Dynamic Imaging of Metabolism in health and Disease

February 1-2, 2017

Each year the Advanced Imaging Research Center and The National Center for Research Resources host a symposium on a topic relevant to work being carried out at the Center. The purpose of the symposium is to provide information on research activities and training opportunities.

Faculty, research staff, undergraduate, graduate and post doctoral students are all encouraged to attend. Past participants have included those from academia and industry around the country. Each symposium is devoted to training in which the latest developments at the Center are discussed.

There will be no poster presentations. Instead, all attendees are encouraged to submit a one page abstract on a primary research interest (instructions are available on the registration page). These abstracts, along with speaker abstracts, will be distributed in a booklet at the meeting registration desk. The intent of the booklet is to outline attendee research interests and expertise to augment Investigator interaction.

Target Audience
This Symposium is intended for physicians, scientists and students with an interest in metabolic imaging of disease by hyperpolarized (HP) 13C MRI and positron emission tomography (PET).

Purpose and Content
Altered metabolism is an important hallmark of cancer, diabetes, and other diseases. Traditional imaging methods are clinically valuable but actually provide only limited metabolic information. Methods to quantify biochemical events in patients are important because chronic adaptations in metabolism may drive processes with adverse consequences, such as impaired energy capture and oxidative stress. Furthermore, some cancers appear to be initiated and maintained by metabolic reprogramming.

Recent advances in HP MRI have allowed for real-time imaging of substrate metabolism in living organisms, healthy humans, and patients. It is now possible to image metabolic fluxes in several enzymatic pathways with high temporal resolution using HP 13C MRI. PET technology has also advanced and new methods to image amino acid metabolism are now accessible. Coupled with PET, HP 13C MRI offers new approaches to high-impact diseases. The ability to image substrate metabolism is important in current clinical practice and additional information about the complexities of these pathways will likely yield new clinical insights.

The Symposium was designed to advance our understanding of methods for dynamic imaging of metabolism. Basic concepts in 13C MRI analyses of substrate metabolism and hyperpolarized MRI will be reviewed. Key technical needs in preparation of hyperpolarized samples, the necessary RF coils and new imaging sequences

will be presented, with an opportunity to observe a hyperpolarization set-up. On Thursday, recent developments in imaging by hyperpolarized 13C MRI and by PET will be presented by internationally-recognized experts. This Symposium is supported by the National Institute of Heath - National Institute of Biomedical Imaging and Bioengineering (NIH-NIBIB: EB015908) and by the University of Texas Southwestern Medical Center.

Educational Objectives

Metabolic imaging plays important roles in the diagnosis and treatment of diseases. Upon completion of the Symposium, attendees should be able to:

- Describe the role of 13C NMR in understanding substrate metabolism.
- Describe the fundamental principles and hardware of MR hyperpolarization.
- Describe recent advances in PET imaging of metabolism.
- Explain the utility of hyperpolarized 13C MRI and PET in disease characterization.
- Explain the potential synergy between HP 13C MRI and PET for metabolic imaging of diseases.

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Wednesday, February 1, 2017

07:30 AM	***Breakfast & Registration***	
Morning Session 1		*Moderator:* Elizabeth Maher, MD, PhD *UT Southwestern Medical Center*
08:30 AM	Simulating Metabolism and ^{13}C Isotopomers	Dean Sherry, PhD *UT Southwestern Medical Center*
09:00 AM	^{13}C NMR in Simple Systems: Analysis of Substrate Oxidation	Charlie Khemtong, PhD *UT Southwestern Medical Center*
09:30 AM	^{13}C NMR in Complex Systems: Exploring Liver Metabolism	Eunsook Jin, PhD *UT Southwestern Medical Center*
Morning Session 2		Crystal Harrison, PhD *UT Southwestern Medical Center*
10:00 AM	***Break***	
10:30 AM	Basic Principles of Hyperpolarized Magnetic Resonance	Lloyd Lumata, PhD *University of Texas at Dallas*
11:00 AM	Modeling and interpretation of HP MRI	James Bankson, PhD *James Bankson, PhD* *MD Anderson Cancer Center*
11:30 AM	Problems to be Solved for Clinical HP	Craig Malloy, MD *UT Southwestern Medical Center*
12:00	***Lunch***	
01:00 PM	Convene in NG, Tour Group Assignment	*Moderator:* Charlie Khemtong, PhD *UT Southwestern Medical Center*
01:15 PM - 2:45 PM	***Facility Tour and Demos***	

SPINlab/Clinical MRI by Crystal Harrison, PhD and Jian-Xiong Wang, PhD
1:15 PM – Group A
1:45 PM – Group B
2:15 PM – Group C

HyperSense/SwissSense by Gaurav Sharma, PhD
1:15 PM – Group B
1:45 PM – Group C
2:15 PM – Group A

Pharmacy by Jeff Liticker, PharmD and Jeannie Baxter, RN
1:15 PM – Group C
1:45 PM – Group A
2:15 PM – Group B

Afternoon Session		*Moderator: Steve Wright, PhD* *Texas A&M University*
03:00 PM	MRI Coils and Acquisition Methods	Lawrence Wald, PhD *Harvard Medical School*
03:45 PM	Challenges in Hyperpolarized MR: RF Pulses, Pulse Sequences, and Image Reconstruction	John Pauly, PhD *Stanford University*
04:30 PM	***Reception***	

Thursday, February 2, 2017

07:30 AM	***Breakfast & Registration***	
08:15 AM	Welcoming Remarks and Opening Address	Neil Rofsky, MD *UT Southwestern Medical Center*
Morning Session 1		*Moderator:* Lloyd Lumata, PhD *University of Texas at Dallas*
08:30 AM	Hyperpolarized Metabolic MR	James Kempf, PhD *Bruker Biospin*
09:15 AM	Metabolic Flux In Vivo: Key Agents that Drive New Insights	Matthew Merritt, PhD *University of Florida*
10:00 AM	***Break***	
Morning Session 2		*Moderator:* Ralph Deberardinis, MD, PhD *UT Southwestern Medical Center*
10:30 AM	Cancer Imaging with PET – Where We Are Today	Jason Lewis, PhD *Memorial Sloan Kettering Cancer Center*
11:15 AM	Hyperpolarized MR Metabolic Imaging in Cancer	Kayvan Keshari, PhD *Memorial Sloan Kettering Cancer Center*
12:00	***Lunch***	
Afternoon Session 1		*Moderator:* Joseph A. Maldjian, MD *UT Southwestern Medical Center*
01:00 PM	Glutamine based PET imaging of Primary Brain Tumors	Sriram Venneti, MD, PhD *University of Michigan School of Medicine*
01:45 PM	Exploring Cerebral Metabolism Using Hyperpolarized MR Spectroscopy	Jae Mo Park, PhD *UT Southwestern Medical Center*
02:30 PM	***Break***	

Afternoon Session 2		*Moderator: Vlad Zaha, MD, PhD* *UT Southwestern Medical Center*
03:00 PM	Hyperpolarized Metabolic and Functional Cardio and Renal MR Imaging	Christoffer Laustsen, PhD *Aarhus University, Denmark*
03:45 PM	Cardiac PET and HP MR: Friends or Foes?	Robert Gropler, MD *Washington University School of Medicine*
04:30 PM	***Discussion and Adjourn***	Craig Malloy, MD

Discussion of Off-Label Use

Because this course is meant to educate the physicians with what is currently in use and what may be available in the future, there may be "off-label" use discussed in the presentations. Speakers have been requested to inform the audience when off-label use is being discussed.