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 Health - 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.

**Dynamic Imaging of Metabolism in Health and Disease**

**Wednesday, February 1, 2017**

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<tr>
<th>Time</th>
<th>Event</th>
<th>Speaker(s)</th>
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<tbody>
<tr>
<td>07:30 AM</td>
<td>Breakfast &amp; Registration</td>
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<tr>
<td>08:30 AM</td>
<td>Simulating Metabolism and $^{13}$C Isotopomers</td>
<td>Dean Sherry, PhD UT Southwestern Medical Center</td>
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<td>09:00 AM</td>
<td>$^{13}$C NMR in Simple Systems: Analysis of Substrate Oxidation</td>
<td>Charlie Khemtong, PhD UT Southwestern Medical Center</td>
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<tr>
<td>09:30 AM</td>
<td>$^{13}$C NMR in Complex Systems: Exploring Liver Metabolism</td>
<td>Eunsook Jin, PhD UT Southwestern Medical Center</td>
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<td>10:00 AM</td>
<td>Break</td>
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<tr>
<td>10:30 AM</td>
<td>Basic Principles of Hyperpolarized Magnetic Resonance</td>
<td>Lloyd Lumata, PhD University of Texas at Dallas</td>
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<td>11:00 AM</td>
<td>Modeling and interpretation of HP MRI</td>
<td>James Bankson, PhD MD Anderson Cancer Center</td>
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<td>11:30 AM</td>
<td>Problems to be Solved for Clinical HP</td>
<td>Craig Malloy, MD UT Southwestern Medical Center</td>
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<td>12:00 AM</td>
<td>Lunch</td>
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<tr>
<td>01:00 PM</td>
<td>Convene in NG, Tour Group Assignment</td>
<td>Moderator: Charlie Khemtong, PhD UT Southwestern Medical Center</td>
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<td>01:15 PM - 2:45 PM</td>
<td>Facility Tour and Demos</td>
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Afternoon Session

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<tr>
<th>Time</th>
<th>Session Title</th>
<th>Presenter</th>
<th>Affiliation</th>
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<tr>
<td>03:00 PM</td>
<td>MRI Coils and Acquisition Methods</td>
<td>Lawrence Wald, PhD</td>
<td>Harvard Medical School</td>
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<td>03:45 PM</td>
<td>Challenges in Hyperpolarized MR: RF Pulses, Pulse Sequences, and Image Reconstruction</td>
<td>John Pauly, PhD</td>
<td>Stanford University</td>
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<td>04:30 PM</td>
<td>Reception</td>
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**Thursday, February 2, 2017**

07:30 AM    Breakfast & Registration
08:15 AM    Welcoming Remarks and Opening Address

Morning Session 1

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

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

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
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.