



MR Spectroscopy Signal

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## 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.

#### 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.

#### 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.



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Research Faculty

# Summer Internship Program

## How to apply?

[www.developingbrain.org](http://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](http://www.nature.com) | [Wudan Y.](#)

Featured in the article: "Pioneering study images activity in fetal brains" by Greg Miller in *Science*. January 9, 2017.

[www.sciencemag.org](http://www.sciencemag.org) | [Greg M.](#)

## Research Publications

Andescavage, Nickie et al. Cerebrospinal Fluid and Parenchymal Brain Development and Growth in the Healthy Fetus. *Dev Neurosci*, March 2017.

You, Wonsang et al. Semi-automatic segmentation of the placenta into fetal and maternal compartments using intravoxel incoherent motion MRI. *Proc. of SPIE Vol 10137*, 2017.

Porras, Antonio et al. Quantification of oxygen changes in the placenta from BOLD MR image sequences. *Proc. of SPIE Vol 10134*, 2017.

## Upcoming Event

### March of Dimes-Washington, DC

Saturday May 6, 2017 Nationals Park-3k Walk

[www.marchforbabies.org](http://www.marchforbabies.org) | 3K Walk



# Research Impact

## Eastern Society for Pediatric Research (ESPR):

Philadelphia, PA – March 24-26, 2017

[www.aps-spr.org](http://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](http://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 7<sup>th</sup> Annual Research and Education Week:

Washington, DC-April 24-28, 2017

[www.childrensnational.org](http://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](http://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*