Innovative Research Studies
Optimizing Imaging Techniques for Fetal and Neonatal Magnetic Resonance Imaging (MRI)

What is the study about?

This research seeks to develop a toolbox to guide the Magnetic Resonance Spectroscopy (MRS) acquisition and analysis routine to increase the clinical use and diagnostic value of MRS. Optimization of data acquisition will include identification of robust fetal brain regions coupled with echo-time that yields high quality data. MRS can be helpful in investigating the brain bio-chemical profiles in healthy and in compromised fetuses. The ability to incorporate fetal brain MRS into the clinical setting would ultimately lead to better surveillance and improved anticipatory planning of the high-risk fetus during the critical transition from in-utero to ex-utero life.

Why is MRS relevant to the work that we do in the Developing Brain Research Program?

Over the past decade, our team has been at the forefront of developing advanced MRI techniques to study in utero brain and placental development in healthy and high-risk fetuses. Notably, this pioneering work has demonstrated the ability to identify early in vivo biomarkers of brain growth failure in high-risk fetuses, before conventional MRI findings become clinically evident, and therefore opening windows of therapeutic opportunity that were previously inaccessible. More recently, our team has extended these investigations to applying MRS to the fetal brain and placenta. These timely methodological developments now afford us the unique opportunity to study normal and abnormal brain and placental metabolism in vivo. Our long-term goal is to develop early biomarkers of fetal brain and placental metabolic failure, which will lead to reliable surveillance and the formulation of effective in utero treatments.

What is MR Spectroscopy? What can be measured using MRS?

MR spectroscopy is a non-invasive tool that allows us to assess metabolite content and measure metabolite concentrations in the tissue being studied (e.g., brain). Each metabolite has signals in specific locations in the MR spectrum based on their chemical structure and is independent of the tissue the spectrum is acquired from. By using this information, we can evaluate the metabolic content and concentrations. MRS is widely used to characterize normal brain metabolic profiles and their alteration in various pathologies.

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Research Faculty
Summer Internship Program

How to apply?
www.developingbrain.org | Internship Program

Our summer Internship officially starts on June 12, 2017. We will be hosting our onboarding/ orientation on Monday, June 12. Please join us as we welcome our 2017 Summer Interns.

Featured Press
Featured in the article: "Womb zoom: what advances in fetal and newborn imaging have revealed" by Wudan Yan in Nature Medicine News. March 8, 2017. www.nature.com | Wudan Y.


Research Publications


Upcoming Event
March of Dimes-Washington, DC
Saturday May 6, 2017 Nationals Park-3k Walk
www.marchforbabies.org | 3K Walk

Research Impact

Eastern Society for Pediatric Research (ESPR):
Philadelphia, PA – March 24-26, 2017
www.aps-spr.org | ESPR Annual Meeting ‘17

Basu S. Biochemical profiles of the developing cerebellum in preterm infants. Platform

Mirza H. Cerebral Injury in the Preterm Infant: Remote Effects on Cerebellar Development. Platform

Ottolini K. Impact of breastmilk on brain microstructural development in VLBW infants. Platform

Wu Y. Prenatal Maternal Anxiety: Effects on Hippocampal Development in Fetuses with Complex Congenital Heart Disease. Poster

International Society for Magnetic Resonance in Medicine (ISMRM): Honolulu, HI- April 22-27, 2017
www.ismrm.org | 25th Annual Meeting & Exhibition

Wu Y. Improved Infant MRI Brain Extraction utilizing Clustering and Morphological Approaches. Poster

Wu Y. Prenatal Maternal Depression and Anxiety Alter Hippocampal Development In Vivo. Poster

Zun Z. Quantitative susceptibility mapping in the neonatal brain with congenital heart disease. Platform

Zun Z. Non-Invasive Placental Perfusion Imaging in Pregnancies Complicated by Fetal Heart Disease Using Velocity-Selective Arterial Spin Labeled MRI. E-Poster

CNHS 7th Annual Research and Education Week:
Washington, DC-April 24-28, 2017
www.childrensnational.org | Research & Education Week

Mirza H. Cerebral Injury in the Preterm Infant: Remote Effects on Cerebellar Development. Poster

Ottolini K. Impact of breastmilk on brain microstructural development in VLBW infants. Poster

Pediatric Academic Societies (PAS):
San Francisco, CA-May 6-9, 2017
www.pas-meeting.org | PAS ’17

Basu S. Biochemical profiles of the developing cerebellum in preterm infants. Poster

Bouyssi-Kobar M. Early functional brain network disturbances following preterm birth. Platform

Kumar M. Preterm birth impairs regional cerebellar development. Platform/Poster

Mirza H. Cerebral Injury in the Preterm Infant: Remote Effects on Cerebellar Development. Poster

Ottolini K. Impact of breastmilk on brain microstructural development in VLBW infants. Platform

Wu Y. Prenatal Maternal Anxiety Alters Hippocampal Development in Fetuses with Congenital Heart Disease. Poster