Second Annual International Symposium on the

FETAL BRAIN

PROGRAM

August 24-25, 2017

Washington, DC's Iconic Watergate Hotel

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Fetal Medicine Institute

Part of the Children's National Health System

Dear Friends,

Welcome to Washington! We are delighted to have you join us at our second International Symposium for the Fetal Brain. After the amazing success of our first symposium in 2016, we are hoping to achieve even greater heights this year. For first-timers we are confident that you will find the format refreshing, the curriculum stimulating, and the faculty superb – truly world leaders in their fields. Our goal has been to gather together a diverse group from across the spectrum of disciplines focused on the well-being of the fetal brain and to engage all disciplines together. Our hope is that through higher-level discussions, a rich cross-pollination of ideas and concepts will occur, promoting collaboration and the development of lasting academic relationships. We encourage you all to continue to be active participants through your engagement in the discussion, your ideas for its future direction, and your commitment to keep returning every year.

ISFB is your conference and we look forward to your feedback as we continue on this path of collaboration and innovation.

May this be a memorable and rewarding few days in the nation's capital.

Yours,

André J. du Plessis, MBChB, MPH
Director, Fetal Medicine Institute
Director, Fetal Brain Program
Division Chief, Fetal and Transitional Medicine

We would like to thank our gold-level sponsor, Alcresta Therapeutics, for their support in making this event a reality.

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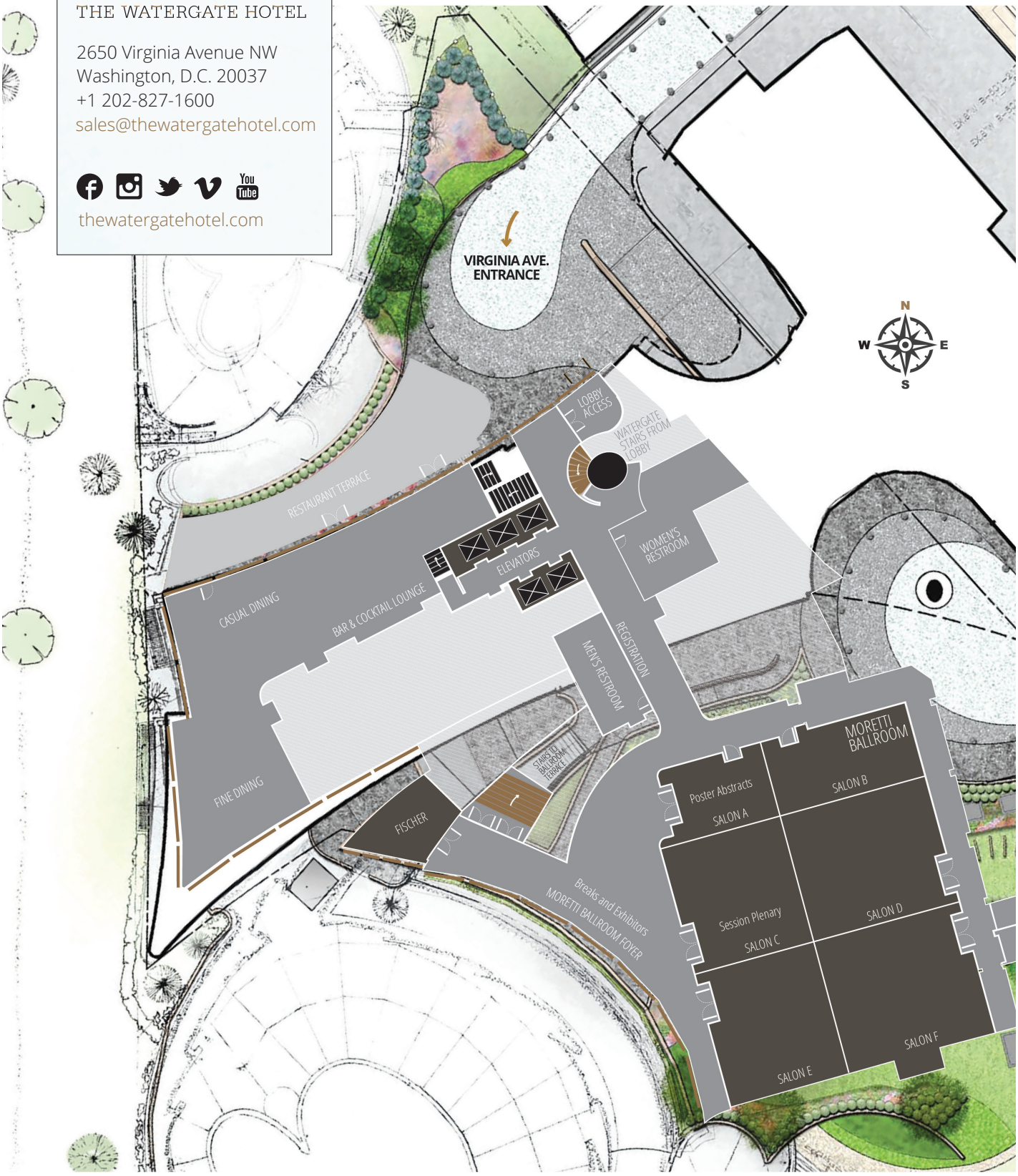

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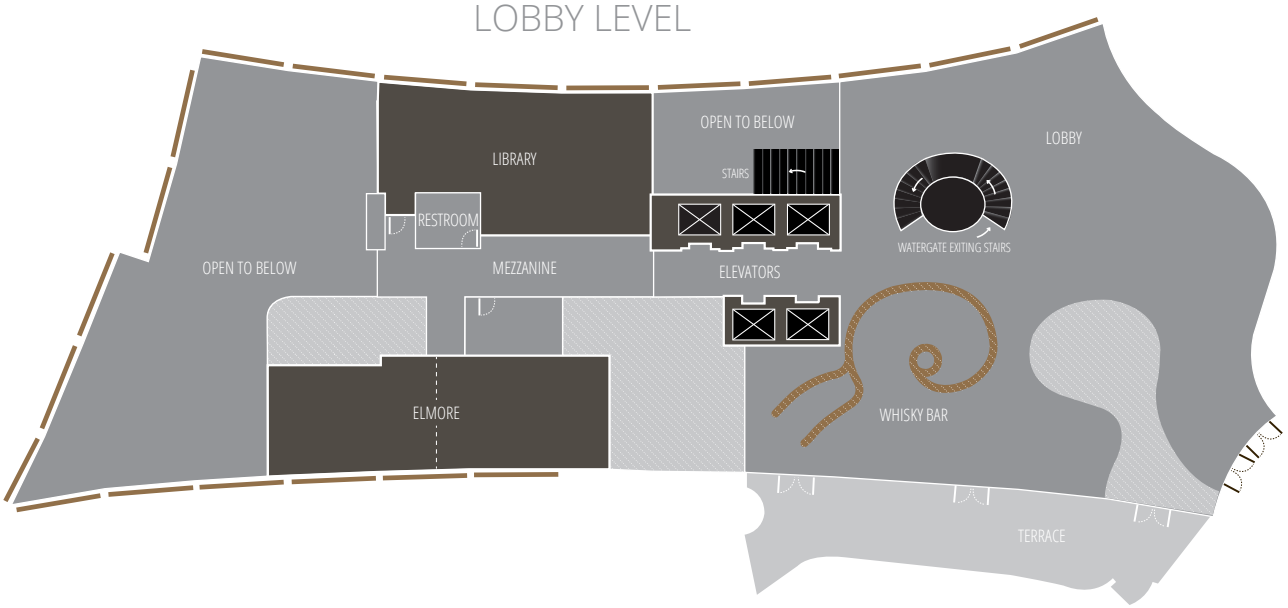

PROGRAM AGENDA | AUGUST 24 - 25, 2017

THURSDAY, AUGUST 24, 2017

Time	Talk Title	Speaker
7:15 – 8:15 a.m.	*Continental Breakfast and Registration*	
SESSION 1	**Brain Development in an Unsupportive In Utero Environment - Diagnosis and Consequences**	
8:15 a.m. – 12 p.m.	Opening Remarks	André duPlessis
	• Fetal Heart Rate: What It Does and Does Not Tell Us	Alistair Gunn
	• Non-Invasive Quantitation of the Fetal Circulation and Oxygenation	Mike Seed
	Break 10:35 – 10:55 a.m.	
	• Fetal Brain Development in an Environment of Chronic Hypoxia	William Pearce
12 – 1 p.m.	*Lunch*	
SESSION 2	**Supporting Brain Development in the Ex Utero Fetus: How Far Are We From Optimal?**	
1 – 4:30 p.m.	Opening Remarks	Robin Steinhorn
	• Quantitative Comparison of Brain Development in the In Utero versus Ex Utero Fetus	Catherine Limperopoulos
	• Nutritional Influences on Brain Development in the Ex Utero Fetus	Mike Georgieff
	Break 3:15 – 3:30 p.m.	
	• Optimal Oxygenation for Ex Utero Fetal Brain Development	Emin Maltepe
4:30 – 6:30 p.m.	*Cocktail Reception*	

FRIDAY, AUGUST 25, 2017

Time	Talk Title	Speaker
7 – 8:15 a.m.	Breakfast Breakout Sessions	
SESSION 3	**Genomic and Epigenomic Mechanisms Underlying Differences in Brain Development**	
8:15 a.m. – 12 p.m.	Opening Remarks	André du Plessis
	• Non-Invasive Fetal Testing Beyond Karyotype: What's in it for the Fetal Brain?	Diana Bianchi
	• The Role of Gender in Fetal Brain Development	Eric Vilain
	Break 10:45. – 11 a.m.	
	• The Environment-Genome Interplay and the Emergence of Neuro-Epigenetics	Lubo Zhang
12 – 1:00 p.m.	*Lunch*	
SESSION 4	**The Emergence of Consciousness and Pain Sensation**	
1 – 4:30 p.m.	• Formation of the Mind and the Emergence of Consciousness	Hugo Lagercrantz
	• Pain in the Ex Utero Fetus: Does It Play a Role in the Altered Neurodevelopment of Prematurity?	Ruth Grunau
	Break 2:20 – 2:40 p.m.	
	Andrea Poretti Abstract Award presented by Catherine Limperopoulos	
	• Emergence of Electrocortical Activity: the Underpinning of Emerging Cosciousness	Sampsa Vanhatalo
	Closing Remarks	André du Plessis

BREAKFAST BREAKOUT SESSIONS: 7 – 8:15 a.m.

Session Topics	Room Name
• Fetal Ultrasound: the Cornerstone of Fetal Neurodiagnosis Dorothy Bulas and Ashley Robinson	Elmore, Salon A
• The Essentials of Neurogenetic Testing Margaret Menzel and Annapurna Poduri	Elmore, Salon B
• Developing a Transitional Fetal-Neonatal Program Taeun Chang and Sarah Mulkey	Corning
• Using MRI to Advance Fetal Neurodiagnosis Charles Raybaud and Matthew Whitehead	Moretti Ballroom

ABSTRACTS

THE **ANDREA PORETTI** ABSTRACT AWARD

Andrea Poretti,
1977-2017

This Abstract Award is dedicated to Andrea Poretti, who was a member of our abstract selection committee.

Andrea Poretti was a world-renowned expert in pediatric cerebellar abnormalities and neurodegenerative and neurogenetic disorders. He was in charge of the research mission of pediatric neuroradiology at Johns Hopkins, which he led with enthusiasm and boundless energy.

"**Andrea was the most exceptional person**," said Thierry Huisman, professor of radiology and radiological science at the School of Medicine, who knew Poretti as a close personal and academic friend for more than 15 years. "**He was an extremely intelligent, hardworking, humble, and beloved scientist, clinician, and friend. His passing is an incredible loss to all people who had the privilege to know him.**"

We were privileged to have crossed paths with Andrea, and we dedicate this award to his brilliance and dedication.

We encourage you to explore our abstracts on display in the A and B sections of the Moretti Ballroom. To view the abstracts ahead of time, please click here.

CME CREDITS:

This activity has been planned and implemented in accordance with the accreditation requirements and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint providership of The George Washington University School of Medicine and Health Sciences and Children's National Health System. The George Washington University School of Medicine and Health Sciences is accredited by the ACCME to provide continuing medical education for physicians.

The George Washington University School of Medicine and Health Sciences designates this live activity for a maximum of 12 AMA PRA Category 1 Credit(s) ™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

Claiming your CME Credits: You will receive an email with instructions on setting up a GW account to claim CME within the next week. Once you have setup your account, you will be able to login and complete a CME survey to claim your credits.

SYMPOSIUM FACULTY:
Talk Abstracts and Research Faculty

Diana Bianchi, MD

Non-Invasive Fetal Testing Beyond Karyotype: What's in it for the Fetal Brain?

Abstract: Genomic sequencing of cell-free circulating DNA in the plasma of pregnant women has revolutionized screening for fetal chromosome abnormalities. Fetal treatment for neurocognitive abnormalities such as Down syndrome is the next frontier. Dr. Bianchi will discuss how gene expression analysis of RNA in amniotic fluid has led to novel approaches to fetal therapy, thus potentially providing expectant couples with additional options in the future. She will review proof of principle data from mouse models and also discuss ethical considerations.

Research Background: Dr. Bianchi is the director of the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD).

As NICHD director, Dr. Bianchi oversees research on pediatric health and development, maternal health, medical rehabilitation, population dynamics, reproductive health, and intellectual and developmental disabilities. With an annual budget of approximately $1.3 billion, the NICHD supports research grants and contracts at universities and other institutions across the country and overseas and an intramural research program of scientists working at NIH.

Dr. Bianchi was previously the founding executive director of the Mother Infant Research Institute and vice chair for pediatric research at the Floating Hospital for Children and Tufts Medical Center in Boston, as well as the editor-in-chief of the international journal Prenatal Diagnosis.

A practicing medical geneticist with special expertise in reproductive genetics, Dr. Bianchi's research focuses on prenatal genomics with the goal of advancing noninvasive prenatal DNA screening and diagnosis to develop new therapies for genetic disorders that can be administered prenatally.

Dr. Bianchi recently received two major lifetime achievement awards: the Landmark Award in 2015 from the American Academy of Pediatrics in recognition of her research and contributions to genetics and newborn care, and the Maureen Andrew Award for Mentoring in 2016 by the Society for Pediatric Research, which recognized her commitment to mentoring the next generation of clinician-scientists.

Mike Georgieff, MD

Nutritional Influences on Brain Development in the Ex Utero Fetus

Abstract: Fetal and neonatal brain growth is highly dependent on nutrient support. In contrast to the adult human brain that consumes approximately 20% of the total body oxygen consumption, the term newborn's brain consumes 60%. While all nutrients are important for brain growth and function, those that support fundamental energy and protein metabolic processes are most important. These include oxygen, glucose, iron, zinc, and amino acids. Shortages of key nutrients during rapid fetal and neonatal brain growth not only cause acute brain dysfunction, but underlie life-long effects through critical period and epigenetic mechanisms. This talk will discuss those key nutrients and the mechanisms of long-lasting effects.

Research Background: Dr. Georgieff holds the position of professor of Pediatrics and Child Psychology and director of the Division of Neonatology at the University of Minnesota. He received his MD from Washington University in St. Louis, Missouri. He served his internship and residency at The Children's Hospital of Philadelphia. He followed with a residency in neonatology at the University of Pennsylvania and the University of Minnesota. In addition to attending on the Neonatal Intensive Care Unit (NICU) at the University of Minnesota, Dr. Georgieff is director of the NICU Follow-up Clinic, director of Neonatal Nutrition Support Service, and director of the Center for Neurobehavioral Development. Dr. Georgieff's research focuses on fetal/

neonatal nutrition - specifically the effect of fetal/neonatal iron nutrition on brain development and neurocognitive function. He has been published in numerous journals, including American Journal of Physiology, Pediatric Research, Journal of Nutrition, and Journal of Pediatrics. He has written and contributed to a number of book chapters and has over 100 published papers.

Ruth Grunau, PhD, RPsych

Pain in the Ex Utero Fetus: Does It Play a Role in the Altered Neurodevelopment of Prematurity?

Abstract: The immature developing "fetal" brain ex-utero is highly vulnerable to neurotoxic events. Painful procedures in very preterm infants undergoing neonatal intensive care induce hemodynamic and EEG changes, as well as inflammatory and hormonal responses. While hospitalized, these babies undergo repetitive pain and stress of invasive procedures (~10 per day), at a time of rapid brain development and programming of stress systems. This talk will explore mechanisms of how painful stressors in the NICU are independently associated with regional alterations in brain microstructure and function, and changes in stress regulation, leading to poorer cognition and behavior.

Research Background: Dr. Grunau is a professor in the Division of Neonatology and Department of Pediatrics at the University of British Columbia, and senior scientist at the Child & Family Research Institute in Vancouver, Canada.

Dr. Grunau's research in long-term effects of pain and stress in infants born very prematurely is at the forefront of her field internationally. Her landmark multidisciplinary work has established that repetitive neonatal pain and stress (above and beyond other risk factors of prematurity) is associated with altered brain development and stress regulation in infancy and at school age, thereby contributing to neurodevelopmental and behavioral difficulties in this fragile population. Her research has been supported by the United States' National Institutes of Health and the Canadian Institutes of Health Research.

Alistair Gunn, MBChB

Fetal Heart Rate: What It Does and Does Not Tell Us

Abstract: Fetal heart rate recordings are the main non-invasive tool to continuously monitor the unborn child. Unfortunately, intrapartum monitoring has increased the rate of intervention in labor, with modest effects on morbidity, likely in part reflecting confusion about what heart changes can tell us. Fetal heart rate and heart rate variation before labor are controlled by finely balanced autonomic activity. In labor, although complex hypotheses have been put forward to explain fetal heart rate patterns, there is now a considerable body of evidence that essentially all decelerations are mediated by chemoreflex responses to repeated hypoxia and that the parasympathetic autonomic nervous system is the critical regulator of both fetal heart rate and heart rate variation in labor.

Research Background: Dr. Gunn is the head of the Department of Physiology at the University of Auckland and is a pediatrician-scientist who has conducted groundbreaking basic research into ways of identifying compromised fetuses in labor, the mechanisms and treatment of asphyxial brain injury, and the mechanisms of life-threatening events in infancy. His research helped to establish mild cooling as the first ever technique to reduce brain injury due to low oxygen levels at birth. He has developed a range of chronically instrumented fetal sheep paradigms that have helped characterize the relationship between fetal heart rate patterns and fetal condition before birth and in labor.

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Hugo Lagercrantz

The Emergence of Consciousness and Pain Sensation

Abstract: The human fetus reacts to touch, pain, and sound. It seems to remember vowels and jingles, and habituates. Despite manifesting certain features of consciousness, the fetus is primarily in a state of rapid eye movement (REM) sleep, and therefore cannot be regarded as conscious. Furthermore, the fetus lives at a very low oxygen levels and is sedated by adenosine, pregnanolone and prostaglandin E2. During vaginal birth there is an enormous surge in catecholamines and other neurohormones; this stress of being born is crucial for the transition to the extrauterine environment and the alleviation of pain. Newborns delivered vaginally react less to painful stimuli than infants born after caesarean section. Activation of the brain's noradrenergic system activates arousal and awakens the newborn. The newborn infant can imitate an adult, react preferentially to the human voice, express emotions and feel joy, but since it is "not aware of the past or planning for the future"(Henri Bergson) this might be considered a minimal level of consciousness. If consciousness resides in the cortex, it is unlikely that consciousness is possible before 24-25 weeks when the thalamo-cortical connections first begin to contact the cortex.

Research Background: Dr. Lagercrantz was appointed professor of pediatrics at Karolinska Institutet in 1989 and was director of the Neonatal Program at the Astrid Lindgren Children's Hospital until 2004.

He is presently editor-in-chief for Acta Paediatrica, and has been a member of the Nobel Assembly and the Nobel Committee.

Dr. Lagercrantz coined the expression "the stress of being born" (Scientific American 1986) - this stress seems to be of vital importance for neonatal adaptation. He also has been interested in the apnea of prematurity and the sudden infant death syndrome (SIDS). Recently, his main interests have been in brain development, particularly for preterm babies. By studying how children process stimulation of the senses, such as smell, pain or the vision of a face, he tries to understand how consciousness emerges and what happens when there is abnormal development of the brain. He also has been involved in the finding of a spontaneous resting activity in the newborn brain – showing that it is not "a blank slate".

Catherine Limperopoulos, PhD

In Utero versus Ex Utero Fetus

Abstract: Approximately 50% of survivors of very premature birth exhibit at school age learning and social-behavioral dysfunction, even in the absence of obvious brain injury. The recent successful application of advanced in vivo MRI tools to the in utero fetus and its deployment in healthy pregnancies may provide unprecedented insights into the timing and potential factors associated with impaired brain development in the gestational age-equivalent ex-utero fetus (i.e., preterm infant). We will explore how these emerging tools represent a paradigm shift in our current ability to support extra-uterine brain maturation and provide novel insights into how, when, and where support is inadequate. The development of rational and targeted therapeutic strategies for interventions will also be discussed.

Research Background: Dr. Limperopoulos is a neuroscientist who directs MRI Research of the Developing Brain and Pediatric Developing Brain Laboratory at Children's National Health System. Her research focuses on studying the causes and consequences of early life brain injury in high-risk fetal and newborn populations. Central to her research is the application of advanced magnetic resonance imaging techniques to understand the timing and evolution of brain injury, as well as the brain's adaptive response following injury. The long-term goal of her research program is to develop reliable biomarkers of brain injury that will guide medical and surgical interventions aimed at circumventing injury and minimizing long-term developmental disability.

Emin Maltepe, MD, PhD

Optimal Oxygenation for Ex Utero Fetal Brain Development

Abstract: Oxygen is a morphogen. In addition to its roles in metabolism, oxygen levels dictate wide ranging cellular and developmental processes throughout gestation. Understanding the physiological and molecular mechanisms involved is critical for devising optimal oxygenation approaches for supporting fetal brain development postnatally in premature infants. Here, I will provide an overview of the role of oxygen exposure during development and the central role played by Hypoxia Inducible Factor-dependent gene expression in organogenesis. Novel therapeutic approaches based on these insights will be discussed and placed in the context of clinical studies guiding current oxygenation approaches in intensive care nurseries worldwide.

Research Background: Dr. Maltepe received his BA, MD, and PhD degrees from the University of Chicago. While there, he developed an interest in the role of oxygen tension during development and pursued clinical training in pediatrics as well as neonatology at the University of California, San Francisco. He is currently an associate professor in residence in the Department of Pediatrics at UCSF and an attending physician in the intensive care nursery where he focuses his clinical interest on the care of premature infants.

Dr. Maltepe leads a research lab concentrating on the role of organism-environment interactions during development. Specifically, he has helped define the role of oxygen tension as a morphogen during mammalian development. Using transgenic technologies and stem cell-based approaches, he has been interested in defining the role of oxygen sensitive transcription factors during organ formation. Most recently, he has concentrated on the role of oxygen tension during placental development and the potential role hypoxia signaling pathways may have in disorders of human placental development such as preeclampsia. Additionally, he is interested in the clinical implications of exogenous oxygen exposure to premature infants.

William Pearce, MD

Fetal Brain Development in an Environment of Chronic Hypoxia

Abstract: Late fetal development ushers in a rapid pace of vascular development that influences both the structure and function of fetal cerebral arteries. Smooth muscle cells of fetal cerebral arteries undergo phenotypic transformation that culminates in contractile differentiation for some, but not all, cerebrovascular smooth muscle. In tandem, fetal cerebrovascular endothelial cells increase their size and capacity to release nitric oxide in response to increases in shear stress. Interestingly, all of these processes are potently influenced by hypoxia, which can induce long-term alterations in cerebrovascular structure and function through the combined actions of sympathetic nerves and growth factors such as VEGF and endothelin-1.

Research Background: Dr. Pearce is a professor of Physiology and Pharmacology in the Lawrence D. Longo, MD Center for Perinatal Biology at Loma Linda University School of Medicine.

Dr. Pearce's research is focused on the vascular biology of the fetal cerebral circulation, with emphasis on the effects of biological stresses such as hypoxia, ischemia and nutrient deprivation, on the structural and functional maturation of the cerebrovasculature. His recent work has focused on the ability of in utero stresses to induce long lasting epigenetic changes in cerebral artery structure, due in part to the combined actions of glucocorticoids and microRNAs working in tandem to alter the extracellular matrix of cerebral arteries.

In aggregate, Dr. Pearce's work of 30 years emphasizes that the fetal cerebrovasculature is highly dynamic, exquisitely adaptable but fragile, and is governed by a very different set of mechanisms than those that regulate structure and function in adult cerebral arteries.

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Mike Seed, MBBS

Talk Title: Non-Invasive Quantitation of the Fetal Circulation and Oxygenation

Abstract: New MRI techniques including metric optimized gating for cine phase contrast vessel flow measurements and T2 mapping for vessel oximetry have provided a new approach to assessing the relationship between placental and fetal cardiovascular physiology and in utero brain development. Here we present how reductions in cerebral oxygen delivery in fetuses with congenital heart disease and intrauterine growth restriction are associated with impaired brain growth and maturation.

Research Background: Dr. Seed was appointed as a staff cardiologist at The Hospital for Sick Children (SickKids) and Assistant Professor in Paediatrics in July 2011 and is cross appointed to Diagnostic Imaging and Obstetrics and Gynecology at the University of Toronto. He received his medical degree at the University of Newcastle upon Tyne in the United Kingdom where he initially trained in pediatrics before completing a residency in radiology at Leeds. He undertook fellowships in pediatric radiology and cardiac MRI followed by a fellowship in pediatric cardiology at SickKids. Dr. Seed splits his clinical time between cardiac imaging and in-patient cardiology. His research has been into the development of fetal cardiovascular MRI and he is the recipient of several grants from the CIHR for his work on the fetal circulation and its relationship with brain development.

Eric Vilain, MD, PhD

The Role of Gender in Fetal Brain Development

Abstract: The mechanisms by which sex differences in the mammalian brain arise are poorly understood, but are influenced by a combination of underlying genetic differences and gonadal hormone exposure. Using a mouse embryonic neural stem cell (eNSC) model to understand early events contributing to sexually dimorphic brain development, we identified novel interactions between chromosomal sex and hormonal exposure that are instrumental in the development of early brain sex differences. We also present data from individuals with variations of sexual development and investigate the underlying mechanisms of the development of gender roles during fetal life.

Research Background: Dr. Vilain is the director of the Center for Genetic Medicine Research within Children's National Children's Research Institute (CRI). In addition, he is the A. James Clark Distinguished Professor of Molecular Genetics. Dr. Vilain received his BS in Biochemistry at the Universite Pierre et Marie Curie in 1987 and his PhD in 1994 at the Pasteur Institute. In 1995, Dr. Vilain received his MD at the Faculte de Medecine Necker Enfants Malades. When he was a medical student, his first assignment was a pediatric service taking care of intersexed infants. He was shocked to see how poor the understanding of this condition was, and how many life-altering decisions were made on behalf of the babies. Dr. Vilain has devoted his academic career to the biology of intersexuality. He serves on several national committees on intersexuality. He has received numerous awards, notably from the NIH and the March of Dimes. Dr. Vilain is an expert in the field of the genetics of sexual development. He has deciphered a large number of molecular mechanisms responsible for intersexuality in humans, such as mutations in the sex-determining genes SRY and SOX9, and worked on the mechanisms of early gonadal development and brain sexual differentiation.

Lubo Zhang, PhD

The Environment-Genome Interplay and the Emergence of Neuro-Epigenetics

Abstract: Neonatal hypoxic-ischemic encephalopathy (HIE) is associated with high neonatal mortality and severe long-term neurologic morbidity. The molecular mechanisms and the pathway of brain injury in infants with HIE remain largely elusive. Thus, there is an urgent need to further investigate the underlying mechanisms and to develop additional treatment strategies. Recent studies reveal new insights into epigenetic mechanisms underlying fetal stress-mediated ischemic-sensitive phenotype in the developing brain, and provide a novel target of epigenetic regulation in potential therapeutic strategies that may be beneficial for the treatment of infants with hypoxic-ischemic brain injury. This is of critical importance given limited options currently available for effective therapeutic intervention for the important clinical problem of neonatal hypoxic-ischemic encephalopathy.

Research Background: Dr. Zhang is a professor of Physiology and Pharmacology and director of the Lawrence D. Longo, MD Center for Perinatal Biology at Loma Linda University School of Medicine. Dr. Zhang's research focuses on maternal and developmental physiology with specific interests in key research areas of molecular and epigenetic modulations of developmental plasticity in programming of health and disease, particularly maternal adaptation and fetal and neonatal development in response to hypoxia during gestation. His research helped to understand the molecular and epigenetic mechanisms in developmental programming of "ischemic-sensitive" phenotype in the brain and heart and their impacts in perinatal hypoxic-ischemic brain injury and ischemic heart disease later in life. His research has been continuously funded by multiple NIH grants for over 20 years, and he is the Program Director of a Program Project Grant funded by the NICHD to investigate gestational hypoxia and developmental plasticity. He has published over 250 peer-reviewed publications in journals with high impact factors on the subjects. Dr. Zhang has served various study sections of grant review for the US National Institutes of Health and American Heart Association over the past 20 years.

BREAKFAST BREAKOUT SESSION FACULTY:
Abstracts and Research Backgrounds

Fetal Ultrasound: The Cornerstone of Fetal Neurodiagnosis
Dorothy Bulas and Ashley Robinson

Abstract: Ultrasound is often the first clue that a fetal brain anomaly is present. This workshop will review sonographic techniques important in assessing fetal supratentorial and infratentorial anatomy. Key measurements, landmarks, and facial evaluation will be discussed. Case reviews will be presented to demonstrate the important role ultrasound provides and how MRI and US are critical partners in optimal evaluation of the fetal brain.

Research Background:
Dorothy Bulas, MD

Dorothy Bulas, MD, is an attending in the Division of Diagnostic Imaging and Radiology at Children's National Health System. She serves as the section head of ultrasound and fetal imaging. Dr. Bulas's clinical and research interests include prenatal sonographic and MRI evaluation of congenital anomalies, transcranial doppler evaluation of neonatal and pediatric cerebrovascular injury, and blunt abdominal trauma.

Research Background:
Ashley Robinson, MB, ChB, FRCR, FRCPC

Dr. Robinson joined Sidra Medical and Research Center in April 2014 as the division chief of Interventional Radiology. Before joining Sidra, Dr. Robinson was the head of Pediatric Interventional Radiology and deputy head of the Department of Radiology at the Children's Hospital of British Columbia in Vancouver, Canada.

Dr. Robinson completed his medical degree at Leeds Medical School in the UK and radiology training at the University of Manchester, UK. Dr. Robinson has won several awards for his work in fetal and neonatal neuroradiology, including the John Kirkpatrick Award from the Society for Pediatric Radiology in 2007, the Ella Preiskel Prize from the Royal College of Radiologists (UK), in 2005 and the Derek Harwood-Nash award from the American Society of Neuroradiology in 2004. He also is a member of the Interventional Radiology Committee and the Fetal Imaging Committee of the Society for Pediatric Radiology.

The Essentials of Neurogenetic Testing
Margaret Menzel and Annapurna Poduri

Abstract: Thorough evaluation of fetal brain abnormalities includes careful consideration of genetic etiologies. In this session we will review the fundamentals of prenatal genetic testing and genetic counseling. Using case examples, we will describe some of the more common fetal brain abnormalities, and review the relevant genetic testing and counseling options.

Research Background:
Margaret Menzel, MS, GCG

Ms. Menzel is a genetic counselor within Children's National Fetal Medicine Institute with more than 14 years of prenatal genetic counselor experience. She holds certifications from the American Board of Medical Genetics and the American Board of Genetic Counseling.

Ms. Menzel's background is in psychology and medical genetics, and her current interests include biomedical ethics, research of sexual development disorders, and the psychological effects of stress due to prenatal diagnoses. In addition to serving as the clinical program director for Fetal Genetic Counseling, she serves as a care coordinator for referred patients and serves on the Children's National Ethics Committee.

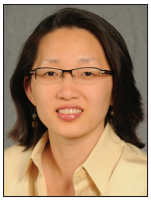
Research Background:
Annapurna Poduri, MD

Dr. Poduri directs the Epilepsy Genetics Program at Boston Children's Hospital as a clinician-scientist, with one hand in the clinic as a pediatric epileptologist and the other hand in the laboratory on a mission to identify the genetic underpinnings of epilepsy. She is also the Co-Director of the Neurology Department's Program in Neurogenetics and serves on the BEST Committee for standardizing laboratory practices.

Dr. Poduri is a key participant in epilepsy genetics research at the local and national levels. She is the Epilepsy Genetics Benchmark Steward to the National Institute of Neurological Disorders and Stroke (NINDS) and the Boston Children's Principal Investigator for the NIH-funded Epilepsy Phenome/Genome Project (EPGP), a national, multi-centered research study. She has been actively involved in data quality review and publications from the phenotyping phase of that project, and is now involved in the genotyping phase. In addition, Dr. Poduri is part of an international effort to understand the genetics of severe early-onset epilepsies.

Developing a Transitional Fetal-Neonatal Program
Taeun Chang and Sarah Mulkey

Abstract: Fetal evaluation and diagnosis is an evolving and very exciting area in pediatrics. Fetal MRI and prenatal testing are enabling fetal conditions to be evaluated in detail early in pregnancy. A successful fetal program in fetal medicine can help the parent(s) make an informed decision regarding the care of their fetus and help provide the fetus a safe and planned transition to neonatal care. In this session we will discuss the essential elements to building a successful transitional fetal-neonatal program, including common challenges and strategies to overcome these. At the conclusion of the program, attendees should have new insights into the development and implementation of a fetal-neonatal program, and how to achieve the exciting clinical and research goals of this emerging field.



Research Background:
Taeun Chang, MD

Dr. Chang is a neurologist in the Division of Neurophysiology, Epilepsy, and Critical Care at Children's National Health System. She also serves as the director of the Neonatal Neurology and Neonatal Neurocritical Care Program, where she successfully created a neonatal neurocritical care (NNCC) service and an outpatient neonatal neurology clinic program in 2004. In conjunction with the NICU, Dr. Chang established Children's neonatal cooling protocol and program in 2006. Children's National has cooled over 280 newborns to date.

Dr. Chang, with colleagues, has established an internationally-renowned neonatal neuromonitoring unit with four digital video EEG monitors in the NICU and bedside remote EEG access to each NICU bed. Dr. Chang and her team are working on advancing the frontiers of neonatal neurointensive care and examining the antecedents for their brain injury or malformations.

Research Background:
Sarah Mulkey, MD, PhD

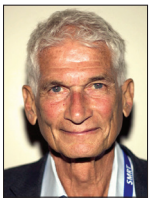
Dr. Mulkey is a fetal-neonatal neurologist in the Division of Fetal and Transitional Medicine at Children's National Health System. Dr. Mulkey earned her medical degree from the Florida State University College of Medicine in 2005 and completed a residency in Child Neurology at the University of Arkansas for Medical Sciences in Little Rock, Arkansas.

Following completion of her residency, she became the first and only dedicated neonatal neurologist in Arkansas, providing state-of-the-art neurologic care to newborns with a variety of complex neurologic conditions. She was the Site-principal Investigator at Arkansas Children's Hospital for the Phase II clinical trial for erythropoietin as a neuroprotective agent for neonatal hypoxic-ischemic encephalopathy led by UCSF (Dr. Yvonne Wu).

In 2015, Dr. Mulkey earned a PhD in Clinical and Translational Sciences to further support her development as a clinical researcher. Her research interests include brain injury in the fetus and newborn, brain growth and development, and neurodevelopmental outcomes in newborns at risk for brain injury. Dr. Mulkey's clinical expertise and interests focus on abnormal development or injury to the developing brain.

Using MRI to Advance Fetal Neurodiagnosis
Charles Raybaud and Matthew Whitehead

Abstract: Fetal MRI is clinically feasible after week 18. In the fetus, malformations, hydrocephalus, infections, anoxia or vascular disorders interfere with the brain development: cellular migration and corticogenesis before 20 weeks, connectivity and gyration thereafter. The identification of specific disruptions in the developmental processes provides a better understanding of the morphologic and functional changes associated with the pathology.



Research Background:
Charles Raybaud, MD, FRCP(C)

Dr. Raybaud graduated from Faculty of Medicine of Marseille, France, and trained in Clinical Neurosciences, Neuroanatomy and Neuroradiology in Marseille and the Mallinckrodt Institute of Radiology in Saint Louis. He moved to Toronto in 2004 to become the division head of Neuroradiology at the Hospital for Sick Children and a professor of radiology at the University of Toronto. He has been the Derek Harwood-Nash Chair in Medical Imaging since 2011.

Dr. Raybaud's main research interests are brain development in health and disease and its disorders (this includes: brain malformations and genetic disorders, diseases of the brain in fetuses and infants, mental delay/autism and a long standing interest in epilepsy).

Research Background:
Matthew Whitehead, MD

Dr. Whitehead is the Director of Pediatric Neuroradiology Education and Neuroradiologic MRI at Children's National Health System. A pediatric neuroradiologist with a special interest in structural and metabolic brain abnormalities, he holds an American Board of Radiology certificate of added qualification in neuroradiology and has completed both neuroradiology and pediatric neuroradiology fellowships.

Dr. Whitehead's research encompasses many facets of fetal and pediatric central nervous system anatomy and pathology. He has a keen interest in the developing brain and works closely with the division of fetal medicine, providing fetal brain MRI interpretations and case discussions during their weekly multidisciplinary fetal conference.

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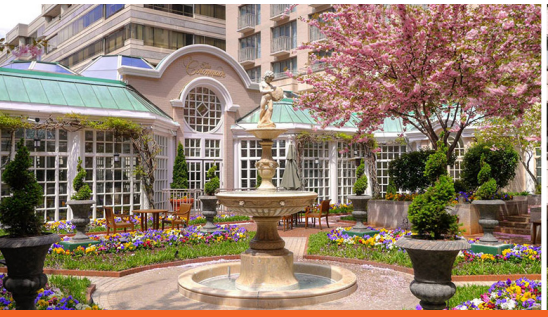
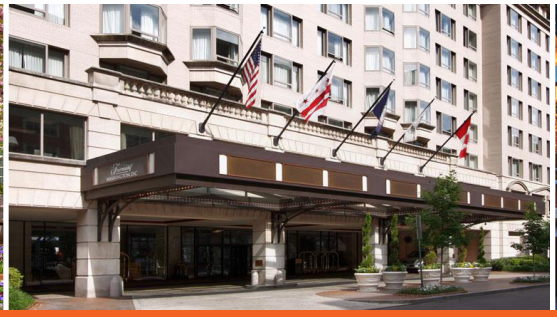
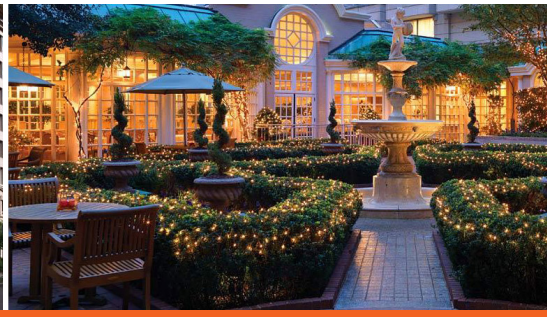

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