Harvard Medical School/Harvard School of Dental Medicine
Format for the Curriculum Vitae

Date Prepared: August 18, 2014

Name: Alexander P. Lin, Ph.D.

Office Address: Center for Clinical Spectroscopy
4 Blackfan Street, HIM-820
Boston, MA 02115

Work Phone: (617) 525-5083

Work Email: aplin@partners.org

Work FAX: (617) 979-8700

Education

2003	B.S.	Biology	California Institute of Technology
2006	M.S.	Bioengineering	California Institute of Technology
2009	Ph.D.	Biochemistry and Molecular Biophysics (Advisor: Scott Fraser, PhD)	California Institute of Technology
2007-2009	IRTA Research Fellow	Cardiac Energetics (Advisor: Han Wen, PhD)	National Heart Lung and Blood Institute, National Institutes of Health

Faculty Academic Appointments

2014-	Assistant Professor	Radiology	Harvard Medical School
2009-2014	Instructor	Radiology	Harvard Medical School

Appointments at Hospitals/Affiliated Institutions

Past

1999-2008	Clinical Spectroscopist	Research	Huntington Memorial Hospital

Current

2009-	MR Spectroscopist	Radiology (Center for Clinical Spectroscopy)	Brigham and Women's Hospital

Other Professional Positions

1993-1994	Research Assistant, Dept of Biology	California Institute of Technology
1994-1995	Research Technician, Dept of Electrical Engineering	California Institute of Technology
1999-2003	Research Associate	Huntington Medical Research Institutes
2006-2007	Consultant	St. Jude Medical, Inc.
2003-2009	Senior Scientist	Rudi Schulte Research Institute
2007-2009	Scientific Advisory Board	Molecular Imaging, Inc.
2012-2013	Medical Consultant	Snow, Christensen, & Martineau

Major Administrative Leadership Positions

Local

2003-2009	Director of Clinical Services	Huntington Medical Research Institutes (Clinical Spectroscopy Group)

National and International

2000-2007	Course co-director	Huntington Medical Research Institutes/ GE MR Masters Series (Clinical MR Spectroscopy)
2002-2008	Course director (accredited)	American Society of Radiologic Technologists (Spectroscopy for MR Technologists Training Course)
2010	Course co-director	Harvard Medical School/ Breast MR Imaging and Spectroscopy Conference
2014	Organizing Committee Member	Academy of Radiology Research / Uncovering Connections: Imaging Advances in Autism, Traumatic Brain Injury, and Alzheimer's Disease

Committee Service

Regional

2009-2011	CIMIT Post-traumatic Stress Disorder Study Group	Center for Integration of Medicine and Innovative Technology
2009-2011	CIMIT Traumatic Brain Injury Study Group	Center for Integration of Medicine and Innovative Technology
2011-	College Scholarship Committee	BWH Student Success Job Program
2011-	Traumatic Brain Injury Research Workgroup	Spaulding Rehabilitation Hospital.
2011-	MR Imaging Excellence Group	Brigham and Women's Hospital
2013	Radiology Research Symposium Planning Task Force	Brigham and Women's Hospital

Professional Societies

1998-	International Society of Magnetic Resonance in Medicine	2009- : Abstract Reviewer 2012: Moderator/Chair

		2013-2014: Faculty
2001-	Radiological Society of North America	
2001-	American Academy of Neurology	
2002-2008	European Society of Magnetic Resonance in Medicine and Biology	
2004-2010	Society of Cardiovascular Magnetic Resonance	
2006-2009	Society of Molecular Imaging	
2007-2010	American Heart Association	
2010-	IEEE International Symposium on Biomedical Imaging	2010-2013: Abstract reviewer

Grant Review Activities

2003-2004, 2006	NeuroAIDS Review Committee	National Institute of Neurological Disorders and Stroke, National Institutes of Health
	2003-2004, 2006	Ad hoc Member
2011	Traumatic Brain Injury	US Army Medical Research and Materiel Command, Department of Defense
	2011	Mail Review
2012-	Leading Edge and New Initiatives Expert Committee	Canadian Foundation for Innovation
	2012, 2014	Committee Member
2013	Militarily Relevant Peer Reviewed Alzheimer's Disease Research Program	Telemedicine and Advanced Technology Research Center, Department of Defense
	2013	Committee Member

Editorial Activities

Ad hoc Reviewer

American Journal of Neuroradiology
Developmental Neuropsychology
JAMA Psychiatry
Journal of Magnetic Resonance
Journal of Magnetic Resonance Imaging
Medical Physics
Neuroimage
Neuroimage: Clinical
NeuroTx
NMR in Biomedicine
Pain Medicine
Radiology
Schizophrenia Bulletin
Translational Psychiatry

Honors and Prizes

2003	1st place, Young Investigators Award	European Society of Magnetic Resonance in Medicine and Biology
2006-2009	Dean's Scholarship Award	California Institute of Technology
2007	Fellows Retreat Research Award	National Heart Lung and Blood Institute, NIH
2009	Moving to the Top	Brigham and Women's Hospital Center for Faculty Diversity and Development
2011	Clinical Research Excellence Award	Brigham and Women's Hospital Biomedical Research Institute
2011	Partners in Excellence Team Award	Partners Healthcare
2014	Young Mentor Award	Harvard Medical School
2014	Advocacy Award	Academy of Radiology Research

Report of Funded and Unfunded Projects

Funding Information

Past

1999-2001 Short-echo Time Proton MR Spectroscopy in the Presence of Gadolinium
Berlex Research Fund
Investigator initiated industry funding
Principal Investigator
The goal of the study was to determine the effects of gadolinium on metabolite peaks and peak ratios in short-echo time proton MR spectroscopy in patients with contrast-enhancing lesions and to determine if the changes would change diagnosis.

2004-2009 Earlier Diagnosis and Treatment of Human Brain Tumor and Stroke: Molecular Neuroimaging of Angiogenesis
Rudi Schulte Research Institutes
Investigator initiated foundation funding
Co-PI
Using an innovative form of MR imaging – PASADENA – which promises 10,000 to 25,000 fold increases in sensitivity over MRI and MRS currently available, we will develop molecular imaging of angiogenesis in vivo.

2005-2009 PASADENA: Ultra-fast Carbon 13 Imaging for Early Diagnosis of Cancer
National Cancer Institute, National Institutes of Health
NCI 1R21CA118509-01A1
Co-investigator
The goal of the study was to use hyperpolarized 13C to develop an early diagnostic marker in animal models of pancreatic and breast cancer. My role in the project was to develop the 13C ultra-fast MR imaging sequences necessary to observe the 13C labeled reagents.

2005-2010 Ultra-fast 15N Imaging of Choline in Cancer

National Cancer Institute, National Institutes of Health
NCI R01CA122513-01A1
Co-investigator
The goal of the study was to develop ultra-fast 13C choline MR molecular microimaging to measure real0time tumor choline metabolism and determine the efficacy of these hyperpolarized reagents in rat models of malignant brain tumor. My role in the project was to develop ultra-fast 13C MR imaging and spectroscopy sequences on 4.7T small animal system and 1.5T human clinical MR scanner.

2006-2008 Non-invasive Imaging of Carotid Arterial Stiffness using DENSE MRI
Gordon and Betty Moore Discovery Grant
Investigator initiated foundation funding
Co-PI
The goal of the study was to optimize a novel displacement encoding with stimulated echoes (DENSE) magnetic resonance imaging sequence for the characterization of strain in the carotid arteries.

2006-2008 Non-invasive Imaging of Carotid Arterial Stiffness using DENSE-MRI
American Heart Association
AHA 0615039Y Pre-doctoral Fellowship
PI
The goal of this fellowship was to validate the strain measurements obtained with DENSE-MRI at 3.0T

2007-2009 Intramural Research Training Award
National Heart Lung and Blood Institute, National Institutes of Health
PI
The goal of this fellowship was to validate the strain measurements obtained with DENSE-MRI at 1.5T.

2008-2009 Non-invasive Imaging of Carotid Arterial Strain in Patients with Atherosclerosis using DENSE-MRI
American Heart Association
AHA 0815330F Competitive renewal
PI
The goal of the competitive renewal was to measure strain in the carotid arteries of subjects with various degrees of atherosclerosis to determine the relationship of strain and atherosclerosis.

2009-2010 Pattern Recognition Methods for Comparison of MR Spectral Data Using Wavelet Decomposition & Statistical Testing: Further Development and Testing in Vivo
Charles Stark Draper Laboratories (URAD_2010_181)
Co-investigator
We propose to expand the pattern recognition process to include magnetic resonance spectroscopy data from patients with neuropathic and nociceptive pain and extend the method to include a range of post-acquisitional processing procedures. My role in this proposal is to assist with data collection and interface with Draper staff.

2009-2010 Imaging and Spectroscopy of Breast Cancer at 3T
Siemens Medical Systems (BWH-2009-MR-01-Mountford)
Co-investigator
The goal here is to test a series of breast coils on the Siemens TIM Trio system and develop a new protocol for breast spectroscopy that will be user friendly and effective. My role on this project is to assist with coil testing, test the COSY method in breast, and oversee data acquisition in human subjects.

2009-2010 Noninvasive Cerebral Glutamate Monitoring in Veterans with Traumatic Brain Injury
Harvard Catalyst Pilot Award
Principal Investigator
The aim of this study is to measure in vivo cerebral glutamate levels in soldiers with traumatic brain injury using advanced magnetic resonance spectroscopy methods and pattern recognition software.

2009-2010 Neurospectroscopy at 3T to Study Human Pain and Control Cohort
Siemens Medical Systems (BWH-2009-MR-02-Mountford)
Co-investigator
The goal of the study is to develop, test, and optimize MR neurospectroscopy sequences, hardware, and software for the Siemens 3T systems. My role as co-investigator is to manage data collection of 1D and 2D magnetic resonance spectroscopy in subjects with neuropathic pain and age-matched healthy controls.

2012-2013 Neurochemical and Multimodal Biomarkers for Chronic Traumatic Encephalopathy
Center for Integration of Medicine and Innovative Technology Innovations Award (#127)
Principal Investigator
The goal of this study is to identify neurochemical biomarkers for Chronic Traumatic Encephalopathy (CTE) by comparison with related cognitive and behavioral metrics and identify additional biomarkers using advanced MRS methods including spectral editing and two dimensional spectroscopy. The data will be analyzed by the Draper Bioinformatics team producing pattern recognition algorithms which will then be fused with multimodal metrics from clinical findings and neuroimaging.

Current

2010-2014 Identifying biomarkers that distinguish post-traumatic stress disorder and mild traumatic brain injury using advanced magnetic resonance spectroscopy
DoD CDMRP Investigator Research Award (PT090609)
Principal Investigator
We propose a multi-parametric approach using conventional one dimensional spectroscopy as well as major advances on two-dimensional correlated spectroscopy to identify biomarkers that can be used to distinguish between post-traumatic stress disorder, traumatic brain injury, and their co-occurrence. This will be achieved using advanced pattern recognition methods that are capable of revealing discriminating metabolic markers in MR spectroscopy measurements

2011-2014 Chronic Traumatic Encephalopathy: Clinical Presentation and Biomarkers
NIH NINDS (R01 NS 078337-01A1)

Co-investigator (PI: Robert Stern, PhD)
The goal of this project is to examine the clinical presentation and biomarkers that accompany chronic traumatic encephalopathy (CTE; also known as dementia pugilistica), a preventable cause of dementia. To date, the only means of diagnosing CTE is post-mortem brain examination. In order to conduct prospective research into early detection, clinical course, and, ultimately, treatment and prevention of CTE, objective biomarkers for the disease must first be discovered. This project involves a cross-sectional examination of the relationship between estimated cumulative head impacts and the clinical symptoms and biomarkers of CTE that appear later in life.

2013-2016 Bedside to Bench and Back: Cardiometabolic Effects of Betaine Supplementation
American Diabetes Association (7-13-CE-17)
Co-investigator (PI: Allison Goldfine, MD)
The aim of this proposal is to determine whether betaine is a marker or mediator of insulin resistance, dysglycemia, and hepato-cardiovascular risk in humans. Aims: 1) Study whether betaine supplementation will improve insulin sensitivity and/or glycemia in overweight insulin resistant persons with abnormal glucose tolerance. 2) Determine whether betaine supplementation reduces hepatic fat in obese insulin resistant persons 3) Evaluate if betaine supplementation will reduce oxidative stress and restore endothelium-dependent vasodilation in obese insulin resistant persons.

2013-2016 Tau Imaging of Chronic Traumatic Encephalopathy
DoD CDMRP Traumatic Brain Injury Research Award (PT120012)
Co-investigator (PI: Martha Shenton, PhD; Robert Stern, PhD)
The purpose of this proposal is to utilize a very promising new PET tau ligand in order to measure and to localize tau deposition in the living brains of former NFL players who are at high risk for having CTE (n=20), in controls (n=5), and in Alzheimer's disease (AD) patients (n=5). Specifically, we will: 1) Detect tau accumulation in living subjects at high risk for CTE (former NFL players from an NIH funded study at BU CSTE), compared with controls and patients with AD; 2) Compare tau accumulation by PET with tau levels in cerebrospinal fluid; 3) Relate tau accumulation to cognitive functioning and symptomatology; 4) Test for genetic susceptibility to tauopathy; and 5) Develop surrogate MRI/MRS markers for tau accumulation.

2013-2016 Development of MR Biomarkers of Brain Injury in Acute and Chronic mTBI
VA Merit Award (1 I01 RX000928-01A2)
Co-investigator (PI: Martha Shenton, PhD)
Our strategy is to combine multi-modal imaging to provide prognosis of mTBI outcome, based on neuroimaging markers at the acute stage. Our aims are: 1) to detect brain abnormalities associated with persistent post-concussive symptoms (PPCS) using advanced patient-specific multimodal imaging profiles of injury; 2) to chart the longitudinal course of mTBI from injury to recovery or PPCS; and 3) to identify multimodal imaging predictors of recovery versus PPCS. Using longitudinal data, we will make predictions about recovery versus PPCS based on a priori hypotheses and an empirically derived algorithm.

2014-2015 2-Hydroxyglutarate as Biomarker of Tumor Response in IDH1-Mutant Gliomas Using Magnetic Resonance Spectroscopy

BWH Institute for the Neurosciences seed grant
Co-investigator (PI: Nils Arvold, MD)
We will use novel MRS methods to quantitate 2HG and glutamate concentrations among patients with IDH1-mutant gliomas before adjuvant therapy to establish a baseline range, and compare these levels to a control group with IDH1-wildtype gliomas. We will then test the hypothesis that among IDH1-mutant gliomas, adjuvant therapy with radiotherapy and/or chemotherapy reduces the concentration of tumor-associated 2HG detected on MR spectroscopy. Finally, we will assess for correlation between 2HG and glutamate concentrations and initial patient presentation with tumor-associated seizures, and with seizure frequency at specified timepoints following tumor-directed radiotherapy and/or chemotherapy.

2014-2015 The Brain, Neurological Features and Neuropsychological Functioning in Adults with Phenylketonuria: A Pilot Study
Biomarin
Co-investigator (PI: Susan Waisbren, PhD)
Newborn screening and early treatment prevent the most severe manifestations of PKU. However, executive functioning deficits, attention deficit disorder, slow processing speed, and visual-motor problems commonly occur. Many adults with this disorder also suffer depression and anxiety. Using advanced electroencephalogram (EEG) and magnetic resonance imaging (MRI) techniques, including novel MR spectroscopy (MRS) we hope to discover why this distinct constellation of deficits occurs in PKU. Adult subjects with PKU will undergo EEG and comprehensive MRI evaluations, including a novel method of MR spectroscopy to determine brain phenylalanine levels. In addition, they will receive neurological and neuropsychological examinations and dietary evaluation.

2014-2015 Advanced neuroimaging evaluation of the central nervous system biological changes associated with efavirenz therapy
Gilead Phase 4 ISR Proposal
Co-investigator (PI: Nina Lin, MD)
The objective of this study is to assess physiological changes in the brain associated with the Efavirenz (EFV)-based regimen using advanced imaging techniques of MRS and fMRI, and the relationship of these structural, neurochemical and functional changes. We will ssess the changes in levels of neuro-metabolites measured by MRS while on and off the EFV-based therapy.

Report of Local Teaching and Training

No presentations below were sponsored by outside entities

Teaching of Students in Courses

2007	BE248: Introduction to MRI Undergraduate and graduate students	California Institute of Technology Teaching assistant and guest lecturer

2008	EE691: Advanced MRI Undergraduate and graduate students	University of Southern California Part-time lecturer (two 3 hr lectures)

Formal Teaching of Residents, Clinical Fellows and Research Fellows (post-docs)

2009	MR Spectroscopy Introduction to MRI course for fellows	Brigham and Women's Hospital 1 hour lecture
2010-2012	MR Spectroscopy Radiology Core Clerkship	Brigham and Women's Hospital/ Dana Farber Cancer Institute 1.5 hour lecture
2011	Neurospectroscopy Radiology fellows	Beth Israel Deaconess Medical Center 1.5 hour lecture
2012	MR Spectroscopy in Pediatrics Radiology fellows	Children's Hospital Boston 1 hour lecture
2013	Section Didactic: Traumatic Brain Injury Radiology residents	Brigham and Women's Hospital 1 hour lecture
2014	The "Virtual Biopsy": Clinical Applications of MR Spectroscopy Neuroradiology Fellows	Brigham and Women's Hospital 1 hour lecture

Laboratory and Other Research Supervisory and Training Responsibilities

1999-2009	Supervision of 5 research associates all of whom have pursued PhD or PharmD after working in the laboratory	Daily mentoring for one to three years
1999-2007	Supervision of 12 undergraduates through the HMRI summer student program	Daily mentoring for 10 weeks per year
2003-2009	Supervision of 8 undergraduates through the American Heart Association Undergraduate Research Fellowship	Daily mentoring for 10 weeks per year
2006-2008	Supervision of 2 Masters students through the University of Eindhoven-Caltech Study Abroad Program	Daily mentoring for 4 months per year
2009-2010; 2013-	Harvard Medical School Office of Enrichment Programs Medical Student Research program	Daily mentoring for 12 months
2011-2013	Supervision of 2 Tufts Masters students: supervision of high school students	Daily mentoring
2010-	BWH Student Success Jobs Program: supervision of 2 high school students	Three days per week mentoring
2010-	Harvard Catalyst Visiting Research Internship Program (2 medical students)	Daily mentoring for 10 weeks
2011-	Harvard Catalyst Summer Clinical and Translational Research Program (3 undergraduates)	Daily mentoring for 10 weeks
2014-	NMSU RISE program (PhD student)	

Formally Supervised Trainees (selected)

2003-2005	Andrew Lee, PhD/Medical student at Stanford Medical School Co-authored published manuscript and presented first-author oral presentation at international medical conference; recently awarded HHMI research fellowship
2006	Lauren Wisk, PhD/Postdoctoral Research Fellow at Harvard Medical School Co-authored published manuscript
2006	Jessica Bastiaansen, PhD/Postdoctoral Research Fellow at Centre Hospitalier Universitaire Vaudois Successful submission of Masters thesis
2007	Nicole Hijnen, PhD/Research Scientist at Philips Research Successful submission of Masters thesis
2008-2009	Peter Bruno, BS/Graduate student MIT Presented two first-author posters at Stroke conference and first author on manuscript in press
2009-2010	Hayden Box, MD/ Orthopaedic Surgery Resident at University of Texas Southwestern Co-authored published manuscript
2010	Oluseyi Awodele, MD/Physician in the US Navy Co-authored manuscript in preparation
2010-2013	Daniel Rodriguez/undergraduate at University of Massachusetts Lowell Featured on national television (PBS NewsHour: American Graduate program)
2011-2014	Sai Merugumala, MS/MD/PhD student at Texas Tech Co-authored several manuscripts
2013-	Thomas Ng, MD,PhD/ Radiology resident at Brigham and Women's Hospital Co-authored published manuscript

Formal Teaching of Peers (e.g., CME and other continuing education courses)

1998	Hands-on Training for MR Spectroscopy 7th Annual PROBE Course	Two teaching sessions Pasadena, CA
1999	PROBE: 5x to 9x 8th Annual PROBE Course	Lecture and hands-on training Pasadena, CA
2000	Hands-on Training for MR Spectroscopy Clinical MR Spectroscopy Course (Siemens Medical Systems)	Two teaching sessions Honolulu, HI
2000	From Research to Clinical Practice 11th Annual Clinical MRS Course	Lecture and hands-on training Pasadena, CA
2001	Strategies for the Clinical MRS Practice 12th Annual Clinical MRS Course	2 Lectures and hands-on training Pasadena, CA
2001	Building and Billing for MRS in your Clinical Practice 13th Clinical MRS Course	Lectures and hands-on training Pasadena, CA
2002	Physics and Practice of CSI 14th Annual Clinical MRS Course	2 Lectures and hands-on training Pasadena, CA
2003	The Virtual Biopsy: MRS of Brain Tumors 15th Annual Clinical MRS Course	3 Lectures and hands-on training Pasadena, CA
2003	Acquiring SVS: Techniques in Global Diseases 16th Clinical MRS Course	3 Lectures and hands-on training Pasadena, CA
2004	Clinical Applications: MRS and the RT 17th Annual Clinical MRS Course	3 Lectures and hands-on training Pasadena, CA

2005	Clinical Applications of MR Spectroscopy 18th Annual Clinical MRS Course	3 Lectures and hands-on training Pasadena, CA
2006	Clinical CSI 19th Annual Clinical MRS Course	3 Lectures and hands-on training Pasadena, CA
2008	Acquiring Single Voxel Spectroscopy: Global and Focal Applications / Evidence-Based Medicine and MRS Neurospectroscopy Course Boston at Brigham and Women's Hospital	2 Lectures and hands-on training Boston, MA
2011	Introduction to MR Spectroscopy Beth Israel Deaconess Medical Center Technologists Meeting	CME Lecture Boston, MA
2012	The Virtual Biopsy: Magnetic Resonance Spectroscopy in Traumatic Brain Injury / Measuring Glutamate Neurotransmission in vivo using 13C MR Spectroscopy Joint Program in Nuclear Medicine: Seminars in Nuclear Medicine & Molecular Imaging	2 CME Lectures Boston, MA
2012	Traumatic Brain Injury and Spectroscopy Partners MRI Safety Seminar	CME Lecture Newton, MA
2013	Magnetic Resonance Spectroscopy: The Basics Sunrise Sessions, 21st Annual Meeting and Exhibition of the International Society for Magnetic Resonance in Medicine	CME Lecture Salt Lake City, UT
2013	Pitfalls in MR Spectroscopy 94th annual scientific program of the New England Roentgen Ray Society	CME Lecture Boston, MA
2013	Advances in TBI Imaging: SWI, DTI, MRS MRI/CT Update BWH Radiology	CME Lecture Boston, MA
2014	Clinical Spectroscopy CLINICAL MRI 2014: From Structure to Function	CME Lecture Boston, MA

Local Invited Presentations

2001	Diagnostic and Cost-Containment Benefits of Integrated MRI/MRS / Grand Rounds Department of Medicine, Huntington Memorial Hospital
2005	Displacement Encoding with Stimulated Echoes of the Carotid Arteries / 3T Users Meeting, California Institute of Technology
2006	Magnetic Resonance Spectroscopy / 3T Users Meeting, California Institute of Technology
2009	Magnetic Resonance Imaging of Strain in the Carotid Arteries / BRI Cardiovascular, Diabetes, and Metabolic Disorders Seminar
2009	Introduction to Spectroscopy: A Technologist's Perspective / BWH MR Technologists, Brigham and Women's Hospital
2010	Magnetic Resonance Spectroscopy of Traumatic Brain Injury / Partners Radiology Retreat
2010	MRS of TBI: Protocol Training / BWH MR Technologists
2011	Imaging Pain / Children's Hospital Boston Pain Club
2011	The Virtual Biopsy: Magnetic Resonance Spectroscopy of TBI / Spaulding Rehabilitation Hospital Traumatic Brain Injury Research Workgroup

2011 The "Virtual Biopsy": Clinical Applications of MR Spectroscopy / Psychiatry Neuroimaging Laboratory, Brigham and Women's Hospital
2012 "Brain Tumor Spectroscopy" / Golby Lab, Brigham and Women's Hospital
2012 "Clinical Applications of MR Spectroscopy in Cancer" / Tufts Medical Center Cancer Center Structural and Chemical Biology Program
2012 "TBI and MR Spectroscopy" Interest Group / Radiology Research Retreat
2012 "Real-time Measurements of Glutamate Neurotransmission using 13C MRS: Potential Applications in mTBI" / Spaulding Rehabilitation Hospital Traumatic Brain Injury Research Workgroup
2012 "Muscle Energetics and Characterization using Magnetic Resonance Spectroscopy" / Creager Lab, Brigham and Women's Hospital
2013 "Clinical Appliations of ^{31}P Magnetic Resonance Spectroscopy"/BWH Radiology Retreat
2013 "Outcome Prediction and Energy Utilization in Traumatic Brain Injury using Magnetic Resonance Spectroscopy"/Stroke & Neurocritical Care Research Meeting
2013 "MR Spectroscopy: Available Techniques and Applications"/ BRI Neurosciences Research Center Neuroimaging Salon Series
2014 "Non-invasive Monitoring of Cerebral Glutamine using MR Spectroscopy"/ BWH Medical Intensive Care Unit Teaching Session
2014

Report of Regional, National and International Invited Teaching and Presentations

Those presentations below sponsored by outside entities are so noted and the sponsor(s) is (are) identified.

Invited Presentations and Courses

Regional

2002 Spectroscopy for MR Technologists / Invited lectures and training
San Louis Obipso, CA (San Luis Obispo MRI Center)
2002 Spectroscopy for MR Technologists / Invited lectures and training
Los Angeles, CA (Parkview Imaging)
2004 Spectroscopy for MR Technologists / Invited lectures and training
Santa Barbara Cottage Hospital, Santa Barbara, CA (GE Medical Systems)
2004 Clinical MR Spectroscopy / Invited lecture
Keck School of Medicine at University of Southern California, Los Angeles, CA (Insite Imaging)
2006 Measuring Strain in the Carotid Arteries using DENSE MRI / Invited lecture
Radiology Diagnostic Cardiovascular Imaging Section, University of California Los Angeles, Los Angeles, CA
2007 In Vitro and In Vivo Testing of Medical Devices in MRI / Invited lecture
Sylmar, CA (St. Jude Medical, Inc.),
2007 Measuring Strain in the Carotid Arteries using DENSE MRI / Invited lecture
Viterbi School of Engineering, University of Southern California, Los Angeles, CA
2009 Spectroscopy MRI / Invited lecture
SMRT New England Regional Educational Seminar, Boston, MA
2010 MR Spectroscopy: A Technologists Perspective / Invited lecture
SMRT New England Regional Educational Seminar, Foxwood, MA
2011 Computer Assisted Diagnostics: Opportunities and Obstacles / Invited Speaker and

panelist
Medical Development Group, Waltham, MA

2011-2012 Introduction to Magnetic Resonance Spectroscopy / Invited lectures
Massachusetts Institute of Technology, Brain and Cognitive Sciences FPOP

2012 Magnetic Resonance Spectroscopy in Head Injury / Invited lecture
SMRT New England President's Regional Educational Seminar, Salem, MA

2012 GABA Signaling and Spectroscopy / Invited lecture
ORWH-NIMH SCOR: Center for Sex Differences in Depression, Boston, MA

2013 Clinical Applications of MRS / Invited lecture
Integrative Medicine Fellowship Conference, Boston, MA

2014 Science Presentations from the MRI Research Community / Invited lectures
Boston Children's Hospital

National

2003- Visiting Associate, Center for Magnetic Resonance, University of Illinois College of Medicine at Chicago, IL Dr. Keith Thulborn

1999 Clinical efficacy and added value of quantitative MR spectroscopy compared with MRI in patients with suspected brain tumors (abstract)
67th Annual Meeting of the American Association of Neurological Surgeons, New Orleans, LA

1999 No impact of Gd-DTPA on quantitative MRS of human brain tumors (abstract)
85th Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL

2000 Monitoring intrahippocampal neurotransplant for Alzheimer's disease (abstract)
Annual Meeting of the American Academy of Neurology, Philadelphia, PA

2001 Identification of Dietary Supplement Methylsulfonyl Methane (MSM) in the Brain by Multinuclear Magnetic Resonance Spectroscopy
87th Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL

2001 Spectroscopy for MR Technologists / Invited lectures and training
Long Island, NY (Nassau Radiologic Group)

2002 The Virtual Biopsy: MRS of Brain Tumors / Invited lecture
University of Medicine and Dentistry of New Jersey, Newark, NJ

2002 Spectroscopy for MR Technologists / Invited lectures and training
Kalamazoo, MI (KNI Southwest Michigan Imaging Center)

2002 Clinical Applications of MR Spectroscopy / Invited lectures and training
Inland Imaging Medical Imaging Series, Spokane, WA (Inland Imaging)

2003 Abnormal brain 1H MRS may be predictive of Lipodystrophy in HIV positive patients. (abstract)
ISMRM Workshop on Dynamic Spectroscopy and Measurements of Physiology, Metabolism, and Function, Orlando, FL

2004 Spectroscopy for MR Technologists / Invited lectures and training
Cardinal Glennon Children's Hospital, St. Louis, MO

2004 Virtual Dissections: Non-Invasive Characterization Of Fiber Tracts in Normal Pressure Hydrocephalus with Diffusion Tensor Imaging and MR Spectroscopy (abstract)
90th Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL

2004 Cost-effectiveness and Efficacy of Proton Magnetic Resonance Spectroscopy in the

Management of Recurrent and High Risk Brain Tumors. (abstract)
90th Scientific Assembly and Annual Meeting of the Radiological Society of North America, Chicago, IL

2006 Preliminary Validation of Circumferential Strain Measurements using DENSE at 1.5T and 3T (abstract)
Society of Cardiovascular Magnetic Resonance, Miami, FL

2008 Molecular Basis of Atherosclerosis / Invited lecture
Global Enterprise for Micromechanics and Molecular Medicine Conference, Pasadena, CA

2010 Neurochemical Changes in Athletes with Chronic Traumatic Encephalopathy (abstract)
Radiological Society of North America, Chicago, IL

2011 Identifying Biomarkers for PTSD and mTBI using Magnetic Resonance Spectroscopy / Invited lecture
US Department of Defense Traumatic Brain Injury In Progress Review, Bethesda, MD

2011 Identifying Biomarkers for PTSD and mTBI using Magnetic Resonance Spectroscopy / Invited lecture
2nd Annual Navy Medicine Research Conference, Bethesda, MD

2011 Magnetic Resonance Spectroscopy of Traumatic Brain Injury / Invited Lecture
Children's Hospital Los Angeles, CA

2011 The Virtual Biopsy: MRS of CTE / Invited lecture
United States Army Medical Research and Materiel Command, Current State of TBI Imaging Debrief for MajGen James K. Gilman, commanding general USAMRMC

2011 The Virtual Biopsy: Measuring Brain Biochemistry in TBI and PTSD
2nd Annual Health Disparities Symposium, New Mexico State University, Las Cruces, NM

2013 Identifying Biomarkers for PTSD and mTBI using MRS / Invited lecture
US Department of Defense, Post-traumatic Stress In Progress Review, Ft. Dietrick, MD

2013 Magnetic Resonance Spectroscopy: The Basics / Invited lecture
21st Annual Meeting & Exhibition, International Society for Magnetic Resonance in Medicine, Salt Lake City, UT

2014 MR Spectroscopy of Hepatic Encephalopathy / Invited lecture
Web lecture (Hyperion Pharmaceuticals)

2014 Imaging Advances in Traumatic Brain Injury/ Invited lecture
Uncovering Connections: Imaging Advances in Autism, Traumatic Brain Injury, and Alzheimer's Disease, Bethesda , MD (Academy of Radiology)

2014 Identifying Biomarkers for PTSD and mTBI using MRS / Invited lecture
US Department of Defense, Post-traumatic Stress In Progress Review, Ft. Dietrick, MD

2014 Regional Metabolite Profiles in Chronic Sports-Related Concussion (abstract)
10th World Congress on Brain Injury, San Francisco, CA

2014 The Virtual Biopsy: Clinical Applications of Magnetic Resonance Spectroscopy / Invited Lecture
Texas Tech Neuroimaging Institute

International

2000 The Effect of Gadolinium on Quantitative Short-echo Time Single Voxel MRS of Treated and Untreated Brain Tumors (abstract)
8th Scientific Meeting, International Society for Magnetic Resonance in Medicine, Denver

2002 Evidence of reduced glutamate neurotransmission in patients with Alzheimer's disease – An in vivo 13C MRS study (abstract)
19th Scientific Meeting of the European Society of Magnetic Resonance in Medicine and

Biology, Cannes

2004 Clinical MR Spectroscopy Course / Invited lectures
Shanghai, China (GE Medical Systems Asia)

2004 CME Meeting on MR Spectroscopy / Invited lectures and hands-on training
St. Theresa's Hospital, Hong Kong, China (Siemens Medical Systems)
MRS: Basics, Advanced Techiques, and Non-neoplastic Disease /Invited lectures and hands-on training
UC Davis Radiology Workshop, Cancun Mexico

2005 Feasibility, Safety, and Clinical Utility of Proton Magnetic Resonance Spectroscopy in the Presence of Deep Brain Stimulators for Parkinson's Disease (abstract)
13th Scientific Meeting, International Society for Magnetic Resonance in Medicine, Miami

2005 Apparent Rate of NAA Synthesis is Increased in Alzheimer's Disease (abstract)
13th Scientific Meeting, International Society for Magnetic Resonance in Medicine

2005 Metabolic Imaging of Hyperpolarized 13C Substrates using Echo Planar Chemical Shift Imaging. (abstract)
22nd Scientific Meeting of the European Society of Magnetic Resonance in Medicine and Biology, Basle

2006 ^{13}C MRS: Technique and Potential Clinical Applications / Invited lectures
1st International Symposium of Ultra-High Field Strength of Magnetic Resonance in Medicine. Beijing, China

2006 The Virtual Biopsy / Invited lecture
Peking University Hospital, Beijing China (GE Medical Systems)

2006 Strategies for MR Spectroscopy / Invited lectures
Tong Ji Hospital, Wuhan, China (GE Medical Systems)

2008 Reimbursement for MR$ / Invited lecture
GE Spectroscopy Users Group Meeting (GE Healthcare)

2008 Clinical Applications of Multinuclear MR in White Matter / Invited lecture
White Matter Study Group, International Society of Magnetic Resonance in Medicine. Toronto, Canada

2008 Spatial Heterogeneity of Carotid Artery Wall Strain Using Displacement-Encoded MRI at 1.5T and 3.0T (abstract)
16th Scientific Meeting, International Society for Magnetic Resonance in Medicine, Toronto, Canada

2009 Magnetic Resonance Spectroscopy: New Roles for Glutamate / Invited lecture
World Molecular Imaging Conference, Montreal, Canada

2010 In vivo L-COSY MR Distinguishes Glutamate from Glutamine and Shows Neuropathic Pain to Cause a Buildup of Glutamine in the Brain. (abstract)
18th Scientific Meeting, International Society for Magnetic Resonance in Medicine, Stockholm, Sweden

2011 Advanced MR Spectroscopy Training Class (3 lectures, 2 clinical reading sessions, hands-on training)
Universidad de La Laguna, Santa Cruz de Tenerife, Spain

2012 Comparison of Cerebral Glutamate and GABA in Schizotypal Personality Disorder using Spectral Editing and 2D Correlated Spectroscopy (abstract)
20th Scientific Meeting, International Society for Magnetic Resonance in Medicine, Melbourne, Australia

2012 International Symposium of Absolutely Quantified MR Spectroscopy (5 lectures), The Neuroradiological Society of Taiwan, Taipei, Taiwan

2014 Advanced MR Imaging & Spectroscopy of Traumatic Brain Injury: What is the Potential?, The Joint Annual Meeting, International Society for Magnetic Resonance in Medicine – European Society for Magnetic Resonance in Medicine and Biology, Milan, Italy

2014 Clinical MRS in the realm of evidence based medicine, 2nd TRANSACT Workshop, Bern, Switzerland

Report of Clinical Activities and Innovations

Current Licensure and Certification

2009- Registered Magnetic Resonance Imaging Technologist

Report of Technological and Other Scientific Innovations

Patent Magnetic Resonance Spectroscopy Provides a Non Invasive Means of Monitoring Repetitive Head Injury (USPTO, ed. A61B5/055 ed. USA: Brigham and Womens Hospital, 2011; US2011/062211)

Patent Method And System For Detecting and Identifying Different Types of Pain and Monitoring Subsequent Therapy (USPTO 61/801,369)

Patent Detection of Lobular and Ductal Cancer (USPTO 61/800,953)

Report of Education of Patients and Service to the Community

Activities

2007-2010 MentorNet mentor
MentorNet is a virtual network for diversity in engineering and science and as a member I have enjoyed mentoring several undergraduate and graduate students of different ethnicity and gender.

2010 Radiological Society of North America Press conference
Press conference and press release resulted in over 1,000 placements in print, television, and online media with an estimated total exposure of 553 million viewers. http://bit.ly/rsna_apl

2011 Brain Injury Awareness Day on Capitol Hill
By invitation from the Congressional Brain Injury Task Force, I helped to educate Members of Congress and their staff on the effects of traumatic brain injury by exhibiting our research at this fair.

2011 "Head Games" WCVB-Ch 5 Special Report
I was interviewed for a special segment on my research in sports-related head injury

that aired on September 15th, 2011 and was also featured as one of a four part series on concussion on the Chronicle HD news program on October 29th, 2011.

2012 "I Am Harvard Catalyst: Alexander Lin" Feature
"I am Harvard Catalyst" is a series of spotlights on clinical/translational investigators, showcasing examples of innovation, collaboration, community engagement, or professional development that have been supported by Harvard Catalyst. I was featured in a spotlight that is currently available online: http://bit.ly/catalyst_apl

2012 "Putting on the Scrubs: Experiencing Health Careers" Knowledge @Wharton Special Article
I was interviewed for an article on the BWH Student Success Jobs Program which I serve as a mentor. The interview was featured on the University of Pennsylvania Wharton School of Business website for highlighting high school educational experiences. Available online at: http://bit.ly/penn_ssjp

2012 BWH Clinical & Research News Feature
My involvement in the Harvard Catalyst Summer Clinical and Translational Research Program was highlighted in the article that is available online at: http://bit.ly/bwh_sctrp

2012 PBS Newshour American Graduate program
My participation in the BWH Student Success Jobs Program was highlighted in a special segment aired on national broadcast on the PBS Newshour American Graduate program. Footage is online at: http://bit.ly/pbs_ssjp

2013 White Ribbon Day
Participated in the creation of a video to speak out against violence against women in the March 7th worldwide celebration of White Ribbon Day. Video is online at: http://vimeo.com/60553134

2013 Chronicles of Higher Education article
Featured in the cover article of the July 15th, 2013 edition of the Chronicles Review entitled "A Brain Gone Bad: Researchers clear the fog of chronic head trauma" The article is online at: http://bit.ly/chronicle_cte

Report of Scholarship

Publications

Peer reviewed publications in print or other media

Original Manuscripts

1. **Lin A**, Bluml S, Mamelak A. Efficacy of Proton Magnetic Resonance Spectroscopy In Clinical Decision Making for Patients with Suspected Malignant Brain Tumors. Journal of Neuro-Oncology. 1999; 45(1): 69-81, 1999.
2. Ross BD, Hoang T, Bluml S, Dubowitz D, Kopyov O, Jacques D, **Lin A**, Seymour KJ and Tan J. In vivo magnetic resonance spectroscopy of human fetal tissue transplants. NMR in Biomedicine. 1999; 12:221-236
3. Pandit S, **Lin A**, Gahbauer H, Libertin C R, Erdogan B. MR spectroscopy in Neurocysticercosis. J. Comp. Assist. Tomogr. 2001; 26(6):950-952.
4. **Lin A**, C-H Nguy, F. Shic, BD Ross. Accumulation of Methylsulfonylmethane (MSM) in the Human Brain: Identification by Magnetic Resonance Spectroscopy. Toxicology Letters, 2001;123:169-177.
5. **Lin AP**, Ross BD. Short-Echo Time Proton MR Spectroscopy in the Presence of Gadolinium J Comput Assist Tomogr 2001; 25(5):705-713.
6. Cecil KM, **Lin A**, Ross BD, Egelhoff JC. Methylsulfonylmethane Observed by in vivo Proton Magnetic Resonance Spectroscopy in a Five Year Old Child with Developmental Disorder: Effects of Dietary Supplementation. J Comput Assist Tomogr. 2002 Sep-Oct;26(5):818-20.
7. **Lin AP**, Shic F, Enriquez E, Ross BD. Reduced glutamate neurotransmission in patients with Alzheimer's disease – an in vivo 13C magnetic resonance spectroscopy. Magn Reson Mater Phy. 2003; 16:29-42
8. Ross BD, **Lin AP**, Harris K. Clinical Experience with 13C MRS in vivo. NMR in Biomed. 2003 Oct/Nov; 16(6): 358-369
9. Haseler LJ, **Lin AP**, Richardson RS. Skeletal muscle oxidative metabolism in sedentary humans: 31P MRS assessment of O2 supply and demand limitations. J Appl Physiol. 2004; 97(3):1077-81.
10. England B, Lee A, Tran T, Faw H, Yang P, **Lin A**, Roth F, Ross BD. Magnetic Resonance Criteria for Future Trials of Cardiac Resynchronization Therapy. J Cardiac Magn Reson. 2005; 7(5):827-834.
11. Bhattacharya P, Harris K, **Lin A**, Mansson M, Norton V, Perman W, Weitekamp D, Ross BD. Ultrafast Three Dimensional Free Precession Imaging. Magn Reson Mater Phy. 2005;18(5):245-56.
12. Harris K, **Lin A**, Bhattacharya P, Tran T, Wong W, Ross B. Regulation of NAA-synthesis in the human brain in vivo: Canavan's disease, Alzheimer's disease and schizophrenia. Adv Exp Med Biol. 2006; 576:263-73
13. **Lin AP**, Tran TT, Ross BD. Impact of evidence-based medicine on magnetic resonance spectroscopy. NMR Biomed. 2006;19(4):476-83.
14. Haseler LJ, **Lin A**, Hoff J, Richardson RS. Oxygen availability and PCr recovery rate in untrained human calf muscle: evidence of metabolic limitation in normoxia. Am J Physiol Regul Integr Comp Physiol. 2007;293(5):R2046-51.
15. Bhattacharya P, Chekmenov EY, Perman WH, Harris KC, **Lin AP**, Norton VA, Tan CT, Ross BD, Weitekamp DP. Towards Hyperpolarized 13C-succinate imaging of brain cancer. JMR. 2007; 186:108-13.
16. **Lin AP**, Bennett E, Wisk LE, Gharib M, Fraser SE, Wen H. Circumferential Strain in the Wall of the Common Carotid Artery: Comparing Displacement-Encoded and CINE MRI in Volunteers. Magn Reson Med. 2008; 60(1):8-13.
17. Perman WH, Bhattacharya P, Leupold J, **Lin AP,** Harris KC, Norton VA, Hovener JB, Ross BD. Fast volumetric spatial-spectral MR imaging of hyperpolarized (13)C-labeled compounds using multiple echo 3D bSSFP. Magn Reson Imaging. 2010; 28(4):459-65.
18. Stanwell P, Siddall P, Keshava N, Cocuzzo D, Ramadan S, **Lin A**, Herbert D, Craig A, Tran Y, Middleton J, Gautam S, Cousins M, Mountford C. Neuro magnetic resonance spectroscopy using wavelet decomposition and statistical testing identifies biochemical changes in people with spinal cord injury and pain. Neuroimage. 2010; 53(2):544-52.

19. Ramadan S, Andronesi OC, Stanwell P, **Lin AP**, Sorensen AG, Mountford CE. Use of in vivo two-dimensional MR spectroscopy to compare the biochemistry of the human brain to that of glioblastoma. Radiology. 2011; 259(2):540-9.
20. Ramadan S, Baltzer PA, **Lin A**, Stanwell P, Box H, Kaiser WA, Mountford CE. L-COSY of breast cancer at 3T. Eur J Radiol. 2012; 81(1):S129-31
21. **Lin AP,** Tran T, Bluml S, Merugumala S, Liao HJ, Ross BD. Guidelines for acquiring and reporting clinical neurospectroscopy. Semin Neurol. 2012; 32(4):432-53.
22. Cocuzzo D, **Lin A**, Stanwell P, Mountford C, Keshava N. In Vivo Brain Magnetic Resonance Spectroscopy: A Measurement of Biomarker Sensitivity to Post-Processing Algorithms. IEEE J Trans Eng in Health and Med. 2014; e-pub ahead of print
23. **Lin AP**, Ramadan S, Stern RA, Box H, Nowinski C, Ross BD, Mountford CE. Changes in the Neurochemistry of Athletes with Repetitive Brain Trauma. Alzheimer Research and Therapy. (In Press)

Peer-reviewed Review Articles

1. **Lin AP**, Ross BD, Harris K, Wong W. Efficacy of Proton Magnetic Resonance Spectroscopy in Neurological Diagnosis and Neurotherapeutic Decision-Making. NeuroRx. 2005; 2(2): 197-214.
2. Xu V, Chan H, **Lin AP**, Sailasuta N, Valencerina S, Tran T, Hovener J, Ross BD. MR Neurospectroscopy in Diagnosis and Neurological Decision Making. Semin Neurol. 2008; 28(4):407-22.
3. Tran T, Ross B, **Lin A**. Magnetic resonance spectroscopy in neurological diagnosis. Neurol Clin. 2009 Feb;27(1):21-60
4. Mountford CE, Stanwell P, **Lin A**, Ramadan S, Ross B. Neurospectroscopy: The Past, Present and Future. Chem Rev. 2010; 110(5):3060-86.
5. Gavett BE, Cantu RC, Shenton M, **Lin A**, Nowinski CJ, McKee AC, Stern RA. Clinical appraisal of chronic traumatic encephalopathy: current perspectives and future directions. Current Opinion in Neurology. 2011; 24:525-531
6. Cocuzzo D, **Lin A**, Ramadan S, Mountford C, Keshava N. Algorithms for characterizing brain metabolites in two-dimensional in vivo MR correlation spectroscopy. Conf Proc IEEE Eng Med Biol Soc. 2011;2011:4929-34.
7. Shenton ME, Hamoda HM, Schneiderman JS, Bouix S, Pasternak O, Rathi Y, Vu MA, Purohit MP, Helmer K, Koerte I, **Lin AP**, Westin CF, Kikinis R, Kubicki M, Stern RA, Zafonte R. A review of magnetic resonance imaging and diffusion tensor imaging findings in mild traumatic brain injury. Brain Imaging Behav. 2012; 6(2):137-92.
8. Baugh CM, Stamm JM, Riley DO, Gavett BE, Shenton ME, **Lin A**, Nowinski CJ, Cantu RC, McKee AC, Stern RA. Chronic traumatic encephalopathy: neurodegeneration following repetitive concussive and subconcussive brain trauma. Brain Imaging Behav. 2012; 6(2):244-54.
9. **Lin AP**, Liao HJ, Merugumala SK, Prabhu SP, Meehan WP 3rd, Ross BD. Metabolic imaging of mild traumatic brain injury. Brain Imaging Behav. 2012; 6(2):208-23.
24. Oz G, Alger JR, Barker PB, Bartha R, Bizzi A, Boesch C, Bolan PJ, Brindle KM, Cudalbu C, Dincer A, Dydak U, Emir UE, Frahm J, Gonzalez RG, Gruber S, Gruetter R, Gupta RK, HEerschap A, Henning A, Hethertington H, Howe FA, Huppi PS, Hurd RE, Kantarci K, Klomp DWJ, Kreis R, Kruiskamp MJ, Leach MO, **Lin AP**, Luijten PR, Marjanska M, Maudsley AA, Meyerhoff DJ, Mountford CE, Nelson SJ, Pamir MN, Pan JW, Peet AC, Poptani H, Posse S, Scheenen TWJ, Schuster C, Smith ICP, Soher BJ, Tkac I, Vigneron DB, Kauppinen RA. Clinical Proton MR Spectroscopy in Central Nervous System Disorders: The MRS Consensus Group. Radiology 2014; 270(3):658-79
10. **Lin AP**, Ross BD. Recent Progress in Clinical Magnetic Resonance Spectroscopy. eMagRes

(formerly Encyclopedia of Magnetic Resonance). 2013; 2: 47–54.
11. Ramadan S, **Lin A**, Stanwell P. Glutamate and Glutamine: A Review of In Vivo MRS in the Human Brain. NMR in Biomed 2013; 26(12):1630-46.
12. Ng TSC*, **Lin AP***, Koerte IK, Pasternak O, Liao HJ, Merugumala S, Bouix S, Shenton SE. Neuroimaging in Repetitive Brain Trauma. Alzheimer's Research and Therapy 2014; 6(1):10-25

Non-peer reviewed scientific or medical publications/materials in print or other media

Book Chapters:
1. Ross BD, Bluml S, Seymour KJ, Tan J, Hwang JH, **Lin A**. Systemically Induced Encephalopathies: Newer Clinical Applications of MRS. Encyclopedia of Nuclear Magnetic Resonance, J Wiley & Sons, NY Grant DM and Harris RK (1999).
2. Shic F, **Lin A**, Shelden H, Ross BD, Panagiotacopulos N, Lertsuntivit S, Savidge LA. "Wavelet Analysis in the Study of the Nuclear Magnetic Resonance Spectroscopy of Head Trauma" in Advances in Physics, Electronics and Signal Processing Applications. 2000; 297-302
3. Ross BD, **Lin A**, Enriquez C. Chapter 41 MRS spectroscopy of hypoxic brain injury. Physiological MR in Clinical Neuroscience. Cambridge Univ Press, Cambridge UK. Eds. Gillard, Waldman, and Barker. (2005)
4. Ross BD, Colletti P, **Lin A**. Chapter 30: MR Spectroscopy of the Brain. Clinical Magnetic Resonance Imaging, Third Edition, W.B. Saunders Co, Philadelpha PA. Eds. Edelman R, Hesselink JR, Zlatkin MB. (2006)
5. **Lin AP**. Acquiring Magnetic Resonance Spectroscopy in Clinical Practice. Modern Magnetic Resonance, Kluwer Academic Publishers, London. Eds. C. Mountford and G.A. Webb. (2006)
6. Ross BD, Tran T, **Lin A**. Chapter 41 MRS spectroscopy of hypoxic brain injury. Physiological MR in Clinical Neuroscience 2nd edition. Cambridge Univ Press, Cambridge UK. Eds. Gillard, Waldman, and Barker. (2009)
7. **Lin AP**, Blüml S. Traumatic Brain Injury and Concussion. MR Spectroscopy of Pediatric Brain Disorders. Springer, New York, NY. Eds Blüml and Panigrahy. (2012)
8. Merugumala S, Ramadan S, Keenan W, Liao HJ, Wang L, **Lin AP**. Magnetic Resonance Spectroscopy in Psychiatry. MRI in Psychiatry. Springer-Verlag, Heidelberg, DE. Eds. Mulert and Shenton (2014)

Professional educational materials or reports, in print or other media

1. **Lin A**, Ross BD. Virtual Biopsy Becomes Possible with Neurospectroscopy. Diagnostic Imaging 2002; 24(9):44-48.
2. Ross BD, **Lin A**. Neurological Applications of Magnetic Resonance Spectroscopy. Magnetic Resonance Update 2003.
3. Ross BD, **Lin A**. Introduction to Clinical Proton MR Spectroscopy. Magnetic Resonance Update May 2005.
4. Ross BD, **Lin A**, Hollis C. MRS gains indications, but still fights for reimbursement. Diagnostic

Imaging Nov 2005

Thesis

Lin, Alexander (2009) Non-Invasive Imaging of Carotid Arterial Strain using Displacement Encoded MRI. Dissertation, California Institute of Technology.

Abstracts, Poster Presentations and Exhibits Presented at Professional Meetings (last 3 years only)

1. Ramadan S, Box H, Baltzer PA, **Lin A**, Stanwell P, Gombos E, Kaiser WA, Mountford C. Distinction of Invasive Lobular Carcinoma, Invasive Ductal Carcinoma, and Healthy Breast Tissue In Vivo With L-COSY at 3T, *Proc. Intl. Soc. Mag. Reson. Med*.(2011), Montreal, Canada
2. Ramadan S, Andronesi OC, Stanwell P, **Lin A**, Sorensen AG, Mountford C, In vivo L-COSY MRS of Healthy Brain and Glioblastoma. *Proc. Intl. Soc. Mag. Reson. Med*.(2011), Montreal, Canada.
3. Shic F, **Lin A**, Stanwell P, Ramadan S, Gombos E, Mountford C. Time-Frequency Analysis of In Vivo MRS of the Breast Improves Cancer Detection. *Proc. Intl. Soc. Mag. Reson. Med*.(2011), Montreal, Canada.
4. **Lin AP**, Ramadan S, Stern RA, Box H, Stanwell P, McKee AC, Cantu R, Nowinski C, Mountford C. In vivo L-COSY Identifies Neurochemical Changes in Professional Athletes with Repetitive Head Injuries. *Proc. Intl. Soc. Mag. Reson. Med*.(2011), Montreal, Canada.
5. Cocuzzo DC, **Lin A**, Ramadan S, Mountford C, Keshava N. Algorithms for Characterizing Brain Metabolites in Two-Dimensional in Vivo MR Correlation Spectroscopy. (2011) *33rd Annual International IEEE Engineering in Medicine and Biology Society (EMBS) Conference*, Boston, MA
6. **Lin AP**, Liao HJ, Cadena A, Ramadan S, Molina I, McCarley R. Comparison of Cerebral Glutamate and GABA in Schizotypal Personality Disorder using Spectral Editing and 2D Correlated Spectroscopy. (2012) *Proc Int Soc Magn Reson Med*, Melbourne, Australia
7. Ramadan S, Liao HJ, **Lin AP**, Mountford C. Different Types of COSY Applied To Study Glutamate and Glutamine in a Clinical Scanner (2012) Proc Int Soc Magn Reson Med, Melbourne, Australia
8. Wang L, Liao HJ, Ramadan S, Mountford CM, **Lin AP**. Distinguishing GABA from lysine in vitro and in vivo by 2D localized correlated spectroscopy. (2012) *Proc Int Soc Magn Reson Med*, Melbourne, Australia
9. **Lin AP**, Meugumala S, Ramadan S, Liao HJ, Fiorina P, Chandraker A, Mountford CM. Optimization and Characterization of Two-Dimensional Correlated Spectroscopy of Transplanted Kidney. (2012) *Proc Int Soc Magn Reson Med*, Melbourne, Australia
10. **Lin AP**, Liao HJ, Cadena A, Ramadan S, Molina I, McCarley R. Comparison of Cerebral Glutamate and GABA in Schizotypal Personality Disorder using Spectral Editing and 2D Correlated Spectroscopy. (2012) *Schizophrenia International Research Society*, Florence, Italy
11. Ramadan S, Baltzer P, **Lin A**, Stanwell S, Box H, Kaiser WA, Mountford CE. L-COSY of Breast Cancer at 3T. *European Journal of Radiology* (2012) 81, S129-S131
12. **Lin AP**, Liao HJ, Merugumala S, Niznikiewicz M, Spencer K, Hirano K, McCarley R. MRS GABA and Glutamate abnormalities in the superior temporal gyrus and their association with gamma band oscillation abnormalities in schizotypal personality disorder and schizophrenia. *51st Annual Meeting of the American College of Neuropsychopharmacology*, Hollywood, Florida.
13. Shenton ME, Koerte I, Bouix S, **Lin AP,** Pasternak O, Echlin P, Zafonte R, Stern, R Utilizing Advanced Neuroimaging to Provide Insights into Mild Traumatic Brain Injury and Repetitive Brain Trauma: DTI, MRS, and Emerging PET Tau Imaging (2013) *3rd Annual Traumatic Brain Injury Conference*, Washington, DC.
14. Liao HJ, Merugumala S, Tauhid S, Bakshi R, **Lin AP**. Optimization of GSH Measurement in

Multiple Sclerosis. (2013) *Proc Int Soc Magn Reson Med*.

15. **Lin AP**, Merugumala S, Liao HJ, Niznikiewicz M, Spencer K, Hirano Y, McCarley R. GABA and Glutamate abnormalities in the superior temporal gyrus and their association with electrophysiological abnormalities in schizotypal personality disorder and schizophrenia (2013) *Proc Int Soc Magn Reson Med*
16. Merugumala S, Balschi J, Liao HJ, **Lin AP**. Improving 31P MRS Measurements of Metabolic Kinetics in Skeletal Muscle Using Time Domain Filtering. (2013) *Proc Int Soc Magn Reson Med*
17. **Lin AP**, Merugumala S, Liao HJ. Pitfalls in MR Spectroscopy (2013) *New England Roentgen Ray Society*, Boston MA
18. **Lin AP**, Liao HJ, Merugumala S, Shenton M. Advances in TBI Imaging: SWI, DTI, MRS (2013) *MRI/CT Update* Boston, MA
19. **Lin AP**, Liao HJ, Merugumala SK, Stern RA, Ross BD. Regional Metabolite Profiles in Chronic Sports-Related Concussion. *International Brain Injury Association Tenth World Congress on Brain Injury*. (2014). San Francisco, USA. 10:831
20. Pasternak O, Stern SA, Giwerc M, Yegartian C, Merugumala S, Liao H, Baugh CM, Westin C-F, Shenton ME, **Lin AP**. Identification of Atrophy, Excitotoxicity and Gliosis in the White Matter of Retired NFL Players. *International Brain Injury Association Tenth World Congress on Brain Injury*. (2014). San Francisco, USA. 10:683.
21. Shenton ME, Koerte IK, Bouix S, Pasternak O, **Lin AP**, Mayinger M, Coleman M, Dahlben B, Giwerc M, Green K, Stamm J, Helmer K, Zafonte R, Stern R. Invited Symposium on Chronic Traumatic Encephalopathy, "Advanced Neuroimaging in CE and Repetitive Concussive and Subconcussive Head Trauma". *International Brain Injury Association Tenth World Congress on Brain Injury*. (2014). San Francisco, USA.
22. **Lin AP**, Charney M, Liao HJ, Merugumala SK, Baugh C, Stern RA. Neuroinflammation in Chronic Sports-Related Repetitive Brain Trauma. *Proc Int Soc Magn Reson Med* (2014) 14:5378
23. Pasternak O, Stern SA, Giwerc M, Yegartian C, Merugumala S, Liao H, Baugh CM, Westin C-F, Shenton ME, **Lin AP**. The Relation between Free-Water, Atrophy and Microstructural Pathologies in Retired NFL Players – A Combined Diffusion MRI and MRS study. *Proc Int Soc Magn Reson Med* (2014) 14:6823
24. Wang LY, Merugumala S, Liao HJ, **Lin AP**. Sleep and Wakefulness Affect GABA Levels in the Dorsolateral Prefrontal Cortex *Proc Int Soc Magn Reson Med* (2014) 14:4576
25. Merugumala S, Liao HJ, Bolo N, Del Re E, McCarley RW, Lin AP. Spectral Alignment Improves GABA Measures in Schizotypal Personality Disorder *Proc Int Soc Magn Reson Med* (2014) 14:7986
26. Rathi Y, Ning L, Michailovich O, Liao H, Gagoski B, Grant PE, Shenton ME, Stern R, Westin CF, Lin A. Maximum entropy estimation of Glutamate and Glutamine in MR spectroscopic imaging. *MICCAI* (2014)
27. Mariano LJ, Irvine JM, Lin AP, Tripdis Y, Stern RA. Towards a Multimodal Characterization of Chronic Traumatic Encephalopathy. *Joint Statistical Meeting* (2014)
28. Lin AP, Huang RY, Merugumala S, Liao HV, Long X, Mukundan S, Reardon D, Wen P, Arvold ND. Detection of 2-Hydroxyglutarate in Gliomas using Spatial and Spectral 2D MR Spectroscopy: Translation to the Clinic. *Radiological Society of North America*. (2014)

Narrative Report

I am a Clinical Spectroscopist at the Center for Clinical Spectroscopy at Brigham and Women's Hospital and a young investigator at Harvard Medical School. My special expertise is clinical applications of magnetic resonance spectroscopy (MRS) with over 15 years of experience. In my research where I spend 100% of my time, I am fully supported by federal grants to develop MRS for clinical use. I am also involved in teaching and training MRS at Brigham and Women's Hospital as well as on the national and international level.

I began my undergraduate education as a biologist at the California Institute of Technology however I was unsatisfied with the basic science approach and became interested in translational research. I decided to take a leave of absence and joined Dr. Brian Ross' lab at Huntington Medical Research Institutes (HMRI), a world-recognized leader in clinical MRS. I was challenged with many exciting projects which were completed successfully including my first publication which has been cited by major evidenced-based medicine studies and described as "a pivotal study in that it clearly showed the positive impact on clinical decision-making" and my work in ^{13}C MRS in Alzheimer's disease which was recognized by a Young Investigator Award. I was also fortunate to be given opportunities and responsibilities equivalent to a post-doctoral experience by obtaining grants as a PI or co-PI, hiring, training, and managing staff for the clinical MRS program at HMRI, and lecturing at CME-based courses across the world. Recognizing the need for the proper credentials, I returned to academia and completed my Masters and PhD within three years.

My research interests now include clinical applications of multinuclear MRS in the brain, breast, liver, and muscle as well as its interface with magnetic resonance imaging. I have recently focused my efforts in identifying biomarkers for traumatic brain injury (TBI) using proton MRS which includes a DoD CDMRP grant to study soldiers returning from the Iraq/Afghanistan wars. Collaborations with the Boston University Center for the Study of Traumatic Encephalopathy to study the effect of cumulative concussions in NFL players using proton MRS resulted in R01 funding from NIH/NINDS. Preliminary results of this study was recently highlighted on a local CBS program on concussion and articles in the New York Times, CNN, and other media reports on sports-related head injury.

My strong interest in education is reflected in my experiences as co-director of the Clinical Spectroscopy Course for the past ten years and internationally invited lectures. I designed and developed the curriculum for the AART-certified Spectroscopy for MR Technologists training course have recently been the primary lecturer for courses in Tenerife, Spain and Taipei, Taiwan. Another aspect of education I enjoy is the mentoring of young minds and have supervised nearly two dozen students most of whom have published peer-reviewed papers and have gone on to medical, graduate and pharmaceutical school. My involvement as a mentor in the BWH Students Success Job Program has resulted in a Partners in Excellence award as well as featured in national and local media programs.

In summary, my main goal is to take magnetic resonance spectroscopy from being a research tool to a objective non-invasive diagnostic tool that would be valuable in the clinic. I hope to achieve this goal through excellence in research as well as education in MRS.