Stanford

Daniel Spielman

Professor of Radiology (Radiological Sciences Lab) and, by courtesy, of Electrical Engineering

NIH Biosketch available Online

Bio

BIO

My interests are in the field of in vivo magnetic resonance imaging (MRI) and spectroscopy (MRS) and the development of new methods of imaging metabolism within the body. Current projects include 13C MRS of hyperpolarized substrates for the assessment of glycolysis, oxidative phosphorylation, and other key metabolic pathways, optimized mapping of 1H metabolite distributions throughout the body, and quantifying neurotransmitter levels and cycling rates in the brain. In our laboratory, we have focussed on a novel array of both acquisition and analysis techniques for use in preclinical and clinical studies. These developments, which include improved spectroscopic imaging and shimming methods, multinuclear NMR studies, application of estimation theory for optimal data quantification, and metabolic imaging, which address the inherent difficulties of low concentrations of the desired components, overlapping resonances, and magnetic field inhomogeneities caused by imperfect magnets and magnetic susceptibility variations with the body. Primary applications of this work include cancer diagnosis, treatment monitoring, and prediction of response to therapy, assessment of cardiac function, improved understanding and treatment of metabolic diseases (e.g. diabetes, liver failure) and neurologic disorders including Alzheimer's disease, schizophrenia, and epilepsy.

ACADEMIC APPOINTMENTS

- Professor, Radiology
- Professor (By courtesy), Electrical Engineering
- Member, Bio-X
- Member, Maternal & Child Health Research Institute (MCHRI)
- Member, Stanford Cancer Institute
- Member, Wu Tsai Neurosciences Institute

HONORS AND AWARDS

- Fellow, International Society of Magnetic Resonance in Medicine (ISMRM) (2017)
- Academy of Radiology Research Council Distinguished Investigator Award, Academy of Radiology (2012)

PROFESSIONAL EDUCATION

- Ph.D., Stanford University , Electrical Engineering (1991)
- MS, Stanford University , Statistics (1987)
- MS, Stanford University , Electrical Engineering (1984)
- BS, MIT , Electrical Engineering (1983)

LINKS

- The Spielman Laboratory: http://med.stanford.edu/spielmangroup.html

Research & Scholarship

CURRENT RESEARCH AND SCHOLARLY INTERESTS

My research interests are in the field of medical imaging, particularly magnetic resonance imaging and in vivo spectroscopy. While magnetic resonance imaging (MRI) has been advancing at a rapid pace during the past decade, and provides excellent contrast between organs and lesions and exquisite anatomical detail, the promise that in vivo MR spectroscopy holds for revealing functional and physiological information will likely be realized in the decade to come. Many exciting correlations have been obtained between various MR spectroscopic components (e.g., metabolites such as lactate and choline) and disease diagnosis and treatment. However, until these can be robustly presented with high spatial resolution, high signal-to-noise ratio (SNR), and reasonable imaging times, they will remain primarily in the laboratory. Thus, current research in our laboratory has focussed on an array of novel techniques for producing clinically valuable images of these important metabolic components. These approaches, which include improved spectroscopic imaging and shimming methods as well as the application of estimation theory for optimal data quantification, address the inherent difficulties of low concentrations of the desired components, overlapping resonances, and field inhomogeneities caused by imperfect magnets and magnetic susceptibility variations with the body. Applications of this work include cancer diagnosis, treatment monitoring, and prediction of response to therapy. In addition, we are conducting basic research into a variety of neurologic conditions including brain development in pediatric patients and neurodegeneration associated with Alzheimer's disease, alcoholism, and aging.

These research activities are in collaboration with faculty and staff in various departments of the Medical School and in the School of Engineering, and I advise graduate students in various degree programs including Biophysics, Bioengineering, Electrical Engineering, and Medical Informatics.

Teaching

COURSES

2025-26

- MRI Spin Physics, Relaxation Theory, and Contrast Mechanisms: BIOE 226, BMP 226, RAD 226 (Win)

2024-25

- MRI Spin Physics, Relaxation Theory, and Contrast Mechanisms: BIOE 226, BMP 226, RAD 226 (Spr)

2022-23

- MRI Spin Physics, Relaxation Theory, and Contrast Mechanisms: BIOE 226, BMP 226, RAD 226 (Spr)

Publications

PUBLICATIONS

- **Preclinical1H MRS Study of a Porcine Model Shows Evidence and Mechanisms for Acute Neuronal Injury in Neonatal Cardiopulmonary Bypass (CPB) Surgery.** *Magnetic resonance in medicine*
  Omon, A., Gu, M., Hurd, R., Riemer, K., Hanley, F., Spielman, D.
  2026
- **Differentiating Creatine and Phosphocreatine In Vivo Using 3T1H MR Spectroscopy.** *Magnetic resonance in medicine*
  Hurd, R. E., Gu, M., Adamson, P. M., Okamura, K., Shibata, M., Ono, Y., Haidar, M., Riemer, K., Hanley, F. L., Spielman, D. M.
  2025
- **A novel therapeutic strategy using a single non-toxic agent that produces consistent long-term control of orthotopic experimental glioblastomas**

Khojasteh, A., Pisani, L., Kiebish, M., Cao, T., Nagpal, S., Nastke, M., Adamson, P., Beinat, C., Gesta, S., Hurd, R., Spielman, D., Recht, L.
OXFORD UNIV PRESS INC.2025: v452-v453

- **The Circulatory Arrest Recovery Ammonia Problem (CARAP) Hypothesis: a 1H-MRS study of brain metabolism during neonatal cardiopulmonary bypass surgery.** *The Journal of thoracic and cardiovascular surgery*
  Spielman, D., Gu, M., Liu, H., Liu, S. C., Hurd, R., Riemer, K., Okamura, K., Shibata, M., Shuttleworth, P., Kleiman, Z., Epperson, K., Epperson, K., Hanley, et al
  2025

- **Detection of elevated succinate in brain during circulatory arrest in a piglet model: A 3T 1H MR spectroscopy study.** *Magnetic resonance in medicine*
  Hurd, R. E., Gu, M., Okamura, K., Shibata, M., Ono, Y., Haidar, M., Riemer, R. K., Hanley, F. L., Spielman, D. M.
  2024

- **Investigating the origin of the13C lactate signal in the anesthetized healthy rat brain in vivo after hyperpolarized [1-13C]pyruvate injection.** *NMR in biomedicine*
  Zhu, M., Jhajharia, A., Josan, S., Park, J. M., Yen, Y., Pfefferbaum, A., Hurd, R. E., Spielman, D. M., Mayer, D.
  2023: e5073

- **Deuterium metabolic imaging for 3D mapping of glucose metabolism in humans with central nervous system lesions at 3T.** *Magnetic resonance in medicine*
  Adamson, P. M., Datta, K., Watkins, R., Recht, L. D., Hurd, R. E., Spielman, D. M.
  2023

- **Efficacy of Ketamine in Unmedicated Adults With OCD: A Randomized Controlled Trial**
  Rodriguez, C., Chen, C., Glover, G., Jo, B., Spielman, D., Williams, L., van Roessel, P., DeBattista, C., Wintermark, M., Lombardi, A., Pinto, A., Valentine, K., Filippou-Frye, et al
  ELSEVIER SCIENCE INC.2023: S83

- **A Phase 1 Study of Oral Vitamin D3 in Boys and Young Men With X-Linked Adrenoleukodystrophy.** *Neurology. Genetics*
  Van Haren, K. P., Cunanan, K., Awani, A., Gu, M., Peña, D., Chromik, L. C., Považan, M., Rossi, N. C., Goodman, J., Sundaram, V., Winterbottom, J., Raymond, G. V., Cowan, et al
  2023; 9 (2): e200061

- **Efficacy of Ketamine in Unmedicated Adults With Obsessive-Compulsive Disorder: A Randomized Controlled Trial**
  Rodriguez, C., Chen, C., Glover, G., Jo, B., Spielman, D., Williams, L., Van Roessel, P., DeBattista, C., Flood, P., Ringold, A., Wintermark, M., Anderson, K., Linkovski, et al
  SPRINGERNATURE.2022: 302-303

- **Proton MRS Assessment of Neonatal Brain Metabolism During Cardiopulmonary Bypass (CPB) Surgery.** *NMR in biomedicine*
  Spielman, D. M., Gu, M., Hurd, R. E., Riemer, K., Okamura, K., Hanley, F. L.
  2022

- **Hyperpolarized NMR study of the impact of pyruvate dehydrogenase kinase inhibition on the pyruvate dehydrogenase and TCA flux in type 2 diabetic rat muscle.** *Pflugers Archiv : European journal of physiology*
  Park, J. M., Josan, S., Hurd, R. E., Graham, J., Havel, P. J., Bendahan, D., Mayer, D., Chung, Y., Spielman, D. M., Jue, T.
  2021

- **Inflammatory Cytokines and Anterior Cingulate Cortex Glutamate in Adolescent Depression**
  Segarra, J., Teresi, G., Gu, M., Spielman, D., Sacchet, M., Rosenberg-Hasson, Y., Maecker, H., Gotlib, I., Ho, T.
  ELSEVIER SCIENCE INC.2021: S285

- **Higher Levels of Pro-inflammatory Cytokines Are Associated With Higher Levels of Glutamate in the Anterior Cingulate Cortex in Depressed Adolescents.** *Frontiers in psychiatry*
  Ho, T. C., Teresi, G. I., Segarra, J. R., Ojha, A., Walker, J. C., Gu, M., Spielman, D. M., Sacchet, M. D., Jiang, F., Rosenberg-Hasson, Y., Maecker, H., Gotlib, I. H.
  2021; 12: 642976

- **Study Protocol for Teen Inflammation Glutamate Emotion Research (TIGER)** *FRONTIERS IN HUMAN NEUROSCIENCE*
  Walker, J. C., Teresi, G. I., Weisenburger, R. L., Segarra, J. R., Ojha, A., Kulla, A., Sisk, L., Gu, M., Spielman, D. M., Rosenberg-Hasson, Y., Maecker, H. T., Singh, M. K., Gotlib, et al

2020; 14

- **Study Protocol for Teen Inflammation Glutamate Emotion Research (TIGER).** *Frontiers in human neuroscience*
  Walker, J. C., Teresi, G. I., Weisenburger, R. L., Segarra, J. R., Ojha, A., Kulla, A., Sisk, L., Gu, M., Spielman, D. M., Rosenberg-Hasson, Y., Maecker, H. T., Singh, M. K., Gotlib, et al
  2020; 14: 585512

- **MRI of [2-13 C]Lactate without J-coupling artifacts.** *Magnetic resonance in medicine*
  Datta, K., Spielman, D.
  2020

- **Water and lipid suppression techniques for advanced 1 H MRS and MRSI of the human brain: Experts' consensus recommendations.** *NMR in biomedicine*
  Tkáč, I. n., Deelchand, D. n., Dreher, W. n., Hetherington, H. n., Kreis, R. n., Kumaragamage, C. n., Považan, M. n., Spielman, D. M., Strasser, B. n., de Graaf, R. A.
  2020: e4459

- **Thalamic and prefrontal GABA concentrations but not GABAA receptor densities are altered in high-functioning adults with autism spectrum disorder.** *Molecular psychiatry*
  Fung, L. K., Flores, R. E., Gu, M. n., Sun, K. L., James, D. n., Schuck, R. K., Jo, B. n., Park, J. H., Lee, B. C., Jung, J. H., Kim, S. E., Saggar, M. n., Sacchet, et al
  2020

- **GABA Measurement in a Neonatal Fragile X Syndrome Mouse Model Using 1H-Magnetic Resonance Spectroscopy and Mass Spectrometry.** *Frontiers in molecular neuroscience*
  Reyes, S. T., Mohajeri, S. n., Krasinska, K. n., Guo, S. G., Gu, M. n., Pisani, L. n., Rosenberg, J. n., Spielman, D. M., Chin, F. T.
  2020; 13: 612685

- **Multimodality Hyperpolarized C-13 MRS/PET/Multiparametric MR Imaging for Detection and Image-Guided Biopsy of Prostate Cancer: First Experience in a Canine Prostate Cancer Model** *MOLECULAR IMAGING AND BIOLOGY*
  Bachawal, S. V., Park, J., Valluru, K. S., Loft, M., Felt, S. A., Vilches-Moure, J. G., Saenz, Y. F., Daniel, B., Iagaru, A., Sonn, G., Cheng, Z., Spielman, D. M., Willmann, et al
  2019; 21 (5): 861–70

- **Detection of Metabolic Changes using Hyperpolarized C-13 MRI in a Negative F-18-FDG PET Rat Brain Cancer Model**
  Lauritzen, M., Datta, K., Merchant, M., Jang, T., Hurd, R., Liu, S., Recht, L., Spielman, D.
  SOC NUCLEAR MEDICINE INC.2019

- **Effects of acute N-acetylcysteine challenge on cortical glutathione and glutamate in schizophrenia: A pilot in vivo proton magnetic resonance spectroscopy study** *PSYCHIATRY RESEARCH*
  Girgis, R. R., Baker, S., Mao, X., Gil, R., Javitt, D. C., Kantrowitz, J. T., Gu, M., Spielman, D. M., Ojeil, N., Xu, X., Abi-Dargham, A., Shungu, D. C., Kegeles, et al
  2019; 275: 78–85

- **Effects of acute N-acetylcysteine challenge on cortical glutathione and glutamate in schizophrenia: A pilot in vivo proton magnetic resonance spectroscopy study.** *Psychiatry research*
  Girgis, R. R., Baker, S., Mao, X., Gil, R., Javitt, D. C., Kantrowitz, J. T., Gu, M., Spielman, D. M., Ojeil, N., Xu, X., Abi-Dargham, A., Shungu, D. C., Kegeles, et al
  2019; 275: 78–85

- **Multimodality Hyperpolarized C-13 MRS/PET/Multiparametric MR Imaging for Detection and Image-Guided Biopsy of Prostate Cancer: First Experience in a Canine Prostate Cancer Model.** *Molecular imaging and biology : MIB : the official publication of the Academy of Molecular Imaging*
  Bachawal, S. V., Park, J. M., Valluru, K. S., Loft, M. D., Felt, S. A., Vilches-Moure, J. G., Saenz, Y. F., Daniel, B., Iagaru, A., Sonn, G., Cheng, Z., Spielman, D. M., Willmann, et al
  2019

- **Comparison of dynamic brain metabolism during antegrade cerebral perfusion versus deep hypothermic circulatory arrest using proton magnetic resonance spectroscopy.** *The Journal of thoracic and cardiovascular surgery*
  Hanley, F. L., Ito, H. n., Gu, M. n., Hurd, R. n., Riemer, R. K., Spielman, D. n.
  2019

- **Hyperpolarized C-13 MRI: Path to Clinical Translation in Oncology** *NEOPLASIA*
  Kurhanewicz, J., Vigneron, D. B., Ardenkjaer-Larsen, J., Bankson, J. A., Brindle, K., Cunningham, C. H., Gallagher, F. A., Keshari, K. R., Kjaer, A., Laustsen, C., Mankoff, D. A., Merritt, M. E., Nelson, et al
  2019; 21 (1): 1–16

- **Reversed metabolic reprogramming as a measure of cancer treatment efficacy in rat C6 glioma model.** *PloS one*
  Datta, K. n., Lauritzen, M. H., Merchant, M. n., Jang, T. n., Liu, S. C., Hurd, R. n., Recht, L. n., Spielman, D. M.
  2019; 14 (12): e0225313

- **Socio-Communicative Deficits are Modulated by GABA Concentrations but Not GABA(A) Receptor Densities in Adults With Autism Spectrum Disorder**
  Fung, L., Flores, R., Gu, M., Spielman, D., Chin, F., Hardan, A.
  NATURE PUBLISHING GROUP.2018: S317

- **Hyperpolarized 13C MRI: Path to Clinical Translation in Oncology.** *Neoplasia (New York, N.Y.)*
  Kurhanewicz, J., Vigneron, D. B., Ardenkjaer-Larsen, J. H., Bankson, J. A., Brindle, K., Cunningham, C. H., Gallagher, F. A., Keshari, K. R., Kjaer, A., Laustsen, C., Mankoff, D. A., Merritt, M. E., Nelson, et al
  2018; 21 (1): 1–16

- **Metabolic markers, regional adiposity, and adipose cell size: relationship to insulin resistance in African-American as compared with Caucasian women.** *International journal of obesity (2005)*
  Allister-Price, C. n., Craig, C. M., Spielman, D. n., Cushman, S. S., McLaughlin, T. L.
  2018

- **A Metabolic Therapy for Malignant Glioma Requires a Clinical Measure** *CURRENT ONCOLOGY REPORTS*
  Corbin, Z., Spielman, D., Recht, L.
  2017; 19 (12): 84

- **Comprehensive Examination of the GABAergic System in Adults With Autism by Simultaneous [18F] Flumazenil-Positron Emission Tomography and Magnetic Resonance Spectroscopy**
  Fung, L., Flores, R., Liu, K., Gu, M., Spielman, D., Chin, F., Hardan, A.
  NATURE PUBLISHING GROUP.2017: S206–S207

- **CEREBRAL BLOW FLOW AND SUV TRENDS IN PET/MRI FOLLOWING BEVACIZUMAB ADMINISTRATION IN GLIOBLASTOMA**
  Corbin, Z. A., Zaharchuk, G., Spielman, D. M., Recht, L. D.
  OXFORD UNIV PRESS INC.2017: 158

- **PKM2 activation sensitizes cancer cells to growth inhibition by 2-deoxy-D-glucose** *ONCOTARGET*
  Tee, S., Park, J., Hurd, R. E., Brimacombe, K. R., Boxer, M. B., Massoud, T. F., Rutt, B. K., Spielman, D. M.
  2017; 8 (53): 90959–68

- **PKM2 activation sensitizes cancer cells to growth inhibition by 2-deoxy-D-glucose.** *Oncotarget*
  Tee, S. S., Park, J. M., Hurd, R. E., Brimacombe, K. R., Boxer, M. B., Massoud, T. F., Rutt, B. K., Spielman, D. M.
  2017; 8 (53): 90959-90968

- **C-Thiourea.** *ACS chemical biology*
  Wibowo, A., Park, J. M., Liu, S., Khosla, C., Spielman, D. M.
  2017

- **Hyperpolarized Sodium [1-C-13]-Glycerate as a Probe for Assessing Glycolysis In Vivo** *JOURNAL OF THE AMERICAN CHEMICAL SOCIETY*
  Park, J., Wu, M., Datta, K., Liu, S., Castillo, A., Lough, H., Spielman, D. M., Billingsley, K. L.
  2017; 139 (19): 6629–34

- **Simultaneous [18F]Flumazenil-Positron Emission Tomography and GABA-Magnetic Resonance Spectroscopy in Adults with Autism and Healthy Volunteers**
  Fung, L., Flores, R., Gu, M., Hjoernevik, T., Hardan, A., Spielman, D., Chin, F.
  ELSEVIER SCIENCE INC.2017: S127–S128

- **C]Alanine.** *Magnetic resonance in medicine*
  Park, J. M., Khemtong, C., Liu, S., Hurd, R. E., Spielman, D. M.

2017; 77 (5): 1741-1748

- **In vivo assessment of intracellular redox state in rat liver using hyperpolarized [1-C-13]Alanine** *MAGNETIC RESONANCE IN MEDICINE*
  Park, J. M., Khemtong, C., Liu, S., Hurd, R. E., Spielman, D. M.
  2017; 77 (5): 1741-1748
- **Interrogating the GABAergic system with simultaneous [F-18]-Flumazenilpositron emission tomography and GABA-magnetic resonance spectroscopy in healthy volunteers**
  Fung, L., Flores, R., Gu, M., Leuze, C., Hjoernevik, T., Shen, B., Park, J., Jung, J. H., Lee, B. C., Kim, S. E., McNab, J., Srinivas, S., Spielman, et al
  SAGE PUBLICATIONS INC.2017: 214-215
- **GABA editing with macromolecule suppression using an improved MEGA-SPECIAL sequence.** *Magnetic resonance in medicine*
  Gu, M., Hurd, R., Noeske, R., Baltusis, L., Hancock, R., Sacchet, M. D., Gotlib, I. H., Chin, F. T., Spielman, D. M.
  2017
- **C-pyruvate studies.** *NMR in biomedicine*
  Datta, K., Spielman, D. M.
  2017; 30 (2)
- **Doublet asymmetry for estimating polarization in hyperpolarized C-13-pyruvate studies** *NMR IN BIOMEDICINE*
  Datta, K., Spielman, D. M.
  2017; 30 (2)
- **A proton MR spectroscopy study of the thalamus in twins with autism spectrum disorder.** *Progress in neuro-psychopharmacology & biological psychiatry*
  Hegarty, J. P., Gu, M. n., Spielman, D. M., Cleveland, S. C., Hallmayer, J. F., Lazzeroni, L. C., Raman, M. M., Frazier, T. W., Phillips, J. M., Reiss, A. L., Hardan, A. Y.
  2017
- **Studying GABA Neurophysiology by Simultaneous [18F]Flumazenil-Positron Emission Tomography and Magnetic Resonance Spectroscopy**
  Fung, L., Gu, M., Leuze, C., Hjoernevik, T., Shen, B., Park, J., Flores, R., Reyes, S., Holley, D., Gandhi, H., Jung, J., Lee, B., Kim, et al
  NATURE PUBLISHING GROUP.2016: S209
- **CHANGES IN ACUTE FDG-PET FOLLOWING BEVACIZUMAB ADMINISTRATION IN GLIOBLASTOMA**
  Corbin, Z., Zaharchuk, G., Spielman, D., Recht, L.
  OXFORD UNIV PRESS INC.2016: 140
- **THALAMIC METABOLITE LEVELS AND SENSORY PROCESSING IN TWINS WITH AUTISM SPECTRUM DISORDER**
  Hegarty, J. P., Gu, M., Spielman, D., Cleveland, S., Hallmayer, J. J., Lazzeroni, L. C., Raman, M., Monterrey, J., Frazier, T., Phillips, J. M., Reiss, A. L., Hardan, A.
  ELSEVIER SCIENCE INC.2016: S102
- **Real-time PET/Hyperpolarized MRS/Ultrasound Molecular Imaging Fusion for Focal Prostate Cancer Detection and Guided Biopsy**
  Valluru, K. S., Park, J., Bachawal, S. V., Liu, C., Taviani, V., Gulaka, P. K., Saenz, Y., Felt, S. A., Vilches-Moure, J. G., Daniel, B., Cheng, Z., Spielman, D. M., Willmann, et al
  SPRINGER.2016: S152
- **Metabolite-selective hyperpolarized C-13 imaging using extended chemical shift displacement at 9.4 T** *MAGNETIC RESONANCE IMAGING*
  Yang, S., Lee, J., Joe, E., Lee, H., Choi, Y., Park, J. M., Spielman, D., Song, H., Kim, D.
  2016; 34 (4): 535-540
- **Adipose Cell Size and Regional Fat Deposition as Predictors of Metabolic Response to Overfeeding in Insulin-Resistant and Insulin-Sensitive Humans** *DIABETES*
  McLaughlin, T., Craig, C., Liu, L., Perelman, D., Allister, C., Spielman, D., Cushman, S. W.
  2016; 65 (5): 1245-1254
- **Hyperpolarized (13) C-lactate to (13) C-bicarbonate ratio as a biomarker for monitoring the acute response of anti-vascular endothelial growth factor (anti-VEGF) treatment.** *NMR in biomedicine*
  Park, J. M., Spielman, D. M., Josan, S., Jang, T., Merchant, M., Hurd, R. E., Mayer, D., Recht, L. D.
  2016; 29 (5): 650-659

- **Volumetric spiral chemical shift imaging of hyperpolarized [2-(13) c]pyruvate in a rat c6 glioma model.** *Magnetic resonance in medicine*
  Park, J. M., Josan, S., Jang, T., Merchant, M., Watkins, R., Hurd, R. E., Recht, L. D., Mayer, D., Spielman, D. M.
  2016; 75 (3): 973-984
- **Metabolite-selective hyperpolarized (13)C imaging using extended chemical shift displacement at 9.4T.** *Magnetic resonance imaging*
  Yang, S., Lee, J., Joe, E., Lee, H., Choi, Y. S., Park, J. M., Spielman, D., Song, H. T., Kim, D. H.
  2015
- **Assessing inflammatory liver injury in an acute CCl4 model using dynamic 3D metabolic imaging of hyperpolarized [1-C-13]pyruvate** *NMR IN BIOMEDICINE*
  Josan, S., Billingsley, K., Orduna, J., Park, J. M., Luong, R., Yu, L., Hurd, R., Pfefferbaum, A., Spielman, D., Mayer, D.
  2015; 28 (12): 1671-1677
- **Multivendor implementation and comparison of volumetric whole-brain echo-planar MR spectroscopic imaging** *MAGNETIC RESONANCE IN MEDICINE*
  Sabati, M., Sheriff, S., Gu, M., Wei, J., Zhu, H., Barker, P. B., Spielman, D. M., Alger, J. R., Maudsley, A. A.
  2015; 74 (5): 1209-1220
- **Assessing inflammatory liver injury in an acute CCl4 model using dynamic 3D metabolic imaging of hyperpolarized [1-(13) C]pyruvate.** *NMR in biomedicine*
  Josan, S., Billingsley, K., Orduna, J., Park, J. M., Luong, R., Yu, L., Hurd, R., Pfefferbaum, A., Spielman, D., Mayer, D.
  2015
- **Hyperpolarized 13C NMR observation of lactate kinetics in skeletal muscle.** *journal of experimental biology*
  Park, J. M., Josan, S., Mayer, D., Hurd, R. E., Chung, Y., Bendahan, D., Spielman, D. M., Jue, T.
  2015; 218: 3308-3318
- **Association of Metabolite Concentrations and Water Diffusivity in Normal Appearing Brain Tissue with Glioma Grade** *JOURNAL OF NEUROIMAGING*
  Maudsley, A. A., Roy, B., Gupta, R. K., Sheriff, S., Awasthi, R., Gu, M., Husain, N., Mohakud, S., Behari, S., Spielman, D. M.
  2014; 24 (6): 585-589
- **The feasibility of assessing branched-chain amino acid metabolism in cellular models of prostate cancer with hyperpolarized [1-(13)C]-ketoisocaproate.** *Magnetic resonance imaging*
  Billingsley, K. L., Park, J. M., Josan, S., Hurd, R., Mayer, D., Spielman-Sun, E., Nishimura, D. G., Brooks, J. D., Spielman, D.
  2014; 32 (7): 791-795
- **The feasibility of assessing branched-chain amino acid metabolism in cellular models of prostate cancer with hyperpolarized [1-C-13]-ketoisocaproate** *MAGNETIC RESONANCE IMAGING*
  Billingsley, K. L., Park, J., Josan, S., Hurd, R., Mayer, D., Spielman-Sun, E., Nishimura, D. G., Brooks, J. D., Spielman, D.
  2014; 32 (7): 791–95
- **Dynamic metabolic imaging of hyperpolarized [2-(13) C]pyruvate using spiral chemical shift imaging with alternating spectral band excitation.** *Magnetic resonance in medicine*
  Josan, S., Hurd, R., Park, J. M., Yen, Y., Watkins, R., Pfefferbaum, A., Spielman, D., Mayer, D.
  2014; 71 (6): 2051-2058
- **Hyperpolarized [1,4-C-13]-diethylsuccinate: a potential DNP substrate for in vivo metabolic imaging** *NMR IN BIOMEDICINE*
  Billingsley, K. L., Josan, S., Park, J. M., Tee, S. S., Spielman-Sun, E., Hurd, R., Mayer, D., Spielman, D.
  2014; 27 (3): 356-362
- **Improved Slice-Selective Adiabatic Excitation** *MAGNETIC RESONANCE IN MEDICINE*
  Balchandani, P., Glover, G., Pauly, J., Spielman, D.
  2014; 71 (1): 75-82
- **In vivo investigation of cardiac metabolism in the rat using MRS of hyperpolarized [1-(13) C] and [2-(13) C]pyruvate.** *NMR in biomedicine*
  Josan, S., Park, J. M., Hurd, R., Yen, Y., Pfefferbaum, A., Spielman, D., Mayer, D.
  2013; 26 (12): 1680-1687
- **Prospective neurochemical characterization of child offspring of parents with bipolar disorder.** *Psychiatry research*
  Singh, M. K., Jo, B., Adleman, N. E., Howe, M., Bararpour, L., Kelley, R. G., Spielman, D., Chang, K. D.

2013; 214 (2): 153-160

- **Prospective neurochemical characterization of child offspring of parents with bipolar disorder** *PSYCHIATRY RESEARCH-NEUROIMAGING*
  Singh, M. K., Jo, B., Adleman, N. E., Howe, M., Bararpour, L., Kelley, R. G., Spielman, D., Chang, K. D.
  2013; 214 (2): 153-160
- **Association of metabolite concentrations and water diffusivity in normal appearing brain tissue with glioma grade.** *Journal of neuroimaging : official journal of the American Society of Neuroimaging*
  Maudsley, A. A., Roy, B., Gupta, R. K., Sheriff, S., Awasthi, R., Gu, M., Husain, N., Mohakud, S., Behari, S., Spielman, D. M.
  2013; 24 (6): 585-589
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  Tee, S., Park, J., Spielman, D.
  AMER ASSOC CANCER RESEARCH.2013
- **Exchange-linked dissolution agents in dissolution-DNP (13)C metabolic imaging.** *Magnetic resonance in medicine*
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