumors", *World Molecular Imaging Congress*, Montreal, Canada, 2009.

15. Krishnamachary B, Penet MF, Nimmagadda S, Solaiyappan M, Artemov D, Glunde K, **Pathak AP**, Raman V, Pomper M, Bhujwalla ZM. "Molecular characterization of the relationship between hypoxia, total choline and breast cancer stem cell markers", *World Molecular Imaging Congress*, Montreal, Canada, 2009.

16. **Pathak AP**, Zhang J, Jones M, "Vascular Phenotyping of Brain Tumors with MR Microscopy (μMRI)", *Proc. ISMRM, 17th Annual Mtg*, Honolulu, Hawaii, 2009.

17. Kakkad S, Solaiyappan M, Glunde K, O'Rourke B, **Pathak AP**, Raman V, Penet M, Bhujwalla ZM, "Hypoxic Environments and the Extracellular Matrix: MRI and Second Harmonic Generation Microscopy Studies", *Proc. ISMRM, 17th Annual Mtg*, Honolulu, Hawaii, 2009.

18. Krishnamachary B; Penet M, Nimmagadda S, Solaiyappan M, Artemov D, Glunde K, **Pathak AP**, Winnard P, Raman V, Pomper MG, Bhujwalla ZM, "Molecular Characterization of the Relationship Between Hypoxia, Total Choline and Breast Cancer Stem Cell Markers", *Proc. ISMRM, 17th Annual Mtg*, Honolulu, Hawaii, 2009.

19. Krishnamachary B; Penet M, Nimmagadda S, Solaiyappan M, Artemov D, Glunde K, **Pathak AP**, Winnard P, Raman V, Pomper MG, Bhujwalla ZM, "Hypoxic induction of cancer stem cell markers in human breast cancer xenograft", AACR Annual Meeting, Denver, CO.

20. **Pathak AP**, Jones M, Zhang J. "New Techniques for 3D, High-Resolution, Whole brain Mapping of Murine Vasculature", *Proc. ISMRM, 16th Annual Mtg*, Toronto, Canada, 2008.

21. **Pathak AP**, Ward BD, Schmainda KM. "An Exploration of the Relation between Angiogenic Status and Susceptibility contrast in Brain Tumors", *Proc. ISMRM, 16th Annual Mtg*, Toronto, Canada, 2008.

22. Krishnamachary B, Penet M-F, Nimmagadda S, Solaiyapan M, Artemov D, Glunde G, **Pathak AP**, Raman V, Pomper MG, Bhujwalla ZM. "Hypoxia and Elevated Total Choline are Associated with 'stem-like' Cancer Cells in Brest Cancer Xenografts in Vivo: An MRI, SPECT/CT and Optical Study", *Proc. ISMRM, 16th Annual Mtg*, Toronto, Canada, 2008.

23. Kato Y, **Pathak AP**, Artemov D. "Activated MR Contrast Agent by a Dual Contrast Technique and their Application, *Proc. ISMRM, 16th Annual Mtg*, Toronto, Canada, 2008.

24. Soong TR, **Pathak AP**, Asano H, Wang L, Fox-Talbot K, Baldwin WM. "Lymphatic injury and regeneration patterns are associated with alloimmune responses in cardiac allografts", *Am Journal of Transplantation*, v8:344-345, Suppl. 2, 2008.

25. **Pathak AP**, McNutt S, Wildes F, Raman V and Bhujwalla ZM. "Differential Effects of VEGF Overexpression on Angiogenesis and ECM Integrity in Breast Cancer Xenografts Pre-selected for Their Invasiveness", *Proc. ISMRM, 15th Annual Mtg*, Berlin, Germany, 2007.

26. **Pathak AP**, Kato Y, Zhang J, and Jones M. "A New Lectin-targeted Contrast Agent for MR and Optical Molecular Imaging of Vascular Endothelium", *Proc. ISMRM, 15th Annual Mtg*, Berlin, Germany, 2007.

27. **Pathak AP**, Ward BD and Schmainda KM. "A New Technique for Investigating the Biophysical Basis of Angiogenic Contrast in Tumors using Susceptibility-based MRI", *Proc. ISMRM, 15th Annual Mtg*, Berlin, Germany, 2007.

28. Penet M-F, **Pathak AP**, Raman V, Ballesteros Garcia P, Artemov and Bhujwalla ZM. "Characterization of a Prostate Cancer Xenograft in Orthotopic and Subcutaneous Sites", *Proc. ISMRM, 15th Annual Mtg*, Berlin, Germany, 2007.

29. Mikhaylova M, Mori N, Gimi B, Walczak, Bulte JWM, **Pathak AP** and Bhujwalla ZM. "Cancer Cells Induce Lymphatic Endothelial Cell Migration", *Proc. ISMRM, 15th Annual Mtg*, Berlin, Germany, 2007.

30. Penet MF, **Pathak AP**, Raman V, Ballesteros P, Artemov D and Bhujwalla ZM. "Role of the tumor microenvironment in prostate cancer xenograft metastasis", AACR Meeting Apr 14-18, 2007; Los Angeles, CA: v2007, 3051.

31. Shah P, Jimeno A, Rubio-Viqueira B, Zhang X, Cusatis G, Chong C, Kulesza P, **Pathak AP**, Zhao M, Liu J and Hidalgo M. "In vivo testing of Mycophenolic acid (MPA) in primary pancreatic cancer (PaCa) xenografts", AACR Meeting Apr 14-18, 2007; Los Angeles, CA: v2007, 2213.

32. **Pathak AP**, "Characterizing "Angiogenic" Contrast And Extracellular Matrix Integrity In Tumors Using MRI", *ISMRM MR of Cancer Study Group Workshop on Frontiers in Metabolic, Molecular and Clinical Imaging*, Poconos, PA, USA, October 13-16, 2006.

33. Penet MF, Pathak AP, Solaiyappan M, Raman V, Ballesteros Garcia P, Artemov D, Bhujwalla ZM, "Characterization of Prostate Cancer Xenografts in Orthotopic and Subcutaneous Sites", *ISMRM MR of Cancer Study Group Workshop on Frontiers in Metabolic, Molecular and Clinical Imaging*, Poconos, PA, USA, October 13-16, 2006.

34. **Pathak AP**, Kato Y, Zhang J, Jones M. "A Novel Lectin-targeted Contrast Agent for Molecular MR Imaging of Blood Vessels", *Molecular Imaging* 5(3): 292, Sept 2006.

35. **Pathak AP,** Artemov D, Raman V, Bhujwalla ZM. "Combined Magnetic Resonance and Fluorescence Imaging of ECM Remodeling Induced by Hypoxia in Solid Tumors", *Molecular Imaging* 5(3): 230, Sept 2006.

36. **Pathak AP**, Artemov D, Raman V, and Bhujwalla ZM. "Characterizing Hypoxia-induced Alterations in ECM Integrity of Solid Tumors In Vivo Using MRI and Fluorescent Microscopy", *Proc. ISMRM, 14th Annual Mtg*, 2006, Seattle, WA.

37. Bhujwalla ZM, **Pathak AP**, Solaiyappan M, Raman V, Ballesteros P and Artemov D" Characterizing the Physiological Environments of a Prostate Cancer Xenograft in Orthotopic and Subcutaneous Sites", *Proc. ISMRM, 14th Annual Mtg*, 2006, Seattle, WA.

38. **Pathak AP,** Artemov D, Neeman M, Bhujwalla ZM. "Lymph Node Metastasis in Breast Cancer Xenografts is Associated with Increased Regions of Extravascular Drain, Lymphatic Vessel Area, and Invasive Phenotype". *AACR Special Conference - Antiangiogenesis and Drug Delivery to Tumors: Bench to Bedside and Back*, Waltham, MA, 2005.

39. **Pathak AP,** Artemov D, Neeman M, and Bhujwalla ZM, "Lymph Node Metastasis in Breast Cancer Xenografts is Associated with Increased Regions of Extravascular Drain, Lymphatic Vessel Area and Invasive Phenotype", *Proc. AACR Conference on Anti-angiogenesis and Drug Delivery to Tumors*, 2005, Boston, MA.

40. **Pathak AP,** Artemov D, Ward DB, Jackson DG, Neeman M, and Bhujwalla ZM. "Characterizing extravascular fluid transport of macromolecules in the tumor interstitium by MRI", *Proc. ISMRM, 13th Annual Mtg*, 2005, Miami, FL.

41. **Pathak AP,** Artemov D, Neeman M, and Bhujwalla ZM. "Lymph node metastasis depends upon lymphatic-convective transport, lymphatic vessel density and invasive phenotype", *Proc. ISMRM, 13th Annual Mtg*, 2005, Miami, FL.

42. Kim YR, Rebro K, **Pathak AP** and Schmainda KM. "Multi-parameter characterization of a rat cerebral tumor model using 2D GRE: Measurements of blood volume, water exchange, and inflow velocity", *Proc. ISMRM, 13th Annual Mtg*, 2005, Miami, FL.

43. Glunde K, Raman V, Solaiyappan M, **Pathak AP** and Bhujwalla ZM. "Hypoxia increases cellular phosphocholine and total choline levels in human prostate cancer cells", *Proc. ISMRM, 13th Annual Mtg*, 2005, Miami, FL.

44. **Pathak AP,** Artemov D, Jackson DG, Raman V, Neeman M, and Bhujwalla ZM. "Imaging Alterations in the Angiogenic and Lymphangiogenic Phenotype Following VEGF-A Overexpression in a Human Breast Cancer Model", *ISMRM MR of Cancer Study Group Workshop on Advances In Experimental and Clinical MR in Cancer Research*, Manchester, UK, October 16-18, 2004.

45. **Pathak AP,** Artemov D, Jackson DG, Neeman M, and Bhujwalla ZM. "Mapping Intratumoral Lymphatic-Convective Drain in Vivo using MRI", *ISMRM MR of Cancer Study Group Workshop on Advances In Experimental and Clinical MR in Cancer Research*, Manchester, UK, October 16-18, 2004.

46. **Pathak AP**, Artemov D, Jackson DG, Raman V, Neeman M, and Bhujwalla ZM. "Imaging Alterations in the Angiogenic and Lymphangiogenic Phenotype Following VEGF-A Overexpression in a Human Breast Cancer Model", *Proc. Socty for Molec Imag, 3rd Annual Mtg*, 2004, St. Louis, MO.

47. **Pathak AP**, Artemov D, Jackson DG, Neeman M, and Bhujwalla ZM. "Mapping Intratumoral Lymphatic Drain in Vivo Using MRI", *Proc. Socty for Molec Imag, 3rd Annual Mtg*, 2004, St. Louis, MO.

48. **Pathak AP**, Artemov D, and Bhujwalla ZM. "A Multi-Resolution Adaptive Filtering for Preserving Information in Dynamic Functional Imaging", *Proc. ISMRM, 12th Annual Mtg*, 2004, Kyoto, Japan.

49. **Pathak AP**, Artemov D, Jackson DG, Neeman M, and Bhujwalla ZM. "Differences in Lymphatic Drain Following VEGF Overexpression in a Human Breast Cancer Model ", *Proc. ISMRM, 12th Annual Mtg*, 2004, Kyoto, Japan.

50. Solaiyappan M, **Pathak AP**, Artemov D, Raman V and Bhujwalla ZM. "VEGF Overexpression Alters Co-Localization Patterns Of Vascular And Metabolic Parameters", *Proc. ISMRM, 12th Annual Mtg*, 2004, Kyoto, Japan.

51. **Pathak AP**, Artemov D, Jackson DG, Dafni H, Neeman M, and Bhujwalla ZM. "Probing Intratumoral Lymphangiogenesis and Lymphatic Function Using Optical Imaging", *Proc. Socty for Molec Imag, 2nd Annual Mtg*, 2003, San Francisco, CA.

52. **Pathak AP**, Artemov D, Jackson DG, Neeman M, and Bhujwalla ZM. "Intratumor and Intertumor Heterogeneity in Contrast Agent Kinetics as Assessed by Functional MRI - Initial Results with Implications for Metastasis", *Proc. ISMRM, 11th Annual Mtg*, 2003, Toronto, Canada.

53. Bhujwalla ZM, Raman V, Artemov D, Mironchik Y, Collars P, **Pathak AP** and Solaiyappan M. "MRI of Prostate Tumors Overexpressing VEGF Exhibit Distinct Alterations Of Vascular Permeability", *Proc. ISMRM, 11th Annual Mtg*, 2003, Toronto, Canada.

54. Schmainda KM, Rand SD, Joseph A, Hanson R, Ward BD, **Pathak AP**, Baddrudoja M, and Krouwer HG. "A Combined Gradient-Echo/Spin-echo DSC Method: A Surrogate Marker for Brain Tumor Histologic Grade and Angiogenesis in Patients", *Proc. ISMRM, 11th Annual Mtg*, 2003, Toronto, Canada.

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