# 6th Annual Canadian National Perinatal Research Meeting

**February 12—15, 2019**
**Mont Tremblant, Quebec**

# 6e Congrès Canadien de la Recherche en Périnatalité

CNPRM
Canadian National Perinatal Research Meeting
Congrès Canadien de la Recherche en Périnatalité

## Co-hosted by:

Children's
HEALTH RESEARCH INSTITUTE
Children's Health Research Institute is an Institute within the Lawson Health Research Institute.

McMaster University

# CNPRM 2019

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# Welcome Delegates

Welcome to the 6th Annual Canadian National Perinatal Research Meeting (CNPRM). We are delighted that you have all decided to join us for exciting and novel science and great fun at the Fairmont Mt Tremblant, Quebec!

The CNPRM is now in its 6th year. Prior to the formation of CNPRM, Canadian perinatal researchers had been meeting yearly for nearly 40 years as Western and Eastern groups, and in February 2014 they came together to form the Canadian National Perinatal Research Meeting that was first held in Banff. It was so successful that this new national format was adopted and has formed the basis for meetings ever since. The 2019 meeting has achieved excellent numbers of registrants and trainees. This is evidence of Canada's vibrant and growing perinatal research community, and our immense contribution to perinatal research and our role in the global effort of supporting and maintaining maternal and child health and policy the group representatives. **This year we have over 365 registered delegates and over 275 submitted abstracts resulting in 48 trainee orals and over 200 poster presentations.**

A big thank you to all the members of the Organizing and Thematic Committees for their hard work in reviewing abstracts and selecting session speakers. We also have four world-class international Plenary speakers. This year, we added a few new themes to the scientific program, with 12 concurrent sessions. As in previous years, the meeting in 2019 will host two evening poster sessions as well as 11 special interest workshop sessions spread over the course of the meeting with topics ranging from, how to secure that first faculty position to neonatal feeding and improving neonatal care with the help of veteran parents. There will also be several topical group meetings during CNPRM 2019, and the conference will include a banquet dinner where we are excited to have Dr. Joe Schwarcz Director of the McGill Office for Science and Society as our guest speaker.

The CNPRM is primarily about trainees, and we work hard every year to ensure that trainee's whom have had their abstracts accepted, are provided with a comfortable and nurturing environment at a heavily subsidized rate. To honour our emerging scientists, CNPRM 2019 offers at total of **20 trainee awards.** Among the many awards won at the CNPRM, we have **four** awards sponsored by the CIHR - Institute of Human Development, Child and Youth Health, that value $200 plus registration for CNPRM 2020, as well as **sixteen** other oral and poster presentation awards for our trainees. Trainee support does not come without cost and this year over $190,000 of sponsorship money was raised to fund trainee participation at CNPRM 2019. We are very grateful to the generosity of so many sponsors from industry, Research Institutes and University Divisions, Departments and Sections, which enable CNPRM to continue to fully support our young scientists - our perinatal research leaders of tomorrow.

Please take advantage of this meeting to exchange ideas, network and discuss science. We hope you will go home with novel ideas, new research avenues, and breakthrough concepts to explore, as well as new collaborators and friends.

We would like to thank all our guest speakers, delegates, sponsors and attendees, as well as members of our Organizing and Thematic Committees, workshop organizers, judges and session moderators, who have travelled from far and wide to join us to make this what we are confident will be, a memorable CNPRM. Finally, without the support of the Fairmont Mont Tremblant, and our dedicated administrative support staff of Karen Burell (CHRI), Andrea Rudy (MICYRN) and Jennifer Ryder (PRG), the meeting would have been impossible to organize, thank you all!

On behalf of the CNPRM 2019 Organizing Committee, welcome and enjoy!

Timothy Regnault, PhD (Western University)
Deborah Sloboda, PhD (McMaster University)
Sarah Kimmins, PhD (McGill University)

# Bienvenue aux Deleguees et aux Delegues

Bienvenue au 6e Congrès canadien de la recherche en périnatalité (CNPRM). Nous sommes ravis de votre présence parmi nous pour partager une science passionnante et novatrice ainsi que pour profiter du merveilleux cadre du Fairmont Mont Tremblant, au Québec!

Chaque année, durant près de 40 ans, les chercheurs canadiens en périnatalité se sont réunis en tant que groupes de l'Est et de l'Ouest. En février 2014, ils se sont associés pour donner naissance au CNPRM. Devant le succès de ce nouveau rassemblement national, dont la première édition s'est tenue à Banff, le CNPRM est devenu une tradition annuelle. L'édition de 2019 regroupe un grand nombre de participants, d'étudiants ainsi que de stagiaires postdoctoraux. Ceci est la preuve que la communauté canadienne de la recherche périnatale est dynamique et en pleine croissance. L'immense contribution de nos travaux reflète notre volonté de participer à l'effort mondial visant le soutien et le maintien de la santé maternelle et infantile. **Cette année, nous comptons plus de 365 délégués inscrits et plus de 275 résumés soumis.**

Un grand merci à tous les membres des comités organisateurs pour leur travail soutenu dans la révision des résumés et la sélection des conférenciers. Soulignons, d'ailleurs, que quatre d'entre eux viennent de l'international et sont reconnus mondialement pour leurs travaux. Cette année, vous aurez la chance de découvrir de nouvelles thématiques dans le programme scientifique, composé de 12 sessions simultanées. Comme les années précédentes, il vous sera proposé deux périodes d'affiches en soirée ainsi que onze ateliers d'un intérêt particulier répartis au cours des prochains jours. Plusieurs réunions de groupe thématiques auront également lieu. Enfin, nous aurons l'occasion de nous retrouver au cours du dîner gala où nous aurons le plaisir de recevoir le Dr Joe Schwarcz, directeur du Bureau des sciences et de la société de l'université de McGill, en tant qu'intervenant.

Le CNPRM concerne avant tout les jeunes chercheurs en formation. Ainsi, il nous tient à cœur d'offrir aux étudiants et stagiaires postdoctoraux dont les résumés ont été acceptés, un environnement à la fois accueillant et stimulant à des tarifs extrêmement avantageux. De plus, afin de récompenser leur travail, le CNPRM décernera cette année nombreux prix dont six pour les présentations orales et **quatorze** pour les affiches. Quatre prix d'une valeur de 200 $ sont parrainés par l'Institut du développement et de la santé des enfants et des adolescents des Instituts de recherche en santé du Canada (IRSC) et inclus une inscription au congrès de 2020. Nous tenons également à souligner que plus de 190 000 $ ont été collectés, cette année, auprès de nos partenaires pour financer la participation des étudiants et des stagiaires postdoctoraux. Nous sommes extrêmement reconnaissants de la générosité de nos nombreux commanditaires de l'industrie, des instituts de recherche et des divisions, départements et sections universitaires, qui permettent ainsi au CNPRM de continuer à soutenir pleinement nos futurs leaders en recherche périnatale.

Profitez de ce congrès pour échanger vos idées et agrandir votre réseau. Nous espérons que vous rentrerez chez vous avec des idées novatrices, de nouveaux axes de recherche à explorer, ainsi que de nouveaux collaborateurs et amis. Nous remercions tous nos conférenciers, nos délégués, nos commanditaires et nos participants, ainsi que les membres des comités thématiques, les organisateurs d'ateliers, les juges et les modérateurs de séance, qui sont parfois venus de très loin pour se joindre à nous. Votre contribution est la clé du succès de ce 6e congrès qui sera sans aucun doute mémorable. Enfin, nous tenons à remercier le Fairmont Mt Tremblant pour son accueil ainsi que tout particulièrement notre personnel administratif qui est composé de Karen Burell (CHRI), Andrea Rudy (MICYRN) et Jennifer Ryder (PRG), sans qui, ce congrès n'aurait pas pu voir le jour.

Au nom du comité d'organisation du CNPRM 2019, nous vous souhaitons la bienvenue et un bon congrès!

Timothy Regnault, PhD (Western University)
Deborah Sloboda, PhD (McMaster University)
Sarah Kimmins, PhD (McGill University)

# By the Numbers

Over

**40** Hours

**5** Days

**1**
Beautiful Location

**1**
Fantastic Hotel

**365** Meeting Delegates

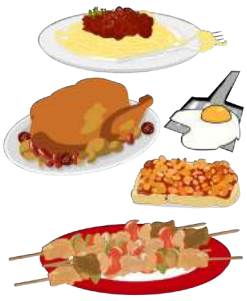
**11** Dynamic Workshops

**12** Amazing Thematic Speakers

**4** Prestigious Plenary Speakers

**4** Special Group Meetings

**>3500**
Delicious Meals



**217** Poster Presentations

**48**
Trainee Thematic Orals

**18**
Trainee Plenary Talks

**37**
Amazing Sponsors

**20**
Trainee Awards

**8** Cool Winter Activities

# Schedule at a Glance

| | Tuesday February 12 | Wednesday February 13 | Thursday February 14 | Friday February 15 |
|---|---|---|---|---|
| 7:00-9:00am | DOHaD Canada Meeting (9:00am-5:00pm) | CNPRM Breakfast Workshops | | |
| 9:00am-noon | | Plenary Lecture I<br>Indigenous Health<br>Dr. Gina Muckle<br>Plenary Orals | Plenary Lecture II<br>Neuroscience<br>Dr. Terrie Inder<br>Plenary Orals | Plenary Lecture IV<br>Fertility<br>Dr. Cliff Librach<br>Plenary Orals |
| noon-1:30pm | | Lunch Break with Workshops | | |
| 1:30-3:30pm | CNPRM Registration | Thematic Sessions<br>1) MFM I (Fetal Medicine)<br>2) Parental Environments and Pediatric Outcomes<br>3) Indigenous Health | Thematic Sessions<br>1) Nursing and Midwifery<br>2) Neonatal II<br>3)DOHaD | Thematic Sessions<br>1) MFM II (Maternal Medicine)<br>2) Reproductive (epi)Genetics & Fertility<br>3)Perinatal Epidemiology II |
| 3:30-5:00pm | | Thematic Sessions<br>1) Placental and Fetal Physiology<br>2) Perinatal Epidemiology I<br>3) Neonatal I | Plenary Lecture III<br>DOHaD<br>Dr. Tessa Roseboom<br>Free Time | Trainee Awards (1:00)<br>Lunch (1:30pm)<br>CNPRM Business Meeting/Lunch (1:30pm) |
| 5:00-7:00pm | Cocktails<br>Poster Session I | Cocktails<br>Poster Session II | | |
| 7:00-9:00pm | Dinner | | Reception and Banquet | |

# Organizing and Thematic Committees

## Co-Chairs

| | |
|---|---|
| Timothy Regnault | Dept. of Obstetrics & Gynaecology and Physiology & Pharmacology, Western University |
| Deborah Sloboda | Dept. Biochemistry & Biomedical Sciences, McMaster University |
| Sarah Kimmins | Dept. of Animal Science, McGill University |

## Organizing Committee

| | |
|---|---|
| Shyamala Dakshinmurti | Dept. of Pediatrics, University of Manitoba |
| Vern Dolinsky | Dept. of Pharmacology & Therapeutics, University of Manitoba |
| Richard Keijzer | Dept. of Surgery, Pediatrics & Child Health & Physiology, University of Manitoba |
| Tracey Galloway | Dept. of Anthropology, University of Toronto |
| Bernard Robaire | Dept. of Pharmacology & Toxicology, McGill University |
| Janice Bailey | Dept. of Food and Agricultural Sciences, Universite Laval |
| Daniel Hardy | Dept. of Physiology and Pharmacology,Western University |
| Pablo Nepomnaschy | Dept. of Health Sciences, Simon Fraser University |
| KS Joseph | Dept. of Obstetrics and Gynecology, University of British Columbia |
| Sarah McDonald | Dept. of Obstetrics and Gynecology, McMaster University |
| Jocelynn Cook | Scientific Director, Society of Obstetricians & Gynaecologists of Canada |
| Barbra de Vrijer | Dept. of Obstetrics and Gynecology, Western University |
| Gregory Lodygensky | Dept. of Paediatrics University of Montreal |
| Liz Darling | Dept. of Obstetrics and Gynecology, McMaster University |
| Robert Jankov | Dept. of Pediatrics, University of Ottawa |

## Thematic Committees

**DOHaD**
Pablo Nepomnaschy (Simon Fraser University)
Meghan Azad (University of Manitoba)
Alison Holloway (McMaster University)
Maria-Beatriz Ospina (University of Alberta)

**Indigenous Health**
Tracey Galloway (University of Toronto)
Stephanie Montesanti (University of Alberta)
Jon McGavock (Children's Hospital Research Institute of Manitoba)

**MFM I: Fetal Medicine**
Jocelynn Cook (Society of Obstetricians & Gynaecologists of Canada)
Sandra Davidge (University of Alberta)
Graeme Smith (Queen's University)
Venu Jain (University of Alberta)

**MFM II: Maternal Medicine**
Barbra de Vrijer (Western University)
Christy-Lynn Cook (University of Alberta)

Stefania Ronzoni (University of Toronto)
Genevieve Eastabrook (Western University)
Laura Gaudet (University of Ottawa)

**Neonatal I: Neonatal Cardiopulmonary Medicine**
Robert Jankov (Hospital for Sick Children)
Anne Monique Nuyt (CHU Sainte-Justine)
Bernard Thebaud (Ottawa Hospital Research Institute)
Georg Schmolzer (University of Alberta)

**Neonatal II: Neonatal Neurosciences**
Doug Swanson (Kids Brain Health Network)
Bryan Richardson (Western University)
Gregory Lodygensky (Children's Neonatal Brain Platform)

**Nursing and Midwifery**
Liz Darling (McMaster University)
Kellie Theissen (University of Manitoba)
Wendy Sword (University of Ottawa)

**Parental Environment and Pediatric Outcomes**
Bernard Robaire (McGill University)
Jacquetta Trasler (McGill University)
Barbara Hales (McGill University)
Sarah Kimmins (McGill University)

**Perinatal Epidemiology I**
K.S. Joseph (BC Children's Hospital Research Institute)
Dawn Kingston (University of Calgary)
Liz Darling (McMaster University)
Christy Woolcott (Dalhousie University)
Haim Abenhaim (McGill University)
Sara McDonald (McMaster University)

**Perinatal Epidemiology II**
Sarah McDonald (McMaster University)
Dawn Kingston (University of Calgary
Liz Darling (McMaster University)
Christy Woolcott (Dalhousie University)
Haim Abenhaim (McGill University)
K.S. Joseph (BC Children's Hospital Research Institute)

**Placental and Fetal Physiology**
Daniel Hardy (Western University)
Paul Degado Olguin (Hospital for Sick Children)
Venu Jain (University of Alberta)
Steven Renaud (Western University)
Denise Hemmings (University of Alberta)
David Gynspan (University of Ottawa)

**Reproductive (Epi)genetics/Fertility**
Janice Bailey (Universite Laval)
Louis Lefebvre (University of British Columbia)
Marc Andre Sirard (Universite Laval)
Sophie Petropoulos (University of Montreal)

# Venue – Fairmont Tremblant

Toll Free (Room Reservations only):
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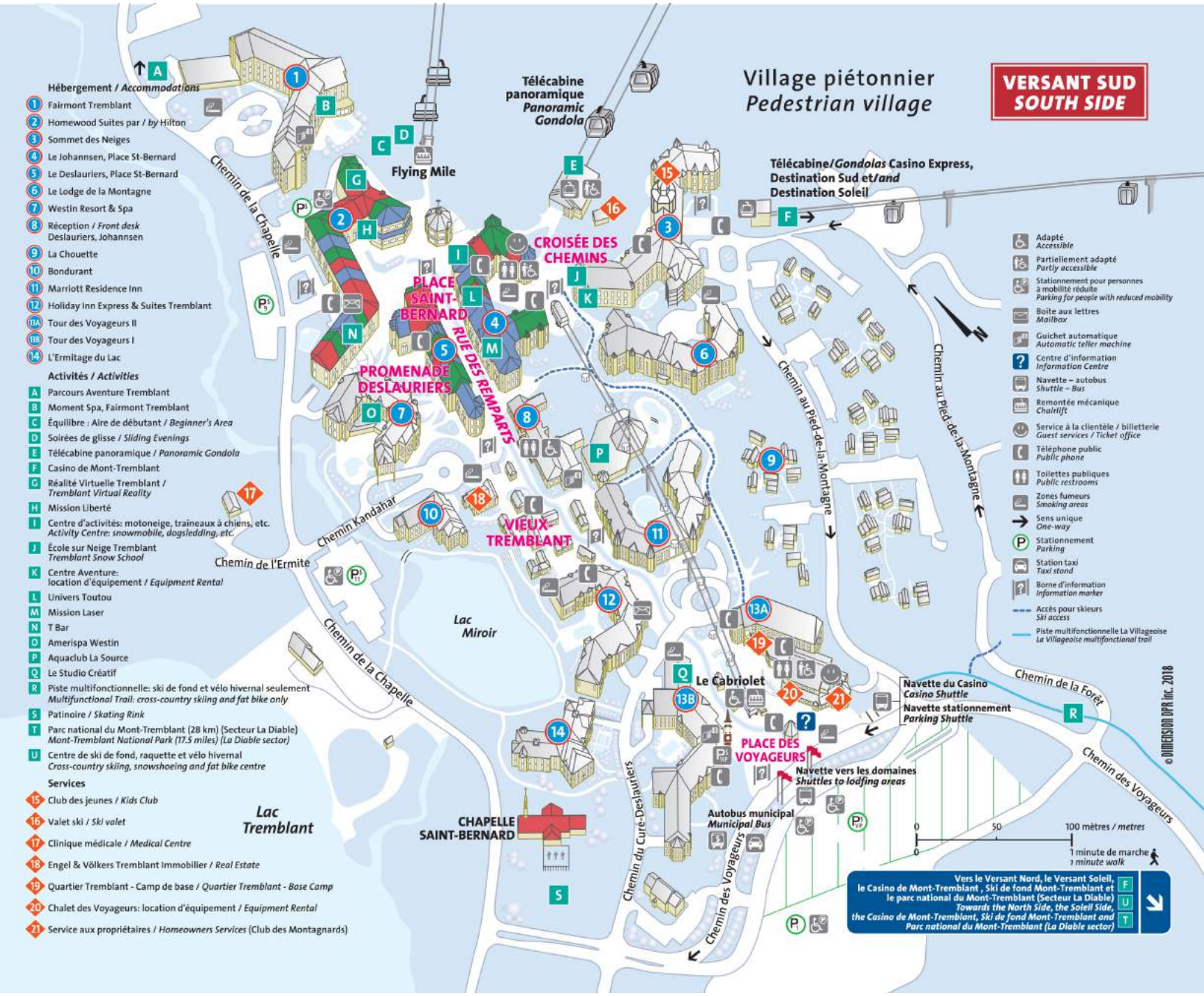
fairmonttremblant@fairmont.com
TEL + 1 (819) 681-7000

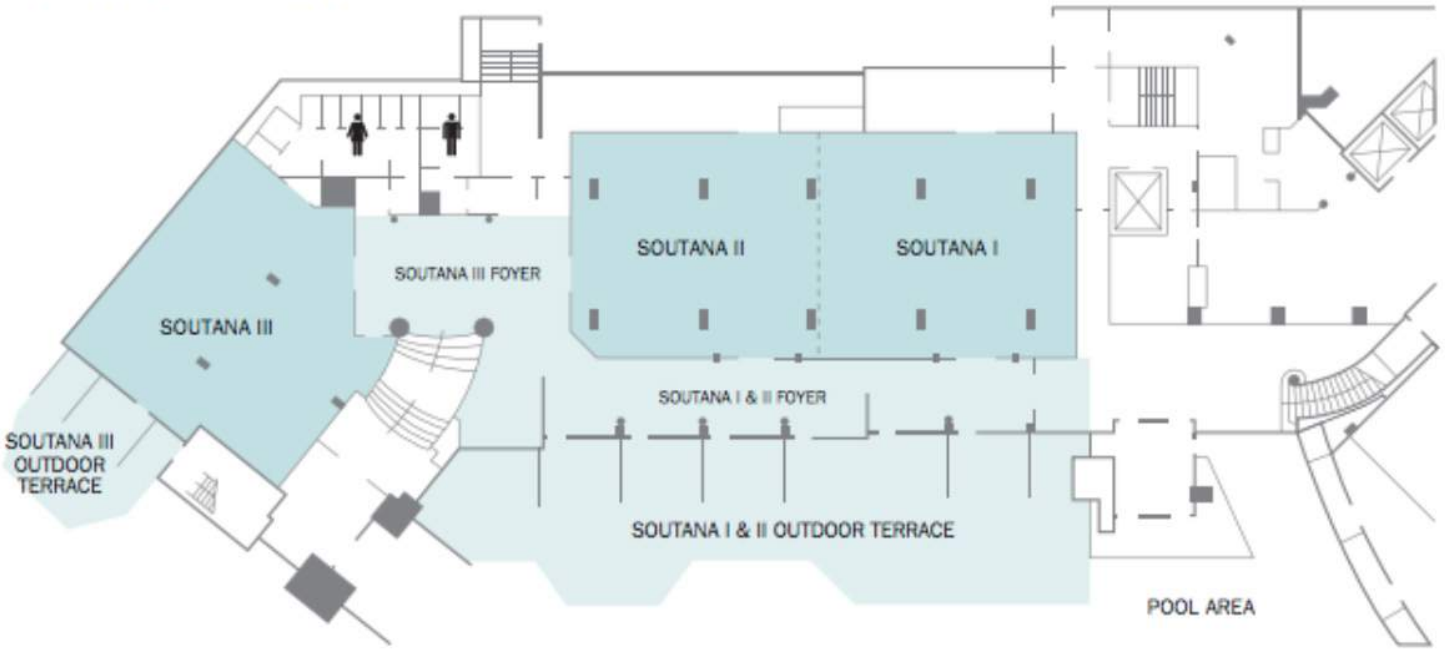
Fairmont Tremblant
3045 Chemin de la Chapelle
Mont-Tremblant, QC J8E 1E1




CNPRM is pleased to offer a family room for nursing parents and parents with young children, who are delegates or accompanying a delegate, during the conference. Please look for this sign on the Mailhot room (Convention Centre Level C1) and if locked a key can be obtained from the Meeting Planner Office one floor up outside the Mali Foyer.

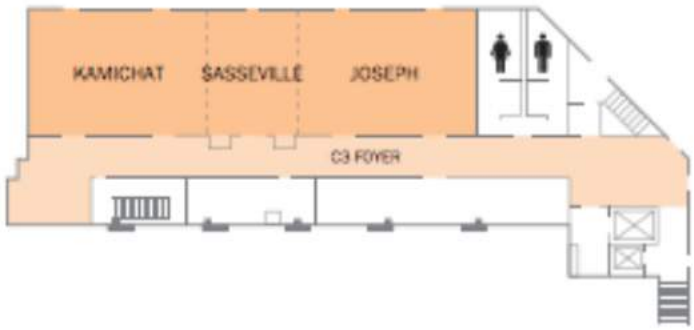
# Floor Plans

MAIN HOTEL TERRACE LEVEL



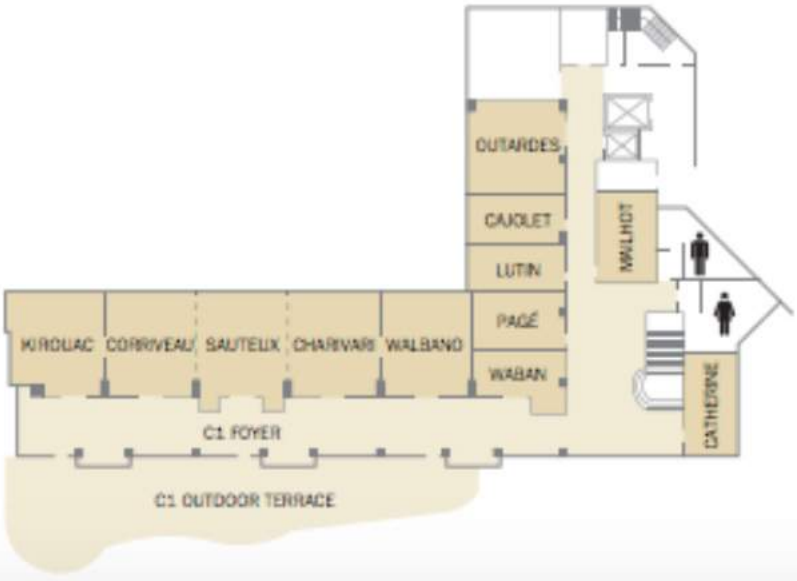

MAIN HOTEL 7TH FLOOR

**CONVENTION CENTRE LEVEL C3**




**CONVENTION CENTRE MAIN LEVEL C2**


**CONVENTION CENTRE LEVEL C1**



## Poster Presentations

Please hang your posters according to poster number on the provided poster boards at least one hour prior to the beginning of the poster session. All delegates are expected to attend their scheduled poster session in order to answer questions. Please remove your poster at the end of the session.

## Oral Presentations

Please submit your oral presentation to the moderator of your session during the break prior to your session. Please have your presentation loaded onto a USB or portable device. Presentations on laptops will not be accommodated. All short oral presentations are 10min in length with 5 minutes of questions. Invited speakers are to check their presentation timing with their moderators. The moderators will be keeping strict time.

# Detailed Scientific Program

| Tuesday, February 12th | |
|---|---|
| 1:30-5:00 pm | CNPRM Registration (Fairmont Conference Area) |
| **Cocktails and Poster Session I (P001 — P100)<br>5:00-7:00 pm<br>(Mali I/II)** | |
| **Dinner<br>7:00-9:00 pm<br>Soutana I/II/III** | |

| Wednesday, February 13th | |
|---|---|
| 6:45-8:45 am | Breakfast (Soutana I/II/II) |
| **Concurrent Morning Workshop Sessions** | |
| 7:30-8:30 am | **WS1a – Indigenous-led Development of Interventions to Support Healthy Life Trajectories** (Outardes) (Supported by: CNPRM 2019)<br><br>**WS1b – Controversies in Neonatal Pulmonary Hypertension** (Kamichat) (Supported by: Mallinckrodt)<br><br>**WS1c – The Advantages of a Rodent Model for Examining Human Placental Function** (Joseph) (Supported by: TEW Fund) |

| PLENARY SESSION I<br>(Mali III/IV)<br>MODERATORS: Dr. Tracey Galloway and Megan Jarman | |
|---|---|
| 8:45-9:00 am | **Land Acknowledgement:** Kitigan Zibi First Nation<br>**Opening Remarks:** Drs. Sloboda, Kimmins and Regnault |
| 9:00-9:45 am | **Plenary Lecture I: Environmental contaminants and Inuit child development: 25 years of interdisciplinary research**<br>Professor Gina Muckle, Laval University (sponsored by CIHR-IHDCYH) |
| 9:45-10:00 am | **PO-01:** Britt Voaklander<br>The Prevalence of Diabetes in Pregnancy Among Indigenous Women: A Systematic Review |
| 10:00-10:15 am | **PO-02:** Saja Anabosi<br>Notable outcomes in twin neonates by planned mode of delivery: A secondary analysis of the Twin Birth Study |
| 10:15-10:30 am | **PO-03:** Emily Rogers<br>Neurodevelopmental outcomes after cystic white matter injury in very preterm infants: A two decades of experience |
| **Refreshment Break 10:30-11:00 am**<br>**(Mali Foyer)** | |
| **Plenary Session I Continued**<br>**MODERATORS: Dr. Deborah Sloboda and Christian Bellissimo** | |
| 11:00-11:15 am | **PO-04:** Jenna Treissman<br>Dissecting the Role of Oxygen in Trophoblast Column Outgrowth |
| 11:15-11:30 am | **PO-05**: Patrycja Jazwiec<br>Paternal diet-induced obesity induces placental hypoxia and endoplasmic reticulum stress and alters placental vascularization |
| 11:30-11:45 am | **PO-06:** Mollie Sivaram<br>The Effect of Antenatal Corticosteroids on Survival in Extreme Prematurity |

| Concurrent Afternoon Workshop Sessions | |
|---|---|
| 11:50-1.00 pm | **WS2a** – DESIGN THINKING: An Innovative Approach to Knowledge Translation (Sasseville) (Supported by: CNPRM 2019)<br><br>**WS2b** – Canadian policy frameworks for improving perinatal and early childhood nutrition for Indigenous families (Kamichat) (Supported by: Lawson Foundation)<br><br>**WS2c** – Neonatal Abstinence Syndrome Data Harmonization (Joseph) (Supported by: The Dr. Paul H.T. Thorlakson Foundation Fund) |
| 12.00-1.30 pm | **Lunch (Soutana I/II/III)** |
| **Concurrent Thematic Session – 1** | |
| **Session: MFM (I) – Fetal Medicine<br>Moderator: Dr. Jocelynn Cook (Mali III/IV)** | |
| 1:30-2:00 pm | **Thematic Speaker: Dr. Robert Tanguay (Caleo Health)<br>Pot, Pills and Pain: Opioids, cannabis and their DOHaD implications** |
| 2:00-2:15 pm | **TO-01:** Alyaa Al Refai<br>Impact of fetal surgery on progression of ventriculomegaly in fetuses with spina bifida |
| 2:15-2:30 pm | **TO-02:** Colin Cheng<br>IL-1 receptor modulators prevent preterm birth and retinopathy and are independent of Nf-kB inhibition |
| 2:30-2:45 pm | **TO-03:** Elizabeth Prairie<br>Antenatal administration of a potential interleukin-6 receptor antagonist prevents inflammation-induced preterm birth and foetal tissue injury |
| 2:45-3:00 pm | **TO-04:** Sarah-Eve Loiselle<br>Optimal dose of Rytvela for prevention of inflammation-induced preterm birth and fetal tissue injury |

| Session: Parental Environment and Pediatric Outcomes<br>Moderator: Dr. Bernard Robaire (Joseph) | |
|---|---|
| 1:30-2:00 pm | **Thematic Speaker: Dr. Bernard Robaire (Dept. of Pharmacology and Therapeutics, McGill University)**<br>**Consequences to progeny of paternal drug and environmental exposures** |
| 2:00-2:15 pm | **TO-05:** Charlene Nielsen<br>Patterns of small for gestational age and industrial emissions in space and time |
| 2:15-2:30 pm | **TO-06:** Whitney Ereyi-Osas<br>Maternal Postpartum Depression and Child Behaviour Problems: The Role of Socio-demographic Risk |
| 2:30-2:45 pm | **TO-07:** Anne-Sophie Pépin<br>Paternal diet-induced obesity impairs offspring metabolism in a sex-specific manner |
| 2:45-3:00 pm | **TO-08:** Charlene Nielsen<br>Geographic information assessment of maternal ambient health hazards and babies born too small |
| **Session: Indigenous Health<br>Moderator: Dr. Tracey Galloway (Kamichat)** | |
| 1:30-2:00 pm | **Thematic Speaker: Amanda Lapinski (Indigenous Diabetes Health Circle)**<br>**Seven Generations, Gestational Diabetes Prevention with a Focus on Cultural Practices** |
| 2:00-2:15 pm | **TO-09:** Ebenezer Frimpong<br>Management of diabetes and hypertension among Zulu Traditional Health Practitioners: A study of focus group interviews |
| 2:15-2:30 pm | **TO-10:** Pauline Herst<br>DOHaD in wildlife: Exposure to persistent organic pollutants alters the adipose tissue transcriptome in mother polar bears and her cubs from Svalbard, Norway |

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| 2:30-2:45 pm | **TO-11:** Pauline Navarro<br>Prenatal exposure to Arctic pollutants and folic acid supplementation leads to metabolic modifications in male rat offspring |
| 2:45-3:00 pm | **TO-12:** James Ashton<br>Applying a Community-Engaged Approach to Evaluate Maternal and Perinatal Health Outcomes among Métis Albertans |
| **Refreshment Break 3:00-3:30 pm (Mali Foyer)** | |
| **Concurrent Thematic Session – 2** | |
| **Session: Placental and Fetal Physiology<br>Moderator: Dr. Daniel Hardy (Joseph)** | |
| 3:30-4:00 pm | **Thematic Speaker: Dr. Isabella Caniggi (Mount Sinai Hospital)<br>Something old, lots new, something borrowed, something blue: Fibronectin and preeclampsia** |
| 4:00-4:15 pm | **TO-13:** Phanie Charest<br>Is folic acid helpful to fetal development following ancestral exposure to Arctic pollutant? |
| 4:15-4:30 pm | **TO-14:** Katherine Mathers<br>Pyrroloquinoline quinone (PQQ) supplementation during pregnancy affects fetal outcomes in spontaneous intrauterine growth-restricted (spIUGR) guinea pigs in a sex-specific manner |
| 4:30-4:45 pm | **TO-15:** Jessica Morin<br>Fetal Brain Exosomes and MicroRNAs in Umbilical Cord Blood and Amniotic Fluid: Promising Non-invasive Biomarkers |
| 4:45-5:00 pm | **TO-16:** Marie-Julie Allard<br>Placental infection by group B Streptococcus induces sex-specific maternofetal inflammatory responses |
| **Session: Perinatal Epidemiology I<br>Moderator: Dr. Sarah McDonald (Mali III/IV)** | |

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|---|---|
| 3:30-4:00 pm | **Trainee Debate: Dr. Giulia Muraca (Karolinska Institutet, University of British Columbia) and Dr. Alexandra Marseu (McMaster University)**<br>**Maternity Care Providers Have an Obligation to Lower Canada's Cesarean Delivery Rate** |
| 4:00-4:15 pm | **TO-17:** Shazia Hira Chaudhry<br>Is maternal blood plasma homocysteine concentration associated with the risk of placenta-mediated pregnancy complications? A systematic review of prospective studies |
| 4:15-4:30 pm | **TO-18:** Riya Rai<br>The Impact of Maternal Depressive Symptom Trajectories on Child Behavioural Outcomes |
| 4:30-4:45 pm | **TO-19:** Bayane Sabsabi<br>Asphyxiated Neonates Treated with Hypothermia: Birth place matters |
| 4:45-5:00 pm | **TO-20:** Sangmin Lee<br>Can we predict neonatal readmission within 7 days of discharge using administrative databases? |
| **Session: Neonatal I (Neonatal Cardiopulmonary Medicine)**<br>**Moderator: Dr. Robert Jankov (Kamichat)** | |
| 3:30-4:00 pm | **Thematic Speaker: Dr. Anne-Monique Nuyt (CHU Sainte-Justine)**<br>**Cardiopulmonary Health in Adults born Very Preterm** |
| 4:00-4:15 pm | **TO-21:** Kim Anh La<br>Perinatal and surgical determinants of post-operative PICU morbidity in newborns with congenital heart disease |
| 4:15-4:30 pm | **TO-22:** Michael Sage<br>Impact of respiratory rate and tidal volume on lung inflammation during total liquid ventilation |
| 4:30-4:45 pm | **TO-23:** Shyamala Dakshinamurti<br>Localization and nitrosylation of adenylyl cyclase impairs arterial relaxation in hypoxic PPHN |

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| **Cocktails and Poster Session II (P101 — P117)**<br>**5:00-7:00 pm**<br>**Mali I/II** |
| **Dinner**<br>**7:00-9:00 pm**<br>**Soutana I/II/III** |

| **Thursday, February 14th** | |
|---|---|
| 7:00-9:00 am | Breakfast (Soutana I/II/II) |
| **Concurrent Morning Workshop Sessions** | |
| 7:45-8:45 am | **WS3a** – Advanced Methods in Perinatal Epidemiology: Causal Inference (Joseph)<br><br>**WS3b** – Family QI Bootcamp: practical approaches to improve the parent experience (Sasseville) (Supported by: CNPRM 2019)<br><br>**WS3c** – Surfactant administration: Review of Current Practices and the Future (Outardes) (Supported by: Methapharm) |
| **PLENARY SESSION II**<br>**MODERATORS: Dr. Gregory Lodygensky and TBA**<br>**(Mali III/IV)** | |
| 9:00-9:45 am | **Plenary Lecture II: Insight into the Encephalopathy of Prematurity - Pathways and Consequences**<br>Dr. Terrie Inder, Brigham & Women's Hospital (sponsored by Kids Brain Health Network and Canadian Neonatal Brain Platform Neuroscience) |

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| 9:45-10:00 am | **PO-07:** Ghassan Maalouf<br>Asphyxiated newborns developing later cerebral palsy have already impaired brain growth within the first month of life |
| 10:00-10:15 am | **PO-08:** Katherine Kennedy<br>Impact of pre-pregnancy BMI on maternal gut microbiota over the course of pregnancy |
| 10:15-10:30 am | **PO-09:** Andréane Lavallée<br>Which interventions have the potential to enhance parental sensitivity in the NICU? Results from a systematic review & meta-analysis |
| **Refreshment Break 10:30-11:00 am Mali Foyer** | |
| **Plenary II Oral Presentations Continued<br>MODERATORS: Dr. Douglas Sawnson and Silvia Olandi** | |
| 11:00-11:15 am | **PO-10:** Angelo Rizzolo<br>The Cumulative Effect of Evidence-Based Practices on Outcomes of Preterm Infants Born <29 Weeks |
| 11:15-11:30 am | **PO-11:** Antara Chatterjee<br>Improving Our Understanding Of Cervical Physiology During Pregnancy: Combination Of MRI, Histochemical, And Biochemical Analyses Reveal Specific Structural Changes In The Murine Cervical Stroma During Term And Preterm Labor |
| 11:30-11:45 am | **PO-12:** Kashif Mughal<br>Effect of e-therapy on maternal mental health and its association with child development: Findings from the Integrated Maternal Psychosocial Assessment to Care Trial (IMPACT) study |
| **Concurrent Afternoon Workshop Sessions** | |
| 12:00-1.00 pm | **WS4a** – Perinatal Imaging: Advances and Challenges (Sasseville)<br>**WS4b** – Career Advice Across Sectors for Young Scientists and Clinicians (Soutana III) (Supported by Kids Brain Health Network) |

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| 12.00-1.30 pm | **Lunch (Soutana I/II/III)** |

## Concurrent Thematic Session – 1

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| | **Session: Nursing and Midwifery**<br>**Moderator: Dr. Laura Gaudet (Kamichat)** |
| 1:30-2:00 pm | **Thematic Speaker: Dr. Denise Harrison (University of Ottawa and CHEO)**<br>**Neonatal Pain Management – The evidence, the utilization and the knowledge translation strategies** |
| 2:00-2:15 pm | **TO-25:** Camille Dugas<br>Breast milk content in microRNAs and association with gestational diabetes mellitus |
| 2:15-2:30 pm | **TO-26:** Marsha Campbell-Yeo<br>Systematic review on the impact of perinatal mHealth interventions for mothers in low- and middle-income countries |
| 2:30-2:45 pm | **TO-27:** Shokoufeh Modanloo<br>Be Sweet to Babies during Painful Procedures: Evaluation of a Parent-Targeted Video in Persian |
| 2:45-3:00 pm | **TO-28:** Catherine Larocque<br>Are we on the same page about skin-to-skin care? A descriptive correlational study exploring skin to skin care for postoperative NICU infants |
| | **Session: Neonatal II (Neonatal Neurosciences)**<br>**Moderator: Dr. Gregory Lodygensky (Mali III/IV)** |
| 1:30-2:00 pm | **Thematic Speaker: Dr. Pia Watermark (McGill University)**<br>**Repairing the brain of asphyxiated newborns** |
| 2:00-2:15 pm | **TO-29:** Marie-Eve Brien<br>Non-infectious inflammation during pregnancy is associated with fetal growth restriction and altered neurodevelopment |

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| 2:15-2:30 pm | **TO-30:** Rasheda Chowdhury<br>Increase in Cerebral Oxygen Metabolism during Rewarming in Neonates with Hypoxic-Ischemic Encephalopathy Undergoing Therapeutic Hypothermia |
| 2:30-2:45 pm | **TO-31:** Mathilde Chevin<br>Effect of hypothermia on interleukin-1 receptor antagonist pharmacodynamic parameters in inflammatory-sensitized hypoxic-ischemic encephalopathy of term newborns |
| 2:45-3:00 pm | **TO-32:** Lara Eid<br>Deletion of the autism gene MYO9B in GABAergic interneurons delays tangential migration through disrupted actin remodeling in mice |
| **Session: DOHaD<br>Moderator: Dr. Pablo Nepomnaschy (Joseph)** | |
| 1:30-2:00 pm | **Thematic Speaker: Dr. Rhonda Bell (University of Alberta)<br>Using Integrated Knowledge Translation to Move Research into Practice** |
| 2:00-2:15 pm | **TO-33:** Alyson Deprez<br>Impact of transient neonatal hyperoxia exposure on skeletal muscle development in a rat model of prematurity-related condition |
| 2:15-2:30 pm | **TO-34:** Monica Molinaro<br>Developmental Origins of Health and Disease (DOHaD): Uncovering Health Care Providers' Experience in Practice |
| 2:30-2:45 pm | **TO-35:** Janet Poplawski<br>Early life-life migration stress induces sensorimotor deficits in adulthood: Linking trauma to adverse health outcomes |
| 2:45-3:00 pm | **TO-36:** Elizabeth Greco<br>Maternal Nicotine Exposure Induces Congenital Heart Defects in Mice Offspring |
| **Refreshment Break 3:00-3:15 pm Mali Foyer** | |

| PLENARY SESSION III<br>MODERATOR: Dr. Deborah Sloboda<br>(Mali III/IV) | |
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| 3:15-4:00 pm | **Plenary Lecture III**<br><br>**Hyperemesis gravidarum – How little we know about etiology, treatment and long term consequences for mother and offspring**<br>Dr. Tessa Roseboom, University of Amsterdam (sponsored by The Molly Towell Research Foundation) |
| 4:00-5:00 pm | **WORKING GROUPS (LEVEL III Sasseville, Sauteux)** |

**Free Time**
**4:00-6:00 pm**

**Reception 6:00 pm (cash bar)**
**Banquet Dinner 7:00-9:45 pm (wine/soft drinks served)**
**(Mali III/IV)**

**Joe Schwarcz, PhD (Director, McGill Office for Science and Society)**
**The Chemistry of Love**
**(Sponsored by Bles)**

# Friday, February 15th

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| 7:00-9:00 am | Breakfast (Soutana I/II/) |

**Sponsor Breakfast: 7:45-8:45 am**
**Soutana III**

**PLENARY SESSION IV**
**MODERATORS: Dr. Sarah Kimmins and Anne-Sophie Pepin**
**(Mali III/IV)**

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| 9:00-9:45 am | **Plenary Lecture IV**<br><br>**ART and Clinical Outcomes**<br>Dr. Clifford Librach, CReATe Fertility Centre (sponsored by Methapharm) |
| 9:45-10:00 am | **PO-13:** Anish Engineer<br>The Role of microRNA-122 in Pregestational Diabetes-Induced Congenital Heart Defects |
| 10:00-10:15 am | **PO-14:** Elia Palladino<br>The influence of maternal malnutrition on folate and inositol production and transport in the gut – a mechanism for fetal growth restriction and fetal disorders? |
| 10:15-10:30 am | **PO-15:** Ariane Lismer<br>The effects of a folate deficiency on the sperm epigenome and the implications on embryo development |

**Refreshment Break 10:30-11:00 am (Mali Foyer)**

**Concurrent Thematic Session – 4**

**Session: MFM (II) – Maternal Medicine**
**Moderator: Dr. Barbra de Vrijer (Kamichat)**

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| 11:00-11:30 am | **Thematic Speaker: Dr. Bryan Richardson (Western University)**<br>**Pregnancy conditions, size at birth and cord oxygen values: Implications for regulatory mechanisms** |
| 11:30-11:45 am | **TO-37:** Veronica Moramarco<br>Classical Caesarean: What are the maternal and infant risks compared to low transverse caesarean in preterm birth, and subsequent uterine rupture risks? A systematic review and meta-analysis. |
| 11:45-12:00 pm | **TO-38:** Aida Zaza<br>Placental programming and the risk of developing cardiovascular risk factors |
| 12:00-12:15 pm | **TO-39:** Sebastin Hobson<br>Reducing surgical blood loss in placenta accreta spectrum disorders: a 10-year experience of cell salvage implementation |
| 12:15-12:30 pm | **TO-40:** Claudia Savard<br>Subcutaneous fat thickness measured by ultrasound in the first trimester predicts total gestational weight gain |
| **Session: Reproductive (epi)Genetics & Fertility<br>Moderator: Dr. Mathieu Dalvai (Joseph)** | |
| 11:00-11:30 am | **Thematic Speaker: Dr. Mathieu Dalvai (Université Laval)**<br>**Environmental contaminants and paternally-mediated DOHaD** |
| 11:30-11:45 am | **TO-41:** Cyntia Duval<br>Altered transcriptome and epigenome profiles in placentas from complicated pregnancies |
| 11:45-12:00 pm | **TO-42:** Mariyan Jeyarajah<br>Elucidating the role of OVO-like 2 in placental development |
| 12:00-12:15 pm | **TO-43:** Charlotte Talbot<br>Reduced expression of microRNA-126-5p is associated with cardiac dysfunction in rat offspring |

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| 12:15-12:30 pm | **TO-44:** Sherri Lee Jones<br>Prenatal maternal stress affects the structural integrity of the hypothalamic pituitary gonadal axis in males and females: Project Ice Storm |
| **Session: Perinatal Epidemiology II<br>Moderator: Dr. Christy Woolcott (Mali III/IV)** | |
| 11:00-11:30 am | **Thematic Speaker: Dr. K.S. Joseph (University of British Columbia)<br>Towards a unified perinatal theory: Reconciling the births-based and fetus-at-risk models of perinatal mortality** |
| 11:30-11:45 am | **TO-45:** Amelie Boutin<br>Bias in comparisons of neonatal mortality based on very preterm births |
| 11:45-12:00 pm | **TO-46: Daniel Corsi**<br>Interpregnancy Interval and Stillbirth: A Causal Analysis of the Demographic and Health Surveys |
| 12:00-12:15 pm | **TO-47: Sonia Grandi**<br>Implications of the choice of sample population for the development of risk prediction models for long-term outcomes incorporating pregnancy-related predictors |
| 12:15-12:30 pm | **TO-48: Mary Brown**<br>A comparison of multiple imputation procedures for handling missing pre-pregnancy weight in the estimation of the risk of gestational diabetes mellitus: a simulation study |

**Trainee Awards-Closing Remarks**
**1:00-1:30 pm**
**Mali III/IV**

**Lunch**
**1:30-2:20 pm (Soutana I/II)**

**Business Meeting with Lunch**
**1:30-2:20 pm (Soutana III)**

# Plenary and Thematic Speakers

**Rhonda C. Bell, PhD, (University of Alberta)**
***Using Integrated Knowledge Translation to Move Research into Practice***
**Thursday, February 14, 1:30pm**

Dr. Bell is a Professor in the Division of Human Nutrition, Dept of Agricultural, Food and Nutritional Sciences, Faculty of Agricultural, Life and Environmental Sciences at the University of Alberta. She is also the Pregnancy and Developmental Trajectories Theme Lead for the Women and Children's Health Research Institute at the University of Alberta. She received a PhD in Human Nutrition from the Cornell University and degrees in Kinesiology (BSc) and Health Studies (MSc) from the University of Waterloo. She leads a program of research in maternal nutrition before and during pregnancy and its impact on women and children's health.

Dr. Bell is the principle investigator for ENRICH, a multi-faceted research program aimed at supporting women from diverse communities across Alberta to have the healthiest pregnancies possible. As a researcher, she has published over 100 articles in peer-reviewed journals and given more than 100 media interviews and presentations to community groups, professional organizations, and at conferences. Among her many awards, Dr. Bell received the 2016 Earle Willard McHenry Award for Distinguished Service in Nutrition from the Canadian Nutrition Society. Dr. Bell's most important accomplishments come from helping students, researchers, clinicians and policy makers turn research findings into meaningful ways to improve nutrition, health and wellness of women and their families.

**Mathieu Dalvai, PhD (Université Laval)**
***Environmental contaminants and potentially-mediated DOHaD***
**Friday, February 15, 11:00 am**

Mathieu Dalvai conducted undergraduate training in animal and plant physiology followed by a masters degree in molecular biology and a second masters in chemistry analysis in France. He then obtained his Ph.D in epigenetics from the Friedriech Miescher Institute for Biomedical Research, Novartis, Basel University in Switzerland. He conducted postdoctoral research in epigenetic cancer and genome editing both in France and in Canada. He is currently Scientific Coordinator at the Department of Animal Sciences, Faculty of Food & Agricultural Sciences at Laval University in Québec City.

Member of the Reproduction, Development and Intergenerational Health Research Centre, his research focuses on the impact of the environment on male reproduction, including his ability to produce normal, healthy offspring. He is particularly interested on whether environmentally-relevant exposures to contaminants modify the sperm epigenome, thereby perturbing the development of his future generations. He and his collaborators are also exploring nutritional strategies to palliate harmful effects of environmental contaminants.

## Isabella Caniggia, MD, PhD (Mount Sinai Hospital)

***Something old, lots new, something borrowed, something blue: Fibronectin and preeclampsia***

**Wednesday, February 13 3:30**

Dr. Isabella Caniggia MD, PhD is a senior investigator at the Lunenfeld-Tanenbaum Research Institute of the Sinai Health System and a Professor of Obstetrics and Gynaecology and Physiology at the University of Toronto. Dr. Caniggia received her MD *cum laude* from the and completed her residency training in Pediatrics at the University of Perugia, Italy. Following her research training at the Hospital for Sick Children, Toronto, Dr. Caniggia obtained her PhD from the University of Parma, Italy. Dr. Caniggia is internationally recognized for her work on molecular mechanisms regulating normal placental development and diseases, including preeclampsia and IUGR. She was the first to discover the importance of proper HIF-1α and TGFβ3 signaling including endoglin, in preeclampsia and to report that abnorMalities in oxygen sensing define early and late onset preeclampsia as distinct pathologies. Her lab was the first to identify a novel splice variant of the pro-apoptotic BOK protein and has addressed the importance of BCL2 family member in regulating cell death, autophagy and mitochondrial dynamics. More recently, she has established the relevance of sphingolipid metabolism in normal and pathological pregnancies. Dr. Caniggia's team is also investigating epigenetic changes in genes involved in oxygen homeostasis in the human placenta and is currently establishing a new murine genetic model of preeclampsia with the future objective of screening small molecule inhibitors for their potential to correct the PE phenoptype. She has received numerous honors and awards including the Ontario Women's Health CIHR/IGR Mid-Career Award, the Castellucci Award from the International Federation of Placental Associations that recognizes outstanding research achievements in human placental development and preeclampsia, and the National Bank Business Excellence Award in Arts, Science and Culture from the Italian Chamber of Commerce of Ontario for her innovative research. Her work is funded by CIHR, NIH and NSERC. She holds four patents related to discovery of diagnostic marker for preeclampsia and IUGR.

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## Denise Harrison, RN, PhD (University of Ottawa and CHEO)

***Neonatal Pain Management—The evidence, the utilization and the knowledge translation strategies***

**Thursday, February 14, 1:30 pm**

Denise Harrison is a full Professor and the Chair in Nursing Care of Children, Youth and their Families at the University of Ottawa and Children's Hospital of Eastern Ontario (CHEO). Her research program "BSweet2Babies" focuses on improving pain management for sick and healthy babies and young children. Her research includes using knowledge generation, synthesis and translation, and includes using and studying innovative ways to move pain treatment knowledge into action. This includes partnering with parents and clinicians to develop brief videos in multiple languages showing how parents can work with clinicians to use recommended pain management strategies during newborn screening and infant vaccination. The effectiveness of the videos are being studied in multiple ways, including the reach, dissemination and effectiveness in improving pain management when posted onto social media sites. Her research partners include parents of babies and children, clinicians, students, researchers throughout Canada, Brazil, China and the USA, social media experts, statisticians and organizations including BFI, BORN Ontario and Canadian Association of Paediatric Health Centres (CAPHC).

**Terrie Inder, MD, (Brigham and Women's Hospital)**
***Insights into the Encephalopathy of Prematurity—Pathways and Consequences***
**Thursday, February 14, 9:00 am**

I am a dual boarded child neurologist and neonatologist who undertakes clinical and translational research into the nature and timing of brain injury and alterations in brain development using magnetic resonance imaging (MRI) techniques. I have undertaken longitudinal studies in three large cohorts of high-risk infants that have been followed up to adolescence to examine the relationship of alterations in brain structure to developmental outcomes. My laboratory aims to undertake clinical investigations of treatments and preventive strategies that may improve outcomes in high risk infants. We also strive to have a means of accurate, early diagnosis of brain injury or altered brain development. I have published over 200 peer-reviewed scientific papers. Alongside this focused research effort, I have acquired leadership skills in neuroscience research and academic activities, including mentorship. I was recruited to Brigham and Women's Hospital in 2013 as chair of the new Department of Pediatric Newborn Medicine.

**K.S. Joseph, MD, PhD (University of British Columbia)**
***Toward a unified perinatal theory: Reconciling the births-based and fetus-at-risk models of perinatal mortality***
**Friday, February 15, 11:00 am**

K.S. Joseph MD, PhD is a Professor in the Departments of Obstetrics and Gynaecology and the School of Population and Public Health, University of British Columbia and the Children's and Women's Hospital and Health Centre of British Columbia, Vancouver, Canada. His work is supported by the BC Children's Hospital Research Institute.

Dr. Joseph received his MBBS and MD (Community Medicine) degrees from Christian Medical College, Vellore, and a PhD in Epidemiology and Biostatistics from McGill University, Montreal, Canada. In 2014, the Society for Pediatric and Perinatal Epidemiologic Research presented Dr. Joseph with the Mentor award and in the same year he received the Greg Alexander Award for Advancing Knowledge sponsored by the US-based Coalition for Excellence in Maternal and Child Health Epidemiology. In 2018, he and his co-authors received the Harold A. Kaminetzky Prize Paper award from Obstetrics and Gynecology, the official publication of the American College of Obstetricians and Gynecologists, on factors underlying the temporal increase in maternal mortality in the United States (Obstet Gynecol 2017;129:91-100).

**Clifford Librach, MD, FRCS(C), FACOG(REI) (CReATe Fertility Centre)**
***ART and Clinical Outcomes***
**Friday, February 15, 9:00 am**

Dr Clifford Librach completed his Medical School and Obstetrics and Gynecology Residency training at the University of Toronto, followed by fellowship subspecialty training in Reproductive Endocrinology and

Infertility (REI) at the University of California, San Francisco. Dr. Librach is the founder and Director of the CReATe Fertility Centre in Toronto. He is a Professor in the Department of Obstetrics and Gynecology at the University of Toronto. Dr Librach has made significant contributions to current fertility practice in Canada and Internationally. He has served on provincial and national committees for the development of standards for the practice of REI in Canada. Dr Librach is the current president of the Canadian Fertility and Andrology Society (CFAS).

Dr. Librach is a leader in the field of reproductive biology research. Some of his major basic science contributions include identifying the role of HLA-G in pregnancy and preeclampsia, uncovering important factors indicative of embryo quality, developing new methodologies in preimplantation embryo genetics, improving andrology diagnostic testing, and he has carried out pioneering research on the use of a novel multipotent progenitor cell from umbilical cord perivascular tissue for regenerative therapy in both reproductive and non-reproductive applications. From a clinical research standpoint, Dr. Librach has been a pioneer in the development and reporting of the Canadian Reproductive Technologies Registry (CARTR) and has helped guide the development of the Ontario BORN ART database. This database provides a unique link between all aspects of IVF treatments and pregnancy outcome, and his research involving this database has helped him uncover interesting correlations between IVF laboratory procedures and maternal and neonatal outcomes. He is also studying psychosocial aspects and pregnancy outcomes related to third party reproduction (surrogacy and gamete donation). Dr. Librach has been an invited speaker at greater than 40 international and national meetings.

**Amanda Lipinski, Program Director, (Indigenous Diabetes Health Circle)**
***Seven Generations, Gestational Diabetes Prevention with a Focus on Cultural Practices***
**Wednesday, February 13, 1:30 pm**

Amanda is Métis and grew up in Thunder Bay, ON. She made the move to Southern Ontario to complete her degree in Social Anthropology at York University and has since had the honour of working within different Indigenous communities throughout Ontario and New Brunswick with a focus on holistic wellness. Amanda joined the Indigenous Diabetes Health Circle team as a Diabetes Prevention Coordinator for the Toronto region in February 2009 and has since transitioned into the position of Program Director at the IDHC head office in Niagara. Amanda is a mother of one and strives to maintain a healthy lifestyle in order to be a positive role model for her son and the communities she serves.

**Alexandra Marseu, MD (McMaster University)**
***Trainee Debate: Maternity Care Providers Have An Obligation to Lower Canada's Cesarean Delivery Rate (Against the motion)***
**Wednesday, February 13, 3:30 pm**

Alexandra Marseu is currently in her first year of the Maternal Fetal Medicine Fellowship at McMaster University. She completed her undergraduate degree at the University of Toronto in Biology, and subsequently completed medical school and OB/GYN residency at McMaster University.

**Giulia Muraca, PhD (Karolinska Institutet, University of British Columbia)**

***Trainee Debate: Maternity Care Providers Have An Obligation to Lower Canada's Cesarean Delivery Rate (Against the motion)***

**Wednesday, February 13, 3:30 pm**

Dr. Giulia Muraca received her B.Sc. (Hons.) in Biological Anthropology and African Studies from the University of Toronto and her M.P.H. and Ph.D. degrees from the School of Population and Public Health at the University of British Columbia. Currently, she is a postdoctoral fellow in the Clinical Epidemiology Unity at the Karolinska Insitutet in Stockholm, Sweden. Dr. Muraca was funded by a Pacific Century Graduate Scholarship throughout her Master's degree and was awarded a Vanier Canada Graduate Scholarship to support her doctoral work in perinatal epidemiology. She has received Outstanding Achievement and Best Presentation awards during her PhD, which was aimed at evaluating the perinatal and maternal safety of strategies to reduce the rate of cesarean delivery. Her postdoctoral research is funded by a Canadian Institutes of Health Research Fellowship and builds on her previous work regarding optimal rates of intrapartum intervention in industrialized settings.

**Gina Muckle, PhD (Université Laval)**

***Environmental contaminants and Inuit child development: 25 years of interdisciplinary research***

**Wednesday, February 13, 9:00 am**

After postdoctoral fellowships in developmental psychology and in environmental health, Dr. Muckle was professor at the Department of Social and Preventive Medicine at UL for five years before being hired at the School of Psychology in 2003. Her area of specialization, developmental and behavioral teratology, integrates concepts from child development, toxicology and epidemiology. Her research focus on developmental effects of pre- and postnatal exposure to environmental contaminants such as pesticides and heavy metals. This work brought her to work with highly exposed populations like the Inuit of northern Canada. Her work based on a cohort of Inuit children followed from pregnancy to adolescence helped shed light on the developmental effects of mercury, lead and PCB exposure. Dr. Muckle is also co-principal investigator of the Canadian MIREC mother-child cohort providing data on effects of low exposure to environmental chemicals. Results of her work and are used by Canada to support the signing of the Minamata Convention on mercury. She has received research grants from CIHR, FRQS, NIH, Indian Affairs and Northern Development and Health Canada. She has been a member one CIHR Institute advisory committee and the Canadian Government Chemicals Management Plan Challenge Advisory Panel.

**Anne-Monique Nuyt, MD, (CHU Sainte-Justine)**

***Cardiopulmonary Health in Adults Born Very Preterm***

**Thursday, February 13, 3:30 pm**

Anne Monique Nuyt is a senior clinician-scientist at CHU Ste-Justine, Université de Montréal. Dr. Nuyt's research team studies mechanisms of developmental programming of hypertension and cardiovascular

dysfunction in children and adults who were born preterm. Her translational research program spans from experimental animal work, to clinical as well as epidemiological studies. With Dr. Thuy Mai Luu, she leads the HAPI (Health of Adults born Preterm Investigation) cohort study. She is currently Professor of Pediatrics, Head of the Division of Neonatology and Head of the Center of Excellence in Neonatology at CHU Sainte-Justine, as well as vice-chair of IHDCYH Institute Advisory Board. Her research is mainly funded by the Canadian Institutes of Health Research and the Heart and Stroke Foundation of Canada. Dr Nuyt was awarded number of prices for her work and is actively involved in scientific societies in perinatal as well as adult cardiovascular research.

**Tessa Roseboom, PhD (University of Amsterdam)**

***Hyperemesis gravidarum—how little we know about etiology, treatment and long-term consequences for mother and offspring***

**Thursday, February 14, 3:15 pm**

Tessa Roseboom is a Professor of Early Development and Health at the Academic Medical Centre in Amsterdam, the Netherlands. Her work focuses on the impact of the early life environment on growth, development and health throughout life. Her studies in the Dutch famine birth cohort provided the first direct evidence in humans that maternal nutrition during gestation affected offspring´s and potentially grand-offspring's health (www.hongerwinter.nl). Her current research focuses on the fundamental biological processes that underlie 'developmental programming' and on translation to current pregnancies, in developed and developing settings. These studies include observational and experimental studies of the long-term consequences of lifestyle interventions before and during pregnancy (www.womb-project.eu), obstetric interventions, hyperemesis gravidarum, and assisted reproduction techniques. The ultimate aim of her work is to contribute to improved human health by giving each child the best possible start in life.

**Bryan Richardson, MD (Western University)**

***Pregnancy conditions, size at birth and cord oxygen values: Implications for regulatory mechanisms***

**Friday, February 15, 11:00 am**

Health Program of the Children's Health Research Institute in London, Ontario. He received his MD and training in Obstetrics and Gynecology from Western University and training in Maternal-Fetal Medicine and Perinatal Physiology from the University Oregon Health Sciences Center. He is a member of numerous professional societies including the Society for Reproductive Investigation and the Perinatal Research Society where he served on the Executive Council and as President. He has been an Editorial Board Member for the journals Early Human Development and Reproductive Sciences, Committee Member for the MRC/CIHR Clinical Investigation and March of Dimes Review Panels, and member of the inaugural CIHR Advisory Board for the Institute of Human Development, Child and Youth Health. He has had longstanding support from the MRC/CIHR, initially as an MRC Fellow and subsequently a Scholar, and with continuous grant funding for over 25 years. He was additionally the first WYETH AYERST Canada/CIHR Clinical Research Chair in Perinatology, and subsequently a Canada Research Chair in Fetal and Neonatal Health. He has been invited to give over 140 scientific presentations nationally and internationally, and has published 152 peer review papers and 21 book chapters/symposia. He is currently investigating the impact

of maternal undernourishment leading to fetal growth restriction with chronic hypoxia on later development focusing on the brain.

## Bernard Robaire, PhD (Dept. of Pharmacology & Therapeutics, McGill University)

***Consequences to progeny of paternal drug and environmental exposures***

**Wednesday, February 13, 1:30 pm**

Bernard Robaire received his B.A from UCLA and his Ph.D. from McGill University. After a postdoctoral fellowship at Johns Hopkins University, he returned to McGill to take up a joint appointment in the Departments of Pharmacology & Therapeutics and of Obstetrics & Gynaecology where he has remained and is currently a James McGill Professor. Dr. Robaire's research interests focus on aging of the male reproductive system, male-mediated reproductive toxicology, mechanisms of androgen actions, and the structure, function, and regulation of the epididymis. This research activity has resulted in over 200 journal articles, 70 book chapters, and editing/co-editing of 10 books. He conceived and has been co-Editor of both editions of the Handbook of Andrology. He has mentored many graduate students (30 PhDs, 10 MSc) and over 20 Postdoctoral Fellows, most of whom have gone on to have successful careers in academia, industry and government. His team's work has been funded by the CIHR/MRC continuously since he opened his lab as well as by the NIH, March of Dimes, FRQNT, FRQS, and the private sector. He has served on peer review committees for numerous agencies including NIH, CIHR, CAAT, FRQNT, FRQS and has been an active member of the Advisory Board of CIHR's IHDCYH. Honors awarded to Dr. Robaire during his career include the Award for Excellence in Reproduction from the Canadian Fertility and Andrology Society (CFAS) and the Distinguished Academic Award of the CAUT. He received both of the highest recognitions from the American Society of Andrology (ASA): the Distinguished Service Award and the Distinguished Andrologist Award. Over the last few years, he was awarded the R. Howard Webster Foundation Award in Reproductive Medicine, the Prix du Mentor Scientifique (CRCQ), the Prix Guy Rochon (FQPPU), the Gabriel Plaa Award of Distinction of the Canadian Society of Toxicology, and in 2013 he was elected as a Fellow of the Royal Society of Canada. He has served as President of ASA, CFAS, ACFAS, MAUT and is currently Chair of the North American Testis Workshop and the International Epididymis Symposium. He has served as both Associate Editor and then Editor-in-Chief of *Biology of Reproduction*, and is currently Consulting Editor for this Journal and Associate Editor of *Andrology*.

## Robert Tanguay, MD (Caleo Health)

***Pot, Pills and Pain: Opioids, cannabis and their DOHaD implications***

**Wednesday, February 13, 1:30 pm**

Dr. Tanguay completed his B.Sc. (Hons.) in Neuroscience at the University of Lethbridge in Alberta and attended medical school at the University of Calgary where he continued on to complete his residency in Psychiatry. Dr. Tanguay completed fellowships in Addictions Medicine with the department of psychiatry, certified with the International Society for Addiction's Medicine (ISAM), and Pain Medicine with the department of anesthesia. He is currently the Medical Lead of the Transitional Pain Program at Caleo Health and he has helped initiate the first publicly funded Opioid Taper Program for Chronic Non-Cancer Pain at

the Opioid Dependency Program in Calgary. He is an authority in opioid prescribing, the effects of opioids on functioning, opioid tapering in chronic non-cancer pain (CNCP), opioid addiction, and medical marijuana. Dr. Tanguay has been invited to be a keynote, plenary, and panel speaker at national and international conferences, as well as for local events, and is a Clinical Lecturer at the University of Calgary, Cumming School of Medicine, for the Department of Psychiatry.

**Pia Watermark, MD (McGill University)**
***Repairing the brain of asphyxiated newborns***
**Thursday, February 14, 1:30 pm**

Dr. Pia Wintermark founded the NeoBrainLab in 2010. The NeoBrainLab (www.neobrainlab.org) is devoted to the understanding of the causes and consequences of brain and eyes damages in sick babies. The laboratory uses both clinical research and basic science techniques to understand mechanisms underlying these brain and eyes damages. The main goals of the lab are to develop innovative strategies to prevent or repair these brain and eyes damages, and thus to improve the future of these babies. Before joining the Montreal Children's Hospital in July 2010, Dr. Pia Wintermark trained at the Children's Hospital Boston (Harvard Medical School) in Boston, USA, and at the Lausanne University Hospital (University of Lausanne) in Lausanne, Switzerland.

## Banquet Speaker

**Joe Schwarcz, PhD, Director (McGill Office for Science and Society)**
***Chemistry of Love***
**Thursday, February 14, 8:30pm**

Dr. Joe Schwarcz is well known for his informative and entertaining public lectures on topics ranging from the chemistry of love to the science of aging. Dr. Joe has received numerous awards for teaching chemistry and for interpreting science for the public and is the only non-American ever to win the American Chemical Society's prestigious Grady-Stack Award for demystifying chemistry. He hosts "The Dr. Joe Show" on Montreal's CJAD and has appeared hundreds of times on The Discovery Channel, CTV, CBC, TV Ontario and Global Television.

He is also an amateur conjurer and often spices up his presentations with a little magic. Dr. Joe also writes a newspaper column entitled "The Right Chemistry" and has authored a number of books including best-sellers, *Radar, Hula Hoops and Playful Pigs*, The Genie in the Bottle, The Right Chemistry, An Apple a Day, Is That a Fact?, and *Monkeys, Myths, and Molecules*. Dr. Joe was awarded the 2010 Montreal Medal, the Canadian Chemical Institute's premier prize recognizing lifetime contributions to chemistry in Canada. In 2015 he was named winner of the Balles Prize for critical thinking by the US based Committee for Skeptical Inquiry in recognition of his 2014 book, *Is That A Fact?*

# Workshops

## Workshop Session 1 (WS1) Wednesday, February 13: 7:30 – 8:30 am

### WS1a: Indigenous-led Development of Interventions to Support Healthy Life Trajectories

Room: Outardes
**Convenors:** Tracey Galloway (University of Toronto), Pablo Nepomnaschy (Simon Fraser University)
**Presenters:** Leona Star, Stephanie Sinclair, Rhonda Campbell, Wanda Philips-Beck (Nanaandawewigamig), Jamie Cidro (University of Winnipeg), Sherry Copenace, Jon McGavock (University of Manitoba), Richard Oster (University of Alberta), Mandy Commonda (Kitigan Zibi Anishinabeg)

Objectives: Presenters will briefly describe the context of prenatal care and birthing services in the regions they serve, highlighting where possible creative, culturally-grounded approaches to improving the perinatal and early child service landscape for Indigenous families. At the end of this session, the participant will better understand innovative, community-led projects improving birth experiences and outcomes for Indigenous families.

**Supported by: CNPRM2019**

### (WS1b) Controversies in Neonatal Pulmonary Hypertension

Room: Kamichat
**Convenor:** Robert Jankov (Children's Hospital of Eastern Ontario)
**Presenters:** Patrick McNamara and Regan Giesinger (University of Iowa)

Objectives: At the end of this session, the participant will be able to:
1. Learn the scope of physiologic derangement in neonates with acute Pulmonary Hypertension
2. Understand how comprehensive hemodynamic appraisal, using Targeted Neonatal Echocardiography, may provide additional physiology insights which may enhance clinical decision making.

**Supported by: Mallinckrodt**

### (WS1c) The Advantages of Rodent Model for Examining Human Placental Function

Room: Joseph
**Convenor:** Dan Hardy (Western University)
**Presenters:** David Natale (UC San Diego) Girard Sylvie (Université de Montréal) and Stephen Renaud (Western University)

Objectives: At the end of this session, the participant will be able to:
1. To review the advantages and disadvantages of the rodent to model the human placenta in normal and disease states.
2. To highlight the latest genetic animal lines in understanding mammalian placental physiology.
3. To identify innovative techniques and state-of the-art imaging to help researchers investigate the role of the placenta in pregnancy and long-term postnatal outcomes.

**Supported by: Tew Fund (Department of Obstetrics and Gynaecology, Western University)**

## Workshop Session 2 (WS2) Wednesday, February 13: 11:50 – 1:00 pm

### WS2a: DESIGN THINKING: An Innovative Approach to Knowledge Translation

Room: Sasseville
**Convenor:** Janice Bailey (Université Laval)
**Presenter:** Krystle van Hoof (Institute of Gender and Health, CIHR)

Objectives: At the end of this session, the participant will be able to:
1. Understand how design thinking can be used as a novel approach to knowledge translation
2. Identify opportunities to apply design thinking methods to improve knowledge translation in the area of perinatal research
3. Gain hands-on experience applying design thinking methodology to complex problems.

**Supported by: CNPRM2019**

### (WS2b) Canadian policy frameworks for improving perinatal and early childhood nutrition for Indigenous families

Room: Kamichat
**Convenor:** Tracey Galloway (University of Toronto)
**Presenter:** Daniel Sellen
Objectives: At the end of this session, the participant will have received the most recent updates from Indigenous Services Canada and Public Health Agency of Canada on directions for perinatal and early childhood care strategies.

**Supported by: The Lawson Foundation**

### (WS2c) Neonatal Abstinence Syndrome Data Harmonization

Room: Joseph
**Convenor:** Thierry Lacaze (University of Calgary/Alberta Children's Hospital Research Institute)
**Presenters:** Flora Shan and Lauren Kelly (University of Manitoba)

Objectives: This workshop will focus on the need to harmonize data collection and discuss creating a multi-provincial Neonatal Abstinence Syndrome (NAS) database. Specific objectives include:
1. Define the problem of outcome selection in clinical trials and in NAS
2. Present systematic review of literature on outcome selection and measurement in NAS
3. Share the methods and resulting core outcome set
4. Introduce next steps including maternal and neonatal common data elements to build registry compatible with the USA
5. Gage interest in development of a national NAS database (What are the challenges? What is the cost?)
6. Discuss proposed common data elements and measurement tools

**Supported by: The Dr. Paul H.T. Thorlakson Foundation Fund**

## Workshop Session 3 (WS3) Thursday, February 14: 7:45 – 8:45 am

### (WS3a) Advanced Methods in Perinatal Epidemiology: Causal Inference

Room: Joseph
**Convenors:** Maggie Brown (Dalhousie University), Dr. Amélie Boutin (University of British Columbia)
**Presenter:** Robert Platt (McGill University)

Objectives: At the end of this session, the participant will be able to:
1. List the introductory concepts with regard to causal inference.
2. Identify why epidemiologic modelling benefits from the formulation of a causal question as a directed acyclic graph.
3. Describe the conceptual issues underling confounders, modifiers, mediators, direct and indirect effect, and collider stratification bias.
4. Discuss in simple terms how marginal structural models and g-estimation aids causal inference.

### (WS3b) Family QI Bootcamp: practical approaches to improve the parent experience

Room: Sasseville
**Convenor:** Anne-Monique Nuyt (Université de Montréal)
**Presenters:** Annie Janvier (Université de Montréal) and Fabiana Bacchini. (Canadian Premature Babies Foundation)
Objectives: During this interactive workshop, a veteran resource parent and a neonatologist-researcher (also mother of a preterm infant) will discuss, exchange and reflect on how to improve parent well-being in the NICU. Easy strategies will be presented, as well as more complex initiatives. The pros and cons of recent changes in the NICU environment - such as single-patient rooms- and their impacts on families will be explored; as well as solutions to decrease potential negative impacts.

**Supported by: CNPRM2019**

### (WS3c) Surfactant administration: Review of current practices and the future

Room: Outardes
**Convenor:** Thierry Lacaze (University of Calgary/Alberta Children's Hospital Research Institute)
**Presenters:** Rangasamy Ramanathan (Children's Hospital, Los Angeles and USC Medical Center, Keck School of Medicine of USC, Los Angeles, CA, USA) and Georg Schmoelzer (University of Alberta)

Objectives: At the end of this session, the participants will be able to:
1. Describe the techniques for less invasive surfactant administration (LISA)
2. Compare outcomes with Intubation, Surfactant and Extubation (INSURE) technique
3. Review the most recent results from Systematic Review and meta-analysis, comparing LISA versus INSURE technique
4. Have hands-on experience with LISA technique using Preemie manikin and administration catheters/feeding tubes

**Supported by: Methapharm**

## Workshop Session 4 (WS4) Thursday, February 14: 12:00 – 1:00 pm

### (WS4a) Perinatal Imaging: Advances and challenges

Room: Sasseville
**Convenor:** Michael Seed (Hospital for Sick Children)
**Presenters:** Chris MacGowan and Michael Seed (Hospital for Sick Children)
Objectives: At the end of this session, the participant will be able to explain:

1. Challenges associated with fetal MRI
2. Role of MRI for assessing fetal development and cardiovascular health
3. Recent MRI innovations for studying prenatal and postnatal physiology
4. Appropriate animal models, novel therapies and future outlooks

### (WS4b) Career Advice Across Sectors for Young Scientists and Clinicians

Room: Soutana III
**Convenor:** Jocelynn Cook, SOGC (Moderator) and Doug Swanson Kids Brain Health Network (Co-convener)
**Panel Discussants:** Dr. Terrie Inder (Harvard, Brigham and Women's Hospital) - Clinical Research Careers. Dr. Garth Smith (Ontario Brain Institute, Director for Industry Relations) - Health Research/Industry Opportunities. Amanda MacFarlane (Health Canada, Micronutrient Research Section Head) - Careers in Government.

Objectives: Through this workshop we will explore advice and opportunities for academic and "academic-adjacent" career path choices as next steps in your training and careers. Following the workshop there will be a "Ask and Expert" breakout table session. The learning objectives are:

1. Employment opportunities for young researchers within Academia, Industry, Government, and Community Organizations;
2. Advice on building training/achievement portfolios for success;
3. Hiring insights, advice for those seeking first jobs in your sector;
4. Insights into life-work balance choices and opportunities.

**Supported by: Kids Brain Health Network**

# 2018 Award Winners

## Poster Award

### CIHR Winners – Free Registration +$100

- **Chioma Odozor:** 11cuo@queensu.ca (Graeme Smith, gns@queensu.ca)
  P5 - Menadione increases endogenous carbon monoxide production in pregnant mice.

- **Shelby Oke:** soke2@uwo.ca (Daniel Hardy, Daniel.Hardy@schulich.uwo.ca)
  P43 – Postnatal catch-up growth in low protein IUGR offspring leads to increased expression of hepatic microRNA-140: mechanism of premature senescence?

### CNPRM Winners – Free Registration

- **Bethany Radford:** bradfor@uwo.ca (Victor Han, Victor.Han@lhsc.on.ca)
  P160 - Tissue-specific Adaptations Associated with an Altered Adult Metabolism in a Mouse Model of Intrauterine Growth Restriction (IUGR)

- **Janet Poplawski:** janet.poplawski@uleth.ca (Tony Montina, tony.montina@uleth.ca)
  P164 - PERINATAL SHIPMENT STRESS PERMANENTLY PROGRAMS BRAIN METABOLISM AND LEADS TO INCREASED ANXIETY-LIKE BEHAVIOUR IN MICE

- **Deliwe Ngwezi:** ngwezi@ualberta.ca (Lisa Hornberger, Lisa.Hornberger@albertahealthservices.ca)
  P86 - Exploring the Effect of Developmental Toxicants Exposure and Socio-Economic Status on Congenital Heart Disease in Urban and Rural Alberta

- **Jenna Treissman:** jtreissman@bcchr.ca (Alexander Beristain, alexander.beristain@ubc.ca)
  P85 - Effects of oxygen tension on first trimester invasive trophoblast biology using placental explant models

- **Logan Barr:** 12lcb1@queensu.ca (Graeme Smith, gns@queensu.ca)
  P7 - Examining the Microvasculature Following a Pregnancy Complicated by Preeclampsia

## Oral Presentation Award

### CIHR Winners – Registration + $100

- **Daniela Urrego:** OR26 - Cyclooxygenase inhibitors for treating preterm labour? A review of the scientific evidence

- **Sebastian Srugo:** OR51 - The impact of maternal malnutrition on gut barrier defence. Implications for pregnancy health and fetal development?

### CNPRM Winners – $200

- **Hui Jue Zhang:** huijue.zhang@sinaihealthsystem.ca (Greg Ryan, greg.ryan@sinaihealthsystem.ca)
  OR30 - The outcomes of prenatally diagnosed hemoglobin Barts disease with or without intra

uterine transfusion in Ontario, Canada

- **Erin Hetherington:** elhether@ucalgary.ca (Sheila McDonald, sheilaw.mcdonald@albertahealthservices.ca)
  OR6 - Social support and maternal mental health at 4 months and 1 year postpartum: analysis from the All Our Families cohort

### CNPRM Winners – $100

- **Rebecca Menzies:** rebecca.menzies@utoronto.ca (PI Unknown)
  OR 27 - Risk of preterm birth in a singleton pregnancy following prior preterm twin birth: a cohort study

### CNPRM Winners – $50

- **Stephanie Kereliuk:** umkereli@myumanitoba.ca (Vern Dolinsky)
  OR46 - Gestational diabetes alters mitochondrial bioenergetics in early-life and impairs cardiac function in the rat offspring

- **Scally Chu:** scally.chu@phsa.ca (Sylvie Langlois, SLanglois@cw.bc.ca)
  OR32 - Impact of publicly-funded non-invasive prenatal testing on the utilization of invasive diagnostic testing in British Columbia

## CNPRM 2019 Awards

CNPRM 2019, in conjunction with CIHR-IHDCYH, is pleased to offer a number of trainee Oral and Poster awards.

**A total of six awards for oral presentations will be offered.**

There will be two CIHR-IHDCYH Trainee Oral Awards given to the top two oral presentations from trainee presentations made during the Plenary and Thematic sessions over the course of the meeting. These awards are valued at $200 in cash plus registration to CNPRM 2020. In addition, there will be four CNPRM Trainee Oral Awards given to the next four best oral presentations from trainee presentations made during the Plenary and Thematic sessions over the course of the meeting. These awards are valued at $100.

**A total of fourteen awards for Poster presentations will be made.**

There will be two CIHR-IHDCYH Trainee Poster Awards given to the top two poster presentations from trainee presentations made in the poster sessions over the course of the meeting. These awards are valued at $200 in cash plus registration to CNPRM 2020. In addition, the best poster in each of the Thematic groups will be awarded a CNPRM Trainee Poster award. These awards are valued at $100.

A big thank you to all our judges that will help us award these prizes to the top ranked oral and poster trainee presentations.

# Scientific Oral Abstract Listings

## Plenary Oral 01

### THE PREVALENCE OF DIABETES IN PREGNANCY AMONG INDIGENOUS WOMEN: A SYSTEMATIC REVIEW

**Britt Voaklander**[1,2], **Stewart Rowe**[2,3], **Omolara Sanni**[2,3], **Sandra Campbell**[2,4], **Dean Eurich**[1,2], **Maria Ospina**[1,2,3]
[1]School of Public Health, [2]University of Alberta, [3]Faculty of Medicine, [4]Health Sciences Library

**Introduction:**
Diabetes in pregnancy, including both pre-existing diabetes and gestational diabetes mellitus (GDM), is a maternal morbidity that is associated with poor maternal and perinatal outcomes. Low-risk populations report a prevalence of 2%, but among Indigenous women, the prevalence ranges from 3.1% to 12.8%. This systematic review compared the prevalence of both pre-existing and gestational diabetes mellitus (GDM) between Indigenous women and their non-Indigenous counterparts.

**Methods:**
A protocol was published on *Prospero: International Prospective Register of Systematic Reviews* prior to the beginning of the systematic review. Comprehensive searches were conducted by an information specialist and supplemented by grey literature searches. Observational studies assessing the prevalence of diabetes (pre-existing and GDM) among Indigenous women compared to non-Indigenous women in Canada, Australia, the USA and New Zealand were included in the review. Two independent reviewers assessed study eligibility and evaluated the risk of bias of included studies. Pooled unadjusted odds ratios (OR) were calculated in a random effects model meta-analysis.

**Results:**
Of the 1,292 citations identified, 25 unique studies met the inclusion criteria. The majority of studies used a cohort design (n=20) and most studies had an 'unclear' risk of bias. A meta-analysis of Canadian cohort studies for the association between Indigeneity and GDM showed a significantly higher prevalence among Indigenous women (OR 1.72; 95% confidence interval [CI]: 1.22, 2.43) versus non-Indigenous women. This association was also present in Australia (OR 1.36; 95%CI: 1.02, 1.80), and the USA (OR 1.44; 95%CI: 1.19, 1.75), however there was high heterogeneity across studies (Canada $I^2$:99%, Australia $I^2$:98%, USA $I^2$:97%).

**Conclusions:**
There is evidence in the existing literature demonstrates that GDM is associated with being Indigenous in Canada, Australia, and the USA. These findings have important implications for the planning of prenatal care services and monitoring among Indigenous women living in industrialized countries.

## Plenary Oral 02

### NOTABLE OUTCOMES IN TWIN NEONATES BY PLANNED MODE OF DELIVERY: A SECONDARY ANALYSIS OF THE TWIN BIRTH STUDY

**Saja Anabusi**[1,2,3], **Jon Barrett**[1,3], **Elizabeth Asztalos**[1,3], **Arthur Zaltz**[1,3], **Nir Melamed**[1,3], **Elad Mei-Dan**[1,2,3]
[1]Sunnybrook Health Sciences Centre, [2]North York General Hospital, [3]University of Toronto

**Introduction:**
The Twin Birth Study (TBS) documented no differences in neonatal deaths and serious neonatal morbidity between planned vaginal delivery (VD) and planned cesarean section (CS) in twin pregnancies. We aimed to compare notable but less severe neonatal adverse events between planned VD and planned CS in twin pregnancy.

**Methods:**
This was a secondary analysis of the TBS. Women with a twin pregnancy at 34+0 to 38+6 weeks of gestation with a cephalic first twin were randomized to planned CS or planned VD. The primary outcome was a composite of neonatal respiratory and neurological morbidities and neonatal care unit admission. Multivariable logistic regression analysis was used to identify factors associated with the primary outcome.

**Results:**
A total of 1304 women were randomly assigned to planned CS and 1326 women to planned VD. The rate of cesarean delivery was 90.1% in the planned CS group and 40.3% in the planned VD group. Demographic and obstetrical characteristics were similar between study groups. There was no significant difference in the primary outcome between the planned CS and planned VD groups (21.10 vs. 21.16%, p=0.99). Stratification by gestational age at delivery, found lower composite outcome at those delivered by planned CS in compare to planned VD at 34-35 weeks gestation (49.4% and 56.1%, respectively; p=0.02). Stratification by actual mode of delivery found no different in the primary outcome between groups, although the respiratory morbidity was higher with those delivered by CS (9.7% and 7.6%, p=0.009). Factors that were independently associated with notable adverse outcomes were birth at 34-37 weeks gestation, being 2nd born twin at CS or exposure to antenatal corticosteroids following by VD

**Conclusions:**
Our results strength the original TBS finding of no benefits with planned CS, as compared with planned VD, in twins between 34+0 weeks and 38+6 weeks of gestation.

| Outcome n (%) | Planned Cesarean Delivery N=2588 | Planned Vaginal Delivery N=2632 | P- value |
|---|---|---|---|
| **Composite outcome** | 546 (21.10%) | 557 (21.16%) | 0.99 |
| **Respiratory morbidity:** | 242 (9.35%) | 230 (8.74%) | 0.44 |
| Need for supplemental oxygen ≥ 4 consecutive hours after the initial resuscitation | 201 (7.77%) | 198 (7.52%) | 0.74 |
| Use of continuous CPAP or high-flow nasal cannula for at least ≥2 consecutive hours | 96 (3.71%) | 99 (3.76%) | 0.92 |
| Assisted ventilation with endotracheal tube, inserted within 72 hour after birth and lasting <24 hour | 10 (0.39%) | 24 (0.91%) | 0.02 |
| **Neurological morbidity:** | 16 (0.62%) | 26 (0.99%) | 0.16 |
| Abnormal level of consciousness (hyperalert drowsy, or lethargic) | 8 (0.31%) | 7 (0.27%) | 0.80 |
| 1 seizure within first 72 hours of birth | 2 (0.08%) | 2 (0.08%) | 1.00 |
| Use of anticonvulsants | 5 (0.19%) | 5 (0.19%) | 1.00 |
| Intraventricular hemorrhage grade 1 and 2 | 4 (0.15%) | 15 (0.57%) | 0.01 |
| **NICU admission morbidity:** | 459 (17.74%) | 468 (17.78%) | 0.96 |
| Admission to an intermediate care unit and length>48 hours | 423 (16.34%) | 418 (15.88%) | 0.64 |
| Admission to an intensive care unit and length >48 hours | 91 (3.52%) | 90 (3.42%) | 0.84 |

## Plenary Oral 03

### NEURODEVELOPMENTAL OUTCOMES AFTER CYSTIC WHITE MATTER INJURY IN VERY PRETERM INFANTS: A TWO DECADES OF EXPERIENCE

**Emily Rogers**[1], **Michael Vincer**[2], **Victoria Allen**[2], **Naeem Khan**[2], **Satvinder Ghotra**[1,2]
[1]Dalhousie University, [2]IWK Health Centre

**Introduction:**
Cystic white matter injury (cWMI), such as cystic periventricular leukomalacia and porencephaly, in a premature brain is known to be highly associated with neurodevelopmental abnorMalities. Previous studies examining the long-term outcomes of cWMI are limited by significant loss to follow-up. Moreover, these studies have an inherent selection bias due to the use of hospital-based data. The objective of this study was to examine neurodevelopmental outcomes after cWMI in a population-based cohort of very preterm infants (VPI) with minimal selection bias and minimal loss to follow-up.

**Methods:**
All VPIs (22 to <31 weeks gestational age) born in the province of Nova Scotia, Canada between January 1993 – December 2013 were included in this retrospective study. Infants with severe congenital malformations, chromosomal abnorMalities and early deaths (before 6 weeks) were excluded. Information on presence or absence of cWMI, as diagnosed by serial cranial ultrasounds, as well as neurodevelopmental outcomes was extracted from the population-based provincial Perinatal Follow-Up Program database. Neurodevelopmental impairment (NDI) was defined as presence of cerebral palsy (CP), mental developmental index (MDI) score <85 as assessed by Bayley-II/III, blindness and/or deafness. NDI was further categorized as mild, moderate or severe.

**Results:**
Cystic WMI was identified in 87 (7%) out of 1184 eligible infants. Long-term outcome data was available in 94.4% patient population (Table 1). Only 2 patients in cWMI group had no outcome information available. Any NDI was present in 85.0% of the cWMI group compared to 21.8% of the non-WMI group (OR: 20.4). All neurodevelopmental morbidities except deafness were more prevalent in cWMI survivors. Moderate-severe NDI was observed in about half of cWMI survivors, with moderate-severe CP in 43%.

**Conclusions:**
In this population-based cohort study with minimal loss to follow-up, almost half of cWMI survivors experienced none or mild NDI. These findings have important implications for counselling families of patients with cWMI.

**Table 1: Death and neurodevelopmental outcomes at 18-36 months of age in WMI vs non-WMI group**

| Outcome | WMI % (n/total) | Non-WMI % (n/total) | Odds Ratio (95% CI) |
|---|---|---|---|
| Death 42 - 364 days⊕ | 5.8 (5/85) | 1.5 (15/1030) | 4.2 (1.2-12.6) |
| Normal outcome⊕ | 15 (12/80) | 78.2 (791/1011) | 0.05 (0.02-0.09) |
| Any NDI⊕ | 85 (68/80) | 21.8 (220/1011) | 20.4 (10.7-41.2) |
| Mild NDI⊕ | 31.3 (25/80) | 13.8 (140/1011) | 2.8 (1.6-4.8) |
| Moderate NDI⊕ | 21.3 (17/80) | 4.5 (45/1011) | 5.8 (2.9-11.0) |
| Severe NDI⊕ | 32.5 (26/80) | 3.5 (35/1011) | 13.4 (7.2-24.7) |
| Cerebral palsy (all level) ⊕ | 81.3 (65/80) | 6.2 (63/1011) | 65.2 (34.1-129) |
| Cerebral palsy level 1⊕ | 36.7 (29/79) | 4.7 (48/1011) | 11.6 (6.5-20.6) |
| Cerebral palsy level 2 to 3⊕ | 24 (19/79) | 1.1 (11/1011) | 28.8 (12.3-69.6) |
| Cerebral palsy level 4 to 5 | 19 (15/79) | (<5/1011) | NA |
| Blindness | 9 (7/78) | (<5/1030) | NA |
| Deafness | (0/78) | 0.9 (9/1030) | NA |
| Mean MDI score⊕ | 78.78±28.10 (76) | 96.47±18.22 (1030) | -17.7 (-22.1 to -13.2) |
| MDI <85⊕ | 51.3 (39/76) | 21.3 (219/1030) | 3.9 (2.4-6.4) |
| MDI <70⊕ | 36.8 (28/76) | 7.4 (76/1030) | 7.3 (4.2-12.7) |
| MDI <55⊕ | 25 (19/76) | 2.9 (30/1030) | 11.1 (5.5-21.7) |

Note: ⊕ indicates p<0.05, CI: confidence intervals, NA : not assessed

## Plenary Oral 04

### DISSECTING THE ROLE OF OXYGEN IN TROPHOBLAST COLUMN OUTGROWTH

**Jenna Treissman**[1,2], **Jennet Baltayeva**[1,2], **Alexander Beristain**[1,2]
[1]BC Children's Hospital Research Institute, [2]University of British Columbia

**Introduction:**
During the first trimester of pregnancy, a shift from relatively low oxygen levels (3-5%) to higher levels (6-8%) occurs. However, the role that changing oxygen concentrations play in early development of the placenta, particularly on trophoblast differentiation into invasive extravillous trophoblasts (EVT), responsible for anchoring the placenta to maternal tissues, is poorly understood. This study aims to characterize how varying levels of oxygen control trophoblast column formation.

**Methods:**
First-trimester placental specimens (N=70), donated by women undergoing elective abortion at the BC Women's Hospital, were used to establish placental explants that model trophoblast columns. The effect of low (1%), physiological (5%) and high (20%) oxygen levels on column outgrowth (length and area) was examined microscopically. These morphometric measurements were then correlated with global gene expression signatures and pathways generated by gene microarray analysis (N=5 explants per oxygen condition).

**Results:**
Grossly, 1% oxygen promoted greater column outgrowth than either 5% or 20% oxygen; outgrowth length and area were not different between 5% and 20% oxygen levels. Gene array analyses (FDR < 0.05) identified 978 differentially expressed genes in 1% vs. 20% and 769 differentially expressed genes in 5% vs. 20% conditions. Comparison of gene signatures between 1% and 5% oxygen did not identify any differentially expressed genes. Anchoring columns cultured in 1% or 5% oxygen showed enrichment of genes involved in hypoxia, hormone and growth factor signaling, and extracellular matrix attachment. By comparison, anchoring columns established at 20% oxygen showed enrichment of genes involved in promotion of the cell cycle.

**Conclusions:**
Our findings suggest that low oxygen promotes outgrowth by stimulating EVT migration and matrix interactions, which higher levels of oxygen promote anchoring column expansion through pro-proliferative mechanisms. Together, these findings provide novel insight into how naturally occurring variation in oxygen conditions in early pregnancy control placenta development.

## Plenary Oral 05

### PATERNAL DIET-INDUCED OBESITY INDUCES PLACENTAL HYPOXIA AND ENDOPLASMIC RETICULUM STRESS AND ALTERS PLACENTAL VASCULARIZATION

**Patrycja Jazwiec**[1], **Brendan Patterson**[1], **Wajiha Gohir**[1], **Tatiane Ribeiro**[1], **Jim Petrik**[2], **Deborah Sloboda**[1]
[1]McMaster University, [2]University of Guelph

**Introduction:**
Paternal obesity reduces sperm quality, increases risk of infertility and miscarriage, and predisposes offspring to metabolic dysfunction. However, few data exist on how paternal obesity impacts placental development. We investigated the effect of paternal diet-induced obesity (pDIO) on placental vascular development and the mediating role of endoplasmic reticulum (ER) stress.

**Methods:**
Male C57BL/6 mice were fed a chow (CON; 17% kcal fat; n=7-9) or high fat diet (HF; 60% kcal fat; n=6-8) for 10 weeks prior to mating with chow-fed C57BL/6 female mice. Placentae were collected on embryonic day (E)14.5 and E18.5. Placental hypoxia (CAIX, HIF1-α), angiogenesis (VEGF, VEGFR2), vessel maturity (α -SMA) and vessel density (CD31) markers were quantified using immunohistochemistry, immunofluorescence and Western blotting. Protein levels of ER stress markers were quantified using Western blotting. Significance was assessed by Student's t-test or 2-way ANOVA with Bonferroni's *post-hoc*.

**Results:**
At mid-gestation (E14.5), pDIO induced placental hypoxia as CAIX immunostaining was increased in HF placentae ($p<0.001$) as well as HIF1-α protein levels in male HF placentae ($p<0.05$). Placental VEGF and VEGFR2 immunostaining was increased at E14.5 in both sexes ($p<0.001$). Vascular α-SMA immunostaining was lower in HF placentae at E14.5 ($p<0.0001$). Protein levels of ER stress chaperone, GRP78, and activator phospho-PERK were also elevated in HF male placentae ($p<0.01$). Activator phospho-IRE1α protein levels were only increased in female HF placentae ($p<0.05$). At term gestation (E18.5), placental hypoxia persisted (increased CAIX, VEGF and VEGFR2 immunostaining) in pDIO-exposed placental tissue ($p<0.01$). CD31 immunostaining was also increased in HF female placentae at E18.5. Protein levels of GRP78 remained higher in HF male placentae ($p<0.05$) but phospho-PERK protein levels were increased only in female HF placentae ($p<0.01$) at E18.5.

**Conclusions:**
Our data suggest that pDIO induced placental hypoxia and altered angiogenesis in a sex- and gestational age- dependent manner. This hypoxia is associated with placental ER stress.

## Plenary Oral 06

### THE EFFECT OF ANTENATAL CORTICOSTEROIDS ON SURVIVAL IN EXTREME PREMATURITY

**Mollie Sivaram**[1], **Julie Nguyen**[1,2], **Noor Ladhani**[1,2], **Jon Barrett**[1,2]
[1]University of Toronto, [2]Sunnybook Health Sciences Centre

**Introduction:**
The decision to administer antenatal corticosteroids (ACS) to women who present with threatened preterm birth prior to 25 weeks remains controversial. Recent studies suggest an improvement in survival with administration of ACS prior to 24 weeks, with marginal improvement in morbidities associated with extreme preterm birth. As such, our primary objective was to evaluate the effect of ACS on survival in extreme prematurity. Our secondary objective was to assess the effect of ACS on morbidities associated with preterm birth including respiratory distress syndrome (RDS), chronic lung disease (CLD), intraventricular hemorrhage (IVH), and necrotizing enterocolitis (NEC).

**Methods:**
A retrospective chart review was conducted on patients who delivered after threatened preterm birth between gestational ages (GA) of 23-25 weeks at a large tertiary academic centre between Jan 1st 2003 and Dec 31st 2017. Multiple gestation pregnancies, terminations, and patients who declined neonatal resuscitation were excluded. Logistic regression was used to assess the effect of ACS treatment on neonatal mortality and morbidity, while controlling for maternal age, GA, and maternal complications.

**Results:**
A total of 435 singleton births met criteria, with 422 (97.0%) mothers receiving at least one dose of ACS and 13 (3.0%) receiving no ACS. Neonatal mortality was significantly lower for infants exposed to at least one dose of

ACS, in both unadjusted (OR=0.168, 95% CI=0.055-0.514) and adjusted analysis (OR=0.225, 95% CI=0.067-0.762). Administration of ACS did not show any significant effect on morbidity, but did show a reduction in IVH (OR=0.599, 95% CI=0.130–2.758) and NEC (OR=0.872, 95% CI=0.147–5.163), and increased odds of CLD (OR=1.272, 95% CI=0.347–4.661) and pneumothorax (OR=1.124, 95% CI=0.113–11.128).

**Conclusions:**
Treatment with ACS for infants born at 23 to 25 weeks gestation was associated with a lower rate of neonatal mortality. No significant effect on morbidity was demonstrated.

Table 3: Outcomes of Infants by ACS Exposure (ADJUSTED)

| | No ACS | ACS | p-value |
|---|---|---|---|
| Neonatal mortality | 7/13 (53.8%) | 69/422 (16.4%) | |
| OR (95% CI)[a] | 0.225 (0.067 - 0.762) | | 0.017 |
| RDS | 13/13 (100%) | 413/422 (97.9%) | |
| OR (95% CI)[a] | NA | | |
| CLD | 5/11 (45.5%) | 229/419 (54.7%) | |
| OR (95% CI)[a] | 1.272 (0.347 – 4.661) | | 0.716 |
| BPD | 0/11 (0%) | 15/418 (3.6%) | |
| OR (95% CI)[a] | NA | | |
| Pneumothorax | 1/11 (9.1%) | 31/417 (7.4%) | |
| OR (95% CI)[a] | 1.124 (0.113 – 11.128) | | 0.920 |
| Seizures | 0/10 (0%) | 28/416 (6.7%) | |
| OR (95% CI)[a] | NA | | |
| Need for Intubation | 13/13 (100%) | 413/422 (97.9%) | |
| OR (95% CI)[a] | NA | | |
| IVH | 7/10 (70%) | 225/417 (54.0%) | |
| OR (95% CI)[a] | 0.599 (0.130 – 2.758) | | 0.511 |
| PVL | 1/10 (10%) | 49/417 (11.8%) | |
| OR (95% CI)[a] | 1.000 (0.110 – 9.064) | | 1.000 |
| NEC | 2/10 (20%) | 62/411 (15.1%) | |
| OR (95% CI)[a] | 0.872 (0.147 – 5.163) | | 0.880 |

[a]Logistic regression used to calculate odds ratio. Adjusted for maternal age, gestational age pre-eclampsia, PPROM, and chorioamnionitis

## Plenary Oral 07

### ASPHYXIATED NEWBORNS DEVELOPING LATER CEREBRAL PALSY HAVE ALREADY IMPAIRED BRAIN GROWTH WITHIN THE FIRST MONTH OF LIFE

**Ghassan Maalouf**, **Fatema Al Amrani**, **Tristan Marcelis**, **Pia Wintermark** (McGill University)

**Introduction:**
After birth, the brain continues to grow and mature. Birth asphyxia is a common neonatal complication, often leading to brain injury and long-term neurodevelopmental impairments. The objective of our study was to compare brain growth during the first month of life between asphyxiated newborns developing or not later cerebral palsy (CP).

**Methods:**
Brain magnetic resonance imaging (MRI) scans up to day 50 of life in asphyxiated newborns treated with hypothermia were reviewed. Each MRI scan included a sagittal T1-weighted (T1W) imaging sequence, as well as a coronal T2-weighted (T2W) imaging sequence and an axial T2W imaging sequence. Nine different brain metrics were measured to study brain growth in these newborns. Presence of CP was assessed around 2 years of age. Brain metrics measurements were compared between newborns developing or not later cerebral palsy according to the timing when the MRIs were performed.

**Results:**
311 scans were available in 165 asphyxiated babies treated with therapeutic hypothermia. 16% (27/165) developed later cerebral palsy. In the first week of life, brain metrics were not different between the groups. In the second week of life, asphyxiated newborns developing later CP presented with significantly reduced cerebellar area ($p = 0.02$) and vermis area ($p = 0.003$), compared to asphyxiated newborns not developing later CP. Beyond the second week of life, they still presented significantly reduced cerebellar area ($p = 0.03$) and vermis area ($p = 0.01$), but also displayed significantly reduced deep grey matter area ($p = 0.005$).

**Conclusions:**
Asphyxiated newborns developing later cerebral palsy presented with impaired growth of deep grey matter area, cerebellar area and vermis area. Monitoring brain growth within the first month of life may thus identify early the newborns at risk to develop cerebral palsy, who would benefit from early intervention.

## Plenary Oral 08

### IMPACT OF PRE-PREGNANCY BMI ON MATERNAL GUT MICROBIOTA OVER THE COURSE OF PREGNANCY

**Katherine Kennedy**, **Caroline Moore**, **Stephanie Atkinson**, **Michael Surette**, **Deborah Sloboda**
McMaster University

**Introduction:**
The gut microbiota are key contributors to host metabolism and may contribute to metabolic adaptations to pregnancy. In this study, we hypothesized that the maternal gut microbiota would differ by pre-pregnancy BMI and shift over the course of pregnancy.

**Methods:**
Stool samples were collected from 42 lean and 20 overweight and obese (OW/OB) women enrolled in the Be Healthy in Pregnancy RCT (NCT01689961) during the 1$^{st}$ (12-17 weeks), 2$^{nd}$ (26-28 weeks), and 3$^{rd}$ trimester (36-38 weeks). Stool consistency was measured by self-reported Bristol Stool Scale (BSS) score. Following 16s rRNA gene sequencing, Amplicon Sequence Variants (ASVs) were generated using the

DADA2 package in R. Taxonomy was assigned by RDP Classifier against Greengenes (2011).

**Results:**
Alpha diversity was similar between lean and OW/OB women, and across timepoints. There was a small effect of maternal OW/OB on overall microbiota community composition (PERMANOVA; $r^2$=2.2%, p=0.013), potentially due to differing dispersions (betadisper; F=10.33, p=0.002), but no effect of gestational timepoint. Stool consistency also impacted community composition (PERMANOVA; $r^2$=11.8%, p=0.001). One ASV, classified as belonging to the genus Clostridium within the family Clostridiaceae, differed significantly between first and third trimester samples (DESeq2; log2 FC = 1.89, adjusted p=0.00036). Across all timepoints, maternal OW/OB was associated with a decreased relative abundance of the highly-heritable Christensenellaceae (DESeq2; log2 FC=1.73, adjusted p=0.012), and Tissierellaceae ASVs belonging to genera Gallicola (log2 FC=4.93, adjusted p=0.008) and 1-68 (log2 FC=2.74, adjusted p=0.012).

**Conclusions:**
In this study, although the relative abundance of taxa previously associated with BMI differ between lean and OW/OB women, the effect of OW/OB on overall microbiota community composition is small. Additionally, we did not find a shift in overall microbiota community composition over the course of pregnancy. Analysis of the impact of maternal diet and gestational weight gain is ongoing.

## Plenary Oral 09

### WHICH INTERVENTIONS HAVE THE POTENTIAL TO ENHANCE PARENTAL SENSITIVITY IN THE NICU? RESULTS FROM A SYSTEMATIC REVIEW & META-ANALYSIS

**Andréane Lavallée**[1,2], **Gwenaëlle De Clifford-Faugère**[1,2], **Marilyn Aita**[1,2,3]
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**Introduction:**
Parental sensitivity is central to the parent-infant relationship and predicts long-term attachment which also influences the child's neurodevelopment. Parents of preterm infants are not less sensitive than parents of term infants but preterm infants may need more sensitive parenting. Objectives of this systematic review are to examine the characteristics of interventions designed to enhance parental sensitivity and the effectiveness on parental sensitivity, parental stress and preterm infant neurodevelopment, compared to standard care.

**Methods:**
Protocol was previously published (Lavallée et al., 2017). Included studies were randomized controlled trials (RCT) of interventions for parents of preterm infants implemented in NICUs with parental sensitivity as a primary outcome. Infant neurodevelopment was considered if measured. Parental stress was added as a secondary outcome retrospectively. Intervention characteristics were qualitatively summarized. A meta-analysis was conducted for the parental sensitivity and parental stress outcome using a random effects model.

**Results:**
Eighteen studies were included in the systematic review. Interventions are often composed of an educational component where parents are taught preterm infant's cues. Parents had a passive role in five interventions and had an active role in 13 interventions. Active parental participation included participation in kangaroo care, stimulation of their infant's senses and participation in their infant's care. The meta-analysis showed that passive interventions have an overall small but significant effect on parental sensitivity. Active interventions show no significant effect on this outcome. Both active and passive interventions also show no significant effect on parental stress. Infant neurodevelopment could not be considered in the meta-analysis because of insufficient data.

**Conclusions:**
This is the first systematic review examining the effectiveness of interventions promoting sensitivity of parents of preterm infants in NICUs. Results of this review will guide clinical practice for the implementation of interventions in NICUs to enhance parental sensitivity and optimize neurodevelopment of preterm infants.

## Plenary Oral 10

### THE CUMULATIVE EFFECT OF EVIDENCE-BASED PRACTICES ON OUTCOMES OF PRETERM INFANTS BORN <29 WEEKS

**Angelo Rizzolo**[1], **Prakesh Shah**[2], **Brigitte Lemyre**[3], **Valérie Bertelle**[4], **Ermelinda Pelausa**[1], **Marie St-Hilaire**[5], **Marc Beltempo**[1]
[1]McGill University, [2]University of Toronto, [3]University of Ottawa, [4]Université de Sherbrooke, [5]University of Montreal

**Introduction:**
Extremely preterm infants born <29 weeks' gestation are at high risk of death or severe neurological injury (SNI; ≥grade 3 intraventricular hemorrhage and/or periventricular leukomalacia). Individual studies of four evidence-based practices (EBPs) have been associated with reductions in death/SNI. The objective of this study is to investigate the cumulative use of four evidence-based practices and their association with death/SNI among preterm infants born <29 weeks.

**Methods:**
Observational study of infants born $23^0$-$28^6$weeks admitted in NICUs participating in the Canadian Neonatal Network 2013-2017. EBPs included: antenatal $MgSO_4$ for neuroprotection ($MgSO_4$), antenatal corticosteroids (ACS), delayed cord clamping ≥30 seconds (DCC) and normothermia on admission (NT). The effect of exposure to one, two, three and all four EBPs on death/SNI was assessed using multivariate logistic regression models adjusted for patient characteristics.

**Results:**
Rate of death/SNI was 26% (966/3788) in the cohort. Rate of exposure to EBPs was: none, 3% (132); one, 16% (606); two, 36% (1362); three, 33% (1267); all, 11% (421). Significantly lower odds of death/SNI were observed with exposure to ACS (adjusted odds ratio [AOR] 0.60, 95% CI 0.50-0.72) and DCC (AOR 0.77, 95% CI 0.61-0.98) but not with $MgSO_4$(AOR 0.87, 95% CI 0.71-1.05) and NT (AOR 0.93, 95% CI 0.55-1.13). Compared to infants exposed to no EBPs (37% [49/132]), odds of death/SNI were lower among infants exposed to two EBPs (25% [346/1362], AOR 0.70, 95% CI 0.66-0.60), three EBPs (22% [281/1267], AOR 0.66, 95% CI 0.49-0.88) and four EBPs (18% [78/421], AOR 0.60, 95% CI 0.41-0.87).

**Conclusions:**
Among infants born <29 weeks' gestation, exposure to higher number of EBPs is associated with decreasing odds of death/SNI. Increasing compliance with implementation of these four EBP should be the goal to improve outcomes.

**Table 1: Association of exposure of evidence-based practices (EBPs) with outcomes**

| Exposure vs. no exposure | Death AOR[a] (95% CI) | SNI AOR[a] (95% CI) | Death/SNI AOR[a] (95% CI) |
|---|---|---|---|
| 1 EBP | 0.96 (0.69-1.33) | 0.83 (0.55-1.24) | 0.94 (0.67-1.31) |
| 2 EBP | 0.65 (0.51-0.84) | 0.64 (0.47-0.87) | 0.70 (0.54-0.90) |
| 3 EBP | 0.62 (0.46-0.83) | 0.63 (0.44-0.89) | 0.66 (0.49-0.88) |
| 4 EBP | 0.49 (0.32-0.76) | 0.62 (0.42-0.91) | 0.60 (0.41-0.87) |

[a]Odds ratios adjusted for GA, SGA, mode of delivery, sex, multiple pregnancy, SNAP>20

## Plenary Oral 11

### IMPROVING OUR UNDERSTANDING OF CERVICAL PHYSIOLOGY DURING PREGNANCY: COMBINATION OF MRI, HISTOCHEMICAL, AND BIOCHEMICAL ANALYSES REVEAL SPECIFIC STRUCTURAL CHANGES IN THE MURINE CERVICAL STROMA DURING TERM AND PRETERM LABOR

**Antara Chatterjee**[1,2], **Lindsay Cahill**[3], **Kartik Jhaveri**[2,4], **John Sled**[2,3], **Wendy Whittle**[2,5], **Stephen Lye**[1,2], **Oksana Shynlova**[1,2]
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**Introduction:**
About 10% of pregnancies are complicated by preterm birth (PTB). We hypothesize that combining magnetic resonance imaging (MRI) with histochemical and biochemical analyses of the murine cervix will detect structural changes that occur before term labor (TL) and preterm labor (PTL) - improving detection of PTB.

**Methods:**
Cervixes were collected from non-pregnant mice and across gestational days (GD) 15-19.5 and during TL. Mifepristone (RU486) or lipopolysaccharide (LPS) were injected into mice on GD15 and sacrificed during PTL (n=4-8/group). For image analysis, two regions of interest (ROI) were selected in the mouse cervix: the upper (endocervix), and the lower part (ectocervix). Diffusion tensor imaging (DTI) was applied to assess orientation of fibers in the murine cervix. Changes in cellular and extracellular components across gestation were visualized by histology. RT-qPCR evaluated gene expression of extracellular markers. One-way ANOVA and t-tests were used for statistical analyses.

**Results:**
DTI and histology analysis reveals the presence of an outer longitudinal muscular layer, a middle circular muscular layer, and an inner longitudinal collagenous layer in the murine endocervical stroma. We found that the muscular content of pregnant murine endocervix is significantly higher compared to the ectocervix ($p<0.05$), providing a sphincter-like function; hyaluronic acid content increases and collagen type 1 fibers decrease as gestation advances. In the laboring cervix, gene expression of collagen biosynthesis (*Col1*, *Col3* and *Adamts14*) were downregulated, while matrix biodegradation (*Mmp8* and *Timp1)* was upregulated ($p<0.05$).

**Conclusions:**
Combining MRI, histochemical, and biochemical analyses of the murine cervix show that a loss of structural integrity occurs at the region of the endocervix in preparation for labor, enhancing our understanding of cervical physiology during pregnancy. Based on this animal study we speculate that MRI could be used as a screening tool to detect similar changes in the endocervix of pregnant women at risk for PTB.

## Plenary Oral 12

### EFFECT OF E-THERAPY ON MATERNAL MENTAL HEALTH AND ITS ASSOCIATION WITH CHILD DEVELOPMENT: FINDINGS FROM THE INTEGRATED MATERNAL PSYCHOSOCIAL ASSESSMENT TO CARE TRIAL (IMPACT) STUDY

**Kashif Mughal**[1], **Muhammad Arshad**[1], **Abdul Wajid**[1], **Sander Van Zanten**[2], **Marie-Paule Austin**[3], **Anne Biringer**[4], **Sarah McDonald**[5], **Katherine Bright**[1], **Mireille Lecharrois**[1], **Karly Jarema**[1], **Dawn Kingston**[1]
[1]University of Calgary, [2]University of Alberta, [3]University of New South Wales, [4]University of Toronto, [5]McMaster University

**Introduction:**
Approximately 17% of children experience developmental problems at school entry. Risk factors for

these delays include biological, socio-demographic, and psychosocial risk factors. One in four women experience depression and/or anxiety from conception to one year postpartum. While studies show that improved maternal health can prevent child delays, very little research has explored the impact of prenatal mental health intervention on child development. Objective: The study examined the impact of integrated e-screening, e-referral, and e-therapy on maternal anxiety and its association with the risk of child global delays.

**Methods:**
Data were drawn from 1033 mother-child dyads (control = 577; intervention = 456) participating in a randomized controlled trial study in Canada. Maternal anxiety was assessed using Spielberg State Anxiety Inventory (STAI) during pregnancy, at 7 weeks post-intervention, and 3 months postpartum. Child development was measured using The Ages and Stages Questionnaires (ASQ) at 3 months.

**Results:**
Majority of the participants were Caucasian (79%), 25 years or older (93%), and had family incomes ≥$100,000 (57%). We found no significant differences ($p > .05$) on socio-demographic characteristics or baseline mental health measures in control and intervention groups. 13% of children were at risk of delayed on two or more ASQ domains at age 3 months. In the control group, 18% of mothers had clinical anxiety (STAI ≥40) at 3 months postpartum compared to 14% of women in the intervention group. Mothers experiencing clinical anxiety had 21% of children with risk of delays in the control group compared to 14% of children with risk of delays in the intervention group.

**Conclusions:**
The preliminary study findings indicate a protective trend of integrated e-screening, e-referral, and e-therapy in mitigating the risk of child delays and provide evidence the need to undertake routine mental health screening and interventions for women, to improve both maternal and child outcomes.

## Plenary Oral 13

### THE ROLE OF MICRORNA-122 IN PREGESTATIONAL DIABETES-INDUCED CONGENITAL HEART DEFECTS

**Anish Engineer**, **Sharon Lu**, **Qingping Feng**
Western University

**Introduction:**
Congenital heart defects (CHDs) are the leading cause of infant death. Pregestational maternal diabetes increases the risk for CHDs by over five times. Diabetic pregnancy may alter maternal/fetal microRNAs leading to CHDs. Using microarray analysis, miR-122 was upregulated in embryonic hearts from diabetic mice. miR-122 acts as a tumor suppressor, needed for liver development. miR-122 in heart development has not been explored.

**Methods:**
Embryonic hearts from control mice were collected at E10.5 and E12.5 to assess proliferation, apoptosis, gene expression and migration, *ex-vivo*. Explants were transfected with miR-122 or anti-miR-122 and grown in normal glucose or high glucose conditions for four days. Diabetes was induced by streptozotocin (75 mg/kg, IPx3) to female mice, which were then injected with anti-miR-122 or scrambled control (10 mg/kg, SCx2), to examine heart morphology and function of offspring at E18.5.

**Results:**
Both premature and mature miR-122 transcripts were upregulated over two-fold in embryonic hearts from diabetic dams. Transfection of miR-122 to E10.5 heart explants grown in normal glucose inhibited cell proliferation and

increased apoptosis, to the same level as high glucose. In contrast, miR-122 antagonism promoted proliferation and decreased apoptosis back to normal under high glucose. Migratory capacity of developing heart was inhibited in high glucose or with the presence of miR-122. Whereas, anti-miR-122 returned migration under high glucose to normal. The same trend was seen for gene targets of miR-122, critical for cell cycle progression, angiogenesis, and heart development, such as Cyclin D1, Snail1, Gata4 and Hand2. Finally, antagonism of miR-122 in diabetic dams resulted in offspring with significantly less CHDs (23.1%) compared to scramble control treatment (56.5%).

**Conclusions:**
This is the first study to reveal the role of miR-122 in cardiac development. The insights into mechanisms behind maternal diabetes-induced CHDs can be used to design possible therapeutics to combat congenital malformations.

## Plenary Oral 14

### THE INFLUENCE OF MATERNAL MALNUTRITION ON FOLATE AND INOSITOL PRODUCTION AND TRANSPORT IN THE GUT - A MECHANISM FOR FETAL GROWTH RESTRICTION AND FETAL DISORDERS?

**Elia Palladino**[1], **Tim Van Mieghem**[2], **Kristin Connor**[1]
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**Introduction:**
Maternal malnutrition is associated with reduced serum folate levels, even if the diet is sufficient in folate. Low folate in turn can increase the risk of fetal growth restriction and neural tube defects. The mechanisms through which malnutrition leads to folate insufficiency are not fully understood. We hypothesised that malnutrition alters the maternal gut microbiome (which produces folate through lactobacilli and bifidobacteria) and gut folate/inositol transport.

**Methods:**
Mice (n=7-8/group) were fed a control diet (CON), undernourished (UN, by 30% of control intake from day (d)5.5-18.5 of pregnancy) *or* fed a 60% high fat diet (HF from 8 weeks before and throughout pregnancy). At d18.5, maternal small intestine (SI) expression of folate (*FRa/b*, *Pcft*, *Rfc1*) and inositol (*TonEBP*, *Smit2*) transporters were measured (qPCR). Relative abundance of lactobacilli in maternal caecal contents was quantified (G3 PhyloChip™). Groups were compared by ANOVA (Tukey's or Games-Howell *post hoc*). Correlations between total relative abundance of lactobacilli and SI folate/inositol mRNA expression were determined (Pearson). Significance=$p<0.05$.

**Results:**
*Pcft* mRNA expression was higher in SI of HF mothers compared to UN but not CON. *Rfc-1* mRNA expression was higher in HF SI compared to CON and UN. *Smit2* mRNA expression was reduced in HF SI compared to UN but not CON. Total relative abundance levels of three lactobacilli, previously found to be different between HF and control diets, was higher in HF than UN. There was a positive association between *Pcft* expression and total relative abundance of lactobacilli.

**Conclusions:**
Maternal malnutrition alters abundance of gut lactobacilli, some of which may be important for folate production, and expression of key folate and inositol transporters, even when the mother's diet is folate sufficient. The maternal gut microbiome and its interactions with gut folate transport may play a critical role in micronutrient delivery during early development and the onset of fetal disorders.

## Plenary Oral 15

### THE EFFECTS OF A FOLATE DEFICIENCY ON THE SPERM EPIGENOME AND THE IMPLICATIONS ON EMBRYO DEVELOPMENT

**Ariane Lismer**[1], **Christine Lafleur**[1], **Vanessa Dumeaux**[2], **Sarah Kimmins**[1]
[1]McGill University, [2]Concordia University

**Introduction:**
A father's environmental exposure to toxicants and poor diet influence disease transmission across generations, potentially through epigenetic inheritance (Lambrot et al., 2015 & Li et al., 2017 & Carone et al., 2010). The consequences of environmental stressors on the sperm epigenome and the paternal contributions towards embryonic development need to be elucidated.

**Methods:**
To investigate if a paternal folate deficiency altered the sperm epigenome, we fed wildtype (WT) C57BL/6 males a folate sufficient (FS, 2.0 mg/kg) or folate deficient (FD, 0.3 mg/kg) diet beginning at weaning for two full spermatogenic cycles. In order to determine whether there can be cumulative damages to the sperm epigenome and on offspring health, we also fed a FS or FD diet to a transgenic (TG) mouse model overexpressing the lysine-specific histone demethylase KDM1A in sperm. The WT and TG male mice fed either a FS or FD diet were then bred to WT C57BL/6 females on a regular diet. Pregnancy losses and a quantitative skeletal analysis were assessed on embryonic day E18.5 (7 – 10 litters per experimental group, 2 fetuses randomly selected per litter). We performed ChIP-sequencing for H3K4me3 on the sperm of the adult sires (n = 5 males per group) followed by analysis using the Bioconductor package csaw to quantitate for differential histone enrichment across treatment groups (Lun et al., 2016).

**Results:**
Paternal folate deficiency in WT and TG males was associated with an increase number of pre-implantation losses. Skeletal analysis at embryonic day E18.5 revealed a significant increase in severe abnorMalities in the offspring sired by FD TG. In addition, sires on the FD diet have altered H3K4me3 enrichment in their sperm at critical developmental regions.

**Conclusions:**
This work will contribute to the broader understanding of how paternal lifestyles can influence embryonic development and offspring health.

## Thematic Oral 01

### IMPACT OF FETAL SURGERY ON PROGRESSION OF VENTRICULOMEGALY IN FETUSES WITH SPINA BIFIDA

**Alyaa AlRefai**[1], **Abhaya V.Kulkarni**[1], **Susan Blaser**[1], **Dafna Sussman**[2], **James Drake**[1], **Jose Carvalho**[1], **Greg Ryan**[1], **Nimrah Abbasi**[1], **Tim Van Mieghem**[1]
[1]University of Toronto, [2]Ryerson University

**Introduction:**
Fetal spina bifida is associated with progressive hydrocephalus, leading to postnatal ventriculoperitoneal shunting. The aim of this study was to document the evolution of the size of the fetal lateral ventricles throughout pregnancy in fetuses with spina bifida and to assess whether fetal surgery had a measurable impact on ventricular size.Fetal spina bifida is associated with progressive hydrocephalus, leading to postnatal ventriculoperitoneal shunting. The aim of this study was to document the evolution of the size of

the fetal lateral ventricles throughout pregnancy in fetuses with spina bifida and to assess whether fetal surgery had a measurable impact on ventricular size.

**Methods:**
Retrospective analysis of all cases of fetal spina bifida assessed at the Fetal Medicine Unit at Mount Sinai Hospital, Toronto, between 2008 and 2018 who had longitudinal follow-up during pregnancy. The lateral width of the posterior horn of the lateral ventricle was recorded over the course of pregnancy.

**Results:**
We assessed 72 fetuses. At the time of first presentation, 42 (58.33%) had ventriculomegaly, of which 13 (30.95%) had mild, 15 (35.71%) moderate and 14 (33.33%) severe ventriculomegaly. Eleven fetuses underwent fetal surgery. In fetuses who did not undergo fetal surgery, the mean increase in ventricular width was 0.57 ±0.68 mm per week gestation, compared to a postoperative increase of 0.21±1.11 mm per week in those that underwent the surgery ($p$=0.14). Two (18%) fetuses who underwent fetal surgery required shunting postnatally. In fetuses who did not require shunting, the rate of ventricular increase was -0.07±0.92 mm (p= 0.008 compared to untreated cohort).

**Conclusions:**
Fetal spina bifida is associated with progressive ventriculomegaly. In fetuses who undergo in-utero closure of the defect there was a trend towards a slower rate of progression of ventriculomegaly, compared to fetuses who underwent postnatal repair.

## Thematic Oral 02

### IL-1 RECEPTOR MODULATORS PREVENT PRETERM BIRTH AND RETINOPATHY AND ARE INDEPENDENT OF NF-KB INHIBITION

**Colin Cheng**[1,2,3], **Azade Geranurimi**[4], **Christiane Quiniou**[2], **Tang Zhu**[2], **Xin Hou**[2], **William Lubell**[4], **Sylvain Chemtob**[1,2,3,4]
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**Introduction:**
Preterm birth (PTB) and retinopathy of prematurity (ROP) are two neonatal complications associated with a dysregulated inflammatory response. Interleukin(IL)-1 is strongly implicated; however, current therapies against IL-1 indiscriminately block all IL-1 signalling pathways causing undesirable immunosuppressive effects. We previously developed an allosteric modulator of the IL-1 receptor (all-D peptide RYTVELA) that was effective in several animal models in an Nf- κB-independent manner. Here we synthesise a panel of RYTVELA lactam derivatives with varying chiralities in residues 3 and 4 and tested them in PTB and ROP models.

**Methods:**
RAW-blue or HEK-blue cells were stimulated with IL-1β after pre-treatment with our derivatives. The QUANTI-blue spectroscopic assay was used to quantify secreted alkaline phosphatase, a reporter gene of Nf- κB activity. Western blots were used to quantify phosphorylation of ROCK2, p38 and Jun kinases (JNK). Derivatives were also tested *in vivo* in a CD-1 mouse model of LPS-induced PTB, and a Sprague Dawley rat model of ROP induced by exposure to 80% oxygen.

**Results:**
All derivatives did not inhibit Nf-kB signaling, but most inhibited ROCK2 phosphorylation. Derivatives with an L-valine were stronger inhibitors of p38 phosphorylation and weaker inhibitors of JNK phosphorylation than those with a D-valine. Notably, D-valine derivatives were stronger inhibitors of PTB. The efficacy of D-valine derivatives *in vivo* PTB did not completely translate into efficacy in ROP. Nonetheless, it was observed that both JNK and ROCK2 inhibition were necessary for ROP prevention, while JNK alone prevented PTB.

**Conclusions:**
Selective modulation of IL-1 signaling, especially JNK and ROCK2 phosphorylation, without affecting Nf-κB is a feasible strategy for preventing PTB and ROP. Our small molecules could offer advantages over existing therapies, such as reduced side effects and easier administration.

## Thematic Oral 03

### ANTENATAL ADMINISTRATION OF A POTENTIAL INTERLEUKIN-6 RECEPTOR ANTAGONIST PREVENTS INFLAMMATION-INDUCED PRETERM BIRTH AND FOETAL TISSUE INJURY.

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**Introduction:**
Preterm birth (PTB) is one of the main causes of neonatal mortality and morbidity. Of all major contributors, inflammation stands out firmly linked to PTB. Current studies showed that neonate morbidity in PTB is linked to increased levels of IL-6 in amniotic fluid, fetal blood and gestational tissues and that IL-6 increases uterine activation proteins leading to PTB. A small peptide, labelled HSJ633, developed by our lab inhibits selectively IL-6-induced STAT3 phosphorylation and LPS-induced PTB in mice. We hypothesize that IL-6 can induce damages to fetal tissues, and that inhibiting IL-6 receptor using our nanopeptide HSJ633 will improve birth outcome and maintain the integrity of the fœtal tissue.

**Methods:**
An established LPS-induced preterm birth model on timed pregnant mice was used to evaluate the degree of inflammation in the utero-placental tissue, as well as fetal lungs and gut. Pregnant mice were injected with LPS (10mg/kg i.p.) at gestational day 16 in presence or absence of HSJ633 (1mg/kg/12h), Tocilizumab (TOC; 10mg/kg/12h), or vehicle. Birth outcome was analysed and integrity of fetal tissues was examined using histological analysis. All experiments were compared with TOC, an anti-IL6R antibody commercially available.

**Results:**
Results showed that LPS shortens gestation, reduces pup weight and diminishes survival of newborns. Concomitant treatment with HSJ633 and to a lesser extent TOC reduced inflammation in reproductive tissues, as well as in fetal lungs and intestines. Immunohistological analysis of HSJ633-FITC revealed that although it may be located in the placenta the peptide did not cross the placental barrier.

**Conclusions:**
HSJ633 antagonized the activity of IL-6R in a LPS-induced PTB model, and improved birth outcome by increasing survival and preserving diminishing fetal organ integrity. The findings highlight the experimental importance of IL-6 and uncover in vivo pharmacologic efficacy of a novel IL-6R modulator. HSJ633 is a promising new therapeutic prototype in prevention of PTB.

## Thematic Oral 04

### OPTIMAL DOSE OF RYTVELA FOR PREVENTION OF INFLAMMATION-INDUCED PRETERM BIRTH AND FETAL TISSUE INJURY.

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**Introduction:**
Preterm birth (PTB) is commonly accompanied with devastating in utero fetal inflammation. Of the candidate proinflammatory mediators, IL-1 appears central. The host lab has recently designed a small IL-1 antagonist, “rytvela”, found effective against PTB. “Rytvela” desirably does not interfere with the NF-kB pathway important for immunosurveillance but blocks the MAPK pathway. The study objective is to evaluate the optimal dose to inhibit efficiently inflammatory cytokines production and to maintain the integrity of fetal tissues.

**Methods:**
A dose-response of “rytvela” efficacy to inhibit PTB was determined in LPS and IL-1b-induced murine preterm model. Pregnant mice were injected with LPS (10mg i.p.) or IL-1b (1mg/kg i.u.) at G16.5 in presence of different doses of “rytvela” or vehicle. PTB was monitored. Gestational tissues (placenta, fetal membrane, uterus, amniotic fluid) were collected in a separate experiment on G17.5. Inflammatory cytokines gene expression and protein production were quantified by PCR and ELISA. A one-way ANOVA with Dunnett multiple comparison was used for statistical analysis.

**Results:**
The minimal dose of 1mg/kg/day of “rytvela” inhibited 75-100% ($p<0.05$) of both LPS and IL-1b-induced PTB. Treatment with “rytvela” reduced inflammation in reproductive tissues. The 0.1mg/kg/12h dose was enough to induce inhibition of IL-6, IL-8 and IL-1b. IL-6 gene expression was decreased in placenta, uterus and fetal membrane. IL-8 gene expression was decreased in uterus. IL-1b and IL-6 protein were reduced in all gestational tissues. IL-8 protein was reduced in uterus, and TNFa in placenta.

**Conclusions:**
A 0.1mg/kg dose of “rytvela” antagonized the activity of IL-1R, and improved birth outcome by reducing inflammatory cytokines production and preserving diminishing fetal organ integrity. The findings uncover *in vivo* pharmacologic effective dose. “Rytvela” is a promising new safe therapeutic prototype in prevention of PTB. More doses will be tested in the laboratory to establish a more complete dose-response profile.

## Thematic Oral 05

### PATTERNS OF SMALL FOR GESTATIONAL AGE AND INDUSTRIAL EMISSIONS IN SPACE AND TIME

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**Introduction:**
Critically ill small for gestational age (ciSGA) newborns are those who are admitted to neonatal intensive care units (NICU) and have a birthweight below the 10th percentile for gestational age and sex according to Canadian normative data. These are life-threatening and costly events requiring further understanding of risk factors. Our objective was to assess spatiotemporal hot spots of ciSGA and industrial chemical emissions, an infrequently studied source of shared exposures.

**Methods:**
Using NICU admission data from the Canadian Neonatal Network (CNN) between 2006 and 2010, we aggregated the mother's residential postal codes for nineteen census metropolitan areas (CMA) into space-time cubes and applied emerging hot spot analyses. Using National Pollutant Release Inventory (NPRI) data and Environment Canada weather station data, we estimated monthly dispersion of air emissions in these areas. We compared the resulting patterns using logistic regression, with covariates for low socioeconomic status, traffic-contributed pollution, and the total number of infants during the study period.

**Results:**
Three-dimensional and time-series maps of small newborns and 161 chemical emissions displayed differing distributions for the 32,836 CNN records of singleton, first admissions having valid postal codes within the nineteen CMAs. Seventy eight industrial chemical hot spots were associated with ciSGA hot spots. The greatest number of positive associations were observed for 28 different pollutants, mostly in Edmonton, Halifax, Montréal, Toronto, Vancouver, and Winnipeg. Twenty one of those chemicals were known or suspected developmental toxicants, such as particulate matter, carbon monoxide, heavy metals, and VOCs.

**Conclusions:**
Hot spot patterns of ciSGA differed among CMAs. Associations with hot spots of industrial chemical emissions were geographically specific and may help explain the space-time trends of ciSGA.

## Thematic Oral 06

### MATERNAL POSTPARTUM DEPRESSION AND CHILD BEHAVIOUR PROBLEMS: THE ROLE OF SOCIO-DEMOGRAPHIC RISK

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**Introduction:**
Maternal mental health problems are common, with 10-30% of women experiencing a significant mental health difficulty during pregnancy or in the postpartum period (WHO, 2008). Maternal postpartum depression has been well documented in the literature as a risk factor for poor child emotional and behavioural development (Van den Bergh, van den Heuval, Lahti, et al., 2017). A current gap in the literature is how maternal cumulative sociodemographic risk factors, such as minority status and education level, can impact the relationship between postpartum depression and child development outcomes. We aimed to fill this gap through the use of a meta-analysis. Aim: To establish the impact of postpartum depression on child emotional and behavioural development and determine maternal risk factors that influence this association.

**Methods:**
A broad search on maternal postpartum stress and child socioemotional outcomes yielded 19,184 study abstracts. Studies with data on postpartum depression, child emotional and behavioural development, and racial minority status of mothers were identified of which 69 full-text articles were reviewed. Thirty-four studies met inclusion criteria, providing effect sizes for approximately 30,000 children. The direct effect of postpartum depression was examined on child behaviour problems and cumulative sociodemographic risk was examined as a moderator, using CMA 3.0.

**Results:**
Mothers with postpartum depression were twice as likely to have children with behavioural problems (both internalizing and externalizing problems) (OR 2.10, 95% CI: 1.71-2.58, $p<0.001$). As the number of sociodemographic risk factors increased (e.g., low education, adolescent parenthood, ethnic minority status) the association between maternal postpartum depression and child behavioural problems strengthened ($p=0.01$). Similar findings emerged when internalizing and externalizing behaviours were examined separately.

**Conclusions:**
Maternal postpartum depression is a risk factor for child behavioural and emotional problems. Mother-child dyads with cumulative sociodemographic risk stand to benefit most from interventions and support to mitigate poor child outcomes.

## Thematic Oral 07

### PATERNAL DIET-INDUCED OBESITY IMPAIRS OFFSPRING METABOLISM IN A SEX-SPECIFIC MANNER

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**Introduction:**
Sperm counts have halved over the past 40 years. These rising rates of infertility may in part be due to the worldwide obesity epidemic. Although epidemiological and animal studies suggest that paternal obesity is associated with compromised metabolism in offspring, the molecular mechanisms underlying this non-genetic inheritance remain elusive. The Kimmins lab previously demonstrated using a genetic model of epigenetic inheritance, that histone methylation in sperm is implicated in transgenerational epigenetic inheritance (Siklenka et al, 2015 *Science*). Using the same genetic model, we aimed to determine whether there can be environment-epigenome interactions in sperm mediated by diet that can impact descendants' metabolism.

**Methods:**
Wildtype, KDM1A transgenic and wildtype littermates (n=13-26) males ($F_0$) were fed for 10-12 weeks a low- or a high-fat diet (10% and 60% kcal fat). The $F_1$ and $F_2$ were generated by breeding $F_0$ males to 6-weeks-old wildtype females fed a chow diet. Metabolic function in the $F_0$-$F_2$ was assessed at 4 months of age by intraperitoneal glucose and insulin tolerance tests, fasting blood glucose and serum insulin levels. RNA was extracted from livers of $F_0$ (n=6) and $F_1$ (n=3) animals followed by RNA-sequencing. $F_0$ sperm (n=5 per group) was used for chromatin immunoprecipitation-sequencing targeting the gene activating mark, histone H3 lysine 4 tri-methylation, to determine if HFD alters the sperm epigenome at the level of this robust epigenetic mark associated with genes implicated in fertility, growth and development.

**Results:**
High-fat fed males became obese and showed signs of metabolic syndrome. Interestingly, there were sex-specific effects of paternal HFD where $F_1$ males showed altered metabolic functions and more severe phenotypes when sired by transgenic fathers. No paternal dietary effects were observed in female $F_1$.

**Conclusions:**
These findings indicate that sires bearing epigenetic defects in sperm can be further influenced by diet impacting offspring metabolic phenotypes.

## Thematic Oral 08

### GEOGRAPHIC INFORMATION ASSESSMENT OF MATERNAL AMBIENT HEALTH HAZARDS AND BABIES BORN TOO SMALL

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**Introduction:**
Small newborns, defined as small for gestational age (SGA: birth weight below 10$^{th}$ centile) or low birth

weight at term (LBWT: birth weight below 2,500 g at 37 or more weeks gestation), have been increasing in Canada since 2000 and are the second leading cause of infant mortality. Recently, associations of SGA and LBWT have been linked to maternal exposure to environmental hazards. Our research objective was to assess which provinces have more associations with industrial air pollutants or land activities.

**Methods:**
We classified SGA and LBWT events from Statistics Canada's Vital Statistics–Birth Database (2006-2012). We calculated spatial proxies of exposures to 228 industrial chemicals released to air and seven land-based hazards and assigned the values to the 6-character postal codes of the maternal residence at birth. We used logistic regression, with covariates on area-level socioeconomic status, traffic, maternal age, migration, sex, urban, total number of births, and season.

**Results:**
Of the 2,525,645 births meeting our criteria (single, live, between 22 to 42 weeks gestation, and having a valid 6-character postal code), 8.55% were SGA and 1.54% were LBWT. Maps of the provincial patterns showed higher adverse birth outcomes where there were more industrial emissions. More provinces had associations with land hazards, especially dumps/waste depots, gas stations, powerlines and transformer stations. Of the 12 identified industrial chemicals, nine are suspected or known developmental toxicants, including ammonia, benzene, carbon monoxide, methyl ethyl ketone, and particulate matter.

**Conclusions:**
Maternal exposures to ambient health hazards and the identified associations with small newborns differed by province, reflecting the multifactorial nature of SGA and LBWT. The large geographical scale and population-level exposure assignment preclude causation, but the use of publicly available data and accessible tools identified associations and facilitated a more holistic environmental health approach in understanding SGA and LBWT risk factors.

## Thematic Oral 09

### MANAGEMENT OF DIABETES AND HYPERTENSION AMONG ZULU TRADITIONAL HEALTH PRACTITIONERS: A STUDY OF FOCUS GROUP INTERVIEWS.

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**Introduction:**
Within the African continent, Traditional Health Practitioners (THPs) are often the first point of care for many people with what can be life threatening conditions such as diabetes and hypertension. The aim of this study was to explore Zulu THPs perspectives about managing diabetes and hypertension.

**Methods:**
5 Focus Group Discussions (FGDs) sessions were held in June 2018. 67 THPs (39 females and 28 males) were purposely selected from the three geo-spatial locations (urban, traditional or tribal and farm areas) in both the uMshwati (UMgungundlovu) and Emnambithi/Ladysmith (uThukela) Districts. A Semi-structured interview guide was used, with the discussion being audio taped and the contents thematically analysed.

**Results:**
The THPs reported that diabetes and hypertension were not curable and could only be managed.

**Conclusions:**
THPs in this study suggested the need for an effective collaboration between THPs and biomedical health professionals (BHPs) to halt the spread of diabetes and hypertension in our societies.

## Thematic Oral 10

### DOHAD IN WILDLIFE: EXPOSURE TO PERSISTENT ORGANIC POLLUTANTS ALTERS THE ADIPOSE TISSUE TRANSCRIPTOME IN MOTHER POLAR BEARS AND HER CUBS FROM SVALBARD, NORWAY.

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**Introduction:**
Persistent organic pollutants (POPs) are of concern in Arctic ecosystems as they are persistent, lipophilic and bioaccumulate. Being on top of the food chain, polar bears (*Ursus maritimus*) are highly contaminated. Females nurse their offspring with contaminated milk – consequently, even young cubs have sometimes higher POPs concentrations than their mothers. Recent studies suggest that POPs may affect lipid metabolism in female polar bears, however, the mechanisms and impact on her offspring remain unknown. HYPOTHESES: (1) Increasing exposure to POPs in polar bear mothers disrupts adipose tissue transcriptomes of adult female polar bears and their offspring. (2) POP-related transcriptomic dysregulation in adipose tissue is sex-specific and differs between male and female polar bear cub pairs.

**Methods:**
Adipose tissue biopsies were collected from adult female polar bears and her cubs in Svalbard, Norway, spring 2011-2013 (PCBs plasma concentration: 10.46 - 248.62 ng/g wet weight). Total RNA extracted from biopsies from adult females (n=13) and cub pairs (♂-♂n=5 I ♂-♀n=4 I ♀-♀n=4) were subjected to next-generation sequencing to assess RNA presence and quantity.

**Results:**
The expression of the top 50 most correlated genes with POPs exposure are altered differently due to low, medium and high exposure in mothers. Several cubs from low exposed mothers had resembling gene expression profiles to medium exposed cubs. Male and female cub pairs responded differently to POPs.

**Conclusions:**
DISCUSSION & PERSPECTIVES: POPs alter the adipose transcriptome of polar bear mothers and cubs, which may be linked to metabolic dysfunction. Male and female cubs demonstrated remarkably different adipose transcriptome profiles. We will elucidate coping mechanisms polar bears utilize to adapt to their changing environment. This is a unique opportunity to observe sex-specific coping between cub pairs. This study will broaden our understanding of POPs and their impact on lipid metabolism and physiology in apex predators and offspring.

## Thematic Oral 11

### PRENATAL EXPOSURE TO ARCTIC POLLUTANTS AND FOLIC ACID SUPPLEMENTATION LEADS TO METABOLIC MODIFICATIONS IN MALE RAT OFFSPRING.

**Pauline Navarro**, **Nadine Leblanc**, **Mathieu Dalvai**, **Maryse Lessard**, **Pauline Herst**, **Phanie Charest**, **Janice Bailey**, **Hélène Jacques (**Laval University)

**Introduction:**
The incidence of type 2 diabetes (T2D) has more than doubled in ten years among Inuit and has been associated with their high blood levels of persistent organic pollutants (POPs). The objective was to examine whether prenatal supplementation with folic acid (FA) in a rat model prenatally exposed to POPs, can improve glucose metabolism in male rat offspring.

**Methods:**
Four treatments were administered to Sprague-Dawley female rats (F0) for nine weeks and stopped after birth of F1 generation: 1) Control + 2mg FA/kg of diet (n = 10), 2) POPs + 2mg FA/kg of diet (n = 10), 3) control + 6mg FA/kg of diet (n = 10), 4) POPs + 6mg FA/kg of diet (n = 10). At six months old, after a 12h fast, F1 males were sacrificed and body composition, hepatic triglycerides (TG) and cholesterol, plasma TG, cholesterol, insulin, C-peptide and blood glucose were measured. ANOVA for 2 x 2 factorial design and Pearson correlations were performed using SAS.

**Results:**
In F1 generation, while no effect was observed on blood glucose, we noted a strong decrease of fasting plasma insulin ($p=0.03$) and C-peptide ($p=0.01$) in offspring of FA supplemented dams compared to those of non-supplemented dams. We observed positive correlations between plasma insulin, C-peptide and body lipid mass ($r=0.39$, $p=0.02$; $r=0.40$, $p=0.02$, respectively), and between plasma C-peptide and plasma TG ($r=0.32$, $p=0.04$). We also noted negative correlations between plasma insulin, C-peptide and body lean mass ($r=-0.42$, $p=0.01$; $r=-0.48$, $p=0.003$, respectively). Hepatic TG ($p=0.03$) and cholesterol ($p=0.02$) were increased in pups of POPs-exposed dams compared to those of non-exposed dams.

**Conclusions:**
In old male rats, prenatal FA supplementation without prenatal POPs exposure improved glucose metabolism related to plasma TG and body composition while prenatal POPs exposure showed a deleterious effect on hepatic TG and cholesterol.

## Thematic Oral 12

### APPLYING A COMMUNITY-ENGAGED APPROACH TO EVALUATE MATERNAL AND PERINATAL HEALTH OUTCOMES AMONG MÉTIS ALBERTANS

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**Introduction:**
Métis people are one of Canada's constitutionally-recognized Indigenous peoples, yet the unique experiences and needs of Métis people are largely underrepresented in mainstream Indigenous health literature. This knowledge gap is particularly wide for Métis-specific maternal and perinatal health outcomes. We will explore the application of community-engaged methodology in a research project among the Métis Nation of Alberta (MNA), and Métis and non-Métis academics, to evaluate the maternal and perinatal health status of Métis Albertans.

**Methods:**
Our research team's application of community-engaged methodology draws on strengths of Métis and Western ways of knowledge, and prioritizes Métis governance and self-determination in the research process, including the design, data collection, analysis, and interpretation of results.

**Results:**
This project combines a retrospective cohort study based on Alberta administrative health data and gatherings of Métis knowledge holders based on conversational methods. While epidemiological data is valuable to inform the maternal and perinatal health status of Métis Albertans, qualitative gatherings explore the "stories behind the numbers" and provide specific knowledge about the influences of colonialism, intergenerational trauma, resilience, cultural healing, and traditions on pregnancy and birthing. The

analytical strategy combines Métis ways of collecting data with Western ways of organizing data for thematic analysis. Transcripts, and preliminary codes and themes, are shared with participants to confirm accuracy, and for additional comments and clarification about the information provided. This approach allows for a decolonized method of interpretation as themes emerge from the perspectives of Métis participants without imposing theories or structures, and ensures the information remains rooted in Métis knowledge and culture.

**Conclusions:**
Incorporation of community-engaged methodology has aided our research team in designing and implementing a research protocol that prioritizes Métis ways of knowledge, while preserving self-determination, decolonization of the research process, and the unaltered "voice" of Métis participants.

## Thematic Oral 13

### IS FOLIC ACID HELPFUL TO FETAL DEVELOPMENT FOLLOWING ANCESTRAL EXPOSURE TO ARCTIC POLLUTANT?

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**Introduction:**
Inuit people have higher adverse pregnancy outcomes and a shorter life expectancy. Because of their traditional diet, Inuit have low folate intake and are highly contaminated by Persistent Organic Pollutants (POPs), known to have negative health effects. We hypothesize that folic acid (FA) supplementation attenuates developmental disorders in fetuses and placentas associated with prenatal paternal exposure to POPs over multiple generations.

**Methods:**
Thirty-two founder female rats (F0) were divided into four treatment groups and gavaged with corn oil or an environmentally-relevant Arctic POPs mixture before mating and until parturition. Their diet contained either a basal level of FA (2 mg/kg), or supplemented level of FA (6 mg/kg), corresponding to periconceptional recommendations for women. Twelve F1 males/treatment group were mated to untreated females to produce F2 rats and so on until F4. Females were sacrificed at gestational day 19.5 for macroscopic and histopathological examination of the fetuses and placentas.

**Results:**
The fetal:placental weight (FW:PW) ratio, indicator of placental efficiency, was reduced by POPs*FA interaction in F1 ($p$=0.0001) and F2 ($p$=0.004). In contrast, the FW:PW was increased by POPs in F3 ($p$=0.03) and by both POPs ($p<0.0001$) and FA ($p=0.0004$) in F4. Placental histology reveals a reduced basal zone area by POPs*FA interaction in F1 ($p=0.04$), whereas it was increased by both POPs ($p=0.02$) and FA ($p=0.05$) in F2. Results suggest inadequate placental efficiency and possible compensatory mechanisms. Surprisingly, FA-supplemented lineages exceeded the expected fetal malformation incidence in F1, F2 and F4 generations.

**Conclusions:**
Prenatal paternal POPs exposure does cause developmental disorders. FA supplementation, however, may not represent an ideal solution to counteract the consequences of POPs. Multigenerational transmission of the paternal environment was apparent and may occur via placental disruption. Achieving our objectives will broaden current understanding of the toxicological impacts of the environment on human health and the developmental origins of disease.

## Thematic Oral 14

### PYRROLOQUINOLINE QUINONE (PQQ) SUPPLEMENTATION DURING PREGNANCY AFFECTS FETAL OUTCOMES IN SPONTANEOUS INTRAUTERINE GROWTH-RESTRICTED (SPIUGR) GUINEA PIGS IN A SEX-SPECIFIC MANNER

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**Introduction:**
Spontaneous intrauterine growth restriction (spIUGR), a severe complication impacting 8% of human pregnancies, is associated with increased oxidative stress in utero and permanent metabolic changes later in life including impaired liver mitochondrial metabolism. Pyrroloquinoline quinone (PQQ), a natural antioxidant, is linked with increased antioxidant defense and mitochondrial proliferation/function. We predicted that supplementing pregnant guinea pigs with PQQ would improve metabolic outcomes for spIUGR fetuses.

**Methods:**
PQQ was administered to dams in drinking water (1.5mg/L; n=7) from mid-gestation until 65d (term ~69d). Control animals (n=9) received no PQQ. Fetuses with brain-to-liver ratio >0.65 and body weight <80g were classified as spIUGR (30% of fetuses), and those outside both thresholds classified as normal intrauterine growth (NG).

**Results:**
There was no difference in litter size or pregnancy loss between PQQ and control groups. Fetal weight and brain-to-liver ratio were negatively correlated, and PQQ-exposed fetuses displayed increased body weight compared to control (p=0.020). Brain, heart, and kidney weights positively correlated with brain-to-liver ratio, while liver weights were negatively correlated. Brain-to-liver ratios were higher in PQQ-exposed female fetuses compared to control (p=0.04), but this effect was not seen in males. Additionally, spIUGR/PQQ females had increased heart weights and decreased kidney and placenta weights compared to spIUGR/control females. Hepatic mitochondrial ADP-stimulated (State 3) respiration rates negatively correlated with brain-to-liver ratio with pyruvate as a substrate, but not succinate, suggesting that Complex I, but not Complex II activity is impaired in spIUGR liver. spIUGR/PQQ fetuses had increased resting (State 4) rates and citrate synthase activity compared to spIUGR/control, suggesting increased respiratory efficiency and mitochondrial content.

**Conclusions:**
Our results demonstrate that PQQ administration during pregnancy is safe (e.g., no differences in litter outcomes), however, several fetal sex-specific effects, including differences in brain-to-liver ratio, body weight, organ size, and liver mitochondrial function, have unknown consequences over life course and warrant further investigation.

## Thematic Oral 15

### FETAL BRAIN EXOSOMES AND MICRORNAS IN UMBILICAL CORD BLOOD AND AMNIOTIC FLUID: PROMISING NON-INVASIVE BIOMARKERS

**Jessica Morin**, **Virginie Gillet**, **Annie Ouellet**, **Larissa Takser (**University of Sherbrooke)

**Introduction:**
Brain is the organ that expresses the most microRNAs, which are intercellular communication tools with an implication in all cellular processes. MicroRNAs have been reported as biomarkers of pathologic antenatal expositions or processes specific the fetus in a few studies. The objective of this study is to isolate fetal microRNAs specific to cerebral cells in umbilical cord blood and amniotic fluid, witch has never been done before.

**Methods:**
This project is a proof of concept technical study. Eight patients were recruited at admission for an elective caesarean section at term in the *Centre Hospitalier Universitaire de Sherbrooke*. Arterial and venous umbilical cord blood and amniotic fluid were collected during the surgery after cord clamping. Detection of fetal cerebral specific protein, contractine-2/TAG1, was used to isolate fetal brain exosomes. Then, brain specific miRNAs from those exosomes were extracted and quantified at the Rnomic platform at University of Sherbrooke: miR-124-3p, hsa-miR-134-5p, miR-219a-1-3p, hsa-miR-9-5p. To confirm fetal origin, four women of reproductive ages were recruited as negative controls.

**Results:**
Presence of fetal brain exosomes, positive for contactin-2/TAG1, was shown by electron microscopy in cord blood and amniotic fluid, with higher proportion in cord blood. Exosomes positive for contactin2/TAG1 were not present in non-pregnant women samples. Brain specific miRNAs were detected and quantified in all fluid samples.

**Conclusions:**
We successfully demonstrated the presence of fetal brain specific exosomes and microRNAs in all fluids analysed except in the non-pregnant women. These results support the fetal origin of the brain exosomes and microRNAs isolated. Interestingly, three of the miRNAs analysed were found in higher quantities in exosomes released in arterial cord blood, witch also support their fetal origin. This innovative study opens the door to many uses of cerebral microRNAs as non-invasive biomarkers. Future researches should allow us to use them to monitor brain development following various antenatal insults.

## Thematic Oral 16

### PLACENTAL INFECTION BY GROUP B STREPTOCOCCUS INDUCES SEX-SPECIFIC MATERNOFETAL INFLAMMATORY RESPONSES

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**Introduction:**
Group B *Streptococcus* (GBS) is isolated in 15% of chorioamnionitis, which is associated with premature birth and brain injuries. Dysregulation of proinflammatory cytokines in maternofetal tissues have been associated with higher risks of having a child with autism. Placental infection by GBS in rats induced a histological chorioamnionitis - characterized by an increased density of polymorphonuclear cells (PMN) in male compared to female placentas - and led to autistic-like behavioural impairments in males. We hypothesized that a sex-specific maternofetal immune activation is responsible for the observed outcomes. We aimed to map out the expression profiles of cytokines and innate immune cells within GBS-infected placentas and comparing this immune profile between male and female tissues.

**Methods:**
Lewis rats were injected intraperitoneally on gestational day 19 with β-hemolytic serotype Ia GBS ($10^8$ CFU) or saline. Caesarean-sections were performed at 48h and 72h post-injection to collect maternofetal tissues (placentas, maternal and fetal blood). PMN-associated chemokines and proinflammatory and anti-inflammatory cytokines were studied by ELISA and immunohistochemistry.

**Results:**
At 72 h, GBS-infected placentas displayed increased titers of interleukin(IL)-1β, tumor necrosis factor(TNF)-α, IL-6 and IL-10 in both sexes, although IL-1β and TNF-α levels were higher in males. At 72 h, placentas associated with males – but not females – presented increased titers of the PMN chemoattractant CINC-1 and S100A9. At 72 h, an increased

concentration of IL-1β and IL-6 was detected in the sera of GBS-exposed male – but not female – fetuses. At 48h and 72 h, increased titers of IL-1β, TNF-α, IL-6, and CINC-1 (CXCL1) were detected in GBS-exposed maternal sera.

**Conclusions:**
The detected sex-specific placental inflammatory responses are interesting considering the higher susceptibility of the male population for preterm birth, brain injuries and ASD. Innovative insights into the mechanistic underpinning the pathophysiology of pathogen-induced placental injuries are needed to develop appropriate novel therapeutic interventions.

## Thematic Oral 17

### IS MATERNAL BLOOD PLASMA HOMOCYSTEINE CONCENTRATION ASSOCIATED WITH THE RISK OF PLACENTA-MEDIATED PREGNANCY COMPLICATIONS? A SYSTEMATIC REVIEW OF PROSPECTIVE STUDIES

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**Introduction:**
Elevated plasma homocysteine, a marker of cardiovascular disease risk, is linked to pregnancy complications involving the utero-placental vasculature; however, between-study heterogeneity limits the interpretability of previous findings. We conducted a systematic review and meta-analysis of the association between maternal homocysteine and placenta-mediated complications (small for gestational age (SGA), preeclampsia, placental abruption, and pregnancy loss). Sources of heterogeneity investigated were probable folate status, study region, study quality, and whether analyses adjusted for changes in homocysteine during pregnancy and for important covariates.

**Methods:**
Databases searched were MEDLINE, Embase and PubMed; supplementary sources included dissertations and theses (until 6 June 2018). To maintain temporality of an association, inclusion criteria were cohort, nested-case control, or case-cohort studies that measured maternal homocysteine concentration using samples obtained from pre-conception to the mid-second trimester of an index pregnancy. Non-English language studies were excluded. Two reviewers independently screened studies and extracted data. Study quality was assessed using the Newcastle-Ottawa Scale.

**Results:**
A total of 29 prospective cohort or nested case-control studies were included. Twenty studies reported effect estimates for elevated homocysteine using different cut-offs. Twenty-four studies reported mean homocysteine concentrations in cases versus controls. A random effects meta-analysis of pooled mean differences revealed significantly higher means for SGA: mean difference (SGA cases versus controls) 0.44 $\mu$mol/L (95% confidence interval (CI) 0.13 to 0.76), with moderate heterogeneity (51%); and for preeclampsia: 0.94 $\mu$mol/L (95% CI 0.55 to 1.32), with high heterogeneity (92%). A trend towards a significant difference was observed for pregnancy loss: 0.36 $\mu$mol/L (95% CI -0.20 to 0.93), with moderate heterogeneity (45%). Significant sources of heterogeneity were study region (SGA and preeclampsia), probable folate status (preeclampsia—significant mean difference in low- to mid-folate subgroups), and adjusting for covariates (preeclampsia).

**Conclusions:**
Our study suggests that a slightly higher homocysteine concentration is associated with increased risk of SGA and preeclampsia in certain subgroups.

## Thematic Oral 18

### THE IMPACT OF MATERNAL DEPRESSIVE SYMPTOM TRAJECTORIES ON CHILD BEHAVIOURAL OUTCOMES

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**Introduction:**
10-15% of young children are estimated to have behavioural problems. Perinatal depression is a known risk factor for poor child behavioural development; however, only assessing maternal depression pre-or-postnatally and child behaviour at one time point limits the existing literature. This study aimed to: 1) identify distinct trajectories of maternal depressive symptoms from pregnancy to 11 years postpartum; and 2) compare child behavioural outcomes per trajectory at 6, 9, and 11 years postpartum.

**Methods:**
The sample data (N=9341) was derived from the Avon Longitudinal Study of Parents and Children, a UK-based longitudinal birth cohort study. Maternal depressive symptoms and child behavioural outcomes were assessed using the Edinburgh Postnatal Depression Scale and Strengths and Difficulties Questionnaire respectively. Latent growth mixture modelling was conducted to identify trajectories of maternal depressive symptoms. Latent growth analysis was used to assess the association between maternal depressive symptom trajectories and child behavioural outcomes, while controlling for potential covariates.

**Results:**
We found four distinct trajectories: persistently low (78.5%); persistently high (8.7%); increasing (7.3%); and decreasing (5.5%) depressive symptoms. The sociodemographic characteristics of our sample were not evenly distributed amongst all classes; on average, women with higher depressive symptoms were younger, less educated, and had no partner, no previous pregnancies, children with low birth weights, and premature children. Compared to mothers with persistently low depressive symptoms, mothers with persistently high, increasing, and decreasing symptoms had children with 1.50-1.62, 1.31-1.40, and 1.28-1.36 times more behavioural problems at all time points respectively, after controlling for potential covariates.

**Conclusions:**
From pregnancy to 11 years postpartum, mothers experienced persistently low, persistently high, increasing, or decreasing depressive symptoms. We found that increased maternal depressive symptoms over time had significant negative impacts on child behavioural development, which suggests that the chronicity and severity, rather than timing, of maternal depressive symptoms best predicts child behavioural outcomes in school-aged children.

## Thematic Oral 19

### ASPHYXIATED NEONATES TREATED WITH HYPOTHERMIA: BIRTH PLACE MATTERS

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**Introduction:**
Neonatal encephalopathy (NE) secondary to birth asphyxia remains an important cause of neurodevelopmental deficits in childhood. Many perinatal factors have been shown to influence the outcome

of these neonates. However, it remains unclear whether the hospital where the neonate was born can also influence outcome. The objective of our study was to assess whether the hospitals' levels of care influences the outcome of asphyxiated neonates treated with hypothermia.

**Methods:**
Retrospective population study of asphyxiated neonates born between 2010-2014 and treated with hypothermia. Our main outcomes included death, brain injury and finally severity of brain injury. Comparisons of outcomes were performed according to hospitals' levels of care.

**Results:**
The incidence of neonates requiring hypothermia treatment was 0.11% (126/114627) among level-1 units, 0.10% (84/84890) among level-2 units, and 0.08% (57/71093) among level-3 units.General characteristics (weight, gestational age, gender, Apgar score and cord pH) were not different between the neonates from the different units; only the pH within the first hour of life was significantly different ($p<0.001$) by level of care, with lower pH's in neonates born in levels 1 and 2 compared to level 3. The incidence of adverse outcome (death and/or brain injury) was significantly different according to hospitals' levels of care: 0.06% (71/114627) among level-1 units vs. 0.05% (43/84847) among level-2 units vs. 0.03% (24/71069) among level-3 units ($p<0.05$). There was no statistical correlation between hospitals' levels of care and severity of brain injury ($p=0.5$).

**Conclusions:**
Newborns born in level-1 units had worst pH within the first hour of life and higher incidence of adverse outcome, compared to newborns born in level-2 and level-3 units. Further work is needed to understand variations between hospitals.

## Thematic Oral 20

### CAN WE PREDICT NEONATAL READMISSION WITHIN 7 DAYS OF DISCHARGE USING ADMINISTRATIVE DATABASES?

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**Introduction:**
Approximately 3% of Canadian newborns are readmitted to hospitals within 28 days. Due to increasingly short lengths-of-stay for childbirth, some of these readmissions may be potentially preventable. This study aimed to develop a risk prediction model for 7-day neonatal readmission (where most readmissions occur due to jaundice) in healthy newborns to assist health care providers with discharge planning.

**Methods:**
All liveborn term singleton infants born vaginally without congenital anoMalies and who were not admitted to the NICU (2012-2015) were identified using Alberta's perinatal and hospitalization databases (n=84,961). A split-sample design was used: model derivation data (Apr. 2012-Jun. 2014; n=63,378) and model validation data (Jul. 2014-Mar. 2015; n=7,477). A multivariable logistic regression model using backwards stepwise selection ($p<0.10$) were used to predict readmission within 7 days of discharge. Predictors of interest included maternal age, parity, infant sex, gestational age at delivery, 1-minute Apgar score, birthweight, urban/rural residence, and initial neonatal length of stay. Hosmer-Lemeshow goodness-of-fit tests and c-statistics were used to measure calibration and discrimination.

**Results:**
2,080 (3.3%; 95% CI:3.1-3.4%) infants were readmitted into hospital within 7 days of discharge. Significant

predictors of readmission included maternal age, gestational age at delivery, parity, 1-minute Apgar score, infant sex, and urban/rural residence. In the derivation data, the Hosmer-Lemeshow goodness-of-fit test was not statistically significant (p=0.203) and the c-statistics was 0.680. This was similar in the validation data (Hosmer-Lemeshow: p=0.898; c-statistic=0.675). However, a subset of infants with a high predicted probability of readmission >15% were able to be identified.

**Conclusions:**
The model to predict for 7-day neonatal readmission using administrative databases had sub-optimal discrimination; however, a high risk group of infants that may potentially benefit from earlier and/or more frequent physician visits once discharged were able to be identified. Ultimately, additional information (e.g., clinical, laboratory, education/knowledge factors) is needed to improve prediction of neonatal readmission.

## Thematic Oral 21

### PERINATAL AND SURGICAL DETERMINANTS OF POST-OPERATIVE PICU MORBIDITY IN NEWBORNS WITH CONGENITAL HEART DISEASE

**Kim Anh La**, **Rachel Richard**, **Bohdana Marandyuk**, **Béatrice Desnous**, **Marien Lenoir**, **Kenza Ibrir**, **Elizabeth Zhang**, **Nancy Poirier**, **Ala Birca**, **Geneviève Du Pont-Thibodeau**
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**Introduction:**
Each year, close to 1% of children are born with congenital heart disease (CHD), making it one of the leading causes of death in newborns. Advances in surgical techniques have significantly improved the survival rates of children undergoing CHD surgery. However, several of these patients will develop complications during their stay in the pediatric intensive care unit (PICU). The objective of our study is to evaluate perinatal and surgical determinants of PICU morbidity in CHD patients.

**Methods:**
This is a retrospective descriptive cohort study of 78 children that underwent CHD surgery including cardiopulmonary bypass (CPB) before 48 weeks of post-menstrual age. Clinical variables were collected from an electronic database. PICU risk for morbidity on admission was defined following three scores of severity, that are the Pediatric Risk of Mortality (PRISM) III score, the Pediatric Logistic Organ Dysfunction (PELOD) 2 score and the Multiple Organ Dysfunction score (MODS). Correlations between predictor variables and mortality scores, PICU and hospitalization length of stay were demonstrated using the Spearman rank correlation coefficient. A p-value of $<0.05$ was considered significant.

**Results:**
Patients included were operated between February 2013 and June 2018. Mean age at surgery was 11±7 days. Higher surgical complexity Risk Adjustment for Congenital Heart Surgery (RACHS) scores were associated with higher PRISM III scores (p=0.01), PELOD 2 scores (p=0.016) and a longer PICU ($p<0.001$) and hospitalization stay (p=0.005). Age at surgery had a negative correlation with the MODS scores (p=0.001). CPB duration was associated with a prolongation in PICU ($p<0.001$) and hospitalization (p=0.007) length of stay, as well as higher PRISM III scores (p=0.01).

**Conclusions:**
In CHD newborns requiring cardiac repairs, major perinatal and surgical determinants of PICU morbidity are RACHS scores, age at surgery and CPB duration. Additional studies are needed to evaluate the impact of PICU severity scores on patients' long-term neurodevelopment.

## Thematic Oral 22

### IMPACT OF RESPIRATORY RATE AND TIDAL VOLUME ON LUNG INFLAMMATION DURING TOTAL LIQUID VENTILATION.

**Michaël Sage**, **Wendy See**, **Christophe Morin**, **Benoit Chabot**, **Philippe Micheau**, **Jean-Paul Praud**, **Étienne Fortin-Pellerin**
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**Introduction:**
Total liquid ventilation (TLV), where lungs are filled with a perfluorochemical, has shown promising results in animal models of respiratory distress. However, optimal ventilatory parameters are unknown and need to be evaluated before TLV can be used in humans. Our objective was to compare the impact of TLV using a low respiratory rate (RR) (high initial tidal volume) or high RR (low tidal volume) on lung development, inflammation and surfactant synthesis gene expression.

**Methods:**
Five newborn lambs were used as control (no ventilation). Sixteen healthy newborn lambs were intubated, anesthetized and placed under conventional mechanical ventilation (CMV) before randomization to either TLV-1 (RR 10/min, vt 10ml/kg) or TLV-2 (RR 5/min, vt 20ml/kg). Tidal volumes were adjusted to maintain normal blood gases. After 4h of TLV, lambs were weaned to CMV prior to extubation, using a standardized protocol. Lambs were euthanized 4h after this weaning and lung samples were taken for PCR analysis. A Venn diagram is used to compare genes with significant change in expression ($p<0.05$) compared to controls.

**Results:**
21 out of 46 genes have a significant change in their level of expression compared to control. In both groups, 9 genes associated with lung development were upregulated, including EGR1 and HIF-1alpha. PDGF and VEGF were downregulated. Pro-inflammatory genes GM-CSF, IL-1a, IL-1b and IL-6 were only upregulated in the TLV-1 group, while CCL4 was upregulated in the TLV-2 group. Surfactant proteins (B,C) were upregulated in both groups.

**Conclusions:**
Our results suggest that a lower respiratory rate approach, and thus the use of higher tidal volumes, limits lung inflammatory response. These surprising results will require confirmation but could be explained by the higher minute-ventilation in the TLV-1 group to maintain acceptable $CO_2$ levels. Finally, the impacts of TLV on lung development and surfactant protein genes measured were similar in both groups.

## Thematic Oral 23

### LOCALIZATION AND NITROSYLATION OF ADENYLYL CYCLASE IMPAIRS ARTERIAL RELAXATION IN HYPOXIC PPHN

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**Introduction:**
Persistent pulmonary hypertension of the newborn (PPHN) features hypoxemia, pulmonary vasoconstriction and impaired cardiac inotropy. Vasodilator prostacyclin (IP) receptors coupled to G-alpha-s and adenylyl cyclase (AC) usually localize in sarcolemmal caveolar lipid rafts. AC isoforms 6 and 7 are upregulated by

hypoxia; AC6 is considered cardioprotective. However we have reported inhibited AC enzyme activity due to protein nitrosylation in PPHN pulmonary artery, and in pulmonary artery myocytes exposed to hypoxia.

**Methods:**
PPHN was induced in newborn swine by normobaric hypoxia ($FiO_2$ 0.10) for 72hr, versus age-matched normoxic controls. We studied relaxation of pulmonary arterial (PA) rings to AC activator forskolin by isometric myography; AC content, isoform expression and catalytic activity in presence or absence of forskolin and/or trans-nitrosylating agent s-nitrosocysteine, in neonatal porcine PASMC, and HEK293T stably expressing AC6, after 72hr hypoxia (10% $O_2$) or normoxia (21% $O_2$). Localization of vasodilator receptor complexes was determined by caveolar fractionation using centrifugation in a sucrose gradient.

**Results:**
PA myocytes from PPHN swine exhibited decreased AC activity despite exposure to normoxia in culture; transient hypoxia *in vitro* further decreased AC activity. AC isoforms 6 and 7 expression and protein content increased in hypoxia. Hypoxia did not alter abundance of IP receptor, G-alpha-s or total AC in caveolin-1 associated lipid rafts; however both AC6 and AC7 were found in lipid rafts only after 72hr exposure to hypoxia. AC6 activity decreased in hypoxia, and was dose-dependently decreased by nitrosylation. Control and PPHN PA treated with s-nitrosocysteine had markedly impaired AC-mediated relaxation.

**Conclusions:**
AC6 and AC7 are upregulated and selectively recruited to caveolae to form signaling complexes with G-alpha-s coupled IP receptors in hypoxic PPHN, but are amenable to cysteine nitrosylation in hypoxia, and thereby inhibition of enzyme activity. This results in impaired PA relaxation in PPHN.

## Thematic Oral 25

### BREAST MILK CONTENT IN MICRORNAS AND ASSOCIATION WITH GESTATIONAL DIABETES MELLITUS

**Camille Dugas**[1,2,3,4], **John Weisnagel**[3], **André Tchernof**[1,2], **Julie Perron**[2], **Isabelle Marc**[3], **Anne-Sophie Morisset**[1,2,3], **Julie Robitaille**[1,2,3], **Bertrand Kaeffer**[4]
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**Introduction:**
MicroRNAs (miR) are regulator of genes expression that are present in breast milk and ingested by the breastfed infant. Given that children exposed to gestational diabetes mellitus (GDM) *in utero* are at high-risk of obesity and type 2 diabetes (T2D), the aim of this study was to compare levels of miR related to obesity or T2D in breast milk of women with (GDM+) and without (GDM-) previous GDM. The second objective was to assess the association between maternal pre-pregnancy body mass index (BMI) and miR levels in breast milk.

**Methods:**
Breast milk samples of GDM+ (n=13) and GDM- (n=9) women were collected between 2.5 and 13.4 weeks after birth and were stored at -80°C until analyses. Analyses on hsa-miR-103a-3p, hsa-miR-320-3p and hsa-miR-30b-5p were performed using qPCR (Floris et al. 2015, PMID: 26474056). The comparative method $2^{-(\Delta Cq)}$ using 3 reference genes has been used and the obtained values were compared between GDM+ and GDM- women using student T test. Pearson correlations adjusted for women's age were performed to assess the association between pre-pregnancy BMI, calculated with measured height and self-reported weight, and miR of interest.

**Results:**
GDM+ women were significantly older (33.4±4.0 and 29.7±3.0 years, p=0.03) and had similar pre-pregnancy BMI than GDM- women (26.8±6.2 and 25.6±5.7 kg/m$^2$, p=0.64). Relative levels of miR of interest were

similar between GDM+ and GDM-. Pre-pregnancy BMI tended to be associated with levels of miR-103a-3p only among GDM+ women (r=0.51, p=0.08). However, the association was attenuated after adjustment for women's age (r=0.49, p=0.10).

**Conclusions:**
These preliminary results suggest that the association between pre-pregnancy BMI and levels of miR-103a-3p, a miR involved in adipogenesis, differs according to GDM status. More studies are needed to better understand the role of pre-pregnancy BMI in breast milk composition of GDM+ women and the potential impact on children's health.

## Thematic Oral 26

### SYSTEMATIC REVIEW ON THE IMPACT OF PERINATAL MHEALTH INTERVENTIONS FOR MOTHERS IN LOW- AND MIDDLE-INCOME COUNTRIES

**Justine Dol**[1,2], **Gail Tomblin Murphy**[1,3], **Megan Aston**[1], **Douglas McMillan**[1,2], **Brianna Richardson**[1,2], **Marsha Campbell-Yeo**[1,2]
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**Introduction:**
Mobile health (mHealth) projects for maternal and newborn health have grown in low and middle-income countries (LMICs). mHealth may not only increase the use of the perinatal clinical care, but also improve maternal knowledge and self-efficacy through education to impact newborn outcomes. The objective of this review is to determine the impact of mHealth education during the perinatal period in LMICs on antenatal/postnatal clinic attendance, maternal knowledge and self-efficacy, and newborn mortality and morbidity outcomes.

**Methods:**
We systematically searched CINAHL, PubMed, and Embase for studies published after 2000 reporting on mHealth interventions targeting mothers from birth to 6 weeks postnatally in LMICs. Peer-reviewed published experimental or quasi-experimental English studies were eligible. All screening and data extraction were conducted with two reviewers.

**Results:**
1,448 articles and 84 full-texts were screened with 19 articles critically appraised. Three articles were excluded due to poor quality as per Joanna Briggs Institute methodology. Of the 16 studies included, 9 targeted antenatal education, 4 postnatal, and 4 both. Studies varied in terms of country, approach, frequency, and content. Mothers who received an mHealth intervention attended a significantly greater number of antenatal contacts (MD=0.57, 95% CI, 0.28 to 0.85, p=0.0001) and were significantly more likely to have at least one postnatal contact by eight weeks (OR 1.36, 95% CI, 1.00 to 1.85, p=0.05). Maternal knowledge, self-efficacy as well as newborn mortality and morbidity were inconsistently reported across studies with varied findings.

**Conclusions:**
mHealth education interventions is associated with increased maternal contact antenatally and postnatally in LMICs. Due to heterogeneity of studies among country of implementation, approach, frequency, and content of the mHealth interventions, the impact on other maternal and newborn outcomes is inconclusive. Future work using mHealth to target maternal education during the perinatal period should focus on standardization of content and outcome evaluations.

## Thematic Oral 27

### BE SWEET TO BABIES DURING PAINFUL PROCEDURES: EVALUATION OF A PARENT-TARGETED VIDEO IN PERSIAN

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**Introduction:**
Breastfeeding, skin-to-skin care (SSC), and sucrose effectively reduce pain in babies during painful procedures. These strategies are recommended nationally and internationally, however they are not consistently used in practice. This study aimed to disseminate the Persian "Be Sweet to Babies" video through popular on-line platforms in Iran and evaluate viewers' knowledge, and intention to advocate/use these strategies.

**Methods:**
The video with a survey link was disseminated to the public through on-line video sharing platforms in Iran: Telegram, Facebook, YouTube, Aparat. The researchers reviewed video statistics every 2 weeks for 8 months (October 2017- May 2018). The survey included 7 questions related to: previous viewing of the video; previous knowledge of infant pain treatment; future intention to use pain treatment; and perception of how useful the video is. The questionnaire was created using Research Electronic Data Capture (REDCap). Descriptive statistics were used to analyse data.

**Results:**
The video was viewed 61, 8000, 609 and 76 times on Telegram, YouTube and Aparat respectively, and the views number was not possible to capture on Facebook. Due to the highly restrictive nature of social media in Iran, a key challenge was the continual removal of the video (considered scam, assumed against copyright or too explicit due to showing breastfeeding). In total, 194 people completed the survey, 66.5% parents versus16% HCPs (response rate=0.03%). Almost all participants (95%) had not seen the video before. Almost half of participants knew about using breastfeeding (40%), SSC (53%) or sucrose (43%) as pain-reduction strategies. Almost all participants found the video useful (97%), understandable (100%), easy to apply (96%), and 96% intended to advocate for and/or implement one of the strategies.

**Conclusions:**
Despite challenges, the video still had a broad reach. Results suggest that the video was acceptable to Iranians and has potential to increase use of evidence-based pain management strategies in infants.

## Thematic Oral 28

### ARE WE ON THE SAME PAGE ABOUT SKIN-TO-SKIN CARE? A DESCRIPTIVE CORRELATIONAL STUDY EXPLORING SKIN TO SKIN CARE FOR POSTOPERATIVE NICU INFANTS.

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**Introduction:**
Skin-to-skin care (SSC) is a key component of family-centered developmentally sensitive care (FCC) in the neonatal intensive care unit (NICU). Despite this, there is a paucity of literature on this topic for surgical neonates, who have unique needs and challenges when compared to premature neonates.
*Aims*. The goals of this study are fourfold: i) to describe the frequency and duration of parental presence (PP), parental holding (PH), and SSC in a surgical NICU, ii) to ascertain PP, PH, and SSC during minor

acute painful procedures, iii) to identify factors that influence PP, PH, and SSC for post-operative neonates admitted to a surgical NICU and, iv) to evaluate the relationship between PP, PH, and SSC and the Neonatal Therapeutic Intervention Scoring System (NTISS).

**Methods:**
This study will employ a nonexperimental quantitative descriptive correlational design. There will be three sources of data: i) Parent-infant closeness diaries to ascertain frequency and duration of PP, PH, and SSC (in minutes/day) and frequency of PP, PH, and SSC during painful procedures, ii) a parent survey will provide information regarding various factors that influence parental closeness (i.e. distance to hospital), and iii) daily NTISS scores will provide information about neonatal illness severity.

**Results:**
This study will aim to enrol 100 post-operative infants with data collection for each infant occurring for 14 days, or until discharge. All infants with a predicted stay of >24hours postoperatively will be considered for inclusion. At the time of presentation, preliminary results will be reported.

**Conclusions:**
There is a unique opportunity to explore SSC in this context to contribute new knowledge about this understudied population and to explore opportunities for parent involvement. The resulting integration of findings will provide new insights into the reality of families and infants in the surgical NICU.

## Thematic Oral 29

### NON-INFECTIOUS INFLAMMATION DURING PREGNANCY IS ASSOCIATED WITH FETAL GROWTH RESTRICTION AND ALTERED NEURODEVELOPMENT

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**Introduction:**
Prenatal inflammation alters placental function which can led to intra-uterine growth restriction (IUGR) and is associated with an increased risk of neurodevelopmental disorders. Pathogens are most often used in animal models; however, infections are not usually detected during pregnancy, but inflammation is still present. We developed a new animal model of exposure to an endogenous inducer of inflammation, uric acid, during pregnancy (Brien et al., 2017). In this model, FGR was observed alongside placental inflammation. However, the impact of prenatal exposure to non-infectious inflammation on postnatal development is still unknown. Our objective was to investigate the effects of prenatal exposure to uric acid on the fetal development, particularly neurodevelopment.

**Methods:**
Using our model of prenatal inflammation-induced FGR, we investigated the impact of *in utero* exposure to uric acid on the developing brain, from gestational day 22 (GD22) to postnatal day 21 (PND21). We evaluated microglial and astroglial activation, neuronal precursors and myelin formation by immunohistochemistry. Motricity was evaluated by the Open Field test. We also investigated the therapeutic potential of targeting the interleukin (IL)-1 system.

**Results:**
Prenatal non-infectious inflammation led to growth restriction that was still observed at PND21. Anti-inflammatory treatment was able to restore postnatal growth. Increased number of microglial cells was seen in the hippocampus at PND7/ 21 and in the corpus callosum at PND7. Astrogliosis was observed in the

white matter, motor cortex and hippocampus at PND7. Prenatal treatment with IL-1Ra reduces the number of microglia and astrocyte observed. Decreased number of neuronal precursor cell was also observed in the Dentate Gyrus at PND21 and this reduction was abolish with IL-1Ra treatment. Motor skills were also decreased after uric acid exposition during pregnancy.

**Conclusions:**
Prenatal exposure to non-infectious inflammation has important negative impact on pups development. Prenatal anti-inflammatory intervention (IL-1Ra) protected pups growth and some aspect of the developing brain.

## Thematic Oral 30

### INCREASE IN CEREBRAL OXYGEN METABOLISM DURING REWARMING IN NEONATES WITH HYPOXIC-ISCHEMIC ENCEPHALOPATHY UNDERGOING THERAPEUTIC HYPOTHERMIA

**Rasheda Chowdhury**[1,2], **Beatrice Desnous**[1,2], **Zamzam Mahdi**[2], **Bohdana Marandyuk**[2], **Imen Benhmida**[2], **Atousa Assadi**[1], **Guylaine Aubé**[2], **Ala Birca**[1,2], **Mathieu Dehaes**[1,2]
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**Introduction:**
Hypoxic-ischemic encephalopathy (HIE) is the leading cause of death and disability in term neonates. Our previous study showed that cerebral blood flow (CBF) and oxygen metabolism ($CMRO_2$) were lower during therapeutic hypothermia (TH) compared to post-therapy. However, it is not clear how CBF and $CMRO_2$ fluctuate during rewarming. Our study aimed to assess CBF, $CMRO_2$, hemoglobin oxygen saturation ($SO_2$) and $O_2$ extraction fraction (OEF) in HIE neonates during rewarming.

**Methods:**
Nineteen newborns with moderate to severe HIE (Table 1) underwent moderate TH (33-34°C for 72h) followed by rewarming (0.5°C/h over 6h). Advanced near infrared spectroscopy (NIRS) measures of $SO_2$ and an index of CBF ($CBF_i$) were used to derive an index of $CMRO_2$ ($CMRO_{2i}$). Also, OEF was calculated by the norMalized difference of $SO_2$ and peripheral arterial oxygen saturation ($SaO_2$). Parameters were compared during TH, rewarming, post-rewarming and discharge periods using general linear mixed models corrected for repeated measurements.

**Results:**
Significant increases in $CBF_i$ and $CMRO_{2i}$ were observed from TH to post-TH (Fig. 1A, B), which may suggest a gradual improvement in cerebral circulation and metabolism post-therapy as neonates became normothermic. For OEF, a significant decrease between TH and rewarming was initially observed while significant increases were observed from rewarming to post-rewarming and discharge (Fig. 1C). A similar pattern was observed in $SaO_2$ (Fig. 1D). Also, mean $SO_2$ was 65-75% during the hospital stay with a significant decrease between rewarming and post-rewarming (Fig. 1E). These changes may reflect a compensatory mechanism to tolerate rewarming while maintaining a gradual increase in oxygen delivery and metabolism.

**Conclusions:**
These results show the potential of advanced NIRS to better understand cerebrovascular/metabolic changes during rewarming in HIE. Further work includes the study of interaction between neuronal and metabolic responses to TH through Electroencephalography data, as well as their association with brain injury and long-term outcomes.

**Table1.** Patient characteristics
Gestational age (GA); w.d (weeks.days);
Birth Weight (BW); Duration of hospital stay (HS)

| Patient | Sex | GA (w.d) | BW (g) | HS (days) |
|---|---|---|---|---|
| H1 | M | 41.1 | 3744 | 6 |
| H2 | M | 36.1 | 2625 | 24 |
| H3 | M | 37 | 2530 | 12 (died) |
| H4 | M | 40.4 | 3870 | 17 |
| H5 | M | 35.2 | 4280 | 14 |
| H6 | M | 40.5 | 3050 | 16 |
| H7 | F | 38.5 | 4850 | 32 |
| H8 | F | 36.3 | 1660 | 20 |
| H9 | F | 37.3 | 2070 | 5 (died) |
| H10 | F | 41.1 | 4370 | 31 |
| H11 | M | 40.4 | 3550 | 6 |
| H12 | M | 41.0 | 3800 | 6 |
| H13 | F | 37.6 | 2740 | 10 |
| H14 | F | 39.5 | 3925 | 4(died) |
| H15 | M | 41.2 | 3140 | 10 |
| H16 | F | 41.0 | 3010 | 7 |
| H17 | M | 41.0 | 3240 | 17 |
| H18 | M | 40.4 | 3760 | 16 |
| H19 | M | 38.5 | 3170 | 7 |

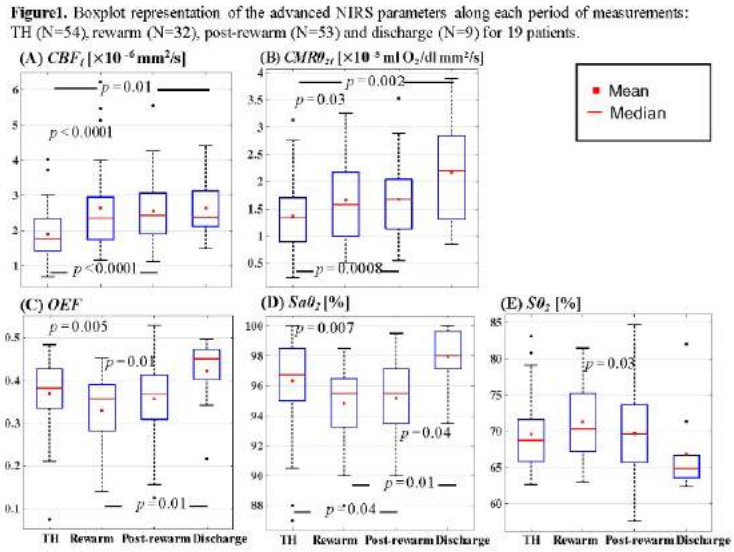


**Figure1.** Boxplot representation of the advanced NIRS parameters along each period of measurements: TH (N=54), rewarm (N=32), post-rewarm (N=53) and discharge (N=9) for 19 patients.

## Thematic Oral 31

### EFFECT OF HYPOTHERMIA ON INTERLEUKIN-1 RECEPTOR ANTAGONIST PHARMACODYNAMIC PARAMETERS IN INFLAMMATORY-SENSITIZED HYPOXIC-ISCHEMIC ENCEPHALOPATHY OF TERM NEWBORNS

**Mathilde Chevin**[1], **Clémence Guiraut**[1,2], **Guillaume Sébire**[1,3]
[1]McGill University, [2]Hôpital Sainte-Justine, [3]Université de Sherbrooke

**Introduction:**
Pure hypoxia-ischemia (HI) or inflammatory-sensitized HI are the most prevalent clinical scenario underlying neonatal encephalopathy (NE). Neuroprotective treatment in NE consist in therapeutic hypothermia (HT). Recent evidence demonstrated that HT can alter the pharmacokinetic and pharmacodynamic parameters of drugs and induced unexpected or adverse effects. Our team and others recently showed that HT fails to counteract the activation of the interleukin-1 (IL-1) system (Chevin *et al.*, 2016) which plays a key role in NE. Before evaluating the added value of IL-1 receptor antagonist (IL-1Ra) to HT, it is important to test the effect of HT on IL-1Ra pharmacodynamic parameters.

**Methods:**
We used a rat model of lipopolysaccharide (LPS)+HI-induced NE at postnatal (P) day 12, as described (Chevin *et al.*, 2016). Pups were submitted to HT (32° ± 0.5°C, 4 h) and/or IL-1Ra (50 - 200 mg/kg q12 h from P12 to P14). Extent of brain injuries (histological measurements), motor behavioral tests, and expressions of neurotoxic inflammatory cytokines (IL-1β, tumor-necrosis factor (TNF)-α) were assessed to define the efficacy of IL-1Ra.

**Results:**
We showed that HT induced a 2-fold increase of the IL-1Ra titers within the plasma, cerebrospinal fluid and hemisphere exposed to LPS+HI. In HT conditions, IL-1Ra induced significant upregulations of IL-1β and TNF-α productions within the brain. We did not observe any added value of IL-1Ra to HT on LPS+HI-induced brain injury and motor impairments. HT+IL-1Ra at the dose of 200 mg/kg dramatically increased the extent of cerebral injury

**Conclusions:**
The lack of effectiveness of the combination of IL-1Ra with HT – as compared to sole IL-1Ra in the same model (Savard *et al.*, 2015) – could be explained by the effect of HT on the IL-1Ra metabolism.

## Thematic Oral 32

### DELETION OF THE AUTISM GENE MYO9B IN GABAERGIC INTERNEURONS DELAYS TANGENTIAL MIGRATION THROUGH DISRUPTED ACTIN REMODELING IN MICE

**Lara Eid**[1,2,3], **Praveen Raju**[1,2,3], **Alexis Lupien-Meilleur**[2,3], **Mathieu Lachance**[2,3], **Gilles Hickson**[2,3], **Elsa Rossignol**[2,3]
[1]Equal contribution, [2]CHU Sainte-Justine Research Center, [3]Université de Montréal

**Introduction:**
Recent data suggest that a subset of genetically-determined autism spectrum disorders (ASD) result from defects in the development of inhibitory GABAergic interneurons (INs). *De novo* mutations in the *MYO9B* gene, encoding a non-muscular myosin with a RhoA-specific RhoGAP domain, have recently been associated with ASD. However, the role of *MYO9B* in brain development remains unknown. Given the central role of RhoA in actin remodeling during neuronal migration and the implication of IN pathologies in ASD, we hypothesized that *Myo9b* might be a central regulator of IN migration.

**Methods:**
We generated *Nkx2.1*$^{Cre}$*;Myo9b*$^{c/c}$*;RCE*$^{EGFP}$ mutant mice carrying a conditional deletion of *Myo9b* in medial ganglionic eminence (MGE)-derived INs. We investigated the prenatal impact of the targeted deletion of *Myo9b* on IN migration dynamics and actin remodeling using time-lapse imaging of organotypic slices and MGE explants, respectively.

**Results:**
We find a delay in tangential migration in *Myo9b* mutant mice at both e13.5 and e15.5, as shown by 40% and 10% reductions in the number of INs at the migratory front, respectively, compared to *Myo9b* heterozygous littermates (controls). Time-lapse imaging of acute organotypic slices at e13.5 reveals disrupted migration dynamics of INs in mutants, with 30% slower and less frequent nucleokinesis, compared to controls. Also, following time-lapse imaging of MGE explants electroporated with *Lifeact*, allowing to live-track actin remodeling, we note a more diffuse distribution of F-actin in the soma of mutant INs, with a decreased compaction at the rear of the cell body, compared to controls.

**Conclusions:**
Altogether, our data suggest that *Myo9b* is a critical player regulating IN development, and that its loss prevents actin remodeling and perturbs IN migration. In turn, this delay in tangential migration might impact the establishment of neuronal networks during early post-natal ages and lead to the cognitive impairments seen in patients with *MYO9B*-associated ASD.

## Thematic Oral 33

### IMPACT OF TRANSIENT NEONATAL HYPEROXIA EXPOSURE ON SKELETAL MUSCLE DEVELOPMENT IN A RAT MODEL OF PREMATURITY-RELATED CONDITION

**Alyson Deprez**[1,2], **Daniela Dartora**[1,2], **Junio Dort**[1,2], **Rita Néhmé**[1,2], **Ying He**[1], **Anik Cloutier**[1], **Nicolas Dumont**[1,2], **Anne-Monique Nuyt**[1,2]
[1]Research Center of CHU Sainte-Justine, [2]University of Montreal

**Introduction:**
In Canada, 7.7% of all children are born preterm. At birth, the premature exposure to higher oxygen ($O_2$) levels compare to relative hypoxia in utero induces oxidative stress and systemic inflammation, which could be deleterious for immature organs. These local and systemic changes could affect the muscle stem cells, the satellite cells,

responsible for muscle development and myogenesis. Thus, we aimed to investigate whether neonatal transient hyperoxia exposure induces an inadequate response of satellite cells leading to an alteration of myogenesis.

**Methods:**
Sprague-Dawley pups were kept in 80% $O_2$ (Hyperoxia) or room air (control) from day 3 to 10 of life, a recognized model for prematurity. Morphometric and immunohistological analyzes of muscles with fast phenotype (anterior tibial) or slow (soleus) were performed at 4 and 16 weeks in males. Two-way or one-way ANOVA statistical tests were carried out using R software (n =4-8/group. $p<0.05$).

**Results:**
In the anterior tibial, Hyperoxia group presented a significant decrease in muscle mass at 4 weeks (1.71 ±0.18 mg/g) and at 16 weeks (1.41 ±0.60 mg/g), a significant reduction in muscle fiber diameter and increase of the fibrosis at 4 weeks (0.65 ±0.12% of total pixels) and 16 weeks (0.95 ±0.08 % of total pixels). Expression of MHC-1, marker of inflammation, was also significantly increased in both tibial anterior (15.65±2.92) and soleus (11.55±2.16) at 4 weeks. Satellites cells density was significantly decreased in Hyperoxia group *vs.* controls in the tibial anterior (9.15 ± 1.32; 2.2 ± 0.27) and soleus (22.66 ± 1.05; 7.42 ± 0.160) at 4 and 16 weeks respectively.

**Conclusions:**
Our results indicate that transient hyperoxia exposure in the neonatal period significantly impacts striated muscle development and capacity of muscular regeneration, which is an independent risk factor of the chronic diseases. Ours futures studies will characterize the muscular regeneration, the muscular function and investigate new therapeutic avenues.

## Thematic Oral 34

### DEVELOPMENTAL ORIGINS OF HEALTH AND DISEASE (DOHAD): UNCOVERING HEALTH CARE PROVIDERS' EXPERIENCE IN PRACTICE

**Monica Molinaro**[1], **Marilyn Evans**[1], **Timothy Regnault**[1,2], **Barbra de Vrijer**[2]
[1]Western University, [2]Schulich Medicine & Dentistry

**Introduction:**
An adverse *in utero* environment programs metabolic changes associated with transgenerational transmission of non-communicable disease susceptibility to the fetus. This phenomenon is commonly termed the Developmental Origins of Health and Disease (DOHaD). There is limited knowledge on health care providers' perception and understanding of DOHaD (Hanson & Gluckman, 2014), which may impact how they inform women and families throughout the perinatal period. This qualitative descriptive study explored if and how health care providers discuss *in utero* programming and future health outcomes with women and families both pre-conception and during pregnancy.

**Methods:**
Guided by a Charmazian grounded theory approach, semi-structured interviews were conducted with a purposeful sample of 23 health care providers (obstetrician/gynecologists, maternal fetal medicine specialists, midwives, endocrinologists, internal medicine generalists, pediatricians, and family physicians). Recruitment ceased upon data saturation. The audiotaped interviews lasted 25-80 minutes, were transcribed verbatim, and analyzed using inductive thematic analysis. The transcripts were coded independently, then grouped into categories, and final themes were identified through team discussion and consensus.

**Results:**
Three themes were identified: *Health care providers' knowledge on DOHaD, Counselling on DOHaD in Practice Settings, and Impact of DOHaD on Healt*h. Participants described potential health benefits of DOHaD counselling, but also indicated barriers to knowledge translation, such as a disconnect between researchers and practitioners and need for clinical practice guidelines. All participants expressed concerns on how to introduce DOHaD when counselling women. Providers suggested educating patients on the impact of DOHaD can have positive societal implications, but expressed concerns about patient uptake of DOHaD-related knowledge.

**Conclusions:**
More dialogue is needed between health providers and researchers to identify strategies supporting knowledge translation generated from DOHaD research into practice and counselling settings. The development of best practice guidelines surrounding DOHaD is needed. Counselling should be empowering, supportive, and encompass all modifiable factors for disease risk.

## Thematic Oral 35

### EARLY-LIFE MIGRATION STRESS INDUCES SENSORIMOTOR DEFICITS IN ADULTHOOD: LINKING TRAUMA TO ADVERSE HEALTH OUTCOMES

**Janet Poplawski**, **Tony Montina**, **Gerlinde Metz**
University of Lethbridge

**Introduction:**
Violence related to civil war, political instability and ethnic conflict has produced millions of refugees over the last several decades. In 2017, for example, there were 68.5 million forcibly displaced persons worldwide. Although children constitute over half of the global refugee population, little is known about the long-term health implications of early postnatal migration stress (EPMS). Here, we propose that shipment stress in laboratory mice may serve as an animal model of migration stress in human populations. Objective: In this study, we used shipment stress to investigate the sensorimotor consequences of EPMS in a rodent model.

**Methods:**
Mice shipped from an external breeder on postnatal day (P) 12-13 were compared to mice bred in-house. To assess the impact of EPMS on brain development, P35 motor cortices underwent cortical thickness measurements. Cerebella from adult (P50) mice were used for metabolic profiling by $^{1}$H NMR spectroscopy. Fine motor control was assessed in early adulthood (P48) using the ladder rung walking task.

**Results:**
EPMS significantly reduced cortical thickness in the primary motor cortex in stressed animals at P35 ($P < 0.05$). EPMS also induced metabolic changes in the brain, with greater metabolic differences between treatment groups present in the left cerebellum. These morphological and metabolic alterations were associated with fore- and hind limb motor deficits in skilled walking. Specifically, EPMS animals made significantly more errors on the ladder rung apparatus ($P < 0.05$) and took significantly longer to cross the length of the ladder ($P < 0.05$).

**Conclusions:**
The results indicate that EPMS programs health throughout the lifespan. EPMS alters brain development and maturation in motor areas which lead to lasting motor deficits. These findings reveal potential mechanisms underlying stress-induced motor deficits and call for further research into interventions that mitigate the long-term effects of migration stress.

## Thematic Oral 36

### MATERNAL NICOTINE EXPOSURE INDUCES CONGENITAL HEART DEFECTS IN MICE OFFSPRING

**Elizabeth Greco**, **Anish Engineer**, **Sharon Lu**, **Douglas Jones**, **Qingping Feng**
Western University

**Introduction:**
Congenital heart defects (CHDs) are the most prevalent birth defect, and maternal cigarette smoking is a known risk factor. Pregnant women who smoke cigarettes are recommended nicotine replacement therapies to help aid in smoking cessation. These alternatives are thought to be safer because they do not contain the many toxins found in tobacco smoke. However, these products contain nicotine, and the safety of nicotine on the developing heart is not well known. It was hypothesized that maternal nicotine exposure (MNE) during pregnancy leads to CHDs and coronary artery (CA) defects in the offspring of mice.

**Methods:**
Female mice were treated with subcutaneous nicotine infusion (1.5 mg/kg/day) via osmotic pump, a human dose equivalent to 1-10 cigarettes/day. Pumps were implanted fourteen days before mating with a wildtype male, and nicotine exposure was continued throughout gestation. Heart samples were collected at embryonic day (E)18.5, and E10.5 for morphological, and mRNA/oxidative stress analysis, respectively.

**Results:**
MNE resulted in both CHDs and hypoplastic CAs at an incidence of 43% and 31%, respectively. Major CHDs, such as atrioventricular septal defects, double outlet right ventricle and truncus arteriosus were observed. Coronary artery abundance and volume was significantly reduced with MNE. Significantly higher levels of oxidative stress were observed in E10.5 hearts of the MNE group compared to the control. As a result, many important molecular regulators of myocardial and CA development were significantly lower with MNE, including, *eNOS, Notch1, Hif1-alpha, beta-MHC*. Additionally, E10.5 MNE hearts had less actively proliferating cells compared to control. DNA methylation is thought to play a role in the nicotine-induced increase in oxidative stress that contributes to the pathogenesis of CHDs.

**Conclusions:**
This study shows that MNE results in an elevated incidence of CHDs and CA defects. This could provide insight into the dangers of nicotine replacement therapy during pregnancy.

## Thematic Oral 37

### CLASSICAL CAESAREAN: WHAT ARE THE MATERNAL AND INFANT RISKS? COMPARED TO LOW TRANSVERSE CAESAREAN IN PRETERM BIRTH, AND SUBSEQUENT UTERINE RUPTURE RISKS? A SYSTEMATIC REVIEW AND META-ANALYSIS.

**Veronica Moramarco**, **Sugee Liyanage**, **Kiran Ninan**, **Amit Mukerji**, **Sarah McDonald**
McMaster University

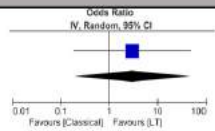
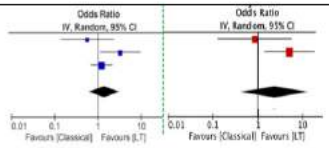
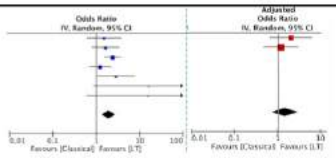
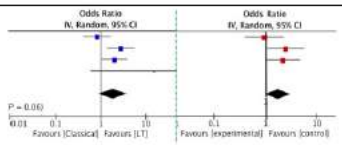
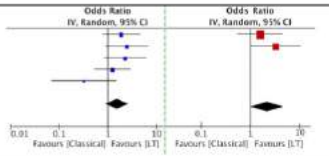
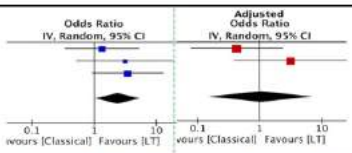
**Introduction:**
Classical caesarean section may be associated with increased short and long-term maternal and infant risks.We do not know the rate of uterine rupture, when not planning a trial of labour. Our objectives were to determine: first, the short-term maternal and infant risks with classical compared to low transverse caesarean section in preterm deliveries; second, the risk of spontaneous or early labour uterine rupture, excluding planned trial of labour.

**Methods:**
For our systematic review and meta-analysis, we searched MEDLINE, EMBASE, Cochrane CENTRAL and ClinicalTrials.gov from January 1980 to July 9, 2018. We included studies comparing outcomes after preterm classical versus low transverse caesarean section, or addressing subsequent pregnancy outcomes. We synthesized data using random effects, and generated odds ratios and 95% confidence intervals.

**Results:**
We included 9 studies addressing short-term outcomes and 15 studies addressing subsequent pregnancy outcomes. There was no significant difference between preterm classical and low transverse caesarean sections in the odds of maternal death (OR 2.38, 95% CI 0.15-38.07) or ICU admission (aOR 2.38, 95% CI 0.42-13.35). There were small increases in several secondary outcomes such as endometritis (aOR 2.14, 95% CI 1.00-4.59). A subgroup from 28 to 31 weeks of gestation in one study also had increased risks of transfusion and maternal ICU admission. None of the neonatal outcomes were significantly different between groups, but limited data. When not planning a trial of labour, approximately 1% of women with a previous classical incision will experience a uterine rupture before labour or before a caesarean section could be performed.

**Conclusions:**
Preterm classical caesarean section is not associated with significantly increased immediate risks, but data were scarse. The incidence of uterine rupture in a subsequent pregnancy when not planning a trial of labour is low.

**Table 1. Summary of maternal outcomes of classical compared to low transverse caesarean section in singleton preterm birth**

| Outcome | GA (weeks) | Data | OR 95% CI, # studies, $I^2$ | Forest plots |
|---|---|---|---|---|
| Maternal death | $23^{+0}$-$33^{+6}$ | crude | 2.38 (0.15-38.07) 2 studies |  |
| ICU admission | $23^{+0}$-$33^{+6}$ | crude | 1.39 (0.61-3.14) 2 studies, $I^2$ 54% |  |
| | $23^{+0}$-$31^{+6}$ | adjusted | 2.38 (0.42-13.35) 1 study | |
| Hemorrhage EBL>1000 ml | $23^{+0}$-36 | crude | **1.93 (1.35-2.76)** 6 studies, $I^2$ 25% |  |
| | $23^{+0}$-$31^{+6}$ | adjusted | 1.46 (0.71 – 2.99) 1 study | |
| Transfusion | $23^{+0}$-36 | crude | 1.84 (0.90-3.79) 3 studies, $I^2$ 64% |  |
| | 23-34 | adjusted | 1.73 (0.99 – 3.05) 2 studies, $I^2$ 31% | |
| Endometritis | $23^{+0}$-37 | crude | 1.54 (0.90 – 2.65) 4 studies, $I^2$ 31% |  |
| | $23^{+0}$-$31^{+6}$ | adjusted | **2.14 (1.00 – 4.59)** 1 study | |
| Sepsis | $23^{+0}$-35 | crude | **2.39 (1.03-5.52)** 2 studies, $I^2$ 0% |  |
| | $23^{+0}$-$31^{+6}$ | adjusted | 1.04 (0.15 – 7.33) 1 study | |

Abbreviations: GA, gestational age range (weeks); OR, odds ratio; 95% CI, confidence interval; EBL, estimated blood loss.

## Thematic Oral 38

### PLACENTAL PROGRAMMING AND THE RISK OF DEVELOPING CARDIOVASCULAR RISK FACTORS

**Aida Zaza**[1], **Jessica Pudwell**[1], **Shannon Bainbridge**[2], **Kristin Connor**[3], **Graeme Smith**[1]
[1]Queen's University, [2]University of Ottawa, [3]Carleton University

**Introduction:**
Pre-eclampsia (PE) is a hypertensive disorder that complicates 5-7% of pregnancies and is the leading cause of maternal and fetal morbidity worldwide. The purpose of this study was to investigate the relationship between the morphology of the placenta and cardiovascular risk (CVR) at 6 months postpartum in women who experienced PE.

**Methods:**
Women were eligible if they attended the Maternal Health Clinic (MHC) from November 2011 to December 2017, were diagnosed with PE, and had a least one placenta measurement available. Women were excluded if they had a twin pregnancy. Placental measurements were abstracted from pathology reports and electronic birth records. PE related blood work and blood pressure measurements were obtained from the electronic birth record and CVR information was obtained from the MHC database. Multivariate logistic regression was used to examine the relationship between placental measures and high lifetime risk of cardiovascular disease at 6 months postpartum. $P<0.05$ was used to definite significance.

**Results:**
186/216 women with preeclampsia who attended the MHC met inclusion criteria. Mean placental weight was 503.2±187.3g, mean ratio of placental to birth weight was 18.2± 4.4% and35/182 (19.2%) had a ratio <15.0%. In multivariate modelling that controlled for maternal age increased pre-pregnancy BMI (Odds Ratio (OR)=1.10, 95%CI [1.03-1.17]), severe PE vs HELLP syndrome (OR=5.22 [1.85-14.72]), placental to birth weight ratio of 15.0-19.9% vs ≥20.0% (OR=2.99 [1.13-7.89]) and <15.0% vs ≥20.0% (OR=5.13 [1.57-16.74]) were associated with an increased odds of high lifetime risk. Greater gestational age (OR=0.79 [0.70-0.90]) was associated with a decreased odds of high lifetime risk.

**Conclusions:**
Preliminary data suggests an association between the ratio of placental to birth weight and CVR at 6 months postpartum. Placental measurements may be used to identify thosewho are likely to be at greatest risk and who would most benefit from risk screening preventive interventions.

## Thematic Oral 39

### REDUCING SURGICAL BLOOD LOSS IN PLACENTA ACCRETA SPECTRUM DISORDERS: A 10-YEAR EXPERIENCE OF CELL SALVAGE IMPLEMENTATION

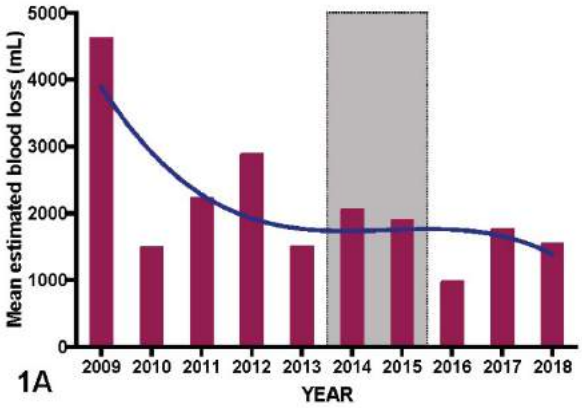
**Sebastian Hobson**[1,2], **Natasha Milligan**[1,2], **Jessica Pacheco**[1,2], **Catherine Lu**[1,2], **Katherine Steckham**[1,2], **John Kingdom**[1,2], **Rory Windrim**[1,2], **Ally Murji**[1,2], **Lisa Allen**[1,2]
[1]University of Toronto, [2]Mount Sinai Hospital

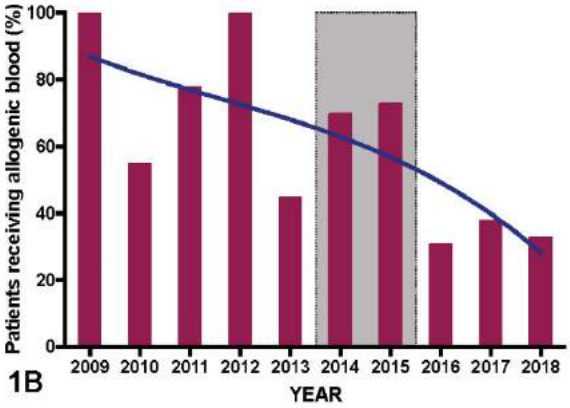
**Introduction:**
Placenta accreta spectrum disorders (PASD) have become a significant concern to the Canadian population, complicating over 1 in 400 pregnancies and posing significant risks to mothers and infants. Women with PASD are frequently cared for by dedicated multidisciplinary teams to reduce adverse outcomes, including haemorrhage and transfusion requirements. Since the introduction of intra-operative cell salvage (IOCS) to minimize allogenic transfusions at our institution, we aimed to describe our 10-year experience of IOCS use in PASD management.

**Methods:**
We retrospectively collected data from 113 consecutive patients undergoing caesarean delivery for suspected PASD at Mount Sinai Hospital between 2009-2018. Outcomes were compared from three distinct time periods: 2009-2013 (pre-IOCS), 2014-2015 (IOCS transition period) and 2016- 2018 (post-IOCS implementation).

**Results:**
We identified 42 patients pre-IOCS, 21 in the IOCS transition and 50 post-IOCS implementation. Overall, hysterectomy rates were high in this population ranging from 94-100%. Mean yearly EBL and percentage receiving allogenic blood are shown in Figures 1A and 1B. Mean EBL was reduced from pre-IOCS to post-IOCS implementation (2275±307mL vs 1463±162mL, p=0.032). While IOCS uptake was high (71-86%), there was a reduction in mean autologous blood reinfused from IOCS transition to post-IOCS implementation (372±133mL vs 149±28mL, p=0.023). Fewer patients required allogenic blood transfusions post-IOCS compared to the pre-IOCS and IOCS transition groups (26.0% vs 57.1% vs 66.7%, p=0.001), with less volumes given per-patient in the post-IOCS versus pre-IOCS groups (258±84mL vs 786±151mL, p=0.0062). Importantly, compared to pre-IOCS, median postoperative admissions were reduced in both the IOCS transition (5-days vs 3-days, p<0.0001) and post-IOCS (5-days vs 3-days, p<0.0001) periods. No differences were observed in adverse events or IOCS-specific complications between the groups with no cases of amniotic fluid embolism or death.

**Conclusions:**
The findings of this study indicate that IOCS is both a safe and effective strategy in the surgical management of PASD.




## Thematic Oral 40

### SUBCUTANEOUS FAT THICKNESS MEASURED BY ULTRASOUND IN THE FIRST TRIMESTER PREDICTS TOTAL GESTATIONAL WEIGHT GAIN

**Claudia Savard**[1,2,3], **Simone Lemieux**[1,3], **André Tchernof**[2,3,4], **Claudia Gagnon**[1,2,4,5], **Julie Robitaille**[1,2,3], **Mario Girard**[2], **Emmanuel Bujold**[2], **Anne-Sophie Morisset**[1,2,3]
[1]Nutrition and Functional Foods' Institute, [2]CHU de Quebec-Laval University, [3]School of Nutrition, Laval University, [4]Quebec Heart and Lung Institute, [5]Faculty of Medicine, Laval University

**Introduction:**
One in two Canadian mothers gains an excessive amount of weight during pregnancy, which is associated with negative short- and long-term consequences for both the mother and her child. This study aims to examine associations between early-pregnancy factors and total gestational weight gain (GWG).

**Methods:**
Pregnant women (n=74) were recruited in their 1st trimester and completed 3 Web-based 24h recalls from which the Canadian Healthy Eating Index (HEI) was calculated. Visceral and subcutaneous adipose tissue (VAT and SAT) depths were measured by ultrasonography at 12 weeks' gestation, following the routine fetal nuchal translucency assessment. Maternal fasting plasma adiponectin, interleukin-6 (IL-6), triglycerides and cholesterol (total, LDL, HDL) levels were also measured at 12 weeks' gestation. Pre-pregnancy BMI was calculated from the self-reported pre-pregnancy weight. Total GWG was calculated as the difference between maternal weight at delivery or at the last prenatal visit (≥37th week), and self-reported pre-pregnancy weight.

**Results:**
After adjustment for pre-pregnancy BMI, total GWG was inversely associated with 1st trimester diet quality ($r=-0.24$, $p=0.04$), adiponectin levels ($r=-0.24$, $p=0.04$) and HDL-cholesterol ($r=-0.39$, $p<0.001$), and positively associated with SAT ($r=0.79$, $p<0.0001$), VAT ($r=0.55$, $p<0.001$), IL-6 levels ($r=0.25$, $p=0.03$), LDL-cholesterol ($r=0.28$, $p=0.02$) and triglycerides ($r=0.34$, $p<0.01$). In a model including pre-pregnancy BMI, primiparity, maternal age and 1st trimester factors (diet quality, SAT, VAT, cholesterol, triglycerides and plasma adiponectin and IL-6 levels), independent predictors of total GWG were SAT and primiparity, explaining respectively 8.0% and 6.2%, ($p<0.05$) of the model variance (Total $r^2x100=21\%$).

**Conclusions:**
Various metabolic and dietary factors in early-pregnancy are associated with total GWG. Overall, primiparity and thicker subcutaneous adipose tissue in the 1st trimester seemed to better predict total GWG. Ultrasound measurement of fat distribution could help identify, early in pregnancy, women that are at higher risk of excessive GWG. Further studies are needed to confirm our findings.

## Thematic Oral 41

### ALTERED TRANSCRIPTOME AND EPIGENOME PROFILES IN PLACENTAS FROM COMPLICATED PREGNANCIES

**Cyntia Duval**[1,2], **Jacqueline Piché**[1,2], **Ines Boufaied**[1], **Lisa-Marie Legault**[1,2], **Maxime Caron**[1,2], **Serge McGraw**[1,2], **Daniel Sinnett**[1,2], **Sylvie Girard**[1,2]
[1]CHU Sainte-Justine Research Center, [2]Université de Montréal

**Introduction:**
Pregnancy complications, including preterm birth (PTB), intra-uterine growth restriction (IUGR) and preeclampsia (PE) are strongly linked to inflammation. Targeting inflammatory pathways could be a new therapeutic avenue. However, to identify women that would most benefit from an anti-inflammatory treatment, a better understanding of modulated pathways in the placenta is needed. Objective: Identify pathways specific to one pathology or common to multiple complications.

**Methods:**
Whole genome transcriptomic sequencing (TruSeq Library kit – threshold at +/-0.5FC) and methylome sequencing (epigenome) with RRBS (peak score of +/-20%) were executed on human placenta from uncomplicated term pregnancies (13) or pregnancies complicated with PTB (5), IUGR (4) or PE (24). We compared the list of genes and analysed the Gene Ontology and Metascape. We also correlated the most modulated genes with the newborn clinical data.

**Results:**
Analysis of the transcriptome showed specific and exclusive genes regulation in each pathology; PTB

(4560 genes), IUGR (507 genes), PE (847 genes) whilst 60 genes were common to all pathologies. GO term analysis of these common genes demonstrated the implication of general biological processes, but pathology specific modulated genes showed a clear inflammatory component. Differentially methylated regions (DMRs) were observed in 323 genes in PTB and 1081 in PE, while 83 were common to PTB and PE. When affected genes were compared to the transcriptomic results, the pathways modulated were different in the methylome, being mainly implicated in brain development. Modulated genes common to both analysis (ex. LINC00551, NTRK2, TBX15) were correlated with neonatal complications based on a newborn health score.

**Conclusions:**
These results show a clear association between placental inflammation, pregnancy pathologies and neonatal complications. However, gene expression is not directly modulated by the methylome in the human placenta. Future studies will investigate the link between modulated gene expression and placental defects.

## Thematic Oral 42

### ELUCIDATING THE ROLE OF OVO-LIKE 2 IN PLACENTAL DEVELOPMENT

**Mariyan Jeyarajah**[1], **Stephen Renaud**[1,2,3]
[1]University of Western Ontario, [2]Children's Health Research Institute, [3]Lawson Health Research Institute

**Introduction:**
The placenta is comprised of various trophoblast sublineages derived from trophoblast stem (TS) cells. Improper TS cell differentiation impairs development of these lineages and consequently the placenta. Mice deficient in the transcription factor OVO-like 2 (OVOL2), fail to produce a functioning placenta, and die at embryonic day (E)10.5, suggesting that OVOL2 has a critical function in trophoblast development. In this study, we test the hypothesis that OVOL2 is a critical regulator of TS cell development.

**Methods:**
Placentas and embryos were collected from pregnant female C57BL/6 and CD1 mice on E9.5, 12.5, 15.5, and 18.5. RT-PCR and *in situ* hybridization were used to determine expression and localization of *Ovol2* in various mouse tissues and organs throughout development. Quantitative RT-PCR and western blot analysis were used to evaluate OVOL2 expression in TS cells *in vitro*.

**Results:**
*Ovol2* was highly expressed in placenta and was lowly expressed in embryos and decidua at E9.5, 12.5, 15.5, and 18.5. In placentas, *Ovol2* transcript was expressed in labyrinth zone and trophoblast giant cells, but absent in junctional zone and decidua. Differentiated TS cells exhibited approximately 90-fold reduced expression of stem-state associated genes *Cdx2*, *Eomes*, *Esrrb*, and *Id2* ($P<0.05$) and increased expression of differentiation markers *Prl3d1*, *Prl3b1*, *Gcm1*, and *Tpbpa* (upregulated by 34, 5824, 4.8, and 4370-fold, respectively; $P<0.05$). Furthermore, differentiated TS cells also showed a 40-fold upregulation of *Ovol2*, when compared to TS cells in stem-state ($P<0.05$). We have successfully isolated *Ovol2*-null TS cells from blastocysts obtained following breeding of $Ovol2^{+/-}$ heterozygotes. These will be used to investigate the role of *Ovol2* in TS cell differentiation.

**Conclusions:**
OVOL2 is highly expressed in mouse placenta and in differentiating TS cells. Our ongoing work will delineate the importance of OVOL2 for TS cell differentiation and placental development.

## Thematic Oral 43

### REDUCED EXPRESSION OF MICRORNA-126-5P IS ASSOCIATED WITH CARDIAC DYSFUNCTION IN RAT OFFSPRING.

**Charlotte Talbot**[1,2,3], **Prasoon Agarwal**[1,2,3], **Donald Chapman**[2,3,4], **Stephanie Kereliuk**[1,2,3], **Brandy Wicklow**[2,3,5], **Allison Dart**[2,3,5], **Elizabeth Sellers**[2,3,5], **Joseph Gordon**[2,3,4], **Vern Dolinsky**[1,2,3]
[1]Department of Pharmacology & Therapeutics, [2]DREAM Research Theme, [3]DEVOTION, [4]Human Anatomy & Cell Science, [5]Department Pediatrics & Child Health

**Introduction:**
Worldwide, 1 in 7 births is affected by gestational diabetes (GDM). MicroRNA (miRNA) are small non-coding RNAs that post-transcriptionally regulate gene expression. Alterations in miRNA expression have been detected in GDM. Little is known about how GDM-induced miRNA signatures are transmitted to the next generation. The aim of this study is to identify miRNAs involved in the transmission of GDM-induced phenotypes to the offspring.

**Methods:**
Using an established diet-induced GDM model (Pereira et al 2015), expression of miRNAs were measured by q-RT-PCR in rat cardiac tissues (n=5 per group) from 15 week-old offspring exposed to GDM and compared to non-exposed control offspring. The interaction with postnatal low fat (LF) and high fat and sucrose (HFS) diets was also examined. Cardiac structure and function in rats was evaluated by ultrasound.

**Results:**
The proximal promoters of three miRNAs that are hypomethylated and one that was hypermethylated in white blood cells of children with type 2 diabetes were selected for expression analysis in cardiac tissue of rats (e.g. miR-483-3p, miR-126-5p, miR-200b-5p and miR-33a-5p respectively). In offspring of control rats, a postnatal HFS diet reduced miR-126 expression by 54% in cardiac tissue, as compared to LF diet ($p<0.0001$). In offspring of GDM dams, miR-126 expression was 29% lower in GDM-LF cardiac tissue compared to non-exposed control-LF ($p<0.001$). Reduced miR-126 correlated with a 1.2-fold ($p<0.05$) increased left ventricular posterior wall thickness and diastolic dysfunction of the GDM rat offspring heart. TargetScan analysis revealed miR-126 target genes to be IRS1, TOM1 and SIRT1, suggesting potential roles in the dysregulation of cardiac insulin sensitivity, metabolic and mitochondrial function.

**Conclusions:**
This project provides additional insight about epigenetic mediators involved in the effects of GDM exposure on the offspring. Altered miRNA signatures could be potential therapeutic targets and early biomarkers for cardiometabolic disease in the offspring.

## Thematic Oral 44

### PRENATAL MATERNAL STRESS AFFECTS THE STRUCTURAL INTEGRITY OF THE HYPOTHALAMIC PITUITARY GONADAL AXIS IN MALES AND FEMALES: PROJECT ICE STORM

**Sherri Lee Jones**[1,2], **Chloe Anastassiadis**[2], **Matthieu Dupuis**[2], **Guillaume Elgbeili**[2], **Francois-Pierre Marcoux**[3], **James Gazetas**[3], **Gabriel Devenyi**[1,4], **Jamie Near**[1,2], **David P. Laplante**[2], **Jens C. Pruessner**[5], **Suzanne King**[1,2]
[1]McGill University, [2]Douglas Hospital Research Center, [3]Collège Jean-de-Brébeuf, [4]Douglas Cerebral Imaging Center, [5]University of Konstanz

**Introduction:**
Maternal stress during pregnancy leads to physical and behavioral problems in the unborn child. Prenatal

maternal stress (PNMS) interferes with the typical development of the hypothalamic-pituitary-gonadal (HPG) axis in animal studies, disrupting the sexually dimorphic development of hypothalamic volumes, causing problems with fertility and fecundity in females, and fertility in males. GOAL. To determine whether PNMS disrupts the structural integrity of the human HPG axis. We hypothesized that PNMS 1) would disrupt the typical sex difference in hypothalamic volume 2) would be associated with smaller testicular volume in males, and with polycystic-like ovaries in females.

**Methods:**
PNMS (objective hardship and subjective distress) was recorded in mothers in June 1998, shortly after the Quebec Ice Storm, and the children were followed prospectively. Integrity of HPG axis structures was assessed in 19-year-old Ice Storm youth (ICE, 18M, 21F) and 1997-born controls (CTRL, 17M, 14F) using structural magnetic resonance imaging (MRI) and manual delineation. Ovarian antral follicles (2-10mm) were counted from MRI images. Data were analyzed with ANOVAs and regressions.

**Results:**
Whereas the typical sex difference in hypothalamic volume (M>F) was detected in CTRLs, PNMS disrupted that sex difference in ICE youth, as no sex difference was detected. Moreover, within ICE, the sex difference was observed at low, but not high levels of PNMS (objective and subjective). Additionally, in boys, objective hardship was associated with smaller (i.e., less male-like) hypothalamic volume. Similarly, pituitary volume was smaller in ICE boys compared to CTRL boys. Within ICE, objective hardship was associated with smaller testicular volume. Finally, ICE girls had more antral follicles and tended to have larger ovarian volume compared to CTRL girls.

**Conclusions:**
This is the first study to show that PNMS systematically affects all levels of the HPG axis in humans, suggesting that reproductive function in humans may be influenced by PNMS.

## Thematic Oral 45

### BIAS IN COMPARISONS OF NEONATAL MORTALITY BASED ON VERY PRETERM BIRTHS

**Amelie Boutin**[1], **Sarka Lisonkova**[1], **Giulia Muraca**[2], **Razaz Neda**[1,2], **Shiliang Liu**[3], **Michael Kramer**[4], **KS Joseph**[1]
[1]University of British Columbia, [2]Karolinska Institutet, [3]Public Health Agency of Canada, [4]McGill University

**Introduction:**
Neonatal mortality among very preterm births (<32 weeks' gestation) is commonly compared between centres, between countries, and in studies of risk factors. Such studies can show unexpected results, e.g., infants of hypertensive mothers have lower mortality than infants of normotensive mothers, and infants of older mothers have lower mortality than infants of younger mothers. To demonstrate the bias inherent in such analyses (i.e., analyses restricted to the left side of intersecting perinatal mortality curves), we compared the results of studies of very preterm infants to those based on a complete cohort of live births.

**Methods:**
We included all singleton live births from the United States (2004-2015) and Canada (2013-2015) with a clinical estimate of gestation >24 and ≤43 weeks. Low-risk U.S. infants (born to mothers without hypertension or diabetes) were compared with those born to hypertensive women at 24-31 weeks and overall (24-43 weeks) using births-based and fetuses-at-risk denominators. Similar analyses of neonatal mortality in Canada vs the U.S. (2013-2015) were carried out to demonstrate the bias in international comparisons restricted to very preterm infants.

**Results:**
U.S. infants born to hypertensive mothers at 24-31 weeks had lower neonatal mortality than those born to low-risk mothers (56.9 vs 85.2 per 1000 live births; rate ratio [RR]=0.67, 95% CI 0.65-0.69). However, overall neonatal mortality was higher among those born to hypertensive vs low-risk women (3.5 vs. 1.9 per 1000 live births; RR=1.84, 95% CI 1.79-1.88), as was neonatal mortality at 24-31 weeks based on fetuses-at-risk denominators (2.17 vs. 0.80 per 1000 fetuses at risk; RR=2.72, 95% CI 2.64-2.80). Births-based neonatal mortality in Canada vs the U.S. at 24-31 weeks also resulted in biased findings (higher in Canada), while overall mortality, and fetuses-at-risk mortality at 24-31 weeks, was lower in Canada.

**Conclusions:**
Studies restricted to early preterm gestation biases inferences in comparative studies of neonatal mortality.

## Thematic Oral 46

### INTERPREGNANCY INTERVAL AND STILLBIRTH: A CAUSAL ANALYSIS OF THE DEMOGRAPHIC AND HEALTH SURVEYS

**Akshay Swaminathan**[1,2], **Deshayne Fell**[3,4], **Mark Walker**[1,4], **Daniel J Corsi**[1,3,4]
[1]Ottawa Hospital Research Institute, [2]Harvard College, [3]CHEO Research Institute, [4]University of Ottawa

**Introduction:**
The causal effect of short interpregancy interval on adverse pregnancy outcome has been debated. We used a large, international dataset to examine the effects of interpregnancy interval on subsequent risk of stillbirth.

**Methods:**
Data on reproductive histories of women were compiled from Demographic and Health Surveys conducted in 52 countries between 2002 and 2016. Stillbirth was defined as a baby born with no signs of life at or after 28 weeks' gestation (7 calendar months). Interpregnancy interval, or number of months from live (?) birth to next conception, was categorized as 0-5 months, 6-11 months, 12-17 months, 18-23 months, or ≥24 months. Linear probability regression models were used to compare the effect of interpregnancy interval within and between mothers.

**Results:**
We studied 354,333 pregnancies among 172,481 women with at least 2 deliveries within 80 calendar months of the survey. The mean age at first birth was 20.0 years (SD 3.7) and the mean interpregnancy interval was 17.5 months (SD 9.5). In the first interpregnancy interval, short intervals of 0-5 months and 6-11 months significantly increased the risk of stillbirth by 0.5% (95% CI 0.39-0.65, $p<0.0001$) and 0.29% (95% CI 0.19-0.40, $p<0.0001$), respectively, compared to an interval of 18-23 months adjusting for socioeconomic status and maternal age. These effects disappeared when considering subsequent intervals or when comparing pregnancies within mothers.

**Conclusions:**
Interpregnancy interval is of interest as a potential modifiable factor which can influence perinatal outcome. Although shorter first interpregnancy interval was associated with stillbirth, the effect was not robust in subsequent pregnancies or with different modelling approaches and may not be causally associated with risk of stillbirth.

## Thematic Oral 47

### IMPLICATIONS OF THE CHOICE OF SAMPLE POPULATION FOR THE DEVELOPMENT OF RISK PREDICTION MODELS FOR LONG-TERM OUTCOMES INCORPORATING PREGNANCY-RELATED PREDICTORS

**Sonia Grandi**[1,2], **Kristian Filion**[1,2], **Robert Platt**[1,2]
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**Introduction:**
To increase the utility of risk prediction models, the sample population used to develop the models should represent the population in whom the model is used in clinical practice. In perinatal epidemiology, the appropriate sample population for models of long-term outcomes incorporating pregnancy-related predictors is unclear since women have the potential to contribute more than one pregnancy during the follow-up period. Although various sampling methods are possible, their impact on the accuracy of predictions has not been investigated.

**Methods:**
Four sample cohorts are generated using plasmode simulations. The models in our simulations are developed for long-term risk of cardiovascular disease including obstetrical history.

**Results:**
The first cohort includes the first pregnancy per woman and predictors related to this pregnancy. The second cohort includes a random sample of pregnancies per woman obtained by a simple random sampling method to recreate the distribution of parity in the original population. Predictors for this cohort include characteristics of the current and prior pregnancies. The last two cohorts include all eligible pregnancies per woman. For the third cohort, the start of follow-up begins at the first pregnancy and ends at the start of the next pregnancy. Follow-up for all subsequent pregnancies continues until a future pregnancy, an event, or end of the study period, whichever occurs first. To account for the correlation between pregnancies, an accelerated failure time generalized estimating equation model is used. In the fourth cohort, the follow-up time for each pregnancy is not censored at the start of the subsequent pregnancy and continues until an event or end of the study period, allowing for the assessment of the impact of censoring and double counting events and follow-up time.

**Conclusions:**
The findings from this work highlight the need for careful consideration when choosing the sample population for development of pregnancy-related risk prediction models.

## Thematic Oral 48

### A COMPARISON OF MULTIPLE IMPUTATION PROCEDURES FOR HANDLING MISSING PRE-PREGNANCY WEIGHT IN THE ESTIMATION OF THE RISK OF GESTATIONAL DIABETES MELLITUS: A SIMULATION STUDY

**Mary Brown**, **Christy Woolcott**, **Stefan Kuhle**, **Bruce Smith**
Dalhousie University

**Introduction:**
Maternal pre-pregnancy weight (PPW) is an important determinant of maternal and child outcomes, but is often incompletely captured in perinatal registries. Multiple imputation (MI) is a widely used technique that

may be applied when PPW is missing. The objective of this study was to determine if data from earlier or later pregnancies could aid in the imputation process compared to information from the current pregnancy alone under various missing data mechanisms using simulation.

**Methods:**
We simulated missing at random (MAR) and missing not at random (MNAR) scenarios in 100 datasets of 5000 randomly selected women with complete data in their first two pregnancies from the Nova Scotia Atlee Perinatal Database. Under both scenarios, missingness in PPW depended on maternal smoking, marital status, urban residence, and delivery weight, while for MNAR, missingness also depended on PPW values themselves. MI was performed using i) information from the current pregnancy only, and ii) using information from both pregnancies. Pooled log odds ratio estimates for the association between PPW and gestational diabetes mellitus adjusted for confounding variables were obtained for each set of multiply imputed data. Bias was estimated relative to the original dataset.

**Results:**
Under MAR, both MI procedures resulted in minimal bias (2.3%) and had slightly less bias than the complete case analysis (2.6%). Under MNAR, MI using information from both pregnancies resulted in the least bias (2.3%) compared to MI using information from the current pregnancy (2.8%) and the complete case analysis (4.1%).

**Conclusions:**
MI outperformed the usual complete case analysis under both missing data mechanisms. MI using information from both pregnancies performed similarly to that using information from the current pregnancy under MAR, but using information collected in another pregnancy from the same woman in the imputation procedure seemed to mitigate some of the bias under MNAR.

# Detailed Poster Listings

## Poster 001

### MATERNAL VITAMIN B12 STATUS IN EARLY PREGNANCY IS ASSOCIATED WITH NEWBORN VITAMIN B12 STATUS, BUT NOT WITH BIRTH OUTCOMES

**Amy Tan**[1,2], **Theresa Schroder**[1,2], **Graham Sinclair**[1,2], **Andre Mattman**[1,3], **Hilary Vallance**[1,2],**Yvonne Lamers**[1,2]
[1]University of British Columbia, [2]BC Children's Hospital Research Institute, [3]St. Paul's Hospital

**Introduction:**
Maternal vitamin $B_{12}$ ($B_{12}$) status has been inversely associated with preterm birth (<37 weeks), low birth weight (LBW) (<2,500 grams) and small for gestational age (SGA) (birth weight <10$^{th}$ percentile), which are linked to morbidity and mortality across the lifespan. In Canada, 17-25% of pregnant women were classified as $B_{12}$ deficient (total $B_{12}$ <148 pmol/L) in early pregnancy; however, there is limited research on whether maternal $B_{12}$ status is associated with birth outcomes. We investigated the relationship between early pregnancy maternal $B_{12}$ status, and birth weight, birth head circumference (HC), gestational age at birth, and newborn $B_{12}$ status.

**Methods:**
A secondary analysis was conducted on 709 mother-newborn pairs in British Columbia (BC), Canada. Bio-banked first- and second-trimester maternal serum samples from the BC Prenatal Genetic Screening Program were quantified for total $B_{12}$, holotranscobalamin, methylmalonic acid (MMA) and total homocysteine. Neonatal $B_{12}$ status was assessed quantifying MMA in dried blood spots. Data on obstetric history and birth outcomes were obtained from the BC Perinatal Data Registry. All associations were assessed using multiple linear regression.

**Results:**
The cohort included healthy women of European (*n*=352) and South Asian (*n*=357) ethnicity with a median (IQR) age of 31 (28-34) years. The ratio of male:female newborns was 1:1. Median (IQR) birth weight and HC were 3,380 (3,086-3,691) g and 35 (34-36) cm, respectively. The incidence of preterm birth, LBW and SGA were 7% (*n*=46), 3% (*n*=20) and 5% (*n*=34), respectively. Although ~25% of women were classified as $B_{12}$ deficient and maternal $B_{12}$ status decreased between trimesters, maternal first- and second-trimester $B_{12}$ status were not associated with birth outcomes. However, maternal $B_{12}$ status was associated with newborn MMA concentration after adjusting for sex and maternal ethnicity ($p$<0.01).

**Conclusions:**
Early pregnancy maternal $B_{12}$ biomarker concentrations are associated with newborn $B_{12}$ status, but not with birth outcomes.

## Poster 002

### PREGNANCY CHANGES MATERNAL INTESTINAL BARRIER FUNCTION IN CONTROL AND OBESE MICE.

**Tatiane Ribeiro**, **Jessica Wallace**, **Patrycja Jazwiec**, **Erica Yeo**, **Deborah Sloboda**
McMaster University

**Introduction:**
Maternal obesity impairs maternal adaptation to pregnancy and confers an increased risk to both the mother and the fetus. We have shown that obesity during pregnancy results in alterations in maternal gut microbial

profiling and may influence maternal gut function. The relationship between intestinal gut barrier function and metabolism has become an important factor to understanding microbial – host interactions. But little is known about maternal intestinal barrier integrity during pregnancy. This study aimed to determine 1) the impact of pregnancy on maternal intestinal barrier integrity and 2) maternal intestinal barrier integrity in the context of maternal obesity.

**Methods:**
Females were fed either a control (17%kcal fat) or a high fat diet (60%kcal fat, HFD) for 6wks prior to and during pregnancy until endpoint measures. Intestinal barrier integrity in non-pregnant and pregnant (at embryonic day (E) 14.5 and E18.5) mice (n=15 per group) was tested using *in vivo* experimentation (fluorescently labelled-4kDa (FITC-Dextran) to understand how pregnancy changes intestinal barrier function in control and obese pregnant mice. Animals were gavaged with 80mg/kg FITC-Dextran and blood samples collected before gavage and at 1; 2; 3 and 4 hours after FITC-Dextran gavage.

**Results:**
At term gestation (E18.5) in control fed mice, maternal intestinal barrier integrity was decreased compared to non-pregnant female. This outcome was not apparent at E14.5. High fat diet induced obesity modestly decreased barrier function in non-pregnant females and pregnant females at E14.5, although at E18.5, this effect was magnified, suggestive of a pregnancy x diet interaction on intestinal barrier function.

**Conclusions:**
We conclude that pregnancy appears to decrease maternal intestinal barrier function, but only at term gestation and maternal high-fat diet induced obesity exacerbates this intestinal adaptation. Ongoing studies will evaluate tight junction proteins in maternal intestinal tissues.

## Poster 003

### ALTERATIONS IN CARDIOVASCULAR ADAPTATION DURING EXERCISE IN YOUNG ADULTS BORN PRETERM

**Amy Al-Simaani**, **Muhammad Oneeb Rehman Mian**, **Jacques Delfrate**, **Anik Cloutier**, **Valérie Orlando**, **Daniel Curnier**, **Anne Monique Nuyt**, **Thuy Mai Luu**
CHU Sainte-Justine Research Center

**Introduction:**
Preterm-born young adults (PTYA <29 weeks of gestation) exhibit reduced aerobic exercise capacity. Exercise limitation may be due to an alteration of the systems responsible for oxygen supply. At rest, PTYA present structural and functional abnorMalities of the cardiopulmonary system compared to full-term (T) subjects. However, adaptive cardiac changes during exercise in PT have not yet been studied. We hypothesized that altered cardiac adaptive changes during exercise contribute to the limitation of exercise capacity in PTYA.

**Methods:**
43 PTYA and 43 term (T) matched for sex, age, race and education level underwent standardized cardiopulmonary exercise testing. Stroke volume (SV), end diastolic volume (EDV), cardiac output (CO) index, heart rate (HR), systemic vascular resistance index (SVRI), contractility index (CTI) were measured using the Physioflow system. Paired t-test was done for group comparison (mean±SD).

**Results:**
All cardiac parameters were indexed for body surface area, which was lower in PTYA than T (1.8±0.2 vs

1.7±0.2m$^2$). At baseline, PTYA had lower SV (58±16 vs 62±14mL) and EDV (88±13 vs 94±19mL). During warm up, PTYA exhibited lower SVRI (1540±416 vs 1890±148Dyns/cm$^5$m$^2$) and higher CTI values (241±113 vs 222±106 L/min/m$^2$). At peak exercise, there was no difference in HR, SVRI, CTI, and blood pressures. Recovery of SV, SVRI and CTI appeared slower in PTYA. SVRI remained depressed (1385±415 vs 1704±783Dyns/cm$^5$m$^2$) and CTI elevated (288±145 vs 247±129L/min/m$^2$) after monitored active and passive recovery. However, throughout exercise and at recovery, none of the findings were statistically significantly different between groups.

**Conclusions:**
Our study did not identify significant differences in cardiac adaptation during warm-up and recovery that could have contributed to exercise limitation in PTYA. Integration of all systems involved in oxygen transport and use during exercise is necessary to understand mechanisms underlying reduced exercise capacity following preterm birth, which is likely multifactorial and require multiple targets for intervention.

## Poster 004

### EFFECT OF PERINATAL IRON DEFICIENCY ON NEONATAL CARDIAC MITOCHONDRIAL FUNCTION

**Claudia Holody**, **Andrew Woodman**, **Rowan Carpenter**, **Hélène Lemieux**, **Stéphane Bourque**
University of Alberta

**Introduction:**
Iron deficiency (ID) during gestation can predispose offspring to non-communicable disease in later life. An estimated 38% of women worldwide will develop anemia throughout pregnancy, thus ID likely significantly contributes to the global burden of chronic disease. Given that iron is essential for oxygen transport and a component of the electron transport system, we hypothesized that perinatal ID would permanently alter cardiac mitochondrial function through the neonatal period.

**Methods:**
Female rats were fed either an iron-restricted diet (3-10 mg/kg) or an iron-replete diet (35 mg/kg) before and during pregnancy. At birth, all dams were fed the iron-replete diet. At post-natal days (PD) 1, 14, and 28, hearts from male and female offspring were collected. Electron transport system and fatty acid β-oxidation capacities were assessed in permeabilized cardiac fibers using High-Resolution Respirometry. Data were analyzed by 2-way ANOVA for the effects of iron-restriction and PD with Tukey's post hoc test.

**Results:**
Hemoglobin levels were reduced in ID pups at PD 1 ($P<0.001$) and PD 14 ($P<0.05$), but not at PD 28 ($P>0.05$). Body weights of ID pups were reduced at all ages compared to control pups ($P<0.05$). Heart weight relative to body weight was larger in ID pups at all ages ($P<0.001$). Mitochondrial respiration ($O_2$ flux per fiber mass) increased with age; flux control ratios suggest this may be due to differences in mitochondrial content. Overall, mitochondrial respiration was similar between ID and control groups. However, ID females showed an increased capacity to oxidize medium vs. long chain fatty acids ($P=0.006$) compared to controls. A similar trend was observed in male offspring ($P=0.08$).

**Conclusions:**
Perinatal iron deficiency is associated with minor changes in cardiac mitochondrial function compared to other tissues (i.e. kidney, liver), albeit energy substrate utilization may be altered.
This work is funded by CIHR and the Women and Children's Health Research Institute.

## Poster 005

### POSTNATAL CATCH-UP GROWTH IN LOW PROTEIN IUGR OFFSPRING LEADS TO ELEVATED HEPATIC P66SHC: MECHANISM OF MITOCHONDRIAL OXIDATIVE STRESS?

**Shelby Oke**[1,2,3], **Daniel Hardy**[1,2,3,4,5]
[1]Department of Physiology and Pharmacology, [2]Children's Health Research Institute, [3]Western University, [4]Department of Obstetrics and Gynaecology, [5]Lawson Health Research Institute

**Introduction:**
Maternal protein restriction (MPR) can promote asymmetrical intrauterine growth restriction (IUGR), culminating in reduced birth weight and liver to body weight ratio. Studies suggest an inverse relationship between birth weight and long-term metabolic outcomes, while postnatal catch-up growth exacerbates this relationship. The adaptor protein p66shc is implicated in biological processes contributing to mitochondrial dysfunction; however, its role in mediating the dysmetabolism in MPR offspring has not yet been investigated. We hypothesize that altered p66shc expression will contribute to hepatic mitochondrial dysfunction in MPR offspring exclusively with catch-up growth.

**Methods:**
Pregnant rat dams were fed a control (20%) protein diet or a low protein (LP, 8%) diet throughout gestation. Pups born to control mothers were fed a control diet, while pups born to MPR mothers remained on a LP diet (LP1) or received a control diet post-weaning (LP2) or at birth (LP3). Hepatic mRNA and protein abundance were assessed via qRT-PCR and western immunoblotting, respectively.

**Results:**
P66Shc and Pin1 protein abundances were significantly increased exclusively in LP2 offspring at postnatal day (PND) 130 ($p<0.001$ and $p<0.05$). These offspring also exhibited significantly increased superoxide dismutase (SOD) 1 ($p<0.05$), SOD2 ($p<0.01$) and phosphorylated pyruvate dehydrogenase protein abundance ($p<0.01$), indicating mitochondrial oxidative stress. In addition, LP2 offspring demonstrated significantly decreased succinate dehydrogenase ($p<0.0001$) and citrate synthase ($p<0.001$) protein abundances at PND 130, suggesting impaired aerobic metabolism.

**Conclusions:**
Our results suggest that p66Shc may act as a regulator of impaired mitochondrial function in MPR offspring with catch-up growth. Given that these trends are exclusive to LP2 offspring, it appears that a LP diet during perinatal life, a period of liver plasticity, followed by catch-up growth is detrimental to aerobic metabolism. Overall, our data suggests that timing of nutritional restoration for IUGR offspring in postnatal life could influence long-term hepatic metabolism via modulation of mitochondrial function.

## Poster 006

### FETAL ALCOHOL SPECTRUM DISORDER, SUBSTANCE USE AND MENTAL HEALTH: RESULTS FROM THE NATIONAL FASD DATABASE

**Jocelynn Cook**[1,2,3], **Kathy Unsworth**[1]
[1]The Canada FASD Research Network, [2]Society of OBGYNs of Canada, [3]The University of Ottawa

**Introduction:**
Despite the well-documented teratogenic effects, prenatal alcohol and polysubstance use exposure during pregnancy is still prevalent in Canada. The National Fetal Alcohol Spectrum Disorder (FASD) Database captures patient-level data on substance use, neurodevelopment and secondary issues. The study describes

the characteristics of individuals with FASD who have co-occurring mental health concerns, as well as prenatal exposure to other substances, where these my contribute to risk for adverse health outcomes later in life.

**Methods:**
Participating Canadian FASD diagnostic clinics completed an online questionnaire for each patient assessed. Data was collected, including functional diagnoses and management recommendations. Based on 1139 records from 26 clinics, descriptive analyses were used to describe individuals prenatally exposed to alcohol and other substances, as well as the frequency of substance use and mental health concerns among individuals with FASD.

**Results:**
666 individuals (58%) were diagnosed with FASD. Many of those with FASD were prenatally exposed to other substances; nicotine (42.3 %), cannabis (30.8 %) and cocaine (17.2%). The prevalence of mental health disorders among those with FASD were higher than those in the general Canadian population, with almost 20% having a mood disorder, 10% with conduct disorder and 5.6% with Autism. Among adolescents/adults with FASD, 51% had anxiety and 57% were experiencing substance use themselves. Prenatal exposure to cannabis, in particular, seems to have an additive negative effect on the function of nine brain domains.

**Conclusions:**
Individuals who have been prenatally exposed to alcohol have also likely been exposed to other substances, which can act together to increase risk for mental health and substance use disorders later in life. Understanding the complexities of prenatal exposures changes the way we think about the prevention of FASD and supporting women to have a healthy pregnancy.

## Poster 007

### ENVIRONMENT, NOT PSYCHOLOGICAL RESILIENCE, AFFECTS FOOD SECURITY AND DIET QUALITY DURING PREGNANCY: NEW DATA FROM THE MOTHERS TO BABIES HAMILTON STUDY

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[1]McMaster University, [2]Southampton University

**Introduction:**
Twelve percent of Canadian households experience food insecurity, wherein financial barriers prevent members from eating appropriate foods. In managing food insecurity, mothers are more likely than other household members to eat poor quality diets. Most Canadian mothers give birth more than once; therefore, food insecurity can impact intra-partum preconception and pregnancy nutrition, with negative downstream consequences for maternal-child health. Seeking to identify ways to mitigate this, we investigated food insecurity, diet quality, and potentially-related/mediating factors in pregnant Canadians.

**Methods:**
We used data from 283 respondents to the Mothers to Babies survey, our health/nutrition survey of pregnant women living in Hamilton, Ontario, to assess: 1) whether respondents experience food insecurity, 2) if food insecurity is associated with poor pregnancy diet quality, and 3) whether a main factor (psychological resilience) mediating between diet quality and food insecurity in other populations does so in the context of pregnancy in Canada. A $\chi^2$ test compared respondents' likelihood of reporting poor diet quality by food security category. We then fit a structural equation model (SEM) with diet quality as the outcome, maternal socio-economic characteristics as indicators of environment influencing food security (i.e. latent predictors), food insecurity score as main predictor, and psychological resilience score as hypothesized mediator.

**Results:**
Poor diet quality, characterizing 23% of respondents, was associated with food insecurity, characterizing 16% ($\chi^2$=1081, p=0.003). SEM coefficients suggest: environment influences food insecurity (β=0.37, p=0.000). Food insecurity (β=-0.21, p=0.001) and psychological resilience (β=0.20, p=0.000) affect diet quality. However, psychological resilience does not mediate between food insecurity and diet quality (β=-0.09, p=0.121).

**Conclusions:**
Food insecurity negatively affects pregnancy diet in Hamiltonian women, independent of maternal resilience. This suggests that, to improve food security, diet quality and, ultimately, health outcomes for mothers and developing children, we should focus on enriching mothers' socio-economic environments rather than on boosting resilience.

## Poster 009

### EXPLORING THE EARLY DEVELOPMENT OF THE PRETERM GUT MICROBIOME

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**Introduction:**
Preterm infants experience significant disturbances in the early development of gut microbial communities compared to full term infants, and these disturbances may play a role in the development of metabolic diseases in adulthood. We hypothesize that postmenstrual age (PMA) is an important driver of gut microbiome composition, and that samples collected at the same PMA will be more similar between early preterm (EP: born <32 weeks gestation) and late preterm (LP: 32-<37 weeks) infants than samples collected at the same postnatal age.

**Methods:**
After enrollment in the Baby & Pre-Mi pilot study, diapers containing stool were collected from 28 EP infants and 29 LP infants during hospitalization, and again at study visits that took place at term (40 weeks PMA). Bacterial DNA from stool samples was sequenced using the Illumina platform. Alpha diversity (diversity within samples), beta diversity (diversity between samples), and relative taxa abundance were compared between EP and LP infants at week 1 and week 2 of age, and at term.

**Results:**
15, 22, and 23 samples were collected from EP infants at week 1, week 2, and term, respectively, while 27, 16, and 17 samples were collected from LP infants. Comparisons at week 2 of life between the preterm cohorts found that LP infants had significantly higher alpha diversity. Significant differences in beta diversity were also reported at week 2 ($R^2$=0.09, p<0.01), as seen in *Table 1.0* (attached). By term, no significant differences were seen in diversity metrics, and stool samples were dominated by *Clostridiaceae*, *Bifidobacterium*, and *Escherichia*.

**Conclusions:**
Our research shows that there appears to be early differences in microbiome composition between EP and LP infants that are not present at term. Future work is needed to identify and characterize developmental patterns in colonization related to postmenstrual age within early and late preterm infants.

**Table 1.0:** Preterm characteristics an in-hospital and at term and alpha and beta diversity measures at week 1, week 2, and term.

| | | Early Preterm | Late Preterm |
|---|---|---|---|
| Delivery Mode | Vaginal delivery without intrapartum antibiotic (IAP) | 5/28 (18%) | 8/29 (28%) |
| | Vaginal with IAP | 6/28 (21%) | 6/29 (21%) |
| | Caesarean section | 17/28 (61%) | 15/29 (52%) |
| Antibiotic exposure | In-hospital | 23/28 (82%) | 6/29 (14%) |
| | Term | 1/23 (4%) | 1/17 (6%) |
| Breastmilk exposure | In-hospital | 28/28 (100%) | 26/29 (90%) |
| | Term | 17/23 (74%) | 15/17 (88%) |
| Species Richness (Alpha Diversity) | Week 1 | 17.44 (12.14-22.85) | 16.44 (11.04-20.81) |
| | Week 2 | 14.50 (11.35-18.19)** | 17.69 (15.25-21.67) |
| | Term | 27.17 (21.77-30.73) | 24.76 (21.77- 25.90) |
| Bray-Curtis dissimilarity matrices with PERMANOVA (Beta Diversity) | Week 1 | $R^2 = 0.03$, $p = 0.08$ | |
| | Week 2 | $R^2 = 0.09$, $p > 0.01$** | |
| | Term | $R^2 = 0.03$, $p = 0.29$ | |

Categorical variables are presented as n (%). Alpha diversity (species richness) is reported as median (25th–75th percentile) and comparisons were made between EP and LP using Mann-Whitney, with ** denoting a significant difference compared to LP ($p<0.05$). Beta diversity (Bray-Curtis with Permutational multivariate analysis of variance) is reported with the $R^2$ value and p value, and ** denotes significant differences between preterm cohorts.

## Poster 010

### PERINATAL IRON-DEFICIENCY AND A HIGH-SALT DIET CAUSE LONG-TERM SEX-DEPENDENT HYPERTENSION, RENAL MITOCHONDRIAL DYSFUNCTION AND OXIDATIVE STRESS

**Andrew Woodman**, **Richard Mah**, **Danae Keddie**, **Ronan Noble**, **Sareh Panahi**, **Ferrante Gragasin**, **Helene Lemieux**, **Stephane Bourque** (University of Alberta)

**Introduction:**
Iron deficiency (ID) during gestation can alter growth and developmental trajectories, increasing offspring risk of developing cardiovascular disease. Here, we studied the effects of perinatal ID on blood pressure, kidney mitochondrial function and reactive oxygen and nitrogen species levels in adult offspring. Furthermore, we sought to determine whether these effects are exacerbated by chronic consumption of a high-salt diet — a common cardiovascular stress in developed nations.

**Methods:**
Sprague Dawley rats were fed an iron-replete (control; CTL) or low-iron diet (ID) 2wk before and throughout pregnancy. Following parturition, all dams and offspring were fed an iron-replete diet. At 4.5 months of age, ID and CTL offspring were fed either normal-salt (NS; 0.26% NaCl w/w) or high-salt (HS; 5% NaCl w/w) diets for 6wk prior to experimentation. Direct blood pressure measurements were made with indwelling catheters under anesthesia. Following euthanasia, kidney medullary and cortical homogenates were prepared for mitochondrial respirometry (Oroboros Oxypgraph-2k). Renal superoxide and nitric oxide (NO) were assessed by dihydroethidium and DAF-FM-diacetate fluorescence, respectively.

**Results:**
Perinatal ID caused 52% decreases in newborn offspring hemoglobin. Systolic blood pressure was increased

in male, but not female, offspring by both ID (P=0.01) and HS (P=0.02) at 6mo. Male offspring medulla exhibited increased respiration due to HS (P<0.05), and reduced succinate-dependent respiration through complex II due to ID (P<0.05). Complex IV activity was reduced by the combination of ID and HS in the cortex of male offspring ($P_{int.}$=0.03). Perinatal ID increased superoxide (P<0.001) concomitant with decreased NO (P<0.001) in the medulla and cortex in male offspring, whereas HS further increased superoxide in the cortex (P=0.04). Female offspring exhibited no alterations in mitochondrial respiration or oxidative stress.

**Conclusions:**
Perinatal ID and a HS-diet cause sex-dependent renal mitochondrial dysfunction and oxidative stress, which is associated reductions in NO bioavailability and hypertension in male offspring.
Funding: CIHR and WCHRI

## Poster 011

### EFFECT OF MATERNAL ANTIOXIDANT (NMITOQ) TREATMENT ON CARDIAC FUNCTION IN ADULT OFFSPRING EXPOSED TO PRENATAL HYPOXIA

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**Introduction:**
Fetal hypoxia is a major consequence of complicated pregnancies that affects fetal programming *in utero* and results in pathological cardiac remodeling in adult life. We have previously shown that hearts of adult males from hypoxic pregnancies display enhanced susceptibility to ischemia/reperfusion (I/R) injury and reduced cardiac mechanical performance. To improve fetal outcomes from complicated pregnancies we are assessing early interventions based on treating the placenta (preventing off-target fetal effects) using specific nanoparticles loaded with mitochondrial antioxidant (nMitoQ). We hypothesized that nMitoQ treatment decreases cardiac susceptibility to I/R injury in adult offspring from hypoxic pregnancies.

**Methods:**
Pregnant Sprague-Dawley rats were exposed to normoxia (21% $O_2$) or hypoxia (11% $O_2$) from gestational day (GD) 15 to GD21 and intravenously injected with saline or nMitoQ (125 μM) on GD15. Female and male offspring were aged for 4 months. Susceptibility of the hearts to a 20 min. ischemic insult was measured with the *ex vivo* isolated working heart technique. The cardiac β/α myosin heavy chain (MHC) ratio (a marker of mechanical performance) was analyzed by Western blotting.

**Results:**
Preliminary data shows that prenatal hypoxia tended to increase β/α MHC ratio in male offspring (p=0.064; n=5) while nMitoQ treatment did not have an effect. In male offspring, pre-ischemic cardiac power was not different, while nMitoQ treatment increased cardiac power during reperfusion in the hypoxic group only (interaction between nMitoQ treatment and hypoxia: p=0.04; n=2-7). No changes were observed in female offspring.

**Conclusions:**
In line with our previous studies, our preliminary data showed that hypoxia tended to decrease cardiac mechanical performance in the male hearts. nMitoQ treatment improved cardiac power after ischemic insult in male hypoxic offspring only. This suggests that nMitoQ treatment offers potential to improve fetal outcomes from complicated pregnancies in a sexually dimorphic manner. Further studies are needed to increase n-numbers.

## Poster 012

### HIGH PREVALENCE OF CHILDHOOD TRAUMA IN PARENTS RECEIVING PERINATAL CARES: A CALL FOR TRAUMA-INFORMED PRACTICES

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**Introduction:**
Childhood abuse and neglect (CAN) have long lasting consequences that may be triggered or exacerbated by demanding life-transitions such as expecting a child. This study aimed to evaluate the prevalence of CAN in expecting parents receiving perinatal cares and to evaluate whether a dose-effect association is observed between the complexity of CAN and mental health during pregnancy.

**Methods:**
Participants (n=1079; 71.14% women) were recruited in prenatal classes and services for high-risk mothers. They completed, during the third trimester of pregnancy, the Childhood Trauma Questionnaire assessing 5 types of CAN before 18 years old. A subsample of 329 participants also completed self-report measures of depression, post-traumatic stress disorder, dissociation and personality disorders.

**Results:**
34% of pregnant women and 31% of expecting fathers from the general population reported having experienced at least one type of CAN before 18 years old. Prevalence of CAN was much higher for participants from the high-risk population (63%). The severity of all mental health problems was correlated with the number of different types of CAN participants have experienced. ANCOVAs controlling for confounding variables showed that adults exposed to multiple types of CAN differed from participants without CAN in terms of PTSD ($p$<.001,95% CI[7.40,15.49]), personality disorders ($p$<.001,95% CI[7.84,16.34]), dissociation ($p$=.003,95% CI[1.86,8.89]) and depression ($p$<.001,95% CI [0.94, 4.02]). Expecting parents exposed to multiple types of CAN reported more clinical features of personality disorders ($p$=.02,95% CI[.79,10.95]) and more severe symptoms of dissociation ($p$<.0,01,95% CI[1.86,8.89]) than participants with one type of CAN.

**Conclusions:**
The prevalence of CAN in parents participating to perinatal services is high in the general population and alarming in high-risk population. Results suggest that the severity of exposure to CAN is associated with the severity of mental health problems in expecting adults. The presentation will discuss the implications of the results for perinatal practice using the paradigm of trauma-informed cares.

## Poster 013

### FETAL PROGRAMMING OF ADRENAL PNMT AND ADULT HYPERTENSION BY GLUCOCORTICOID EXPOSURE IS DOSE DEPENDENT AND SEX SPECIFIC

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**Introduction:**
Biochemical changes *in utero* may alter normal fetal development, resulting in disease later in life, a phenomenon known as fetal programming. Epidemiological studies link fetal programming to negative health outcomes, such as low birth weight and hypertension in adulthood. Here we studied the molecular changes triggered by prenatal glucocorticoid (GC) exposure on the development of hypertension, and on the regulation of phenylethanolamine N-methyl transferase (PNMT), the enzyme responsible for biosynthesis of epinephrine, and a candidate gene linked to hypertension.

**Methods:**
Pregnant Wistar-Kyoto (WKY) dams were injected with 10, 50 or 100mg/kg/day of DEX in the third trimester. Blood pressure and weights of the offspring were measured from week 3-18, at which point the animals were sacrificed and tissues collected. Total RNA was extracted from the adrenal glands, and the expression of PNMT, its regulatory transcription factors (Egr-1, GR, Sp1 and Ap2), and other stress sensitive genes were analyzed by qRT-PCR.

**Results:**
Our data suggests that prenatal stress programs increased expression of PNMT and altered regulation of PNMT in males and females. Importantly, we identified that DEX mediated programming was more apparent in males, and a lower dose of 10*μ*g/kg/day of DEX did not lead to changes in blood pressure (BP) in females suggesting that this dose is safe and below the threshold required for programming of hypertension. Transcriptional regulators Egr-1, GR, Sp1 and Ap2 were altered in a sex and dose dependent manner. The expression of stress-sensitive genes was also altered.

**Conclusions:**
Prenatal exposure to dexamethasone leads to elevated blood pressure in adult rats. The increase in adrenal PNMT in prenatally stressed rats is dose, and sex dependent. Sex-specific differences were observed in gene expression and programming mechanisms that may account for hypertension in males.

## Poster 015

### UNRAVELLING THE MECHANISMS OF STRESS RESILIENCE: RECURRENT ANCESTRAL STRESS ALTERS SEX-SPECIFIC GENE EXPRESSION PROFILES IN ADULT RATS

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**Introduction:**
Adverse experiences in early life “program” brain development and behaviour differently in males and females. Recent findings showed that the recurrent stress in a multigenerational prenatal stress (MPS) rat model promotes the development of stress resilience. The complex nature and mechanisms of stress resilience are still poorly understood. Here we investigated the impact of MPS on gene expression in male and female rats of the fourth generation.

**Methods:**
This research involved fourth (F4) generation males and females derived from a rat lineage of multigenerational prenatal stress (MPS) in which their mothers (F3), grandmothers (F2), great-grandmothers (F1), and great-great-grandmothers (F0) were stressed during pregnancy (gestational days 12-18). A non-stress lineage served as control. Genome-wide profiling of the frontal cortex was performed by Illumina GAIIx genomic analyzer at 6 months of age.

**Results:**
Global unbiased deep sequencing revealed that MPS altered the expression of 55 genes in males and 136 genes in females when compared to non-stressed controls. In both males and females MPS altered MAP-K pathway regulating genes and neuronal plasticity genes. Higher expression of MAPK was seen in MPS males but not in MPS females. Additionally, the PDX3 gene involved in immunity was upregulated in MPS males but downregulated in MPS females. MPS also increased expression of SSRM2 and EGFR involved in DNA methylation and miRNA patterns in males but not in females. Genes such as NPAS2 and NMB involved in protein translation and metabolic function were found to be upregulated in females.

**Conclusions:**
Ancestral stress results in sex-specific gene expression patterns. The findings show that MPS regulates pathways that are vital for brain development, immunity and neuroplastic adaptation. These findings shed light

on how the (epi)genome regulates biological processes involved in stress regulation and neural adaptation.

## Poster 016

### ASSESSING HAIR CORTISOL CONCENTRATION IN MOTHERS AND THEIR NEWBORNS USING ON-LINE SOLID PHASE EXTRACTION LIQUID CHROMATOGRAPHY TANDEM MASS SPECTROMETRY (SPE LC-MS).

**Catherine Herba**[1,2], **Sonia Lupien**[3], **Jean Séguin**[2,3], **Clemens Kirschbaum**[4], **Vivette Glover**[5], **Gabriel Shapiro**[6], **Sarah Lippé**[2], **Gina Muckle**[7], **Cathy Vaillancourt**[8], **Natalie Castellanos-Ryan**[2,3], **William Fraser**[9]
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**Introduction:**
Hair cortisol concentration (HCC) uniquely provides a measure of stress response over months. Very few studies have assessed HCC in newborn babies and their mothers. However, such investigation would provide insights as to the fetal stress response in the final months of gestation and associations with mothers' stress response. This study aimed to (a) assess the feasibility of measuring HCC in newborn hair using the on-line solid phase extraction liquid chromatography tandem mass spectrometry (SPE LC-MS); (b) examine associations with maternal HCC reflecting the same period (final trimester of pregnancy).

**Methods:**
Analyses were conducted within the context of the 3D (Design, Discover Develop) pregnancy cohort and biobank. Hair samples were collected within 48 hours of delivery.HCC was analysed using SPE LC-MS following a procedure reported by Gao et al., 2013. Data were available for 609 mothers and 575 newborns. HCC data were log-transformed. Descriptive analyses were conducted and we examined correlations between mothers' and newborns' HCC levels.

**Results:**
The mean weight of newborn hair was 2.86mg; min = 0.10; max = 7.90. Mean (untransformed) scores for newborn HCC (146.22 pg/mol, SD=202.86) were higher than for mothers (17.70 pg/mol, SD=139.90). Maternal HCC was not significantly correlated with newborn HCC (r=0.024, p=0.58).

**Conclusions:**
Findings highlight the feasibility of assessing cortisol in hair specimens of newborns. No associations were found between mother's HCC and their newborn's HCC. Further work could examine these measures further by also studying the role of the placenta. Findings could contribute to a better understanding of how mothers' pregnancy stress may affect her developing fetus.

## Poster 017

### IS VITAMIN D DEFICIENCY COMMON IN PREGNANCY? RESULTS FROM THE BE HEALTHY IN PREGNANCY STUDY IN SOUTHERN ONTARIO.

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[1]McMaster University, [2]Western University

**Introduction:**
To assess vitamin D status in Canadian women in early and late pregnancy we aimed to: 1) measure serum 25(OH)D for the $D_2$ and $D_3$ isomers; 2) identify the significant contributors to vitamin D status across pregnancy.

**Methods:**
Healthy pregnant women enrolled in the Be Healthy in Pregnancy RCT (Southern Ontario, Canada) (NCT01689961) were assessed for vitamin D status (25(OH)$D_2$ and $D_3$ by LC-MS/MS) and intake (3-day diet and supplement record by Nutritionist Pro) at 12-17 and 36-38 weeks gestation.

**Results:**
In 187 women (88% Caucasian, mean pre-pregnancy BMI 24.4 kg/m$^2$ (17.4-39.6 kg/m$^2$)), vitamin D status (Table) was adequate for the majority, but higher at the end compared to early pregnancy, with 22% exceeding the upper cut-off of 125 nmol/L. The 25(OH)$D_2$ isomer was detected in 15% of women, averaging 0.7 ± 2.4 nmol/L. Total vitamin D intake increased from early to late pregnancy (Table) and met the Estimated Average Requirement (400 IU/d) for 83-87% of women and exceeded Upper Level (4000 IU/d) in 1-2%. Prenatal vitamin supplements contributed the majority of intake (Table) with 22% women also consuming a separate vitamin D supplement. Primary food sources of vitamin D in early versus late pregnancy were milk (39% vs 54%) and animal products (31 % vs 22%). In adjusted multivariate analyses, supplement intake (β:0.008, 95%CI(0.0; 0.1), p<0.001) and summer season (14.56 (7.4; 21.7), p<0.001) in early pregnancy, and supplement intake (0.005 (0.0; 0.0), p=0.04), summer season (22.81 (14.0; 31.6), p<0.001) and yogurt intake (0.15 (0.0; 0.3), p=0.003) in late pregnancy were positively associated with maternal vitamin D status.

**Conclusions:**
The adequate intakes and status for vitamin D achieved by the majority of women in Southern Ontario was associated with sun exposure, supplement use and yogurt intake. Reliance on prenatal and vitamin D supplements led to elevated 25(OH)D in some women.

| | Vitamin D status | | Vitamin D intake | | | | |
|---|---|---|---|---|---|---|---|
| | 25(OH)D | | Total intake | Food intake | | Supplement intake | |
| Timepoint | (nmol/L) mean (SD) | % women with adequate status (25(OH)D ≥ 50 nmol/L) | (IU/D) Median (Q1, Q3) | (IU/D) Median (Q1, Q3) | % of total intake | (IU/D) Median (Q1, Q3) | % of total intake |
| **Early pregnancy** 12-17wk gestation | 82.5 (22.5) | 89 | 586 (459, 860) | 130 (79, 238) | 23 | 400 (400, 600) | 77 |
| **Late pregnancy** 36-38wk gestation | 103.1 (29.3) * | 75 | 689 (544,974)* | 230 (136,369)* | 36 | 400 (400, 600) | 64 |

** Indicates significance at p<0.05 by paired t-tests*

## Poster 018

### HEALTH-RELATED QUALITY OF LIFE IN YOUNG ADULTS BORN VERY PRETERM

**Elisabeth Bernard**[1,2], **Adrien Flahault**[2,3], **Catherine Fallaha**[2], **Camille Girard-Bock**[2,3], **Anik Cloutier**[2,3], **Nathalie Alos**[1,2,3], **Melanie Henderson**[1,2,3], **Jean-Luc Bigras**[1,2], **Anne Monique Nuyt**[1,2,3], **Thuy Mai Luu**[1,2,3]
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**Introduction:**
A growing number of individuals born very preterm (PT) are now entering adulthood and display risk factors for chronic health diseases. Whether risk of chronic health diseases affects health-related quality of life (HR-QoL) remains undetermined. This study aimed to assess HR-QoL in PT adults versus term-born controls (T) and correlate HR-QoL with markers of organ dysfunction.

**Methods:**
Eighty-eight PT (≤29 weeks' gestational age) and 88 age- and sex-matched T (37-41 weeks) were recruited. They completed the Short-Form 36 Health Survey (SF-36), a 36-item questionnaire evaluating 8 health

domains and yielding two main scores: the physical (PCS) and mental (MCS) component summary. Participants underwent a comprehensive assessment of respiratory, cardiovascular, metabolic and renal health to identify presence of organ dysfunctions. Wilcoxon Rank Sum Test was performed for group comparisons. Mixed model analysis was used to account for matching and determine factors associated with HR-QoL.

**Results:**
Median gestational age in PT was 27.3 weeks (IQR 2.3). Sixty percent and 53% of PT and T, respectively, displayed ≥2 organ dysfunctions (P=0.50). No group difference in median PCS or MCS was detected [PCS: PT=57.1(5.6), T=56,4(6,7), P=0.11; MCS: PT=49,3(14,9), T 50(12,1), P=0.48] in unadjusted model. However, after accounting for matching, both PT (P=0.008) and having ≥2 organ dysfunctions (P=0.046) were independently associated with a reduction on PCS.

**Conclusions:**
Factors beyond organ dysfunctions affect QoL related to physical functioning in young adults born preterm. Understanding these can improve targeted intervention to improve QoL.

## Poster 019

### EXPOSURE TO Δ9-TETRAHYDROCANNABINOL DURING RAT PREGNANCY LEADS TO IMPAIRED FETAL GROWTH AND POSTNATAL CARDIAC DYSFUNCTION

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**Introduction:**
Approximately ~20% of pregnant women (18-24 years) continue to use cannabis in pregnancy. Clinical studies suggest that cannabis use in pregnancy leads to impaired fetal growth, but the long-term effects on cardiac function in the offspring are unknown despite the fact that fetal growth deficits are associated with an increased risk of developing cardiovascular disease in postnatal life. While animal studies have shown that maternal exposure to Δ9-tetrahydroocannabinol (Δ9-THC, the major psychoactive ingredient in cannabis) can decrease fetal growth, to date little is known about its effects on cardiac function in the offspring. Therefore, we hypothesize that maternal exposure to Δ9-THC during pregnancy will impair fetal development and resulting in cardiac dysfunction in postnatal life.

**Methods:**
Pregnant Wistar rats were exposed to 3 mg/kg Δ9-THC *i.p.* daily during gestation (gd 6-22) followed by echocardiogram analysis of cardiac function at postnatal day 1 and 21. Heart tissue was collected at both time points for assessment of cardiac remodeling and endoplasmic reticulum (ER) stress.

**Results:**
Exposure to Δ9-THC during pregnancy led to fetal growth restriction with a disproportional decrease in cardiac growth. This was accompanied by higher neonatal heart rate and lower stroke volume at birth. By three weeks this culminated in greater left ventricle anterior wall (LVAW) thickness (at systole), along with decreased fractional shortening, stroke volume, and cardiac output. Moreover, these Δ9-THC exposed offspring exhibited augmented cardiac Δ-MHC expression and endoplasmic reticulum (ER) stress (*e.g.* higher Chop levels), associated with cardiac remodeling.

**Conclusions:**
Collectively, these data suggests that maternal exposure to Δ9-THC during pregnancy impedes fetal growth and resulting in impaired postnatal heart function in early life. Furthermore, the increased ER stress associated with catch-up growth at 3 weeks may mediate the cardiac remodeling observed. Further studies are warranted to address whether the cardiac deficits in these Δ9-THC exposed offspring persist into adulthood.

## Poster 020

### CARDIAC MITOCHONDRIA IMPAIRMENT AFTER TRANSIENT NEONATAL HYPEROXIA EXPOSURE IN A RAT MODEL OF PREMATURITY-RELATED CONDITION

**Daniela Ravizzoni Dartora**[1,2], **Ying He**[1,2], **Alyson Deprez**[1,2], **Camille Girard-Bock**[1,2], **Anik Cloutier**[1,2], **Gael Cagnone**[1,2], **Perrine Gaub**[1,2], **Jean-Sebastien Joyal**[1,2], **Thuy-Mai Luu**[1,2], **Anne-Monique Nuyt**[1,2]
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**Introduction:**
The heart relies on adequate mitochondrial (mito) ATP production to match myocardial demand, mostly through oxidative phosphorylation. Preterm birth (PT) results in ex utero development of an immature myocardium and PT-born individuals represent a newly recognized group at high risk of cardiovascular diseases. Our group has shown that newborn rats exposed to high oxygen (O2), mimicking PT-related conditions, develop $O_2$-induced cardiomyopathy (OIC) and dysfunction later in life. However, whether mito impairments prevail in the programmed left ventricle (LV) changes associated with PT is unknown. We *aimed* to determine whether OIC is associated with altered LV mito characteristics in 4 wks-old rats.

**Methods:**
Male rat pups were kept with their mother in 80% $O_2$ (OIC) or room air (Ctrl) from days 3 to 10 of life. Results are mean±SEM; OIC vs. Ctrl are compared using t-test (n=4 6/group.P<0.05).

**Results:**
At 4 wks, extracellular flux analysis of isolated LV cardiomyocytes revealed significantly decreased $O_2$ consumption rate in OIC (12.14±5.74 vs. 67.39±13.61 pmoles/min/ug). OIC rats show reduced LV mito copy number determined by the ratio between mito and genomic DNA (26.7±6.30 vs. 52.7±7.32), biogenesis markers Pgc1α (0.59±0.14 vs. 1.18±0.25), and citrate synthase (0.20±0.16 vs. 1.60±0.56) mRNA, and reduced Complex IV (0.66±0.15 vs. 1.26±0.09) protein expression. Gene expression of a key glycolytic enzyme, Hexokinase (3.34±0.59 vs. 0.88±0.39) is significantly increased, indicating a shift toward glycolysis. OIC rats were also found to have higher LV mtROS production (7581±51 vs. 5191±99, fluorescence arbitrary units) and decreased antioxidant SOD2 protein expression (0.84±0.09 vs. 1.04±0.05).

**Conclusions:**
Taken together our results indicate that neonatal hyperoxia exposure leads to decreased LV mito biogenesis and function with impaired oxidative phosphorylation capacity in juvenile animals. Further studies are needed to determine the role of long-term mito dysfunction in the increased susceptibility to heart failure observed after deleterious neonatal conditions.

## Poster 021

### THE IMPACT OF PRETERM BIRTH AND EXERCISE TRAINING ON SKELETAL MUSCLE FUNCTION IN YOUNG ADULTHOOD - THE HAPIFIT PROJECT.

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**Introduction:**
Some studies suggest individuals born preterm have reduced muscle function. This may be secondary to fixed changes induced by preterm birth on the developing skeletal muscle. Whether exercise training can improve muscle function in this population remains unknown. We aimed to evaluate and compare changes in muscle function pre/post a 14-week supervised exercise intervention in adults born preterm (PT) vs. term (T).

**Methods:**
The current preliminary sample consists of ten young adults born <29 weeks of gestation and nine term-born controls. They underwent a cardiovascular and muscle training program three times/week. Pre- and post-intervention skeletal muscle function assessments included handgrip strength, balance (opened and closed eyes), arm extension, sit-ups, and lower limb power. Mann-Whitney and Wilcoxon rank tests were used for group comparison.

**Results:**
We did not identify any significant group difference in muscle function prior to intervention. Overall, participants maintained or improved their muscle function following the intervention. In fact, arm extensions were improved from 17.8 ± 11.9 to 25.3 ± 9.4 reps (p=0.002), sit-ups by 18.8 ± 13.1 to 37.2 ± 12 reps (p=0.003) and lower limb power by 2697 ± 775 to 2369 ± 712 watts (p=0.05). No difference in improvement between PT and T was found. However, despite non-significant differences, PT had, compared to T, a reduction in grip strength (-3.5 vs. -1.3 kg), flexibility (-2.1 vs. +2.6 cm) and open-eye balance (-3.9 vs. 0 sec), a similar improvement in the number of arm extensions (10.4 vs. 10.8 reps) and greater improvements in sit-ups (22.6 vs. 17.0 reps) and lower limb power (119 vs. 87 watts).

**Conclusions:**
A difference in muscle function between PT and T was not observed with our preliminary results. Improvements were found in both groups following an exercise intervention. Subsequent cohorts of participants will confirm whether these findings hold true.

## Poster 022

### DOES HIVEXPOSURE IN UTERO INFLUENCE INFANT DEVELOPMENT AND IMMUNE OUTCOMES? FINDINGS FROM A PILOT STUDY IN PRETORIA, SOUTH AFRICA.

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**Introduction:**
HIV-infected infants show altered growth, brain development, and immune function. Yet, it remains unclear how detrimental fetal exposure to maternal HIV, in the *absence* of infant HIV infection, is to infant development. We conducted a pilot study at Kalafong Hospital in Pretoria, South Africa, to determine the effect of maternal HIV status on infant outcomes. We hypothesised that *in utero* HIV-exposed, uninfected (HEU) infants would have poorer postnatal development and altered innate immune function vs. unexposed, uninfected infants (HUU).

**Methods:**
Mother-infant dyads were recruited after delivery and followed until 10-weeks postpartum (HIV+ n=22; HIV- n=9). Maternal data and infant growth (age- and sex-standardised anthropometry [WHO]), neurodevelopment (APGAR, Guide for Monitoring Child Development) and brain-to-body-weight ratio (BBR; NINCDS Collaborative Perinatal Project) outcomes were obtained. CD14, CD16 and CCR2 were quantified on infant peripheral blood mononuclear cells (PBMC) within 4 days of birth. Major initial findings from adjusted multiple regression models are presented (mean [95% CI], $R^2$). Covariates were retained at a=0.20. Sig=p<0.05*.

**Results:**
HEU vs. HUU infants had lower head circumference (-1.5 [-2.0, -1.0] vs. -0.4 [-1.0, 0.2]*, $R^2$=0.3) at birth. BMI, length, weight and BBR did not differ. At 10-weeks, there were no differences in growth measurements. HEU had lower fine motor (1.0 [0.8, 1.2] vs. 1.4 [1.1, 1.9]*, $R^2$=0.2) and higher expressive language (2.9 [2.7, 3.2] vs. 2.3 [1.9, 2.7]*, $R^2$=0.5) scores vs. HUU at 10-weeks. Proportion of CD14+/CCR2+ (86.5 [84.2, 88.9] vs. 80.6 [77.6, 83.5]*, $R^2$=0.2), but not CD16+/CCR2+, in PBMCs was higher in HEU vs. HUU.

**Conclusions:**
HEU infants have reduced head circumference and activated proinflammatory pathways at birth, which has been associated with poor motor and cognitive outcomes, consistent with our motor findings at 10-weeks. Elevated innate immune activation may initiate pro-inflammatory pathways that target the brain, which are known to impact neurodevelopment and lifelong health.

## Poster 023

### HEALTH PERCEPTION AND NEED FOR PREMATURITY-ADAPTED LONG TERM HEALTH MONITORING IN YOUNG ADULTS BORN VERY PRETERM: A PILOT STUDY

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**Introduction:**
In Canada, 1.5% of births are very premature (<29 weeks, PT). Our group and others report cardiopulmonary and metabolic differences between PT young adults and term-born controls. Still, there is no specific recommendations for health monitoring of PT adults as a new at-risk population for chronic disease. Our hypothesis is that PT subjects have specific needs regarding their health and associated information, which are not currently recognized and addressed by health care providers.

**Methods:**
An online survey with quantitative and qualitative questions about health perception and use of health services: 17 addressed to all subjects, and 11 additional questions for PT. The survey was emailed to the HAPI cohort (n=95 PT and 95 T).

**Results:**
Preliminary results are from completed surveys of 35 PT and 24 T. While mean health perception (on a 10 scale) was similar between groups (7.31 vs 8.04), only PT subjects scored their health at 6 or under (n=4, 11%). Furthermore, 7 PT (20%) vs. no term subject reported their overall health to be 'below average' compared to that of their same-age term-born peers. Six PT (17%) vs. no term subject reported consulting a medical specialist more than once a year during adolescence and adulthood. Seventeen PT (49%) said that they were not aware of aspects of their health to which they should pay more attention due to their prematurity. Only 4 PT (15%) reported being asked if they were born preterm by at least one health professional. Twenty-one PT (77%) addressed directly the subject of prematurity with their healthcare provider(s).

**Conclusions:**
Despite differences in health care needs, PT status is under-recognized and under-addressed by health care providers as well as by PT subjects themselves. Results will allow researchers and clinicians to coordinate chronic diseases prevention efforts in, and *with*, this new at risk population.

## Poster 024

### INFLAMMATION AND OXIDATIVE STRESS IN RELATION WITH EARLY MARKERS OF CHRONIC DISEASE IN VERY PRETERM BORN YOUNG ADULTS

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**Introduction:**
Very preterm (PT) birth (≤29 weeks) is associated with inflammatory and oxidative conditions and disrupted

organogenesis. Young adults born PT have increased cardiovascular disease (CVD) risk factors, but the underlying pathophysiological mechanisms leading to these abnorMalities are not well established. Since inflammation and oxidative stress (OS) are associated with CVD in adults, we aim to determine whether inflammatory and oxidative conditions prevail in adults born PT in association with CVD risk factors, compared to young adults born term.

**Methods:**
We designed an observational matched cohort study of PT adults and term controls in whom inflammatory (CRPhs, IL-6, VCAM-1, ICAM-1, MCP-1) and OS (glutathione redox status) biomarkers were determined. A comprehensive clinical assessment was performed in order to obtain early markers of organ dysfunction, as defined by international guidelines.

**Results:**
PT and term controls (95/group, median age 23.1 years) were included. We designed a composite organ dysfunction score, that accounted for blood pressure, adiposity, glucose metabolism, lipid profile and cardiac, vascular, renal and respiratory functions. Inflammation and OS levels were similar in PT and term groups. PT birth was associated with a higher proportion of airflow limitation (56% vs 25%, $p<0.001$), glucose intolerance (30% vs 15%, $p=0.01$) and a higher composite organ dysfunction score (mean ± SD, 2.1 ± 1.4 vs 1.6 ± 1.3, $p=0.05$). Multivariate analysis showed that inflammation, but not OS, was a strong predictor of organ dysfunction ($p=0.004$), irrespective of prematurity status. However, an increase in OS was an independent predictor of airflow limitation in PT adults only ($p=0.02$).

**Conclusions:**
Inflammation and OS markers are similar in term and PT young adults, but an increase in OS is associated with airflow limitation in PT only. Whether improving antioxidant capacity decreases the risk of pulmonary dysfunction in young PT adults remains to be determined.

## Poster 025

### RATS UNDER SOCIAL ISOLATION ARE PREDISPOSED TO ADVERSE PREGNANCY OUTCOMES AND MODIFIED INFLAMMATORY PROFILES.

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**Introduction:**
Maternal stress before and during pregnancy results in adverse perinatal outcomes, such as preterm labor predisposing offspring for metabolic and cardiovascular diseases. Social isolation (SI) as a maternal stressor is associated with altered brain development and behavior in rodents. We hypothesize that SI before conception and during pregnancy predisposes a rat to adverse pregnancy outcomes and to an altered profile of inflammatory and stress markers that may be epigenetically programmed.

**Methods:**
Female rats of the F0-F1 generations (n=6-10) were assigned to SI or control groups. SI involved housing dams alone for two weeks before breeding and during pregnancy. This gave rise to three groups of F1 dams: control, single generation (SG) and multigenerational (MG). Uterine tissues were collected at weaning of offspring. RT-qPCR was performed to analyze mRNA abundance for uterine inflammatory and stress markers such as *Il1b*, *Il1ra,* corticotropin-releasing hormone (*Crh*) and 11β-hydroxysteroid dehydrogenase type 2 (*Hsd11b2*). Data were analyzed by t-test (F0) and one-way ANOVA (F1), $p \leq 0.05$.

**Results:**
In F0 uterus, *Hsd11b2* mRNA levels were decreased in the SI group ($p<0.05$). Similarly, *Crh* mRNA was significantly lower in tissues from SI dams ($p<0.05$). In F1 uteri, expression of *Il1b* was downregulated in the SG ($p<0.01$) and MG ($p<0.05$) groups. *Il1ra* abundance was lower only in SG group ($p<0.05$). Conversely, *Hsd11b2* mRNA expression was increased in SG tissues only ($p<0.05$). *Crh* and receptors mRNA expression did not change in the F1 generation.

**Conclusions:**
SI preconceptionally and during pregnancy differentially affects gene expression in F0 and F1 postpartum uteri. SI has an opposite effect in F0 compared to F1 on *Hsd11b2* expression, potentially altering the local corticosterone levels. The inflammatory state appeared unchanged in F0 uteri but reduced in F1. Altered programming as a consequence of epigenetic changes by stress could change the offspring's ability to adapt to stress later in life.

## Poster 026

### TRANSCRIPTOME ANALYSIS OF RAT ADRENALS FROM PRENATALLY GLUCOCORTICOID EXPOSED ADULT OFFSPRING

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**Introduction:**
Prenatal glucocorticoid (GC) exposure is associated with the development of hypertension in adulthood. We, and others, have previously demonstrated that antenatal dexamethasone (DEX) administration in Wistar-Kyoto (WKY) dams results in offspring with elevated systolic, diastolic, and mean arterial pressure, along with increased plasma epinephrine levels. Maternal exposure to GCs can lead to modification of hypothalamic-pituitary-adrenal (HPA) function and impact stress-related behaviours. The purpose of this study was to further elucidate the molecular mechanisms, and genes that play a role in prenatal stress-mediated hypertension.

**Methods:**
Pregnant WKY rats were given daily subcutaneous injections of 0.1 mg/kg/day Dexamethasone (DEX) or a saline vehicle throughout the third trimester. RNA was extracted from the adrenal gland of 18-week-old male offspring and whole-transcriptome analysis was performed using Rat Gene 2.0 ST GeneChip (Thermo Fisher Scientific). Expression levels of dysregulated genes was verified using RT-qPCR.

**Results:**
Differential gene expression analysis of DEX-exposed offspring compared with saline-treated controls revealed 84 significantly differentially expressed genes; 55 upregulated genes and 29 downregulated genes (criteria: fold-change $<-1.5$ and $>1.5$; p-value $<0.05$; false discovery rate $< 0.1$). The mRNA expression of select genes involved in stress response identified by the transcriptome analysis was verified using RT-qPCR. Global network analysis demonstrated robust dysregulation of genes involved in circadian rhythm signaling, with DEX-exposed offspring demonstrating 2-fold increase in BMAL1 and NPAS2 expression while Per2 and Per3 expression was significantly downregulated.

**Conclusions:**
The transcriptome analysis of DEX-exposed offspring displayed an abnormal expression of circadian rhythm genes in the adrenal glands. These results suggest an altered mechanism of circadian signaling where BMAL1 and NPAS2 control the expression of the clock genes rather than the normal Clock/BMAL1 system, which may have effects on blood pressure regulation. This altered circadian rhythm signaling may provide a mechanism by which prenatal GC exposure programs hypertension later in life.

## Poster 027

### ULTRA-SHORT ECHO TIME MRI: A NEW IMAGING MODALITY TO INVESTIGATE LONG-TERM EFFECTS OF PRETERM BIRTH ON LUNG DEVELOPMENT

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**Introduction:**
Prematurity disrupts normal lung development with lasting respiratory sequelae. Underlying long-term structural pulmonary changes have not been thoroughly explored. Innovative non-invasive imaging technologies such as proton ($^1$H) ultra-short echo time (UTE) MRI have been used in patients with chronic obstructive lung disease to better characterize lung impairment. This study aims to examine micro-structural abnorMalities using $^1$H UTE MRI in relation to pulmonary function in young adults born preterm (PT).

**Methods:**
Eighteen PT adults (≤29 weeks) and 17 term-born controls (T) underwent comprehensive pulmonary function and cardiopulmonary exercise testing. $^1$H UTE MRI at different lung volumes provided a measure of overall parenchymal signal intensity (SI). Statistical analyses included Mann-Whitney U Test for group comparisons and Spearman correlational analyses.

**Results:**
For PT and T, median (interquartile range) predicted $FEV_1$ was 89 (73-99)% vs 95 (90-103)%, $FEV_1$/FVC 90 (79-101)% vs 96 (89-99)%, RV/TLC, 30 (21-35)% vs 24 (22-33)%, predicted DLCO 78 (72-91)% vs 87 (83-96)%, lung clearance index 6.8 (6.0-7.6) vs 6.5 (5.8-6.9), $VO_2$max 28 (26-36) vs 33 (29-38) mL/min/kg, respectively. We did not observe any group difference in median SI at different lung volumes (full inspiration: PT: 32 (29-36) vs T: 34 (32-37), *P*=0.287; full expiration: PT: 37 (33-41) vs T: 39 (36-40), *P*=0.519; functional residual capacity: PT: 35 (30-41) vs T: 38 (36-40), *P*=1.000; functional residual capacity + 1 liter: PT: 34 (27-37) vs T: 39 (36-40), *P*=0.519). Overall, SI at full inspiration did not correlate with any functional pulmonary measures.

**Conclusions:**
We could not detect any differences in overall lung microstructure between preterm- and term-born young adults using $^1$H UTE MRI. Whether a segmented approach in image analysis to account for possible heterogeneity in lung architecture following preterm birth remains to be investigated.

## Poster 028

### CARDIORESPIRATORY ALTERATIONS IN A NEWBORN OVINE MODEL OF BACTERIAL SEPSIS

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**Introduction:**
Neonatal sepsis remains a major problem, partly due to cardiorespiratory consequences. The latter manifest as severe cardiorespiratory events and cause substantial morbidity and mortality, especially in preterm infants. The link between neonatal sepsis, inflammation and altered cardiac and respiratory activity remains poorly understood. Our research program aims to further characterize this link in newborn lambs, who are closer to the human newborn than the murine models previously studied.

**Methods:**
Two six-hour polysomnography recordings were performed on two consecutive days in eight full-term newborn lambs. During the first recording, an IV saline injection was given, whereas the second recording was performed after an IV injection of 2.5µg/kg of *E.coli* LPS 0127:B8. Body temperature, arterial blood gases, states of alertness, locomotor activity, respiratory and heart rates, arterial blood pressure, apneas and cardiac decelerations were measured.

**Results:**
LPS injection increased body temperature [max $\Delta T^{o}$ = +1.2$^{o}$C] and decreased locomotor activity [38.7 (35.4, 54) vs. 93.8 (73, 128.1) m, median (Q1,Q3), $p = 0.03$] and active wakefulness [21 (17, 23) vs. 28 (19, 31) % $p = 0.01$] vs. control condition. Meanwhile, heart rate [245 (229, 261) vs. 180 (172, 183) $min^{-1}$, $p = 0.005$], respiratory rate [61 (59, 63) vs. 49 (47, 52) $min^{-1}$, $p = 0.0005$] and the number of cardiac decelerations [36 (31, 50) vs. 18 (13, 25) $p = 0.04$] were increased, while total apnea duration [35.7 (18.2, 61.6) vs. 88.5 (42.7, 133.7) s, $p = 0.04$] was decreased.

**Conclusions:**
LPS injection in newborn lambs mimics a bacterial sepsis with multiple consequences, including cardiorespiratory alterations. Ongoing studies in the same lambs will provide further results on alterations of heart and respiratory rate variabilities, as well as on brainstem cardiorespiratory center inflammation. The results will pave the way for similar studies in preterm lambs.

## Poster 030

### VARIATIONS IN PRACTICE MAY BE EVIDENCE-BASED: APPLICATION OF MULTI-CRITERIA DECISION ANALYSIS TO TREATMENTS FOR PATENT DUCTUS ARTERIOSUS

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**Introduction:**
Patent Ductus Arteriosus (PDA) is a common cardiovascular condition in preterm infants where considerable variation in management practices exists. In a recent network meta-analysis of treatments for hemodynamically significant PDA (hsPDA), authors identified ten treatments evaluated across eight outcomes. The study purpose was to evaluate how treatment decisions for hsPDA differ across decision maker preference sets and baseline event rates.

**Methods:**
We conducted a re-analysis of a recently published Bayesian network meta-analysis of pharmacological treatments for hsPDA. Stochastic Multi-criteria Acceptability Analysis (SMAA), a tool to support decision making based on performance across multiple outcomes which differ in their importance for decision making, was conducted using ordinal preference constraints (e.g. Mortality > necrotizing enterocolitis) from clinicians two (SM, MCY) and a “preference free” model. Sensitivity to baseline rates was explored through increasing or decreasing single event rates +/- 2-10%. Monte-carlo methods were used for parameter estimation in NMA and integration over the feasible weight space given preference constraints with 30,000 iterations used for both. Outcomes included first rank acceptability (FRA), the vector of central weights required to have an a priori preference for one treatment over another, and a confidence factor (CF) reflecting certainty in decisions.

**Results:**
Clinicians differed in outcome rankings, which influenced treatment recommendations and their uncertainty (SM: highest FRA = oral acetaminophen (0.50), CF = 0.66; MCY: highest FRA = IV ibuprofen standard dose (0.31), CF = 0.33). Central weights for the preference free model suggests that oral acetaminophen is preferred when weights across outcomes are generally equal, while IV ibuprofen requires heavier weights on intraventricular hemorrhage and oliguria. Variations in baseline rates have a similar effect on recommendations.

**Conclusions:**
These findings suggest that observed treatment variation may be the result of a rational synthesis of available evidence, local event rates, and outcome preference.

## Poster 031

### HEART RATE VARIABILITY CHANGE IN INFANTS FOLLOWING MATERNAL RECEIPT OF COGNITIVE BEHAVIOURAL THERAPY FOR POSTPARTUM DEPRESSION

**John Krzeczkowski**, **Louis Schmidt**, **Ryan Van Lieshout** (McMaster University)

**Introduction:**
In keeping with the developmental origins of health and disease (DOHaD) hypothesis, maternal postpartum depression (PPD) is known to adversely affect offspring neurodevelopment. Low heart rate variability (HRV), a marker of physiological dysregulation and psychiatric risk, has been consistently observed in infants of women with PPD. However, no studies have examined if treating mothers with PPD can improve neurophysiology in their infants. The objectives of this study were to determine whether HRV i) differed between infants of mothers with PPD and healthy control infants at baseline and ii) improved in infants following maternal receipt of cognitive behavioural therapy (CBT).

**Methods:**
We recruited 60 mother-infant dyads (30 mothers with a primary diagnosis of PPD, and 30 mothers free of PPD and matched on infant age and family SES). Mothers with PPD received a 9-week group CBT intervention. Resting-state HRV was assessed in infants during two sessions (before *CBT* and *immediately after CBT*). Between-group differences were examined using independent samples t-tests and change in HRV from the two sessions was assessed using repeated measures ANOVAs.

**Results:**
Infants were 5.6 (0.8) months old at baseline. Before CBT, infants of mothers with PPD exhibited lower HRV ($M$=3.19, $SD$=0.84) compared to the infants of healthy control mothers ($M$=3.81, $SD$=0.8), [$t$(69)=3.05, SE=0.19, $p$=0.003]. Following maternal participation in CBT treatment, a significant increase in HRV was observed in the infants of mothers with PPD [$F$(1,27)=6.79, $p$=0.015] so that levels did not differ from infants of healthy control mothers. No changes over time were noted in healthy control infants.

**Conclusions:**
We show for the first time that non-pharmacological treatment for PPD appears to improve a core physiological regulatory system in infants. Given the long-term effects of PPD exposure in infants, these treatments may have the potential to improve the health of Canadians across the lifespan.

## Poster 032

### TELE-NEONATOLOGY PROGRAM: WHAT'S HINDERING OUR IMPLEMENTATION AND USE IN SOUTHERN ALBERTA?

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**Introduction:**
Telemedicine has been used to stabilize sick neonates outside of tertiary centres. Since the implementation of the Southern Alberta Tele-Neonatology Program, the utilization rate has been suboptimal. Our objective

was to identify the barriers and facilitators to the implementation and utilization of Tele-Neonatology.

**Methods:**
A 26 item questionnaire based on the Theoretical Domain Framework was distributed by email to transport team members in Calgary, and pediatricians, family physicians, nurses, respiratory therapists, and unit (facility) managers in the referring centres. Results were presented using proportions.

**Results:**
We received 59 responses; 54% from rural/regional centres, and 61% from active Tele-Neonatology centres. Implementation: physicians' buy-in, local champions, organizational support, and presence of suitable patients were considered facilitators of implementation by > 80% of respondents. Tele-Neonatology consultation process, patient privacy, medico-legal concerns, staff shortage, and equipment/operation cost were cited as barriers by > 30% of respondents. Utilization: 43% felt using Tele-Neonatology was challenging with technology related issues, inadequate technical support, unclear process, or medico-legal concerns being most cited challenges. Accessibility to telemedicine equipment, clear operating instruction, training, availability of technical support, and Tele-Neonatology guidelines were considered important in encouraging use of Tele-Neonatology by > 80% of respondents. More than 80% of respondents believed that utilization could improve by providing ongoing technical support, regular simulated sessions, and outreach education. Satisfaction: 75% were satisfied with Tel-Neonatology Program and 91% intended to use it in the future. Also, 82% and 76% felt that Tele-Neonatology has positive impact on patient care and their practice; respectively.

**Conclusions:**
Users of Tele-Neonatology are highly satisfied and believed it had a positive impact. We identified areas for improvement including enhancing education through simulated and outreach sessions, ensuring availability of appropriate technical support, and simplifying Tele-Neonatology consultation process.

## Poster 033

### LARYNGEAL MASK AIRWAY FOR SURFACTANT ADMINISTRATION IN NEONATES WITH RESPIRATORY DISTRESS SYNDROME: A META-ANALYSIS

**Roqaia Al Ali**, **Bishal Gautam**, **Doris Yuen**, **Michael Miller** (Western University)

**Introduction:**
Standard methods of surfactant administration for Respiratory distress syndrome (RDS) are still associated with complications such as orpharyngeal tissue injuries and stress responses. Laryngeal Mask Airway (LMA) has emerged as an alternative surfactant delivery method, however its efficacy and safety have not been systematically reviewed. The aim of this systematic review and meta-analysis was to analyze randomized control trials (RCT) assessing respiratory outcomes for preterm neonates with RDS treated with LMA administration of surfactant.

**Methods:**
*Data Sources*: Cochrane library, MEDLINE, Embase. Literature searches included all clinical trials indexed up to October 2018 with no language restriction. Keyword search terms, including lower hierarchy MeSH terms and synonyms, for premature infant, respiratory distress syndrome, pulmonary surfactants and laryngeal mask airway *Inclusion Criteria:* RCTs comparing short-term respiratory outcomes in neonates with RDS, who were administered surfactant through an LMA or another method. The primary outcomes were the need for mechanical ventilation and repeat surfactant dosing. Two independent investigators screened the publications for inclusion. Differences in selection of publications by the investigators were resolved by consensus. A random effects mode was used to pool dichotomous outcomes using relative risk and 95% confidence interval.

**Results:**
Six publications were identified in the literature database searches. Four studies met the predefined inclusion criteria. The total sample size was 238 (119 each arm). Data analyses of the primary outcomes, FiO2 requirement and mechanical ventilation, are in progress. Secondary outcomes were collated (duration of respiratory support, bronchopulmonary dysplasia or death). Appropriate data analysis will be applied to these outcomes.

**Conclusions:**
Will have our conclusion by end of December based on analysis results.

## Poster 034

### NEURODEVELOPMENTAL OUTCOMES OF PRETERM INFANTS WITH CHRONIC PULMONARY HYPERTENSION MANAGED USING A STANDARDIZED SYMPTOM-BASED ALGORITHM

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**Introduction:**
There is currently no consensus on management of chronic pulmonary hypertension (cPH) in neonates with chronic lung disease (CLD). Our objective is to describe the outcomes of CLD neonates managed using a standard approach to cPH based on recognition and treatment of right ventricular (RV) congestion with diuretics (Figure 1).

**Methods:**
In this retrospective study, over a two year period, all neonates with "CLD+cPH" were compared to those with "CLD-only". cPH was defined as pulmonary:systemic systolic pressure ratio ≥0.5 beyond 34 weeks corrected gestational age (GA) on echocardiography. Mortality or disability at 18-24 months of age was the primary outcome. Disability was defined as a score < 70 in any domain on Bayley Scale of Infant and Toddler Development or cerebral palsy with Gross Motor Function Classification score ≥3 or severe hearing or vision loss. Multivariate analysis was conducted for the primary outcome including the following variables: GA, cPH, antenatal and post-natal steroids, days of invasive ventilation and $FiO_2$ >0.30 in the first two weeks of life.

**Results:**
Of 128 CLD neonates, 47(38%) had cPH, 29 received diuretics of which 26 had acute symptomatic improvement (Figure 2). In comparison to CLD-only, CLD+cPH neonates had greater respiratory morbidity during the first two weeks of life (Table 1). Following standardized management using the algorithm, CLD+cPH group demonstrated similar short and long-term outcomes compared to CLD-only (Table 2). Post-natal use of systemic steroids was the only variable associated with the primary outcome (adjusted odds ratio 11.7, 95% confidence interval 2.8-48.2). There were three deaths in CLD+cPH group, none in CLD-only; however, no death was ascribed to cPH/RV failure.

**Conclusions:**
Standardized management of cPH in CLD infants based on symptomatic control of RV congestion is commonly associated with acute improvement in symptoms and may result in short and long-term outcomes similar to CLD infants without cPH.

**Figure 1** - Management algorithm of infants at-risk of developing chronic pulmonary hypertension.

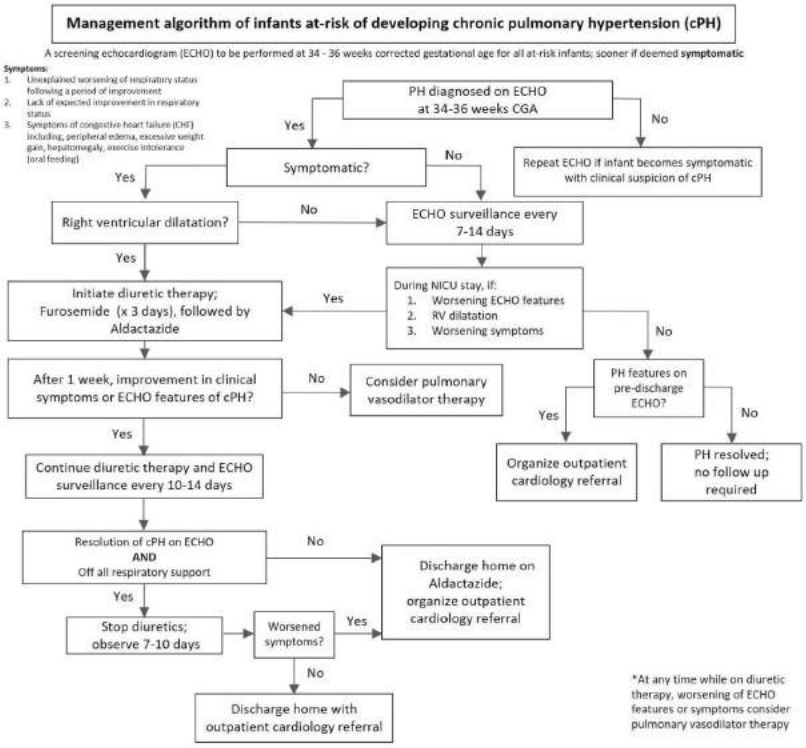


**Figure 2** - Eligible infants identified from database and resultant patient flow chart.

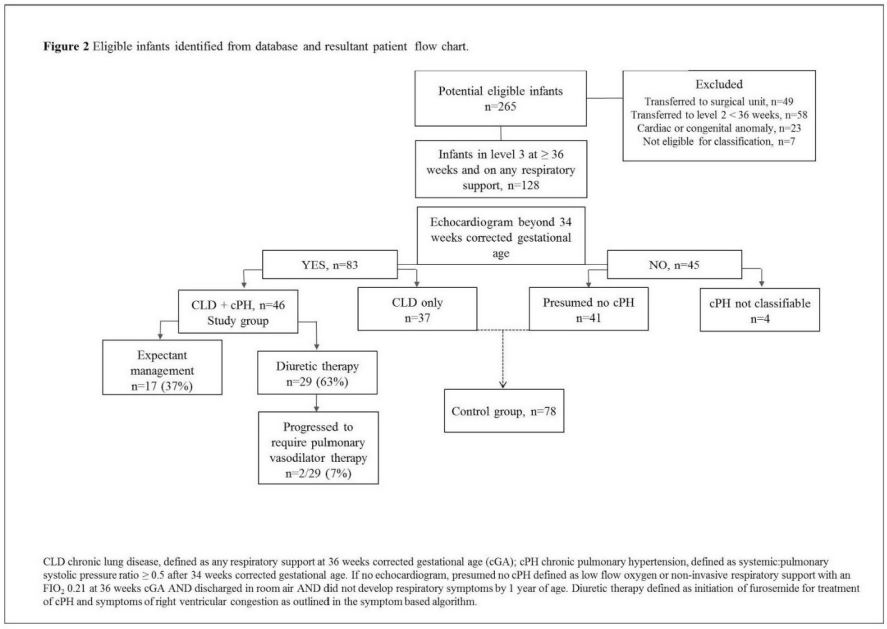

**Table 1** Inter group comparison of baseline variables in infants with chronic lung disease with chronic pulmonary hypertension and chronic lung disease only.

| Variable | CLD + cPH (Study group) (n=46) | CLD only (Control group) (n=78) | P value |
|---|---|---|---|
| Gestational age (weeks) | 26.0 (2.1) | 26.8 (2.1) | 0.04 |
| Birth weight (grams) | 857 (299) | 920 (260) | 0.22 |
| Male sex | 31 (66.0) | 42 (54.6) | 0.21 |
| PROM > 24 hours | 16 (34.0) | 18 (23.4) | 0.20 |
| Antenatal steroids | 47 (100) | 66 (86.8) | 0.01 |
| Chorioamnionitis | 10 (21.3) | 11 (14.3) | 0.31 |
| Cesarean delivery | 32 (68.1) | 41 (53.3) | 0.10 |
| Small for gestational age | 8 (17.0) | 14 (18.2) | 0.87 |
| 5 minute APGAR score | 8 (5, 9) | 8 (6, 9) | 0.54 |
| SNAP score ≥ 20 | 22 (50.0) | 21 (29.2) | 0.02 |
| Received surfactant | 35 (74.5) | 58 (75.3) | 0.91 |
| Days ventilation in first 2 weeks (days) | 7.2 (5.5) | 5.4 (4.9) | 0.05 |
| No. of days with $FiO_2$ >0.30 in first 2 weeks | 2.9 (3.5) | 1.0 (2.5) | <0.01 |
| iNO in first 2 weeks | 4 (8.5) | 2 (2.6) | 0.20 |
| Systemic steroids | 16 (34.0) | 16 (20.8) | 0.10 |
| Inhaled steroids | 11 (23.4) | 14 (18.2) | 0.48 |
| Culture positive sepsis during NICU stay | 11 (23.4) | 13 (16.9) | 0.37 |
| Treatment for PDA | 15 (31.9) | 27 (35.1) | 0.72 |
| NEC ≥ stage 2 | 2 (4.3) | 1 (1.3) | 0.56 |
| IVH ≥ grade 3 or PVL | 5 (10.6) | 9 (11.8) | 0.84 |

Results presented as mean (SD), number (percentage) or median (IQR) as appropriate. CLD chronic lung disease, defined as any respiratory support at 36 weeks corrected gestational age (cGA); cPH chronic pulmonary hypertension, defined as systemic:pulmonary systolic pressure ratio ≥ 0.5 after 34 weeks corrected gestational

age. If no echocardiogram, presumed no cPH defined as low flow oxygen or non-invasive respiratory support with an $FIO_2$ 0.21 at 36 weeks cGA AND discharged in room air AND did not develop respiratory symptoms by 1 year of age. CLD-only was comprised of both: infants with no cPH on echocardiogram and infants who were presumed to not have cPH based on the aforementioned criteria. PROM premature rupture of membranes; chorioamnionitis as documented on placental pathology; $MgSO_4$ magnesium sulfate prior to delivery; small for gestational age defined as weight <3rd percentile; SNAP II Scores for Neonatal Acute Physiology II ≥ 20 was considered a marker of significant illness severity. NICU neonatal intensive care unit; PDA patent ductus arteriosus includes any treatment (medical or surgical); ROP retinopathy of prematurity; NEC necrotizing enterocolitis ≥ Bell stage 2; IVH intraventricular hemorrhage ≥ grade 3; PVL periventricular leukomalacia.

**Table 2** Comparison of mortality and long-term neurodevelopmental outcomes

| Variable | CLD + cPH (Study group) | CLD only (Control group) | P value |
|---|---|---|---|
| **Primary outcome*** | | | |
| Mortality or disability | 12/44 (27.2) | 12/76 (15.7) | 0.16 |
| **Secondary outcomes** | | | |
| Mortality before discharge | 3 (6.5) | 0 (0) | 0.05 |
| Disability in survivors | 9/41 (21.9) | 12/76 (15.8) | 0.46 |
| CP GMFCS ≥ 3 | 2 (6.3) | 3 (5.0) | 0.99 |
| Cognitive score | 90 (80, 100) | 90 (85, 100) | 0.09 |
| Language score | 83 (74, 97) | 86 (77, 94) | 0.76 |
| Motor score | 91 (85, 97) | 97 (91, 100) | 0.04 |
| Hearing loss | 1 (3.0) | 1 (1.6) | 0.99 |
| Vision loss | 1 (3.0) | 1 (1.6) | 0.99 |
| Cognitive score < 70 | 1 (3.2) | 2 (3.7) | 0.99 |
| Language score < 70 | 5 (18.5) | 6 (12.2) | 0.46 |
| Motor score < 70 | 3 (10.3) | 4 (7.7) | 0.70 |

Disability defined as a composite of the following at 18-24 months of age: 1. Score of < 70 in any domain (Motor, Cognitive or Language) on Bayley Scale of Infant and Toddler Development, Third Edition; 2. CP cerebral palsy classified as GMFCS Gross Motor Function Classification System score ≥ 3; 3. Severe hearing loss defined as need for bilateral hearing implants; 4. Visual impairment defined as uncorrectable vision loss in at least one eye. *4 patients were lost to follow up; 2 patients from each group.

## Poster 035

### AIR DISTRIBUTION WITHIN THE LUNGS AFTER A TRIAL OF TOTAL LIQUID VENTILATION IN A NEONATAL OVINE MODEL

**Wing Wendy See**[1], **Michaël Sage**[1], **Catherine Gohier**[1], **Symon Stowe**[2], **Philippe Micheau**[1], **Jean-Paul Praud**[1], **Andy Adler**[2], **Étienne Fortin-Pellerin**[1]
[1]Université de Sherbrooke, [2]Carleton University

**Introduction:**
Total liquid ventilation (TLV) with perfluorocarbon liquids (PFC) could be an alternative to endotracheal gas

ventilation (GV) in extremely preterm babies, with the potential to prevent bronchopulmonary dysplasia. However, very little is known about liquid-to-air transition within the lungs after TLV. This project aims to document the air and PFC distribution in the lungs during the transition from TLV to GV.

**Methods:**
Twenty-two full-term lambs (1-5 days old, 3.2±0.1kg) were anaesthetized, intubated, instrumented, then curarized for TLV (Experimental; n=14) or GV (Control; n=8) for 4hrs. Following the return from TLV to GV, ventilatory support was gradually removed and lambs were observed for another 4hrs. The transition from TLV to GV was monitored using two non-invasive and complimentary lung imaging techniques: thoracic electrical impedance tomography and lateral videofluoroscopy. While the latter differentiates between air and PFC, the former can monitor regional lung volume (air and/or PFC) variations. Regional changes in ventilation through the transition were analyzed (Friedman) in both the dependent and the non-dependent regions. Thoracic impedance was used as a proxy for lung volumes.

**Results:**
End-expiratory lung volumes decreased during the first 10min of the transition from TLV to GV (p=0.02). Tidal volume distribution was stable during the transition (p=0.5) and similar to the distribution seen in control animals never subjected to TLV (distribution in anterior: 43-48%, p=0.4-0.8). Fluoroscopy showed a progressive decrease in PFC and/or more air in the non-dependent regions during the first 10min of transition to air breathing (p=0.009), but no change in the dependent regions.

**Conclusions:**
Weaning to GV after 4hrs of TLV was not associated with lung hyperinflation and did not affect tidal volume (air+PFC) distribution within the lungs. Fluoroscopy suggests end-expiratory lung volume in non-dependent regions changes from liquid to air in the first 10min of transition to air breathing.

## Poster 038

### THE ASSOCIATION OF POSTNATAL GROWTH VELOCITY WITH RETINOPATHY OF PREMATURITY AND BRONCHOPULMONARY DYSPLASIA IN PERTERM INFANTS: A POPULATION BASED RETROSPECTIVE COHORT STUDY

**Jessica Chisholm**[1], **Michael Vincer**[1,2], **Souvik Mitra**[1,2]
[1]Dalhousie University, [2]IWK Health Centre

**Introduction:**
Retinopathy of prematurity and bronchopulmonary dysplasia are associated with multiple risk factors, but the etiologies and pathophysiology of these conditions are not completely understood. Recent evidence suggests that poor postnatal weight gain may contribute to the development of both conditions.This study aimed to investigate if in preterm infants, poor weight gain velocity is a risk factor for ROP and BPD.

**Methods:**
A total of 725 preterm infants with gestational age £30 weeks born in the province of Nova Scotia, Canada between 2003 and 2015 were retrospectively reviewed. The primary outcomes assessed were development of ROP ≥ stage 3 and development of BPD, defined as need for supplemental oxygen for ≥28 days and a need for ≥30% oxygen/nasal CPAP/ mechanical ventilation at 36 weeks PMA/discharge. WGV was calculated using exponential model of estimating growth velocity.

**Results:**
Of the 725 infants, 670 were categorized as having poor WGV. In the poor WGV cohort, the incidence of ROP

was significantly higher than in the good WGV cohort (adjusted odds ratio, 3.257; 95% confidence interval, 1.999-10.638, P= 0.039). Similarly, in the poor WGV cohort, the incidence of BPD was significantly higher than in the good WGV cohort (adjusted odds ratio, 3.497; 95% confidence interval, 1.464-9.524; P= 0.003). After performing multivariable logistic regression controlling for maternal age, maternal diabetes, pregnancy-induced hypertension, clinical chorioamnionitis, antenatal corticosteroid, cesarean section, sex, gestational age, BW, Apgar score (AS) (1 and 5 min), respiratory distress syndrome (RDS) requiring surfactant, patent ductus arteriosus (PDA), necrotizing enterocolitis (NEC), severe intraventricular hemorrhage (IVH) (grade III-IV), blood culture positive sepsis, WGV was found to be an independent risk factor for both ROP and BPD (P= 0.000 and P= 0.002 respectively).

**Conclusions:**
Poor weight gain velocity in the first 4 weeks of life is an important and independent risk factor for ROP and BPD.

## Poster 039

### FACTORS RELATED TO PRENATAL CARE UTILIZATION AMONG WOMEN IN NORTHERN MANITOBA

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**Introduction:**
In northern Manitoba rates of inadequate PNC are high (35-45%) compared to the Manitoba average (11.5%). Objectives were the factors related to inadequate PNC, and explore the perceptions of women and health care providers (HCPs) related to PNC.

**Methods:**
Women were interviewed using a structured questionnaire. Chi-square analysis tested for differences in proportions of women with inadequate and adequate PNC. ANOVA tested for differences in means. Women and HCPs were interviewed for perceptions.

**Results:**
131 women participated, 32% received inadequate and 68% adequate PNC. Women with inadequate PNC were significantly younger (M = 25 [SD 5.3]), less educated (M = 10.7 [SD 1.8]), had more children (M = 3.2 [SD 2.0]), confirmed pregnancies later (M = 9.7 [SD 7.3]) began PNC later (M =19.5 [SD 7.8] weeks), with fewer visits (M = 2.41[SD 1.4). 100% of the women with inadequate PNC self-identified as Indigenous. Greater proportions of women with inadequate PNC had to leave their community for PNC (66%), were single (48%), unemployed (76%), had unplanned pregnancies (76%) and used substances (smoking [76%], alcohol, [24%], illicit drugs [43%]). Barriers included: long waits for appointments (41.5%), child care problems (47.2%), wanted pregnancy private (31.7%), not wanting to leave their communities (48.6%), thinking PNC was not needed (40.5%), infant apprehension concerns (11.9%), considering abortion (16.7%) personal problems (45.2%), and stress (47.6). Facilitators included: transportation (72.5). Motivators included wanting a healthy baby and ultrasound. In interviews, women reported additional barriers including: lack of support, lack of motivation, negative experiences with HCPs and in the health care system, rigid clinic schedules, and lack of services. HCPs reported abuse, housing, poverty, lack of awareness of services, and stigma.

**Conclusions:**
Reasons for inadequate PNC are complex and rooted in the social determinants of health and structural disadvantage. Community involvement, cultural safety, partnership and inter-jurisdictional collaboration are needed.

## Poster 040

### MÂMAWIHITOWIN: BRINGING THE CAMPES TOGETHER. FINDINGS FROM THE ENRICH PROJECT

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[1]University of Alberta,[2]Rick Lightning Ermineskin Cree Nation, [3]Bruce Cutknife Samson Cree Nation, [4]Ida Bull Samson Cree Nation

**Introduction:**
Seminal literature has routinely critiqued historical and current trends in cultural awareness training as trivial and inadequate. In our previous study done with healthcare providers (HCPs) that provide care for Indigenous women from the Cree community of Maskwacis, the findings showed that healthcare providers wanted more meaningful interaction with the community and an opportunity to build relationships.

**Methods:**
We used a community-based participatory research approach guided by our Elders Advisory Committee, with significant community input. A mixed methods approach was used. Two surveys were administered to a group of prenatal HCPs and staff working both on reserve and in a border town, before and after they participated in a series of cultural activities and ceremonies. Qualitative description was used to analyze the post intervention interviews.

**Results:**
When comparing the pre and post surveys the findings showed that there was a substantial shift in the HCP's awareness and comfort levels in engaging with the community of Maskwacis. Twenty and 17 participants completed the survey before and after the intervention, respectively. Following the intervention, there was an increased proportion of HCPs who agreed/strongly agreed that they: felt safe and welcome in the community (+34%), were more aware of Maskwacis culture (+48%), were aware of the historical processes and how it influences health today (+56%) and improved communication with community members (+15%). Qualitative results show that the intervention was effective and meaningful and provided valuable data on how to move forward.

**Conclusions:**
This type of community-derived intervention can detect changes in HCPs and staff perceptions of the community, cultural awareness/security. This approach could be adapted to be used in other communities to assess changes in cultural awareness among those who service specific Indigenous communities.

## Poster 041

### CORRELATION OF SINGLE POCKET METHODS OF AMNIOTIC FLUID ASSESSMENT TO THE AMNIOTIC FLUID INDEX.

**Chantal Mayer[1,2], Leanne Dahlgren[1,2], Brendan Lim[2], Kenneth Lim[1,2]**
[1]British Columbia's Women's Hospital, [2]University of British Columbia

**Introduction:**
Polyhydramnios (PolyH) as defined by the Amniotic Fluid Index (AFI) has been correlated to adverse obstetrical outcomes in many studies. Adverse outcomes for PolyH defined using Single pocket estimations (Maximum Vertical Pocket (MVP, Kehl 2015) and Single Deepest Pocket (SDP, Chamberlain, 1984) has not been well studied. Correlation between MVP and SDP with the AFI would allow for more clinically relevant definitions of PolyH using either MVP or SDP. The objectives of this study are to determine the correlation of MVP and SDP to the AFI, and estimate values of MVP and SDP that correlate with AFI definitions of PolyH.

**Methods:**
Retrospective study. The BCWH ultrasound structured report system was searched from Mar 2015 to Jan 2017 for singleton obstetrical ultrasounds over 20 weeks gestation where the MVP, SDP and AFI were performed on the same scan at BCW Hospital. Pearson correlation was performed between all three measurements. Data plots were performed and R2 calculated for linear fit equations. Descriptive statistics used where appropriate.

**Results:**
The search identified 502 sets of measurements that fit the inclusion criteria. The AFI ranged from 19 to 494 mm. Pearson correlation between SDP and AFI was 0.91 (95% CI 0.88, 0.93) and between MVP and AFI was 0.93 (95% CI 0.91, 094). R2 values of linear equations for SDP and MVP versus AFI were 0.82 and 0.86 respectively. Using the best fit linear equations, an AFI of 250 equates to an SDP of 95mm, and an MVP of 87mm. An AFI of 350 equates to an SDP of 132mm, and MVP of 119 mm.

**Conclusions:**
The data shows a good linear correlation between AFI and both MVP and SDP. Estimates of SDP and MVP for AFI thresholds of 250 and 350 are presented. Prospective studies to verify clinical correlation of these definitions of PolyH are needed.

## Poster 043

### DEVELOPMENT AND APPLICATION OF AN ALGORITHM FOR TRANSPARENT REPORTING OF NODE-MAKING DECISIONS IN NETWORK META-ANALYSIS

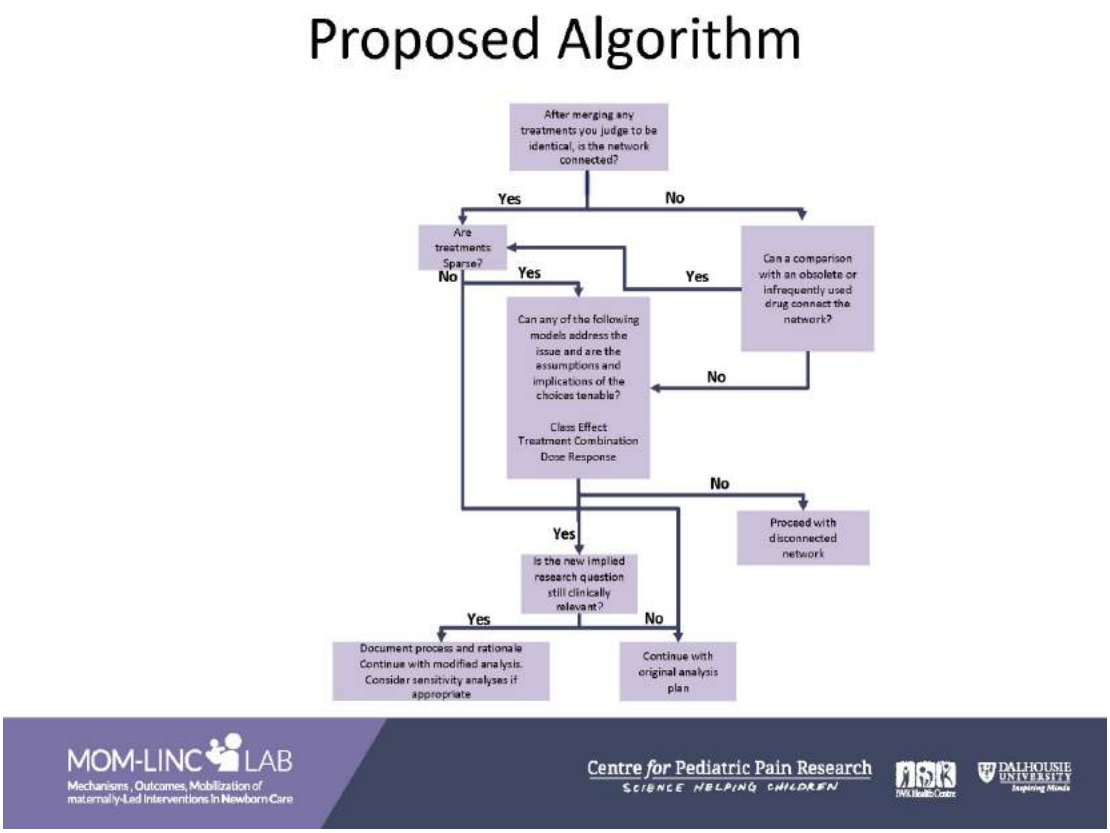
**Kelti Munroe**[1], **Timothy Disher**[1], **Jason Busse**[2], **Chris Cameron**[3], **Behnam Sadeghirad**[2], **Gerhard Pichler**[4], **Georg Schmölzer**[5], **Souvik Mitra**[1,6], **Theresa Kim**[6], **Marsha Campbell-Yeo**[1,6]
[1]Dalhousie University, [2]McMaster University, [3]Cornerstone Research Group, Inc, [4]Medical University of Graz, [5]Royal Alexandra Hospital, [6]IWK Health Centre

**Introduction:**
Formation of treatment nodes in network meta-analysis (NMA) is generally poorly reported, and limited guidance is available. Node formation balances the desire to analyze data in its least aggregated form against practical decisions related to parameter stability, network connectivity, and clinical relevance. The objective of this abstract is to develop an algorithm related to forming treatment nodes in NMAs, which facilitates transparent reporting of the node-making process and optimal use of available statistical models.

**Methods:**
The algorithm was developed using published methodological literature and expert opinion. It incorporates considerations of the acceptability of flexible statistical models (e.g., class-level, component, and dose-response models) to address issues of network connectivity and sparsity (e.g., single study connections). Lumping of treatments is reserved for those that can be considered similar (e.g., equivalent placebos). The proposed algorithm was used to guide the node formation process for an in-progress NMA comparing interventions for reducing pain from immunizations in neonates.

**Results:**
The algorithm allowed for a systematic approach to assess class-level, component, and dose-response model applicability and the influence of each on network connections. In the worked example, the initial network of treatments consisted of three sub-networks which were connected in the first step by lumping alternate placebos as one. A combined class-level and component model was selected in response to network sparsity. The addition of a dose-response assumption was incorporated to reduce the number of effect parameters to estimate (14 vs. 20). Decisions were documented with the use of a structured form.

**Conclusions:**
The proposed algorithm will improve the methods and transparency related to forming treatment nodes in NMA's. In our example, this leads to a meaningfully different network than what would have been originally analyzed while maintaining the clinical relevance of the research question.




## Poster 044

### THE UTILITY OF SERIAL ULTRASOUND ASSESSMENTS IN PPROM AND ITS IMPACT ON NEONATAL OUTCOMES

**Paula Quaglietta**[1,2], **Amir Aviram**[1,2], **Eran Wainer**[1,2], **Eugene Ng**[1,2], **Nir Melamed**[1,2], **Jon Barrett**[1,2], **Stefania Ronzoni**[1,2]
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**Introduction:**
One-third of preterm births follow preterm prelabor rupture of the membranes (PPROM). Chorioamnionitis (CA) complicates half of early PPROM. While corticosteroids and antibiotics are the mainstay of treatment, antenatal fetal surveillance including ultrasounds (US) is still a matter of controversy. We aimed to assess the impact of biweekly US among women admitted with PPROM on clinical decision-making.

**Methods:**
Singleton pregnancies with early PPROM (23-34weeks) and delivered at SHSC within 34 weeks were retrospectively analyzed (2005-2017). Based on the clinical suspicion of CA, women were divided into two comparison groups: indicated delivery for CA (study group) and spontaneous delivery (control group).

Maternal data, US parameters [estimated fetal weight (EFW), amniotic fluid volume (AFV), biophysical profile (BPP), pulsatility index of the umbilical or middle cerebral arteries (UAPI, MCAPI)], pregnancy and neonatal outcomes were collected.

**Results:**
504 pregnancies were included, of which 120 (23.8%) women were placed in the study group and 384 (76.2%) in the control group. No differences were found with regards to US parameters such as EFW, AFV, BPP, UAPI and MCAPI (Table 1). Women in the study group were more likely to be febrile, septic and undergo a Cesarean section compared with controls. Despite no difference in gestational age at birth, neonates in the study group presented significantly worse outcomes (Apgar score <7 at 5', RDS, severe IVH, sepsis, days of admission in NICU) compared with controls (Table 1).

**Conclusions:**
In patients admitted for PPROM, biweekly sonograms do not influence the decision to deliver the fetus and do not predict fetal outcomes.

Table 1: Ultrasound Data, Pregnancy and Neonatal Outcomes

| Variable | CA (n=120) | Control (n=384) | p value |
|---|---|---|---|
| Last US EFW, grams* | 1081±355 | 1105±362 | 0.71 |
| Last US oligohydramnios (MVP), n (%) | 77 (64.2) | 252 (65.6) | 0.77 |
| Last US oligohydramnios (AFI), n (%) | 92 (76.7) | 288 (75.0) | 0.71 |
| Last US biophysical profile<6/8, n (%) | 30 (25.0) | 89 (23.2) | 0.68 |
| Last US UAPI > 95$^{th}$ percentile, n (%) | 0 (0) | 1 (0.3) | 0.58 |
| Last US MCAPI < 5$^{th}$ percentile, n (%) | 5 (4.2) | 15 (3.9) | 0.90 |
| Rate of Oligohydramnios (MVP), %* | 54.5±44.0 | 52.7±45.4 | 0.79 |
| Rate of Oligohydramnios (AFI), %* | 66.7±43.4 | 63.0±44.5 | 0.59 |
| Gestational age at delivery, weeks* | 28.1±2.4 | 28.5±2.3 | 0.06 |
| Latency (PPROM-delivery), days* | 9.8±8.1 | 10.2±10.4 | 0.07 |
| Maternal fever, n (%) | 61 (50.8) | 10(2.6) | **<0.001** |
| Maternal sepsis, n (%) | 13 (10.8) | 9 (2.3) | **<0.001** |
| Cesarean Delivery, n (%) | 84 (70.0) | 161 (41.9) | **<0.001** |
| Male neonate, n (%) | 65 (54.2) | 219 (57.0) | 0.58 |
| Birth weight, grams* | 1122±389 | 1203±376 | 0.05 |
| Stillborn, n (%) | 2 (1.7) | 6 (1.6) | 0.94 |
| Arterial pH<7.1, n (%) | 6 (5.1) | 9 (2.4) | 0.13 |
| 5-minutes Apgar score<7, n (%) | 27(22.9) | 54 (14.3) | **0.03** |
| Neonatal death, n (%) | 3 (2.5) | 3 (0.8) | 0.13 |
| NICU III level admission, days* | 33±32 | 27±27 | **0.05** |
| Neonatal sepsis | 22 (18.6) | 33 (8.7) | **0.003** |
| Neonatal RDS | 76 (64.4) | 191 (50.5) | **0.008** |
| IVH grade 3-4 | 15 (12.7) | 26 (6.9) | **0.04** |
| ROP ≥3 | 2 (1.7) | 7 (1.8) | 0.91 |
| NEC | 5 (4.2) | 13 (3.4) | 0.69 |

* Data is presented as mean ± standard deviation

US - Ultrasound; EFW - Estimated fetal weight; MVP - Maximal vertical pocket; AFI - Amniotic fluid index; UAPI - Umbilical artery pulsatility index; MCAPI - Middle cerebral artery pulsatility index; RDS - Respiratory distress syndrome; IVH - Intraventricular hemorrhage; ROP - Retinopathy of prematurity; NEC - Necrotizing enterocolitis

## Poster 045

### LGA INFANTS HAVE DECREASED FETAL INSULIN SENSITIVITY AND BETA-CELL FUNCTION

**Zhong-Cheng Luo**
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**Introduction:**
Fetal overgrowth is associated with increased risk of metabolic syndrome and type 2 diabetes in adulthood. How this risk was "originated" during fetal life is unclear. We sought to assess whether large for gestational age (LGA, birth weight >90th percentile), an indicator of fetal overgrowth, is associated with altered fetal insulin sensitivity and β-cell function.

**Methods:**
In the 3D (design, development and discover) birth cohort in Quebec, Canada, we studied 106 pairs of LGA and optimal birth weight (OBW, birth weight 25-75th percentiles) infants matched by maternal ethnicity, smoking status and gestational age. Cord plasma glucose-to-insulin ratio was used as an indicator of fetal insulin sensitivity, and proinsulin-to-insulin ratio as an indicator of β-cell function.

**Results:**
Comparing LGA to OBW infants, cord blood insulin, proinsulin and leptin concentrations were significantly higher, while HWM adiponectin concentrations were similar. Glucose-to-insulin ratios were significantly lower (P=0.001), while proinsulin-to-insulin ratios significantly higher (P=0.02) in LGA vs. OBW newborns, indicating lower insulin sensitivity and β-cell function in LGA newborns. These significant differences remained after adjusting for maternal and infant characteristics, virtually unchanged further adjusting for cord blood adiponectin levels, but disappeared with further adjustment for cord blood leptin levels.

**Conclusions:**
LGA infants might have decreased fetal insulin sensitivity and β-cell function; the alterations appear to be related to elevated leptin levels.

## Poster 046

### NATURAL HISTORY OF VENTRICULOMEGALY IN FETAL AGENESIS OF THE CORPUS CALLOSUM

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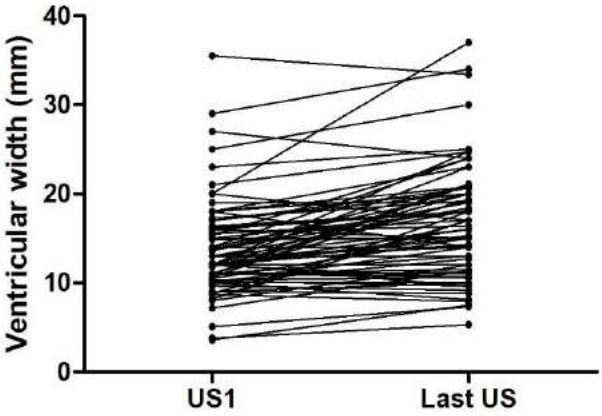
[1]Mount Sinai Hospital Toronto, [2]University Hospital Lausanne, Switzerland, [3]Hospital for Sick Children Toronto

**Introduction:**
Isolated agenesis of the corpus callosum (ACC) is associated with good neurodevelopmental outcomes in up to 70% of the cases. It is unknown whether cases with ACC and ventriculomegaly can still be considered as 'isolated' and have similar outcomes to ACC without ventriculomegaly. The aim of this study was to assess the natural evolution of the size of the fetal lateral ventricles throughout the pregnancy in fetuses with callosal anoMalies in an attempt to further clarify its potential impact on postnatal outcomes.

**Methods:**
This is a retrospective analysis of fetal callosal anoMalies at Mount Sinai Hospital, Toronto, between 2008 and 2018. Cases were classified as isolated or complex based on the presence of other structural or genetic anoMalies. (Longitudinal) ultrasound studies were reviewed and postnatal outcomes were retrieved for isolated cases.

**Results:**
We retrieved 135 fetuses with corpus callosum anoMalies, of which 33 had isolated agenesis of corpus callosum. At the time of first presentation, 97 fetuses (72%) had ventriculomegaly. There were more cases of ventriculomegaly after 24 weeks (N=58/68; 85%) than before 24 weeks (N=39 of 67; 58%, $p<0.001$). In 79 cases who had longitudinal follow-up, the mean increase in ventricular width was 0.6mm per week (figure 1), without significant difference between isolated and complex cases (0.6 ± 1.5mm vs 0.6 ± 1.1mm; $p=0.45$). Postnatal follow-up was available for 7 infants with isolated agenesis of the corpus callosum. All had severe ventriculomegaly at birth. Five had normal neurodevelopment (71%) and two had mild delay.

**Conclusions:**
Both isolated and complex callosal anoMalies are frequently associated with progressive ventriculomegaly and 85% will have ventriculomegaly in the third trimester of pregnancy. Despite the presence of severe ventriculomegaly, we demonstrated normal (short-term) developmental outcomes in 5 of 7 cases. As such, ventriculomegaly is part of the disease spectrum and does not allow prediction of postnatal outcome.




## Poster 047

### ASSOCIATION BETWEEN THE CEREBROPLACENTAL RATIO AND PRETERM BIRTH <34 WEEKS IN MONOCHORIONIC TWINS

**Naila Ramji**[1,2], **Vanessa Bacal**[1,2], **Jennifer Clancy**[1], **Felipe Moretti**[1,2], **Karen Fung Kee Fung**[1,2]
[1]The Ottawa Hospital, [2]University of Ottawa

**Introduction:**
Low cerebroplacental ratio (CPR) is associated with poor outcomes in singleton pregnancies, but there is little evidence for this in twins. The objective was to determine whether low CPR is associated with adverse obstetrical outcomes in monochorionic twins.

**Methods:**
This was a secondary outcomes analysis of a retrospective cohort of 164 pathologically confirmed monochorionic twins, delivering at The Ottawa Hospital, between January 2014 and December 2017. Outcomes included PTB<34 weeks, hypertensive disorders of pregnancy, mode of delivery, intrauterine fetal death(IUFD) and placental abruption. We investigated their relationship to low CPR<2.5%, elevated UA-PI>95%, and low MCA-PI<5%. SAS 9.4 was used for analyses. For categorical variables, differences between groups were calculated using Chi-square or Fisher exact tests. For continuous variables, differences were calculated using t-test, Wilcoxon rank sum, ANOVA and Kruskal-Wallis tests. P<0.05 was considered statistically significant. Sensitivities, specificities, positive predictive values(PPV) and negative predictive

values(NPV) were calculated for Dopplers with respect to PTB<34 weeks and hypertensive disorders.

**Results:**
Complications in monochorionic twins included PTB <34 weeks (14.6%), hypertensive disorders of pregnancy (20.7%), Caesarean section (56.1%), IUFD (2.4%) and abruption (0.6%). For PTB <34 weeks, the prevalence of low CPR was significantly increased(p=0.002), as was elevated UA-PI(p=0.04), and low MCA-PI(p<0.001). Hypertensive disorders of pregnancy were associated with a higher prevalence of elevated UA-PI(p=0.03). Caesarean section was associated with a higher frequency of low MCA-PI(p=0.006). No significant differences were observed between Dopplers and IUFD nor abruption. Low CPR was most sensitive, whereas elevated UA-PI and low MCA-PI were more specific, for both PTB<34 weeks and hypertensive disorders. PPV was low and NPV was relatively high (comparable) for all Doppler variables.

**Conclusions:**
Low CPR, elevated UA-PI and low MCA-PI are significantly associated with PTB<34 weeks in monochorionic twins. Low CPR is the most sensitive of the Doppler variables for both PTB<34 weeks and hypertensive disorders of pregnancy.

**Prevalence of Abnormal Dopplers by Secondary Outcomes**

| Secondary Outcome | CPR | | | UA-PI | | | MCA-PI | | |
|---|---|---|---|---|---|---|---|---|---|
| | *Low < 2.5%, n/N (%)* | *Normal, n/N (%)* | *P* | *Elevated > 95%, n/N (%)* | *Normal, n/N (%)* | *P* | *Low < 5%, n/N (%)* | *Normal, n/N (%)* | *P* |
| PTB < 34 wGA | 12/45 (26.7) | 6/99 (6.06) | 0.002 | 5/16 (31.3) | 16/143 (11.2) | 0.04 | 13/24 (54.2) | 8/123 (6.5) | <0.001 |
| Hypertensive Disorders of Pregnancy | 10/45 (22.2) | 17/99 (17.2) | 0.49 | 7/16 (43.8) | 26/143 (18.2) | 0.03 | 4/24 (16.7) | 23/123 (18.7) | 1 |
| Caesarean section | 30/45 (66.7) | 53/99 (53.5) | 0.11 | 10/16 (62.5) | 79/143 (55.2) | 0.27 | 21/24 (87.5) | 65/123 (52.9) | 0.006 |

**Sensitivity, Specificity, PPV and NPV of Dopplers for Secondary Outcomes**

| Doppler Variable | PTB < 34 wGA % (CI) | Hypertensive Disorders of Pregnancy % (CI) |
|---|---|---|
| **Low CPR < 2.5%** | | |
| Sensitivity | 66.7 (41.0-86.7) | 37.0 (19.4-57.6) |
| Specificity | 73.8 (65.2-81.2) | 70.1 (60.9-78.2) |
| PPV | 26.7 (14.6-41.9) | 22.2 (11.2-37.1) |
| NPV | 93.9 (87.3-97.7) | 82.8 (73.9-89.7) |
| **Elevated UA-PI > 95%** | | |
| Sensitivity | 23.8 (8.22-47.2) | 21.2 (8.98-38.9) |
| Specificity | 92.0 (86.2-96.0) | 92.9 (86.9-96.7) |
| PPV | 31.3 (11.0-58.7) | 43.8 (19.8-70.1) |
| NPV | 88.8 (82.5-93.5) | 81.8 (74.5-87.8) |
| **Low MCA-PI < 5%** | | |
| Sensitivity | 61.9 (38.4-81.9) | 14.8 (4.19-33.7) |
| Specificity | 91.3 (84.9-95.6) | 83.3 (75.4-89.5) |
| PPV | 54.2 (32.8-74.5) | 16.7 (4.74-37.4) |
| NPV | 93.5 (87.6-97.2) | 81.3 (73.3-87.8) |

## Poster 048

### EFFECT OF IUGR AND BROCCOLI SPROUT SUPPLEMENTATION ON DOPAMINE AND SEROTONIN RECEPTORS.

**David Jay**, **Edward Armstrong**, **Elizabeth Garcia**, **Jerome Yager**
University of Alberta

**Introduction:**
Intrauterine growth restriction (IUGR) is a form of placental insufficiency (PI) that generates chronic hypoxia

in fetuses. IUGR is a risk factor for the development of cerebral palsy (CP) through its inherent induction of perinatal brain injury. There is little neuropathology knowledge to account for changes in behavior. In this study, we aim to determine if IUGR-induced behavioral changes are due to alterations in neurotransmitter receptors and the effects of broccoli sprout (BrSp) consumption in this response.

**Methods:**
Pregnant Long-Evans rats underwent IUGR and Sham surgery on gestational day (GD) 20. Dams allocated to receive supplementation were treated with 200 mg/day of dried BrSp. Brain samples taken from the rats' cortex, striatum, and the hippocampus were extracted and homogenized. After norMalizing the protein we measured the DA and 5-HT concentrations by Enzyme-Linked Immunosorbent Assay (ELISA). We used Univariate ANOVA in SPSS to determine significance in our treatments.

**Results:**
The ELISA measurements revealed that BrSp significantly increased the cortex membrane 5-HT levels of female pups ($p = <0.05$). In addition, the implemented IUGR surgery increased the hippocampus DA concentration of male pups ($p = <0.05$) in the Chow group, but not the BrSp group. Suggesting that BrSp had a protective effect on the DA levels in the hippocampus of male pups. Preliminary data shows that IUGR surgical procedure increases the DA concentrations in relation to the control (Sham) groups in the Striatal and Cortical regions of male pups. Finally, trends indicate that males may be more susceptible than females to neurotransmitter imbalances caused by IUGR.

**Conclusions:**
IUGR does cause changes in neurotransmitter receptors and these changes can be ameliorated by BrSp consumption. These findings suggest that BrSp dietary supplementation during pregnancy is a novel, safe and efficacious preventive strategy in the challenge of treating cerebral palsy and developmental disabilities.

## Poster 050

### UTILIZATION OF CFFDNA SCREENING IN A PUBLICLY FUNDED CONTINGENT PRENATAL SCREENING MODEL

**Kara Bellai Dussault**[1], **Tianhua Huang**[1,2], **Andrea Lanes**[1], **Mark Walker**[1,3], **Nan Okun**[1,4], **Christine Armour**[1,5], **Shelley Dougan**[1]
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**Introduction:**
Ontario offers a publicly-funded contingent model of prenatal screening where cell-free fetal DNA (cffDNA) screening is funded in situations conferring a higher risk for fetal aneuploidy, including positive multiple marker screen (MMS) result, advanced maternal age (AMA, ≥40 years) and nuchal translucency (NT) measurement ≥3.5mm. This study examined the utilization and positive rates for each funded indication in order to inform future funding policy around cffDNA screening in Ontario.

**Methods:**
This descriptive cohort study is based on secondary analysis of data collected by Ontario's prescribed maternal and child registry, the Better Outcomes Registry & Network (BORN), to which all laboratories and hospitals contribute. The study population includes all pregnant women who received cffDNA screening from January 2016 to December 2017.

**Results:**
25,234 cffDNA screening records were collected over the study period, with 67.3% meeting the clinical eligibility criteria

for public funding. The most common clinical indicators for funded cffDNA screening were: AMA (37%), positive MMS (33%), increased risk for aneuploidy due to other clinical factors such as soft markers (11%), and previous aneuploidy (5%). The clinical indicator "increased NT" provided the highest cffDNA positive rates, at 11.5%. Several indicators yielded a 0% screen positive rate, including "other risk factor", "risk of sex-limited disorder", "ultrasound findings suggestive of sex chromosome aneuploidy" and "ultrasound findings suggestive of a disorder of sex determination". The use of certain eligibility criteria could be audited by cross-referencing with other data sources available in the BORN registry. For example, of the cffDNA screens funded for the indication of increased NT, 19.7% had an NT measurement <3.5mm.

**Conclusions:**
Examining the utilization and positive rates for cffDNA screening funded in Ontario for various high-risk indications allows the potential for audit and improvement of adherence to standardized cffDNA screening protocols, and provides a basis for reassessment of the funding model currently in place.

## Poster 051

### ASSOCIATION BETWEEN THE CEREBROPLACENTAL RATIO AND FETAL GROWTH DISORDERS IN MONOCHORIONIC TWINS

**Naila Ramji**[1,2], **Vanessa Bacal**[1,2], **Jennifer Clancy**[1], **Felipe Moretti**[1,2], **Karen Fung Kee Fung**[1,2]
[1]The Ottawa Hospital, [2]University of Ottawa

**Introduction:**
Low cerebroplacental ratio (CPR) has been associated with fetal growth restriction in singleton pregnancies, but the evidence for low CPR in twins is sparse. The objective was to determine whether low CPR is associated with fetal growth disorders in monochorionic twins.

**Methods:**
This was a retrospective cohort of 164 pathologically confirmed monochorionic twins, delivering after 20 weeks at The Ottawa Hospital, between January 2014 and December 2017. Primary outcomes included presence of IUGR in one or both twins(EFW <10%), growth discordance(>20%), and selective IUGR(IUGR+growth discordance). We investigated the relationship of these outcomes to low CPR<2.5%, elevated UA-PI>95%, low MCA-PI<5%, and inter-twin Doppler discordance. SAS 9.4 was used for statistical analyses. For categorical variables, differences between groups were calculated using Chi-square or Fisher exact tests. For continuous variables, differences were calculated using t-test, Wilcoxon rank sum, ANOVA and Kruskal-Wallis tests. P<0.05 was considered statistically significant. Sensitivities, specificities, positive predictive values (PPV) and negative predictive values (NPV) were also calculated for Doppler variables with respect to fetal growth disorders.

**Results:**
Fetal growth disorders were present in 34.7% of monochorionic twin pregnancies: 16.4% were IUGR, 5.5% were growth discordant and 12.8% were sIUGR. Low CPR was significantly associated with fetal growth disorders(p=0.011). Growth disorders were also significantly associated with elevated UA-PI(p=0.001) and low MCA-PI(p=0.009). For inter-twin Doppler discordance, UA-PI discordance was significant between groups(p<0.001). CPR and MCA-PI discordance were not significantly different in normally grown twins compared to those with growth disorders. Low CPR was most sensitive, whereas elevated UA-PI and low MCA-PI were more specific, for fetal growth disorders. PPV was low and NPV was relatively high and comparable for all Doppler variables.

**Conclusions:**
Low CPR, elevated UA-PI and low MCA-PI are significantly associated with fetal growth disorders in monochorionic twins. Low CPR is the most sensitive of the Doppler variables for fetal growth disorders.

| Relationship between Dopplers and Fetal Growth Disorders | | | | | |
|---|---|---|---|---|---|
| **Doppler Variable** | **No growth issues N=107 n/N (%)** | **IUGR N=27 n/N (%)** | **Growth Discordance N=9 n/N (%)** | **sIUGR N=21 n/N (%)** | **P** |
| Low CPR < 2.5% | 22/94 (23.4) | 10/26 (38.5) | 2/6 (33.3) | 11/18 (61.1) | 0.011 |
| Elevated UA-PI > 95% | 4/105 (3.81) | 6/27 (22.2) | 1/8 (12.5) | 5/19 (26.3) | 0.001 |
| Low MCA-PI < 5% | 11/95 (11.6) | 3/25 (12.0) | 0/7 (0.00) | 10/20 (50.0) | 0.009 |

| Sensitivity, Specificity, PPV and NPV of Dopplers for Fetal Growth Disorders | | | |
|---|---|---|---|
| **Doppler Variable** | **IUGR % (CI)** | **Growth Discordance % (CI)** | **sIUGR % (CI)** |
| **Low CPR < 2.5%** | | | |
| Sensitivity | 47.7 (32.5-63.3) | 54.2 (32.8-74.5) | 61.1 (35.8-82.7) |
| Specificity | 76.0 (66.4-84.0) | 73.3 (64.5-81.0) | 73.0 (64.5-80.5) |
| PPV | 46.7 (31.7-62.1) | 28.9 (16.4-44.3) | 24.4 (12.9-39.5) |
| NPV | 76.8 (67.2-84.7) | 88.9 (81.0-94.3) | 92.9 (86.0-97.1) |
| **Elevated UA-PI > 95%** | | | |
| Sensitivity | 23.9 (12.6-38.8) | 22.2 (8.62-42.3) | 26.3 (9.15-51.2) |
| Specificity | 95.6 (90.0-98.6) | 92.4 (86.5-96.3) | 92.1 (86.4-96.0) |
| PPV | 68.8 (41.3-89.0) | 37.5 (15.2-64.6) | 31.3 (11.0-58.7) |
| NPV | 75.5 (67.6-82.3) | 85.3 (78.4-90.7) | 90.2 (84.1-94.5) |
| **Low MCA-PI < 5%** | | | |
| Sensitivity | 28.9 (16.4-44.3) | 37.0 (19.4-57.6) | 50.0 (27.2-72.8) |
| Specificity | 89.2 (81.5-94.5) | 88.3 (81.2-93.5) | 89.0 (82.2-93.8) |
| PPV | 54.2 (32.8-74.5) | 41.7 (22.1-63.4) | 41.7 (22.1-63.4) |
| NPV | 74.0 (65.3-81.5) | 86.2 (78.8-91.7) | 91.9 (85.6-96.0) |

## Poster 052

### MICRORNAS: NEW TEST HELPS DETERMINE IF LATE PRETERMS NEED ANTENATAL BETAMETHASONE

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[1]Centre Hospitalier Universitaire de Sherbrooke

**Introduction:**
Infants born between $34^{0/7}$ and $36^{6/7}$ weeks of gestation, referred to as late preterm, represent 75% of the preterm deliveries. They are at higher risk of adverse respiratory outcomes than those born at term (37 weeks and beyond). Antenatal administration of betamethasone in this population is controversial, and currently, no reliable test enables physicians to decide whether the benefits outweigh the risks. MicroRNAs regulate gene expression and are transported in exosomes. Recent studies have shown that miR-200c is involved in the pulmonary surfactant metabolism. The purpose of this study is to demonstrate that microRNAs can be used as biomarkers of fetal lung maturity.

**Methods:**
We conducted a case-control study involving eight term pregnancies (control group) and 2 women who delivered in the late preterm period after receiving betamethasone. We collected arterial cord blood plasma (ACBP), venous cord blood plasma (VCBP), and amniotic fluid (AF). Exosomes were isolated

using ultracentrifugation, then characterized and quantified by electron microscopy with immunolabelling CD81- exosome specific protein and enzyme-linked immunosorbent assay (ELISA). We used digital droplet polymerase chain reaction (ddPCR) to quantify exosomal miRNA-200c.

**Results:**
Exosomes were successfully isolated from all samples. No significant difference was found between the two groups for exosome concentration in ACBP and VCBP. Exosomes concentration was significantly lower in AF compared to the other biological fluids. When comparing the betamethasone to the control group, MiR-200c concentration in ACBP (340 [180-761] vs 668 [93-1184] copies/ul; p=0,3) and VCBP (168[130-22] vs 319[60-598] copies/ul; p=0,1) was similar. None of the infants suffered from respiratory complications.

**Conclusions:**
Our study is the first study to measure Mir-200c in cord blood and amniotic fluid. MiR-200c expression profile in late preterm infants who received betamethasone resembled that of term infants. We are currently recruiting late preterm pregnancies to confirm our findings.

## Poster 053

### THE UTILITY OF MRI FOR MEASURING HEMATOCRIT IN FETAL ANEMIA

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[1]University of Toronto, [2]Hospital for Sick Children, [3]Mount Sinai Hospital

**Introduction:**
Fetal anemia is evaluated noninvasively by Doppler ultrasonographic measurements of the peak systolic velocity of the middle cerebral artery (MCA-PSV), which has higher likelihood of being falsely-positive after the fetus has received intrauterine blood transfusions and in late gestation. A previous *in vitro* study showed that hematocrit can be estimated using MRI $T_1$ and $T_2$ relaxation times. This current study aimed to assess the accuracy of MRI for diagnosing fetal anemia *in vivo*.

**Methods:**
Fetuses undergoing fetal blood sampling or intrauterine blood transfusion were scanned at 1.5 Tesla (Siemens Avanto, Erlangen, Germany). A modified Look-Locker inversion pulse sequence and a $T_2$ preparation sequence were applied for $T_1$ and $T_2$ mapping of the intrahepatic umbilical vein. Estimated fetal hematocrit was calculated using a combination of $T_1$ and $T_2$ values and was then compared with measurements from fetal blood sampling and Doppler MCA-PSV.

**Results:**
23 fetuses were assess with 33 MRI scans. The mean difference between laboratory and MRI hematocrit was 6% ± 5% with a significant correlation of 0.76 determined by generalized estimation equation ($p < 0.001$) (Figure 1a). Bland-Altman analysis revealed a systematic bias of -3% (Figure 1b). The area under the curve for the MRI ROC curve (0.96) was significantly higher than that of Doppler MCA-PSV (0.69) to predict fetal anemia (Figure 2). MRI and Doppler had similar sensitivity at around 90% in predicting moderate to severe anemia (Table 1). However, MRI had a specificity of 93% (95% CI: 66-100%), which was higher than the specificity of Doppler (71%, 95% CI: 42-92%).

**Conclusions:**
Moderate to severe anemia can be detected by MRI non-invasively with high accuracy and specificity. Our results indicate a potential clinical application for fetal MRI in determining which patients should undergo intrauterine blood transfusion, particularly following previous transfusions and in late gestation.

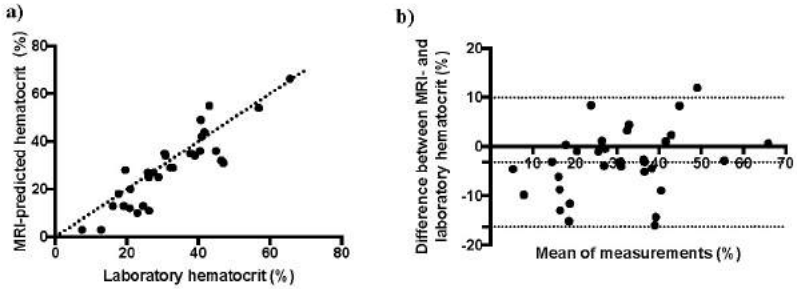


**Figure 1. Comparison of MRI and laboratory measurements obtained from fetal blood sampling from 23 patients (n=33).**
a) A correlation (0.76, $p < 0.001$) was found between MRI estimates of hematocrit and laboratory hematocrit using generalized estimating equation. Dashed line represents the identity line. b) Bland-Altman analysis showed a bias of -0.03 between the two methods. Dashed line represents the 95% limits of agreements.

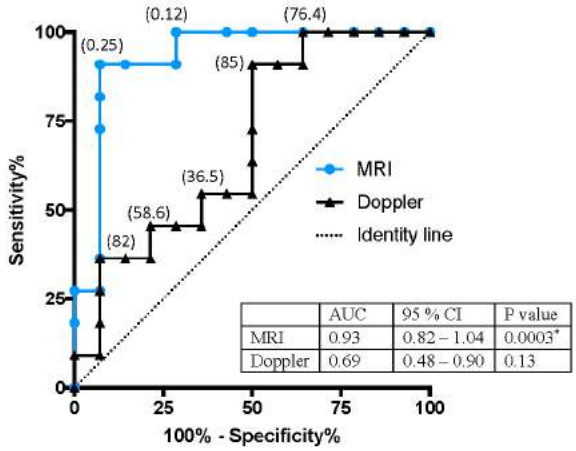


**Figure 2. Receiver operating characteristic curves for Doppler ultrasonography and MRI pre-transfusion measurements for the prediction of moderate to severe fetal anemia.**
Cut off of moderate to severe fetal anemia: 0.65 multiple of median for MRI, 1.50 multiple of median for Doppler. Data were compared against the gold-standard fetal blood sampling measurements. In brackets: values of MRI-estimated hematocrit (%) or Doppler middle cerebral artery peak systolic velocity (multiple of median). Areas under curve (AUC) and the p values are shown. * represents significant results.

**Table 1. Sensitivity, Specificity, Positive and Negative Predictive Values of All Pre-transfusion Doppler and MRI Measurements in Predicting Moderate to Severe Fetal Anemia. ***

| **Test characteristics** | **Doppler** | **MRI** |
|---|---|---|
| | *Percent (95% confidence interval)* | |
| Cut-off | 1.5 multiple of median | 0.65 multiple of median |
| Sensitivity | 91 (59-100) | 91 (59-100) |
| Specificity | 71 (42-92) | 93 (66-100) |
| Positive predictive value | 71 (42-92) | 90 (59-100) |
| Negative predictive value | 90 (59-100) | 93 (66-100) |

## Poster 054

### ACCURACY OF HADLOCK IV FORMULA FOR FETAL WEIGHT ESTIMATION IN PRETERM PREMATURE RUPTURE OF MEMBRANES

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Sunnybrook Health Sciences Centre

**Introduction:**
Estimated fetal weight (EFW) is a tool used for clinical decision making in obstetrics, including patients with preterm premature rupture of membranes (PPROM). The Hadlock IV formula is the most commonly used calculation of EFW, using biparietal diameter, head and abdominal circumferences, and femur length. It is known that several parameters, including amniotic fluid volume, may alter the performance and accuracy of EFW. The objective of this study was to assess the accuracy of the Hadlock IV EFW calculation in patients with PPROM.

**Methods:**
We performed a retrospective cohort study of singleton gestations with PPROM, admitted between $22^{0/6}$-$33^{0/6}$ weeks to a single, university-affiliated, tertiary medical centre, between 2003-2017. All women had sonographic EFW performed within 14 days of delivery, calculated by Hadlock IV formula. The Pearson correlation was calculated in order to determine the association between EFW and birth weight (BW). We also calculate the proportion of estimations (POE) within 10-20% of BW.

**Results:**
Overall, 565 women were included. Mean gestational age (GA) at admission was 26.8±2.4, and mean GA at delivery 28.2±2.6. The median EFW-to-delivery interval was 3 days (range: 0-14 days, intraquartile range: 5 days), mean BW 1154±418 grams, and mean EFW by Hadlock IV was 1078±382 grams. Overall, 49.4% of women had maximal vertical pocket (MVP)<2cm at time of EFW. The Pearson correlation coefficient between EFW and BW was strong at r=0.935 (p<0.001), with 319 (56.5%) of measurements falling within 10%, 408 (72.2%) within 15% and 455 (80.5%) within 20% of BW. This correlation was not affected by gender (r=0.932 for females, r=0.936 for males, p<0.001 for both) or by level of amniotic fluid (r=0.935 for MVP<2 cm, r=0.943 for MVP≥2cm, p<0.001 for both).

**Conclusions:**
The study shows that Hadlock IV provides an accurate estimation of fetal weight in patients with PPROM, regardless of fetal sex or amniotic fluid levels.

**Table 1- Characteristics of the cohort**

| Variable | |
|---|---|
| Gestational age at admission, weeks, mean±SD | 26.8±2.4 |
| Gestational age at delivery, weeks, mean±SD | 28.2±2.6 |
| Sonogram to delivery interval, days, median [range] | 3 [0-14] |
| Birth weight, grams, mean±SD | 1154±418 |
| Oligohydramnios (MVP<2cm), n (%) | 279 (49.4) |
| Male neonates, n (%) | 317 (56.1) |

## Poster 055

### AN ALTERNATIVE APPROACH TO DEVELOPING GUIDELINES FOR THE MANAGEMENT OF INFANTS BORN AT THE THRESHOLD OF VIABILITY

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[1]University of British Columbia, [2]British Columbia Children's Hospital, [3]Royal North Shore Hospital, Australia

**Introduction:**
Guidelines for resuscitation of infants born at the threshold of viability (ToV) based on gestational age (GA) are criticized for 'gestational ageism' and becoming outdated. If probability of survival and neurodevelopmental outcomes were considered instead of GA, bias could be minimized. The study objective is to identify the probability of survival and severe neurodevelopmental impairment (sNDI) at which perinatal health care providers (pHCPs) would or would not provide or recommend resuscitation for infants at the ToV.

**Methods:**
A Delphi process consisting of five rounds was implemented to seek consensus (>80% agreement) amongst pHCPs in BC. The first-round consisted of 2 Neonatology and 2 Maternal-Fetal-Medicine (MFM) Focus Groups. Rounds 2-4 involved surveys of pHCPs, building upon results of previous rounds. For round 5, draft ToV statements were developed and agreement sought.

**Results:**
Focus Groups (20 participants) agreed: (1) guidelines are useful; (2) sNDI is important in decision-making. There were 403 survey responses in Rounds 2-5. The final survey had 148 responses (45% paediatricians, 24% obstetricians, 18% (all) neonatologists, 13% (most) MFM).
Consensus was reached for the following statements:
1. If expected chance of survival < 5%, resuscitation should not be offered (93% Agree).
2. If expected chance of survival < 10%, resuscitation should not be recommended (87% Agree). 3. If expected chance of survival without sNDI> 10% but < 70%, well-informed, capable parent(s) should decide about resuscitation (87% Agree). 4. If expected chance of survival without sNDI> 70% but < 90%, resuscitation is recommended (81% Agree). 5. If expected chance of survival without sNDI> 90%, the baby should be resuscitated, even against parental wishes (84% Agree).

**Conclusions:**
Objective ToV guidelines based on pHCP's consensus can be developed. The above statements form the basis for revised BC ToV management guidelines, which can be rapidly updated with local outcome data.

## Poster 056

### IMPACT OF INTRODUCTION OF NON-INVASIVE PRENATAL TESTING ON UPTAKE OF GENETIC TESTING IN FETUSES WITH CENTRAL NERVOUS SYSTEM ANOMALIES.

**Tim Van Mieghem**, **David Chitayat**, **Johannes Keunen**, **Maian Roifman**, **Gareth Seaward**, **Rory Windrim**, **Greg Ryan**, **Samar Altoukhi** (Mount Sinai Hospital)

**Introduction:**
To evaluate the impact of introduction of non-invasive prenatal testing (NIPT) on the uptake of invasive testing in pregnancies complicated by fetal central nervous system (CNS) anoMalies.

**Methods:**
Retrospective review of all singleton pregnancies complicated by fetal CNS anoMalies seen at a single tertiary center

between 2010 and 2017. Cases who had undergone invasive testing or NIPT prior to the diagnosis of the CNS anomaly were excluded. Cases were segregated according to whether they were seen prior to introduction of NIPT (Group A, 2010-2013) or thereafter (Group B, 2014-2017). We examined the rate of invasive and non-invasive genetic testing in each group.

**Results:**
We retrieved 500 cases of fetal CNS anoMalies (Fig1). Overall, 308 (62%) cases were isolated and 192 (38%) had additional structural anoMalies ('complex'). In the total cohort, 165 women (33%) underwent expectant management with no further prenatal genetic testing, 166 (33%) had invasive testing, 52 (10%) had NIPT and 117 pregnancies (23%) were terminated without further genetic tests. In Group B, 21% underwent NIPT. The introduction of NIPT significantly decreased the number of pregnancies having no genetic testing (44% Group A vs 22% in group B, p<0.0001.) but did not change the uptake of invasive testing (34% vs 32% in group A and B, respectively; p=0.61). In subgroup analysis, this decrease in patients choosing no testing was only significant in the patients presenting with ventriculomegaly: where in group A 43 of 60 cases (72%) chose not to have any further testing compare to 22 of 60 (37%) in group B (p =0.0002). Of 47 low-risk NIPTs, 17 had follow-up with microarray, 3 of which showed pathogenic copy number variants (18%) (Table 1).

**Conclusions:**
Uptake of invasive prenatal testing in fetuses with brain anoMalies was not affected by the introduction of NIPT. NIPT missed a significant number of CNVs.

| | | Common Autosomal Trisomy | Microarray Abnormality |
|---|---|---|---|
| **IPT** | **166** | | |
| Isolated | 74 (44.6%) | - | 3 (4.1%) |
| Complex | 92 (55.4%) | 30 (32.6.1%) | 5 (5.4%) |
| | | | |
| **NIPT** | **52** | | |
| **Low Risk** | | | |
| Isolated* | 29 (55.8%) | - | 2(6.9%) |
| Complex** | 18 (34.6%) | - | 4 (22.2%) |
| **High Risk** | | | |
| Isolated | - | - | - |
| Complex*** | 5 (9.6%) | 2 (40%) | - |

*Table 1 – Genetic Confirmation in IPT and NIPT groups*

* *Only 8 cases underwent genetic testing*
** *Only 8 cases underwent genetic testing*
*** *Only 3 cases underwent genetic testing*

## Poster 057

### COMPARISON OF SONOGRAPHIC FETAL WEIGHT ESTIMATION FORMULAS IN PATIENTS WITH PRETERM PREMATURE RUPTURE OF MEMBRANES.

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**Introduction:**
Numerous formulas for estimated fetal weight (EFW) calculations have been proposed over the years. Since amniotic fluid volume may impact the accuracy of EFW formulas, and since clinical decision-making is often guided by the results of sonographic EFW, these formulas must be compared in the setting of preterm premature rupture of membranes (PPROM). The objective of this study was to compare the accuracy of 21 previously published formulas for sonographic EFW in PPROM patients.

**Methods:**
This was a retrospective cohort study of women with PPROM and singleton gestations, admitted between $22^{0/6}$-$33^{0/6}$ weeks to a single, university-affiliated, referral centre, between 2003-2017. All women had a sonogram for EFW performed within 14 days of delivery by standard biometry (biparietal diameter, head circumference, abdominal circumference and femur length). We compared the accuracy of 21 previously published EFW formulas in the setting of PPROM by comparing the correlation with actual birth weight (BW) and calculating systematic error (SE, the inherent systematic deviation of a given formula from actual birth weight), random error (RE, reflects the random component of prediction error), proportion of estimations (POE) within 10% of birth weight and the Euclidean distance (which represents the geometric average of SE and RE).

**Results:**
Overall, 565 subjects were included. Most formulas had strong correlation with actual birth weight (19/21 formulas with r>0.9). The mean SE was -4.30%, and mean RE 14.48%. The formula that performed best, by highest POE and lowest Euclidean distance was that of Ott (1986), utilizing abdominal and head circumferences, and femur length. Nonetheless, all of the first 10 ranking formulas (including the mostly used Hadlock IV) performed quite similarly, with minimal differences between them.

**Conclusions:**
Ott (1986) formula for EFW performs best in patients with PPROM, yet the differences between the top 10 ranking formulas is negligible, and most perform similarly in this setting.

**Table 2 - Performance of the different formulas**

| Formula | Pearson coefficient (r) | SE (%) | RE (%) | POE<10% (%) | ED | Rank |
|---|---|---|---|---|---|---|
| **Group 1 (AC and FL)** | | | | | | |
| Hadlock (1985) | 0.928 | -2.35 | 13.27 | 58.6 | 13.48 | 8 |
| Woo (1985) | 0.929 | -7.98 | 14.91 | 44.4 | 16.91 | 14 |
| Warsof (1986) | 0.913 | 2.44 | 15.41 | 50.6 | 15.60 | 12 |
| **Group 2 (AC and BPD)** | | | | | | |
| Vintzileos (1987) | 0.923 | -0.76 | 14.08 | 54.3 | 14.10 | 10 |
| Warsof (1977) | 0.922 | -13.42 | 12.06 | 32.6 | 18.04 | 15 |
| Shepard (1982) | 0.924 | -4.90 | 13.25 | 54.0 | 14.13 | 11 |
| Jordaan (1983) | 0.928 | 14.83 | 17.21 | 36.6 | 22.72 | 19 |
| Hadlock (1984) | 0.925 | -4.34 | 13.17 | 56.5 | 13.87 | 9 |
| Woo (1985) | 0.922 | -13.66 | 11.99 | 30.1 | 18.18 | 16 |
| Hsieh (1987) | 0.754 | -80.15 | 21.50 | 0.7 | 82.98 | 21 |
| **Group 3 (AC and HC (±BPD))** | | | | | | |
| Hadlock (1984) | 0.937 | -4.69 | 12.26 | 56.8 | 13.13 | 3 |
| Jordaan (1983) | 0.930 | 13.29 | 15.17 | 37.7 | 20.17 | 18 |
| Jordaan (1983) | 0.927 | 28.11 | 24.00 | 20.2 | 36.96 | 20 |
| **Group 4 (AC, FL and BPD)** | | | | | | |
| Hadlock (1985) | 0.933 | -4.90 | 12.39 | 57.7 | 13.32 | 7 |
| Woo (1985) | 0.925 | -10.66 | 12.24 | 41.8 | 16.23 | 13 |
| Shinozuka (1987) | 0.932 | 0.62 | 13.09 | 60.9 | 13.10 | 2 |
| Hsieh (1987) | 0.895 | 5.14 | 18.40 | 46.4 | 19.10 | 17 |
| **Group 5 (AC, FL and HC)** | | | | | | |
| Hadlock (1985) | 0.936 | -5.17 | 12.16 | 57.3 | 13.21 | 4 |
| Combs (1993) | 0.940 | 3.23 | 12.85 | 58.9 | 13.25 | 5 |
| Ott (1986) | 0.940 | 0.36 | 12.42 | 62.8 | 12.43 | 1 |
| **Group 6 (AC, FL, BPD and HC)** | | | | | | |
| Hadlock 4 (1985) | 0.935 | -5.40 | 12.17 | 56.6 | 13.31 | 6 |

SE - Systemic error; RE - Random error; POE - Proportion of estimations; ED - Euclidean distance; AC - abdominal circumference; FL - Femur length; BPD - Biparietal diameter; HC - Head circumference.

## Poster 058

### PARENTAL TRAUMA AND CHILD TEMPERAMENT: A MODEL OF THE INTERGENERATIONAL TRANSMISSION OF RISK

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**Introduction:**
Recent evidence suggest that maternal exposure to childhood interpersonal traumas may compromise offspring

development through an early effect on its temperament (Bouvette-Turcotte et al., 2015; Enlow et al., 2017). However, the mechanisms of risk remain poorly understood. This research aims to evaluate whether parents' maladaptive personality traits and parental mentalization capacities mediate the association between parental trauma and offspring temperament.

**Methods:**
A total of 176 parent-child dyads (91% mothers, 45% with trauma, $M_{age}$ = 32.17, $SD_{age}$ = 4.08) were recruited in the community. Children were aged between 3 months and 7 years old. Parents completed self-report measures of exposure to childhood abuse and neglect (CTQ), parental mentalization (PRFQ), maladaptive personality traits (SIFS), and a parent-report measure of their youngest child's temperament (IBQ, ECBQ or CBQ, according to the age of the child). The conceptual model was evaluated using structural equation modeling.

**Results:**
Structural equation modeling analyses revealed that maladaptive personality traits mediate the association between maternal history of trauma and parental mentalization. Deficits in parental mentalization predict in turn higher negative affectivity and lower emotional regulation in offspring. Results reveal a good fit for the data: $\chi 2(3, N = 176) = 13.20, p = .21$, CFI = 0.97, Normed Fit Index (NFI) = .90 and RMSEA = .04 with 90% CI [0.00, 0.10].

**Conclusions:**
Findings revealed that parents who were exposed to childhood trauma and who developed maladaptive personality traits are more likely to have children who present, early in their development, a temperament prone to affective dysregulation. This association was mediated by parents' mentalization about their child (i.e. the ability to think of the child's behaviors as the manifestation of underlying mental states). Results suggest that parental interventions aiming to support parental mentalization can contribute to interrupting the intergenerational transmission of risk trajectories associated with childhood trauma.

## Poster 059

### EXPLORING ASSOCIATIONS OF PRENATAL EXPOSURE TO MANGANESE AND MID-CHILDHOOD INTELLIGENCE AND MOTOR DEVELOPMENT

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**Introduction:**
"Manganism", a disease with symptoms similar to Parkinson's disease has been reported among workers, who were intoxicated with Manganese (Mn). Mn is an essential element for growth and Mn deficiency has never been described in humans. Increasing evidence suggest that high exposure to Mn could impair brain development. In Canada, particularly in Eastern township, there are several environmental sources of Mn including drinking groundwater. Only few study investigated the toxicity of prenatal exposure to Mn. Our objective was to examine the relationship between prenatal Mn exposure and psychomotor skills in 358 school aged children in Eastern Townships, Qc, Canada.

**Methods:**
Participant's mothers were recruited between 2008 and 2010 during pregnancy (n = 800) to participate in a prospective cohort GESTE. At 6 – 7 years, a total of 358 children completed a series of neuropsychological tests. Cord blood Mn and maternal blood Mn (1st trimester and delivery) were analysed by ICP-MS. A battery of selected tests from Wechsler Intelligence Scale for the Children – Fourth Edition (WISC-IV) and NEPSY-II was administered to children aged 6-7, those tests allow us to assess working memory, long-term memory, visuospatial precision and motor skills. Caregivers were also asked to answer questionnaires to investigate for potential cofounding factors. Multivariate statistic modelling was used to consider potential confounding factors. We first try to assess

linear relationship between psychomotor outcomes and prenatal exposure to Mn. Considering a potential U shape relationship with Mn, a quadratic non-linear dose-response models were also tested.

**Results:**
Results of this study are still under analysis.

**Conclusions:**
As we are still analysing the results our results we can't provide yet any conclusion.

## Poster 060

### MATERNAL METHYL NUTRIENT PATTERNS IN EARLY PREGNANCY ARE ASSOCIATED WITH NEONATAL ANTHROPOMETRIC AND BODY COMPOSITION OUTCOMES IN CANADIAN MOTHER-NEWBORN DYADS

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**Introduction:**
Methyl nutrients including folate, vitamin B-12, B-6, B-2, and betaine play a crucial and interrelated role in cellular proliferation and DNA synthesis. Divergent findings were reported for the association of maternal folate status or vitamin B-12 concentrations with birth weight. To date, the interrelationship of maternal methyl nutrient concentrations and neonatal anthropometric outcomes has not yet been studied.

**Methods:**
Objective. We explored the interrelationship of maternal methyl nutrient concentrations in early pregnancy and neonatal anthropometric outcomes among Canadian pregnant women. Design. In this retrospective cohort study, we determined methyl nutrient concentrations in biobanked samples of 729 pregnant women (50% European; 50% South Asian), in their first (9-13 weeks of gestation) and second trimester (15-19 weeks of gestation), who participated in the BC Prenatal Genetic Screening Program, BC, Canada. Birth weight (BW), birth length (BL), and head circumference (HC) data were obtained from the BC Perinatal Data Registry. Maternal methyl nutrient patterns were based on the correlation and variation of maternal methyl nutrient concentrations, using principal component analysis. Linear regression was used to examine the relationship between maternal methyl nutrient patterns and neonatal anthropometric outcomes.

**Results:**
First-trimester maternal B-12 pattern was inversely associated with BL (β=-0.18, 95%CI -0.34;-0.03). Folate-betaine pattern was inversely associated with BW (β=-44.5, 95%CI -78.7;-10.3), BW z-score (β=-0.09, 95%CI -0.18;-0.02), and BW/BL ratio (β=-0.06, 95%CI -0.12;-0.005). Second-trimester B-12 pattern was inversely associated with HC (β=-0.14, 95%CI -0.27;-0.02) and BL (β=-0.18, 95%CI -0.36;-0.006), while B-2 pattern was positively associated with ponderal index (β=0.26, 95%CI -0.0009;0.53) and body mass index (β=0.13, 95%CI 0.007; 0.25) after adjusting for confounding variables ($P \leq 0.05$ for all).

**Conclusions:**
Maternal patterns of B-12, folate-betaine, and B-2 biomarkers in early pregnancy were associated with neonatal anthropometric and body composition indicators, indicating a combined and trimester-specific role of methyl nutrients on fetal growth and body composition in newborns.

## Poster 061

### PREGNANCY-SPECIFIC ANXIETY MODERATES THE ASSOCIATION BETWEEN PRE-PREGNANCY BODY MASS INDEX AND INFLAMMATION IN CORD BLOOD AT BIRTH

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**Introduction:**
Higher pre-pregnancy body mass index (BMI) predicts increased inflammation in neonates. Pregnancy-specific anxiety is associated with increased inflammation during pregnancy, but associations with inflammation in offspring have not been explored. No studies have tested whether higher pre-pregnancy BMI is associated with higher pregnancy-specific anxiety, or whether experiencing pregnancy-specific anxiety exacerbates the association between pre-pregnancy BMI and offspring inflammation. Objective: To test associations between pre-pregnancy BMI and infant cord blood inflammatory markers, as moderated by pregnancy-specific anxiety.

**Methods:**
A sample of 25 pregnant women from Alberta (APrON cohort) were followed from mid-pregnancy through delivery. Pregnancy-specific anxiety was calculated as the average of the second and third trimester assessments. Pre-pregnancy BMI was calculated using self-reported pre-pregnancy weight and measured height. An interaction terms was calculated by multiplying together the standardized pregnancy-specific anxiety and pre-pregnancy BMI variables. Cord blood samples were assayed for 10 inflammatory markers. Innate and adaptive branches of the immune system were modelled by averaging standardized values of inflammatory markers: Innate Index [interleukin(IL)-10, IL-1β, IL-6, IL-8, tumor necrosis factor(TNF) α], and Adaptive Index [interferon(IFN) γ, IL-12p70, IL-13, IL-2 and IL-5]. Covariates were gestational length and maternal demographics.

**Results:**
Pre-pregnancy BMI was associated with pregnancy-specific anxiety, $r$=.451. Pre-pregnancy BMI, $r$=.583, and pregnancy-specific anxiety, $r$=.344, were associated with the Adaptive Index, but not the Innate Index, $p$'s>.225. In linear regression models, both higher pre-pregnancy BMI, $b(SE)$=.374(.113), $p$=.005, and pregnancy-specific anxiety, $b(SE)$=.402(.137), $p$=.010, predicted higher Adaptive Index values. A significant interaction also emerged, $b(SE)$=.744(.181), $p$=.001, such that, only when pregnancy-specific anxiety was high, higher pre-pregnancy BMI was associated with higher Adaptive Index, $b(SE)$=.255(.123), $p$=.05.

**Conclusions:**
Higher pre-pregnancy BMI was associated with increased adaptive inflammatory activity in cord blood only when pregnancy-specific anxiety was also high. These findings suggest that the effect of pre-pregnancy BMI on infant inflammatory activity could be influenced by pregnancy-specific anxiety.

## Poster 062

### INDEPENDENT AND INTERACTIVE RELATIONSHIPS BETWEEN MATERNAL PSYCHOSOCIAL HEALTH AND DIET ON INFANT GROWTH IN A LOWER-MIDDLE INCOME COUNTRY

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Health, Vanuatu, [5]Cleveland State University

**Introduction:**
Past research shows relationships between maternal psychosocial health during pregnancy on infant growth. Poor psychosocial health during pregnancy predicts smaller size at birth, and later increased risk of adiposity and obesity. These patterns might interact with diet during pregnancy. However, most studies come from industrialized or high-income countries. Results might differ in low and middle-income countries, where dietary patterns and sources and levels of stress may differ.

**Methods:**
As part of a prospective longitudinal study examining effects of maternal psychosocial health and health behaviors on child development, we analyzed symptoms of stress, anxiety, and depression during pregnancy and diet among 86 women in Vanuatu, a lower-middle income country in the South Pacific. We collected data on psychosocial health and diet during pregnancy and birth records indicating birthweight. We assessed anthropometric measurements of infant growth, infant feeding patterns, and maternal diet and psychosocial health when infants were 4-14 months of age. We analyzed relationships between prenatal psychosocial health and diet on infant growth measurements, controlling for confounding variables.

**Results:**
Preliminary analyses suggest that neither dietary diversity nor psychosocial health during pregnancy directly predicted infant birthweight. Both predicted later infant growth measures, with largely independent relationships. Psychosocial health predicted arm circumference and waist circumference, explaining up to 16% of variance. Dietary diversity during pregnancy predicted subscapular skinfolds, explaining 14% of variance. Relationships were independent of birthweight and infant sex.

**Conclusions:**
Both dietary diversity and psychosocial health during pregnancy can affect long-term growth patterns. Whereas we might target interventions toward women with both poor psychosocial health and diet, the two are not necessarily well correlated. Further analyses will test mediating relationships of postpartum dietary diversity and psychosocial health in these relationships, and similarities and differences with women from high-income countries.

## Poster 064

### THE ROLE OF SOCIO-ECONOMIC STATUS AND CONGENITAL HEART DISEASE IN URBAN ALBERTA

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**Introduction:**
The etiology of congenital heart disease (CHD) for many affected children remains unknown. Previous studies demonstrated inconclusive associations between socioeconomic status (SES) and CHD regardless of the use of individual maternal variables or aggregated neighborhood SES indices. Previously we found associations between CHD and high industrial developmental toxicant (DT) exposures in Alberta. Here we sought to: 1) explore associations between area level SES index and CHD 2) map SES and CHD and 3) map the collocation of high DT exposure and low SES and CHD in urban regions.

**Methods:**
We identified CHD cases (2004 to 2011) from provincial echocardiographic databases. We used Chan's SES index constructed at dissemination area level using Census Canada 2006 and assigned CHD cases to the SES tertile categories with the highest tertile (3) as reference. Relative risk (RR) was calculated using

Poisson regression models adjusted for DTs released to air and traffic related pollutants ($NO_2$, $PM_{2.5}$). ESRI ArcGIS 10.4 was used to map the centroids of low SES, high DT exposed postal codes and CHD.

**Results:**
We found an increased risk of CHD in the lowest SES tertile [RR = 1.1, CI: 1.0, 1.3]. Mapping revealed that 4% (692/18,009) of highly exposed postal codes collocated with low SES and CHD. The proportion of CHD cases in those postal codes was 38% of all cases in urban regions (743/1,967). Furthermore, collocation of high DT exposures, low SES and CHD, occurred in only 7% (174/2,447) postal codes (mostly Edmonton) and these had 10% (189/1,967) of CHD cases with a [RR =1.96, CI: 1.53, 2.51] compared to lowest DT exposures and high SES regions.

**Conclusions:**
Low neighborhood SES was associated with an increased CHD risk independent of DT exposures shown in our previous analysis. Collocation mapping suggest the presence of a localized environmental injustice in urban Alberta.

## Poster 065

### OVERCOMING BARRIERS TO DISCLOSURE OF ALCOHOL USE AMONG PREGNANT WOMEN: A QUALITATIVE STUDY

**Kaylee Ramage** (University of Calgary)

**Introduction:**
Women who consume alcohol during pregnancy experience significant discrimination from peers, family, and healthcare providers that may impact their choice to seek support during their pregnancy and to reduce their drinking. Women who continue to drink alcohol after they know they are pregnant face additional stigma as compared to women who stop drinking upon pregnancy recognition. There is a need to break down stigma surrounding alcohol consumption during pregnancy to better identify and support women who continue to use alcohol during pregnancy, thereby working to prevent new cases of FASD.

**Methods:**
Qualitative interviews with women who use alcohol after pregnancy recognition and service providers who work with these women. Questions focused on childhood and life experiences, reasons for and patterns of alcohol consumption during pregnancy, barriers and facilitators to disclosure, and best practices for harm reduction. Ethics approval for this project was obtained from the Health Research Ethics Board of Alberta.

**Results:**
Women who continued to consume alcohol during pregnancy experienced significant discrimination from healthcare providers and their social networks which precluded seeking help during their pregnancy. Furthermore, stereotypes about who was at risk for an alcohol-exposed pregnancy affected healthcare providers' choices to ask women about their alcohol use during pregnancy and referral to resources. Women identified several leading practices for promoting disclosure of alcohol use and for harm reduction around alcohol use during pregnancy.

**Conclusions:**
Stigma and discrimination are continuing issues affecting the disclosure of alcohol consumption during pregnancy. Both trained professionals and safe spaces for disclosure are necessary to allow women to seek support around alcohol use during pregnancy, ultimately reducing the incidence of alcohol-exposed pregnancies.

## Poster 067

### BEYOND A SEAT AT THE TABLE: THE ADDED-VALUE OF FAMILY STAKEHOLDERS TO NEONATOLOGY, A SINGLE SITE STUDY

**sonia dahan**[1,2,3], **Claude-julie Bourque**[1,2,4], **martin Reichherzer**[3], **ahmed moussa**[1,3,5], **josée prince**[6], **ginette Mantha**[6,7], **fanny labelle**[3], **annie janvier**[1,2,3,4,5,8,9]
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**Introduction:**
Although stakeholder participation is increasingly recommended, practical knowledge and impacts of their participation are rarely published. Since 2011, veteran resource parents/patients (RPs) have been integrated in neonatal initiatives in our center. The purpose of this study was to describe, categorize, and evaluate the impacts of their participation.

**Methods:**
Systematic analysis of all activities involving RP participation in neonatal initiatives. Quality control questionnaires were distributed to RPs and to providers who worked with them. Mixed methods were used to analyze results.

**Results:**
Thirty RPs were involved in a total of 653 activities related to clinical care (n =413), teaching (n =31) and research (n = 209). We described examples of 7 initiatives to illustrate RPs' positive impacts on clinical care, teaching and/or research. RPs had different degrees and intensity of involvement: all were involved in low-risk initiatives and 9 in more complex activities. In the questionnaire, RPs all described positive impacts associated with their participation and benefits to themselves, such as meaning making. Three reported traumatic memories that occurred during medical simulations. The majority of providers report RPs improved their projects, but some also report this new collaboration is complex.

**Conclusions:**
Having many RPs bringing their contributions may be more valuable than a few "experts". Recruiting and orienting RPs towards different types of activities should take into account the complexity and risks of their tasks. Stakeholders are appreciated and have a positive impact on projects they are involved in: they can have more than a seat at the table.

## Poster 068

### PREVALENCE AND DETERMINANTS OF CHILDREN'S EMOTIONAL AND BEHAVIORAL DISORDERS? A POPULATION-BASED COHORT STUDY IN MONGOLIA

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**Introduction:**
Approximately 20% of children are screened to have various mental illnesses worldwide. Emotional and behavioral disorders in children substantially affect child's social, emotional and academic ability with long-lasting mental consequences. However, the issue remains neglected in developing countries, especially in

Mongolia. We aimed to address this problem and evaluate associated risk factors in Mongolian children.

**Methods:**
A population-based cohort study was undertaken between 2013 and 2016 in rural Bulgan, Mongolia when the children were 3 and 6 years old. A total of 856 mothers and their 852 children were included in the final analysis. Data were collected using a pilot-tested structured questionnaire including a standardized screening tool for emotional and behavioral problems of children and anthropometric measurements through door-to-door survey in two data collection periods. Potential predictors of emotional and behavioral problems children at 6 years old were assessed using multivariable logistic regressions using Stata 13.1.

**Results:**
Among the study participants, 8.7% of children had abnormal scores of Strengths and Difficulties Questionnaire (SDQ) out of 20.1% borderline combined scores. Smoking of family members [Adjusted Odds Ratio: AOR 1.92 95% Confidence Intervals: CI (1.23–3.01)] and male child [AOR 1.77 (1.16–2.69)] showed positive, wealthy family [AOR 0.46 (0.22–0.95)] showed negative associations with emotional and behavioral problems in cohort analysis. Whereas, maternal depression symptoms [AOR 1.89(1.07–3.32)] were positively, healthy tooth brushing routine [AOR 0.40(0.20–0.76)] and hospital visit [AOR 0.43(0.25–0.75)] were negatively linked with the condition in cross-sectional analysis.

**Conclusions:**
A continuum of comprehensive services that focus on lower socio-economic status of families and cessation of family members' smoking might be crucial to prevent children's emotional and behavioral problems. In addition, effective intervention towards maternal depression, and promoting healthy lifestyle habits such as tooth brushing and seeking appropriate hospital care may support better mental health of children.

## Poster 069

### "BEING A PARENT IN THE NICU": ASSESSMENT OF A NEW PARTNERSHIP INITIATIVE WITH VETERAN RESOURCE PARENTS

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**Introduction:**
Being the parent of a sick baby is challenging with the uncertainty and the stress of the NICU. Parents are often trying to mourn a normal pregnancy, delivery and baby and often feel guilt and sadness.Furthermore, when babies depend of life-saving technology, this makes bonding more complex. In QI initiatives, many NICU parents report it would help them to meet veteran "resource parents" (RP), parents who have lived the NICU experience with their child. Many clinicians several hesitate to involve RPs in peer-to-peer support meetings because of risks and vulnerabilities of both "old" and new parents. Our objective was to investigate the feasibility and impact of meetings between RPs and new parents in the NICU.

**Methods:**
Since 2011, we partner with 33 RPs. Clinicians and RPs co-constructed a pilot-study of parent meetings in the unit, called "Being a parent in Neonatology", including the design of specific tools: script, check-list of themes to be discussed. Between March and May 2018, we conducted weekly meetings and evaluated them: RPs and participating parents were surveyed to investigate their perspectives

**Results:**
During the pilot study, 6 RPs have moderated 13 meetings. A total of 41 parents participated and 26 answered the survey. The 7 themes in the RP-scripts were discussed in every meeting: initial shock, guilt, the unit, control, parenting, communication and parental confidence. Parents were satisfied: 78% thought meetings were useful, 95% said information was clear. The themes parents most recalled were guilt and self confidence. Parents reported two benefits: feeling less distressed, community and sharing. No parents mentioned any harm.

**Conclusions:**
Parent meetings in the NICU are both feasible and helpful to both new and old parents who can talk about non-medical essential aspects of their experience.

## Poster 070

### LONGITUDINAL ASSOCIATIONS BETWEEN STRESSFUL LIFE EVENTS IN PREGNANT WOMEN AND STRESS BIOMARKERS IN MOTHERS AND NEWBORNS

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**Introduction:**
An increasing number of studies indicate that stressful life event (SLE) and daily perceived stress occurring during pregnancy may be associated with child development. Yet mechanisms explaining how prenatal stress affects the fetus and subsequent child development are not yet fully understood. Hair cortisol concentration (HCC) is a reliable technique to assess stress biomarkers over the past three months. The main objective of this study was to examine the association between SLE during pregnancy (2nd trimester), PSS (1st, 2nd, 3rd trimester) and HCC in the mother and newborns at birth (reflecting the final trimester of pregnancy). We hypothesized that elevated SLE and PSS would be associated with elevated HCC in the mother and newborn.

**Methods:**
Analyses were conducted within the context of the 3D (Design, Develop, Discover) longitudinal cohort following pregnant women and their babies. During the second trimester of pregnancy, mothers reported SLE that occurred since the start of pregnancy using the Prenatal Life Events Scale. Maternal symptoms of stress were assessed using the Perceived Stress Scale (PSS). Hair samples were taken from the mother and her newborn within 48 hours of birth. Hair cortisol concentration was measured using the LC-MS technique and were available for 679 mothers and 609 babies. HCC data were log-transformed and Spearman rho correlations were used to examine the associations.

**Results:**
Elevated SLE and PSS were both associated with increased maternal cortisol (SLE: $\rho$= .09, p=.037 and PSS: $\rho$= .155, p=.000), yet there was no significant correlation between maternal reports of SLE and newborn HCC (p =.857) nor between PSS and newborn HCC (p =.566).

**Conclusions:**
Our results demonstrate an association between mothers' reports of stressful life events occurring during pregnancy and mothers' HCC reflecting the biological stress response during the final pregnancy trimester. Associations were not significant for newborn HCC. Extended studies are needed.

## Poster 071

### THE RETINOID HYPOTHESIS: STUDYING THE LINK BETWEEN VITAMIN A AND CONGENITAL DIAPHRAGMATIC HERNIA

**Ayanna Rocke**, **Timothy Dalmer**, **Tianna Clarke**, **Robin Clugston** (University of Alberta)

**Introduction:**
Congenital Diaphragmatic Hernia (CDH), a birth defect that occurs in approximately 1/3,000 births, arises when the diaphragm fails to form properly during fetal development leaving a hole in the muscle. In utero, the abdominal contents protrude through the hole impeding growth of the lungs causing significant perinatal mortality. While the cause of CDH is poorly understood, abnormal retinoic acid signaling, an active metabolite of dietary vitamin A, has been proposed to play a role in the development of CDH. The goal of this study is to test the hypothesis that maternal Vitamin A status influences the development of teratogen-induced CDH in a mouse model.

**Methods:**
Maternal vitamin A status was manipulated by feeding mice diets with marginal, sufficient or excess vitamin A. Vitamin A status was confirmed in maternal and fetal tissues by HPLC. We induced CDH in the offspring of mice treated with a combination of nitrofen (2,4-Dichlorophenyl 4-nitrophenyl ether) and bisdiamine (N,N'-bis (dichloroacetyl)-1,8-octamethylenediamine). Offspring were collected via dissection and the effect of the teratogen on the incidence and severity of CDH were recorded.

**Results:**
We have established a teratogenic model of CDH in mice, and determined that 0.5 g/kg of teratogen is optimal for the induction of CDH. We have shown that manipulating dietary vitamin A content of female mice changes their vitamin A status, and that of their offspring. Continuing studies are investigating the impact of altered maternal vitamin A status on teratogen-induced CDH.

**Conclusions:**
We expect that offspring of the mothers on a Vitamin A excess diet will have reduced incidence of CDH, while the mothers on a Vitamin A marginal diet will have an increased incidence. This research will help support the Retinoid Hypothesis and highlight the need for future studies on the role of Vitamin A on diaphragm development.

## Poster 073

### EVALUATING A PARENT HANDBOOK FOR SHARED DECISION MAKING FOR EXTREMELY PRETERM INFANTS

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**Introduction:**
The standard of care in Canada for infants born <22 weeks gestational age (GA) is palliative care (PC) while for infants >26 weeks GA, it is early intensive care (EIC). Between these, there is a "gray zone" where both PC and EIC are reasonable options. A shared decision-making (SDM) approach for these decisions is recommended. We use a parent handbook, which complements the prenatal counseling session, to assist with SDM.

**Methods:**
Our research question was: "How do parents of EPI perceive a parent handbook provided during the prenatal counseling process?" This was a qualitative, descriptive study. We recruited a prospective sample of parents facing anticipated birth at extreme prematurity. An in-person interview was conducted using a semi-structured interview guide. Interviews were transcribed verbatim and analyzed manually, using a constant comparative analysis.

**Results:**
-Timing: The handbook was given following a prenatal consult, described as ideal.
-Ease of use: The handbook was easy to understand, clearly written and straightforward.
-Imagery: Reactions to the photos used were varied.
-Graphs and tables: Parents unanimously expressed appreciation for a visual representation of data.
-Content: There was criticism regarding missing imperative data and comparison to the tool used during the prenatal counseling session.

**Conclusions:**
-The parental perceptions of using a handbook on EPI can be divided into 6 main themes: timing, ease of use, layout and format, imagery, graphs and tables and content.
-Overall, parents felt the handbook was a useful resource for reputable information.
-Some parents were satisfied with simple information, which helped them feel less overwhelmed, while others felt the depth of information was insufficient.
-This information will help us to modify our handbook for future parents facing the anticipated birth of an extremely preterm infant.

## Poster 074

### INFLUENCE OF PRENATAL EXPOSURE TO ARSENIC AND MERCURY ON INFANT COGNITIVE DEVELOPMENT IN A CANADIAN BIRTH COHORT

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**Introduction:**
Environmental toxicant exposure *in utero* can adversely impact fetal development and postnatal health trajectories. Perinatal exposure to heavy metals has been associated with delayed cognitive development. We hypothesised that higher levels of heavy metals (mercury, lead, arsenic) in maternal and newborn samples would be associated with poorer cognitive outcomes in children.

**Methods:**
Data were obtained from mother-infant dyads from the Maternal-Infant Research on Environmental Chemicals (MIREC) cohort, a national prospective cohort of 2001 pregnant women. Our final sample population included singleton pregnancies with complete data for child Wechsler Preschool and Primary Scale of Intelligence-Third Edition (WPPSI-III), pre-pregnancy weight, and heavy metal concentrations for: maternal first trimester blood (n=519), umbilical cord blood (n=431), and maternal breast milk (n=288). Relationships between perinatal heavy metal exposure (mercury, lead, arsenic) and child cognitive outcomes (overall WPPSI-III and sub-scores) at age three were evaluated. Findings from ANOVA and adjusted multivariable regression models are presented as effect size (95% CI) or $R^2$ range (SAS v9.4). Covariates were retained at $\alpha$=0.05. Significance=p<0.05*. Data were also stratified for child sex in regression modelling.

**Results:**
In males, there was a negative association between maternal blood arsenic levels and WPPSI-III verbal (-0.09,[-0.14, -0.04]*), receptive (-0.01,[-0.03, -0.003]*), block (-0.02,[-0.03, -0.01]*), and information (-0.02,[-0.03, -0.004]*) sub-scores. In females, there was a positive association between maternal mercury levels and WPPSI-III performance (0.40,[0.003, 0.80]*) and object (0.10,[0.03, 0.17]*) sub-scores. Maternal education explained more variation ($R^2$=0.012—0.08)* in WPPSI-III outcomes compared to each respective metal ($R^2$=0.004—0.02)*.

**Conclusions:**
In a primarily healthy cohort of Canadian women, first trimester maternal blood arsenic levels were

associated with lower cognitive measures in male children, a finding that warrants further investigation. Heavy metal concentrations explained less variation in cognitive outcomes than maternal education, suggesting sociodemographic factors are important to child cognitive development.

## Poster 075

### MATERNAL ADHD MEDICATION USE DURING PREGNANCY AND THE RISK OF ADHD IN CHILDREN.

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**Introduction:**
Attention deficit hyperactivity disorder (ADHD) is the most common childhood neurodevelopmental psychiatric disorder. Genetic trends and environmental risk factors are likely involved in both offspring and adult-onset ADHD. The number of individual being treated with ADHD drugs has increased, which would affect women of childbearing age. We sought to evaluate the risk of ADHD in offspring associated with overall and class-specific intrauterine exposure to ADHD medication.

**Methods:**
We performed a cohort study within the Quebec Pregnancy Cohort (QPC) from 1998 to 2015. Singleton full term liveborns and mothers with continuous prescription drug coverage for at least 12 months before and during pregnancy were included. ADHD medication exposure was defined by trimester of use and class-specific stimulant/nonstimulant. ADHD in children was defined by a diagnosis or a prescription filled for ADHD medications between birth and the end of the follow-up. Cox proportional hazards regression models were used to calculate crude and adjusted hazard ratios (aHR) with 95% confidence intervals (CIs).

**Results:**
Among 166,047 singletons included in the study, 25,454 infants (15.3%) were identified with ADHD. The mean age at first ADHD diagnosis was 8.19 ± 3.11 years. Adjusting for potential confounders and maternal history of ADHD, maternal exposure to ADHD medication was associated with an increased risk of ADHD in the offspring (aHR= 2.04; 95% CI 1.27-3.27; 133 exposed cases). More specifically, use of ADHD medication during first trimester was associated with an increased risk of ADHD in the offspring (aHR=3.70; 95% CI 2.36-5.79; 130 exposed cases); second/third trimester use did not significantly increase the risk. Stimulants, specifically methylphenidate, were associated with an increased ADHD risk in the offspring.

**Conclusions:**
Our findings suggest that maternal exposure to ADHD medication increases the risk of ADHD in the offspring, specifically following 1st trimester exposure. Additionally, methylphenidate was associated with an increased ADHD risk in the offspring.

## Poster 076

### MEDICALLY ASSISTED REPRODUCTION AND THE RISK OF PRETERM BIRTH

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**Introduction:**
Medically assisted reproduction (MAR) includes assisted reproductive technology (ART) and ovarian stimulators (OS). *MAR is not without risk,* as these methods increase obstetrical complications and adverse perinatal outcomes. We aimed

to quantify the risk of preterm birth (PTB) associated with MAR use overall and by method among those exposed.

**Methods:**
*Design:* We conducted a cohort study in the Quebec Pregnancy Cohort (QPC), an ongoing population-based cohort, which includes all pregnancies of mothers covered by Quebec' prescription drug insurance and their children from 01/1998 and 12/2015. We included singleton liveborns between 05/08/2010 and 15/11/2015, whose mothers were covered by the RAMQ drug plan for at least 3 months prior to and during pregnancy. This time-period was used given that the MAR universal reimbursement program was active at that time. *Exposure:* We considered MAR dichotomously, using spontaneous conception as the reference. We then categorized MAR into 3 exposure subgroups: ART (reference), OS, and OS/ART combined. *Outcome*: PTB was defined as <37 wks of gestation. *Analyses*: Crude and adjusted odds ratios (cOR and aOR) and 95% confidence intervals (CI) were obtained using generalized estimation equation models. Subgroup analyses were performed within the MAR-exposed. Covariates included maternal sociodemographics, history of pregnancy complications, comorbidities, and concomitant medication use, measured in the year before the 1st day of gestation.

**Results:**
57,624 pregnancies met inclusion criteria and considered for analyses. During the study period, 2,055 women were exposed to MARs, of which 404 to OS, 557 to ART, and 1094 to a combination of both. MAR users were at increased risk of PTB (cOR [95%CI]: 1.45[1.23-1.69], aOR [95%CI]: 1.47 [1.26-1.73]; 182 exposed cases). Among MAR users, those on OS alone had a higher risk of PTB (aOR [95%CI]: 1.27 [0.79-2.05]; 42 exposed cases).

**Conclusions:**
MAR increases the risk of PTB when compared to spontaneous conception.

## Poster 078

### EPIDEMIOLOGIC CHARACTERIZATION OF SEVERE MATERNAL MORBIDITY AND MORTALITY ASSOCIATED WITH ASSISTED REPRODUCTION.

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**Introduction:**
To determine the incidence and severe maternal morbidity (SMM) associated with assisted reproduction technology (ART).

**Methods:**
We carried out a population based retrospective cohort study of all hospital live births at 20 weeks or beyond gestation between 2009 and 2012. We used data from the Discharge Abstract Database contains information on all separations from hospitals in Canada (except Quebec). Maternal characteristics, disease frequency, case fatality, and length of hospitalization of SMM associated with ART were quantified. Adjusted odds ratios (AOR) and 95% confidence intervals (CI) were estimated using logistic regression adjusting for confounders.

**Results:**
Among the 1,993,946 women who delivered between 2009 and 2012, there were 46,029 pregnancies achieved by ART. The rate of SMM among ART mothers was 29.8 (95% CI 28.3-31.4) per 1000 deliveries Vs 10.4 (95% CI 10.3-10.6) per 1000 in non- ART group. The rate ratio is 2.86 (95% CI 2.71-3.02). The median length of hospital stay for women with and without ART was 4 days versus 3 days, while the frequency of prolonged hospital stay (≥ 7 days) was 6.41% versus 1.51%, respectively (rate ratio 4.24; 95% CI 4.07 to 4.40). ART was associated with high rates of SMM such as Severe preeclampsia or HELLP syndrome, Intrapartum hemorrhage with red cell transfusion, severe

postpartum hemorrhage, Hysterectomy, Disseminated intravascular coagulation, Cerebral edema or coma, and Acute fatty liver. (AOR 60.6, 95% CI 45.4-79.4). The mortality rate in ART group were estimated as 5.43 per 100,000 compared with non-ART pregnancies 3.03 per 100,000. Case fatality rate was 1.79 (95% CI 0.51-6.36) per 100,000.

**Conclusions:**
Disease frequency, case fatality, SMM and mortality patterns among pregnancies achieved by ART suggest that they are at increased risk of SMM and mortality events compare to pregnancies achieved without ART thus warrant proper counseling and vigilant care for women contemplating ART to get pregnant.

Table 1. Frequency of severe maternal morbidity, case fatality and length of stay among deliveries to women following assisted reproduction (ART), Canada, 2009-2012.

| Index | Women with ART | Women without ART | Rate ratio (95% CI) |
|---|---|---|---|
| Number of deliveries | 46,029 | 1,947,917 | - |
| Severe maternal morbidity: Number | 1,372 | 20,333 | - |
| Rate/1,000 (95% CI) | 29.8 (28.3, 31.4) | 10.4 (10.3-10.6) | 2.86 (2.71-3.02) |
| Deaths: Number | <5* | 59 | - |
| Rate/100,000 deliveries | 5.43* | 3.03 | 1.79 (0.51-6.36)* |
| Median length of stay in days (IQR) | 4 (3-5) | 3 (2-4) | - |
| % with length of stay >7 days (95% CI) | 6.41 (6.17-6.65) | 1.51 (1.50-1.53) | 4.24 (4.07-4.40) |

* Number suppressed due to small cell size (i.e., >zero and <5). Rate and rate ratio calculated assuming a numerator of 2.5.

## Poster 079

### GESTATIONAL WEIGHT GAIN AND MID-LIFE BODY COMPOSITION IN A COHORT OF CANADIAN WOMEN

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**Introduction:**
Gestational weight gain (GWG) is a known determinant of maternal weight retention. There is limited evidence regarding the impact of GWG on midlife body composition. Our objective was to determine associations between GWG, measured across all of a woman's pregnancies, and midlife measures of body fat percentage (BFP), waist circumference (WC), and hip circumference (HC).

**Methods:**
Our study population included women aged 35 to 63 years enrolled in the Atlantic Partnership for Tomorrow's Health study between 2009 and 2012 whose pregnancies were recorded in the Nova Scotia Atlee Perinatal Database. We calculated a cumulative measure of GWG relative to the midpoint of the range of recommended GWG. We developed multivariable linear regression models, adjusted for maternal reproductive and midlife characteristics, to quantify associations between GWG and midlife body composition and evaluate effect modification by body mass index prior to the first pregnancy.

**Results:**
Of the 1373 eligible women, 64%, 87%, and 87% had complete BFP, WC, and HC data. Mean follow-up time from last pregnancy to enrollment in A.PATH was 14 years and mean age at follow-up was 46 years. Mean (standard deviation) BFP, WC, and HC were 35.1 (7.6), 88.9 (14.1) cm, and 105.2 (12.1) cm, respectively. An interquartile range increase in cumulative GWG was associated with a mean increase of 1.7 (95% CI: 1.2, 2.2) in BFP, 2.9 cm (95% CI: 2.1, 3.7) in WC, and 3.0 cm (95% CI: 2.4, 3.7) in HC, respectively; these associations were attenuated with adjustment for midlife body mass index. These associations were stronger among women who were underweight and normal weight at their first pregnancy (p-value for heterogeneity <0.01).

**Conclusions:**
In this cohort of Canadian women, GWG was positively associated with midlife anthropometric measures but these associations were not independent of pre-pregnancy or midlife BMI.

## Poster 080

### A CORE OUTCOME SET IN NEONATAL ABSTINENCE SYNDROME

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**Introduction:**
Neonatal abstinence syndrome (NAS) results from abrupt discontinuation of opioid exposure following birth in babies that were exposed to opioids during pregnancy. The prevalence of NAS in increasing globally (more than 5 fold since 2000) and treatment varies across and within countries. Currently no consensus exists on what outcomes to measure in NAS that can be compared across studies to guide diagnosis and management. Objective: Our objective is to create, test and disseminate a harmonized minimum set of outcomes to be measured in NAS clinical practice and research.

**Methods:**
We are developing a NAS core outcome set, a minimum set of outcomes to be measured across in practice and research using standard methodologies. This process involves a systematic literature review, parent interviews, a multi-stage survey (Delphi), consensus meeting, pilot testing and an integrated knowledge translation plan. Our full study protocol is available open access https://trialsjournal.biomedcentral.com/articles/10.1186/s13063-016-1666-9.

**Results:**
Our systematic review identified 54 studies published in the last 10 years which evaluated pharmacologic or nonpharmacologic treatments for NAS. A three round Delphi was completed in January 2019 with 41 clinicians, nurses, social workers and pharmacists (*pending results to be shared at meeting*). Parent interviews were conducted to ensure meaningful outcome selection and measurement. To finalize the core outcome set and plan for knowledge translation, a consensus meeting is scheduled for March 2019.

**Conclusions:**
An evidence-informed, consensus-based core outcome set for NAS will improve NAS clinical research consistency, replicability, impact, will increase informed decision making and improve health outcomes for infants exposed to opioids in pregnancy. Pilot testing and dissemination efforts are needed to increase awareness and impact globally.

## Poster 081

### WEB-BASED MENTAL HEALTH INTERVENTION TO REDUCE PRENATAL DEPRESSION - FINDINGS FROM THE INTEGRATED MATERNAL PSYCHOSOCIAL ASSESSMENT TO CARE TRIAL (IMPACT) STUDY

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**Introduction:**
About 14-25% women experience depression and anxiety during pregnancy. Without early intervention, 50-70% of those women with prenatal depression or anxiety develop chronic symptoms, which prolong into postnatal and early childhood. This may have longstanding impact on child mental health and development.

This randomized controlled trial was conducted to identify the effectiveness of an integrated model of prenatal e-screening, e-referral, and e-depression in reducing prenatal depressive symptoms.

**Methods:**
In this randomized control trial, women were computer-randomized to a control group (CG) of usual prenatal care or the intervention group (IG), a web-based intervention consisting of e-screening, e-referral, and e-therapy (6 modules, cognitive behaviour therapy [CBT]). Depression (EPDS and DASS) and resilience (CD-RISC) data were obtained at 3 time-points: Baseline (pregnancy), 7-week (post-intervention), and 12-week postpartum. Depression trajectories were generated for both groups using longitudinal latent class analysis (LLCA), and analysis of co-variance (ANCOVA) was conducted on women with depressive symptoms.

**Results:**
Out of 1789 total participates, 916 and 873 belonged to CG and IG, respectively, with no significant differences in baseline sociodemographic or mental health variables. LLCA resulted in three classes of women (high, medium and low depression) and multinomial regression analysis revealed that (a) number of CBT modules and (b) time spent on modules predicted depression for "high depression" class of the intervention group. ANCOVA results revealed that mean depression score (±SD) was not significant but lower in IG compared to CG at 7-weeks (8.50±4.80 vs 8.69±4.50) and 12-weeks (5.65±4.32 vs 6.50±4.92). Mean resilience score was higher in IG compared to CG at 7-weeks (63.28±12.74 vs 62.06±13.33) and 12-weeks (65.47±15.28 vs 63.10±13.07).

**Conclusions:**
This study shows that an integrated model of prenatal e-screening, e-referral, and e-therapy may play a role in reducing depression and enhancing psychological strengths.

## Poster 082

### INFANT FEEDING PRACTICES AT 3 MONTHS POSTPARTUM IN WOMEN WHO HAD DIABETES IN PREGNANY

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**Introduction:**
Women with pre-existing or gestational diabetes in pregnancy (DiP) appear less likely to breastfeed. We aim to quantify this association and assess possible contributors towards this. This abstract describes women's' intention to breastfeed and actual infant feeding behaviour in a prospective study of women during pregnancy and their offspring.

**Methods:**
We conducted a nested case-control study within the Alberta Pregnancy Outcomes and Nutrition study. Participants who experienced pre-existing diabetes (n=26) or gestational diabetes (n=50) during pregnancy were matched at a ratio of 1:3 with women without DiP on pre-pregnancy BMI, mode of delivery, pre-term birth, and parity. Intentions to breastfeed was collected in the 3rd trimester (higher scores represent stronger intentions). Infant feeding practices at 3 months postpartum were collected via questionnaires. Differences in intention to breastfeed score in the 3rd trimester and exclusive breastfeeding at 3 months postpartum between women with and without DiP were assessed using a t-test and conditional logistic regression, respectively.

**Results:**
In the 3rd trimester breastfeeding intention score was 66 (SD 1.1) and 67 (SD 1.2) in women with and without DiP respectively (p=0.356). At 3 months postpartum women who had DiP had lower odds of exclusively breastfeeding compared to women who didn't (OR: 0.41 p=0.003). Furthermore, women who had DiP were

more likely to have introduced complimentary feeding compared to women who did not (OR 2.8 p=0.03).

**Conclusions:**
Despite similar intentions to breastfeed reported in the 3rd trimester of pregnancy women who had DiP were less likely to be exclusively breastfeeding at 3 months postpartum compared to women who did not have diabetes. Future directions are to link participants data to their medical records and complete qualitative interviews to explore why these differences may exist so that relevant supports can be better targeted in the future.

## Poster 083

### BLOOD METAL LEVELS AND EARLY CHILDHOOD GROWTH IN A COHORT OF CANADIAN CHILDREN

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**Introduction:**
Fetal exposure to toxic metals has been associated with reduced growth at birth, but the impact of low-level metals (< 50 $\mu$g/L) on childhood growth is not well understood. Our primary objective was to quantify associations between levels of toxic metals and concurrently measured body mass index (BMI) in a population of Canadian preschool aged children.

**Methods:**
Biomonitoring data and anthropometric measures were collected on 480 children between the ages of two and five who were enrolled in the Maternal-Infant Research on Environmental Chemicals Child Development Plus study. Blood levels of four toxic metals (lead, arsenic, cadmium, and mercury) and seven essential elements (zinc, selenium, molybdenum, manganese, copper, nickel, and selenium) were analyzed. Children's weight and height were converted to BMI z-scores using the World Health Organization growth standards. We used linear regression, adjusted for potential maternal and child confounders, to evaluate associations between tertiles of each toxic metal and BMI z-scores and to assess effect modification by child sex. Additionally, Bayesian model averaging (BMA) was employed to identify which metals and elements were potential confounders.

**Results:**
Of the 480 children, 449 (93.5%) children were singleton births and had complete biomonitoring and anthropometric data. The majority of children had detectable concentrations of metals. We observed a statistically significant interaction between lead levels and sex (p-value < 0.05). In adjusted models, girls with blood lead concentrations in the highest tertile (> 8.2 $\mu$g/L) had a 0.32 lower BMI z-score (95% CI: -0.62,-0.01) than girls with blood lead in the lowest tertile (< 5.3 $\mu$g/L) (p-value test for trend <0.05). No other exposure-response relationships or interactions by sex were observed.

**Conclusions:**
In this population, higher blood lead concentration was associated with a lower BMI in pre-school girls, suggesting that even at very low exposure levels, lead might still be associated with subtle effects on development.

## Poster 084

### PREGNANCY CHARACTERISTICS AND MATERNAL RISK OF TYPE 2 DIABETES MELLITUS

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**Introduction:**
Gestational diabetes mellitus (GDM) is known to be associated with an approximately seven-fold increased risk of developing type 2 diabetes mellitus (T2DM) in women. Our objective was to examine other pregnancy characteristics in addition to GDM in relation to T2DM.

**Methods:**
A population-based retrospective cohort study was conducted with information about women's first and subsequent pregnancies from the Nova Scotia Atlee Perinatal Database (1988-2009) and later T2DM from physician claims and hospital discharge databases (1989-2012). Hazard ratios (HR) with 95% confidence intervals (CI) adjusted for maternal weight, age at first birth, area-level income, smoking, and other pregnancy characteristics were estimated.

**Results:**
Among 78,977 women without pre-existing diabetes and complete data, 2969 (3.8%) developed T2DM over a median 14.8 years of follow-up. GDM was associated with the risk of developing T2DM (HR 7.50, CI 6.90-8.15). Among women with a history of GDM, pregnancy characteristics also associated with the risk of T2DM included any history of: Caesarean section (HR 1.16, CI 1.01-1.34); birthweight for gestational age >90$^{th}$ percentile (HR 1.29, CI 1.11-1.49); neonatal hypoglycemia (HR 1.40, CI 1.16-1.69); and breastfeeding (HR 0.79, CI 0.69-0.91). These characteristics were similarly associated with T2DM risk among women without a history of GDM; additionally, pre-eclampsia (HR 1.54, CI 1.28-1.84) and gestational hypertension (HR 1.69, CI 1.52-1.87) were associated with T2DM in this group.

**Conclusions:**
Pregnancy characteristics are associated with the risk of developing T2DM, including hypertensive disorders of pregnancy among women without a history of GDM.

## Poster 085

### SURVIVAL, SHORT-TERM MORBIDITY OF EXTREMELY LOW GESTATIONAL AGE INFANTS AND THEIR PREDICTORS

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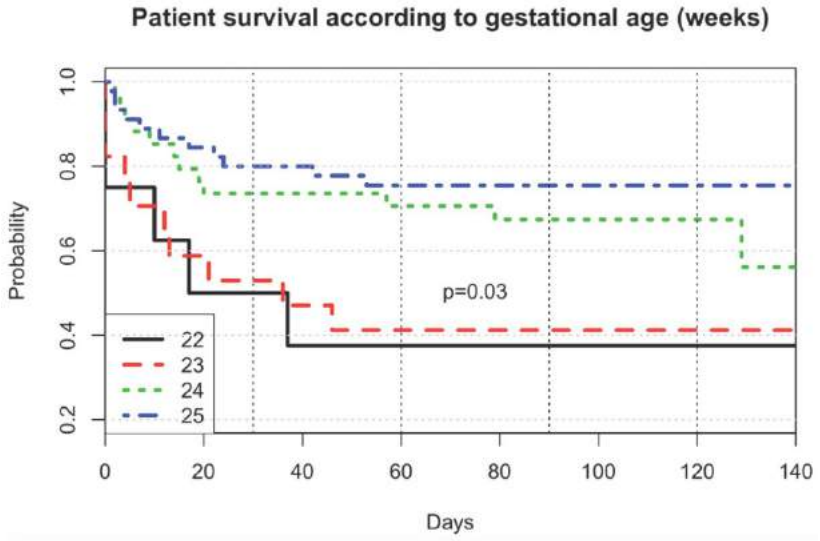
**Introduction:**
Extremely low gestational age (ELGA) infants experience high rates of mortality and morbidity. Local data are crucial for quality improvements and accurate antenatal counselling. The purpose of this study was to determine survival, its predictors, and the prevalence of morbidities of ELGA infants from the Ottawa region.

**Methods:**
We performed a retrospective cohort study of infants born at <26 weeks gestational age who received intensive care at the Ottawa Hospital or Children's Hospital of Eastern Ontario NICU between January 1$^{st}$ 2014 and December 31$^{st}$ 2017. Outcomes included survival to discharge/transfer, and the prevalence of six short-term morbidities.

**Results:**
Of the 117 infants included, the rates of survival were 37.5% at 22 weeks (n=8), 50.0% at 23 weeks (n=20), 68.4% at 24 weeks (n=38), and 76.5% at 25 weeks (n=51). The probability of survival was similar for infants born

at 22 and 23 weeks GA (Fig.1). The overall prevalence of short-term morbidities was 25.9% for intraventricular hemorrhage grade III – IV, 5.4% for periventricular leukomalacia, 89.9% for bronchopulmonary dysplasia, 16.1% for necrotizing enterocolitis, 40.0% for late-onset sepsis, and 19.3% for retinopathy of prematurity requiring treatment. The multivariable analysis demonstrated: an increased risk of mortality for every 100g decrease in birth weight (OR=1.61; 95% CI: 1.23 – 1.81; p =.008) and for an incomplete course of antenatal corticosteroids (OR=1.16; 95% CI: 1.0 – 1.3; p =.05), while demonstrating no effect of gender on mortality (OR=1.38; 95% CI: 0.8-1.68; p=.15).

**Conclusions:**
ELGA infants from our region faced similarly high rates of mortality and major short-term morbidity compared to other Canadian centers (Canadian Neonatal Network data). Infants born at 22 and 23 weeks experienced similar survival trajectories, which should be further explored as it may influence clinical perceptions of viability at 22 weeks.




## Poster 086

### CLINICAL DASHBOARD OF PERINATAL HEALTH INDICATORS FOR PATIENTS WITH GESTATIONAL DIABETES MELLITUS

**Sara Jones**, **Jillian Coolen**, **Christy Woolcott** (Dalhousie University)

**Introduction:**
Rates of gestational diabetes mellitus (GDM) are increasing. As a result, so are its complications, such as fetal overgrowth, shoulder dystocia, caesarean section, and perinatal mortality. Treatment of GDM improves these outcomes; however, there lacks an organized system to track the health indicators related to GDM. The objective of this project was to identify and define key perinatal health indicators related to GDM to inform the development of a clinical dashboard.

**Methods:**
To identify possible health indicators, a review of systematic reviews, meta analyses, grey literature, clinical guidelines, and additional sources published from January 2008 to September 2018 was conducted. Pubmed, National Guidelines Clearinghouse, and Cochrane databases were searched and references were screened for additional sources. Studies combining GDM with preconception diabetes were excluded. To determine which outcomes are most clinically relevant, we will administer a stakeholder survey using REDCap software to assess the current state of indicator tracking and determine which indicators of a clinical dashboard would be most relevant to clinical practice.

**Results:**
49 of articles were included in our literature review Three types of outcomes were extracted: prevalence in GDM, relative risk compared to populations without GDM, and impact of intervention in GDM populations. 63 health indicators were identified. GDM was overall associated with poorer health outcomes compared to non-GDM. However, the responses of GDM groups to interventions shows that these outcomes are modifiable and the prevalence statistics provide insight as to the current state of GDM outcomes.

**Conclusions:**
These results provide a picture of the most topical health indicators in GDM. The large number of outcomes and the heterogeneity of the results illustrates the need for an accessible clinical dashboard, which we are in the process of creating. Tracking outcomes of perinatal care will ultimately lead to improvements in GDM management and better outcomes for patients.

Table 1: List of neonatal health indicators included.

| | Prevalence | GDM vs Non-GDM | GDM Interventions |
|---|---|---|---|
| NEONATAL | Brachial plexus injury | Birthweight <2.5kg | APGAR @ 1 min |
| | Congenital Heart Disease | Birthweight >90th Percentile | APGAR @ 5 mins |
| | Hyperbilirubinemia | Congenital Heart Disease | APGAR <7 @ 1 min |
| | Hypoglycemia | Congenital Malformation | APGAR <7 @ 5 min |
| | Large for Gestational Age | Hypoglycemia (Neonatal) | Birth Trauma |
| | Low birth weight (<2.5kg) | Jaundice | Birth Weight |
| | Macrosomia | Large for Gestational Age | Birthweight >90th |
| | Mortality | Macrosomia | Congenital Anomalies |
| | Preterm | Neonatal Intensive Care Unit | Convulsions |
| | Respiratory distress | Preterm | Fracture |
| | Small for Gestational Age | Shoulder Dystocia | Gestational Age |
| | Shoulder dystocia | Stillbirth | Head Size |
| | Stillbirth | | Hyperbilirubinemia |
| | | | Hypocalcemia |
| | | | Hypoglycemia |
| | | | Intrauterine Fetal Death |
| | | | Jaundice |
| | | | Large for Gestational Age |
| | | | Macrosomia |
| | | | Neonatal Intensive Care Unit |
| | | | Perinatal Mortality |
| | | | Polycythemia |
| | | | Ponderal Index Score |
| | | | Preterm Delivery |
| | | | Pyrexia |
| | | | Respiratory Distress |
| | | | Small for Gestational Age |
| | | | Shoulder Dystocia |
| | | | Stillbirth |

Table 2: List of maternal health indicators included.

| | Prevalence | GDM vs Non-GDM | GDM Interventions |
|---|---|---|---|
| MATERNAL | Caesarean Section | Caesarean Section | Breastfeeding |
| | Depression | Cardiovascular disease | Caesarean Section |
| | Type 2 diabetes mellitus | Depression | Hypertension |
| | Episiotomy | Hypertension | Hypoglycemia |
| | GDM recurrence | Induction | Intensive Care Unit Admission |
| | Hypertension | Instrumental | Impaired Glucose Tolerance |
| | Induction | Metabolic Syndrome | Induction of Labor |
| | Metabolic syndrome | Postpartum Hemorrhage | Instrumental Delivery |
| | Preeclampsia | Preeclampsia | Insulin Use |
| | Insufficient weight gain | | Intact Perineum |
| | Adequate weight gian | | Mental Health |
| | Excessive weight gain | | Perineal Trauma |
| | Non-excessive weight gain | | Pharmacotherapy Use |
| | | | Placental Abruption |
| | | | Post Partum Hemorrhage |
| | | | Preeclampsia |
| | | | Weight Gain |

Table 3: Prevalence ranges for neonatal and maternal health outcomes in GDM patients.

| | Outcome | Lowest | Highest | Single Value |
|---|---|---|---|---|
| NEONATAL | Brachial plexus injury | 0.2 | 2.6 | |
| | Congenital heart defect | 1.265 | * | |
| | Hyperbilirubinemia | 10.4 | 13.2 | |
| | Hypoglycemia | 2.6 | 5.3 | |
| | Large for Gestational Age | 19 | 40 | |
| | Low birth weight (<2.5kg) | 5 | 6.1 | |
| | Macrosomia | 7.1 | 43 | |
| | Mortality | 0.8 | 2.5 | |
| | Preterm | 8.3 | 10.8 | |
| | Respiratory distress | 1 | 4 | |
| | Small for gestational age | 7.8 | 8.8 | |
| | Shoulder dystocia | 0.4 | 23.5 | |
| | Stillbirth | 0.32 | 4.2 | |
| MATERNAL | Caesarean section | 6 | 38.3 | |
| | Depression | 7.8 | 14.1 | |
| | Type 2 diabetes mellitus | 35 | 60 | |
| | Episiotomy | 75 | * | |
| | GDM recurrence | 30 | 84 | |
| | Hypertension | 6 | 37 | |
| | Induction of Labour | 19 | 49 | |
| | Metabolic syndrome | 9 | 86.8 | |
| | Preeclampsia | 2.8 | 14.3 | |
| | Insufficient weight gain | 12 | 55 | |
| | Adequate weight gian | 14 | 72 | |
| | Excessive weight gain | 15 | 61 | |
| | Non-excessive weight gain | 42 | 85 | |

* Where only one value was available it was recorded in the “Lowest” column.

Table 4: Summary of RR and OR comparing patients with GDM to patients without GDM for neonatal and maternal health outcomes.

| | Outcome | Lowest RR | Highest RR | # Citations RR | Lowest OR | Highest OR | # Citations OR |
|---|---|---|---|---|---|---|---|
| NEONATAL | Birthweight <2.5kg | | | | 0.9 (0.4-1.9) | | 1 |
| | Birthweight >90th Percentile | 1.98 (1.73, 2.27) | 2.19 (1.93-2.47) | 2 | | | |
| | Congenital Heart Disease | | | | 1.30 (1.21, 1.40) | 1.49 (1.39, 1.60) | 2 |
| | Congenital Malformation | 1.16 (1.07, 1.25) | * | 1 | 1.40 (1.22, 1.62) | * | 1 |
| | Hypoglycemia | 2.75 (1.01, 7.52) | 15.07 (14.38, 15.8 | 1 | 1.09 (0.66, 1.80) | 1.37 (1.20, 1.57) | 4 |
| | Jaundice | 1.68 (0.71, 4.01) | 3.87 (2.64, 5.67) | 1 | | | |
| | Large for Gestational Age | 1.65 (1.57, 1.72) | 3.27 (1.44, 7.45) | 1 | 1.21 (1.18, 1.24) | 2.11 (1.73, 2.58) | 5 |
| | Macrosomia | 1.65 (1.57, 1.72) | 3.27 (1.44, 7.45) | 1 | 1.13 (1.10, 1.15) | 2.5 (1.0, 60) | 6 |
| | Neonatal Intensive Care Unit | 1.41 (1.27, 1.57) | 4.11 (2.37, 7.10) | 1 | | | |
| | Preterm | 1.28 (1.20, 1.36) | 2.18 (1.24, 3.84) | 2 | 0.77 (0.62, 0.96) | 1.1 (0.4, 2.5) | 5 |
| | Shoulder Dystocia | | | | 1.25 (1.10, 1.43) | 1.97 (1.36, 2.85) | 6 |
| | Stillbirth | 0.31 (0.11, 0.67) | 1.84 (1.5, 2.3) | 12 | | | |
| MATERNAL | Caesarean Section | 1.47 (1.40, 1.55) | 1.88 (1.45, 2.43) | 1 | 1.11 (0.93, 1.31) | 2.2 (1.6, 3.2) | 5 |
| | Cardiovascular disease | 1.4 (1.0, 1.9) | 1.71 (1.08, 2.69) | 3 | | | |
| | Depression | 0.94 (0.68, 1.29) | * | 1 | | | |
| | Hypertension | 2.0 (1.8, 2.2) | 2.70 (2.33, 3.13) | 2 | 1.02 (0.75, 1.38) | 2.86 (1.25, 7.83) | 7 |
| | Induction | 1.54 (1.49, 1.60) | * | 1 | 1.10 (1.04, 1.16) | 5.0 (3.3, 7.5) | 4 |
| | Instrumental | | | | 0.99 (0.87, 1.13) | 1.14 (1.04, 1.23) | 3 |
| | Metabolic Syndrome | 2 | 5 | 4 | | | |
| | Preeclampsia | 1.61 (1.39, 1.86) | 1.69 (1.47, 1.95) | 1 | 1.02 (0.75, 1.38) | 3.11 (1.61, 6.00) | 12 |
| | Post Partum Hemorrhage | | | | 2.2 (1.3, 3.7) | * | 1 |

* Where only one value was available it was recorded in the "Lowest" column.

## Poster 087

### PROTECTIVE ROLE OF PHYSICAL ACTIVITY AND RESILIENCE IN PERINATAL DEPRESSION: FINDINGS FROM A RANDOMIZED CONTROLLED TRIAL (IMPACT)

**Abdul Wajid**[1], **Muhammad Arshad**[1], **Muhammad Mughal**[1], **Sander Zanten**[2], **Marie-Paule Austin**[3], **Anne Biringer**[4], **Sarah McDonald**[5], **Katherine Bright**[1], **Karly Jarema**[1], **Mireille Lecharrois**[1], **Dawn Kingston**[1]
[1]University of Calgary, [2]University of Alberta, [3]University of New South Wales, [4]University of Toronto, [5]McMaster University

**Introduction:**
Almost 25% of the pregnant women experience at least one mental health problem. Half of the women continue with these complaints into the postpartum period or early childrearing years, affecting both the mother and the developing child. Few studies have explored the nature of depressive symptoms across pregnancy and postpartum. Drawing data from a longitudinal study, we aimed to 1) identify distinct patterns of maternal depressive symptoms at three time-points in perinatal period and 2) determine the relationship between physical activity and psychological resilience and the trajectories of depression.

**Methods:**
A secondary analysis was conducted using data from 1789 mothers participating in a randomized controlled trial being implemented in Canada (IMPACT). Depression was measured using the EPDS scale. First, a distinct pattern of depressive symptoms was identified by conducting longitudinal latent class analyses across three time-points in MPlus. The class membership was assigned and used in subsequent regression analyses to determine the relationship between physical activity and psychological resilience and the trajectories in SPSS.

**Results:**
Three distinct trajectories of maternal depression over time were identified: low (63%), medium (29%) and high (9%). Predictors of the trajectories with high depression as compared to low showed that women who were 0-2 times per week active during pregnancy were at a lower risk of being members of the high depression class [aOR: 0.36 (0.13-0.99)]. Similarly, women who had a level of resilience less than the mean resilience (M=74) were 6 times more likely to be members of the high depression class [aOR:5.96 (2.81-12.63)]. All analyses controlled for age, education, income, ethnicity, and marital status.

**Conclusions:**
These analyses identified three patterns of depressive symptoms. Physical activity and psychological resilience

were identified as independent predictors of high depression indicating that moderate levels of physical activity and psychological resilience are beneficial for improving the depressive symptoms in pregnant women.

## Poster 088

### MATERNAL CHRONIC DISEASE AND SUBOPTIMAL BREASTFEEDING: FINDINGS FROM THE 2015/2016 CANADIAN COMMUNITY HEALTH SURVEY

**Natalie Scime**, **Katie Chaput**, **Suzanne Tough**, **Scott Patten** (University of Calgary)

**Introduction:**
The prevalence of chronic disease in perinatal women has consistently risen over the past two decades. Substantial evidence demonstrates that maternal chronic disease is associated with adverse medical outcomes like preterm birth, but less research has characterized non-medical outcomes such as infant feeding practices. It is recommended that infants be exclusively breastfed from birth to 6 months given the numerous health benefits it provides. This study sought to determine the association between maternal chronic disease and suboptimal breastfeeding.

**Methods:**
We conducted a cross-sectional analysis of self-report data from the 2015/2016 Canadian Community Health Survey, restricted to women who gave birth within 2 years (n=2,100, rounded). The exposure was professionally diagnosed chronic disease (e.g., diabetes, arthritis, heart disease). The outcomes were breastfeeding non-initiation and early cessation of exclusive and non-exclusive breastfeeding before 6 months. Multivariable logistic regression modelling was used to estimate adjusted odds ratios (AOR) with 95% confidence intervals (CIs). Estimates were bootstrapped and weighted to represent the national population.

**Results:**
Overall, 11.9% of women reported chronic disease, and this group was more likely to be single, have low education, and be overweight/obese than women without chronic disease. The mean maternal age was approximately 30 years in both groups. Relative to unaffected women, women with chronic disease had similar odds of breastfeeding non-initiation (AOR=0.96, 95% CI=0.54-1.71) and early cessation of non-exclusive breastfeeding (AOR=1.40, 95% CI=0.82-2.40), but over twice the odds of early cessation of exclusive breastfeeding (AOR=2.48, 95% CI=1.49-4.12).

**Conclusions:**
Mothers with chronic disease initiate and continue some form of breastfeeding to 6 months as often as their unaffected peers. However, they are substantially less likely to meet the recommendation of exclusive breastfeeding to 6 months. Findings suggest a need to investigate the reasons for this disparity to ensure that appropriate patient-centered breastfeeding support is available for women with chronic disease.

## Poster 089

### EMERGENCY DEPARTMENT USE DURING PREGNANCY AND POSTPARTUM IN ALBERTA

**Maria Ospina**[1], **Radha Chari**[1], **Brian Rowe**[1], **Susan Crawford**[2], **Susan Jelinski**[2], **Amy Metcalfe**[3], **Jeff Bachman**[1], **Rhonda Rosychuk**[1]
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**Introduction:**
Pregnant and postpartum women represent a high-risk group of frequent visitors to emergency departments (ED), particularly if they experience pregnancy-related complications and/or have not received adequate prenatal or postnatal

care. This study describes the characteristics and outcomes of ED visits during pregnancy and postpartum in Alberta.

**Methods:**
A population-based retrospective cohort study of deliveries (> 20 weeks of gestation) occurring in Alberta between 2011-2017. Individual, de-identified data on ED use during pregnancy and postpartum were obtained via deterministic linkage across a clinical perinatal registry and administrative health databases. The pregnancy period was defined as the number of days indicated by the gestational age prior to the date of birth. The postpartum period was the time elapsed from delivery date and up to 365 days after. Frequency, characteristics and outcomes of ED visits in both pregnancy and postpartum were reported using descriptive statistics.

**Results:**
Overall, 51% of deliveries had an ED visit either during pregnancy or postpartum (20.1% pregnancy only, 13.7% both pregnancy and postpartum, 17.2% postpartum only). A total of 398,806 ED visits (pregnancy: 215,331; postpartum: 165,409) were made by 108,611 women. Median length of stay was 2 hours (interquartile range [IQR] 3.7-1; pregnancy: 1.9, IQR 3.5-1; postpartum: 2.1, IQR 3.9-1.1). Half of the visits (53.3%) had Canadian Triage and Acuity Scale levels 4 and 5 (pregnancy: 53.8%; postpartum: 52.7%). Most (86.5%) ED visits were discharged to the community (pregnancy: 85.3%, postpartum: 87.9%). The proportion of ED visits with a main diagnosis classified as related to pregnancy, childbirth and the puerperium was 32.3% (pregnancy: 45.2%; postpartum: 17.2%).

**Conclusions:**
More than half of the deliveries in Alberta had a recorded visit to the ED, particularly during the pregnancy period. Further research should explore risk factors associated with these ED visits, particularly the role of adequacy of prenatal care, comorbidities, and social determinants of health.

## Poster 090

### INTERPOLATING GESTATIONAL WEIGHT GAIN BETWEEN MEASUREMENTS IN TWIN PREGNANCIES

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**Introduction:**
Gestational weight gain has been consistently associated with short- and long-term adverse maternal/child outcomes in singleton pregnancies. Although gestational weight gain (GWG) is commonly measured at discrete points of time in research contexts, GWG might not be measured at the gestational age (GA) desired for study analysis. Accordingly, this study aimed to evaluate methods for interpolating GWG between measurements.

**Methods:**
Serial weights abstracted from medical charts for non-anomalous twin pregnancies delivered at Magee Women's Hospital in Pittsburgh, Pennsylvania from 1998-2014 were leveraged for this study. Monochorionic pregnancies and mothers with missing height/weight were excluded. Of all serial weights, only those measured at pre-pregnancy, first visit, glucose screening visit, and delivery were retained for interpolation; predicted weights were then compared to remaining antenatal weight measurements. Methods compared were individual-level interpolation (i.e. last value carried forward, linear estimation using most proximal measurements, linear/quadratic regression using all measurements) and population-level/pooled interpolation (i.e. mixed effects models with random intercepts for participant and random slopes for linear/quadratic GA). Absolute differences in kilograms between predicted and remaining measured weights were calculated; summary statistics, including median and sum of squared differences (SSD), were compared between methods.

**Results:**
Included pregnancies (n=2033) had a median of 12 (IQR 10;14) unique weight measurements. As anticipated, individual-level last value carried forward interpolation method, which is the default for time-varying covariates in survival analyses, produced biased estimates (median=4.08, SSD=601511). Interpolation methods that performed best were individual-level linear interpolation using most proximal measurements (median=-0.12, SSD=42113), individual-level quadratic interpolation using all measurements (median=0.21, SSD=49405), and population-level quadratic interpolation with random intercept and slope (median=0.19, SSD=46194).

**Conclusions:**
Some interpolation methods appeared to estimate between-visit GWG with reasonable accuracy and precision. Individual-level methods were more precise than corresponding population-level methods, although these differences were lessened by the inclusion of random intercepts and slopes by pregnancy in mixed-effects models.

## Poster 091

### PREGNANCY RATES IN WOMEN WITH PHYSICAL, SENSORY, AND INTELLECTUAL AND DEVELOPMENTAL DISABILITIES

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**Introduction:**
One in 10 women of reproductive age has a physical, sensory, or intellectual and developmental disability. Community integration and medical advances have resulted in more opportunities for childbearing in women with disabilities. Yet, reproductive health care programs frequently do not meet their needs, possibly because of the persistent assumption that pregnancy is uncommon in this population. Our objectives were to describe the pregnancy rates of women with physical, sensory, and intellectual and developmental disabilities and to compare these to women without disabilities.

**Methods:**
We conducted a population-based study in Ontario, Canada, of 15- to 44-year-old women with physical (n=254,844), sensory (n=87,639), intellectual and developmental (n=7,900), and multiple disabilities (n=27,920) and women without disabilities (n=2,303,066) in 2015. Primary outcomes were overall and age-specific rates of recognized pregnancy per 1,000 women. We also measured rates of pregnancy ending in livebirth, stillbirth, miscarriage, and induced abortion. Rate ratios (RR) and 95% confidence intervals comparing women with and without disabilities were generated using Poisson regression.

**Results:**
Overall pregnancy rates were lower in women with physical (49.8 pregnancies/1,000 women), sensory (50.8/1,000), intellectual and developmental (26.5/1,000), and multiple disabilities (36.8/1,000) compared to women without disabilities (54.0/1,000) (all RR <1.00 and statistically significant). However, when stratified by age, pregnancy rates in adolescents (15-19 years) with physical, sensory, and intellectual and developmental disabilities were higher. Patterns for overall rates of livebirth, stillbirth, miscarriage, and induced abortion were similar, but women with physical disabilities were more likely to have a stillbirth or miscarriage.

**Conclusions:**
While overall pregnancy rates were lower in women with disabilities compared to those without disabilities, our findings show that pregnancy is not uncommon, as previously thought. Reproductive health care programs should attend to the unique needs of women with disabilities; specialized services may be needed for adolescents with disabilities and women with physical disabilities in particular.

Table 1. Overall and age-specific pregnancy rates in women with physical, sensory, intellectual and developmental, and multiple disabilities, Ontario, 2015.

| Outcome | Rate per 1,000 women (95% confidence interval) | | | | |
|---|---|---|---|---|---|
| | Physical disability | Sensory disability | Intellectual and developmental disabilities | Multiple disabilities | No disability |
| Overall pregnancy rate | 49.8 (48.9, 50.6) | 50.8 (49.4, 52.4) | 26.5 (23.0, 30.3) | 36.8 (34.6, 39.1) | 54.0 (53.7, 54.3) |
| Age-specific pregnancy rates | | | | | |
| 15 to 19 years | 9.6 (8.5, 10.8) | 9.5 (7.9, 11.4) | 7.8 (4.6, 12.3) | 4.4 (2.6, 7.1) | 7.1 (6.8, 7.4) |
| 20 to 24 years | 39.8 (37.8, 41. 9) | 35.9 (33.0, 38.9) | 27.0 (20.2, 35.4) | 33.0 (28.1, 38.5) | 33.5 (32.9, 34.0) |
| 25 to 29 years | 80.5 (77.7, 83.4) | 76.3 (72.2, 80.5) | 49.0 (37.6, 62.7) | 63.4 (56.3, 71.2) | 79.5 (78.7, 80.4) |
| 30 to 34 years | 99.2 (96.3, 102.2) | 99.7 (94.5, 105.2) | 42.5 (30.5, 57.7) | 73.9 (65.8, 82.6) | 109.3 (108.3, 110.3) |
| 35 to 39 years | 51.5 (49.6, 53.5) | 62.2 (58.2, 66.5) | 31.2 (20.2, 46.1) | 42.7 (37.1, 48.9) | 61.9 (61.1, 62.6) |
| 40 to 44 years | 13.9 (13.0, 14.0) | 16.1 (14.1, 18.4) | 16.2 (7.8, 29.8) | 8.7 (6.4, 11.5) | 17.0 (16.5, 17.4) |

## Poster 092

### INTRAPARTUM CHARACTERISTICS AND PROGNOSIS ASSOCIATED WITH NEONATAL HYPOXIC ISCHEMIC ENCEPHALOPATHY

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**Introduction:**
Neonatal hypoxic-ischemic encephalopathy (HIE) is associated with neonatal mortality, acute neurological injury and long-term neurodevelopmental disabilities; the role of intrapartum factors remains unclear.

**Methods:**
This population-based cohort study employed linked obstetrical and newborn data derived from the Nova Scotia Atlee Perinatal Database (NSAPD, 1988-2015) and the Perinatal Follow-Up Program Database (2006-2015) for all pregnancies with live, non-anomalous newborns ≥35 weeks, born without pre-labour caesarean section. HIE was defined using standard definitions. Temporal trends in HIE incidence are described; Fisher's exact test and logistic regression were used to test the associations of intrapartum factors with HIE.

**Results:**
The NSAPD identified 227 HIE cases out of a population of 226,711 pregnancies from 1988 to 2015, with a decrease in incidence from 0.14% to 0.1% through those years (P=0.01). Women with clinical chorioamnionitis in labour (OR 8.0, 95% CI 4.7-17), emergency operative delivery (OR 9.9, 95% CI 7.3-13), shoulder dystocia (OR 3.4, 95% CI 2.1-5.4), placental abruption (OR 19, 95% CI 12-29), and cord prolapse (OR 32, 95% CI 17-61) were more likely to have newborns with HIE. Two-thirds of newborns with HIE had an abnormal intrapartum FHR tracing. There was an infant mortality rate of 28% by age 3; neurodevelopmental outcomes in the surviving infants with HIE were normal in 33% and showed severe developmental delay in 37%.

**Conclusions:**
Overall, the rate of HIE was low in late-preterm and term infants. The identification of associated intrapartum factors should promote increased surveillance and careful management to optimize newborn outcomes.

## Poster 093

### LONG-TERM SURVIVAL IN WOMEN DIAGNOSED WITH CANCER DURING PREGNANCY OR POSTPARTUM

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[1]University of Calgary, [2]Alberta Health Services, [3]University of Toronto, [4]St. Michael's Hospital, [5]ICES, [6]University of Ottawa, [7]Children's Hospital of Eastern Ontario, [8]University of British Columbia, [9]BC Children's Hospital Research Institute, [10]Alberta Children's Hospital Research Institute, [11]BC Cancer Research Centre

**Introduction:**
Cancer is the second leading cause of death in reproductive aged women, and the incidence of cancer diagnosed during pregnancy and one year postpartum is rising. In the first Canadian study of its kind, we aimed to determine long-term survival in women diagnosed with cancer during pregnancy or one year postpartum.

**Methods:**
We performed a population-based retrospective cohort study including all reproductive-aged women (18-50 years) with a cancer diagnosis (excluding non-melanoma skin cancer) and who delivered a live or stillborn infant in Alberta between 2003 and 2016. Using Cox regression, we calculated hazard ratios (HR) for all-cause and cancer-specific mortality in women diagnosed with cancer during pregnancy (n=247) or one year postpartum (n=670), using women diagnosed with cancer three to five years before their first pregnancy as the reference group (n=157). Regression models were adjusted for age at diagnosis, parity, cancer stage, and cancer type.

**Results:**
The cumulative incidence of cancer in pregnancy was 34.53 per 100,000 births (95% CI 29.31-39.76) and in postpartum was 93.94 per 100,000 births (95% CI 81.47-106.405). The most common cancers affecting this population were thyroid (22.5%, 95% CI 19.8-25.3), breast (18.3%, 95% CI 15.9-21.0), and cervical (11.7%, 95% CI 9.7-13.9). All-cause mortality in women diagnosed with cancer in pregnancy (HR=8.31, 95% CI 1.92-36.03) or postpartum (HR=8.27, 95% CI 1.97-34.67) was significantly greater than those diagnosed remote from pregnancy. Cancer-specific mortality in women diagnosed with cancer in pregnancy (HR=15.12, 95% CI 2.00-114.23) or postpartum (HR=15.07, 95% CI 2.05-110.99) was significantly greater than those diagnosed remote from pregnancy.

**Conclusions:**
Women diagnosed with cancer during pregnancy or postpartum experience poorer survival than those diagnosed remote from pregnancy. These findings should be used by physicians to guide care of women diagnosed with cancer during pregnancy or postpartum.

## Poster 094

### THE EFFECT OF UNAFFORDABLE HOUSING ON PRETERM BIRTH IN CANADA

**Azar Mehrabadi**[1,2], **Seungmi Yang**[1] ([1]McGill University, [2]McGill University Health Centre)

**Introduction:**
Soaring real-estate and rent prices have led to a housing affordability crisis across Canada. Socioeconomic risk factors are known drivers of disparities in preterm birth. Our aim was to determine the effect of housing unaffordability on preterm birth in Canada.

**Methods:**
Our data source was the 2006 Canadian Birth-Census Cohort, which links 2004-2006 birth registration

data with the long-form census. Our analytic cohort consisted of singleton births among home owners and renters. Logistic regression was used to estimate disparities in preterm birth by shelter-to-income ratios.

**Results:**
Unaffordable housing was experienced by 34.1% of women giving birth according to the classic definition of cost-burdened housing (spending ≥30% of income on shelter). Among renters, 67.2% in the lowest income quintile versus 0.47% in the highest income quintile experienced unaffordable housing. Housing unaffordability was more common among single versus married mother (37.2% versus 31.7%), visible minority and Aboriginal mothers versus non-visible minority mothers (47.1% and 42.6% versus 29.7%) and among immigrant mothers compared to those born in Canada (45.9% versus 30.0%). Preterm birth ranged from 6.7% among the least cost-burdened women (devoting <15% of household income to shelter) to 8.0% among the most cost-burdened women (devoting ≥85% to shelter). However no clear association was observed among shelter-to-income ratios and preterm birth either right above the cut-off (aOR 1.06, 95% CI 0.14, 8.2 for those spending 30 to <50% of income on shelter) or among the most cost-burdened households spending ≥85% of income on shelter (aOR 1.15, 95%CI 0.03, 41.8), adjusting for maternal age, education, visible minority status and household income.

**Conclusions:**
No robust association was found between housing unaffordability and preterm birth. Our findings may suggest a more complex relationship between housing unaffordability and preterm birth due to economic hardship, but also improved housing and neighbourhood conditions, associated with unaffordable housing.

## Poster 095

### NEONATAL MORBIDITY OF APGAR SCORES OF 7 TO 9 AT 1, 5 AND 10 MINUTES

**Neda Razaz**[1], **Sven Cnattingius**[1], **KS Joseph**[2] ([1]Karolinska Institutet, [2]University of British Columbia)
**Introduction:**
Objective: Infants born with Apgar scores within the normal range (7-9) are at higher risks of adverse long-term outcomes, such as epilepsy, cerebral palsy, and adverse child developmental health. Determinants of Apgar score between 7 and 9 may include known risk factors for later neurodevelopmental adversity. We evaluated associations between Apgar scores of 7, 8 and 9 (vs 10) at 1, 5 or 10 minutes and neonatal morbidity.

**Methods:**
A retrospective cohort study in Sweden, including 1,164,692 non-malformed live singleton infants, born at term between 1999 and 2012. Data on maternal characteristics and neonatal mortality were obtained by individual record linkages of nationwide Swedish registries. Infants with Apgar scores of 7, 8 and 9 at 1, 5 and 10 minutes were compared with those with an Apgar score of 10. Logistic regression was used to quantify the effects of neonatal morbidity.

**Results:**
Compared with infants with an Apgar score of 10, odds ratios (ORs) for neonatal infections, asphyxia-related complications, birth asphyxia, neonatal hypoglycemia, neonatal jaundice, and respiratory distress, increased with decreasing Apgar scores and increasing time since birth. For instance, the ORs for respiratory distress for Apgar 9 vs 10 were 1.88, 95% confidence interval (CI) 1.70-2.05) at 1-minute, 4.99 95%CI 4.80-5.19 at 5-minute and 12.0, 95%CI 11.5-12.5 at 10-minute. Furthermore, a reduction in Apgar score from 10 at 5-minute to 9 at 10-minutes was also associated with increased neonatal morbidity. Compared with Apgar scores at both time points, a reduction in 5-minute Apgar score (to 9 at 10-minute) was associated with a 4.53-fold higher odds of neonatal infection.

**Conclusions:**
Among term infants, Apgar scores in the 7 to 9 range at 1, 5, and 10-minute, and those showing a reduction in score from 5 to 10-minute, are positively correlated with neonatal morbidity compared with stable Apgar scores of 10.

## Poster 096

### RISK FACTORS ASSOCIATED WITH TRAJECTORIES OF MOTHERS' ANXIETY SYMPTOMS FROM PREGNANCY TO 8 YEARS POSTPARTUM - FINDINGS FROM A PROSPECTIVE UK BASED COHORT

**Kashif Mughal**[1], **Rebecca Giallo**[2], **Muhammad Arshad**[1], **Abdul Wajid**[1], **Katherine Bright**[1], **Mireille Lecharrois**[1], **Riya Rai**[1], **Dawn Kingston**[1] ([1]University of Calgary, [2]Murdoch Children's Research Institute, Australia)

**Introduction:**
Maternal mental health including depression and anxiety is one of the most common morbidities during the perinatal period. One out of four women experience depression and/or anxiety from conception to one year postpartum. While several studies have investigated maternal anxiety either prenatally or postnatally, little research has explored the patterns of maternal anxiety symptoms from pregnancy to postnatal period in a community-based cohort. Objective: To examine the trajectories of perinatal anxiety symptoms over time and compare characteristics of women across these trajectories.

**Methods:**
Data were drawn from over 14,000 women participating in Avon Longitudinal Study of Parents and Children (ALSPAC), a prospective birth cohort in the UK. Maternal anxiety symptoms were assessed during pregnancy to 8 years postpartum using *Crown Crisp* Experiential Index (CCEI) at eight time points (18, 32 weeks in pregnancy, and 2, 8, 21, 33, 61 and 73 months postpartum). Maternal anxiety trajectories were constructed using longitudinal latent class analysis (LLCA). Multinomial logistic regression (MLR) was used to identify predictors of maternal anxiety symptoms.

**Results:**
Majority of women were 25 years or older (61%), were partnered (66%), did not complete a university degree (71%), and were Caucasian (78%). LLCA identified three distinct classes over time: "minimal anxiety" (57%), "subclinical anxiety" (34%) and "clinical anxiety" (9%) classes. Mean anxiety scores (+SD) for the preceding three classes were 2.5+0.63; 5.8+0.97; and 10.0+0.52. MLR [DK1] indicated that compared to women in the minimal anxiety class, women with clinical and sub-clinical high anxiety classes had significantly lower family income, history of depression, conflicting partner relationship, adverse life events and lower social support (Adjusted OR ranged from 1.27-8.85).

**Conclusions:**
This research identifies risk factors of women experiencing subclinical and clinical anxiety symptoms and provide basis for early detection and interventions to improve maternal mental symptoms during pregnancy and across the early parenting period.

## Poster 097

### SEVERE MATERNAL USE OF CANNABINOIDS OR OPIOIDS AND THE RISK OF CONGENITAL MALFORMATIONS IN OFFSPRING: A RETROSPECTIVE POPULATION-BASED STUDY

**Shiliang Liu** (Public Health Agency of Canada)

**Introduction:**
There is growing concern that maternal drug use may impact the risk of having a baby with birth defects. This study aimed to assess the association between severe maternal use of cannabinoids or opioids and risk of congenital malformations in the offspring.

**Methods:**
We conducted a population-based study of mother-newborn dyads, comprising 3 812 597 live births and stillbirths (including terminated fetuses) in hospitals in Canada from 2004 to 2017. A total of 13 112 mothers with severe use of opioids or cannabinoids, and 45 254 newborns with congenital malformations

were identified using ICD-10 codes. Maternal age, parity, chronic condition or illness, and use of alcohol or tobacco or other drugs were considered as covariates. Multivariable logistic regression was used to estimate the association between maternal use of cannabinoids or opioids and the risk of a number of malformations.

**Results:**
The absolute prevalence of any selected malformation was higher for newborns of women who used either drug compared with women who did not (26.5 vs. 11.8 per 1000 total births). Young women (i.e., <25 years) had a higher rate of severe drug use than older women. Use of opioids was significantly associated with the risk of cleft palate (adjusted odds ratio (aOR), 4.3; 95% confidence interval (CI) 2.7-6.9), atrial septal defect (aOR, 3.2; 95% CI 2.4-4.2), ventricular septal defect (aOR, 2.6; 95% CI 1.9-3.6) or cystic kidney disease (aOR 2.5; 95% CI 1.5-4.3). Use of cannabinoids was significantly associated with gastroschisis (aOR 3.1; 95% CI 2.2-4.4), spina bifida (aOR 2.6; 95% CI 1.1-6.2), transverse limb deficiency (aOR 2.2; 95% CI 1.2-4.5) and critical congenital heart defects (aOR 1.6; 95% CI 1.0–2.6) compared with non-users.

**Conclusions:**
This study suggests that severe maternal use of opioids or cannabinoids is associated with several congenital malformations in the offspring.

## Poster 099

### ASSOCIATION BETWEEN PRENATAL EXPOSURE TO 2009 PANDEMIC H1N1 INFLUENZA INFECTION DURING PREGNANCY AND DEVELOPMENT OF IMMUNE-RELATED HEALTH OUTCOMES IN YOUNG CHILDREN

**Laura Walsh**[1], **Steven Hawken**[1,2,3], **Kumanan Wilson**[2,3], **Deshayne Fell**[1,2,4]
[1]University of Ottawa, [2]ICES, [3]Ottawa Hospital Research Institute, [4]CHEO Research Institute

**Introduction:**
During the 2009 H1N1 pandemic, fewer than half of pregnant women in Ontario received the recommended pandemic H1N1 (pH1N1) influenza vaccine. One commonly-cited reason for low influenza vaccine uptake among pregnant women is a lack of understanding of the possible health impacts of influenza infection during pregnancy. The objective of this study was to evaluate the association between 2009 pH1N1 influenza infection during pregnancy and later development of atopic and infectious diseases during early childhood.

**Methods:**
This was a retrospective cohort study using a province-wide perinatal database from Ontario. The cohort, comprised of infants born between May 17, 2009 and October 31, 2010, was individually linked with provincial health administrative databases to ascertain information on clinically-diagnosed pH1N1 influenza during pregnancy, as well as pediatric study outcomes over five years of follow-up. Cox proportional hazards and negative binomial models were used to estimate hazard ratios (HR) for pediatric asthma and incidence rate ratios (IRR) for infectious outcomes, along with 95% confidence intervals (CI). We used multivariable analysis to adjust for potential confounding bias.

**Results:**
Following exclusions, there were 178,816 eligible live births between May 17, 2009 and October 31, 2010. A total of 2,413 infants (1.35%) were exposed to maternal pH1N1 infection while *in utero*. We observed statistically significant associations between prenatal pH1N1 infection and study outcomes that persisted even after adjustment for maternal age, maternal comorbidities, and smoking during pregnancy (pediatric asthma adjusted HR: 1.27, 95% CI: 1.16-1.39; common childhood infections adjusted IRR: 1.35, 95% CI: 1.28-1.43).

**Conclusions:**
The significant associations between maternal infection and adverse pediatric health outcomes support the current vaccine policy; however, more research in this area is required. These findings may help clinicians inform and counsel

their patients regarding potential health benefits of influenza immunization during pregnancy.

## Poster 100

### BIRTH BY CAESAREAN SECTION AND FEMALE OFFSPRING'S RISK OF PRE-PREGNANCY OBESITY AND CAESAREAN SECTION DELIVERY

**Stefan Kuhle**, **Mary Brown**, **Linda Dodds**, **Jillian Ashley-Martin**, **Christy Woolcott** (Dalhousie University)

**Introduction:**
Offspring born via Caesarean section (CS) are at an increased risk for developing obesity in childhood, but there is limited information regarding whether this association persists into childbearing age and if birth by CS increases the risk of delivering one's own child by CS. The objective of this study was to examine the association of birth by CS with female offspring's risk of i) pre-pregnancy obesity and ii) CS delivery.

**Methods:**
We used data from the 3G Multigenerational Cohort that includes women whose own births and then their own pregnancies were recorded in the Nova Scotia Atlee Perinatal Database (n=27,678 triads). The current analysis was restricted to first births (n=7202 dyads). Confounding variables were identified using a directed acyclic graph. Binomial regression with inverse probability weighting was used to model the association of birth by CS with pre-pregnancy obesity (weight > 76.6 kg) and delivering via CS.

**Results:**
Among the 4669 dyads with complete weight and CS information, 19% of women were born via CS, 28% were obese, and 23% delivered by CS. Birth by CS was associated with offspring pre-pregnancy obesity in the unadjusted (relative risk [RR] 1.15, 95% confidence interval [CI] 1.03, 1.29) but not in the adjusted model (RR 1.04, 95% CI 0.92, 1.17). Women born by CS had a 1.29 times (95% CI 1.14, 1.47) higher risk of delivering by CS compared to women born vaginally in the adjusted model.

**Conclusions:**
Birth by CS is associated with a moderately increased risk of delivering one's own child by CS. This increase in risk does not appear to be mediated by pre-pregnancy obesity but is likely rather due to genetic, cultural, or medical factors.

## Poster 101

### INTERRUPTING THE INTERGENERATIONAL TRANSMISSION OF TRAUMA REQUIRES MENTALIZATION-BASED INTERVENTIONS DURING THE PRENATAL PERIOD: INTRODUCTION TO THE STEP PROGRAM

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**Introduction:**
Child abuse and neglect (CAN) has long-term consequences and its effects may be particularly salient during challenging periods such as pregnancy. Parents with a history of CAN are more likely to present multiple psychological symptoms during pregnancy (Oh et al., 2016), which affects their experience of parenthood (Seimyr, Edhborg, Lundh, & Sjögren, 2004) and compromises fetal development (Meaney, 2018).

**Methods:**
322 future parents (251 women, mean age = 28,5, *SD*= 4,74) were recruited during prenatal meetings or in high-risk perinatal services. During the third trimester of pregnancy, participants completed self-reported measures assessing mental health (*EPDS, PCL-5*), intimate partner violence (*CTS-2*), attitudes towards the

foetus and parenthood (*MAAS, MCQ*) and general (*RFQ*) and trauma-specific (*RFQ-T*) mentalization.

**Results:**
Future parents exposed to CAN reported more intimate partner violence during pregnancy than expecting participants without trauma, $t(130.85) = -2{,}39$, $p = .02$. Linear regressions suggested that parents' mentalization capacities regarding trauma ($B = .02$, $p = .04$) predicted intimate partner violence during pregnancy over and beyond the effect of CAN, $F(2, 177) = 7.13$, $p = .001$. Structural equation modeling also revealed that mentalization mediates the association between CAN, mental health, and their attitude towards the foetus and parenthood (RMSEA = .05, $p = .04$).

**Conclusions:**
In lights of the results showing that intimate partner violence and mental health problems were frequent in pregnant women and expecting men with a history of CAN, we advocate that intervening early postpartum is already late. Results also reveal the protective role of mentalization in the overall experience of pregnancy in adults exposed to CAN. This calls for the development of prenatal programs targeting mentalization in future parents with a history of CAN. Such a program (*STEP: Supporting the Transition to and Engagement in Parenthood*) is under development by our team. The presentation will introduce this program.

## Poster 102

### REPRODUCTIVE HISTORY AND MATERNAL ANXIETY PREDICT PHYSICAL ACTIVITY LEVELS DURING PREGNANCY

**Audrey St-Laurent**[1], **Stephanie-May Ruchat**[1], **Véronique Babineau**[2]
[1]Université du Québec à Trois-Rivières, [2]Centre hospitalier régional de Trois-Rivières

**Introduction:**
The majority of pregnant women (85%) are not meeting the Canadian physical activity (PA) guidelines and understanding why is important to effectively promote prenatal PA. Reproductive history and related psychological anxiety might explain, in part, prenatal PA behavior. The objectives of this study were to: 1) compared PA levels between pregnant women who conceive naturally (NC) and after fertility treatments (FT) throughout pregnancy; 2) determined factors that predict prenatal PA.

**Methods:**
We collected data about reproductive history at the 1st trimester of pregnancy (TR1) and then assessed PA and anxiety levels at each trimester (TR1, TR2, TR3). PA levels were evaluated using questions from the Canadian Community Health Survey and an accelerometer. Anxiety levels were assessed using the State-Trait Anxiety Inventory. Repeated measures ANOVAs and multivariate linear regression analyses were used.

**Results:**
Ninety-six pregnant women were included in the study (58 NC and 38 FT). The baseline characteristics of NC and FT women were similar, except for age (NC: 30.0±3.8, FT: 32.3±3.3, p=0.003). Women who conceived after FT underwent an average of 3.5±3.3 FT cycles before achieving the current pregnancy. Moderate-to-vigorous PA (MVPA) and daily step counts significantly decreased over the course of pregnancy (time effect), but to a similar extent in both groups (no group effect and no interaction effect). The number of FT cycles before achieving the current pregnancy, but not the mode of conception (NC vs FT), state anxiety levels and MVPA practiced in the last three months were significant predictors of MVPA levels in TR1 and TR3. MVPA levels in TR1 was the only predictor of MVPA levels in TR2.

**Conclusions:**
Overall, women who underwent several cycles of fertility treatments, had higher anxiety levels and weaker PA habits in the last three months were less likely to engage in MVPA in early and late pregnancy.

**Reproductive history and maternal anxiety predict physical activity levels during pregnancy**

**TABLES (2)**

Table 1: Sample characteristics

| Variables | Natural conception | | Conception after fertility treatments | | p-value |
|---|---|---|---|---|---|
| Age (years) | n = 58 | 30.0 ± 3.8 (22.0-40.0) | n = 38 | 32.3 ± 3.3 (26-38) | 0.003 |
| Aborta/miscarriages<br>0<br>1<br>>1 | n = 57 | 34 (59.6%)<br>15 (26.3%)<br>8 (14.0%) | n = 38 | 27 (71.1%)<br>8 (21.0%)<br>3 (7.9%) | 0.48 |
| Parity<br>0<br>1<br>>1 | n = 58 | 30 (51.7%)<br>25 (43.1%)<br>3 (5.2%) | n = 38 | 22 (57.9%)<br>16 (42.1%)<br>0 (0%) | 0.55 |
| Pre-pregnancy BMI (kg/m²)<br>Underweight (<18.5)<br>Normal (18.5 à < 25)<br>Overweight (25 à < 30)<br>Obesity (≥ 30) | n = 57 | 25.2 ± 6.3 (18.1-48.7)<br>1 (1,8%)<br>36 (63,2%)<br>10 (17.5%)<br>10 (17.5%) | n = 38 | 25.0 ± 6.2 (18.8-46.1)<br>0 (0%)<br>25 (65.8%)<br>8 (21.1%)<br>5 (13.1%) | 0.90<br><br>0.77 |
| Education<br>Others<br>University | n = 58 | 19 (32.8%)<br>39 (67.2%) | n = 38 | 16 (38.1%)<br>26 (61.9%) | 0.88 |
| Pregnancy achieve by<br>In vitro fertilization<br>Intrauterine insemination<br>Ovarian stimulation | N/A | N/A | n = 38 | 7 (18.4%)<br>16 (41.1%)<br>15 (39.5%) | N/A |
| Nb of FT cycles before current pregnancy | N/A | N/A | n = 38 | 3.5 ± 3.3 (1-12) | N/A |
| PAQ (kcal/kg/day)<br>Inactive (< 1.5)<br>Moderately active (1.5 à < 3)<br>Active (≥ 3) | n = 54 | 1.9 ± 1.6 (0.05-8.8)<br>26 (48.1%)<br>21 (38.9%)<br>7 (13.0%) | n = 36 | 1.6 ± 1.5 (0.08-7.9)<br>24 (61.5%)<br>12 (30.8%)<br>3 (7.7%) | 0.35<br><br>0.60 |

Data are presented as mean ± standard deviation (min-max) or N (%).

BMI : body mass index
FT : fertility treatments
PAQ : physical activity questionnaire

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Table 2: Predictors of physical activity at each trimester of pregnancy (stepwise procedure)

| Variables | Trimester | $R^2$ | p-value |
|---|---|---|---|
| PAQ score | 1 | 0.17 | 0.0002 |
| State anxiety | 1 | 0.20 | 0.07 |
| Nb of FT cycles before current pregnancy | 1 | 0.24 | 0.08 |
| Age | 1 | 0.26 | 0.15 |
| MVPA (min/week), TR1 | 2 | 0.34 | <0.0001 |
| MVPA (min/week), TR2 | 3 | 0.42 | <0.0001 |
| State anxiety | 3 | 0.45 | 0.04 |
| Age | 3 | 0.48 | 0.04 |
| Education | 3 | 0.51 | 0.03 |
| Nb of FT cycles before current pregnancy | 3 | 0.53 | 0.12 |

Variables included in the linear multiple regression models were:
**TR1**: age, aborta/miscarriages, parity, pre-pregnancy body mass index, education, mode of conception (groups), Nb of FT cycles achieve before the current pregnancy, state anxiety, PAQ score.
**TR2**: age, aborta/miscarriages, parity, pre-pregnancy body mass index, education, mode of conception (groups), Nb of FT cycles achieve before the current pregnancy, state anxiety, MVPA (min/week) practiced in TR1.
**TR3**: age, aborta/miscarriages, parity, pre-pregnancy body mass index, education, mode of conception (groups), Nb of FT cycles achieve before the current pregnancy, state anxiety, MVPA (min/week) practiced in TR2.

PAQ : physical activity questionnaire
FT : fertility treatments
MVPA : moderate-to-vigorous physical activity

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Figure 3: Evolution of MVPA (min/day) in FT and NC women over the course of pregnancy

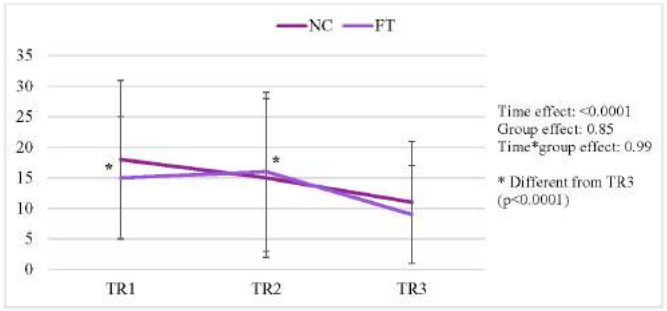
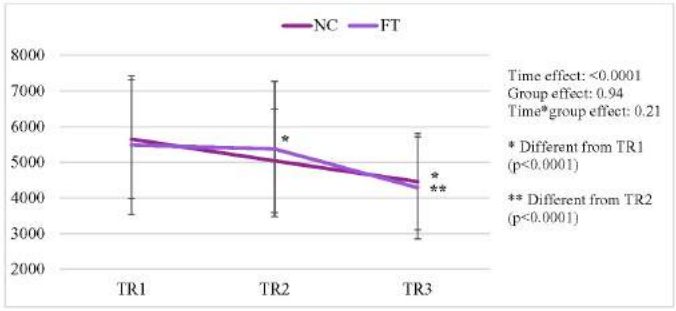



Figure 4: Evolution of daily step counts in FT and NC women over the course of pregnancy

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**FIGURES (5)**

NC: women who conceive naturally, FT: women who conceive after fertility treatments, TR1: first trimester, TR2: second trimester, TR3: third trimester, LPA: light physical activity, MVPA: moderate-to-vigorous physical activity

Figure 1: Evolution of sedentary time (hours/day) in FT and NC women over the course of pregnancy

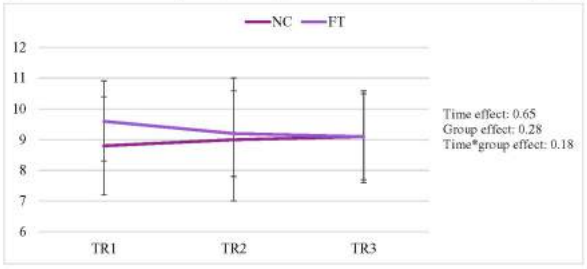


Figure 2: Evolution of LPA (hours/day) in FT and NC women over the course of pregnancy

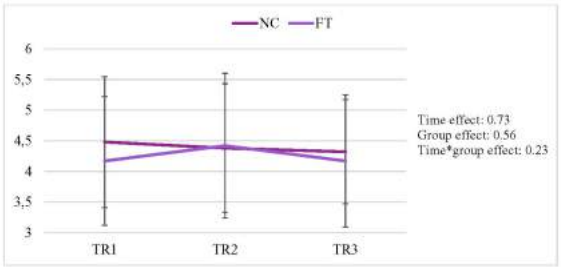


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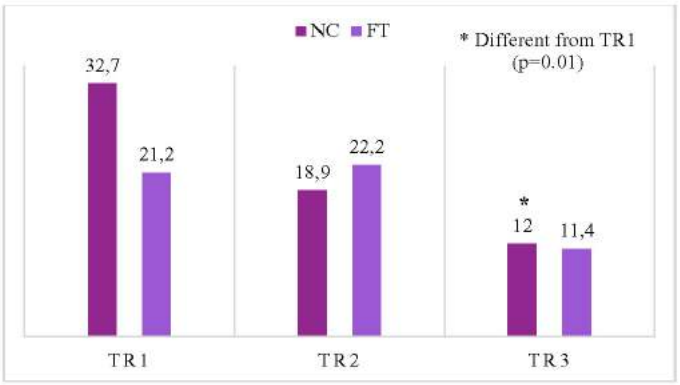
Figure 5: Prevalence of FT and NC women who achieve ≥ 150 minutes of MVPA per week over the course of pregnancy




## Poster 103

### TRANSCRIPTOME ANALYSIS REVEALS DIFFERENTIAL GENE EXPRESSION WITH HEPATIC CHOLESTEROL ACCUMULATION IN LOW BIRTH WEIGHT YOUNG ADULT MALE AND FEMALE GUINEA PIGS

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**Introduction:**
Placental insufficiency-induced intrauterine growth restriction is associated with an increased risk of

hypercholesterolemia and hepatic cholesterol loading in adulthood. Hepatic free cholesterol accumulation contributes to liver damage and non-alcoholic fatty liver disease (NAFLD), a liver disease affecting 25-30% of the general population. We aimed to uncover, through transcriptomics, the molecular mechanisms underlying hepatic cholesterol accumulation in placental insufficiency-induced low birth weight (LBW) offspring in early adulthood.

**Methods:**
Uterine artery ablation-induced LBW and normal birth weight (NBW) male and female guinea pig offspring were fed a regular diet from weaning until tissue collection at postnatal day 150.

**Results:**
Body weight and hepatic triglyceride content were unaltered in LBW *versus* NBW, in both sexes. However, increased hepatic cholesterol esters (+91%), free cholesterol (+24%) and total cholesterol (+34%) were only observed in male LBW *versus* NBW ($p<0.05$). Microarray using the GeneChip™ Guinea Pig Gene 1.1 ST Array Plate, revealed 30 genes in males and 17 genes in females differentially expressed in LBW *versus* NBW livers (>2-fold change; $p<0.05$). Specifically, apolipoprotein A-1 was upregulated (+2.9-fold; $p=0.036$) in male LBW *versus* NBW. The low-density lipoprotein (LDL) receptor was downregulated (-2.4-fold; $p=0.021$) in male LBW *versus* NBW, and LDL receptor protein was unaltered ($p=0.211$). Angiopoietin-like 4, a factor negatively correlated with circulating high-density (HDL) cholesterol, was upregulated (+2.8-fold; $p=0.011$) in male LBW. The top-regulated KEGG pathway in male LBW was the 'cholesterol metabolism pathway' ($p=0.008$). Protein levels of key factors in hepatic cholesterol export (FAS, ACC), elimination (CYP7A1, ABCG8), biosynthesis (SREBP2, HMCGR) were however not altered in LBW in both sexes.

**Conclusions:**
These findings suggest that placental insufficiency potentially programs hepatic cholesterol accumulation in male LBW offspring guinea pigs in young adulthood via augmented cholesterol carried in HDL but does not appear to be the result of increased LDL uptake, biosynthesis, or impaired elimination.

## Poster 104

### MELATONIN RECEPTOR EXPRESSION AND LOCALIZATION IN ENDOMETRIOSIS

**Andrea Mosher**, **Michael Tsoulis**, **Nicholas Leyland**, **Warren Foster** (McMaster University)

**Introduction:**
A recent randomized controlled trial in humans demonstrated reduced pain scores in women with endometriosis after eight weeks of treatment with melatonin. Additionally, melatonin treatment decreased the size of endometriotic lesions in a rat model of endometriosis. The objective of this study was to investigate the expression of melatonin receptors (MR1A and MR1B) in human endometrium, endometriomas, and peritoneal lesions.

**Methods:**
Study participants included thirty-one women with a confirmed diagnosis of endometriosis (n=20 in the endometrioma group; n=11 in the peritoneal lesion group). Women with pelvic pain but no evidence of endometriosis served as controls (n=15). Melatonin receptors were localized by immunohistochemistry and receptor expression (mRNA and protein) was quantified in eutopic and ectopic endometrial tissue samples. RL95-2 cells, an endometrial epithelial cell line, were used to assess the effect of increasing melatonin concentrations (1.0 nM to 1.0 mM) ± estradiol (1.0 nM) on cell proliferation. One-way ANOVA was used to analyze differences in expression between groups.

**Results:**
MR1A and MR1B were localized to glandular epithelial cells and both receptors were expressed in eutopic and ectopic endometrial tissue. Gene expression of both receptors was significantly greater in peritoneal lesions compared to

endometriomas and eutopic endometrium. However, protein expression of MR1A was significantly lower in peritoneal lesions compared to eutopic endometrium and protein expression of MR1B was not significantly different between groups. Melatonin treatment beginning at 1.0 nM significantly attenuated estradiol-induced cell proliferation.

**Conclusions:**
Melatonin receptors are expressed in human endometrial tissue, with differential expression between different endometrial tissue samples. Different patterns seen in gene and protein expression warrants further investigation. Melatonin may represent a novel non-hormonal adjuvant to treatment for endometriosis.

## Poster 105

### A CROSS-SECTIONAL STUDY OF MEN RECRUITED FROM THE CREATE FERTILITY CLINIC (TORONTO, ONTARIO) AND THE ASSOCIATION OF BMI, FOLATE AND VITAMIN D STATUS WITH FERTILITY AS ASSESSED BY SEMEN ANALYSIS

**Chris Filliter**[1,2], **Romain Lambrot**[3], **Karen Lockyear**[4], **Natalia Yasovitch**[4], **Sophia Zeng**[4], **Pamela Kurjanowicz**[4], **Trevor Partch**[4], **Rose Ghemrawi**[3], **Amanda MacFarlane**[5], **Hope Weiler**[3], **Clifford Librach**[4,6], **Sergey Moskovtsev**[4,6], **Jacquetta Trasler**[3], **Linda Dodds**[1,2], **Sarah Kimmins**[3,4]
[1]IWK Health Centre, [2]Dalhousie University, [3]McGill University, [4]CReATe Fertility Centre, [5]Health Canada, [6]University of Toronto

**Introduction:**
Infertility affects approximately 15% of couples, and male factors account for 50% of cases. Semen analysis is the primary method used to asses a man's reproductive health and fertility potential. The aetiology of male infertility is complex, and what factors and mechanisms are involved remain unclear. The objective of this study is to determine if there is an association between demographic, nutritional, and lifestyle factors and abnormal semen parameters.

**Methods:**
The study sample included 157 male partners from couples recruited at the CReATe Fertility Centre in Toronto between 2016 and 2017. Semen quality was analyzed by standard clinical approaches. We collected information on body mass index (BMI), dietary intake, folate parameters (folate, vitamin B12, homocysteine), serum 25-hydroxy vitamin D levels (25(OH)D), and lifestyle information and we examined their associations with semen parameters (sperm count, sperm motility, normal forms, teratozoospermia index, DNA fragmentation index, and mucus penetration kinetics).

**Results:**
Men were 38.9 +/- 6.0 years of age, and most men were obese/overweight (61.8%). Insufficient 25(OH)D (< 50 nmol/L) was associated with having increased odds of abnormal sperm motility (OR = 2.91; 95% CI 1.07 – 7.82) and increased odds of having an abnormal percentage of normal forms (OR = 2.98; 95% CI 1.26 – 7.05). Overweight/obese BMI was associated with having decreased odds of an abnormal percentage of normal forms (OR = 0.39; 95% CI 0.16 – 0.96).

**Conclusions:**
The findings suggest that insufficient vitamin D status is a risk factor for abnormal sperm motility and abnormal sperm morphology. Previous research on the association between vitamin D status and semen quality and male fertility indicate that vitamin D may have a positive effect on male reproductive health. Although not necessarily causal, vitamin D supplementation may help to improve sperm motility and morphology among men looking to become fathers.

## Poster 106

### DIETARY SUGAR INTAKE AND THE EFFECT OF SUGAR ON MICRONUTRIENTS INTAKES IN ALBERTA PREGNANT WOMEN

**Laura Forbes**[1], **Emma Schillings**[1], **Isabella Gregov**[1], **Christina Pham**[1], **Jeannine Smith**[1], **Ye Shen**[2], **Megan Jarman**[2], **Rhonda Bell**[2] ([1]University of Guelph, [2]University of Alberta)

**Introduction:**
There is growing interest in assessing sugar intake during pregnancy as it may be associated with low diet quality including low micronutrient intake and increased risk of negative health outcomes. The objective of this analysis was to describe sugar intake during pregnancy and examine the relationship between sugar and micronutrient intakes.

**Methods:**
In a prospective cohort study of pregnant women (n = 1069), women recruited at < 27 weeks gestation completed web-based 24 hour recalls (the Food Behaviour Questionnaire) during the first, second and third trimesters. The nutrient analysis database was updated to include total sugar, added sugar and natural sugar using data from the Canadian Nutrient File, and USDA and NCI food composition databases.

**Results:**
While absolute sugar intakes increased slightly over the three trimesters of pregnancy, percent of energy coming from sugars remained stable. On average, 22% of women's total energy intake came from sugars; 10% from added sugars and 11.5% from natural sugars. Percent energy from total sugars was positively correlated with vitamin C (r =0.2) and was negatively correlated with sodium (r = -0.2), folate (r = -0.1) and iron intakes (r = -0.1). Percent energy from natural sugars was positively correlated with vitamin C (r = 0.5) and potassium intakes (r = 0.2) and negatively correlated with folate (r = -0.1), sodium (r = -0.2) and iron intakes (r = -0.1). Percent energy from added sugar negatively correlated with vitamin C (r = -0.1), folate (r = -0.1), potassium (r = -0.1) and sodium intakes (r = -0.1).

**Conclusions:**
The weak correlations between sugar intake and micronutrient intakes show that the sugar intakes of this group of women had limited effects on their intake of key micronutrients. However, the relatively low sugar intakes seen in this population may have contributed to these weak associations.

## Poster 107

### THE EFFECT OF IMPLEMENTING AN INSTITUTIONAL OXYTOCIN CHECKLIST ON PATIENT SAFETY DURING LABOUR

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**Introduction:**
Injudicious use of oxytocin may be defined as starting or continuing to use oxytocin in any situation where the fetal heart rate pattern is not entirely normal. This abuse of oxytocin in labour is frequently cited in medicolegal cases. This study therefore attempted to evaluate the contribution of an oxytocin checklist in labour to improve patient safety, using similar methods as are used in medicolegal cases.

**Methods:**
This study was conducted in a single, university-affiliated hospital in two phases; before and after the implementation of an oxytocin checklist based on Canadian guidelines in labour and delivery (2016-2017). 3 obstetricians, a midwife and 2 obstetrical nurses reviewed cardiotocographs of urgent caesarean deliveries for non-reassuring fetal heart rate,

after >=4 hours of oxytocin infusion for induction/augmentation of labour. A total of 100 cases were reviewed; 50 before and 50 after implementation. Each case was reviewed twice, first using expert opinion, and second with the checklist. Experts were tasked to conclude whether oxytocin was managed properly or improperly.

**Results:**

There was no difference in oxytocin management before or after implementation; neither in expert opinion, nor using the checklist. When analyzing the reasons for improper use, there was no consistency before or after implementation in expert opinion and using the checklist. We found poor agreement when using Cohen's Kappa to compare agreement between reviewers. However, there was good agreement between expert opinion and the use of the checklist for each reviewer.

**Conclusions:**

The implementation of the oxytocin checklist did not increase the proper management of oxytocin. This may have resulted from a poor agreement between the reviewers, perhaps because some reviewers may be more circumspect than others. However, the agreement between expert opinion and the checklist may show that clinical decisions made with regards to oxytocin were already based on guidelines, without the need for a checklist.

Table 1: Proper vs. improper management of oxytocin

| | **Reviewer 1** | | ***P*-value** | **Reviewer 2** | | ***P*-value** |
|---|---|---|---|---|---|---|
| | **Pre-oxytocin checklist (50)** | **Post-oxytocin checklist (50)** | | **Pre-oxytocin checklist (50)** | **Post-oxytocin checklist (50)** | |
| Induction of labor | 33(67.3) | 25(51.0) | 0.10 | 33(67.3) | 25(51) | 0.10 |
| Improper management of oxytocin (expert review) | 25(51.0) | 27(55.1) | 0.69 | 24(48.0) | 20(40.8) | 0.47 |
| Improper management of oxytocin (oxytocin checklist) | 31(63.3) | 30(61.2) | 0.83 | 28(56.0) | 20(40.8) | 0.13 |
| Reasons for Improper Management (expert opinion) | | | | | | |
| Should not have initiated | 2(8.0) | 8(29.6) | **0.048** | 5(20.8) | 2(10.0) | 0.33 |
| Should not have continued/increased dose | 7(28.0) | 11(40.7) | 0.34 | 16(66.7) | 1(5.0) | **<0.01** |
| Should have stopped earlier | 19(76.0) | 5(18.5) | **<0.01** | 5(20.8) | 17(85.0) | **<0.01** |
| Reasons for Improper Management (oxytocin checklist) | | | | | | |
| Should not have initiated | 2(6.5) | 4(13.3) | 0.37 | 4(14.3) | 2(10.0) | 0.66 |
| Should not have continued/increased dose | 7(22.6) | 11(36.7) | 0.23 | 15(53.6) | 2(10.0) | **0.02** |
| Should have stopped earlier | 21(67.7) | 5(16.7) | **<0.01** | 8(28.6) | 15(75.0) | **0.02** |

Data is presented in n (%).

Reasons for improper management are calculated only from cases who were concluded as "improper management".

Table 2: Agreement between reviewers (inter-observer), and between expert opinion and oxytocin checklist (intra-observer)

| **Agreement between reviewers (inter-observer)** | | | |
|---|---|---|---|
| | Reviewer 1 | Reviewer 2 | Kappa |
| Improper management of oxytocin (expert review) | 51 | 43 | 0.34 |
| Improper management of oxytocin (oxytocin checklist) | 60 | 47 | 0.24 |
| **Agreement between expert review and oxytocin checklist (intra-observer)** | | | |
| | Expert opinion (n=100) | Oxytocin checklist (n=100) | Kappa |
| Reviewer 1 | | | |
| Improper management of oxytocin | 52 | 61 | 0.73 |
| Should not have initiated | 90 | 94 | 0.60 |
| Should not have continued/increased dose | 81 | 81 | 0.93 |
| Should have stopped earlier | 76 | 74 | 0.78 |
| Reviewer 2 | | | |
| Improper management of oxytocin | 44 | 48 | 0.72 |
| Should not have initiated | 92 | 92 | 0.93 |
| Should not have continued/increased dose | 83 | 82 | 0.70 |
| Should have stopped earlier | 77 | 77 | 0.89 |

Kappa > 0.6 is considered a good agreement.

## Poster 108

### ASSOCIATION OF FIRST TRIMESTER ANESTHESIA WITH RISK OF CONGENITAL HEART DEFECTS

**Jessica Healy-Profitós**[1], **Aimina Ayoub**[1], **François Carrier**[1], **Laura Arbour**[2], **Marianne Bilodeau-Bertrand**[1], **Nathalie Auger**[1]
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**Introduction:**
Up to 2% of women undergo nonobstetric surgical procedures during pregnancy. Emergency surgery requires anesthesia, but the association of first trimester anesthesia with risk of congenital heart defects is not understood. Fetal heart formation in the first trimester may potentially be disrupted by anesthetics. Our objective was to

determine if first trimester maternal anesthesia is associated with the risk of congenital heart defects in offspring.

**Methods:**
We designed a retrospective cohort study of more than 2 million deliveries in Quebec hospitals between 1989 and 2016. We identified infants whose mothers received first trimester anesthesia. The main outcome was any congenital heart defect in infants at birth, including critical and noncritical defects. We used log-binomial regression models adjusted for maternal comorbidity and pregnancy characteristics to compute risk ratios (RR) and 95% confidence intervals (CI) for the association of maternal anesthesia with congenital heart defects.

**Results:**
First trimester maternal anesthesia was associated with an increased risk of congenital heart defects in infants, particularly for anesthesia during critical weeks of cardiogenesis. Compared with no anesthesia, maternal anesthesia during the first trimester was associated with 1.25 times the risk of congenital heart defects (95% CI 1.02-1.54). The risk was particularly high between the 5$^{th}$ and 10$^{th}$ weeks of gestation (RR 1.44, 95% CI 1.06-1.95), and was highest in the 7$^{th}$ and 8$^{th}$ weeks (RR 2.05, 95% CI 1.26-3.32). The association was stronger for general anesthesia than for local or regional anesthesia.

**Conclusions:**
First trimester anesthesia, particularly during cardiogenesis, may be a risk factor for congenital heart defects in offspring. The association is strongest for anesthesia in the 7$^{th}$ and 8$^{th}$ weeks of pregnancy. Women in the first trimester should be informed of the potential risk of heart defects due to anesthesia, and when possible, surgery should be delayed or alternative methods of anesthesia used.

## Poster 109

### KNOWLEDGE AND ATTITUDES OF SERVICE PROVIDERS IN CANADA ABOUT FETAL ALCOHOL SPECTRUM DISORDER

**Kyla Kaminsky**[1], **Courtney Green**[1], **Jocelynn Cook**[1,2]
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**Introduction:**
In 2001-2002, the Public Health Agency of Canada facilitated a survey to examine knowledge and attitudes of physicians and midwives across Canada about Fetal Alcohol Spectrum Disorder (FASD) and alcohol use during pregnancy. The results informed educational initiatives for health care professionals. However, other service providers play an equally important role, yet their knowledge, attitudes and beliefs have not been evaluated, nor have their screening and intervention practices been determined.

**Methods:**
A Canada-wide online survey was developed and disseminated to service providers, who interact with women of reproductive age. Questions were developed by an expert committee comprised of representatives from partner associations and informed by a literature review. Data were analyzed using descriptive statistics.

**Results:**
A total of 1,842 responses were collected. Data suggest that while service providers recognize FASD as an identifiable syndrome (88%) and recommend abstaining from alcohol during pregnancy (98%), 39% feel there are more pressing issues to address (e.g., homelessness, food security, mental health). Many service providers were unaware of standardized screening tools for alcohol use during pregnancy (45%) and

unclear whether these tools effectively identified problematic drinking (48%). Sixty-seven percent provided brief intervention when any alcohol use was reported during pregnancy and 43% referred women to harm reduction services. Lack of resources for women was a concern for 85% of the service providers.

**Conclusions:**
These data highlight gaps in knowledge and practice among service providers underscoring the importance of professional education opportunities. In many cases, service providers are a first point of contact for women of reproductive age, who are using alcohol. They have the unique opportunity to provide early intervention and counselling, often before women seek healthcare services. By identifying their needs and gaps in knowledge, novel training programs can be developed and tailored, to improve confidence and competence in supporting these women.

## Poster 110

### KNOWLEDGE AND ATTITUDES OF HEALTHCARE PROVIDERS IN CANADA ABOUT FETAL ALCOHOL SPECTRUM DISORDER: HAS ANYTHING CHANGED IN 15 YEARS?

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**Introduction:**
In 2002, a large Canadian study collected information from healthcare providers to determine their current levels of knowledge and attitudes towards Fetal Alcohol Syndrome (FAS) and alcohol use during pregnancy. The survey findings revealed clear gaps and provided a baseline from which to measure the effectiveness of educational initiatives and training. Fifteen years later, it is now time to re-asses and measure the practices changes that have occurred. The objective of this project was to quantify changes in knowledge and attitudes of health care providers related to FAS and alcohol use during pregnancy.

**Methods:**
An expanded online survey was widely distributed to a broad group of women's healthcare providers to quantify changes in practice, confidence and competence in managing alcohol use during pregnancy. A total of 633 surveys were collected: 29 % of responses were obstetricians/gynaecologists; 31% were midwives; 17% were family physicians and 9% were registered nurses.

**Results:**
More healthcare providers recognize FAS as an identifiable syndrome (94% vs 84%) and recommend no alcohol during pregnancy (92% vs 87%), although similar proportions believe that the effects of alcohol on the fetus remain unclear (25%). Fewer care providers report using a standardized screening tool for alcohol use during pregnancy (42% vs 62%), and fewer (87% vs 94%) believe that prenatal alcohol exposure is a risk factor for permanent brain damage. Lack of treatment and educational resources was a reported concern for over half of the respondents.

**Conclusions:**
The data support a changes in practice, though specific guidance is still needed about screening tools; management and treatment resources. The brain injury associated with prenatal exposure to alcohol was still unclear for many participants. Targeted education and training activities are still needed, as are resources for patients, despite the investments that have been made over the past 15 years.

## Poster 111

### IDENTIFICATION OF POTENTIAL NEW BIOMARKERS DURING PREGNANCY COMPLICATIONS

**Marie-Eve Brien**[1,2], **Ines Boufaied**[2], **Nathalie Bernard**[3], **Jean-Claude Forest**[3,4], **Yves Giguère**[3,4], **Sylvie Girard**[1,2]
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**Introduction:**
Preeclampsia (PE), preterm birth (PTB) and intra-uterine growth restriction (IUGR), affect 5-12% of all pregnancies. Theses pathologies are known to be associated with placental inflammation but, the presence of inflammatory mediators in the maternal circulation, and association with pregnancy complications, is still debated. Our objective was to determine the changes in inflammatory mediators in the 2nd and 3rd trimesters of uncomplicated or pathological pregnancies to identify potential markers associated with complications as well as normal labour.

**Methods:**
We performed a nested case-control study of 200 women selected from 6000 women recruited at the CHU de Quebec. Women with normal (i.e. uncomplicated) term pregnancy (NORM); PE (severe or not); PTB or IUGR (N=50/each) were included. Plasma samples from the 2nd and 3rd trimesters were studied to detect 30 inflammatory mediators, including cytokines, angiogenic factors and alarmins by multiplex, ELISA or specific assays.

**Results:**
In normal pregnancies changes are observed between the 2nd and 3rd trimester, such as decreased PlGF and elevated sFTL-1 and endoglin levels. Furthermore, increased levels of several inflammatory mediators, MCP-1, CXCL10, IL-6 and uric acid were also observed. These changes suggest a pro-inflammatory phenotype closer to term and were also observed in complicated pregnancy. In the 2nd trimester, levels of PlGF and CXCL9 were decreased in women with PE and increased sFLT-1 and endoglin were also detected. No difference was observed in the 2nd trimester in women that ended up delivering prematurely. In IUGR, increased HMGB1 and IL-1α were observed in the 2nd trimester only.

**Conclusions:**
Our work revealed inflammatory changes in the maternal circulation between the second and third trimester which confirmed that delivery itself is an inflammatory event. Changes in inflammatory mediators in the second trimester were mostly observed in preeclampsia. Those modulations in the level of inflammatory mediators could be used to facilitate early diagnosis of pregnancy complications.

## Poster 112

### THE IMPACT OF MATERNAL OBESITY ON GESTATION-SPECIFIC RISK OF STILLBIRTH

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**Introduction:**
Maternal obesity is associated with stillbirth. However, uncertainty persists around the effects of higher obesity classes, and possible confounding and mediating health variables. We sought to determine the independent effect of BMI category on stillbirth, by gestational age groups and in high versus low risk pregnancies.

**Methods:**
This retrospective cohort study used the Better Outcomes Registry and Network (BORN) for singleton Ontario

hospital births between 2012 and 2017. The primary outcome was stillbirth (fetal death >20 weeks, birth weight >500 grams). The primary exposure was pre-pregnancy body mass index(kg/m$^2$). We used multivariable cox proportional hazard regression to determine the relationship between BMI class and stillbirth, accounting for gestational age, and maternal, fetal and obstetrical complications as independent covariates.

**Results:**
547,306 births between 2012 and 2017 were analyzed, of which 2037 (0.37%) were stillbirths. 52% of the population had a normal BMI(18.5-24.9 kg/m$^2$), 5% were underweight(<18.5 kg/m$^2$), 24% were overweight(24.9-29.9 kg/m$^2$), 11% had class I obesity(30-34.9 kg/m$^2$), 4% had class II obesity(35-39.9 kg/m$^2$), and 3% had class III obesity(>40.0 kg/m$^2$). Maternal characteristics differed significantly by BMI class. In univariate analysis, class I obesity was associated with an increased incidence of stillbirth (Hazard ratio[HR] 1.54, 95%CI:1.35-1.76). This association was stronger for class II obesity(HR 1.90, 95%CI:1.60-2.26), but similar for class III obesity(HR 1.56, 95%CI:1.25-1.94). In high risk pregnancies, the unadjusted HR for stillbirth was 1.90 (95%CI:1.46-2.48) for class II and 1.70 (95%CI:1.23-2.33) for class III obesity. In multivariable models, obesity remained an independent predictor of stillbirth (HR 1.49, 95%CI:1.30-1.72 [class I]; HR 1.78, 95%CI:1.48-2.14 [class II]; HR 1.41, 95%CI:1.12-1.79 [class III]).

**Conclusions:**
Obesity is associated with an increased risk of stillbirth independent of other risk factors. There is a clinically important elevation in risk in women whose pre-pregnancy BMI is ≥35 kg/m$^2$ (class II obesity and higher) beyond 36 weeks' gestation.

## Poster 113

### REGULATING THE REGULATOR: HOW ENHANCED REGULATOR OF G-PROTEIN SIGNALING 2 (RGS2) ATTENUATES UTERINE CONTRACTILITY

**Daniela Urrego**, **Stephen Wood**, **Robert Newton**, **Donna Slater** (University of Calgary)

**Introduction:**
The ability to manipulate uterine contractions is important for labour management. Two mediators thought to drive contractions are the prostaglandins (PG) and oxytocin acting at G-protein coupled receptors (GPCRs). However, evidence suggests $PGE_2$ may drive pro-labour or pro-quiescent signaling depending on the receptor subtype activated. $PGE_2$ also upregulates regulator of G-protein signaling 2 (RGS2), which turns off pro-contractile GPCR signals. We hypothesize that RGS2 regulates contractile GPCR signals in the pregnant uterus, which will determine the balance between contraction and quiescence

**Methods:**
Myometrial biopsies from term non-labour caesarean deliveries were used to isolate myometrial smooth muscle (MSM) cells treated with $PGE_2$ and cytokines in vitro. RGS2 expression was assessed by qRT-PCR and western analyses. A Fluo-4 NW calcium assay was used to assess contractile activity in response to oxytocin or histamine in cells highly expressing RGS2. Results were analyzed using a one-way ANOVA (Bonferroni *post-hoc*).

**Results:**
Expression of RGS2 increased in MSM cells treated with $PGE_2$ (1μM) (n=6, $p<0.05$). Pre-treatment with the inflammatory cytokines IL-1 β or TNFα (1ng/ml) repressed the $PGE_2$ effect by 60% ($p<0.001$). Cells with, $PGE_2$-enhanced, or adenoviral overexpression of RGS2 reduced the calcium response to oxytocin (100nM) ($p<0.05$). An array analysis revealed expression of >300 GPCRs in MSM cells, from which the highly expressed histamine receptor 1 was selected to explore additional uterine signaling attenuated by RGS2. Histamine (1μM) generated a calcium response that was attenuated by both $PGE_2$-induced RGS2, and RGS2 adenoviral overexpression (n=6, $p<0.05$).

**Conclusions:**
RGS2 is upregulated by pro-quiescent signals and downregulated by inflammatory mediators. Enhanced RGS2 expression reduces contractile responses to oxytocin and histamine, which we propose is consistent with a pro-quiescent role in pregnancy. Understanding how RGS2 regulates uterine contractility may provide insights for improved clinical management of spontaneous preterm labour.

## Poster 114

### PREDICTION OF PREECLAMPSIA AND ITS RELATED OUTCOMES (THE PEARL STUDY): SFLT-1; PLGF; AND THE SFLT-1/PLGF RATIO

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**Introduction:**
There is a growing interest for the use of the maternal serum biomarkers: PlGF; sFlt-1; and the ratio sFlt-1/PlGF; for the prediction of preeclampsia (PE) and its related adverse outcomes. We aimed to evaluated their predictive value during pregnancy.

**Methods:**
We conducted case-cohort study including 45 nulliparous women at low risk for PE (control) and 30 nulliparous women with diagnosed PE (case). Controls were recruited in the first-trimester of pregnancy and seen 4 more times for control visits. Cases were enrolled at diagnosis of PE, at any gestational age, and were seen twice. Blood test for biomarkers were done at every visit. Graphical assessment, along with ROC curves with their area under the curve were used to estimate the predictive value of each biomarker.

**Results:**
We observed a significant fluctuation of the two biomarkers and the ratio during pregnancy. In early pregnancy, the ratio sFlt-1: PlGF is increased. It then decreases and eventually increases towards the end of pregnancy. In cases with PE, the ratio is higher. We observed that from at the time of diagnosis, the sFlt-1 ratio has a sensitivity of 94%; a specificity of 50%, and an overall accuracy of 72% for the prediction of preeclampsia.

**Conclusions:**
SFlt-1, PlGF, and the sFlt-1/PlGF fluctuate during pregnancy and should be adjusted for gestational age. More importantly, the sFlt-1/PlGF has a high sensitivity for the diagnosis of preeclampsia and should be consider as part of the management of women with suspected preeclampsia, mainly in centers with low-resources setting.

## Poster 115

### CHRONIC MEDICAL CONDITIONS AND RISK FOR PERINATAL MENTAL ILLNESS: A POPULATION-BASED COHORT STUDY

**Hilary Brown**[1,2,3], **Andrew Wilton**[2], **Joel Ray**[1,2,4], **Cindy-Lee Dennis**[1,2,4], **Astrid Guttmann**[1,2], **Simone Vigod**[1,2,3]
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**Introduction:**
One in five women experience mental illness in pregnancy or within the year thereafter. Universal preventive interventions have not lowered perinatal mental illness incidence, perhaps because those at highest risk

were not targeted. Outside pregnancy, chronic medical conditions (CMC) are known to confer increased risk for mental illness. We examined the association between CMC and perinatal mental illness.

**Methods:**
We conducted a population-based cohort study in Ontario, Canada, comparing 77,385 women with CMC to 780,619 women without CMC, all with a singleton livebirth in 2005-2015. Excluded were women with a mental illness or addiction diagnosis within 2 years before pregnancy. Exposure was defined by ≥ 1 emergency department visits or hospitalizations for a CMC in the 2 years before pregnancy. The main outcome was perinatal mental illness, defined by ≥ 1 mental illness or addiction diagnosis, based on a physician visit, emergency department visit, or hospitalization, between conception and 365 days postpartum. Modified Poisson regression generated relative risks (aRR) and 95% CI, adjusted for age, parity, rural residence, income quintile, and remote history of mental illness.

**Results:**
More women with (20.4%) than without (15.6%) a CMC experienced perinatal mental illness—an aRR of 1.20 (95% CI 1.18-1.22). The aRRs were statistically significant for mental illness diagnosed in pregnancy (1.12, 95% CI 1.10-1.15) and within 365 days postpartum (1.25, 95% CI 1.23-1.28). Psychotic disorders (aRR 1.52, 95% CI 1.32-1.75), mood or anxiety disorders (aRR 1.19, 95% CI 1.17-1.21), and substance use disorders (aRR 1.43, 95% CI 1.29-1.60) were more likely in women with than without CMC, but not self-harm (aRR 1.02, 95% CI 0.74-1.41).

**Conclusions:**
Women with a CMC are at higher risk of perinatal mental illness and may require targeted efforts to lower the severity of their condition and/or improve their coping strategies and supports in pregnancy and thereafter.

**Table 1. Risk of perinatal mental illness arising between conception and 1 year postpartum, in relation to a woman having a chronic medical condition in the 24 months prior to conception.**

| Variable | Number (%) with outcome | Unadjusted relative risk (95% CI) | Adjusted relative risk (95% CI)[a] |
|---|---|---|---|
| **Perinatal mental illness** | | | |
| No chronic medical condition | 121,764 (15.6) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 15,764 (20.4) | 1.29 (1.27-1.31) | 1.20 (1.18-1.22) |
| ***By timing of perinatal mental illness diagnosis*** | | | |
| Antenatal mental illness | | | |
| No chronic medical condition | 48,198 (6.2) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 5,766 (7.5) | 1.20 (1.17-1.24) | 1.12 (1.10-1.15) |
| **Postnatal mental illness** | | | |
| No chronic medical condition | 73,566 (9.4) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 9,998 (12.9) | 1.36 (1.34-1.39) | 1.25 (1.23-1.28) |
| ***By type of perinatal mental illness diagnosis*** | | | |
| **Psychotic disorder** | | | |
| No chronic medical condition | 1,334 (0.17) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 226 (0.29) | 1.70 (1.47-1.96) | 1.52 (1.32-1.75) |
| **Mood or anxiety disorder** | | | |
| No chronic medical condition | 116,851 (15.0) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 14,870 (19.2) | 1.27 (1.25-1.29) | 1.19 (1.17-1.21) |
| **Substance use disorder** | | | |
| No chronic medical condition | 2181 (0.28) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 434 (0.56) | 1.95 (1.76-2.17) | 1.43 (1.29-1.60) |
| **Self-harm** | | | |
| No chronic medical condition | 357 (0.05) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 48 (0.06) | 1.32 (0.97-1.81) | 1.02 (0.74-1.41) |
| **Other** | | | |
| No chronic medical condition | 1,041 (0.13) | 1.00 (referent) | 1.00 (referent) |
| Chronic medical condition | 186 (0.24) | 1.78 (1.52-2.08) | 1.59 (1.36-1.87) |

[a] Adjusted for age, parity, rural residence, neighbourhood income quintile, and remote history of mental illness.

## Poster 116

### EFFECTS OF GENERAL VERSUS NEURAXIAL ANAESTHESIA ON NEONATAL OUTCOMES AFTER CAESAREAN SECTION: A SYSTEMATIC REVIEW AND META-ANALYSIS

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**Introduction:**
Caesarean Section (CS) is one of the most common inpatient surgical procedures performed internationally. Either general anaesthesia or neuraxial anaesthesia (spinal, epidural, combined spinal-epidural) is used for surgical pain management; however, the impact of these on neonatal outcomes is unknown. This systematic review examined the anaesthetic safety literature to investigate the effects of anaesthetic methods on neonatal outcomes after CS.

**Methods:**
MEDLINE, EMBASE, CINAHL, and Cochrane EBM were searched for randomized controlled trials using a protocol and search strategy developed *a priori*. The search included articles published in all languages, and was completed in November 2018. Screening and data extraction were done independently and in duplicate. Data were analyzed using random effects meta-analysis.

**Results:**
From the 5,474 studies included in abstract screening, 34 studies met all inclusion criteria and were able to be included in the meta-analysis (n=2,812 CS). Statistical differences for APGAR scores at 1 and 5 minutes were found (Odds Ratio (OR):-0.52(95% CI:-0.87,-0.17) and OR:-0.21(95%CI:-0.36,-0.06), respectively), showing spinal anaesthesia's protective effect over general anaesthesia. In contrast, umbilical arterial pH values showed general anaesthesia's protective effect compared to combined spinal-epidural anaesthesia (OR:0.03 (95%CI:0.02,0.04). There were no statistically significant differences in pooled umbilical arterial pH, epidural APGAR scores at 1 and 5 minutes, epidural umbilical arterial pH or spinal umbilical arterial pH outcomes.

**Conclusions:**
Both anaesthetic methods are safe for neonates and there are few meaningful differences in neonatal outcomes based on type of anaesthesia used. The differences in umbilical arterial pH values could provide anticipatory clinical guidance to manage fetuses at risk of acidosis.

## Poster 117

### PREGNANCY CHARACTERISTICS, MANAGEMENT AND OUTCOMES ACCORDING TO DIFFERENT DEFINITIONS OF PRE-ECLAMPSIA AND OTHER HYPERTENSIVE DISORDERS OF PREGNANCY

**Ugochinyere Vivian Ukah**[1], **Beth Payne**[2], **Laura Magee**[3], **Peter von Dadelszen**[3]
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**Introduction:**
The classification of hypertensive disorders of pregnancies (HDPs) especially pre-eclampsia (PET) vary according to different guidelines; however it is unclear if pregnancy characteristics and outcomes of women admitted with HDPs differ by these definitions. We compared pregnancy characteristics, management and outcomes associated with different definitions of PET and other HDPs.

**Methods:**
Dataset of 1972 women admitted with pre-eclampsia in a tertiary hospital in Canada from 2011 to 2016 was used for this study. Women were grouped into 8 groups: (1) chronic hypertension (CH), (2) gestational hypertension only; PET defined by (3)Hypertension and Hyperuricaemia only (4) Hypertension and accelerated hypertension only (5) Hypertension and proteinuria only (6) Hypertension and proteinuria only (7) PET defined by hypertension, proteinuria, and HELLP syndrome and (8) PET defined by hypertension, proteinuria, and either hyperuricaemia or accelerated hypertension. The demographic characteristics, management and adverse outcomes rates for the different groups of HDPs were described.

**Results:**
Majority of the women (32.3%) fell under group 8. Women in Group 1 were more likely to be older and multiparous but with the lowest rate of multiple pregnancy. Women in Group 2 were admitted at a later gestational age (GA) with the highest rate of smoking and had the least interventions (administration of antihypertensive, MgSO4 and antenatal corticosteroids, and caesarian delivery); consecutively group 7 had the earliest GA at admission, lowest smoking rate and most administrations with the highest rates of adverse maternal and perinatal outcomes. Group 7 also had the highest rate of multiple pregnancy.

**Conclusions:**
The different definitions of HDPs were associated with differences with demographics, management and outcomes. Women in group 2 appeared to have the least adverse maternal and perinatal outcomes while women in group 7 (PET with both proteinuria and HELLP syndrome) had worse outcomes. These differences in outcomes by definitions may aid in directing HDPs management.

**Table 1**: Baseline maternal and pregnancy characteristics on women with HDP admission to hospital at BCW hospital, (N (%) women and median [interquartile range] unless otherwise stated)

| | Group 1 (N=90) | Group 2 (N=307) | Group 3 ( N=255) | Group 4 ( N=10) | Group 5 (N=330) | Group 6 (N=271) | Group 7 (N=72) | Group 8 (N=637) |
|---|---|---|---|---|---|---|---|---|
| **BASELINE DEMOGRAPHICS & CURRENT PREGNANCY** | | | | | | | | |
| Maternal age at EDD (yr) | 37 [33, 39] | 34 [31, 38] | 35 [31, 38] | 36 [32, 36] | 34 [30, 37] | 35 [31, 38] | 35 [31, 38] | 34 [30, 38] |
| Gestational age on admission (wk) | 38.1 [37.4, 38.9] | 38.7 [37.7, 39.9] | 38.4 [37.4, 39.4] | 36.6 [34.9, 37.9] | 38.1 [36.6, 39.1] | 38.3 [37.3, 39.3] | 36.0 [32.1, 37.7] | 37.0 [34.4, 38.7] |
| Multiparous | 49 (54.4%) | 120 (39.1%) | 84 (32.9%) | 3 (30.0%) | 110 (33.3%) | 90 (33.2%) | 20 (27.8%) | 188 (26.8%) |
| Multiple pregnancy | 2 (2.2%) | 18 (5.9%) | 20 (7.8%) | 0 | 17 (5.2%) | 17 (6.3%) | 13 (18.1%) | 88 (17.9%) |
| Smoking | 4 (6.3%) | 21 (6.8%) | 9 (3.5%) | 0 | 21 (6.6%) | 9 (3.3%) | 1 (1.4%) | 41 (1.8%) |
| **MANAGEMENT** | | | | | | | | |
| Corticosteroids | 9 (4.4%) | 19 (6.2%) | 29 (11.4%) | 4 (40.0%) | 64 (19.4%) | 34 (12.6%) | 29 (40.3%) | 193 (30.3%) |

| | Group 1 (N=90) | Group 2 (N=307) | Group 3 ( N=255) | Group 4 ( N=10) | Group 5 (N=330) | Group 6 (N=271) | Group 7 (N=72) | Group 8 (N=637) |
|---|---|---|---|---|---|---|---|---|
| MgSO4 administration | 5 (5.6%) | 13 (4.2%) | 33 (12.9%) | 1 (10.0%) | 64 (19.4%) | 37 (13.7%) | 68 (94.4%) | 224 (35.2%) |
| Antihypertensive therapy | 66 (73.3%) | 109 (35.5%) | 129 (50.6%) | 10 (100%) | 208 (63.0%) | 143 (52.8%) | 62 (86.1%) | 483 (75.8%) |
| Induced labour | 43 (47.8%) | 198 (64.5%) | 150 (58.8%) | 8 (80.0%) | 208 (63.0%) | 160 (59.0%) | 27 (37.5%) | 353 (55.4%) |
| **DELIVERY** | | | | | | | | |
| GA at delivery (wk) | 38.3 [37.6, 38.9] | 38.7 [37.9, 40.0] | 38.4 [37.4, 39.4] | 37.7 [36.1, 38.4] | 38.3 [36.7, 39.3] | 38.4 [37.3, 39.4] | 36.0 [36.7, 37.9] | 37.1 [35.0, 38.7] |
| Admission-delivery interval (d) | 1 [0, 1] | 1 [0, 1] | 1 [0, 1] | 1 [1, 8] | 1 [0, 2] | 1 [0, 1] | 1 [0, 2] | 1 [0, 2] |
| Caesarean delivery | 48 (53.3%) | 126 (41.0%) | 141 (55.3%) | 5 (50.0%) | 164 (49.7%) | 153 (56.5%) | 61 (84.7%) | 388 (60.9%) |
| **OUTCOMES** | | | | | | | | |
| Serious maternal complication within 48hrs of admission | 3 (3.3%) | 5 (1.6%) | 12 (4.7%) | 0 | 9 (2.7%) | 12 (4.4%) | 26 (36.1%) | 40 (6.3%) |

| | Group 1 (N=90) | Group 2 (N=307) | Group 3 ( N=255) | Group 4 ( N=10) | Group 5 (N=330) | Group 6 (N=271) | Group 7 (N=72) | Group 8 (N=637) |
|---|---|---|---|---|---|---|---|---|
| Serious maternal complication at anytime | 4 (4.4%) | 5 (1.6%) | 14 (5.5%) | 1 (10.0%) | 21 (6.4%) | 15 (5.5%) | 29 (40.3%) | 57 (9.0%) |
| **PERINATAL OUTCOMES** | | | | | | | | |
| Stillbirth | 3 (3.3%) | 3 (1.0%) | 1 (0.4%) | 1 (10.0%) | 3 (0.9%) | 2 (0.7%) | 0 | 2 (0.3%) |
| Neonatal death | 0 | 3 (1.0%) | 3 (1.2%) | 3 (30.0%) | 1 (0.3%) | 3 (1.1%) | 1 (1.4%) | 5 (0.8%) |
| SGA (<10$^{th}$ centile) | 14 (15.6%) | 39 (12.7%) | 45 (17.7%) | 2 (20.0%) | 77 (23.3%) | 49 (18.1%) | 28 (38.9%) | 204 (32.0%) |

## Poster 118

### EPIDEMIOLOGIC CHARACTERIZATION OF SEVERE MATERNAL MORBIDITY AND MORTALITY ASSOCIATED WITH SOLID ORGAN TRANSPLANT IN PREGNANCY

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**Introduction:**
To determine the incidence, and severe maternal morbidity associated with solid organ transplant in pregnancy.

**Methods:**
We carried out a retrospective cohort study of all live birth at 20 weeks and beyond between 2003 and 2012. We used data from the Discharge Abstract Database contains information on all separations from hospitals in Canada (except Quebec). Maternal characteristics and severe maternal morbidity (SMM) associated with solid organ transplant (SOT) in pregnancy were quantified. Logistic regression was used to obtain adjusted odds ratios (AOR) for maternal morbidity defined by hospital diagnoses (ICD-10 codes); adjusted for maternal age, plurality, parity, and use of assisted reproduction.

**Results:**
Among the 3,587,840 women who delivered between 2003 and 2012, there were no maternal death reported in SOT pregnancies group. The rate of SMM among SOT mothers was 125.0 (95% CI 88.0-172.3) per 1000 deliveries versus 9.42 (95% CI 9.32-9.52) per 1000 in non-Solid organ transplant group. The median length of hospital stay for women with and without a SOT was 8 days for solid organ transplant pregnancies versus 3 days for non transplant pregnancies, while the frequency of prolonged hospital stay (≥ 7 days) was 22.3% versus 1.78%, respectively with a rate ratio of 12.5 (95% CI 9.84-16.0). SOT pregnancies were more associated with high rates of severe maternal morbidity AOR 14.6 (95% CI 10.1-21.3) in compare with non solid organ transplant pregnancies , such as severe preeclampsia or HELLP syndrome, Eclampsia, Acute renal failure, Dialysis, Acute fatty liver with red cell or plasma transfusion, Cardiac conditions and Blood transfusion.

**Conclusions:**
Severe maternal morbidity and length of hospitalization patterns suggest that pregnancies with SOT have significant challenges related to maternal health. Study results will be useful for formulating standard of care guidelines for pregnant women with solid organ transplants to help in managing and counseling such high-risk population.

Table 1. Logistic regression analysis showing unadjusted and adjusted odds ratios expressing the association between women with a solid organ transplant and specific maternal morbidity, Canada (excluding Quebec) 2003-2012.

| Morbidity (SMM) | Crude odds ratio (95%CI) | Adjusted odds ratio* (95%CI) |
|---|---|---|
| Severe preeclampsia or HELLP syndrome | 8.36 (3.13 - 22.3) | 5.85 (1.86 -18.4) |
| Eclampsia | 21.4 (7.97 - 57.3) | 16.3 (5.23 - 50.9) |
| Puerperal sepsis | 3.91 (0.55 - 27.9) | 4.34 (0.61 - 31.0) |
| Acute renal failure | 275.0 (175.7 - 430.2) | 231.3 (140.2 - 381.8) |
| Dialysis | 375.9 (138.2 - 999.9) | 352.3 (127.5 - 973.2) |
| Cardiac conditions | 23.0 (8.55 - 61.6) | 21.6 (8.0 - 58.5) |
| Acute fatty liver with red cell or plasma transfusion | 48.0 (6.72 -342.3) | 38.5 (5.32 - 277.8) |
| Hepatic failure | 115.8 (16.1 - 832.6) | 154.3 (21.3 - 999.9) |
| Assisted ventilation through endotracheal tube | 6.62 (0.93 - 47.2) | 6.48 (0.91 - 46.2) |
| Complications of obstetric surgery and procedures | 4.05 (0.57 - 28.8) | 4.57 (0.64 - 32.6) |
| Evacuation of incisional hematoma with RBC transfusion | 68.5 (9.58 - 489.3) | Undefined |
| Postpartum hemorrhage | 2.16 (1.52 - 3.06) | 2.17 (1.47 - 3.21) |
| Blood Transfusion | 9.58 (6.02 - 15.3) | 8.68 (5.20 - 14.5) |
| Any severe maternal morbidity/mortality | 15.1 (10.7 - 21.3) | 14.6 (10.1 - 21.3) |

*The adjusted model included maternal age, parity, plurality, and use of assisted reproduction.

## Poster 119

### CHARACTERISTICS OF WOMEN WITH HYPERTENSIVE DISORDERS OF PREGNANCY AND FUTURE CARDIOVASCULAR DISEASES

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**Introduction:**
Hypertensive disorders of pregnancies (HDP) complicate 5-10% of pregnancies and are associated with severe maternal and perinatal outcomes. HDPs increase the risk of developing future cardiovascular diseases (CVD). Certain factors may contribute to the increased risks of CVD in women with HDP. Therefore, we sought to describe the characteristics of women with a history of HDP according to their future CVD status.

**Methods:**
MED-ECHO dataset, consisting of all women who delivered in hospitals in the Quebec province of Canada between 1989 and 2016, was used. The analyses were restricted to women who had a history of HDP in any pregnancy and no pre-existing CVD. HDPs were defined as chronic hypertension, gestational hypertension, pre-eclampsia/eclampsia, and superimposed pre-eclampsia, using International Classification of Diseases (ICD) codes. Outcomes were CVD outcomes also identified using ICD codes which included heart diseases e.g. heart failure, cerebrovascular diseases e.g. stroke pulmonary heart diseases, procedures involving the heart and blood vessels, and coronary care unit admission,. The demographics and characteristics of women with and without CVD were presented.

**Results:**
Of 2,197,124 pregnancies admitted for hospital delivery, HDP occurred in n=60,850 (5.2%), with the majority (69.7%) occurring in first births. Among women with HDP, the rate of CVD was 9.8% (Table 1). Women who developed CVDs were more likely to be older, have had substance abuse during pregnancy, pre-existing diabetes, and socio-economic disadvantage compared with women without CVD. Women with CVD were also more likely to have a history of gestational diabetes and adverse perinatal outcomes such as preterm delivery and stillbirth.

**Conclusions:**
Future studies should investigate whether these identified factors, e.g. substance abuse, diabetes, socio-economic disadvantage, preterm delivery and stillbirth, can be used to predict the risk of future CVD in women with a history of HDP.

**Table 1.** Characteristics of study population, N = **60,850** , 95% CIs

| **Variables** (N, %) | **CVDs** **N**= 5,936 (9.8%) | **No CVDs** **N**=54,914 (90.2%) |
|---|---|---|
| *DEMOGRAPHICS* | | |
| Maternal age at admission (years) | | |
| <21 | 464 (7.82%) [95% CIs (7.2-8.5)] | 4727 (8.6%) [95% CIs (8.4-8.9)] |
| 21-39 | 5252 (17.81%) [95% CIs (87.6-89.3)] | 48819 (88.9%) [95% CIs (88.6-0.89.2)] |
| ≥40 | 220 (3.71%) [95% CIs (3.3-4.2)] | 1368 (2.5%) [95% CIs (2.4-2.6)] |
| Multiple pregnancy (Yes) | 148 (2.5%) [95% CIs (2.2- 2.9)] | 2095 (3.8%) [95% CIs (3.7-4.0)] |
| Socio-economic disadvantage*( Yes) | 1284 (21.6%) [95% CIs (20.6-0.23)] | 10874 (19.8%) [95% CIs (19.5-20.2)] |
| Substance use (Any tobacco, alcohol or substance use) (Yes) | 105 (1.77%) [95% CIs (1.5-2.1)] | 718 (1.3%) [95% CIs (1.2-1.4)] |
| Pre-existing diabetes (Yes) | 352 (5.9%) [95% CIs (5.36-6.6)] | 1143 (2.1%) [95% CIs (2.0.-2.2)] |
| *OBSTETRIC HISTORY* | | |
| Preterm delivery (<37 weeks) | 1465 (24.7%) [95% CIs (23.6-25.8)] | 10490 (19.1%) [95% CIs (2.2- 2.9)] |
| Stillbirth (Yes) | 52 (0.9%) | 310 (0.6%) |

| | | |
|---|---|---|
| | [95% CIs (0.7-1.2)] | [95% CIs (18.8-0.19.4)] |
| Infant death (Yes) | 34 (0.6%) [95% CIs (0.4-0.8)] | 173 (0.3%) [95% CIs (0.3-0.4)] |
| Low birth weight (<2.5kg) | 1076 (18.1%) [95% CIs (17.2-19.1)] | 9536 (17.4%) [95% CIs (17.1-17.7)] |
| GDM (Yes) | 556 (9.4%) [95% CIs (8.7-10.1)] | 4201 (7.7%) [95% CIs (7.4-7.9)] |
| PCOS (Yes) | 12 (0.2%) [95% CIs (0.1-0.4)] | 139 (0.3%) [95% CIs (0.2-0.3)] |
| Placental abruption (Yes) | 166 (2.8%) [95% CIs (2.4-3.3)] | 1472 (2.7%) [95% CIs (2.6-2.8)] |
| Acute Renal Failure (Yes) | 29 (0.5%) [95% CIs (0.3-0.7)] | 282 (0.5%) [95% CIs (0.5-0.6)] |
| Shock (Yes) | 12 (0.2%) [95% CIs (0.1-0.4)] | 96 (0.2%) [95% CIs (0.1-0.2)] |

**Poorest fifth of the neighbourhoods for census data on employment rate, mean personal income and proportion with no high school diploma.*

## Poster 120

### DEREGULATION OF MIR-193B-5P IN PLACENTA FROM PREGNANCIES COMPLICATED BY PREECLAMPSIA AND INTRAUTERINE GROWTH RESTRICTION

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**Introduction:**
Preeclampsia (PE) and intrauterine growth restriction (IUGR) are pregnancy complications resulting from abnormal placental development. MicroRNAs (miRNAs) regulate placental development and contribute to disease, by influencing gene expression. Our previous miRNA sequencing expression data revealed up-regulation of miR-193b-5p in placentae from patients with early-onset PE only, IUGR only, and PE+IUGR. The purpose of this study was to investigate the impact of miR-193b-5p up-regulation by (i) integrating miRNA and gene expression data to identify candidate gene targets (ii) utilizing cell culture systems for validation of gene targets and measuring miRNA impact on cellular functions.

**Methods:**
MiRNA and RNA sequencing expression data (control [N=21], PE [N=20], IUGR [N=18], and PE + IUGR [N=20]) were integrated to identify candidate gene targets. Real-time PCR was used to validate expression of miRNAs and gene targets. Validation of miRNA-mRNA interactions was conducted using luciferase assays in the HTR-8/SVneo cell line. HTR-8/SVneo cell line was also used to measure gene target expression and cell functions following transfection with miR-193b-5p.

**Results:**
Integration of the miRNA and RNA sequencing expression data revealed 10 candidate gene targets for miR-193b-5p in all patient groups with significant inverse correlations (Adj. p-value < 0.01, r < - 0.6). Luciferase experiments identified two gene targets for miR-193b-5p, *FGF13* and *APLN*. Real-time PCR confirmed the down-regulation of *FGF13* in all patient groups, and down-regulation of *APLN* in patients with PE + IUGR. Expression levels of *FGF13* and *APLN* were reduced in HTR-8/SVneo cells following up-regulation of miR-193b-5p, in addition to 40% reduction in HTR-8/SVneo cell migration.

**Conclusions:**
Global expression data combined with *in vitro* cell culture experiments support potential regulation of *APLN* and *FGF13* by miR-193b-5p. Integration of global epigenetic and gene expression data is a useful tool to identify molecular mechanisms impacting placental development and disease.

## Poster 121

### PERINATAL IMMUNE CHANGES TO IDENTIFY WOMEN AT HIGH-RISK OF POSTPARTUM PREECLAMPSIA

**Jacqueline Piché**[1,2], **Marie-Eve Brien**[1,2], **Ines Boufaied**[2], **Evelyne Rey**[1,2], **Sylvie Girard**[1,2]
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**Introduction:**
Postpartum preeclampsia (PPPE) is a debilitating maternal condition characterized by *de novo* hypertension in the postpartum period (48h to 6 weeks after delivery) with proteinuria or another maternal organ affected, following a seemingly uncomplicated pregnancy. PPPE leads to increased morbidity and it is currently not possible to identify women at risk, although important to allow preventive intervention. We previously showed elevated immune cells in the placenta of these women suggesting a prenatal initiation of PPPE. Our objective was to determine if perinatal immune changes are detected in routine blood tests and if they could provide a valuable tool for the identification of at-risk women.

**Methods:**
We retrospectively reviewed the medical chart of 500 women who delivered at the CHU St-Justine, including 200 uncomplicated pregnancies (Control), 200 prepartum preeclampsia (PE) and 100 with PPPE. Detailed demographic and obstetrical data, including perinatal (i.e. prior to and following delivery) immune composition, were retrieved. Statistical analysis was performed using one-way ANOVA, as well as paired or unpaired t tests, as appropriate.

**Results:**
Women with PPPE were older, mainly of black ethnicity, had higher BMI and history of hypertension/PE compared to Controls or PE. Immune changes were detected in women with PPPE both prior to and after delivery. Significant increases in total leukocytes and neutrophils were observed after delivery compared to prenatal levels ($p<0.001$), as well as decreases in lymphocytes, monocytes and platelets ($p<0.001$). Compared with Controls, women with PPPE presented decreased prenatal levels of total leukocytes ($p<0.01$) and neutrophils ($p<0.05$), as well as increased prenatal levels of monocytes ($p<0.01$).

**Conclusions:**
Perinatal immune changes were observed in women that later presented with PPPE vs Controls, suggesting that these could be used to identify high-risk women. Immune changes, combined with demographic characteristics could help clinicians identify women that need increased surveillance to avoid complications.

## Poster 122

### ADVERSE PREGNANCY OUTCOMES AMONG WOMEN WITH LOW PLGF AND PAPP-A AT THE FIRST TRIMESTER SCREENING

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**Introduction:**
To compare the risks of adverse pregnancy outcomes between women who have low levels of Placental Growth Factor (PlGF) and/or Pregnancy-Associated Plasma Protein A (PAPP-A) at the First Trimester Screening (FTS) and women with normal levels.

**Methods:**
This was a retrospective cohort study of all women with singleton pregnancy, who undertook FTS and delivered at a single referral center between January 2017 and June 2018. Data was achieved by a linkage between BORN Ontario database and the local Multiple Marker Screening Laboratory. The primary outcome was a composite of hypertensive disorders of pregnancy, intrauterine growth restriction (< 10$^{th}$ percentile) and preterm birth (<37 weeks gestation). Low levels of analytes were defined as < 2SD of our cohort (PAPP-A < 0.49MoM and PlGF < 0.42MoM). Levels of analytes were compared between women with and without the primary outcome. Logistic regression analysis was performed to identify the contribution of low analytes for the primary outcome.

**Results:**
A total of 3130 women were included in the analysis. Median maternal age was 33.2 years and median gestational age at the FTS was 12+4/7 weeks. Median MoM values of PlGF and PAPP-A were significantly lower in women with the primary outcome compared to women without (0.88 vs 1.01, p=0.0009 and 0.9 vs 1.03, p=0.0001, respectively). The relative risk to develop the primary outcome was increased with low PAPP-A and low PlGF (table). A logistic regression model including maternal age, smoking, primigravity, pre-pregnancy BMI, pre-existing hypertension, found PAPP-A and PlGF levels to be negatively corrolate with developing the primary outcome [OR, CI95% , 0.81 (0.66-0.98) and 0.73 (0.58-0.93), respectively].

**Conclusions:**
Our study validated previous reported associations between PAPP-A and PlGF and a risk of developing adverse pregnancy outcomes. Further studies are needed to assess the feasibility and accuracy of a first-line, all- biochemical screening test for these adverse outcomes

Table: The association between levels of PAPP-A and PlGF and the primary outcome.

| Analyte | Normal levels with primary outcome (%) | Low levels with primary outcome (%) | P | RR (95% CI) |
|---|---|---|---|---|
| PAPP-A | 10.2 | 15.3 | 0.0042 | 1.6 (1.12-2.22) |
| PlGF | 10 | 16.7 | 0.0003 | 1.8 (1.3-2.48) |
| PAPP-A or PlGF | 9.6 | 15.3 | <0.0001 | 1.7 (1.31-2.2) |

## Poster 123

### PARP MEDIATED NAD+ DEPLETION AND PLACENTAL DYSFUNCTION IN PREECLAMPSIA

**Fahmida Jahan**, **Philip Marshall**, **Shannon Bainbridge**, **Keir Menzies** (University of Ottawa)

**Introduction:**
Background: Preeclampsia (PE) is a life-threatening hypertensive disorder of pregnancy with no cure. We identified 3 distinct subtypes of PE, one of which demonstrates placental inflammation (PE-subtype#3). In several proinflammatory diseases, $NAD^+$ depletion secondary to hyperactivity of Poly-ADP ribose polymerases (PARPs), is found to be the central cause of compromised energy metabolism, mitochondrial dysfunction and organ failure. We aim to apply this $NAD^+$-centric disease framework to pro-inflammatory PE. Hypothesis: Placental dysfunction observed in pro-inflammatory PE is due to placental $NAD^+$ depletion and subsequent mitochondrial dysfunction.

**Methods:**
Gene expression was profiled using genome-wide microarrays on 157 placenta biopsies. Placental $NAD^+$ levels were measured in PE-subtype#3 patients compared to controls using $NAD^+$/NADH quantification kit. The therapeutic potential of boosting $NAD^+$ was evaluated using human placenta cell line (HTR-8svNeo). TNF-□ treatment was used to mimic PE-subtype#3 and Nicotinamide riboside (NR) was used to boost $NAD^+$. PARP activity was determined by western blot. Cellular bioenergetics was analyzed by XFe96-seahorse assay and invasion capacity was assessed by Matrigel-Invasion assay. To examine $NAD^+$ signaling in-vivo, pregnant Sprague-Dawley rats received TNF-□ infusion to induce pro-inflammatory PE and placental $NAD^+$ levels and PARP activity were quantified.

**Results:**
We observed increased *PARP* expression and reduced $NAD^+$ content in placentas from pro-inflammatory PE patients. Similarly, placentas from rodent model of pro-inflammatory PE showed PARP hyperactivity and decreased $NAD^+$ levels. Elevated PARP activity in TNF-α treated HTR8 cells was attenuated by NR co-treatment. In XFe96-seahorse assay, NR prevented TNF-α induced mitochondrial dysfunction, which was substantiated by increased expression of oxidάative phosphorylation proteins. Further, NR improved invasive function of TNF-α treated cells.

**Conclusions:**
This study is an important first step in identifying subtype-specific therapeutic strategies for PE- finding $NAD^+$ signalling pathway as an intriguing therapeutic target in pro-inflammatory PE. We are currently exploring the therapeutic potential of $NAD^+$-boosting in PE rodent model.

## Poster 124

### MATERNAL ASIAN ETHNICITY AND THE RISK OF ANAL SPHINCTER INJURY: A RETROSPECTIVE COHORT STUDY

**Mohammad Albar**[1], **Amir Aviram**[1], **Saja Anabosy**[1,2], **Modupe Tunde-Byass**[1,2], **Tianhua Huang**[1,2], **Elad Mei-Dan**[1,2]
[1]University of Toronto, [2]North York General Hospital

**Introduction:**
Third and fourth degree perineal lacerations are associated with increased risk of long term morbidity including fecal incontinence, dyspareunia, and chronic pain. The aim of this study was to determine the risk factors of severe perineal lacerations, including race as an independent risk factor.

**Methods:**
We performed a retrospective cohort study of all women with singleton gestation who had a vaginal delivery

at term, between January 2014 and October 2017, with a reported ethnicity. First, women with OASI (Obstetric Anal Sphincter Injury, third/fourth degree perineal lacerations) were compared with the rest of the cohort (control). Subsequently, women of Asian ethnicity with OASI were compared to women of non-Asian ethnicity with OASI. Logistic regression was performed to adjust for potential confounders.

**Results:**
During the study period, 21,369 women delivered at our centre. After exclusion of 6,327 who had caesarian section, 3,957 for unreported race and 74 women with multiple gestation, 11,012 women were eligible for analysis. In total, 336 (3.1%) had OASI, 313 (93.1%) had third degree tear, and 23 (6.9%) had forth degree tear. Women with OASI were characterized by higher rate of maternal age < 35 years, Asian ethnicity, nulliparity, birth weight ≥3500 grams, episotomy, 2nd stage≥60 minutes, assisted vaginal delivery. After adjusting for potential confounders, Asian ethnicity remained independently and significantly associated with OASI (adjusted OR 2.07, 95% CI 1.6-2.7) (Table). Comparing Asian to non-Asian women with OASI (256/76.2% vs. 80/23.8%), Asian women with OASI were more likely to have a midline episiotomy (18.4% vs. 3.8%, p=0.001) and less likely to deliver a neonate with birth weight ≥3500 grams (33.1% vs. 54.7%, p=0.001).

**Conclusions:**
Our study suggests that Asian race is an independent risk factor for OASI. This information, along with the other reported risk factors may be useful in pre-delivery counseling and intra-partum care.

**Table : Logistic Regression Model For Third and Fourth Degree Vaginal Tears**

| Variable | Adjusted odds ratio | 95% CI |
|---|---|---|
| Forceps delivery | 5.99 | 4.2-8.5 |
| Vacuum delivery | 4.48 | 3.3-6.1 |
| Asian ethnicity (vs. non-Asian ethnicity) | 2.07 | 1.6-2.7 |
| Midline episitomy | 1.78 | 1.3-2.5 |
| Mediolateral episitomy | 0.64 | 0.5-0.9 |
| Birth weight≥3500 grams | 1.72 | 1.4-2.2 |
| Previous vaginal delivery | 0.34 | 0.2-0.5 |

Factors in the model: ethnicity (Asian vs non-asian), forceps delivery, vacuum extraction, mediolateral and midline episitomies, second stage duration, birth weight, previous vaginal delivery and oxytocin augmentation.

## Poster 125

### ASSESSMENT OF PARTICIPATION AND PERCEIVED BENEFITS AND BARRIERS TO PHYSICAL ACTIVITY IN LOW-RISK PREGNANCIES

**Kristen McFadyen**[1], **Noor Ladhani**[1,2]
[1]University of Toronto, [2]Sunnybrook Health Sciences Centre

**Introduction:**
Physical activity (PA) is an important part of a healthy pregnancy with demonstrated maternal, fetal, and neonatal benefits. Regular participation throughout pregnancy is low, yet limited research has explored

contributing positive and negative factors. The objective of the present study is to investigate PA behaviours and to assess the perceived benefits and barriers to participation among women with low-risk pregnancies.

**Methods:**
Participants were recruited from low-risk, general obstetrics practices at Sunnybrook Health Sciences Centre; 100 women between 34-40 weeks gestational age completed the study. Participants were consented to complete a questionnaire comprised of three sections: (i) demographic information (ii) PA participation, and (iii) benefits and barriers to PA in their current pregnancy. Chi-square tests were used to analyze the data.

**Results:**
The mean gestational age was 36.29 weeks (SD 1.50), and the mean pre-pregnancy BMI was 23.69 kg/m$^2$ (SD 4.45). Approximately 66% met the criteria for regular PA (≥15 min, ≥3 sessions per week), and 40% of participants reported meeting the PA guidelines (≥30 min, ≥4 sessions per week). Among women who reported being physically active, walking was the most common activity (90%), followed by home exercises (43%). The barriers with the largest negative impact on PA were: fatigue, time, and back pain. Conversely, the barriers with the least negative impact were: cost and unaware of the PA recommendations. The factors with the greatest positive impact on PA were: mood, part of pre-pregnancy routine, and fetal benefits; the benefits with the lowest impact were: decreased risk of gestational diabetes and decreased back pain.

**Conclusions:**
Canadian guidelines recommend PA throughout pregnancy for all women without contraindications. Antenatal discussions on PA should include targeted counselling towards individually identified barriers and provide education on the benefits to maternal, fetal, and neonatal health.

## Poster 126

### VACCINATING PREGNANT WOMEN: ARE HEALTHCARE PROVIDERS HESITANT?

**Courtney Green**[1], **Kyla Kaminsky**[1], **Jocelynn Cook**[1,2]
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**Introduction:**
Maternal vaccination coverage rates are less than optimal, despite the significant positive impact on outcomes for mothers and their babies. Women's healthcare providers comprise the first point of contact for women seeking antenatal care and strongly influence a women's decision to receive vaccinations. With over 390,000 births in Canada a year, a small increase in vaccination rates could have a significant impact. The main objective was to determine current knowledge, beliefs, attitudes and practices of women's healthcare providers related to vaccination in pregnancy.

**Methods:**
An online survey was developed by an expert committee and informed by a literature review. Participants were recruited via partner membership lists. All data sets were anonymous and excluded personal identifiers.

**Results:**
A total of 1,173 responses were collected and analyzed using descriptive statistics. Fifty-nine percent of respondents reported administering vaccines in their practice – most commonly the influenza vaccine (84%). The top reasons for not administering vaccines were: "outside scope of practice" (40%); "no reliable access" (31%); "low volume of patients" (25%); and "lack of staff" (24%). For those that did not administer vaccines, 34% referred them elsewhere. Sixty percent of respondents reported that they administered vaccines

to pregnant women; 67% recommended the influenza vaccine, while 23% recommended the pertussis vaccine. Only 27% of respondents reported receiving information on pertussis vaccination during pregnancy in the past 12 months.

**Conclusions:**
These data indicate that most women's healthcare providers are supportive of vaccination during pregnancy; however, they lack information about its importance and safety. Specific training around pertussis vaccination is needed. Changes in immunization practices can reduce the number of cases of maternal and fetal morbidity and mortality related to vaccine-preventable illnesses leading to potential cost savings to our healthcare system.

## Poster 127

### DO WEIGHT FLUCTUATIONS BEFORE PREGNANCY INFLUENCE GESTATIONAL WEIGHT GAIN AND ADHERENCE TO NUTRITION AND EXERCISE RECOMMENDATIONS DURING PREGNANCY?

**Taniya Nagpal**[1], **Harry Prapavessis**[1], **Christina Campbell**[2], **Barbra de Vrijer**[1,3], **Michelle Mottola**[1,3]
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**Introduction:**
Pre-pregnancy obesity and excessive gestational weight gain (EGWG) increases the risk for pregnancy complications. Women may be recommended to lose weight before pregnancy to improve outcomes, however the impact of this on gestational weight gain has not been assessed. The purpose of this study was to compare pre-pregnancy weight fluctuations and adherence to nutrition and exercise recommendations during pregnancy between women with appropriate or EGWG.

**Methods:**
Women with a pre-pregnancy body mass index ≥25.0kg/m$^2$ who were participating in the Nutrition and Exercise Lifestyle Intervention Program (NELIP) were included. Data were stratified as gained appropriately or excessively using the Institute of Medicine guidelines. Participants completed a weight and health history questionnaire (WHQ) providing information about weight fluctuations and weight loss methods used prior to the index pregnancy. Adherence was measured by scoring participants on meeting the six nutrition and exercise goals for the NELIP. Data were compared using a One-Way ANOVA (weight related changes and adherence) and Chi Square (weight loss attempts) analysis.

**Results:**
One hundred WHQs were compared (n=43 gained excessively; n=57 gained appropriately). More women who gained excessively were attempting to lose weight prior to pregnancy (n=27, 63%) than women who gained appropriately (n=23, 40%, $p<0.05$). Women who gained excessively during pregnancy lost significantly more weight (7.1kg ± 10.6) than women who gained appropriately (2.2kg ± 3.7, $p<0.05$). Women who gained excessively had tried to lose weight more often (4.0 ± 2.3 attempts) than women who gained appropriately (2.7 ± 1.9 attempts, $p<0.05$). Program adherence was lower among women who gained excessively (3.3/6, 55%) than appropriately (4.5/6, 75%, $p<0.05$).

**Conclusions:**
Weight loss before pregnancy may decrease adherence to nutrition and exercise recommendations during pregnancy and increase the risk for EGWG. Future studies should determine effective strategies to improve program adherence, especially for women who have experienced recent weight loss.

## Poster 128

### PROFILING EXPRESSION AND FUNCTIONAL ACTIVITY OF THE PROSTAGLANDIN E2 PATHWAY IN PREGNANCY AND LABOUR: LESSON FROM THE RAT UTERUS

**Anthony Liwa**, **Daniela Urrego**, **William Cole**, **Donna Slater** (University of Calgary)

**Introduction:**
Uterine dysfunction is the hallmark for spontaneous preterm labour leading to preterm birth, uterine dystocia or hyperstimulation, and fetal distress. Prostaglandin $E_2$($PGE_2$), important for the process of parturition, may elicit effects by changes in synthesis, metabolism or expression of receptors. We tested the hypothesis that spatio-temporal regulation of COX or PGES enzymes and EP receptors is critical for maintaining the balance between uterine quiescence during pregnancy and contractility in labour.

**Methods:**
Paired upper and lower segment rat uterine biopsies were collected at gestation day (15, 18, 21 and 22, n=6 per group) for, expression analyses of cyclooxygenase (COX) and prostaglandin E synthase (PGES) enzymes and $PGE_2$receptors (EP1-4) by qRT-PCR and western immunoblot, and functional analyses of the EP receptors in tissue bath contractility experiments.

**Results:**
We identified gene and protein expression of COX-1, COX-2, PGES1, PGES2, PGES3 and all four EP receptors. Gene expression of EP3 was significantly higher in gestation day 15 compared to all other groups ($P$=0.0021). Expression of COX1 gene was significantly higher in the laboring tissues compared to other groups ($P$<0.0001). Significant regional variation was seen on day 21 for EP3 ($P$=0.0015), COX1 ($P$=0.007) and PGES2 ($P$=0.037) where lower segment expressed more. Protein expression remained unchanged in all groups. The action of $PGE_2$was excitatory for all tissues. Absolute magnitude of contraction was achieved in the upper segment in late gestation and labour.

**Conclusions:**
By combining functional activity and expression experiments we demonstrate regional and temporal differences that attribute to variations in the $PGE_2$pathway. These results constitute further evidence for a role of $PGE_2$pathway regulation of myometrial function and support the concept that in part there may be biological basis for differential expression and function activity of $PGE_2$in the uterus.

## Poster 129

### EVALUATION OF A CLINICAL PROTOCOL FOR THE MANAGEMENT OF FEVER IN LABOR IN PREGNANT WOMEN AT TERM: A PRE-POST COHORT STUDY

**Elisabeth Spénard**[1], **Laurent Tordjman**[1,2], **Anne-Elisabeth Marrié-Mas**[1,2], **Annie-Claude Labbé**[1,2], **Brahim Bensouda**[1,2], **Isabelle Boucoiran**[1,3]
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**Introduction:**
Chorioamnionitis occurs in about 1-13% of term pregnancies and can result in serious maternal and neonatal complications. Often over-diagnosed due to the heterogeneity of clinical manifestations, it can lead to unnecessary investigations and treatments and longer hospitalization. The aim of this study was to compare the incidence of clinical chorioamnionitis and the accuracy of its diagnosis before and after implementing a clinical protocol for the management of fever in labor based on the SOGC guidelines. The use of antibiotics and the maternal and neonatal outcomes were also compared.

**Methods:**
In a tertiary care center, during the year prior to the implementation of the clinical protocol, all diagnosed cases of clinical chorioamnionitis in term pregnancies (n=178) were retrospectively reviewed. All cases diagnosed in the first year after its implementation (n=138) were also reviewed. The two periods were compared using bivariate analyses.

**Results:**
Incidence of clinical chorioamnionitis decreased from 7% to 4% birth-year ($p<0.001$). This was associated with a significant increase in clinical diagnostic accuracy (59% to 84% ($p<0.001$)). Tobramycin doses were also better adjusted to patient weight (9% to 53% ($p<0.001$)). Maternal and neonatal outcomes were similar.

**Conclusions:**
The use of a clinical protocol for the management of fever in labor increases the diagnostic accuracy of clinical chorioamnionitis and decreases the use of antibiotics in term pregnancies. This tool significantly contributed to diminish the incidence of this condition, while maintaining the level of maternal and neonatal peri-partum complications low.

## Poster 130

### INCREASED AUTOTAXIN ACTIVITY IN MID-GESTATION OF WOMEN WHO DEVELOP GESTATIONAL DIABETES

**Aiden Cottrell-Callbeck**, **Jesus Serrano-Lomelin**, **Maria Ospina**, **Catherine Field**, **Rhonda Bell**, **David Brindley**, **Denise Hemmings** (University of Alberta)

**Introduction:**
Autotaxin (ATX) is an enzyme secreted by adipose tissue that produces the inflammatory lipid, lysophosphatidic acid (LPA). Plasma ATX levels increase longitudinally in healthy pregnant women. Although the amount of ATX increases, we do not know whether ATX activity is also increased longitudinally. LPA levels are reduced in women with gestational diabetes mellitus (GDM) in 2$^{nd}$ trimester. However, we do not know if this is because ATX activity is reduced. We hypothesized that ATX activity would increase throughout healthy pregnancy and would be reduced in those who develop GDM.

**Methods:**
Plasma samples from each trimester and 6 wks postpartum were obtained from a subset of pregnant women in the Alberta Pregnancy Outcomes and Nutrition (APrON) Study. ATX activity was measured by quantifying choline release using a fluorescence assay. We used Longitudinal Models (random effect models) to assess changes in ATX concentrations from healthy pregnant women (n=270) in relation to GDM (n=58), over the gestational period adjusting by covariates. We used ATX values in the postpartum period as basal values.

**Results:**
Plasma ATX activity increased throughout healthy pregnancy (1st: 7.1 [95%CI 6.6-7.9], 2nd: 10.1 [9.4-10.7], 3rd: 14.9 [95%CI 14.1-15.8]; $p<0.0001$) and then decreased in postpartum to levels lower than in 1$^{st}$ trimester (4.0 [95%CI 3.8-4.3). In women with GDM, plasma ATX activity also increased throughout pregnancy and was higher than in healthy pregnant women only in 2$^{nd}$ trimester (12.73 [95%CI 10.57-14.90]).

**Conclusions:**
Our work indicates that plasma ATX activity in mid-pregnancy could be prognostic for women at risk of GDM. Importantly, we also established a healthy reference range for plasma ATX activity that rises over the course of pregnancy from a large cohort of healthy pregnant women. This will be useful to assess other pregnancy complications such as preeclampsia. Funding: Women and Children's Health Research Institute and CIHR

## Poster 131

### PREVENTION OF RHD ALLOIMMUNIZATION IN NORTHERN BC

**Trina Fyfe**[1], **Geoffrey Payne**[1], **Josée Lavoie**[2], **Davina Banner**[1]
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**Introduction:**
Despite best practice guidelines, international evidence suggests that the provision of anti-D prophylaxis to RhD negative pregnant women is suboptimal. Absent from the literature is research exploring the factors that continue to put RhD negative pregnant women at risk for RhD alloimmunization. The purpose of this project was to understand why RhD negative pregnant women continue to be at risk for RhD alloimmunization within the context of northern BC. The specific research questions are: How do health care providers make decisions regarding the care of RhD negative pregnancies in northern BC? How do RhD negative women in northern BC experience pregnancy?

**Methods:**
A qualitative approach using interpretive description was utilized to explore the research questions. Interviews were conducted with RhD negative women that have been pregnant and health care providers' experiences in caring for RhD negative pregnancies within northern BC. A stakeholder committee guided the research process and provided insight into data analysis to ensure applicability to practice. In-depth analysis of the interviews and stakeholder committee meetings identified patterns and themes.

**Results:**
Sixteen RhD negative women and 13 healthcare providers were interviewed during a six-month duration. The stakeholder committee consisted of eight healthcare providers and a patient partner. A series of themes and subthemes regarding processes, shared-decision, knowledge and understanding, and communication.

**Conclusions:**
A qualitative approach with these two populations has provided a greater understanding into the depth of quality of care for RhD negative pregnancies and the decisions that inform patient safety. This study provides information into guideline adaptation, decision-making and health literacy in rural healthcare settings.

## Poster 132

### A CLINICAL MODEL FOR THE PREDICTION OF DIET CONTROLLED GDM

**Howard Berger**[1], **Shimrit Yaniv-Salem**[1,2], **Beth Murray-Davis**[3], **Haroon Hasan**[4], **Joel Ray**[1], **Jon Barrett**[5], **Sarah McDonald**[3], **Michael Geary**[6], **Mira Persaud**[7], **Taylor Reddi**[8], **Nir Melamed**[5]
[1]St. Michael's Hospital, [2]Soroka Medical Center, [3]McMaster University, [4]BORN Ontario, [5]Sunnybrook Health Sciences Centre, [6]Rotunda Hospital, [7]University of Ottawa, [8]York University

**Introduction:**
Universal screening for Gestational diabetes mellitus (GDM) identifies women with varying degrees of glucose intolerance, many of which will achieve glycemic control by lifestyle and nutritional modification alone. The objective of this retrospective cohort study was to develop a prediction model based on biochemical, clinical and sonographic parameters to accurately identify these "lower-risk" women that could then be directed to a less resource intensive care pathway.

**Methods:**
Data was extracted from the medical records of women diagnosed with GDM between 24-32 weeks'

gestation at two Ontario hospitals. The following clinical risk factors were considered as candidate predictors for the multivariable predictive model: maternal age, GCT value, GTT fasting plasma glucose value, family history of diabetes, history of GDM, fetal abdominal circumference (AC), gestational age and body mass index at GDM diagnosis visit. Discrimination of the model based on the number of clinical risk factors in combination with fetal AC percentile and alone was assessed using the c-statistic, which is an equivalent concept to the area under the receiver operating characteristic curve (AUC ROC).

**Results:**
A total of 961 women with GDM met inclusion criteria. 601 (62.5%) women did not require pharmacological management of GDM and were designated as "low-risk". On univariable and multivariable analysis, fetal AC was not associated with GDM treatment and removed from the final model. The final predictive model had high sensitivity [0.90 (0.87-0.92)] but low specificity [0.29 (0.23-0.34)] and hence a high false positive rate (71%). These results did not change when stratified by method of GDM diagnosis (Table 1).

**Conclusions:**
While correctly identifying 90% of women with GDM who will require only dietary and lifestyle modification, this prediction model falsely labeled 71% of women requiring medical therapy as being "low-risk". A model with increased specificity is needed before it can be safely applied to clinical practice.

**Table 1: Multivariable predictive model performance**

| Model[1] | C-statistic (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) | Positive predictive value (95% CI) | Negative predictive value (95% CI) | Misclassification rate (95% CI) | Correct classification rate (95% CI) |
|---|---|---|---|---|---|---|---|
| GCT and GTT | 0.75 (0.71-0.79) | 0.90 (0.88-0.93) | 0.35 (0.29-0.42) | 0.74 (0.70-0.78) | 0.65 (0.56-0.74) | 0.28 (0.25-0.32) | 0.72 (0.68-0.75) |
| GTT | 0.75 (0.72-0.79) | 0.89 (0.87-0.92) | 0.38 (0.32-0.43) | 0.73 (0.70-0.76) | 0.65 (0.58-0.73) | 0.29 (0.25-0.32) | 0.71 (0.68-0.75) |
| GCT | 0.71 (0.67-0.74) | 0.88 (0.85-0.91) | 0.38 (0.32-0.43) | 0.70 (0.67-0.74) | 0.65 (0.58-0.72) | 0.31 (0.28-0.34) | 0.69 (0.66-0.72) |
| Any method[2] | 0.69 (0.65-0.73 | 0.90 (0.87-0.92) | 0.29 (0.23-0.34) | 0.70 (0.67-0.74) | 0.60 (0.51-0.68) | 0.31 (0.28-0.35) | 0.69 (0.65-0.72) |

[1]Multivariable predictive model includes: maternal age, GCT value (where applicable), GTT fasting plasma glucose value (where applicable), family history of diabetes, history of GDM as well as gestational age and body mass index at GDM diagnosis visit. Models are not mutually exclusive.
[2]Model does not include GCT or GTT value
Note: Sensitivity/Specificity/Positive Predictive Value/Negative Predictive Value calculated based on a predicted probability ≥ 0.5

## Poster 133

### PREGNANCY WEIGHT GAIN BY BODY MASS INDEX (BMI) CATEGORY AND ADVERSE BIRTH OUTCOMES

**Ugochinyere Vivian Ukah**[1], **sarka lisonkova**[2]
[1]McGill University, [2]University of British Columbia

**Introduction:**
Suboptimal weight gain during pregnancy is reportedly associated with adverse events, however little is known on how the outcomes vary based on pre-pregnancy body mass index (BMI) category. We sought to examine women with suboptimal weight gain during pregnancy (by the American College of Obstetricians and Gynecologists) and associated birth outcomes in relation to pre-pregnancy BMI.

**Methods:**
Suboptimal weight gain during pregnancy is reportedly associated with adverse events, however little is known on how the outcomes vary based on pre-pregnancy body mass index (BMI) category. We sought to

examine women with suboptimal weight gain during pregnancy (by the American College of Obstetricians and Gynecologists) and associated birth outcomes in relation to pre-pregnancy BMI.

**Results:**
Among 722,996 women, 3.1% were underweight, 48.1% had normal BMI, 25.8% were overweight, and 22.9% obese. The proportion of women with low, optimal, and excess weight gain were 19.9%, 31.5% and 48.6% respectively, and the rates of adverse outcomes were 3.8%, 2.7%, 3.3%, respectively. Approximately 45% of underweight women, 38% of normal weight, 25% of overweight, and 24% of obese women had optimal weight gain in pregnancy. The highest proportion of excess weight gain was among overweight and obese class 1 women (~60%). Adverse birth outcomes occurred in 3.2% of women. Overweight and class 2 obese women with low weight gain had higher rates of adverse outcomes compared with those with normal or excess weight gain in the same BMI category.

**Conclusions:**
Low weight gain in pregnancy was associated with higher risk of adverse outcomes in each BMI category, while excess weight gain resulted in higher risk in some BMI categories. It is important to monitor both low and excess weight gain in pregnancy, especially in obese women, to improve nutritional and life-style counselling.

**Table 1:** Distribution of weight gain during pregnancy and adverse birth outcomes among women stratified by BMI, Washington State, USA 2003-2013 (N = 722,996).

| **Pre-pregnancy BMI** | **Low weight gain N = 143582**<br><br>AOR* (95% CI) | **Normal weight gain N = 227799**<br><br>(AOR reference) | **High weight gain N = 351615**<br><br>AOR* (95% CI) |
|---|---|---|---|
| Underweight (< 18.5 kg/m$^2$) (N =22714) | 6511<br><br>(outcome rate 3.84%)<br>1.3 (1.1-1.6) | 10240<br><br>(outcome rate 2.79%)<br>1 | 5967<br><br>(outcome rate 3.87%)<br>1.4 (1.1-1.6) |
| Normal weight (18.5-24.9 kg/m$^2$) (N = 347555) | 73353<br><br>(outcome rate 3.32%)<br>1.3 (1.2-1.3) | 132639<br><br>(outcome rate 2.42%)<br>1 | 141693<br><br>(outcome rate 3.17%)<br>1.3 (1.3-1.4) |
| Overweight (25.0-29.9 kg/m$^2$) (N = 186819) | 26285<br>(outcome rate 4.26%)<br>1.4 (1.3-1.5) | 45750<br>(outcome rate 2.91%)<br>1 | 114632<br>(outcome rate 3.03%)<br>1.0 (1.0-1.1) |
| Total Obese (≥ 30 kg/m$^2$) (N = 165908) | 37433<br>(outcome rate 4.44%) | 39170<br>(outcome rate 3.28%) | 89323<br>(outcome rate 3.70%) |
| **Obesity classes:** | | | |
| Obese 1 (30.0-34.9 kg/m$^2$)<br><br>(N = 93838) | 16595<br>(outcome rate 4.20%)<br>1.3 (1.1-1.4) | 20942<br>(outcome rate 3.17%)<br>1 | 56306<br>(outcome rate 3.45%)<br>1.1 (1.0-1.3) |
| Obese 2 (35.0-39.9 kg/m$^2$) (N = 44329) | 11291<br>(outcome rate 4.58%)<br>1.4 (1.2-1.6) | 11067<br>(outcome rate 3.31%)<br>1 | 21981<br>(outcome rate 3.86)<br>1.1 (1.0-1.3) |
| Obese 3 (≥ 40 kg/m$^2$) (N = 27741) | 9547<br>(outcome rate 4.70%)<br>1.3 (1.1-1.5) | 7161<br>(outcome rate 3.54%)<br>1 | 11036<br>(outcome rate 4.64%)<br>1.3 (1.1-1.5) |

*AOR adjusted for maternal age, parity, race, education, smoking during pregnancy, marital status, artificial reproduction, year of birth, baby gender and type of health insurance.

## Poster 134

### FIRST-LINE ANTIHYPERTENSIVE TREATMENT FOR SEVERE HYPERTENSION IN PREGNANCY: A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

**Andréanne Chaumont**[1], **Sepand Alavifard**[2,3], **Rebecca Chase**[1], **Andrea Lanes**[2,3], **Mark Walker**[2,3], **Laura Gaudet**[2,3], **Ghayath Janoudi**[4]
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**Introduction:**
Current clinical practice guidelines recommend IV hydralazine, IV labetalol, and oral nifedipine as first-line treatments for severe hypertension in pregnancy. While all three are effective, there is a lack of sufficient evidence regarding their comparative safety and efficacy. Our goal was to compare safety and efficacy of hydralazine, labetalol, and nifedipine for the treatment of severe hypertension in pregnancy.

**Methods:**
A systematic search of Medline, Embase, and Cochrane Central Register of Controlled Trials up to May 31, 2018 was conducted. Randomized controlled trials in pregnancy comparing a first-line antihypertensive agent (labetalol, hydralazine, or nifedipine) to another first-line antihypertensive treatment. Screening, data abstraction, and quality assessment were done by two independent reviewers. To estimate relative effects, a Bayesian network meta-analysis with vague priors was conducted using both a fixed and random effects model.

**Results:**
A total of 18 RCTs comprising a total of 1669 women met our selection criteria. The random effects model found no significant difference for treatment success between and of the three treatment comparisons although there was a trend favouring nifedipine over labetalol and hydralazine (OR 2.56 [95% CrI 0.85-8.12] and OR 2.90 [95% CrI 0.97-8.31]). This trend was found to be significant in the fixed effects model with nifedipine having significantly higher odds for treatment success compared to labetalol (OR 2.36 [95% CrI 1.08-5.52]) and hydralazine (OR 3.03 [95% CrI 1.45-6.62]). The analysis showed no significant difference in caesarean delivery nor in composite maternal side effects between any of the treatment comparisons.

**Conclusions:**
This study provides evidence favouring oral nifedipine over labetalol and hydralazine, for the management of severe hypertension in pregnancy. Future trials should investigate the effectiveness of nifedipine compared to labetalol/hydralazine using a larger sample size. A core outcome set for hypertension in pregnancy would aid in improving the quality of future meta-analyses.

## Poster 135

### POSTPARTUM MICROVASCULAR ASSESSMENT FOLLOWING A PREGNANCY COMPLICATED BY PREECLAMPSIA

**Logan Barr**[1], **Jessica Pudwell**[2], **Graeme Smith**[2]
[1]Queen's University, [2]Kingston Health Sciences Centre

**Introduction:**
Pre-eclampsia (PE) is a maternal hypertensive disorder associated with elevated lifetime risk for cardiovascular disease through poorly understand mechanisms. Microvascular endothelial dysfunction

has been reported in women following a pregnancy complicated by PE. These changes may predate macrovascular dysfunction manifesting clinically as cardiovascular disease. We hypothesize that microvascular changes in endothelium-dependent vasodilation can be observed following a pregnancy complicated by PE.

**Methods:**
Non-invasive assessment of forearm microvascular endothelial function were conducted in postpartum women with a recent pre-eclamptic or uncomplicated pregnancy, matched for age and BMI. Microvascular reactivity in the right volar forearm was assessed using laser speckle contrast imaging (LSCI) (moorFLPI-2, Moor Instruments, Axminster, UK). Iontophoresis of 1% acetylcholine and sodium nitroprusside solutions, causing endothelial-dependent and –independent vasodilation respectively, was performed in electrode chambers affixed to the forearm. Stepwise application of current (20 $\mu$A, 50 $\mu$A, and 2 applications each of 100 $\mu$A and 120 $\mu$A) was conducted using an iontophoresis controller (MIC2, Moor Instruments, Axminster, UK). Vasodilatory response was compared between subject groups using a mixed linear model, controlling for time postpartum (weeks) as a fixed effect.

**Results:**
Women with previous PE (n=11) and matched controls (n=11) were recruited. Recruitment is ongoing. Formerly pre-eclamptic participants had significantly elevated diastolic blood pressure ($P<0.05$) compared to their normotensive counterparts. Vasodilation significantly increased with iontophoretic dose among both groups compared to the lowest dose ($P<0.05$). There were no significant differences between subject groups in vasodilation to acetylcholine ($P=0.078$) nor sodium nitroprusside ($P=.23$).

**Conclusions:**
There appears to be a trend towards a difference in endothelial-dependent vasodilation following a pregnancy complicated by PE. The precise relationship of PE to postpartum microvascular function may be masked by low participant numbers at this preliminary stage. Ongoing recruitment will clarify this relationship in the near future.

## Poster 136

### AN INTEGRATIVE REVIEW REGARDING THE TREATMENT OF POSTPARTUM DEPRESSION AMONG IMMIGRANT WOMEN

**Kiran Toor** (University of Calgary)

**Introduction:**
Postpartum depression among immigrant women (PPDaIW) represents a significant and important mental health problem, in Canada. Social support, delivered in a culturally sensitive manner, provides a promising approach. In accessing a treatment plan, providers require more information about the preferences and behaviours of different ethno-cultural groups. This approach necessitates a multidisciplinary approach, drawn from research in the nursing and social sciences.

**Methods:**
I will conduct an integrative review that aims to explore the effects of social support on postpartum depression among immigrant women. Literature will be obtained from databases of varying disciplines, master's dissertations, expert knowledge from maternal health providers, and gray literature. The integrative review will appraise the quality of scientific research, identify gaps in current literature, and highlight themes of current literature pertaining to treatment plans of postpartum depression. The review will draw conclusions and discuss practice implications for current social supports aimed for immigrant women

suffering from postpartum depression. Lastly, I will offer recommendations for future research on providing culturally sensitive care.

**Results:**
I believe current literature will depict positive effects between social support and postpartum depression among immigrant women. It is expected that themes will appear between various literature to indicate the effects of social support on postpartum depression.

**Conclusions:**
The presence of various social supports may effect an immigrant woman's experience with postpartum depression along with ability to seek medical treatment. The generalizability of the integrative review may be affected as there are limited studies completed in Canada on the effect social support may have on postpartum depression specifically on immigrant women. The integrative review has implications for maternal newborn healthcare professionals along with immigrant women and families.

## Poster 137

### QUALITY ASSESSMENT OF RNA IN LONG-TERM STORAGE: THE ALL OUR FAMILIES BIOREPOSITORY

**Kylie Hornaday**, **Nikki Stephenson**, **Chelsea Doktorchik**, **Suzanne Tough**, **Donna Slater**
University of Calgary

**Introduction:**
All Our Families (AOF), a longitudinal pregnancy cohort based in Calgary, Alberta, collected biological samples from 1948 women from 2008 to 2010. As biological sample quality can decline with storage, we sought to assess RNA yield and purity over time considering potential factors associated with RNA quality.

**Methods:**
Whole blood was collected from maternal participants into four separate PAXgene Blood RNA Tubes (PreAnalytiX) at 17-23 (Collection 1) and 28-32 (Collection 2) weeks gestation and stored at -80°C. Total RNA was isolated from 268 paired samples (PAXgene Blood RNA Kits, PreAnalytiX) in 2011 and 2018 and evaluated for quality using 260/280 absorbance ratios (Nanodrop 2000c, Thermo Fisher Scientific). Factors such as phlebotomist, collection time, and storage time were evaluated using analysis of variance, paired student's t-test, and linear regression using STATA IC 15.

**Results:**
There was no significant difference in yield comparing samples extracted in 2011 (12.69ng, 95% CI: 11.86ng-13.52ng) to 2018 (12.62ng, 95% CI: 11.81ng-13.43ng) There was an increase in 260/280 ratios in 2018 (2.10, 95% CI: 2.06-2.14) from 2011 (2.08, 95% CI:2.07-2.09), though due to a small effect size and outliers in the 2018 group, this is likely not biologically relevant. The 95% confidence intervals of 260/280 ratios fell above 2.0 indicating "pure" RNA. RNA yield and 260/280 ratios were not significantly correlated to storage time.

**Conclusions:**
In addition to the PAXgene Blood RNA tubes, AOF has stored maternal whole blood in EDTA tubes for DNA isolation ($n_{Collection\ 1}$=1944 $n_{Collection\ 2}$=1857), serum ($n_{Collection\ 1}$=1858), and plasma ($n_{Collection\ 2}$=1947) samples, cord bloods (n=1439) obtained at delivery and comprehensive questionnaire data. These samples, in combination with questionnaire data, would enable comprehensive analyses for child and maternal health research. This study demonstrates the high quality of these biological samples as a valuable resource for future research.

## Poster 138

### THE ASSOCIATION BETWEEN INCREASED HEAD CIRCUMFERENCE AND OBSTETRICAL ANAL SPHINCTER INJURY

**Saja Anabusi**[1,2,3], **Amir Aviram**[3,4], **Elad Mei-Dan**[1,2,3]
[1]Sunnybrook Health Sciences Centre, [2]North York General Hospital, [3]University of Toronto, [4]Mount Sinai Hospital

**Introduction:**
Obstetric Anal Sphincter Injury (OASI, 3rd / 4th degree perineal lacerations) has major long term impact on maternal morbidity after vaginal delivery. In this study we aimed to determine the association between neonatal head circumference (HC) measured at birth and the risk for OASI.

**Methods:**
We performed a retrospective cohort study of all women with singleton gestation who had a vaginal delivery at term (37-42 weekss of gestation) between 2014 and 2018, with documented HC measured at birth. Third degree perineal tear was defined as disruption of the external or internal anal sphincter, while 4th degree perineal tear involved the rectal mucosa as well. Women with OASI were compared with the rest of the cohort for variable paramters including head circumference above 75 percintile. Logistic regression was performed in order to identify the contributors for OASI.

**Results:**
During the study period, 21,369 women delivered at our center, of which 7,222 (33.8%) were eligible for analysis. The rate of OASI was 3.0% (n=217), most of which were 3rd degree tears (n=198, 91.2%). Women with OASI were characterized by higher rates of nulliparity, augmentation of labour with oxytocin, operative vaginal delivery, and prolonged second stage of labour ($p<0.005$). Neonates of women in the OASI group had higher median birth weight, and higher rates of HC>75% percentile($p<0.005$). The logistic regression model included the following: HC>75% percentile, operative vaginal delivery, prolonged second stage, episiotomy, previous vaginal delivery, augmentation of labour with oxytocin and birth weight > 3500 g. HC>75% percentile remained independently and significantly associated with OASI (adjusted OR 1.7, 95% CI 1.2-2.5) (Table)

**Conclusions:**
Neonatal HC above the 75 percentile is an independent risk factor for OASI. Studies asseesing the value of fetal HC by ultrasound before delivery to predict OASI are needed.

*Table: Odds ratio of each risk predictor for obstetric anal spinchter injury-logistic regression analysis*

| Variable | Adjusted odds ratio | 95% CI |
|---|---|---|
| HC ≥75 percentile | 1.709 | 1.186-2.461 |
| Nuliparity | 0.335 | 0.221-0.508 |
| Forceps delivery | 4.892 | 2.999-7.999 |
| Vacuum delivery | 4.100 | 2.647-6.350 |
| Mediolateral episitomy | 0.723 | 0.478-1.095 |
| Midline episitomy | 2.031 | 1.213-3.398 |
| 2nd stage≥180 minutes | 1.350 | 0.925-1.988 |
| Birth weight≥3500 grams | 1.102 | 1.053-1.152 |
| Previous vaginal delivery | 0.335 | 0.221-0.508 |
| Oxytocin augmentation | 1.014 | 0.725-1.417 |

## Poster 139

### LONGITUDINAL BRAIN GROWTH IN CONGENITAL HEART DISEASE

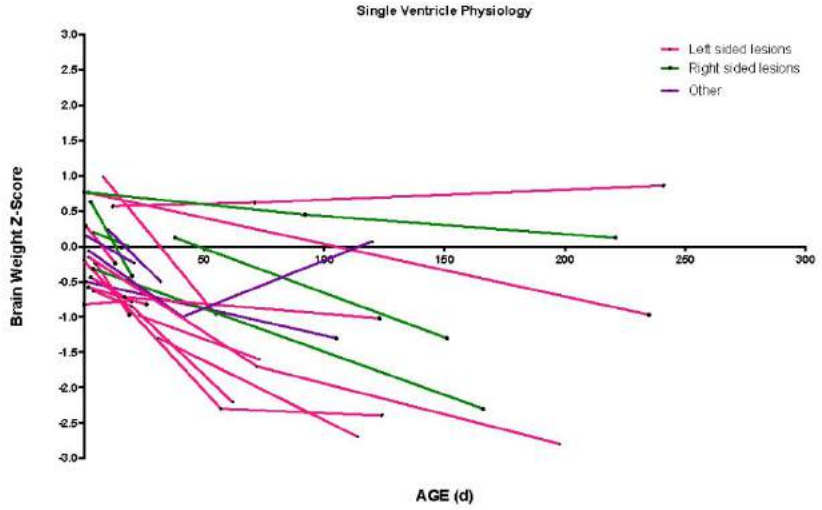
**Jessie Mei Lim**[1], **Davide Marini**[2], **Amandeep Saini**[2], **Stephanie Au-Young**[2], **Susan Blaser**[2], **Vann Chau**[2], **Steven Miller**[2], **Mike Seed**[2]
[1]University of Toronto, [2]The Hospital for Sick Children

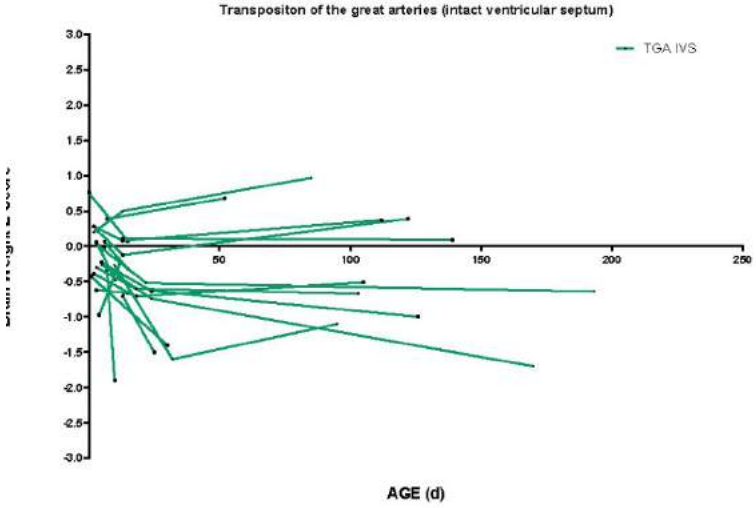
**Introduction:**
Numerous brain imaging studies in congenital heart disease (CHD) have reported impaired brain growth in congenital cardiac lesions such as transposition of the great arteries (TGA) and single ventricle physiology (SV). Brain volume has been correlated with cognitive function and smaller brain sizes have been associated with poor neurodevelopmental outcomes in patients undergoing single ventricle palliation. We were interested to correlate the clinical course of patients undergoing treatment for CHD with longitudinal studies of brain growth using MRI during infancy. We hypothesize that brain growth trajectory differs between cardiac lesion, with those undergoing neonatal repair faring better than those being repaired later and those requiring surgical palliation.

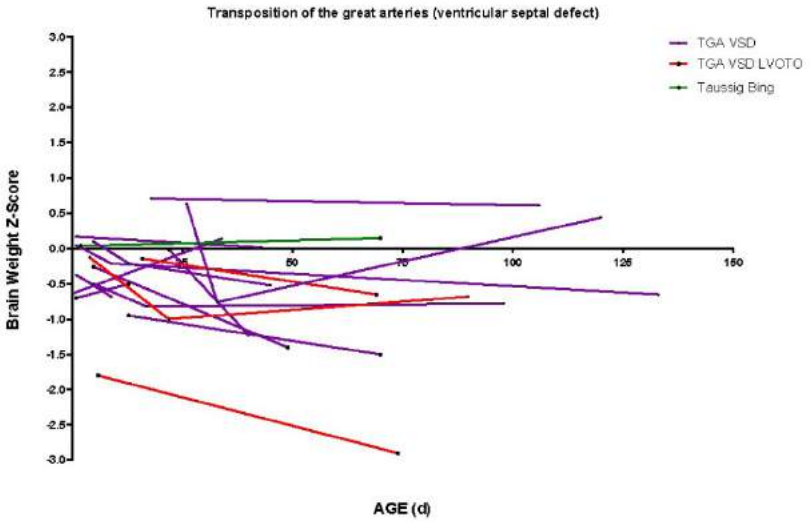
**Methods:**
Routine perioperative and research follow up brain imaging was conducted as part of an IRB approved study. 59 CHD patients were scanned perioperatively (23 SV, 20 TGA IVS and 16 TGA VSD). Of these, 28 had a follow up scan at 3-4 months of age. 3-dimensional steady state free precession acquisitions of the brain were obtained, and images were post processed to yield estimated brain volumes, which were converted into brain weight z-scores.

**Results:**
Trends in brain growth trajectory were noticeably different between the 3 lesion types. Those with SV physiologies demonstrate a steady decline in brain z-score up to 3 months of age. Contrastingly, those with TGA IVS, who were generally repaired during the first two weeks of life demonstrate an increased rate of brain growth at follow up. In those with TGA VSD, who frequently undergo later surgical repair, there was neither a clear improvement nor decline at follow up.

**Conclusions:**
The differences in brain growth trajectories in these different cardiac lesions would appear to reflect the severity of the heart disease and our ability to restore normal cardiovascular physiology. Successful treatment of CHD is likely to optimize brain growth and development.


Single Ventricle Physiology
Left sided lesions
Right sided lesions
Other
Brain Weight Z-Score
AGE (d)


Transpositon of the great arteries (intact ventricular septum)
TGA IVS
AGE (d)


Transposition of the great arteries (ventricular septal defect)
TGA VSD
TGA VSD LVOTO
Taussig Bing
Brain Weight Z-Score
AGE (d)

## Poster 140

### TEMPORAL ANALYSIS OF SERUM CYTOKINES AS MOLECULAR SIGNATURES ASSOCIATED WITH ADVERSE OUTCOME IN HYPOXIC ISCHEMIC ENCEPHALOPATHY

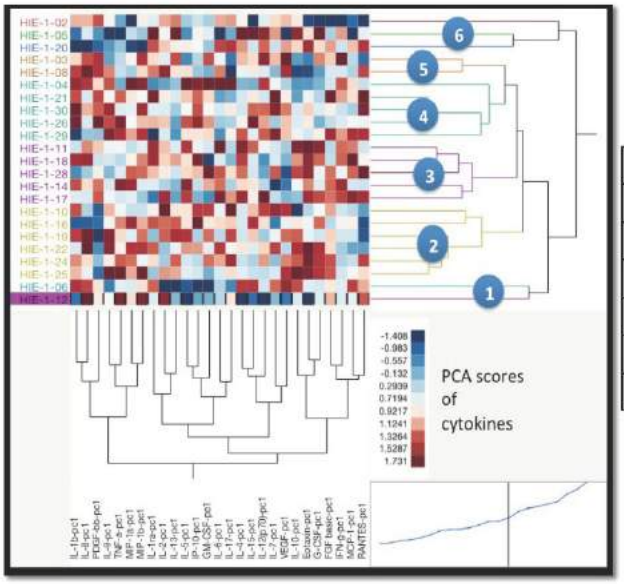
**Ipsita Goswami**[1], **Aleksandra Mineyko**[2], **Khorshid Mohammad**[2], **Quentin Pittman**[2], **Kamran Yusuf**[2], **Michael Esser**[2]
[1]The Hospital for Sick Children, [2]University of Calgary

**Introduction:**
Bedside tools to predict the likelihood of abnormal outcome are necessary to inform therapeutic decisions in hypoxic-ischemic encephalopathy (HIE). We hypothesized that patient-specific molecular signatures can be derived from multiple cytokines measured in serial serum samples through data mining and that this would predict MRI findings in HIE patients.

**Methods:**
We assayed 27 cytokines in cord blood and serum samples at 24h, 72h, 96h of life obtained from 29 HIE neonates and 7 controls. The primary outcome measures were the presence of abnormal neuroimaging or death in the first week of life. Repeat measures mixed effect modeling was used to analyze time-course cytokine data. To identify patient-specific patterns, data were subjected to Principal Component Analysis (PCA) and Hierarchical Clustering, both unsupervised algorithms blinded to outcome groups. Thereafter, the defined patient clusters with similar cytokine patterns were evaluated in the context of the primary outcome.

**Results:**
Cases with the adverse outcome were distinguished from cases with normal MRI by higher levels of MCP1 and IL-10 (cord blood), IL-1ra and G-CSF (24 hrs), IL-7 and IL-17 (72 hours) but lower levels of PDGFbb and IP10 (all time-points). Clustering patients based on norMalized cytokine values at 24h was able to segregate controls. However, PCA scores of cytokines that dominated the time-dependent inflammatory profiles of individuals helped to segregate them into 6 natural clusters. Two of these clusters (7 infants) was characterized by short hospitalization, normal MRI and normal EEG.

**Conclusions:**
Analysing the temporal course of specific pro and anti-inflammatory cytokines appears to differentiate HIE patients with adverse outcome from favorable outcome. Similar patient-specific inflammatory profiles characterize a subcohort with a benign clinical course. An inherent natural variability exists in individual HIE patients' inflammatory milieu during hypothermia therapy, which may be influenced by the severity of initial injury, hypoxic preconditioning, epigenetics and perhaps predictive of clinical outcome.




| | Mortality | Abnormal MRI | Seizure | Abnormal EEG | Average hospital stay | Moderate to severe HIE |
|---|---|---|---|---|---|---|
| Cluster 1 N=2 | 0 | 1 | 1 | 1 | 12 days | 1 |
| Cluster 2 N=5 | 0 | 2 | 1 | 2 | 9.6 days | 3 |
| Cluster 3 N=5 | 0 | 2 | 2 | 4 | 8.4 days | 3 |
| Cluster 4 N=5 | 0 | 0 | 0 | 0 | 7.6 days | 3 |
| Cluster 5 N=2 | 0 | 0 | 0 | 0 | 6.5days | 0 |
| Cluster 6 N=3 | 0 | 0 | 0 | 1 | 8.3 days | 1 |

## Poster 141

### PERFORMANCE EVALUATION OF BRAIN EXTRACTION USING HETEROGENOUS PUBLIC NEONATAL BRAINS DATASETS

**Dumisizwe Bhembe**[1,2], **Yang Ding**[1,2], **David Luck**[1,2], **Gregory Lodygensky**[1,2]
[1]Canadian Neonatal Brain platform, [2]Sainte-Justine Hospital Research Center

**Introduction:**
Neuroimaging in neonates is challenging because of their unique tissue contrasts yet all neonatal neuroimaging analyses start with a robust brain extraction. Brain extractions approaches have never been quantitatively compared methodically with each other in a standardized pipeline against different neonatal datasets. In the current work, we provide an open-source, long-term performance evaluation monitoring pipeline of brain extraction methods against diverse open neonatal datasets.

**Methods:**
Three approaches were included currently: Brain Extraction Tool (BET) from FSL, its lesion tolerant variant optiBET and watershed descalping segmentation from Morphologically Adaptive Neonate Tissue Segmentation toolbox. The robustness of these methods was validated against two different public neonatal MRI datasets: Developing Human Connectome Project (dHCP) and the ALBERTs dataset. The provided brain extraction results from dHCP and our manual segmentation of the ALBERT subjects were considered as the ground truth respectively. All T2 MRI volumes and ground truth are norMalized using SPM12 from subject space to Serag et al. 2012 common 40 weeks template space before brain extraction results comparison with the ground truth. Evaluation of extraction results was performed using the calculation of the Sørensen–Dice coefficient between the extraction and ground truth.

**Results:**
The Table summarized the preliminary brain extraction Dice coefficient across the 8 dHCP subjects and 6 ALBERT subjects analyzed versus the ground truth. Watershed outperformed BET and optiBET (Wilcoxon Signed Rank, $p < 0.01$, $Z > 2.4$). DICE scores are significantly higher in dHCP for both BET and Watershed (Mann Whitney U, $p < 0.002$, $Z > 3$).

**Conclusions:**
Overall, watershed might be more robust brain extraction approach than BET and optiBET performed worst. Higher Dice coefficient in dHCP dataset might be related to dHCP optimal acquisition protocol or their more well-defined ground truth. More pipelines and manually labelled brain extraction dataset are planned to improve our performance monitoring pipeline.

| Dataset | Subject Identifier | BET | Watershed | OptiBET |
|---|---|---|---|---|
| Developing Human Connectome Project | CC00162XX06 | 0.901 | 0.912 | 0.817 |
| | CC00168XX06 | 0.914 | 0.926 | 0.837 |
| | CC00201XX06 | 0.906 | 0.918 | 0.832 |
| | CC00205XX06 | 0.888 | 0.901 | 0.527 |
| | CC00250XX06 | 0.910 | 0.920 | 0.825 |
| | CC00303XX06 | 0.929 | 0.934 | 0.856 |
| | CC00367XX06 | 0.919 | 0.931 | 0.833 |
| | CC00379XX06 | 0.941 | 0.949 | 0.536 |
| | **dHCP Group Average** | **0.913** | **0.924** | **0.758** |

**Table 1:** Sørensen–Dice coefficient of the brain extraction results of the dHCP subjects versus the ground truth

| Dataset | Subject Identifier | BET | Watershed | OptiBET |
|---|---|---|---|---|
| ALBERT | 03_T2 | 0.713 | 0.792 | 0.676 |
| | 05_T2 | 0.797 | 0.871 | 0.744 |
| | 10_T2 | 0.665 | 0.776 | 0.617 |
| | 11_T2 | 0.797 | 0.805 | 0.804 |
| | 12_T2 | 0.655 | 0.814 | 0.561 |
| | 17_T2 | 0.614 | 0.617 | 0.693 |
| | **Albert Group Average** | **0.790** | **0.779** | **0.683** |

**Table 2:** Sørensen–Dice coefficient of the brain extraction results of the ALBERTs subjects versus ground truth

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**BET**: Brain Extraction Toolkit from FSL
**OptiBet**: Source: https://montilab.psych.ucla.edu/fmri-wiki/optibet/
**Watershed**: http://developmentalimagingmcri.github.io/mantis/using/extraction
Sørensen–Dice coefficient computed using adapted script from:
https://github.com/rordenlab/spmScripts/blob/master/nii_dice.m

## Poster 142

### PREDICTING MEMORY IMPAIRMENT WITH MRI IN AN ANIMAL MODEL OF NEONATAL WHITE MATTER INJURY

**Wyston Pierre**[1], **Irene Londono**[1], **Philippe Pouliot**[2], **Frédéric Lesage**[2], **Gregory A. Lodygensky**[1]
[1]CHU Ste-Justine Research Center, [2]École polytechnique de Montréal

**Introduction:**
Inflammation-induced white matter injury (WMI) is associated to diffuse injury, ventricular dilatation, and long-lasting learning and memory impairments in preterm infants and animal models (Akakpo et al., 2017). The development of sensitive and quantitative tools, such as magnetic resonance imaging (MRI), to assess injury load in WMI is an important step towards the development of effective neuroprotective therapy. Using MRI, we aim at examining the association between extent of injury and memory impairments in an animal model of neonatal WMI.

**Methods:**
Three days-old (P3) Wistar pups received LPS (1mg/kg; n=5) or sterile saline (Sham; n=3)) injections in the corpus callosum. MRI were acquired at P27 on a 7T scanner. Lateral ventricle size was measured on T2 images. At P35, learning and memory behaviors were evaluated with the fear conditioning test. In brief, animals had an habituation time and then a training trial consisting of two 2s tone (120s apart) each followed by a foot shock (2s, 0.5mA). 24h later, memory was tested by presenting only the tones, and freezing behaviors were recorded over 300s and evaluated with FreezeFrame. Two-way ANOVA test was used for statistical comparisons.

**Results:**
Based on ventricles size, LPS group was separated in two: overt dilatation (n=2) and minimal dilatation (n=3). During the test trial, LPS animal with overt ventricle dilatation had lower freezing time after the first tone (120-180s) and overall lower freezing time (table 1). Even in animal with minimal injury, neonatal inflammation decreased the total freezing time (table 1). There was an inverse correlation between the extent of ventricle dilatation and freezing behavior at the 120-180s interval (r=-0.8571, p=0.0238).

**Conclusions:**
The extent of ventricle dilatation, measured on T2 images, correlated with memory impairments in an animal model of neonatal WMI. More animals are currently undergoing behavioral tests with multimodal MRI acquisition and thorough measurement of hippocampal volume.

Table I. Freeze time during test trial

| Time interval (s) | Sham | LPS with overt injury at MRI (n=2) | LPS with minimal injury at MRI (n=3) |
|---|---|---|---|
| 0-60 | 11.43±4.27 | 3.62±3.62 | 6.77±2.39 |
| 60-120 | 24.25±8.93 | 20.83±11.21 | 7.23±3.66 |
| 120-180 | 52.33±5.45 | **7.19±3.71**** | 26.42±5.71 |
| 180-240 | 57.05±1.70 | 32.22±6.98 | 43.07±6.62 |
| 240-300 | 48.22±5.25 | 29.34±5.61 | 42.35±6.43 |
| Total freezing time (s) | 193.28±15.54 | **93.20±12.50**** | **125.85±20.88**** |

Results are presented as mean ± SEM. ***: p<0.01; **** : p<0.0001*

## Poster 143

### EFFECT OF FENTANYL BOLUSES ON CEREBRAL OXYGENATION AND HEMODYNAMICS IN PRETERM INFANTS: A PROSPECTIVE OBSERVATIONAL STUDY

**Souvik Mitra**[1,2], **Ege Babadagli**[1], **Helen McCord**[2], **Averie DePalma**[1], **Walid El-Naggar**[1,2], **Georg Schmölzer**[3], **Douglas McMillan**[1,2]
[1]Dalhousie University, [2]IWK Health Center, [3]University of Alberta

**Introduction:**
Fentanyl is a commonly used off-label medication for pain control and sedation in preterm infants. However, there are growing concerns about the link between fentanyl use and poor neurodevelopmental outcomes in preterm infants. Animal studies report significantly reduced cerebral oxygenation in newborn piglets after fentanyl infusion. However, the effect of fentanyl on cerebral perfusion in preterm neonates remains unexplored. Our objective was to evaluate the effects of a bolus dose of fentanyl on regional cerebral oxygen saturation ($RcSO_2$), cerebral fractional tissue oxygen extraction (cFTOE), and left ventricular output (LVO) when compared to pre-administration baseline in preterm infants.

**Methods:**
Prospective observational study conducted in a level III Canadian NICU from October 2017-October 2018. Preterm infants born <37 weeks' gestation receiving a bolus dose of fentanyl (1-2microgram/kg/dose) were eligible. Near-infrared spectroscopy (INVOS™ 5100c) was started 15 minutes prior to the fentanyl bolus and continued for 6 h post fentanyl administration. In addition, the cardiac output (LVO) was measured using non-invasive doppler ultrasound (USCOM™) 5 mins prior and 5, 15, 30 mins and 6h post fentanyl bolus. The primary outcome was the percentage difference between RcSO2 at 5 mins prior and at 5, 15, 30 mins and 6h post fentanyl bolus.

**Results:**
29 infants were enrolled in the study [Median and interquartile range (IQR) for gestational age 28 (25-30) weeks; birth weight 1020 (830-1275)g; age 4 (2.5-7.5)days]. 28 infants received fentanyl for peripherally inserted central catheter insertion and one for endotracheal intubation. Mean(±standard deviation) baseline $RcSO_2$ was 72.8% (±11.4), cFTOE was 21.9 (±11.2) and LVO was 335 (±193) mL/kg/min prior to fentanyl infusion. One-way ANOVA showed no statistically significant difference between baseline and any post-fentanyl bolus time points for cerebral oxygenation or hemodynamic measures (Table).

**Conclusions:**
Administration of fentanyl bolus for procedural pain and sedation does not affect $RcSO_2$, cFTOE, or cardiac output in preterm infants.

**Table. Pre-& post-fentanyl cerebral oxygenation and hemodynamic measures**

| Outcome measure | 5 min pre-fentanyl baseline [Mean (SD)] | 5 min post [Mean (SD)] | 15 min post [Mean (SD)] | 30 min post [Mean (SD)] | 60 mins post [Mean (SD)] | F value (one-way ANOVA) | P value (one-way ANOVA) |
|---|---|---|---|---|---|---|---|
| **RcSO2 (%)** ***(Figure 1)*** | 72.9 (11.4) | 72.6 (13.0) | 76.0 (11.0) | 75.2 (10.6) | 77.0 (9.3) | 0.79 | 0.53 |
| **CFTOE** ***(Figure 2)*** | 22.0 (11.2) | 22.6 (12.9) | 20.2 (10.6) | 20.3 (10.7) | 18.5 (10.2) | 0.51 | 0.73 |
| **LVO (ml/kg/min)** ***(Figure 3)*** | 335 (193) | 311 (130) | 339 (170) | 361 (215) | 349 (201) | 0.18 | 0.95 |

Figure 1 Boxplot of RcSO2 values at 5 timepoints pre- & post fentanyl

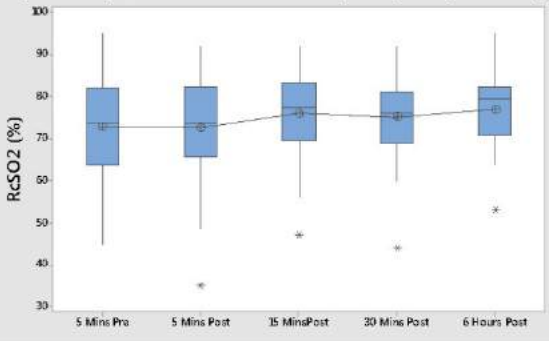



Figure 2. Boxplot of cFTOE values at 5 timepoints pre- & post-fentanyl

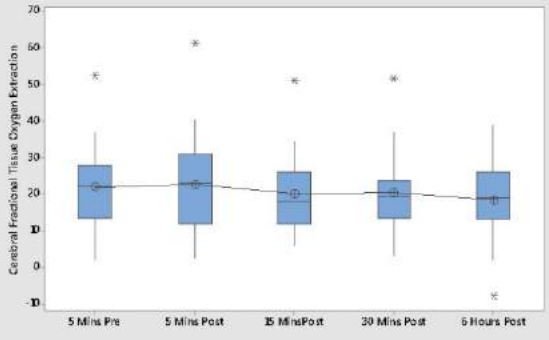
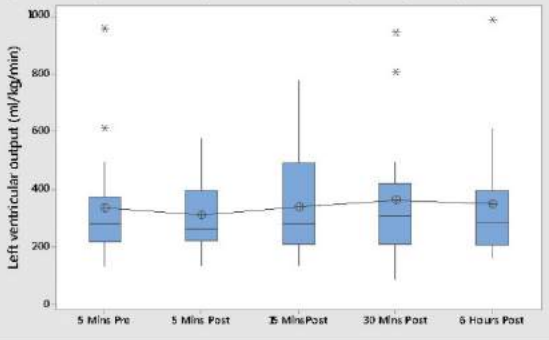



Figure 3. Boxplot of LV output values at 5 timepoints pre- & post-fentanyl



## Poster 144

### ERYTHROPOIETIN IN PERINATAL HYPOXIC-ISCHEMIC ENCEPHALOPATHY: A SYSTEMATIC REVIEW AND META-ANALYSIS

**Abdul Razak**[1], **Asif Hussain**[2]
[1]Princess Nourah Bint AbdulRahman University, [2]SN Medical college,

**Introduction:**
Studies lack the power to demonstrate the role of Erythropoietin (EPO) in infants with hypoxic-ischemic encephalopathy (HIE) making the evidence unclear. We systematically review and meta-analyze the role of EPO (or analogues) (with or without hypothermia) treatment in infants >34 weeks' gestational age with moderate to severe HIE.

**Methods:**
Database search include EMBASE, Medline, CINAHL and Cochrane central. Randomized trials reporting a death, neurodevelopmental outcomes or brain injury included. Two authors extracted data independently from included studies. Cochrane GRADE approach used to assess the quality of the evidence.

**Results:**
Six trials (EPO=5 and darbepoetin alpha=1) involving 454 infants included in the review. A trend towards lower risk of death identified in EPO treated infants (EPO with or without hypothermia: 5 RCT's, 368 participants, relative risk (RR) 0.74, 95% confidence interval (CI) 0.47-1.19, low-quality of evidence; EPO without hypothermia: 4 RCT's, 318 participants, RR 0.89, 95% CI 0.49-1.32, low-quality of evidence ).
In EPO without hypothermia, EPO treatment resulted in a reduced risk of cerebral palsy (2 RCT's, 230 participants, RR 0.47, 95% CI 0.27-0.80, moderate-quality of evidence) and moderate to severe cognitive impairment (2 RCT's, 226 participants, RR 0.49, 95% CI 0.28-0.85, moderate-quality of evidence). In EPO with or without hypothermia, reduced brain injury identified in EPO treated infants (2 RCT's, 148 participants, RR 0.70, 95% CI 0.53-0.92, moderate-quality of evidence) (Table 1).

**Conclusions:**
EPO administration in HIE results in less brain injury, reduced risk of cerebral palsy and cognitive impairment. The evidence is limited to suggest its role as an adjuvant to hypothermia. Larger powered trials underway to overcome this limitation.

## Table 1: Summary of findings

**ERYTHROPOIETIN COMPARED TO PLACEBO OR NO INTERVENTION FOR MODERATE TO SEVERE HYPOXIC ISCHEMIC ENCEPHALOPATHY**

**Patient or population**: Term and Later Preterm Infants
**Setting**: Moderate to Severe Hypoxic Ischemic Encephalopathy
**Intervention**: Erythropoietin
**Comparison**: Placebo or No Intervention

| Outcomes | Anticipated absolute effects* (95% CI) | | Relative effect (M-H, Fixed, 95% CI) | № of participants (studies) | Heterogeneity ($I^2$) | Certainty of the evidence (GRADE) |
|---|---|---|---|---|---|---|
| | Risk with Placebo | Risk with Erythropoietin | | | | |
| **ERYTHROPOIETIN WITHOUT HYPOTHERMIA** | | | | | | |
| Death | 147 per 1,000 | **131 per 1,000** (72 to 194) | **RR 0.89** (0.49 to 1.32) | 318 (4 RCTs) | 0% | ⊕⊕◯◯ LOW [a, b] |
| Cerebral Palsy | 280 per 1,000 | **131 per 1,000** (76 to 224) | **RR 0.47** (0.27 to 0.80) | 230 (2 RCTs) | 0% | ⊕⊕⊕◯ MODERATE [c] |
| Moderate to Severe Cognitive Impairment | 276 per 1,000 | **135 per 1,000** (77 to 234) | **RR 0.49** (0.28 to 0.85) | 226 (2 RCTs) | 0% | ⊕⊕⊕◯ MODERATE [c] |
| **ERYTHROPOIETIN WITH OR WITHOUT HYPOTHERMIA** | | | | | | |
| Death | 153 per 1,000 | **114 per 1,000** (72 to 183) | **RR 0.74** (0.47 to 1.19) | 368 (5 RCTs) | 0% | ⊕⊕◯◯ LOW [a, b] |
| Brain Injury on MRI | 693 per 1,000 | **485 per 1,000** (367 to 638) | **RR 0.70** (0.53 to 0.92) | 148 (2 RCTs) | 0% | ⊕⊕⊕◯ MODERATE [d] |

***The risk in the intervention group** (and its 95% confidence interval) is based on the assumed risk in the comparison group and the **relative effect** of the intervention (and its 95% CI). **CI**: Confidence interval; **RR**: Risk ratio

**GRADE Working Group grades of evidence**
**High certainty**: We are very confident that the true effect lies close to that of the estimate of the effect
**Moderate certainty**: We are moderately confident in the effect estimate: The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different
**Low certainty**: Our confidence in the effect estimate is limited: The true effect may be substantially different from the estimate of the effect
**Very low certainty**: We have very little confidence in the effect estimate: The true effect is likely to be substantially different from the estimate of effect

### Explanations

a. Unclear allocation concealment, non-blinded to care providers in two trials, per-protocol analysis in one trial
b. Confidence Interval wide enough to downgrade the evidence
c. Unclear allocation concealment, unclear randomization in one trial, non-blinded to care providers in one trial, per protocol analysis in one trial
d. One trial utilized EPO with hypothermia and One trial utilized EPO without hypothermia

## Poster 145

### A COMPUTER-BASED ANALYSIS FOR THE EARLY DIAGNOSIS OF MOTOR IMPAIRMENT AND CEREBRAL PALSY

**Silvia Orlandi**[1], **Kamini Raghuram**[2], **Paige Church**[3], **Maureen Luther**[3], **Tom Chau**[1,4]
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**Introduction:**
The diagnosis of cerebral palsy (CP) is difficult to make before 2 years of age. The general movements assessment (GMA) allows predicting CP and motor impairment (MI) from the spontaneous infants' movements in the first months of life. Although highly accurate, the use of the GMA is limited by a lack of trained clinicians and its subjective nature. A computer-based assessment would provide an objective solution to facilitate early intervention and improve functional outcomes. Our aim is to develop a robust video analysis tool to predict MI and CP to facilitate the routine use of clinical GMA.

**Methods:**
589 videos of preterm infants (born ≤ $30^{6/7}$ weeks of gestational age) with clinical GMA outcome were evaluated against eligibility criteria for the automated GMA consisting of a skin model for segmentation and large displacement optical flow for motion tracking. 643 movement parameters (e.g., velocity, acceleration, quantity of motion) were extracted to distinguish typical and atypical movements using classification methods. The most predictive parameters for MI defined as Bayley Scales of Infant and Toddler Development, 3rd edition (BSID-III) ≤ 85 or diagnosis of cerebral palsy, were obtained using a multivariable logistic regression.

**Results:**
152 videos were eligible for the analysis. The rates of MI and CP were 22% (N=33) and 14% (N=22), respectively. Classification results showed accuracy up to 90% and 66% in detecting CP (sensitivity=55%; specificity=99%) and MI (sensitivity=79%; specificity=63%), respectively. Minimum and mean values of the infant's silhouette velocity correlated significantly with MI. The logistic regression model showed a good fit in predicting MI (C-statistic=0.77).

**Conclusions:**
Computer-based analysis can be used to predict CP and MI in preterm infants. A standardized acquisition protocol would likely further improve the quality of videos for automated analysis. Further validation studies are required to translate this technology to clinical practice.

## Poster 146

### THE INFLUENCE OF SURGICAL PARAMETERS ON THE EVOLUTION OF POSTOPERATIVE EEG IN INFANTS WITH CONGENITAL HEART DISEASE

**Kenza Ibrir**[1], **Béatrice Desnous**[2], **Bohdana Marandyuk**[2], **Marien Lenoir**[1], **Kim Anh La**[1], **Elizabeth Zhang**[1], **Zamzam Mahdi**[1], **Geneviève Du Pont-Thibodeau**[2], **Nancy Poirier**[1], **Geneviève Côté**[2], **Ala Birca**[2]
[1]Université de Montreal, [2]CHU Sainte Justine

**Introduction:**
Congenital heart disease (CHD) is the most common congenital defect. Almost half of neonates with CHD require heart surgery during their 1st month of life, which exposes them to an increased risk of brain injury. Studies have shown that surgical risk factors, such as increased surgical complexity scores (Risk Adjustment for Congenital Heart Surgery, RACHS) and prolonged hypothermic circulatory arrest predict

an impaired neurodevelopment. A delayed recovery of normal postoperative EEG background was also associated with adverse outcomes, but the influence of surgical factors on this recovery is not well understood. This study aimed to investigate the influence of surgical parameters on the postoperative recovery of brain activity recorded using electroencephalography (EEG) in neonates with CHD.

**Methods:**
We recruited a mixed cohort of 31 neonates (23 boys) with CHD that underwent cardiac surgery at <44 weeks of postmenstrual age. Medical records were reviewed to collect clinical data, including the RACHS scores, the duration of circulatory arrest, cardiopulmonary bypass and anesthesia. Postoperative EEG recordings were submitted to quantitative analysis to derive EEG discontinuity as an index of impaired brain activity at 18, 21 and 24 hours after the surgery. We used analyses of variance for repeated measures to test the associations.

**Results:**
Our data showed higher postoperative EEG discontinuity in patients with a longer duration of cardiopulmonary bypass ($F_{1,26}$=4, p=0.054) and anesthesia($F_{1,27}$=11, p=0.003), but not in those with higher RACHS scores($F_{1,27}$=0.38, p=0.54) or longer duration of cardiac arrest ($F_{1,3}$=3.6, p=0.16). However, only 5 patients had circulatory arrest during the surgery.

**Conclusions:**
Surgical factors such as the duration of cardiopulmonary bypass and anesthesia delay the recovery of normal postoperative EEG background after the surgery. Future studies should clarify whether these deleterious effects are transient or have lasting effects on neurodevelopment, as well as the role of anesthetic accumulation in mediating these effects.

## Poster 147

### RISK FACTORS ASSOCIATED WITH SEVERE BRAIN INJURY IN OUTBORN INFANTS <33 WEEKS GESTATIONAL AGE

**Stephanie Redpath**[1,2], **Prakesh Shah**[3,4], **Gregory Moore**[1,2], **Junmin Yang**[5], **Jennifer Toye**[6], **Thérèse Perreault**[7], **Kyong-Soon Lee**[4,8]
[1]Children's Hospital of Eastern Ontario, [2]University of Ottawa, [3]Mount Sinai Hospital Toronto, [4]University of Toronto, [5]MiCare, Toronto, [6]Stollery Children's Hospital, Edmonton, [7]Montreal Children's Hospital, [8]Hospital for Sick Children Toronto

**Introduction:**
Background: Severe brain injury (SBI) increases the risk of adverse neurodevelopmental outcomes in preterm infants. Birth in a non-perinatal center ("outborn") is associated with an increased risk of SBI. Objective: To examine the variation in rates of SBI in outborn preterm infants less than 33weeks gestational age (GA) among transport teams across Canada and to determine modifiable risk factors which may provide opportunities for outcome improvement in this vulnerable population

**Methods:**
Retrospective review of data from the Canadian Neonatal Transport Network and Canadian Neonatal Network databases for outborn infants at <33 weeks GA, transported ex-utero to a tertiary level neonatal intensive care unit between Jan 2014 to December 2015 was conducted. SBI was defined as grade 3 or 4 intraventricular hemorrhage or parenchymal echogenicity, including hemorrhagic and/or ischemic lesions.

**Results:**
Among 781 included infants, 115 (14.7%) had SBI with rates among transport teams ranging from 5.6 % to

40%. In multivariable analysis, factors significantly associated [OR (95% CI)] with SBI were: GA [0.77 (0.71, 0.85)] per week, need for chest compressions and/or epinephrine at time of delivery [1.81 (1.08, 3.05)] and the administration of fluid boluses by either the referral site or transport team [1.61 (1.00, 2.58)].

**Conclusions:**

There was significant variation in SBI rates for outborn neonates across Canada. Modifiable risk factors identified for further consideration were the need for resuscitation with compressions and/or epinephrine and receipt of fluid boluses after birth. High priority subjects for community outreach education and transport teams are the promotion of in utero transfer whenever safe, less traumatic deliveries and best stabilization practices in the early postnatal period.

Table 1. Factors associated with severe brain injury

| **n (%)**<br>**Median (IQR)**<br>**Mean (sd)** | **Severe brain injury** (N=115) | **No severe brain injury** (N=666) | p-value |
|---|---|---|---|
| GA in weeks, mean (sd) | 26.6 (2.7) | 28.4 (2.4) | <0.01 |
| BW in grams, mean (sd) | 1028 (411) | 1267 (419) | <0.01 |
| Male, n (%) | 64 (55.7) | 379 (57.0) | 0.79 |
| Cesarean, n (%) | 63 (54.8) | 333 (50.2) | 0.37 |
| Multiple births, n (%) | 14 (12.2) | 132 (19.8) | 0.05 |
| Antenatal steroids (complete), n (%) | 28 (44.4) | 190 (46.3) | 0.88 |
| Any antenatal steroids, n (%) | 63 (57.3) | 410 (65.5) | 0.10 |
| Antenatal magnesium sulfate, n (%) | 35 (35.4) | 195 (33.7) | 0.75 |
| Prophylactic indomethacin, n (%) | 13 (11.3) | 54 (8.1) | 0.26 |
| | | | |
| Chest compressions or epinephrine received for resuscitation at delivery, n (%) | 35 (30.4) | 90 (13.5) | <0.01 |
| | | | |
| Transport team arrived prior to delivery, n (%) | 40 (34.8) | 222 (33.3) | 0.76 |
| Transport team with physician, n (%) | 26 (22.6) | 128 (19.2) | 0.40 |
| Number of attempts for intubation among intubated patients, n (%)<br>By team<br>By referral<br>By team or referral<br>1<br>2<br>>2 | <br>26 (22.6)<br>11 (9.6)<br>34 (29.6)<br>19 (55.9)<br>8 (23.5)<br>7 (20.6) | <br>172 (25.8)<br>66 (9.9)<br>201 (30.2)<br>117 (58.2)<br>55 (27.4)<br>29 (14.4) | <br>0.46<br>0.91<br>0.89<br><br>0.64 |
| Fluid bolus administered by transport team or referral site, n (%) | 43 (37.4) | 149 (22.4) | <0.01 |
| Hypothermia, n (%) | 14 (12.2) | 30 (4.5) | <0.01 |
| | | | |
| Travel distance referral to destination in kilometers, median (IQR) | 70 (25, 249) | 47 (20, 161) | 0.20 |
| Mode of transport for travel from referral to destination by air, n (%) | 31 (27.2) | 163 (24.6) | 0.55 |
| | | | |
| Mortality, n (%) | 33 (28.7) | 24 (3.6) | <0.01 |
| Age at mortality (day), median (IQR) | 10 (4, 24) | 15 (5, 56) | 0.19 |
| Age at transfer, n (%)<br><1 day<br>1 day<br>2 day<br>≥3 day | <br>38 (33.0)<br>64 (55.7)<br>1 (0.9)<br>12 (10.4) | <br>215 (32.4)<br>371 (56.0)<br>11 (1.7)<br>66 (9.9) | <br><br>0.93 |

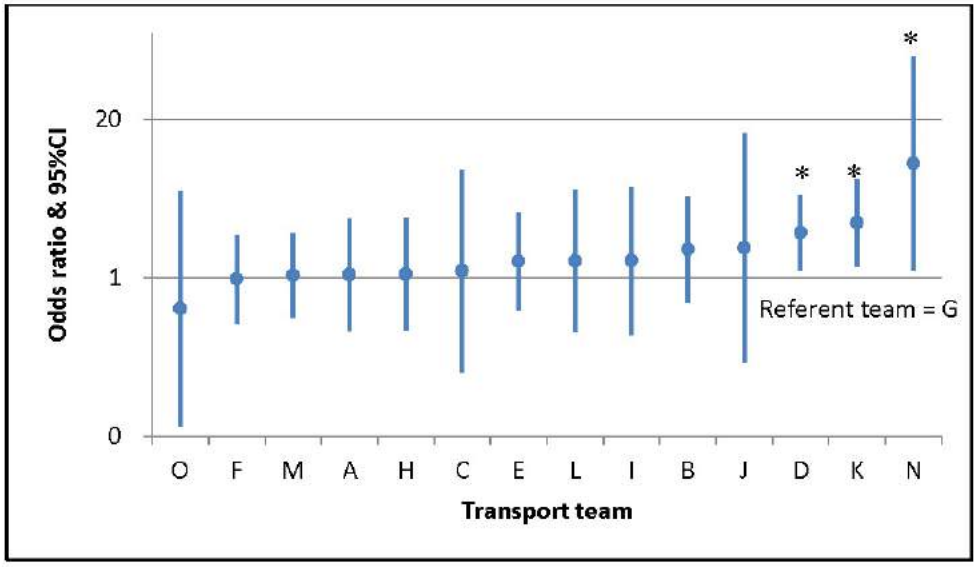
IQR=interquartile range
sd=standard deviation
GA=gestational age
BW=birth weight

Table 2. Multivariate logistic analysis of factors associated with severe brain injury

| Variable | Adjusted OR (95% CI) | P |
|---|---|---|
| GA (per week) | 0.77 (0.71, 0.85) | <0.01 |
| Chest compressions or epinephrine for resuscitation | 1.81 (1.08, 3.05) | 0.03 |
| Transport team arrived prior to delivery | 0.83 (0.51, 1.33) | 0.43 |
| Fluid bolus received | 1.61 (1.00, 2.58) | 0.05 |
| Hypothermia | 1.89 (0.83, 4.35) | 0.13 |

OR=odds ratio
GA=gestational age

Figure 1. Variation in severe brain injury rates by transport team




Data presented as multivariate model odds ratios and 95% confidence interval relative to the referent team G (selected as the median team for unadjusted rate)

*statistically significant from referent team G

## Poster 148

### A CLINICAL PATHWAY OF COMBINED EEG MONITORING IN HIGH-RISK CRITICALLY ILL NEONATES

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Children's Hospital of Eastern Ontario

**Introduction:**
Under treatment and overtreatment of neonatal seizures may both result in neurological morbidity. As neonatal seizures have poor clinical correlation, aEEG, despite low sensitivity, is widely used in Neonatal Units, for ease of bedside interpretation. vEEG, the gold standard, is a limited resource needing expert interpretation. We hypothesize that using aEEG combined with vEEG will increase the sensitivity and specificity of seizure detection and reduce unnecessary anti-convulsants use as compared to aEEG alone.

**Methods:**
Prospective cohort of neonates admitted to CHEO NICU with suspected seizures between April 1st 2018 to present. aEEG and vEEG were connected as soon as possible after admission. Seizures (clinical/aEEG) were documented by bedside clinicians and compared to the vEEG. Bedside clinicians could call a neurologist at any time for a clinical or aEEG concern, for remote review of the vEEG. Outcomes include concordance of aEEG and vEEG events and number of episodes where management was changed based on both readings.

**Results:**
21 out of 26 patients (mean GA 38 weeks) met inclusion criteria and had both modalities recording simultaneously during their admission (total 25 recordings). The mean time from vEEG request to placement was14.2 hours. 18 patients received anti-convulsants prior to vEEG placement. No seizure was identified by either modality in 22 recordings. Seizures were identified in 3 vEEG recordings; the aEEG picked up some of the seizures in 2 of those recordings, for an overall aEEG specificity of 0.95, negative predictive value 0.9, sensitivity 0.33 and positive predictive value 0.5. The bedside clinician contacted a neurologist 6 times; in 2 cases, this prevented unnecessary anti-convulsant treatment.

**Conclusions:**
In this small sample, aEEG had good specificity for ruling out seizures, but low sensitivity for detecting them. The new combined pathway may improve care and avoid unnecessary treatment. Timely vEEG accessibility is a challenge requiring attention.

## Poster 149

### SLEEP SPINDLES AS POTENTIAL BIOMARKERS OF MOTOR OUTCOME IN NEONATAL HYPOXIC-ISCHEMIC ENCEPHALOPATHY

**Nicolas Déom**[1,2], **William April**[1,2], **Zamzam Mahdi**[1,2], **Jessica Gennaoui**[1], **Laura Hannen**[1], **Mihaela Felezeu**[1], **Bohdana Marandyuk**[1], **Ala Birca**[1,2]
[1]CHU Sainte-Justine, [2]Université de Montréal

**Introduction:**
Hypoxic ischemic encephalopathy (HIE) is the most frequent cause of death and neurologic sequelae in neonates born at term. Half of neonates with HIE develop ischemic brain injuries involving rolandic cortices and motor pathways, shown predictive of adverse outcomes such as cerebral palsy. Brain plasticity can modify these outcomes. Sleep spindles recorded using electroencephalography (EEG) over rolandic

cortices typically emerge by two months of age and may represent markers of plasticity. We hypothesize that the power of sleep spindles during slow-wave sleep in two-month-old infants is associated with the early motor outcome after neonatal HIE.

**Methods:**
We included ten consecutive infants (6 girls) who presented neonatal HIE and had follow-up EEG recordings including slow-wave sleep at a postmenstrual median age of 48.4 weeks (range 43.9-58.1 weeks), as well as motor outcome assessments at four months using the Alberta Infant Motor Scale (AIMS). We quantified EEG spectral power using fast Fourier transforms. We categorized motor outcomes as corresponding to typical *versus* atypical development (4 versus 6 infants with an AIMS score above and below the 10$^{th}$ percentile, respectively). A mixed model ANOVA was used to evaluate the difference in relative EEG spectral power recorded over central (rolandic) electrodes as a function of motor outcome.

**Results:**
We observed significantly higher relative spectral power corresponding to spindles (12-16 Hz) in infants with a typical versus atypical motor development $F\ (1,8) = 10.1$ , $p = 0.013$. The partial eta squared suggests a large effect size: $\eta^2 = 0.557$.

**Conclusions:**
The spectral power in the sleep spindles frequency range at two months of age is associated with the early motor outcome in neonatal HIE. Future studies should assess the value of this potentially robust plasticity biomarker for predicting long-term motor deficits and for guiding early intervention.

## Poster 150

### THE BENEFICIAL EFFECT OF SILDENAFIL ON HORIZONTAL AND AMACRINE CELLS IN THE RETINOPATHY OF PREMATURITY

**Ruofan Song**[1], **Alexandra Belanger**[1], **Zehra Khoja**[2], **Pia Wintermark**[2]
[1]McGill University, [2]Montreal Children's Hospital, McGill University

**Introduction:**
Many children worldwide still lose their vision secondary to their retinopathy of prematurity (ROP). ROP is known to reduce the number of neurons in retina, including bipolar cells, horizontal cells, and amacrine cells. Previous studies have suggested the potential therapeutic role of sildenafil for ROP and mentioned its role in improving the number of bipolar cells. The objective of our study is to investigate the effect of sildenafil on the number of horizontal cells and amacrine cells in the oxygen-induced retinopathy (OIR) model.

**Methods:**
Sprague-Dawley rats were exposed from postnatal day 4 to day 14 (P4-P14) to either hyperoxia (80% oxygen) interrupted by three 0.5-hour periods of normoxia (21% oxygen) per day (OIR rats) or normoxia only (control rats). OIR rats were then randomized to sildenafil (OIR-sildenafil) or vehicle (OIR-vehicle) from P15 to P21; control rats received vehicle (control-vehicle). Retinas were collected at P30 for immunohistochemistry staining of horizontal cells and amacrine cells. One-way ANOVA was applied to compare the number of cells at three different distances from the optic nerve (0µm, 1866µm, and 3110µm) between the OIR-sildenafil group, the OIR-vehicle group, and the control-vehicle group.

**Results:**
Hyperoxia caused a reduction in the number of horizontal cells in the central (*p=0.001*) and mid-peripheral (*p=0.009*) retina and a reduction in the number of amacrine cells throughout the retina (*p=0.03* central,

*p=0.02* mid-peripheral, and *p=0.04* peripheral), compared to control animals. Sildenafil treatment given after hyperoxia improved the number of horizontal cells and amacrine cells back to levels not anymore significantly different from controls in the mid-peripheral and peripheral retina, but not centrally (*p=0.002* horizontal cells, *p=0.02* amacrine cells).

**Conclusions:**
Sildenafil treatment given after hyperoxia exposure significantly improved the number of horizontal and amacrine cells, thus confirming its therapeutic potential on neurons in the context of ROP.

## Poster 151

### OPIOIDS AND SHIVERING INFLUENCE EEG BACKGROUND EVOLUTION IN ASPHYXIATED NEONATES UNDERGOING THERAPEUTIC HYPOTHERMIA

**Zamzam Mahdi**[1,2], **Bohdana Marandyuk**[1], **Beatrice Desnous**[1], **Anne-Sophie Liet**[1], **Rasheda Chowdhury**[1,2], **Kenza Ibrir**[1,2], **William April**[1,2], **Nicolas Déom**[1,2], **Veronica Birca**[1], **Josianne Malo**[1,2], **Sophie Tremblay**[1,2], **Gregory Lodygensky**[1,2], **Mathieu Dehaes**[1,2], **Lionel Carmant**[1,2], **Ala Birca**[1,2]
[1]Sainte-Justine University Hospital Center (SJUHC), [2]University of Montreal

**Introduction:**
Hypoxic-ischemic encephalopathy (HIE) remains the leading cause of neonatal death and subsequent severe neurologic sequelae in survivors. Currently, the standard of care for infants with HIE is therapeutic hypothermia, which is effective at providing neuroprotection. However, preclinical animal data have shown a loss of neuroprotection in unsedated piglets undergoing hypothermia, potentially due to the effects of shivering and low body temperature. Our group and others showed that electroencephalographic (EEG) background, a strong predictor of HIE outcome, is also a reliable indicator of HIE evolution in time. The purpose of our study was to evaluate whether shivering estimated using electromyographic activity (EMG) and opioid sedation influenced the evolution of EEG background activity during and after hypothermia in neonates with HIE.

**Methods:**
We retrieved data from a retrospective cohort of 17 near-term neonates (>36 weeks) with moderate HIE without any EEG seizures monitored with continuous EEG during therapeutic hypothermia and at least 12h after its end. We then quantified EMG activity as an estimator of shivering and EEG discontinuity as an index of EEG background impairment. A two-way analysis of variance for repeated measures was used to test the interaction between EMG activity and EEG discontinuity evolution, with opioid cumulative doses received during hypothermia introduced as a co-variable.

**Results:**
We observed a three-way interaction between the evolution of EEG discontinuity, EMG activity and cumulative opioid doses ($F_{1,15}$=5.1, $p$=0.03). A better recovery of the EEG background from the 1st day of hypothermia to 12h post-therapy was observed in neonates who experienced less shivering ($F_{1,15}$=5, $p$=0.04) and those who received higher doses of opioids during hypothermia ($F_{1,15}$=11.2, $p$=0.004).

**Conclusions:**
Exposure to opioids and reduced shivering during hypothermia is associated with a better recovery of cerebral activity in neonates with HIE. Our findings suggest the need for a clinical standardization of sedation protocols.

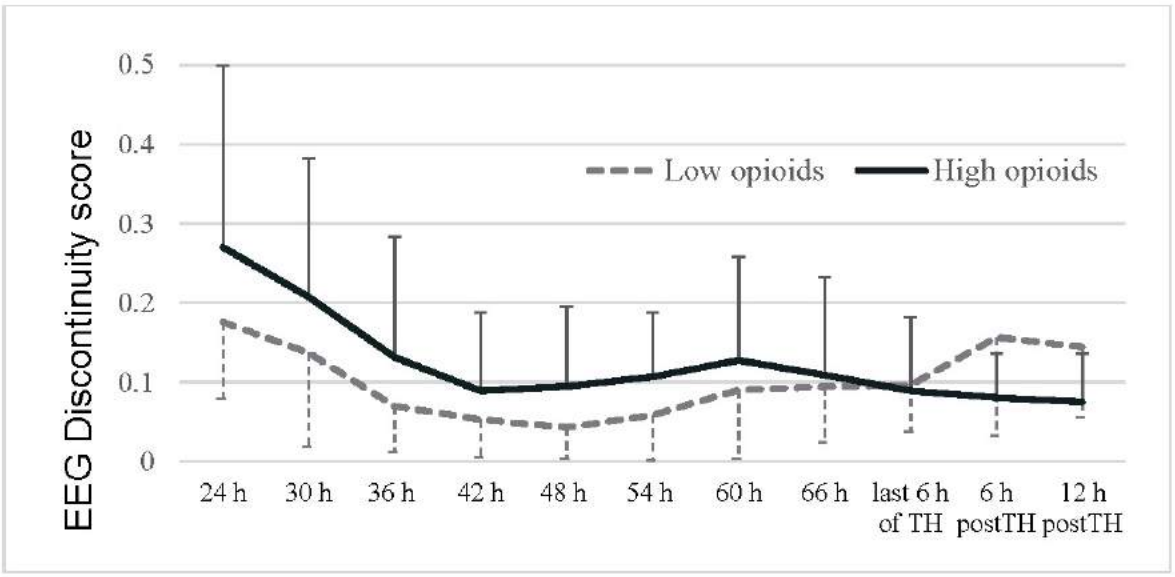


**Fig. 1.** Evolution of the mean EEG discontinuity scores from 24 h of life up to to 12 h after therapeutic hypothermia (TH) in neonates with hypoxic-ischemic encephalopathy (HIE) who received higher (continuous curve) and lower cumulative doses of opioids (dotted curve). Error bars display standard deviations of the mean for the groups with higher (upper error bars) and lower (lower error bars) doses of opioids.

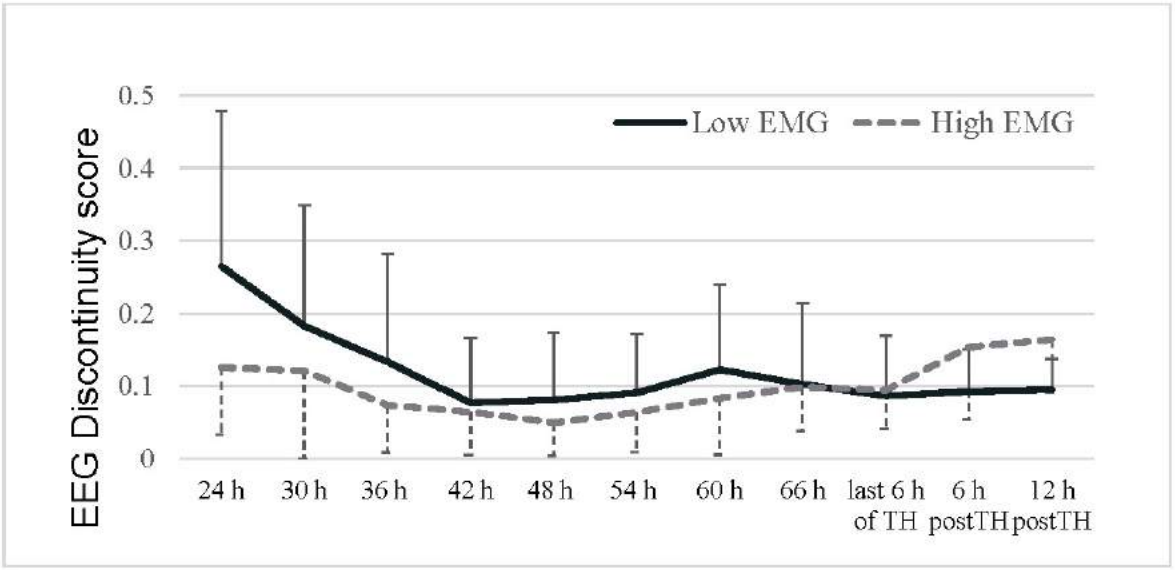


**Fig. 2.** Evolution of the mean EEG discontinuity scores from 24 h of life and up to 12 h after therapeutic hypothermia (TH) in neonates with hypoxic-ischemic encephalopathy (HIE) with lower (continuous curve) and higher EMG activity (dotted curve). Error bars display standard deviations of the mean for the groups with low (upper error bars) and high (lower error bars) EMG activity.

## Poster 152

### STUDYING THE COMBINED EFFECTS OF HYPOTHERMIA AND SILDENAFIL ON BRAIN INJURY FOLLOWING NEONATAL HYPOXIA-ISCHEMIA.

**Yandi Zheng**, **Armin Yazdani**, **Zehra Khoja**, **Pia Wintermark** (McGill University)

**Introduction:**
Sildenafil, a phosphodiesterase-5 inhibitor, was shown to improve brain injury recovery after hypoxia-ischemia (HI) in a rat model of term neonatal encephalopathy. However, it is unclear whether combining sildenafil treatment with therapeutic hypothermia would further improve the treatment outcome. The objective of this study is to investigate the effects of the combination of therapeutic hypothermia and sildenafil on the brain morphology of term-equivalent rat pups with HI-induced brain injuries.

**Methods:**
Hypoxia-ischemia (HI) was induced in rat pups at postnatal day 10 (P10) by a left common carotid ligation (ischemia) followed by a 2-hour exposure to 8% oxygen (hypoxia), and sham-operated rat pups served as the controls. HI rat pups were randomized to receive no additional treatment, hypothermia (32°C for 5 hours) only, sildenafil (50 mg/kg 2x/day for 7 days) only, or a combination of hypothermia and sildenafil. The rats were sacrificed 2 days (P12) and 20 days (P30) after HI, and their brains were extracted, coronally sectioned, and stained with hematoxylin and eosin for structural assessments.

**Results:**
At P12, there were no significant differences in the extent of brain injury between the different groups. However, at P30, the HI rat pups that received no treatment showed significant reduction in left and right hemispheric size, ratio of left and right hippocampal size, and the widths of corpus callosum and external capsules, all of which were restored by the combined treatment of hypothermia and sildenafil. Animals treated with each treatment separately still demonstrate some degree of injury. Hypothermia was more effective than sildenafil on reducing cortical infarction and corpus callosum injury, while sildenafil was more effective than hypothermia on improving hippocampal injury.

**Conclusions:**
The combination of sildenafil and hypothermia after neonatal HI may be more efficient than each treatment separately. Further analysis is required to understand the specific effects of each treatment.

## Poster 153

### RISK FACTORS FOR EPILEPSY IN NEONATES WITH HYPOXIC-ISCHEMIC ENCEPHALOPATHY AND SEIZURES

**William April**[1], **Simon Frédérick Richard**[1], **Brigitte Martin**[2], **Nicolas Déom**[1], **Béatrice Desnous**[1,2], **Zamzam Mahdi**[1], **Josianne Malo**[2], **Bohdana Marandyuk**[1], **Paola Diadori**[2], **Philippe Major**[2], **Anne Lortie**[2], **Sophie Tremblay**[1,2], **Gregory Lodygensky**[1,2], **Lionel Carmant**[1,2], **Ala Birca**[1,2]
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**Introduction:**
One third of neonates with acute seizures secondary to hypoxic-ischemic encephalopathy (HIE) develop epilepsy, which interferes with their neurodevelopment and quality of life. The current ability to predict the risks for epilepsy is very limited and the effectiveness of antiseizure medication to prevent epilepsy has not been established. This study aims to determine the clinical risk factors for epilepsy in neonates with seizures in the context of HIE.

**Methods:**
We performed a retrospective study of 59 consecutive near-term (>35 weeks) neonates with HIE experiencing neonatal seizures, born or transferred to Sainte-Justine Hospital, followed for a median of 9 months (range, 5-98 months). Perinatal and follow-up data, including neonatal seizure characteristics, were documented via chart review. We applied Fisher's exact test, T-tests, Mann-Whitney tests and Kaplan-Meier curves to assess the associations.

**Results:**
Among 59 neonates, 41 (70%) underwent therapeutic hypothermia and 9 (15%) developed epilepsy (median age 18 months; interquartile range, IQR 6-39). Lower median Apgar scores at 10 min (3, IQR 2-4 *vs* 5, IQR 3-8, $p$=0.026) and higher average Sarnat scores (2.1±0.2 *vs* 1.6±0.5, $p$=0.001) were associated with epilepsy. All three neonates with status epilepticus developed epilepsy. Recurrence of neonatal seizures over a longer period of time (4 days, IQR 4-7 *vs* 2 days, IQR 1-2, $p$=0.002), higher median cumulative doses of phenobarbital administered before discharge (80.5 mg/kg, IQR 55-116.5 *vs* 30 mg/kg, IQR 20-41, $p$<0.001), increased median number of different anticonvulsants attempted (3, IQR 2-3 *vs* 1, IQR 1-2, $p$=0.015), the presence and severity of ischemic brain injury on MRI ($p$=0.027) were also associated with epilepsy. Prescription of antiseizure medication at discharge did not influence outcome.

**Conclusions:**
Severity of cerebral insult and difficulty to control neonatal seizures were both potential predictors of epilepsy in neonates with HIE, highlighting the importance to treat and prevent neonatal seizures precociously.

**Table 1: Clinical characteristics of the patients with HIE and seizures during the acute phase and at discharge as a function of epilepsy diagnosis[a]**

| Variable | Full cohort n=59 | Epileptic n=9 | Non-epileptic n=50 | *p*-value[b] |
|---|---|---|---|---|
| Maternal age | 30.1 ± 6.0 | 30.9 ± 7.9 | 30.0 ± 5.6 | 0.679 |
| Sex (male) | 28 (48) | 3 (33) | 25 (50) | 0.477 |
| Birth weight (kg) | 3.224 ± 0.675 | 3.095 ± 0.334 | 3.247 ± 0.719 | 0.506 |
| Gestational age (weeks) | 39.2 ± 1.9 | 39.9 ± 1.0 | 39.0 ± 2.0 | 0.194 |
| Emergent caesarian | 29 (49) | 6 (66) | 24 (46) | 0.299 |
| Apgar scores | | | | |
| 1 min | 2 (1,3.25) | 0 (0,1) | 1 (1,3) | 0.371 |
| 5 min | 4 (2,6) | 2 (0,2) | 4 (1.25,5.75) | **0.034** |
| 10 min | 5 (3,7.75) | 3 (2,4) | 5(3,7.75) | **0.026** |
| Resuscitation score | 4 (3,6) | 6 (4,6) | 4 (3,6) | 0.056 |
| Initial pH | 7.02 ± 0.17 | 6.93 ± 0.22 | 7.04 ± 0.16 | 0.079 |
| Average Sarnat score | 1.65 ± 0.47 | 2.08 ± 0.20 | 1.55 ± 0.45 | **0.001** |
| Therapeutic hypothermia | 41 (70) | 9 (100) | 32 (64) | **0.046** |
| *Status epilepticus* confirmed on EEG | 3 (5) | 3 (33) | 0 (0) | **0.003** |
| High seizure burden (>20%) | 9 (15) | 3 (33) | 6 (12) | 0.130 |
| Seizures suspected before EEG installation | 49 (83) | 9 (100) | 40 (80) | 0.333 |
| Admission length (days) | 13 (8,20.25) | 31 (15,36.25) | 12 (8,19) | **0.015** |
| Persistence of acute-phase seizures (days) | 2 (1,4) | 4 (4,7) | 2 (1,2) | **0.002** |
| Cumulative phenobarbital[c] dose (mg/kg) | 30 (20,48.5) | 80.5 (55,116.5) | 30 (20,41) | **< 0.0005** |
| Number of ASMs to control seizure | 1 (1,2) | 3 (2,3) | 1 (1,2) | **0.015** |
| Use of maintenance LVT[c] | 11 (19) | 2 (22) | 9 (18) | 0.670 |
| ASM prescribed at discharge | 22 (37) | 5 (56) | 17 (34) | 0.272 |
| LVT prescribed at discharge | 8 (14) | 2 (22) | 6 (12) | 0.595 |

[a]Data is displayed according to one of the following: mean ± standard deviation, number (percentage), or median (interquartile range)
[b]Significant values are shown in bold
[c]Employed to control neonatal seizures before discharge

## Poster 154

### CUMULATIVE VENTILATION MEASURES MORE SENSITIVE THAN ONLY BRONCHOPULMONARY DYSPLASIA SEVERITY FOR BRAIN MATRIX ASSOCIATIONS AT TERM EQUIVALENT AGE OF PRETERM INFANTS

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[1]CHU Sainte-Justine, [2]University of Montreal

**Introduction:**
Bronchopulmonary dysplasia (BPD) is associated with impaired neurodevelopment and closely linked to the management of ventilation in the neonatal period. However, the link between BPD severity, ventilation technique used and brain integrity has not been specifically described. The purpose of this study was to see the link between brain measurements, the severity of the BPD and the ventilation technique used.

**Methods:**
This retrospective study included preterm infants (<29 weeks of gestational age (GA)) with BPD at 36 weeks of GA. All newborns were born at the Sainte Justine University Hospital between 2009 and 2012 and had a magnetic resonance imaging examination before 43 weeks of GA. Ventilation variables were measured at each day of hospitalisation every 6 hours and cumulatives oxygen (O2) and mean airways pressure were calculated. Oxygen saturation index was calculated from these cumulative measures. Brain metrics were obtained from T2-weighted coronal and axial images and T1-weighted sagittal images. Data were analysed with SPSS by linear regression.

**Results:**
59 patients met the inclusion criteria and had good quality images. Severity of BPD at 36 weeks of GA was associated with reduced estimated basal ganglia surface ($p < 0.05$). Higher cumulative O2 was associated with smaller bi-frontal and bi-parietal diameters, cerebellum diameter, thickness of corpus callosum at genu and estimated basal ganglia surface ($p < 0.05$). Higher cumulative mean airway pressure was associated with smaller bi-frontal and bi-parietal diameters and estimated basal ganglia surface ($p < 0.05$).

**Conclusions:**
Premature infants with severe BPD and/or with a story of prolonged mechanical ventilation with high O2 requirements are at increased risk of abnormal or delayed brain development. Cumulative O2 and pressure measures might be more reflective of true injury load compared to BPD severity classification only as it more representative of the whole hospitalization course.

## Poster 155

### PRE- AND POSTOPERATIVE INTERACTIONS BETWEEN NEURONAL, VASCULAR AND METABOLIC ACTIVITY IN NEONATES WITH D-TRANSPOSITION OF THE GREAT ARTERIES

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**Introduction:**
Neonates with d-transposition of the great arteries (dTGA) have fetal and preoperative disordered blood circulation. The goal of this report was to study neuronal, vascular and metabolic changes through the hospital stay of neonates with dTGA using multimodal non-invasive advanced NIRS and EEG bedside monitoring.

**Methods:**
Fifteen neonates with dTGA were recruited (Table1). Preoperative EEG was recorded for 4h followed by a 24h-postoperative recording starting from 15h post-surgery. EEG background was quantified using the EEG discontinuity score, with high values indicating higher levels of impairment. Advanced NIRS measures of hemoglobin oxygen saturation ($SO_2$) and an index of cerebral blood flow ($CBF_i$) were used to derive an index of cerebral $O_2$ metabolism ($CMRO_{2i}$). $O_2$ extraction fraction ($OEF$) was estimated using $SO_2$ and peripheral arterial oxygen saturation ($SaO_2$). Hemoglobin concentration in the blood ($HGB$) was retrieved from blood gases. Postoperative parameters were sub-grouped with respect to the vasoactive-inotropic score (VIS) such that the status of baby was unstable (VIS>0) or stable (VIS=0). Parameters were compared using general linear mixed models corrected for repeated measurements.

**Results:**
EEG discontinuity increased significantly from preop to 15h-18h postop followed by a decrease (non-significant) over 19h-24h postop period (Fig.1A). Preop $CBF_i$ and $SaO_2$ were significantly higher and lower, respectively, compared to postop period (Fig. 1B, C). These data may reflect preoperative brain sparing which prioritizes blood flow to the brain. Postop $SaO_2$ and $OEF$ were significantly higher than preop values (Fig.1C, D). The significant decrease in $SO_2$ from preop to postop may be compensatory to decreased $HGB$ (Fig.1E, F). Finally, preop $CMRO_{2i}$ (Fig.1G) was significantly lower compared to postop levels, which may indicate increased post-surgery oxygen demand and consumption.

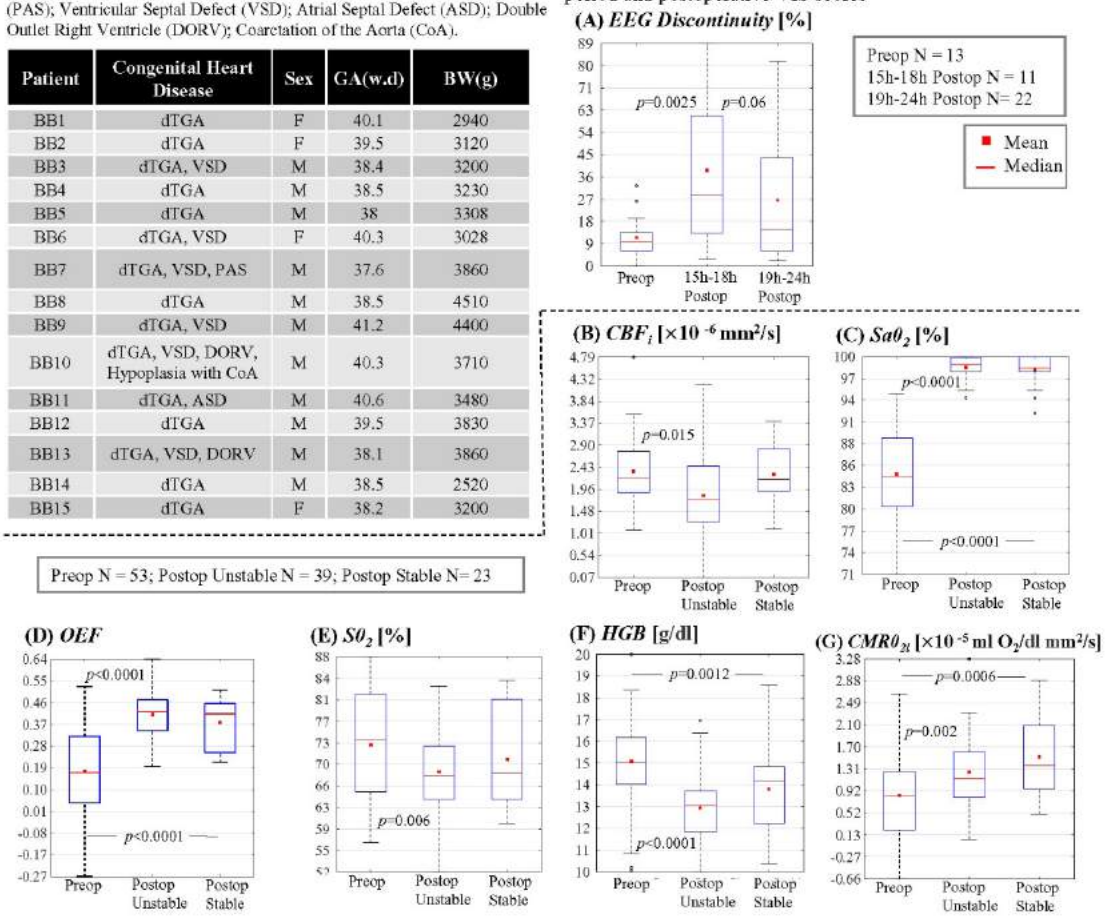
**Conclusions:**
Our multimodal approach provided a neurovascular insight into the cerebral physiology at the bedside of neonatal dTGA. Further studies will report the relationship between these parameters and neurodevelopment outcomes.

**Table1.** Patient characteristics
Gestational age (GA); w.d (weeks.days); Birth Weight (BW); d-Transposition of the Great Arteries (dTGA); Pulmonary Artery Stenosis (PAS); Ventricular Septal Defect (VSD); Atrial Septal Defect (ASD); Double Outlet Right Ventricle (DORV); Coarctation of the Aorta (CoA).

| Patient | Congenital Heart Disease | Sex | GA(w.d) | BW(g) |
|---|---|---|---|---|
| BB1 | dTGA | F | 40.1 | 2940 |
| BB2 | dTGA | F | 39.5 | 3120 |
| BB3 | dTGA, VSD | M | 38.4 | 3200 |
| BB4 | dTGA | M | 38.5 | 3230 |
| BB5 | dTGA | M | 38 | 3308 |
| BB6 | dTGA, VSD | F | 40.3 | 3028 |
| BB7 | dTGA, VSD, PAS | M | 37.6 | 3860 |
| BB8 | dTGA | M | 38.5 | 4510 |
| BB9 | dTGA, VSD | M | 41.2 | 4400 |
| BB10 | dTGA, VSD, DORV, Hypoplasia with CoA | M | 40.3 | 3710 |
| BB11 | dTGA, ASD | M | 40.6 | 3480 |
| BB12 | dTGA | M | 39.5 | 3830 |
| BB13 | dTGA, VSD, DORV | M | 38.1 | 3860 |
| BB14 | dTGA | M | 38.5 | 2520 |
| BB15 | dTGA | F | 38.2 | 3200 |

Preop N = 53; Postop Unstable N = 39; Postop Stable N= 23

**Figure1.** Boxplot representation of **(A)** EEG, and **(B-G)** advanced NIRS parameters with respect to preoperative period and postoperative VIS scores



## Poster 156

### HIPPOCAMPAL GROWTH IS IMPAIRED IN HUMAN ASPHYXIATED NEWBORNS

**Chloe Wang**, **Bianca Olivieri**, **Armin Yazdani**, **Pia Wintermark** (McGill University)

**Introduction:**
Birth asphyxia remains a devastating condition in term newborns, causing significant mortality worldwide and often leading to cerebral palsy and cognitive deficits in survivors. Even though hippocampal neuronal loss has been widely described in rodent models of birth asphyxia, studies of hippocampal impairment in human neonates remain sparse. The objective of our study was to assess hippocampal growth over the first month of life in term asphyxiated newborns.

**Methods:**
Term asphyxiated newborns treated with hypothermia between 2008 to 2018 were included. Brain magnetic resonance imaging (MRI) studies performed during the first two months of life were used to measure hippocampal surface and length. Measurements were compared between asphyxiated newborns with brain injury and newborns without brain injury according to MRI timing.

**Results:**
409 MRI studies were available in 257 asphyxiated newborns and 10 healthy newborns. 31% (127/409) scans were performed during the 1$^{st}$ week of life, 55% (223/409) during the 2$^{nd}$ week of life, and 14% (59/409) beyond the 2$^{nd}$ week of life. Hippocampal length was significantly reduced axially by the 2$^{nd}$ week of life ($p = 0.03$ on days 7-14 of life, and $p = 0.01$ on days 15-50 of life) and hippocampal surface was significantly reduced axially beyond the 2$^{nd}$ week of life ($p = 0.03$) in asphyxiated newborns with brain injury, compared to those without injury. No significant difference was found in coronal measurements. Hippocampal growth significantly increased axially in the newborns without injury between the first two weeks of life and beyond the 2$^{nd}$ week of life ($p = 0.002$ length and $p < 0.001$ surface); there was no such growth in the asphyxiated newborns with brain injury.

**Conclusions:**
Brain injuries secondary to birth asphyxia are associated with a reduction in hippocampal growth impairments. Further studies are required to understand how these hippocampal injuries contribute to later neurodevelopmental impairments.

## Poster 157

### PRENATAL MARKERS OF ATYPICAL NEURODEVELOPMENT IN CHILDREN WITH CONGENITAL HEART DEFECTS

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**Introduction:**
A growing body of literature demonstrate that survivors of congenital heart defects (CHD) are at increased risk of neurodevelopmental delay, which frequently manifests as motor delay during the first year of life. The aim of this study is to determine maternal, fetal and obstetrical prenatal predictors of an atypical or delayed neurodevelopment. This information could help assist decision-making during prenatal counseling.

**Methods:**
In a retrospective cohort study, we reviewed the prenatal records of the 53 children with CHD followed at the *Clinique d'Investigation Neuro-Cardiaque* (CINC) of the Ste-Justine University Hospital Center born between

2013 and 2016. The neurodevelopmental outcome of those children was determined using the Alberta Infant Motor Scale (AIMS) at 4 months. Prenatal records and obstetric ultrasound reports were reviewed. CHD were classified as per antenatal finding according to the Davey Severity Scale. Associations between antenatal factors and atypical neurodevelopment (AIMS scores < 5$^{th}$ percentile) were assessed using bivariate analyses.

**Results:**
Twenty-three infants (43.4%) had atypical neurodevelopment. The median fetal head circumference to abdominal circumference ratio was lower, 1.0 (intequartile range, IQR 0.99-1.1) in infants with atypical neurodevelopment compared to 1.1 (IQR 1.0-1.1) in those with typical neurodevelopment (p = 0.056). Median birth weight tended to be lower in newborns with atypical compared to typical neurodevelopment (2940g, IQR 2495-3375 *vs* 3177g, IQR 3010-3465, p=0.063), while median Davey Severity Scale score tended to show higher values in those with atypical compared to typical neurodevelopment (4, IQR 4-5 *vs* 4, IQR 3-4, p=0.073).

**Conclusions:**
Although there were no statistically significant prenatal predictors of poor neurodevelopment, our results show a trend towards an association between atypical neurodevelopment and lower head circumference to abdominal circumference ratio, lower birth weight and more severe cardiac defect. A larger cohort will be necessary to validate these findings.

## Poster 158

### RESTING STATE FUNCTIONAL CONNECTIVITY (RS-FC) ON NEONATAL RATS. A MULTISPECTRAL OPTICAL IMAGING SYSTEM (OIS) STUDY

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**Introduction:**
Extreme prematurity, is often associated with long lasting neurological impairments. Signs of injury are not always readily identifiable on early imaging. Knowing that RS-FC already appears in the third trimester of gestation [Doria V, et al. 2010], the study of FC could constitute a promising tool. This study aims at: 1) identify the presence of RS-FC at an early age in rat pups and 2) assess the impact of inflammatory white matter injury (WMI) on RS-FC.

**Methods:**
Three days old (P3) rats were injected with lipopolysaccharide (LPS; n=5) or saline (Sham; n=4) in the corpus callosum. At P10, RS-OIS was acquired on rat pups anesthetized with medetomidine and isoflurane [Bukhari Q, et al. 2017]. Acquisitions were performed with a multispectral RSOIS in order to measure the RS signals for both HbR and HbO2 contrasts. Data were preprocessed as described in [Guevara E, et al. 2017]. Functional connectivity was evaluated using Seed-Based analysis for three cortical regions: motor, retrosplenial and somatosensory cortex. Pearson's correlation coefficient with a CI of 95% was used for the FC analysis.

**Results:**
RS-OIS was able to detect the presence of strong RS networks in the pups with both HbR and HbO2 contrasts. When comparing LPS to Sham, we observe decreased FC values for injured brains but wider spatial territories.

**Conclusions:**
In conclusion, RS-OIS is able to detect early cerebral changes following inflammatory WMI using a new sedation protocol. We observed decreased FC and spatial territory which could reflect a certain neuroplasticity. Histological evaluation is ongoing. Our aim is to validate this approach as a tool for early assessment of neuroprotective efficiency.

## Poster 159

### MAGNESIUM SULFATE AS A POTENTIAL NEUROPROTECTIVE AGENT IN NEONATES WITH D-TRANSPOSITION OF THE GREAT ARTERIES

**Lixin Zhang**, **Geneviève Côté**, **Bohdana Marandyuk**, **Béatrice Desnous**, **Marien Lenoir**, **Kenza Ibrir**, **Kim Anh La**, **Rasheda Chowdhury**, **Amélie Doussau**, **Carine Nyalendo**, **Anne Monique Nuyt**, **Gregory Lodygensky**, **Marie-Josée Raboisson**, **Mathieu Dehaes**, **Geneviève Du Pont-Thibodeau**, **Nancy Poirier**, **Ala Birca**
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**Introduction:**
Despite continuous efforts to improve intraoperative neuroprotection, half of neonates with d-transposition of the great arteries (TGA) acquire new post-operative brain injury that are potentially associated with neurodevelopmental sequelae. Recent evidence showed a neuroprotective effect of $MgSO_4$ in preemies and in adults suffering from cerebral ischemia following cardiac surgery or arrest, but these effects have not been explored in neonates with TGA. This study aimed to investigate, in neonates with TGA, whether intraoperative serum Magnesium levels and $MgSO_4$ supplementation influence: (i) intraoperative neurological vulnerability estimated using cerebral hemoglobin oxygen saturation ($rSO_2$) and serum lactates, and (ii) postoperative morbidity evaluated using the Pediatric Logistic Organ Dysfunction (PELOD) score on admission, as well as the pediatric intensive care unit and total postoperative length of stay.

**Methods:**
Between 2013 and 2018, we retrieved data from a retrospective cohort of 65 near-term neonates (44 boys) with TGA who underwent corrective cardiac surgery with cardiopulmonary bypass (CPB) within their 1$^{st}$ month of life. Medical records were reviewed to collect clinical data including intraoperative serum Magnesium levels, serum lactate and $rSO_2$; and cumulative doses of $MgSO_4$ administered as intravenous boluses or perfusion (in 42 and 2 neonates, respectively). Correlations between these parameters were evaluated using Spearman's rank test (significance level of 0.05).

**Results:**
Higher pre-CPB Magnesium levels tended to correlate with higher $rSO_2$ ($p=0.09$), and correlated with lower pre-CPB lactates ($p<0.05$). Higher post-CPB Magnesium levels correlated with higher post-CPB $rSO_2$, higher minimum $rSO_2$, lower postoperative PELOD scores and shorter duration of hospital stay ($p<0.05$). Higher cumulative doses of $MgSO_4$ also correlated with higher post-CPB $rSO_2$ ($p<0.01$).

**Conclusions:**
Our data suggest that $MgSO_4$ may provide neuroprotection in neonates with TGA by reducing intraoperative neurologic vulnerability and postoperative morbidity. Future studies will assess whether $MgSO_4$ supplementation reduces brain injury and/or improves neurodevelopment in TGA and other congenital heart disease.

## Poster 160

### THE EFFECT OF UMBILICAL CORD MILKING ON NEURODEVELOPMENTAL OUTCOMES OF PRETERM INFANTS AT 36 MONTHS OF AGE: A RANDOMIZED CONTROLLED TRIAL

**Walid El-Naggar**, **Douglas D McMillan**, **Arif Hussain**, **Anthony Armson**, **Linda Dodds**, **Andrew Warren**, **Robin Whyte**, **Michael Vincer**, **David Simpson** (Dalhousie University)

**Introduction:**
Background: Umbilical cord milking at birth has been reported to have short-term benefits to preterm infants. Long-term neurodevelopmental outcomes need more exploration. Objective: To compare the effects of cord milking (CM) vs. early cord clamping (ECC) at birth on neurodevelopmental outcomes at 36 months corrected age.

**Methods:**
Preterm infants <31 weeks' gestation who were randomized to receive CM or ECC at birth, were evaluated at 36 months corrected age. Neuro-developmental outcomes were assessed by blinded examiners using Bayley Scales of Infant and Toddler Development (version III). Intention-to-treat was used for primary analyses.

**Results:**
Out of the 74 infants included in the original trial, 2 died and 65 (90%) infants were evaluated at 36 months corrected age. Patients' characteristics were similar in both study groups except for higher hemoglobin concentration on NICU admission (p=0.02) and longer duration of phototherapy (p=0.02) in the CM group (Table 1). The median cognitive, motor and language scores were higher in the CM group but the difference didn't reach statistical significance (Table 2). Similarly, there were no significance differences in the rates of cerebral palsy, developmental impairment, deafness or blindness though cerebral palsy was higher in the CM group.

**Conclusions:**
In this randomized controlled trial, no significant differences in neuro-developmental outcomes at 36 months corrected age, were found between preterm infants who received CM and those who received ECC at birth. The absence of difference may be attributed to the small sample size. Larger trials are needed to evaluate the neuro-developmental outcomes of CM.

**Table 1: Maternal, perinatal, neonatal characteristics and short-term outcomes**

| Measure | UCM (N=34) | ECC (N=31) | p-value |
|---|---|---|---|
| Maternal age in years, mean (SD) | 29.8 (4.7) | 31.5 (5.1) | 0.11 |
| Race/ethnicity, n (%) non-white | 3/14 (21.4) | 4/15 (26.7) | 1 |
| Single mothers | 2/28 (7.1) | 2/29 (6.9) | 1.00 |
| SES: 1&2 vs. 3-5, n (%) | 11/31 (35.5) | 5/25 (20) | 0.24 |
| Antenatal steroids, n (%) | 34 (100) | 31 (100) | 1 |
| Magnesium sulfate, n (%) | 28 (82.4) | 24 (77) | 0.76 |
| Histologic chorioamnionitis, n (%) | 1 (2.9) | 2(6.5) | 0.55 |
| Vaginal deliveries, n (%) | 14 (41.2) | 9 (29) | 0.44 |
| Gestational age in weeks, mean (SD) | 27.3 (1.9) | 27.4 (2) | 0.93 |
| Males, n (%) | 13(38.2) | 16(51.6) | 0.32 |
| Birth weight in grams, mean (SD) | 1050 (280) | 1047 (284) | 0.71 |
| Apgar score at 5 min, median (IQR) | 7 (6,8) | 8 (6,8) | 0.59 |
| Intubation at birth, n (%) | 20 (57.1) | 16 (51.6) | .66 |
| Chest compression, n (%) | 3 (8.8) | 2 (6.5) | 1.00 |
| Admission temperature, median (IQR) | 36.6 (36.2,36.9) | 36.7 (36.3,36.9) | 0.31 |
| Hemoglobin on admission, mean (SD) g/dL | 163 (27.3) | 149 (24.6) | 0.02* |
| Lowest BP in 1st 24 hrs, mean (SD) | 27.5 (5.2) | 27.9 (4.6) | 0.79 |
| Peak serum bilirubin, median (IQR)mmol/L | 165 (137, 188) | 155 (130, 174) | 0.28 |
| Duration of phototherapy, median (IQR) days | 5 (4,7) | 3 (2,6) | 0.02* |
| Necrotizing enterocolitis, n | 0 | 0 | - |
| Bronchopulmonary dysplasia, n (%) | 10 (29.4) | 10 (34.5) | 0.79 |
| Post-natal steroids, n (%) | 2 (5.9) | 6 (19.4) | 0.14 |
| Grade III &IV IVH, n (%) | 6 (17.6) | 3 (9.7) | 0.48 |
| Sepsis, n (%) | 4 (11.8) | 4 (12.9) | 1.00 |
| Retinopathy of prematurity (treated), n (%) | 1 (2.9) | 1 (3.2) | 1.00 |
| Patent ductus arteriosus (treated), n (%) | 11 (32.4) | 9 (29.0) | 0.80 |
| Length of hospital stay, median (IQR) days | 83 (59, 99) | 97 (71, 118.5) | 0.14 |

**Table 2:** Neurodevelopmental outcomes at 36 months corrected age

| Measure | CM (N=34) | ECC (N=31) | p-value |
|---|---|---|---|
| Cognitive score, median (IQR) | 100.0 (95, 105) | 95 (90, 100) | 0.41 |
| Cognitive score < 85 | 0/34 (0%) | 2/30 (6.7%) | 0.22 |
| Cognitive score <70 | 0/34 (0%) | 1/30 (3.3%) | 0.47 |
| Language score, median (IQR) | 109 (100,115) | 101.5 (94.7, 109) | 0.14 |
| Language score <85 | 1/31 (3.2%) | 5/28 (17.9%) | 0.09 |
| Language score < 70 | 0/34 (0%) | 2/28 (7.1%) | 0.22 |
| Motor score, median (IQR) | 100 (94.75, 107) | 97 (88, 103) | 0.43 |
| Motor score < 85 | 5/32 (15.6%) | 6/27 (22.2%) | 0.52 |
| Motor score <70 | 3/32 (9.4%) | 2/27 (7.4%) | 1.0 |
| Any cerebral palsy | 3(8.8) | 1(3.2) | 0.14 |
| Moderate or severe cerebral palsy | 3(8.8) | 0 | 0.09 |
| Deafness | 0 | 1(2.9) | 1.0 |
| Blindness | 0 | 0 | - |

Data are presented as n (%) unless indicated otherwise

## Poster 161

### SILDENAFIL AFTER NEONATAL HYPOXIA-ISCHEMIA REDUCED HIPPOCAMPAL INJURY THROUGH PROMOTION OF NEUROGENESIS AND PREVENTION OF APOPTOSIS

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**Introduction:**
Hypoxic-ischemic (HI) injury at birth accounts for 23% of all neonatal deaths worldwide and is associated with long-term morbidity, such as cerebral palsy. Due to the limited effectiveness of neuroprotective treatments such as therapeutic hypothermia, we are investigating an alternative neurorestorative drug, sildenafil, and its effect to repair neuronal tissue damage after neonatal HI injury. Objective: To investigate the effect of sildenafil on the hippocampus, following term neonatal HI.

**Methods:**
The study was conducted using the Vannucci rat model, involving a permanent unilateral left carotid ligation (ischemia) followed by a 2-hour exposure to 8% oxygen environment (hypoxia) in Long-Evans rat pups at post-natal day 10 (P10). Sildenafil or vehicle at 50 mg/kg was administered orally twice a day from P10 to P17. Brain tissue was collected at P12, P17 and P30. Using histology, immunohistochemistry and western blotting, we analysed the difference in hippocampal surface area, neuronal numbers and expression of

neuronal and apoptosis markers between not-treated and treated HI groups and control group.

**Results:**
Following HI, there was significant damage in the dentate gyrus of the hippocampus ($p<0.05$), associated with a significant increase in the markers of apoptosis ($p<0.05$) and a significant reduction in the number of immature developing neurons ($p=0.03$) and mature neurons ($p=0.04$) in the hippocampus. Treatment with sildenafil after HI reduced the damage in the dentate gyrus ($p<0.05$), reduced markers of apoptosis ($p<0.05$), and increased neuronal numbers, including number of immature developing neurons ($p=0.01$) and mature neurons ($p=0.006$) in the hippocampus.

**Conclusions:**
Neonatal hypoxia-ischemia caused hippocampal injury, with decreased number of total neurons. Sildenafil treatment improved hippocampus injury recovery, reduced neuronal loss, and promoted neurogenesis. The exact mechanism by which sildenafil activates neurogenesis and prevents apoptosis remains to be determined.

## Poster 162

### COMPARISON OF LATE PRENATAL EXPOSURE TO LOW-DOSE IONIZING RADIATION ON THE MENTAL HEALTH OF ADULT OFFSPRING IN TWO MOUSE MODELS

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**Introduction:**
The neurobehavioural effects of late prenatal exposure to low-dose ionizing radiation (LDIR) have not been thoroughly investigated. LDIR exposures occur primarily through diagnostic procedures and have been proposed to induce damage through reactive oxidative species (ROS) and stress-pathways. To elicit potential effects, two mouse models were utilized: the radiation-resistant C57Bl/6J and the radiation-sensitive BALB/c mice. We hypothesized predispositions to depression and anxiety in the BALB/c mice, in contrast to the C57Bl/6J strain.

**Methods:**
On gestational day 15, mice were randomly assigned to either a sham condition, or one of either 50, 300, or 1000mGy doses by placing cages equidistant from a radiation source. Offspring were raised to adulthood and underwent testing designed to measure depression, general anxiety, and social anxiety. These tests included the Porsolt swim test, the open field test, and the social anxiety test. Genes associated with neurogenesis and ROS were analyzed utilizing RT-PCR on the RNA from pre-frontal cortices.

**Results:**
Analyses to date for both animal strains show there were treatment main effects in the social anxiety task: $F_{C57bl/6}(2,25) = 5.818$, $p = 0.008$, $\lambda = 0.682$, $\eta^2 = 0.318$; $F_{balb/c}(4, 22) = 5.835$, $p = 0.002$, $\lambda = 0.485$, $\eta^2 = 0.515$. For the Porsolt Swim Task, C57Bl/6 animals did not exhibit any depressive-like behaviour, $F(6, 106) = 0.510$, $p = 0.800$, $\lambda = 0.945$, $\eta^2 = 0.028$; however, BALB/c animals expressed an inhibition to depressive-like behaviours compared to sham controls: $F(2, 20) = 0.6347$, $p = 0.007$, $\lambda = 0.612$, $\eta^2 = 0.388$.

**Conclusions:**
The doses used in this study were not shown to be adverse; conversely, they have indicated an anti-depressant effect on the BALB/c animals, while the C57Bl/6 animals did not elicit any behavioural changes. Complimentary to other research, stressors within a threshold range may induce protective actions.

## Poster 163

### OLDER AGE AT ARTERIAL SWITCH OPERATION IS ASSOCIATED WITH IMPAIRED BRAIN GROWTH AND SLOWER LANGUAGE DEVELOPMENT IN INFANTS WITH TRANSPOSITION OF THE GREAT ARTERIES

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**Introduction:**
Brain injury, impaired brain growth and long-term neurodevelopmental problems are common in children with transposition of the great arteries (TGA). We sought to identify clinical risk factors for brain injury and poor brain growth and neurodevelopmental outcome in infants with TGA undergoing the arterial switch operation.

**Methods:**
The brains of 45 infants with TGA undergoing surgical repair were examined pre- and post-operatively using MRI. Brain volumes and brain injury scores were collected. The relationships between a range of clinical variables, brain injury and growth and 18-month Bayley-III scores of infant development were analyzed.

**Results:**
On pre and post-operative imaging, moderate or severe white matter injury was present in 1/5 patients while stroke was seen in 1/10 and we were unable to identify any clinical risk factors for brain injury. The presence of a ventricular septal defect ($p = 0.009$) and older age at surgery ($p = 0.007$) were associated with reduced post-operative brain size. Patients undergoing earlier (<14 days old) versus later (>14 days old) surgery had similar clinical variables. However, infants repaired later had significantly worse peri-operative brain growth (late repair post-op brain weight $z = -1.0 \pm 0.90$ versus early repair $z = -0.33 \pm 0.64$; $p = 0.008$). Bayley III testing scores fell within the normal range for all patients, although age at repair ($p = 0.03$) and days of open chest ($p = 0.03$) were associated with lower composite language score and length of stay was associated with lower composite cognitive score ($p = 0.02$).

**Conclusions:**
Delayed surgery is associated with impaired brain growth and slower language development in infants with TGA cared for at our center. While the mechanisms underlying this association are still unclear, extended periods of cyanosis and pulmonary over-circulation may adversely impact brain growth and subsequent neurodevelopment.

| | Early | Late | P-value | TGA IVS | TGA VSD (patch closure) | TGA (direct suture) | P-value |
|---|---|---|---|---|---|---|---|
| Gestational age at birth | 39 ± 1.2 | 39.3 (36, 41) | 0.44* | 39 ± 1.3 | 38.6 (38.6, 40.6) | 38.8 (36.7, 40.3) | 0.54‡ |
| Prenatal Diagnosis | 66% | 38% | 0.11† | 65% | 14% | 75% | 0.04§ |
| VSD requiring patch closure (individuals) | 3 | 4 | - | - | 7 | - | - |
| Birth weight | 3.4 ± 0.5 | 3.4 ± 0.4 | 0.94 | 3.4 ± 0.5 | 3.5 (3.0, 4.0) | 3.3 (2.5, 3.7) | 0.58‡ |
| Birth weight z-score | 0.2 ± 0.9 | 0.1 ± 0.8 | 0.91 | 0.2 ± 0.9 | 0.3 (-0.7, 1.6) | -0.1 (-1.7, 0.8) | 0.57‡ |
| Pre-operative body weight z-score | 0.1 ± 1.0 | -0.2 ± 0.9 | 0.37 | 0.1 ± 1.0 | 0.1 (-1.7, 1.5) | 0.1 (-1.9, 0.7) | 0.94‡ |
| Post-operative body weight z-score | -1.2 ± 1.0 | -1.9 ± 1.3 | 0.05 | -1.4 ± 1.1 | -1.5 (-3.2, -0.04) | -1.2 (-2.3, -1.1) | 0.81‡ |
| Change in body weight z-score | -1.3 ± 0.7 | -1.7 (-4.6, -0.4) | 0.16* | -1.3 (-4.6, -0.1) | -1.5 (-2.8, -1.0) | -1.4 (-1.7, -0.5) | 0.65‡ |
| Pre-op saturation (%) | 86 ± 6 | 80 (74, 93) | 0.006* | 85 ± 6 | 82 (70, 95) | 81 (74, 82) | 0.23‡ |
| Pre-operative intubation (days) | 1 (0, 7) | 3 (0, 21) | 0.03* | 1 (0, 21) | 1 (0, 3) | 2 (1, 15) | 0.47‡ |
| Pre-operative ECMO (individuals) | 0 | 4 | - | 4 | 0 | 0 | - |
| Pre-operative NEC (individuals) | 0 | 2 | - | 2 | 0 | 0 | - |
| Cardiopulmonary bypass time (mins) | 142 (86, 362) | 140 ± 36 | 0.92* | 139 (84, 362) | 146 (137, 176) | 125 (99, 222) | 0.54‡ |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Aortic cross-clamp time (mins) | 90 (52, 280) | 86.3 ± 26.6 | 0.61* | 81 (49, 280) | 103 (87, 121) | 75 (64, 90) | 0.09‡ |
| Deep hypothermic circulatory arrest time (mins) | 0 (0, 16) | 0 (0, 0) | 0.58* | 0 (0, 16) | 0 (0, 0) | 0 (0, 0) | 0.72‡ |
| Total support time | 142 (86, 362) | 140 ± 36 | 0.92* | 139 (84, 362) | 146 (137, 176) | 125 (99, 222) | 0.54‡ |
| Open chest post-op | 44% | 31% | 0.02† | 38% | 43% | 50% | 0.89§ |
| Days of open chest | 0 (0, 8) | 0 (0, 7) | 0.49* | 0 (0, 8) | 0 (0, 7) | 1.5 (0, 3) | 0.87‡ |
| Days of intubation | 2.5 (1, 18) | 2 (1, 12) | 0.47* | 2 (1, 18) | 5 (1, 12) | 3 (1, 7) | 0.74‡ |
| Total hospital length of stay (days) | 15 (7, 55) | 26 (8, 106) | 0.04* | 22 (7, 55) | 13 (8, 106) | 18 (12, 28) | 0.35‡ |
| Post-operative length of stay (days) | 10 (5,49) | 11 (6, 55) | 0.44* | 10 (5, 49) | 8 (6, 55) | 8 (7, 18) | 0.78‡ |
| Incidence of seizure (individuals) | 1 | 2 | - | 3 | 0 | 0 | - |
| Age at post-operative MRI (days) | 17 ± 6.8 | 25 (21, 70) | < 0.0001* | 21 (4, 36) | 33 (11, 70) | 17 (12, 26) | 0.44‡ |
| Total post-operative brain volume (ml) | 345.1 ± 37.0 | 357.3 ± 36.5 | 0.32 | 349 ± 34 | 379 (321, 408) | 294 (275, 375) | 0.04‡ |

TABLE 1: PERIOPERATIVE CLINICAL VARIABLES BETWEEN EARLY AND LATE REPAIR GROUPS AND BETWEEN TGA IVS, TGA VSD (REPAIRED WITH PATCH) AND TGA VSD (REPAIRED WITH DIRECT SUTURE); * INDICATES MANN-WHITNEY TEST, † INDICATES FISHER'S EXACT TEST, ‡ INDICATES KRUSKAL-WALLIS TEST, § INDICATES CHI-SQUARED TEST

| | Normal | Mild WMI | Moderate WMI | Severe WMI | Stroke | IVH |
|---|---|---|---|---|---|---|
| Pre-Op | 26 (57.8%) | 4 (8.9%) | 7 (15.6%) | 3 (6.7%) | 4 (8.9%) | 1 (2.2%) |
| Post-Op | 31 (68.9%) | 1 (2.2%) | 5 (11.1%) | 3 (6.7%) | 2 (4.4%) | 1 (2.2%) |

TABLE 2: PRE AND POST-OPERATIVE WHITE MATTER INJURY SCORES, INCIDENCE OF STROKE AND INTRAVENTRICULAR HEMORRHAGE

| Composite score | Early Repair | Late Repair | P-Value |
|---|---|---|---|
| Cognitive | 106 ± 9 | 100 ± 10 | 0.13 |
| Language | 98 ± 13 | 90 ± 20 | 0.50 |
| Motor | 104 ± 13 | 102 ± 12 | 0.76 |

TABLE 3: BAYLEY III SCORES IN EARLY VS LATE REPAIR GROUPS

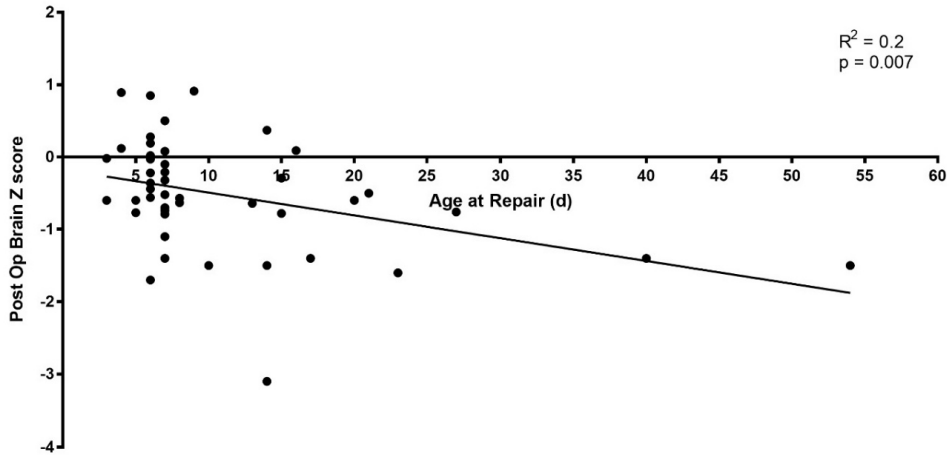


FIGURE 1: LINEAR REGRESSION OF AGE AT SURGERY AND POST OPERATIVE BRAIN SIZE IN ALL PATIENTS WITH TGA

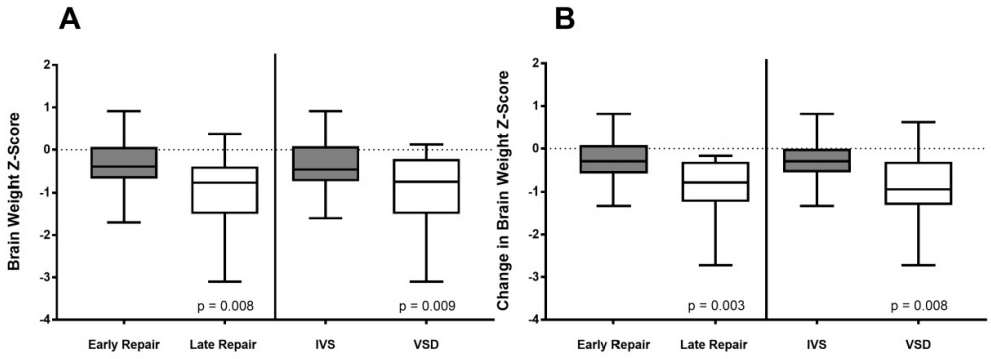


FIGURE 2: A: POSTOPERATIVE BRAIN WEIGHT Z-SCORE COMPARISON IN THE EARLY AND LATE REPAIR GROUPS AND IN THOSE WITH TGA/IVS AND TGA/VSD; B: CHANGE IN BRAIN WEIGHT Z-SCORE BETWEEN PRE- AND POST-OPERATIVE SCANS IN EARLY AND LATE REPAIR GROUPS AND IN THOSE WITH TGA/IVS AND TGA/VSD

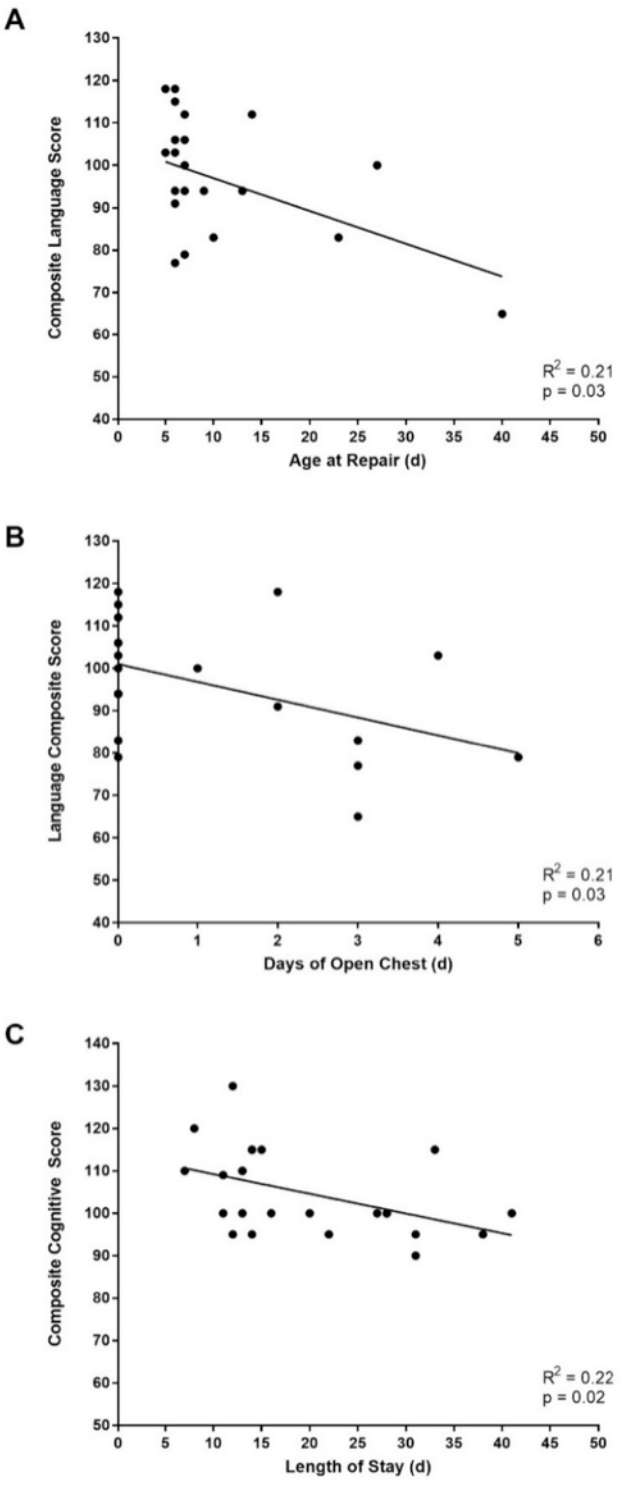


FIGURE 3: LINEAR REGRESSION OF BAYLEY III SCORES WITH CLINICAL PREDICTOR VARIABLES. A: COMPOSITE LANGUAGE SCORES HAD A NEGATIVE CORRELATION WITH AGE AT SURGERY AND B: DAYS OF OPEN CHEST; C. COMPOSITE COGNITIVE SCORES HAD A NEGATIVE CORRELATION WITH LENGTH OF STAY IN THE HOSPITAL

## Poster 166

### ARE THERE DIFFERENCES IN COUNSELLING PRACTICES BETWEEN ANTENATAL HEALTH CARE PROVIDERS REGARDING GESTATIONAL WEIGHT GAIN?

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**Introduction:**
Inappropriate gestational weight gain (GWG) has a significant impact on perinatal outcomes and long-term health for mothers and their infants. In an earlier study, our research group identified that more than half of women gained in excess of recommendations and that excess GWG was associated with adverse perinatal outcomes. Given the high rates of excess GWG, we sought to understand the counselling practices of health care providers (HCP) and the barriers and facilitators they may experience.

**Methods:**
Semi-structured interviews were conducted with family physicians (FP), midwives (MW) and obstetricians (OB). Convenience and purposive sampling techniques were used to ensure groups had equal representation. A grounded theory approach was used for data analysis. Codes, categories and themes were generated using NVIVO software.

**Results:**
Participants reported that they provided GWG counselling to all clients early in pregnancy. Counselling topics covered by all three provider groups included: GWG targets, general nutrition, exercise information, gestational diabetes, and dispelling misconceptions about GWG. The HCPs did not routinely address the adverse maternal and neonatal outcomes linked to GWG or the caloric requirements for pregnancy. MWs offered specific strategies for eating healthy and exercising in pregnancy, while FPs and OBs did not. This may be because OBs and FPs experienced time restrictions while MWs had longer appointments, enabling them to provide more detailed counselling. The HCPs faced similar barriers to counselling including patient attitudes, social and cultural barriers, knowledge gaps and accessibility of resources. Enthusiasm from patients and easy access to dieticians and gestational diabetes clinics motivated HCPs to provide more in-depth GWG counselling.

**Conclusions:**
Our results indicated that GWG counselling practices and the barriers to effective counselling are similar between MWs, OBs and FPs providing antenatal care in Ontario. Future studies should explore strategies to improve the effectiveness of GWG counselling among antenatal care providers.

## Poster 167

### THE CHALLENGES OF POSTPARTUM NURSES FOLLOWING A CHANGE IN A NEWBORN EMERGENCY RESPONSE PROCESS

**Jasmeet Dhadda** (University of Calgary)

**Introduction:**
Recent changes to a resuscitation protocol, labelled the Newborn Emergency Response Process (NERP), at a tertiary care center, requires the transportation of equipment to the mother's bedside. The fragility of newborns and the anxiety experienced by parents in such circumstances, never mind the time constraints associated with the movement of equipment and personnel, require a study in order to identify and understand the life-threatening consequences associated with the new NERP.

**Methods:**
The descriptive qualitative study of registered nurses (RNs) will analyze actual experiences with the new NERP. The researcher will purposefully sample RNs (n= 4) to explore the challenges postpartum RNs face in following the new NERP. Participants will be invited to participate in one-on-one, 20-30-minute semi-structured interviews to gain some understanding of each participant's interpretation of what happened, why it happened and how it transpired. To aid in the thematic analysis, the researcher will audiotape and then transcribe verbatim the interviews.

**Results:**
RNs, as practice scientists, rely on evidence-based practice to direct them in exercising their scope of practice. The adoption of a new process should meet the same standard, especially when associated with any life threatening or anxiety-provoking event. RNs should identify and remedy any anticipated problem before and during implementation, which, as it happens, did not take place with the introduction of the new NERP.

**Conclusions:**
This study has limited applicability. Any conclusions necessarily pertain to the situation at hand. However, the conclusions have wider meaning for RNs expected to implement new protocols without their input and evaluation. As such, the study has ramifications for other populations, likely less fragile but as vulnerable.

## Poster 168

### A SYSTEMATIC REVIEW OF YOUTUBE VIDEOS ON PAIN MANAGEMENT DURING NEWBORN BLOOD TESTS

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**Introduction:**
Newborn blood sampling is painful and causes distress. However, high quality evidence shows breastfeeding, skin-to-skin care, or small volumes of sweet solutions effectively reduce pain. This systematic review of YouTube videos aimed to i) evaluate infants' pain during the blood sampling, ii) ascertain use of recommended pain management strategies.

**Methods:**
YouTube was searched using the terms "baby blood test" and "heel prick". The inclusion criteria were videos showing human newborns undergoing heel prick or venipuncture, with an English title and audio. Data, including date of upload, number of views, likes/dislikes, pokes, types of comments, and any observable pain treatments used, were entered into an Excel spreadsheet. Pain was assessed using: (1) a subset of Neonatal Facial Coding System (NFCS) (brow bulge, eye squeeze, nasolabial furrow, and stretch open mouth) for a total score between 0-4; and (2) crying duration. Descriptive data were presented as frequencies, medians and interquartile ranges.

**Results:**
A total of 55 videos showing 63 procedures were included. The majority of infants (70%) showed the highest NFCS score of 4 at time of poke. For the videos where cry could be measured, 63% cried (median 72sec, max 300sec). Most scenarios (n = 48, 76%) showed caregivers attempting to soothe/comfort their baby during the procedure. Only 5 scenarios (8%) showed BF, 1 scenario showed SSC, and 6 scenarios (10%) showed sucrose. The most common comforting techniques were stroking (n = 9, 28%) and holding (n = 9, 28%). One-quarter of scenarios showed no pain management strategies.

**Conclusions:**
Despite knowledge translation efforts, there is a minimal use of the effective recommended pain treatment strategies of breastfeeding, skin-to-skin care or sucrose. This highlights the importance of developing, implementing and evaluating effectiveness of knowledge translation tools to foster improvement in infant pain management practices.

## Poster 169

### ENHANCING PRETERM INFANTS AND PARENTAL OUTCOMES IN THE NICU THROUGH THE OPTIMIZATION OF EVIDENCE-BASED NURSING PRACTICES

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**Introduction:**
Nurses have a leading role in humanizing the NICU experience and improving neonatal and parental outcomes by implementing evidence-based practices such as optimizing breast milk feedings, skin-to-skin contact, developmental care, and family-centered care. However, challenges to the adoption of these practices include lack of training and resources constraints. A virtual community of practice (CVP) was developed among nurse leaders and university-based nurse researchers across all NICUs (level III) in Quebec, to support and harmonize the implementation of these evidence-based practices.

**Methods:**
Based on clinical and research experience as well as on a literature review, nursing-sensitive indicators were identified for the 4 targeted practices. A multiple case study will examine the indicators in the six NICUs individually and compare them at the different measurement times determined (before and after the activities carried out under the CVP-Neon@t). The baseline indicators will guide priorities in the development of clinical teaching tools, strategies and activities through the CVP-Neon@t. Following the implementation of these activities, the indicators will be evaluated again 18 months after the baseline assessment.

**Results:**
The CVP-Neon@t is accessible to members through an internet platform. The steps taken includes workshops with key stakeholders to collaboratively establish CVP objectives and format, organizing face-to-face educational, networking and tool-sharing activities among CVP members, engaging CVP members in the selection of nursing-sensitive indicators for data collection and the targeted NICU best-practices, and development of an evaluation framework to measure the impact of the project activities.

**Conclusions:**
Through the CVP-Neon@t, this project serves to share educational strategies in order to harmonize care practices between all Quebec level III NICUs, to collect baseline as well as outcome data to evaluate the effects of a CVP on optimizing the implementation of the evidence-based nursing practices. Ultimately, the goal is to enhanced neonatal and parental outcomes in the NICU.

## Poster 170

### A 5-YEAR PERSPECTIVE OF LIGHT AND NOISE LEVELS IN A CANADIAN NICU

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**Introduction:**
Preterm infants' exposure to high light and noise intensity in the NICU can affect significantly their growth and development. To avoid the repercussions associated with an inadequate exposure of infants to light and noise, intensity levels should be measured for proper environmental control. The purpose of this study is to describe the light and noise intensity levels in a level 3 NICU evaluated over a 5-year period.

**Methods:**
A longitudinal descriptive design was used. Light and noise levels were measured over a 5-year period, between 2012 and 2017, including a change of unit configuration to assess whether levels met the experts and organization's recommendations. Collected data were analyzed using descriptive statistics.

**Results:**
A total of 71 noise and light intensity measurements were made between 2012 and 2017. The average noise intensity was 55.3 dB in 2012, 50.86 dB in 2014, 49.37 dB in 2015 and 48.66 dB in 2017. For light intensity, findings indicated that the average was 141.5 lux in 2015 and 106.99 lux in 2017. Noise intensity levels exceeded 45 dB 94.96% of the time in 2012 compared to 85.29% in 2014. For 2015 and 2017, noise levels were higher than 45 dB 56.24% and 68% of the time in 2017. For light intensity, according to the data collected, it was more than 600 lux only 4.38% of the time in 2015 and 0.21% of the time in 2017.

**Conclusions:**
Light and noise levels did not change significantly over the 5-year period and they are not meeting the experts and organization's recommendations, despite a change in unit configuration. Control of light and noise intensity in a NICU always require nurses' clinical practice changes.

## Poster 171

### TEMPORAL TRENDS IN RATES OF MULTIPLE BIRTHS IN CANADA AND THE UNITED STATES FROM 1991 TO 2017

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**Introduction:**
There is ongoing interest in rates of multiple births in Canada and the United States (US) due to rising use of assisted reproductive technologies (ART) coupled with perinatal risks associated with multiple gestations. We updated an earlier assessment of trends in multiple births in both countries, particularly in view of recent policies mandating single embryo transfer in Ontario and Quebec.

**Methods:**
This was a descriptive study of temporal trends in rates of multiple live births in Canada and the US from 1991-2017. We used data from Statistics Canada and the US Centers for Disease Control and Prevention to calculate rates of multiple, twin and triplet or higher-order (triplet+) live births. Temporal trends were visually assessed using plots and quantified using relative change within specific calendar intervals, with particular emphasis on the 2009-2017 interval.

**Results:**
From 2009-2017, rates of twin live births slightly decreased in Canada (from 32.4 to 30.3 per 1,000) and remained stable in the US (at 33.3 per 1,000), while rates of triplet+ live births decreased dramatically in Canada (from 105.5 to 71.7 per 100,000) and the US (from 153.5 to 101.6 per 100,000). During this interval, the relative reduction in twins was significant in Ontario (-10%, 95%CI: -14% to -7%) and Quebec (-6%, 95%CI: -11% to -1%), but not in the rest of Canada or the US (-3% and 0%, respectively). Concurrently, the relative reduction in triplet+ live births was greatest in Ontario (-43%, 95%CI: -55% to -28%) and the US (-34%, 95%CI: -36% to -31%), while Quebec and the rest of Canada, had non-statistically significant reductions of 20%, 17%, respectively.

**Conclusions:**
Since 2009, rates of twin live births have slightly decreased in Canada and the US, while rates of triplet+ live births have continued to drop steeply. Recent ART policies might have impacted these trends

## Poster 172

### THREE-YEAR GROWTH AND COGNITIVE OUTCOMES AMONG PRETERM INFANTS WITH NECROTIZING ENTEROCOLITIS

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**Introduction:**
Necrotizing enterocolitis (NEC), a disease of the gastrointestinal tract, occurs in approximately 1-3 per 1000 births, with the majority occurring in preterm infants. Infants who survive NEC may face growth challenges due to risk of gastrointestinal complications and malnutrition. This study aims to evaluate the effect of NEC on the growth and IQ of preterm infants.

**Methods:**
The Preterm Infant Multicentre Growth Study followed preterm infants in level II/III NICUs from three North American cities from 2001-2014 (Calgary, Regina, and San Diego). The growth of preterm infants (23-32 weeks gestation) with and without NEC at 3-years corrected-age was compared using BMI and head-circumference. We also assessed the association between NEC and IQ at 3-years.

**Results:**
There were 1417 infants included in the analysis, of which 8.5% had NEC. Of those with NEC (n=121), 78.5% were born before 28-weeks gestation. The mean birthweight of infants with NEC was 845g, compared to 943g in infants without NEC. At 3-years, the difference in sex-specific BMI Z-scores between children with and without NEC was not statistically significant. Whether infants with NEC were fed human milk, formula or both at NICU discharge did not affect sex-specific BMI Z-scores at 3-years. Head-circumference Z-scores at 3-years were significantly associated with NEC (p=0.002), even after adjusting for birthweight and small-for-gestational-age (SGA). NEC was also significantly associated with lower IQ at 3-years (p=0.03), and remained significant when adjusted for infants' head-circumference and SGA.

**Conclusions:**
The results suggest that preterm infants with NEC are not at increased risk of suboptimal growth compared to preterm infants without NEC; however, our results suggest that these infants have smaller head circumferences and lower IQs at 3-years. Further investigation may provide insights on the mechanisms by which NEC can compromise head growth and identify potential modifiable factors to support the optimal neurodevelopment of preterm infants with NEC.

## Poster 173

### TRAJECTORIES OF MATERNAL DEPRESSIVE SYMPTOMS FROM PREGNANCY TO 11 YEARS POSTPARTUM - FINDINGS FROM A PROSPECTIVE UK BASED COHORT

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**Introduction:**
Maternal depression is one of the most common morbidities during the perinatal period. Recent studies suggest

maternal depressive symptoms continue or recur from prenatal to postnatal period. While several studies have explored maternal depression either prenatally or postnatally, little research has examined the patterns of maternal depressive symptoms from pregnancy to postnatal period in a community-based longitudinal cohort. The aim of the study was to investigate the chronicity and severity of maternal depressive symptoms over time.

**Methods:**
Data were drawn from over 14,000 women participating in Avon Longitudinal Study of Parents and Children (ALSPAC), a UK based prospective birth cohort. Maternal depressive symptoms were assessed during pregnancy to 11 years postpartum using Edinburgh Postnatal Depression Scale (EPDS) at ten time points (18, 32 weeks pregnancy, 2, 8, 21, 33, 61, 73, 97, 134 months postpartum). Maternal depressive trajectories were built using latent growth mixture modeling (LGMM). Multinomial logistic regression (MLR) was used to identify predictors of maternal depressive symptoms.

**Results:**
Majority of women were 25 years or older (61%), were partnered (66%), did not complete a university degree (71%), and were Caucasian (78%). LGMM identified four distinct classes over time: “low depression” (79%), “high depression” (11%), “increasing depression” (6%) and “decreasing depression” (4%) classes. MLR indicated that compared to women in the low depression class, women in the “high depression class” were non-Caucasian, had lower family income, history of depression, conflicting partner relationship, adverse life events and lower social support (Adjusted OR ranged from 1.40-3.67). Furthermore, conflicting partner relationship was the sole predictor of women in the increasing depression class (Adjusted OR 1.22).

**Conclusions:**
Heterogeneity and continuity of depressive symptoms highlights the importance of mental health assessments during the perinatal period. Early screening and intervention for women in high and increasing risk groups may improve maternal health outcomes.

## Poster 174

### DISCORDANCE OF PREGNANCY INTENTIONS AND BIRTH CONTROL USE: IMPLICATIONS FOR PRECONCEPTION HEALTH

**Nikki Stephenson**, **Suzanne Tough**, **Amy Metcalfe** (University of Calgary)

**Introduction:**
Preconception health, the health of either males or females at any time prior to pregnancy, affects long-term health of potential offspring. While many persons opt to change health behaviours just prior to pregnancy, approximately one-third of pregnancies are un-planned. This study aims to compare the sociodemographic characteristics of those who do or do not use birth control among those who place high importance on avoiding pregnancy, and the corresponding associations with alcohol, smoking, and cannabis use.

**Methods:**
Data was derived using a subsample (n=3533) of respondents from the 2014 Canadian Community Health Survey. Inclusion criteria for this study was: 15-24 years of age, sexual activity 12 months preceding the survey, being non-married, and completion of the ‘sexual behaviours’ questionnaire. The associations between intention to avoid pregnancy, birth control use, sociodemographic, and substance use variables were examined using chi-square tests and odds ratios.

**Results:**
Overall, 92.8% (95%CI:91.8%-93.6%) of respondents reported that it was important to avoid becoming pregnant, yet only 82.6% (95%CI:81.3%-83.8) of them reported usually using birth control. Respondents

wanting to avoid pregnancy, yet who did not use birth control were younger (p=0.005), less educated (p=0.004), had a lower household income (p=0.005), and self-identified as a visible minority (p<0.001). Among those who want to avoid pregnancy, those not on birth control were more likely to smoke (32.4%, 95%CI:28.3%-36.8%; OR=1.43, 95%CI:1.15-1.78) but less likely to consume alcohol (88.5%, 95%CI:85.3%-91.1%; OR=0.67, 95%CI:0.48-0.93) than those on birth control. However cannabis use did not differ between these groups (36.5%, 95%CI:25.4%-49.2%; OR=0.97, 95%CI:0.53-1.73).

**Conclusions:**
Sexually active youth who desire to avoid pregnancy fail to consistently use birth control and continue to engage in health behaviours that increase risk of adverse pregnancy outcomes. Care providers should engage in preconception health discussions as well as contraceptive counselling with all youth, ideally before they are sexually active.

## Poster 175

### ASSESSMENT OF ANXIETY DURING PREGNANCY USING MULTIPLE ANXIETY SCALES: DO ANXIETY SCALES DIFFER IN THEIR ABILITY TO ASSESS ANXIETY DURING PREGNANCY?

**Kamala Adhikari**[1], **Scott Patten**[1], **Tyler Williamson**[1], **Alka Patel**[1], **Shahirose Premji**[2], **Suzanne Tough**[1], **Nicole Letourneau**[1], **Gerald Giesbrecht**[1], **Amy Metcalfe**
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**Introduction:**
No consensus exists regarding the most suitable anxiety screening scale for use during pregnancy. Existing studies have used multiple scales to measure anxiety during pregnancy; however, the information about the validity and comparability of those scales is limited. This study examined the performance of multiple scales in measuring anxiety during pregnancy.

**Methods:**
Anxiety data, measured by the State Anxiety Inventory (SAI) 20-item and 6-item scale, the Edinburgh Postnatal Depression Scale Anxiety Subscale (EPDS-3A), and the Symptoms Checklist-90 (SCL-90), were obtained from two comparable pregnancy cohort studies in Alberta (n=5,528). Both cohorts completed the EPDS-3A, 231 women participated in both cohorts, 3,341 women completed the SAI, and 2,187 women completed the SCL-90. Confirmatory factor analysis was used to test the goodness-of-fit of the scales and Spearman correlation was used to estimate the correlation (r) between the anxiety scores in the total sample and only amongst women with complete data.

**Results:**
The inter-item correlations between items ranged from 0. 42 to 0.58 for the EPDS-3A, 0.13 to 0.63 for the SAI-20, 0.38 to 0.65 for the SAI-6, and 0.16 to 0.51 for the SCL-90. The SAI-6 had adequate model fit, whereas, the SAI-20 and the SCL-90 had inadequate model fit. Model fitness test for the EPDS-3A was inapplicable due to few items. The correlation between the SAI-20 and SAI-6 was excellent (r=0.93). The correlation of EPDS-3A with other scales was low to moderate (r (SAI-20)=0.57, r (SAI-6)=0.53, and r (SCL-90)=0.44). The correlation of SCL-90 with both the SAI-20 and SAI-6 was negligible (r<0.30).

**Conclusions:**
The inadequate fitness may indicate that these scales do not measure anxiety well and the nonequivalence may indicate that these scales conceptualize anxiety differently. This leads to invalid anxiety measurement during pregnancy. The invalid measurement prevents policy recommendations and clinical practices for improving maternal mental health outcomes.

## Poster 176

### DEVELOPING A MODEL TO EXPLAIN THE ASSOCIATION BETWEEN PRENATAL MATERNAL STRESS AND AUTISM: THE ROLE OF MEDICATIONS IN LABOR AND DELIVERY.

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**Introduction:**
The incidence of Autism Spectrum Disorder (ASD) has increased almost five-fold in Canada and the United States over the past 20 years. At the same time, the use of medication during delivery, such as the synthetic oxytocin (OT) Pitocin and the epidural analgesic Bupivacaine, has increased significantly; these medications have also been associated with an increase in ASD risk. Interestingly, prenatal maternal stress (PNMS) has been linked to both pregnancy complications and ASD. Our goal was to develop a model, based on the scientific literature, that would provide a plausible, biological link between PNMS and risk of ASD via administration of OT, epidural, or both.

**Methods:**
We searched PubMed for animal and human research on the following associations: PNMS to obstetric complications, use of OT and epidural, and ASD; use of OT and use of epidural; OT and epidural during delivery and ASD.

**Results:**
The results of our review support a model in which PNMS causes biological changes in the mother's oxytocinergic system, while simultaneously weakening the fetal blood-brain barrier leaving the fetal brain more vunerable. These changes increase the risk of obstetrical complications at birth, which are then controlled by Pitocin injection. This medicalization increases the pain in the parturient, which leads to administration of the analgesic Bupivacaine epidural. Although the literature supports an additive model of ASD, the synergy of these two medications is also theoretically related to ASD, especially during severe complications.

**Conclusions:**
Although there is research supporting individual paths in the cascade of effects suggested by this model, to date there are no studies that can adequately test the full model. Given the public health implications, we plan to put this model to the test using data collected from women who had experienced a sudden-onset natural disaster in pregnancy.

## Poster 177

### GLOBAL EPIDEMIOLOGY OF STILLBIRTH: ANALYSIS OF THE DEMOGRAPHIC AND HEALTH SURVEYS

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**Introduction:**
Over 2.5 million stillbirths occur annually in low- and middle-income countries, imposing a significant economic and societal burden. We investigated maternal and socioeconomic factors that were associated with stillbirth among women in high rate countries.

**Methods:**
We studied the reproductive histories of women from 52 countries between 2002-2016 as part of the Demographic and Health Surveys Program. Stillbirth was defined as a baby born with no signs of life at or after

28 weeks' gestation (7 calendar months). Factors of interest included maternal age at first birth, parity, interval from marriage to first birth/ stillbirth, body mass index (BMI), and socioeconomic factors. Multivariable logistic regression was used to identify risk factors and correlates of stillbirth, adjusted for survey design and country.

**Results:**
Among 930,266 women, there were 7,580 with at least 1 stillbirth (weighted prevalence 0.96%, 95% confidence interval [CI]: 0.92-1.0). The mean age at first livebirth/stillbirth was 20.3±4.1 years, 23% were nulliparous, and 9.8% had BMI>30. The Table shows the association of stillbirth with obstetrical history and socioeconomic characteristics. Women with stillbirths were more likely to have lower parity, (adjusted odds ratio [aOR] 2.33, 95% CI: 2.07-2.63 for nulliparous women vs 5 or more births), be of lower socioeconomic status (aOR 1.52, 95% CI: 1.29-1.81 for lowest vs highest wealth), or have never been married (aOR 4.28, 95% CI: 3.70-4.96). Maternal age, area of residence, and BMI were not associated with stillbirth in this population.

**Conclusions:**
In this large global study of stillbirth, family planning, obstetrical history, and socioeconomic factors emerged as the most important determinants. Strategies to reduce incidence focused on reducing poverty, inequality, improving access to obstetrical care and family planning are required to achieve reductions in rates of stillbirths in high burden countries.

**Table** Distribution of stillbirth among women and association with obstetrical and maternal socioeconomic covariates across 52 low- and middle-income countries, 2002-2016

| | Total Sample (N=922,646) | | | | Stillbirth Rate per 1000 (n=7580) | | | | Odds Ratio (95% CI) | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | n | % | 95% CI | | n | % | 95% CI | | Unadjusted | | | Adjusted | | |
| Age at first birth, y | | | | | | | | | | | | | | |
| under 15 | 38000 | 3.9 | 3.8 | 4.0 | 241 | 101.4 | 82.9 | 119.9 | 0.96 | (0.79 - | 1.17) | 1.11 | (0.90 - | 1.37) |
| 15-19 | 397089 | 43.8 | 43.6 | 44.0 | 3194 | 98.5 | 92.6 | 104.4 | 0.95 | (0.87 - | 1.04) | 0.95 | (0.85 - | 1.05) |
| 20-24 | 364294 | 38.5 | 38.2 | 38.7 | 3056 | 90.0 | 84.0 | 96.0 | 1.00 | | | 1.00 | | |
| 25-34 | 118962 | 13.3 | 13.1 | 13.4 | 1020 | 97.6 | 84.8 | 110.3 | 1.14 | (0.98 - | 1.32) | 1.08 | (0.93 - | 1.26) |
| 35+ | 4301 | 0.6 | 0.5 | 0.6 | 69 | 169.5 | 107.7 | 231.3 | 2.18 | (1.49 - | 3.20) | 1.44 | (0.97 - | 2.13) |
| Parity | | | | | | | | | | | | | | |
| 0 | 195353 | 23.2 | 23.0 | 23.3 | 3413 | 163.4 | 152.9 | 173.9 | 2.66 | (2.40 - | 2.95) | 2.33 | (2.07 - | 2.63) |
| 1 | 253002 | 24.1 | 24.0 | 24.3 | 1425 | 67.0 | 60.6 | 73.3 | 1.13 | (0.99 - | 1.28) | 1.18 | (1.03 - | 1.36) |
| 2-3 | 294519 | 29.2 | 29.0 | 29.4 | 1524 | 75.4 | 68.3 | 82.4 | 1.10 | (0.98 - | 1.24) | 1.15 | (1.01 - | 1.30) |
| 4+ | 179772 | 23.5 | 23.3 | 23.7 | 1218 | 83.5 | 76.7 | 90.3 | 1.00 | | | 1.00 | | |
| Marriage to first birth interval, months | | | | | | | | | | | | | | |
| under 12 | 328733 | 44.6 | 44.4 | 44.9 | 1811 | 66.8 | 62.0 | 71.6 | 1.00 | | | 1.00 | | |
| 13-24 | 283447 | 28.2 | 28.0 | 28.4 | 1716 | 75.6 | 69.3 | 82.0 | 1.11 | (0.99 - | 1.24) | 1.06 | (0.95 - | 1.19) |
| 25-36 | 126915 | 10.6 | 10.4 | 10.7 | 1182 | 123.3 | 108.7 | 137.9 | 1.73 | (1.51 - | 1.99) | 1.66 | (1.44 - | 1.92) |
| 37-60 | 84636 | 6.9 | 6.8 | 7.0 | 918 | 134.8 | 118.4 | 151.1 | 1.82 | (1.57 - | 2.11) | 1.68 | (1.45 - | 1.96) |
| 61+ | 53444 | 4.6 | 4.5 | 4.7 | 568 | 127.2 | 108.1 | 146.3 | 1.65 | (1.38 - | 1.96) | 1.41 | (1.17 - | 1.70) |
| Never married | 45471 | 5.1 | 5.0 | 5.2 | 1385 | 321.4 | 291.3 | 351.6 | 6.15 | (5.31 - | 7.11) | 4.28 | (3.70 - | 4.96) |
| Body mass index, kg/m$^2$ | | | | | | | | | | | | | | |
| <18.5 | 101719 | 5.0 | 5.0 | 5.1 | 877 | 93.9 | 80.3 | 107.6 | 0.86 | (0.74 - | 1.01) | 0.78 | (0.66 - | 0.93) |
| 18.5-24.9 | 436246 | 37.9 | 37.7 | 38.1 | 3638 | 98.0 | 92.0 | 103.9 | 1.00 | | | 1.00 | | |
| 25-29.9 | 157913 | 17.9 | 17.8 | 18.1 | 1034 | 77.7 | 68.7 | 86.7 | 0.90 | (0.79 - | 1.03) | 1.08 | (0.94 - | 1.24) |
| 30+ | 68480 | 9.8 | 9.7 | 9.9 | 480 | 73.8 | 62.9 | 84.7 | 0.86 | (0.72 - | 1.01) | 1.18 | (0.99 - | 1.42) |
| missing | 158287 | 29.3 | 29.1 | 29.6 | 1551 | 111.2 | 102.4 | 120.0 | 0.94 | (0.84 - | 1.05) | 1.00 | (0.90 - | 1.12) |
| Wealth quintiles | | | | | | | | | | | | | | |
| Q1 (lowest) | 195531 | 19.3 | 19.0 | 19.6 | 2055 | 116.4 | 107.8 | 125.1 | 1.56 | (1.37 - | 1.79) | 1.52 | (1.29 - | 1.81) |
| Q2 | 195752 | 19.8 | 19.6 | 20.1 | 1829 | 108.0 | 99.6 | 116.4 | 1.48 | (1.29 - | 1.70) | 1.42 | (1.19 - | 1.68) |
| Q3 | 187125 | 20.1 | 19.9 | 20.4 | 1530 | 96.1 | 88.1 | 104.1 | 1.32 | (1.15 - | 1.52) | 1.28 | (1.09 - | 1.50) |
| Q4 | 177019 | 20.6 | 20.3 | 20.9 | 1179 | 85.5 | 75.4 | 95.7 | 1.17 | (1.01 - | 1.37) | 1.14 | (0.96 - | 1.34) |
| Q5 (highest) | 167219 | 20.1 | 19.8 | 20.4 | 987 | 73.4 | 65.4 | 81.4 | 1.00 | | | 1.00 | | |
| Maternal education | | | | | | | | | | | | | | |
| no education | 289637 | 26.8 | 26.5 | 27.1 | 2602 | 121.4 | 113.6 | 129.3 | 1.34 | (1.14 - | 1.56) | 1.60 | (1.34 - | 1.92) |
| any primary | 220125 | 29.1 | 28.9 | 29.4 | 2104 | 109.0 | 101.9 | 116.1 | 1.43 | (1.23 - | 1.67) | 1.61 | (1.35 - | 1.91) |
| incomplete secondary | 235554 | 22.2 | 21.9 | 22.4 | 1753 | 82.3 | 73.2 | 91.3 | 1.22 | (1.03 - | 1.46) | 1.17 | (0.98 - | 1.41) |
| complete secondary or higher | 164062 | 21.9 | 21.6 | 22.1 | 889 | 53.6 | 46.7 | 60.5 | 1.00 | | | 1.00 | | |
| Area of residence | | | | | | | | | | | | | | |
| urban | 312477 | 38.6 | 38.2 | 38.9 | 1988 | 76.3 | 69.1 | 83.5 | 1.00 | | | 1.00 | | |
| rural | 610169 | 61.4 | 61.1 | 61.8 | 5592 | 107.8 | 103.0 | 112.5 | 1.25 | (1.12 - | 1.38) | 1.05 | 0.93 | 1.19 |

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### PREVALENCE AND TRENDS IN DEPRESSION AND ANXIETY IN PREGNANCY, ANTIDEPRESSANT TREATMENT AND MAJOR MATERNAL CONDITIONS

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**Introduction:**
Depression/anxiety and use of antidepressant medications are common among women of reproductive age and could increase risk for maternal obesity and pregnancy-related conditions (induced hypertension and gestational diabetes) that lead to substantial maternal and child morbidity. However, recent estimates and time trends of both, antenatal depression/anxiety and gestational antidepressant use, and these common maternal conditions are lacking. This study aims to estimate the prevalence and time trends of maternal depression/anxiety, antidepressant use (overall and by specific class) as well as 3 key maternal medical conditions possibly related to depression and/or antidepressant use during pregnancy: obesity, pregnancy-induced hypertension and gestational diabetes mellitus.

**Methods:**
Using the Quebec Pregnancy Cohort data from years 1998 through 2015, we defined a cohort of deliveries. Annual prevalence of antidepressant prescriptions identified in pharmacy records and annual prevalence of maternal conditions identified using ICD-9/10 codes were calculated. Time trends analysis of prevalence, over a 17-year span, were performed using Cochran-Armitage test.

**Results:**
We included 249 234 deliveries. The prevalence of depression/anxiety during pregnancy was ranging around 5-7%. From 1998 to 2015, antidepressant use in women with deliveries increased 3-fold from 2.2% to 6.2% (Cochran-Armitage Trend test: $p<0.01$), driven by an increase in selective serotonin reuptake inhibitors (SSRI) and serotonin-norepinephrine reuptake inhibitors (SNRI) use. Increases of 6.5 fold, 2 fold and 1.3 fold between 1998 and 2015, were observed for obesity, gestational diabetes and pregnancy-induced hypertension respectively.

**Conclusions:**
The study found an overall increasing trend of gestational antidepressant use, mainly due to an increase of SSRI and SNRI prescriptions, while the prevalence of depression/anxiety diagnoses remained stable. Concomitantly, increases have been observed respectively for obesity, gestational diabetes and pregnancy induced hypertension. Uncertainty still remains on the contribution of depression and antenatal antidepressant use to the increase of these conditions during pregnancy.

## Poster 179

### DOES EXCESS FIRST TRIMESTER WEIGHT GAIN PREDICT EXCESS TOTAL GESTATIONAL WEIGHT GAIN?

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**Introduction:**
Excess total gestational weight gain (GWG), and excess first trimester (T1) GWG are associated with adverse maternal-fetal outcomes. While there are no Canadian data, previous European studies found that excess T1 GWG predicted total excess GWG. The objective of this study was to determine whether excess T1 GWG predicts excess total GWG stratified by prepregnancy BMI for normal weight, overweight and obese women.

**Methods:**
A prospective study recruited English-speaking women with a singleton pregnancy from $8^{+0}$ to $21^{+6}$ weeks' gestation in 12 obstetrical, family medicine and midwifery practices across Ontario. Excess GWG (>2.0 kg) in the first trimester (up to $13^{+6}$ weeks) was used to predict excess total GWG. GWG was classified as excess, within or below according to Institute of Medicine/Health Canada guideline. Descriptive statistics summarized data. Positive predictive value (PPV) and positive likelihood ratio (+LR) with 95% confidence intervals (CI) were used to calculate prediction. Sensitivity, specificity, negative predictive values (NPV), and negative LR (-LR) were also calculated using SAS 9.4.

**Results:**
Among 353 women, 38.5% gained in excess, while 61.5% gained within or below. There were no statistically significant differences at baseline. For normal, overweight, obese and all women, the prediction values were as follows: PPV (57%, 80%, 68%, 65%) and +LR with 95% CI [(1.51 (1.06-2.15), 0.97 (0.51-1.84), 0.98 (0.49-1.95), 1.25 (0.94-1.65)]. Table 1 presents the NPV, -LR, sensitivity and specificity of excess T1 GWG.

**Conclusions:**
In the first Canadian study, we found that excess T1 GWG did not strongly predict excess total GWG, unlike in the previous European studies. Since GWG is an important determinant of maternal-fetal outcomes, its prediction warrants further research to enable earlier pregnancy interventions.

**Table 1 –** Specificity, sensitivity, PPV, NPV, +LR and -LR of excess T1 GWG as diagnostic test of excess total GWG

| Predictive values | Normal weight | Overweight | Obese | All |
|---|---|---|---|---|
| **PPV** (95% CI) | 57% (45%-68%) | 80% (63%-92%) | 68% (46%-85%) | 65% (56%-73%) |
| **+LR** (95% CI) | 1.51 (1.06, 2.15) | 0.97 (0.51, 1.84) | 0.98 (0.49, 1.95) | 1.25 (0.94, 1.65) |
| **NPV** (95% CI) | 61% (51%-70%) | 19% (10%-33%) | 31% (19%-46%) | 44% (37%-51%) |
| **-LR** (95% CI) | 0.76 (0.59, 0.97) | 1.02 (0.66, 1.59) | 1.01 (0.72, 1.42) | 0.87 (0.74, 1.03) |
| **Excess T1 GWG as a diagnostic test** | **Normal weight** | **Overweight** | **Obese** | **All** |
| **Specificity** (95% CI) | 49% (38%-60%) | 40% (28%-52%) | 33% (20%-47%) | 42% (35%-49%) |
| **Sensitivity** (95% CI) | 68% (58%-77%) | 59% (33%-82%) | 67% (45%-84%) | 66% (58%-74%) |

**Legend: CI** – confidence interval; **GWG** – gestational weight gain; **+LR** – positive likelihood ratio; **-LR** – negative likelihood ratio; **NPV** – negative predictive value; **PPV** – positive predictive value; **T1** – first trimester

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### ANTIDEPRESSANT USE DURING PREGNANCY AND RISK OF GESTATIONAL DIABETES MELLITUS

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**Introduction:**
Antidepressants are widely used during pregnancy and have been linked to several maternal complications, however their role in gestational diabetes mellitus remains unclear. The study objective was to examine the association between antidepressants classes, types and duration of use during pregnancy and the risk of gestational diabetes.

**Methods:**
We performed a nested case-control study within the Quebec Pregnancy Cohort from 1998 to 2015. Cases of gestational diabetes were identified after week 20 of pregnancy and randomly matched 1:10 to controls on gestational age at index date (i.e. calendar date of gestational diabetes) and year of pregnancy. Antidepressants exposure was assessed by filled

prescriptions between the beginning of pregnancy (first day of last menstrual period) and index date. We estimated crude and adjusted odds ratios (aOR) with 95% confidence intervals (CI) using conditional logistic regression models.

**Results:**
Among the 20,905 cases and 209,050 matched controls, 9,741 (4.2%) women were exposed to ADs during pregnancy. Antidepressant use was associated with an increased risk of gestational diabetes (aOR= 1.19, 95% CI= 1.08 -1.30). Venlafaxine (aOR= 1.27, 95% CI= 1.09 -1.49) and amitriptyline (aOR=1.52, 95% CI= 1.25 -1.84) were also associated with an increased risk of gestational diabetes. Moreover, the risk was increased with longer duration of antidepressant use as well, specifically for serotonin norepinephrine reuptake inhibitors, tricyclic antidepressants and combined use of two antidepressants classes. No statistically significant association was observed for selective serotonin reuptake inhibitors.

**Conclusions:**
Findings suggest that exposure to antidepressants and specifically venlafaxine and amitriptyline, were associated with increased risk of gestational diabetes, after adjusting for maternal depression.

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### EARLY NUTRITIONAL DETERMINANTS OF GROWTH AMONG MODERATE TO LATE PRETERM INFANTS ADMITTED TO THE NEONATAL INTENSIVE CARE UNIT

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**Introduction:**
Infants born 32-34 weeks' gestational-age (GA) represent >40% of infants admitted to Canadian Neonatal Intensive Care Units (NICUs), yet little is known on the impact of early (<72h hours of life [HOL]) nutritional practices on their growth. We hypothesized that energy and protein intakes during first 72 HOL would be inversely associated with weight change percentage at 7 days (%WC).

**Methods:**
Retrospective observational study of 252 infants admitted to the NICU between 2014-2017. On admission, infants received enteral nutrition (EN), parenteral nutrition (PN) or a combination. Patient data included: patient characteristics, daily weight, intake in the first 72HOL, and complications (hypoglycemia, necrotizing-enterocolitis and sepsis). Multivariate linear regression was used to explore associations between %WC and potential predictors (early protein and caloric intake) and adjusted for covariates (GA, birth weight, EN introduction time, total fluid intake, sex, EN and PN proportions).

**Results:**
Median %WC at day 7 was -2.3% [-2.4, -1.2]. Mean caloric and protein intake in the first 72HOL were 57±10Kcal/kg/day and 2.2±0.5g/kg/day respectively. In the adjusted multivariate linear regression, early average caloric intake (Coef=0.16 [95% CI, 0.02-0.12], P=0.008) was associated with %WC but not protein intake (Coef=0.06 [95% CI, (-)0.09-0.22], P=0.34). Higher proportion of EN intake was not associated with %WC. Initiation of EN<12HOL was associated with higher caloric intake over the first 72HOL (62.5±9.9kcal/kg vs 53.9±8.9kcal/kg, p<0.001). In the secondary analysis, no significant association (all p values ≥0.25) was found between early caloric or protein intake and length change and head growth at discharge.

**Conclusions:**
Higher caloric intake in the first 72HOL is associated with lower weight loss at day 7 among infants 32-34 weeks' regardless of method of administration (enteral and/or parenteral). In a NICU where PN is available on admission, early EN was not associated with changes in growth.

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# TEMPORAL TRENDS IN EPISIOTOMY USE AMONG SPONTANEOUS AND OPERATIVE VAGINAL DELIVERIES IN CANADA AND THE ASSOCIATION WITH OBSTETRIC ANAL SPHINCTER INJURY

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**Introduction:**

Although there is sufficient evidence to support a policy of selective episiotomy use for spontaneous vaginal delivery (SVD), there is insufficient evidence regarding episiotomy use for operative vaginal delivery (OVD). We aimed to quantify, firstly, the temporal trends in episiotomy use among SVDs and OVDs in Canada, and secondly, the associations between episiotomy and obstetric anal sphincter injury (OASI) among SVDs and OVDs.

**Methods:**

We carried out a population-based, retrospective, cohort study of all singleton, term deliveries in Canada (2004-2014) using hospitalization data. Temporal trends in episiotomy use by parity, previous cesarean delivery and mode of delivery were tested using the Cochran-Armitage test. Logistic regression was used to estimate the association between episiotomy use and OASI among women with SVD and OVD after controlling for confounders.

**Results:**

The study population included 1,442,484 deliveries. Among nulliparous women, there was a smaller absolute decline in episiotomy use among SVDs (22.9% in 2004 to 14.1% in 2014; p<0.0001) than OVDs (59.3% to 49.9%; p<0.0001). Although episiotomy use was less frequent in parous women without a previous cesarean delivery, temporal trends in episiotomy rates were similar to those in nulliparous women. Among nulliparous women with an SVD, episiotomy use was associated with higher rates of OASI (5.8% with episiotomy vs 4.6% without; AOR 1.25, 95% CI 1.21-1.29; Table 1). In contrast, episiotomy use was associated with lower rates of OASI among women with an OVD (15.3% vs 16.7%; AOR 0.90, 95% CI 0.88-0.93). The protective association between episiotomy and OASI following OVD was strongest among forceps deliveries (17.8% vs 27.2%; AOR 0.63, 95% CI 0.60-0.67; Table 1).

**Conclusions:**

Episiotomy use has declined in Canada in recent years among SVDs and OVDs. There is a pressing need to consider episiotomy use in OVD, particularly with forceps, given the protective association between episiotomy use and OASI.

Table 1. Adjusted odds ratios (AORs) and 95% confidence intervals (CIs) expressing the association between episiotomy and obstetric anal sphincter injury among spontaneous vaginal deliveries (SVDs) and operative vaginal deliveries (OVDs), Canada, 2004-2014

| | Nulliparous | | | | Parous | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | No previous cesarean delivery | | | | Previous cesarean delivery | | | |
| | Without episiotomy | | With episiotomy | | Without episiotomy | | With episiotomy | | Without episiotomy | | With episiotomy | |
| | Rate (%) | AOR | Rate (%) | AOR (95% CI) | Rate (%) | AOR | Rate (%) | AOR (95% CI) | Rate (%) | AOR | Rate (%) | AOR (95% CI) |
| All vaginal deliveries | 6.5 | Ref | 10.5 | **1.56 (1.53-1.59)** | 1.2 | Ref | 4.1 | **3.11 (2.97-3.26)** | 5.7 | Ref | 11.4 | **2.01 (1.85-2.19)** |
| SVD | 4.6 | Ref | 5.8 | **1.25 (1.21-1.29)** | 1.1 | Ref | 2.9 | **2.61 (2.45-2.77)** | 4.1 | Ref | 7.2 | **1.80 (1.58-2.04)** |
| All OVD | 16.7 | Ref | 15.3 | **0.90 (0.88-0.93)** | 5.1 | Ref | 9.0 | **1.84 (1.70-2.00)** | 15.9 | Ref | 16.2 | 1.04 (0.92-1.17) |
| Forceps | 27.2 | Ref | 17.8 | **0.63 (0.60-0.67)** | 9.9 | Ref | 10.7 | 1.17 (0.98-1.39) | 25.5 | Ref | 19.5 | **0.79 (0.63-0.97)** |
| Outlet | 24.3 | Ref | 15.0 | **0.53 (0.43-0.67)** | 12.2 | Ref | 6.3 | **0.46 (0.21-0.97)** | 26.8 | Ref | 16.9 | 0.59 (0.23-1.52) |
| Low | 26.9 | Ref | 17.6 | **0.61 (0.57-0.66)** | 9.6 | Ref | 10.9 | 1.24 (0.97-1.58) | 25.7 | Ref | 19.5 | 0.76 (0.56-1.02) |
| Mid | 28.0 | Ref | 18.3 | **0.64 (0.59-0.69)** | 9.9 | Ref | 11.1 | 1.19 (0.91-1.55) | 25.1 | Ref | 19.9 | 0.82 (0.59- 1.14) |
| Vacuum | 13.7 | Ref | 12.6 | **0.89 (0.86-0.92)** | 4.3 | Ref | 7.5 | **1.77 (1.60-1.96)** | 13.4 | Ref | 13.5 | 1.00 (0.85-1.17) |
| Outlet | 12.9 | Ref | 11.4 | **0.86 (0.78-0.96)** | 3.8 | Ref | 6.6 | **1.99 (1.47-2.71)** | 13.0 | Ref | 10.7 | 0.83 (0.50-1.37) |
| Low | 13.9 | Ref | 12.7 | **0.87 (0.82-0.93)** | 4.6 | Ref | 8.0 | **1.83 (1.55-2.17)** | 12.6 | Ref | 12.7 | 0.97 (0.73- 1.28) |
| Mid | 15.3 | Ref | 13.1 | **0.80 (0.73-0.88)** | 4.2 | Ref | 7.4 | **1.72 (1.34-2.20)** | 14.4 | Ref | 16.3 | 1.16 (0.81-1.67) |
| NOS | 13.1 | Ref | 12.8 | 0.94 (0.88-1.00) | 4.4 | Ref | 7.5 | **1.70 (1.43-2.02)** | 13.9 | Ref | 13.7 | 0.96 (0.74-1.25) |
| Sequential | 32.8 | Ref | 24.1 | **0.67 (0.61-0.75)** | 14.3 | Ref | 18.1 | **1.40 (1.05-1.86)** | 30.9 | Ref | 21.6 | **0.57 (0.35-0.93)** |
| Outlet | 24.9 | Ref | 22.2 | 0.80 (0.58-1.10) | 14.1 | Ref | 20.0 | 1.21 (0.48-3.06) | 31.3 | Ref | 12.0 | 0.27 (0.05-1.54) |
| Low | 37.6 | Ref | 24.1 | **0.56 (0.48-0.65)** | 15.2 | Ref | 17.2 | 1.15 (0.71-1.87) | 37.3 | Ref | 21.0 | **0.43 (0.21-0.89)** |
| Mid | 28.8 | Ref | 24.7 | 0.80 (0.65-1.00) | 13.5 | Ref | 18.9 | **1.77 (1.03-3.03)** | 25.5 | Ref | 18.7 | 0.55 (0.19-1.61) |
| NOS | 32.0 | Ref | 24.3 | **0.69 (0.55-0.87)** | 13.9 | Ref | 17.7 | 1.29 (0.73-2.26) | 22.2 | Ref | 33.3 | 1.38 (0.36-5.32) |

*Reference group is deliveries without episiotomy within each respective SVD/OVD group, i.e., reference group for forceps deliveries is forceps deliveries without episiotomy.

**Models adjusted for maternal age, labour induction, prolonged 2nd stage of labour, epidural anesthesia, infant birth weight, province and year of birth.

***Bold text denotes statistically significant association ($\alpha$<0.05).

## Poster 183

### PREDICTION OF EXCESS TOTAL GESTATIONAL WEIGHT GAIN

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**Introduction:**
Excess gestational weight gain (GWG) increases maternal and infant adverse outcomes. Although exercise and healthy diet are recommended in pregnancy, interventions targeted at modifying these behaviours have limited effect. Hence, new strategies targeting certain psychological constructs may potentially be more effective. The objective was to develop and validate the first prediction model for excess GWG using early pregnancy psychological and other determinants.

**Methods:**
A prospective study recruited English-speaking women with a singleton pregnancy between $8^{+0}$ and $21^{+6}$ weeks from 12 Ontario obstetrical, family medicine and midwifery centres. Baseline characteristics were compared between women gaining excess total GWG and those gaining within or below Institute of Medicine/Health Canada guidelines. Two-thirds of the sample was randomly selected for inclusion in the initial stepwise logistic regression model, with the remaining one-third used to validate the model.

**Results:**
A total of 970 women participated, which was an 81% recruitment rate, who were at median of 15 weeks' gestation. Nine variables were retained which positively and significantly predicted excess GWG and include the following: nulliparity, being overweight, excess planned GWG, eating in front of a screen, low pregnancy weight gain self-efficacy, disagreement or agreement with family or friends' attitude that pregnant women should eat two times as much as pre-pregnancy, difficulties with emotion control, and agreeableness. The training and the testing models yielded areas under the receiver operating characteristic curve of 0.76 (95% confidence interval [CI], 0.72-0.80) and 0.62 CI (0.56-0.68).

**Conclusions:**
In this first validated prediction model based on early pregnancy data, excess GWG was partially predicted using anthropometric, psychological, and behavioural factors. However, there was a reduction of prediction in the validation data, indicating that further research is necesary.

## Poster 184

### VARIATIONS IN RELATIONSHIPS BETWEEN PERCEIVED STRESS AND BIRTH OUTCOMES BY IMMIGRATION STATUS

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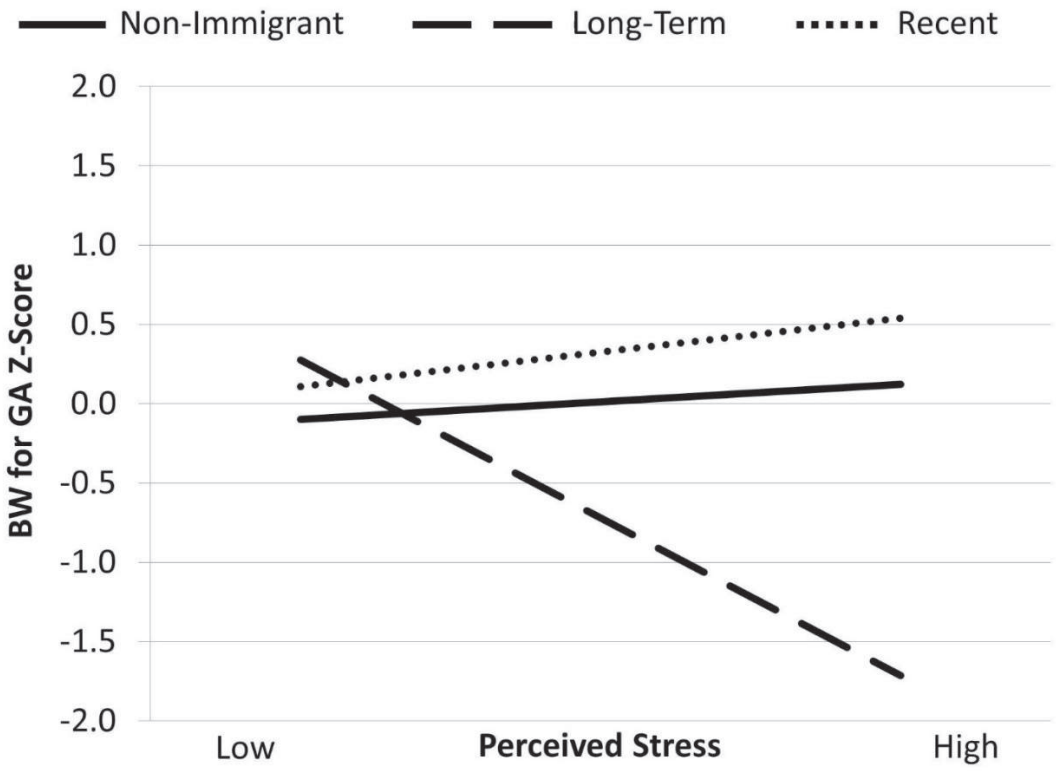
**Introduction:**
Past research shows that stress during pregnancy predicts adverse birth outcomes. These patterns might differ based on immigration status. Our objective was to analyze differences in relationships between perceived stress during pregnancy and birth outcomes by immigration status.

**Methods:**
We recruited 81 pregnant women in Montreal, Canada for detailed studies of psychosocial health during pregnancy and infant development. Participants completed the Perceived Stress Questionnaire at 16-18, 24-26 and 32-24 weeks of gestation. Birth records were available for 64 women, including 21 non-immigrants, 13 long-term immigrants (≥5 years), and 30 recent immigrants (<5 years). We used General Linear Models to test relationships between perceived stress and birth weight, birthweight for gestational age Z-scores, and gestational age, and differences based on immigration status, controlling for sociodemographic covariates.

**Results:**
We observed interactive relationships between birthweight and perceived stress at the 1st (p=0.037, partial $\eta^2$=0.12) and 2nd (p=0.039, partial $\eta^2$=0.13) consultation. Results were similar for birthweight for gestational age Z-scores at the 1st (p=0.020, partial $\eta^2$=0.15) and 2nd consultation (p=0.043, partial $\eta^2$=0.13). There were no evident relationships between perceived stress and birthweight or birthweight for gestational age Z-scores among non-immigrants or recent immigrants, but perceived stress predicted smaller measurements among long-term immigrants. No relation was found between perceived stress, immigration status and gestational age.

**Conclusions:**
Stress during pregnancy might represent one risk factor for adverse birth outcomes observed among immigrant women, and increasing risk with duration of residence, observed in other studies. Promoting psychosocial health screening and care among immigrant women, and assuring continued care with acculturation, might improve health outcomes among both women and their infants.



## Poster 185

### THE IMPORTANCE OF NON-TRADITIONAL RISK FACTORS FOR PREDICTION OF CARDIOVASCULAR DISEASE IN WOMEN OF REPRODUCTIVE AGE

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**Introduction:**
Currently available risk prediction scores for cardiovascular disease (CVD) were developed in older populations, and their generalizability to younger women is unclear. Moreover, these models do not incorporate pregnancy-related risk factors that have been shown to be associated with long-term risk of CVD.

**Methods:**
We created a cohort of 110,544 women aged 15-45 years with a first recorded delivery (stillbirth or livebirth) from April 1999 to March 2018 in the United Kingdom's Clinical Practice Research Datalink pregnancy register. Women with a history of CVD, prior pregnancy, and <1 year of medical history prior to cohort entry (42 days following delivery) were excluded. The primary outcome was CVD defined as a composite endpoint of myocardial infarction, cerebrovascular disease, coronary artery disease, peripheral vascular disease, coronary revascularization, or cardiovascular-related death. Candidate predictors were identified based on clinical and substantive knowledge and defined using diagnostic and procedure codes recorded within the 5 years before the start of the pregnancy (Table). Missing predictor values were imputed using the multiple imputation by chained equations method. A Cox regression model using the Least Absolute Shrinkage and Selection Operator method was used to determine the inclusion of predictors and to estimate parameters of the final model.

**Results:**
A total of 195 women experienced a CVD event over a median follow-up of 4.55 years (interquartile range: 1.96-7.18). Predictors included in the final model were age, ethnicity, social deprivation, body mass index, systolic blood pressure, diabetes, hypertension, family history of CVD, polycystic ovary syndrome, renal disease, oral contraceptive use, history of depression, gestational diabetes, hypertensive disorders in pregnancy, placental abruption, preterm birth, history of infertility or use of infertility treatments, and rheumatoid arthritis.

**Conclusions:**
Our findings highlight the importance of non-traditional risk factors for the prediction of CVD risk in women of reproductive age.

**Table 1. Characteristics of Women at First Delivery.**

| Characteristic | First Delivery (N=110,544) |
|---|---|
| Maternal age at delivery, median (IQR) | 29 (24, 33) |
| Maternal age at delivery, n (%) | |
| < 25 | 30,242 (27.4) |
| 25 – 29 | 28,833 (26.1) |
| 30 – 34 | 32,854 (29.7) |
| 35 – 39 | 15,292 (13.8) |
| ≥ 40 | 3,336 (3.0) |
| Ethnicity, n (%) | |
| White | 93,660 (84.7) |
| Black | 2,374 (2.1) |
| Other | 9,464 (8.6) |
| Unknown | 5,046 (4.6) |
| Multiple Deprivation Index, n (%) | |
| Least Deprived (1) | 24,420 (22.1) |
| (2) | 23,556 (21.3) |
| (3) | 21,067 (19.1) |
| (4) | 22,807 (20.6) |
| Most Deprived (5) | 18,573 (16.8) |
| Unknown | 121 (0.1) |
| BMI, median (IQR) | 24.3 (21.6, 28.3) |
| Unknown, n (%) | 19,439 (17.6) |
| BMI Categories | |
| Underweight (< 18.5 kg/m$^2$) | 3,622 (3.3) |
| Normal (18.5 – 24.9 kg/m$^2$) | 47,312 (42.8) |
| Overweight (25.0 – 29.9 kg/m$^2$) | 23,282 (21.1) |
| Obese (≥ 30 kg/m$^2$) | 16,890 (15.3) |
| Unknown | 19,438 (17.6) |
| Smoking status, n (%)* | |
| Smoker | 50,390 (45.6) |
| Non-smoker | 59,106 (53.5) |
| Unknown | 1,048 (1.0) |
| Excessive alcohol use, n (%)† | 2,057 (1.9) |
| Diabetes, n (%)≠ | 1,356 (1.2) |
| Hypertension (prior to pregnancy), n (%)≠ | 5,323 (4.8) |
| Post-partum blood pressure | |
| Systolic blood pressure, median (IQR) | 115 (109, 123) |
| Diastolic blood pressure, median (IQR) | 70 (67, 80) |
| Unknown, n (%) | 39,003 (35.3) |
| Family history of CVD, n (%) | 2,861 (2.6) |
| Family history of hypertension, n (%) | 8,974 (8.1) |
| Atrial fibrillation, n (%) | 114 (0.1) |
| Polycystic ovary syndrome, n (%) | 4,406 (4.0) |
| Renal disease, n (%) | 331 (0.3) |

| | |
|---|---|
| Venous thromboembolism, n (%) | 443 (0.4) |
| Depression (prior to pregnancy), n (%)[≠] | 16,751 (15.2) |
| Dyslipidemia, n (%)[≠] | 329 (0.3) |
| History of infertility, n (%)[≠] | 13,128 (11.9) |
| Rheumatoid arthritis, n (%)[≠] | 561 (0.5) |
| ***Medications*** | |
| Use of statins, n (%) | 132 (0.1) |
| Use of aspirin, n (%)[§] | 351 (0.3) |
| Use of anti-depressants, n (%) | 11,077 (10.0) |
| Use of non-steroidal anti-inflammatory drugs, n (%)[§] | 22,928 (20.7) |
| Use of oral contraceptives, n (%)[§] | 60,886 (55.1) |
| Use of antihypertensive medications (prior to pregnancy), n (%) | 5,074 (4.6) |
| Use of antidiabetic medications (prior to pregnancy), n (%) | 1,608 (1.5) |
| ***Pregnancy-related predictors*** | |
| Gestational age, days, median (IQR) | 280 (273, 287) |
| Multiple gestation, n (%) | 1,070 (1.0) |
| Preterm birth, n (%) | 4,231 (3.8) |
| Small-for-gestational-age birth (<10$^{th}$ percentile), n (%) | 4,216 (3.8) |
| Unknown (due to missing birth weight), n (%) | 29,667 (26.8) |
| History of ectopic pregnancy, n (%) | - |
| Gestational diabetes, n (%) | 52,526 (5.7) |
| Hypertensive disorders of pregnancy, n (%)[‖] | 4,348 (3.9) |
| Gestational hypertension[¶] | 2,880 (2.6) |
| Preeclampsia/Eclampsia[¶] | 1,227 (1.0) |
| Both | 241 (0.3) |
| Placental abruption, n (%) | 130 (0.1) |
| Stillbirth, n (%) | 496 (0.5) |
| Neonatal death, n (%) | 10 (0) |

**Abbreviations:** BMI: body mass index. *The smoking category includes current and former smokers; †Excess alcohol use is defined using diagnostic codes (Read codes) for excess alcohol use and for alcohol treatment. [≠]Defined using diagnostic codes (Read codes and ICD-9 and ICD-10 codes) and ≥ 1 prescription in the 5 years prior to the start of the pregnancy. [§] Defined as at least one prescription in the year before the start of pregnancy. [‖]Defined using diagnoses, blood pressures measures and use of anti-hypertensive medications. [¶]Defined using diagnoses and blood pressure measures.

## Poster 186

### THE SEX GAP IN THE LONGITUDINAL TRAJECTORIES OF RESPIRATORY HEALTH SERVICES UTILIZATION IN THE FIRST FIVE YEARS OF LIFE AMONG NEONATES EXPERIENCING ADVERSE BIRTH OUTCOMES.

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**Introduction:**
Adverse birth outcomes (ABOs) such as preterm birth (PTB), small and large for gestational age (SGA, LGA) have detrimental health implications in later life, and these may be exhibited differently in males and females. This study compared the longitudinal trajectories of respiratory health services utilization in early childhood between male and female neonates experiencing ABOs.

**Methods:**
The respiratory morbidity of a cohort of 206,994 singleton livebirths in Alberta between 2005-2010 was estimated by the number of emergency department visits and hospitalizations during the first five years of life. This information was obtained from the Alberta Perinatal Health Program, the National Ambulatory Care Reporting System, and

the Discharge Abstracts Database, for the following respiratory conditions: acute bronchiolitis/bronchitis, asthma, other acute lower respiratory infections, croup, other acute upper respiratory infections, influenza, and pneumonia. Poisson random-intercept mixed models were used to estimate the incidence risk ratio (IRR) of the respiratory trajectories over time for very-PTB (<32 weeks gestation), mild-PTB (32-36 weeks gestation), SGA, and LGA adjusted by relevant covariates, using 5-years-old females without ABOs as reference group.

**Results:**
Overall, there was a decrease in the IRR of respiratory episodes of care over the study period. Males had higher IRRs compared with females over the study period, more evidently for: very-PTB in the second year (1.04-fold difference), mild-PTB in the first and second year (0.65 and 0.60-fold difference, respectively), SGA (0.64-fold difference) during the first year and for LGA (0.55-fold difference) in the first year.

**Conclusions:**
Male infants with ABOs showed an increased susceptibility to respiratory morbidities during childhood compared to females, especially during the first two years of life. Providing evidence of the sex differences in the trajectories of respiratory morbidity in childhood across ABOs may guide sex-related healthcare strategies.

## Poster 187

### EFFECT OF FORTIFIERS AND PROTEIN SUPPLEMENTATION ON THE OSMOLALITY OF HUMAN MILK: SAFETY ASPECTS AND CLINICAL IMPLICATIONS

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Alberta Health Services

**Introduction:**
To reduce the risk of necrotizing enterocolitis, American Academy of Pediatrics recommends that osmolality does not exceed 450 mOsm/Kg for human milk (HM) or infant formula. The protein content of fortified HM is less than the recommended dietary intake for very low birth weight (VLBW) infants. A commercial liquid protein supplement has been recently manufactured and used to meet the high protein requirement of this special population. Objective: To identify osmolality of HM with different nutritional supplementations including conventional human milk fortifiers (HMF), liquid protein, and formula powder.

**Methods:**
A prospective study in a level 3 NICU in Calgary. The osmolality of fresh HM was measured at baseline, after fortification with commercial HMF and formula powder, and after further addition of liquid protein increasing in 0.5g/kg steps. Measurements were done after 5 minutes of adding HMF, milk formula and/or liquid protein. Osmolality was determine using micro-OSMETTE II™ Model 6002 Osmometer.

**Results:**
A total of 164 osmolality measurements were performed. The osmolality of expressed fresh HM was 295±4mOsm/kg. Adding 4 HMF to 100 ml of HM (to provide 24 Kcal/Oz) increased osmolality by 49±2mOsm/kg, higher than the data provided by the manufacturer (35 mOsm/kg); p-value <0.001. Every addition of 0.5 g protein to 100 ml HM, using commercial liquid protein fortifier, resulted in a 37±2mOsm/kg increase in HM osmolality. The addition of 1.5 g protein to 100 ml of HM fortified with 4 packets of HMF resulted in a final osmolality of 448±6 mOsm/kg. All further additions with protein to the former mixtures resulted in osmolality levels that exceed the current recommendation.

**Conclusions:**
Adding protein to conventionally fortified HM results in a significant increase in osmolality. We determined the maximum dosages of protein supplementations with different levels of HMF and formula powder.

## Poster 188

### EXAMINING THE RELATIONSHIP BETWEEN GESTATIONAL WEIGHT GAIN AND TIME-TO-DELIVERY IN TWIN PREGNANCIES.

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**Introduction:**
Twins comprise less than 4% of live births, yet account for 15-20% of preterm births. Although gestational weight gain (GWG) is associated with preterm birth in singleton pregnancies, its role in twins is understudied. Therefore, this study aimed to investigate the relationship between GWG and gestational age (GA) at birth in twin pregnancies.

**Methods:**
All non-anomalous twin pregnancies with medical records maintained in the MOMI maternal and neonatal database at Magee Women's Hospital in Pittsburgh, Pennsylvania from 1998-2014 were assessed for inclusion in this study. Monochorionic pregnancies and mothers with missing covariates were excluded. Serial weight measurements were abstracted from medical records. Cox proportional hazards models with extensions for non-linearity of effects and time-dependence of hazards were used to quantify the association between time-varying GWG and GA at birth. Models were adjusted for baseline maternal/pregnancy characteristics.

**Results:**
Approximately 86% (n=1996) of eligible twin pregnancies were included in the current study. Among eligible pregnancies with non-missing height/weight, median GA at birth was 36.3 (IQR 33.9; 37.9) weeks, and median total GWG was 16.8 (IQR 11.8; 21.8) kg. Models produced an array of hazard ratio estimates by GA and GWG. Evidence suggested both time-dependence of hazards and non-linearity of effects; specifically, mid-range GWG was associated with decreased relative hazard of delivery in mid-pregnancy and increased relative hazard of delivery in late pregnancy. Additionally, GWG at both higher and lower ranges was associated with increased relative hazard in mid-pregnancy and decreased relative hazard in late pregnancy, although evidence was weaker than that for time-dependence.

**Conclusions:**
The relationship between GWG and GA at birth is complex, and is contingent on both magnitude of GWG and GA at which GWG occurs. Findings may have implications for GWG guidelines in twin pregnancies. Future work will consider spontaneous, indicated, and absent labour as competing risks and replicate analyses in singletons.

## Poster 189

### TIME TO POSITIVITY OF NEONATAL BLOOD CULTURES: IS IT TIME TO QUESTION THE 48-HOUR EMPIRIC ANTIBIOTIC RULE?

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**Introduction:**
Empiric antibiotic therapy for suspected sepsis is common practice in neonatal intensive care units (NICU). While standard practice is to discontinue antibiotics when blood cultures remain negative after 48 hours, the true time to positivity across gestational ages remains unclear. The objectives of this study were to determine (1) the time required for blood cultures to become positive; (2) differences between time to positivity for early versus late onset sepsis and; (3) factors related to time to positivity.

**Methods:**
A retrospective observational study of blood cultures drawn in neonates within 30 days of life with initiation of empiric antibiotic therapy between January 2013 to December 2017 at a level III Canadian NICU was performed. Data was analyzed using descriptive statistics, chi-square and student t-tests, and multivariable linear regression to examine the relationship between perinatal and neonatal variables on time to positivity.

**Results:**
2213 blood cultures were drawn during the study period. 125 positive blood cultures (5.6%) were identified, of which 49 were excluded [contaminants (n=24); repeat positive cultures during the same sepsis event (n=25)]. The median time to positivity of blood cultures was 12.4 hours (IQR 9-19 h). 13.2% of positive cultures and 0.5% of all cultures drawn became positive after 24 hours. Time to positivity did not differ significantly between suspected early onset sepsis versus late onset sepsis ($p$=0.69). In the linear regression analysis that included gestational age, timing of sepsis onset, pre-treatment platelet count, white blood cell count, and bacterial gram stain, it was found that gram negative cultures were associated with significantly lower time to positivity (β=9.8; $p$=0.019).

**Conclusions:**
With a median time to culture positivity of 12.4 h, many neonates potentially receive unnecessary antibiotic doses with the 48-hour antibiotic rule. A shorter duration of empiric antibiotic therapy may be considered to reduce unnecessary antibiotic exposure in the NICU.

**Table 1:** *Multivariable Linear Regression Results*

| Variable | *B* | *SE B* | β | *p* |
|---|---|---|---|---|
| Gestational Age | -.333 | .381 | -.109 | .386 |
| Pre-Treatment Platelet Count | -.013 | .015 | -.101 | .412 |
| White Blood Cell Count | .231 | .134 | .224 | .088 |
| Bacterial Gram Stain (Negative) | 9.768 | 4.061 | .291 | .019 |
| Timing of Sepsis Onset (Late Onset) | -3.975 | 4.975 | -.097 | .427 |

## Poster 190

### THE DETERMINANTS OF MATERNAL HOMOCYSTEINE IN PREGNANCY

**Shazia Chaudhry**[1,2], **Monica Taljaard**[1,2], **Amanda MacFarlane**[2,3], **Laura Gaudet**[1,2], **Graeme Smith**[4,5], **Marc Rodger**[1,2], **Ruth Rennicks White**[1], **Mark Walker**[1,2], **Shi Wu Wen**[1,2]
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**Introduction:**
Observational studies have found associations between elevated homocysteine and cardiovascular disease and vascular-related pregnancy complications. In studies of the general population and pregnant women, folate intake has been associated with lower homocysteine, although randomized controlled trials of folic acid supplementation to decrease the incidence of vascular conditions have been inconclusive. The objective of our study was to investigate determinants of maternal homocysteine in the early second trimester of pregnancy, particularly in a folic acid-fortified population.

**Methods:**
Data were from the Ottawa and Kingston Birth Cohort with 8085 participants recruited in the early second trimester from 2002 to 2009. We used multivariable regression analyses to identify factors associated with

maternal homocysteine, adjusted for gestational age at bloodwork. Continuous factors were modelled using restricted cubic splines. A subgroup analysis examined the modifying effect of MTHFR 677C>T genotype on folate status. Secondary analyses examined alternative approaches to account for gestational age-related changes in homocysteine; z-scores and dichotomizing at the 90$^{th}$ percentile.

**Results:**
In 7587 participants, factors significantly associated with higher homocysteine concentration were nulliparous, smoking, and chronic hypertension, while factors significantly associated with lower homocysteine were non-Caucasian race, history of a placenta-mediated complication, and folic acid supplementation. Maternal age and BMI demonstrated u-shaped associations with homocysteine. Serum folate was less responsive to folic acid supplementation dose greater than (compared to less than) 1 mg/day. In the subgroup analysis, MTHFR 677C>T modified the effect of folate status on homocysteine concentration. Secondary analyses showed some differences in the results of our analyses when the dependent variable (i.e., homocysteine) was dichotomized.

**Conclusions:**
We have identified determinants of maternal homocysteine relevant to the lowering of homocysteine in the post-folic acid fortification era, characterized by folate-replete populations. A combination of periconceptional folic acid intake and healthy behavioural changes could lead to lower maternal homocysteine.

## Poster 191

### RISK FACTORS, PREGNANCY COMPLICATIONS AND SEVERE ADVERSE OUTCOMES ASSOCIATED WITH HELLP SYNDROME: A POPULATION-BASED STUDY.

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**Introduction:**
Hemolysis, elevated liver enzymes and low platelets (HELLP) syndrome is a serious pregnancy complication; however, limited population-based data are available on risk factors for and obstetric outcomes following HELLP syndrome.

**Methods:**
Delivery hospitalization data on all women with a singleton live or stillbirth in Canada (excl. Quebec), 2012-2015 (N=1,078,323) were used to describe the incidence, risk factors and maternal and perinatal outcomes associated with HELLP syndrome. Demographic characteristics, HELLP syndrome, and maternal and neonatal morbidity were identified using diagnostic/procedure codes. The primary outcomes were maternal and perinatal mortality, and two composites: 1) maternal mortality or severe morbidity (e.g., shock, obstetric embolism), and 2) perinatal mortality or severe neonatal morbidity (e.g., intraventricular hemorrhage, neonatal sepsis). Logistic regression was used to estimate adjusted odds ratios (AOR) and 95% confidence intervals (CI); covariates included, for instance, maternal age, socioeconomic status (SES), and co-morbidity.

**Results:**
The incidence of HELLP syndrome (n=2663) was 24.7 per total 10,000 births. Gestational age-specific rates increased exponentially from 0.1 per 10,000 ongoing pregnancies at 24 weeks to 5.3 per 10,000 at 42 weeks gestation. HELLP syndrome was positively associated with high SES, maternal age >34 years,

rural residence, obesity, excess pregnancy weight gain, nulliparity, parity ≥4, assisted reproduction, chronic and pregnancy-associated hypertension and diabetes, lupus erythematosus, placental disorders (e.g., fetomaternal transfusion), blood disorders (e.g., thrombophilias), chronic infections (e.g., hepatitis), breech/ oblique presentation, and congenital anoMalies; and inversely associated with PROM and maternal age <25 years. Women with HELLP syndrome had elevated mortality (AOR=7.6, CI 1.01-57.3) and mortality/severe morbidity (AOR=7.7, CI 6.9-8.6); and increased rates of perinatal mortality (AOR=4.4, CI 2.7-7.0) and perinatal mortality/severe neonatal morbidity (AOR=12.1, CI 10.9-13.4).

**Conclusions:**
HELLP syndrome increases with increasing gestational age, is associated with specific pre-pregnancy and pregnancy risk factors, and results in substantially higher rates of maternal and perinatal mortality and severe morbidity.

## Poster 192

### MORBIDITY/MORTALITY-BASED INTERGROWTH-21ST CENTILES OF BIRTH WEIGHT FOR GESTATIONAL AGE

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**Introduction:**
The Intergrowth-21st standard identified centiles of birth weight-for-gestational age using a rigorous methodology. These normative centiles are left-shifted compared with centiles of traditional, descriptive references, which creates an obstacle to their adoption. We attempted to identify the Intergrowth centiles at which composite severe neonatal morbidity/ mortality rates were elevated.

**Methods:**
We used data on all live births in the United States for the years 2003 to 2016. Gestational age was based on the clinical estimate of gestation and infants with congenital anoMalies were excluded. The primary outcome was severe neonatal morbidity/mortality, a composite of 5-minute Apgar<4, neonatal seizures, assisted ventilation or neonatal death (excluding deaths due to accidents and homicides). Sex- and gestational age-specific birth weights and Intergrowth centiles at which severe neonatal morbidity/mortality rates were lowest (reference group), and those at which severe neonatal morbidity/mortality rates were relatively higher (odds ratios of 1.1 and 1.5), were identified for all gestational ages between 24 and 42 weeks' gestation.

**Results:**
The study population included 41,955,352 live births. Among boys born at 40 weeks gestation, 10% had a birth weight <=15th Intergrowth centile and 10% had a birth weight >=94th Intergrowth centile. Compared with severe neonatal morbidity/mortality rates at optimal birth weights, severe neonatal morbidity/mortality rates were 10% higher among infants with birth weights of 3122 g and 3931 g, corresponding to the 21st and 87th Intergrowth centiles. Severe neonatal morbidity/mortality rates were 50% higher among infants with birth weights of 2772 g and 4521 g, corresponding to Intergrowth centiles 5 and 99. Similar birth weights and Intergrowth centiles were estimated for boys and girls at each gestational week between 24 and 42 weeks.

**Conclusions:**
Intergrowth standard birth weight-for-gestational age centiles at which severe neonatal morbidity/ mortality rates are elevated can serve as clinically useful cut-offs to identify newborns in need of close clinical monitoring.

## Poster 193

### HYPOXIA INDUCES PLACENTAL MITOCHONDRIA MORPHOLOGY REMODELLING AND IMPAIRED COMPLEX II ACTIVITY

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**Introduction:**
Altered placental function in response to hypoxia can adversely affect pregnancy/fetal health and increase the susceptibility to adult disease. Hypoxia has been shown to impact mitochondria morphology and recent studies identified complex II (CII) as an important regulator, however, the underlying mechanisms regulating mitochondrial function remains poorly understood in placenta. The aim of this study was to evaluate the impact of varying levels of oxygenation upon placental mitochondria morphology, as well as respiratory chain complexes (RCCs) content and CII activity.

**Methods:**
BeWo cytotrophoblasts (CT) and syncytiotrophoblasts (SCT) were maintained at 37°C at 3%, 8% or 20% $O_2$ for 72H. Mitochondrial distribution and biomass quantification were evaluated by immunostaining and confocal microscopy z-stach; RCCs content by western blot and CII activity by spectrometric assay. 2-Way ANOVA-Bonferroni's test was used to examine differences among groups (n=3-6).

**Results:**
3% and 8% $O_2$ induce perinuclear clustering of mitochondria whereas at 20% $O_2$ mitochondria were evenly spread throughout the cytoplasm. Mitochondria biomass (total length/$\mu m^2$) was linearly and significantly reduced in CT and SCT cells at 3% and 8% compared to 20% $O_2$ (2.0-fold downregulation; ***P<0.001 and 1.5-fold downregulation *P<0.05 respectively). At 3% $O_2$, all the RCC protein (CI to CV) were significantly decreased (3.0-fold downregulation, ***P<0.001 in both subtypes) as well as CII activity in CT and SCT (3.0 and 1.5-fold downregulation **P<0.05 respectively) compared to 20% $O_2$.

**Conclusions:**
The altered spatial distribution of mitochondria may markedly influence local concentration of ATP/ROS. Linear decrease in mitochondria biomass and downregulation of RCC content suggests an oxygen concentration-dependent regulation of mitochondria biogenesis associated with a general decrease of all mitochondria subunits. A specific decrease of CII activity may contribute to energy deficiency in cells and participate to ROS generation. This work identifies hypoxia as a regulator of mitochondrial distribution in association with reduced CII activity in CT and SCT.

## Poster 194

### ENDOTHELIAL ACTIVATION BY PERIPHERAL IMMUNE CELLS FROM WOMEN WITH PE-COMPLICATED PREGNANCIES

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**Introduction:**
Preeclampsia (PE) is characterized by de novo hypertension directly linked to endothelial activation and the contribution of maternal circulating immune cells to this activation is still debated. Objective: We investigated the interaction between the vascular endothelium and maternal circulating peripheral blood mononuclear

cells (PBMC) from non-pregnant women (NP), healthy pregnancies (HP) or women with PE.

**Methods:**
Primary Human Umbilical Vein Endothelial Cells (HUVEC) were obtained from term umbilical cord and PBMC isolated from NP or pregnant women (HP/PE, obtained prior to delivery) by Ficoll gradient. PBMC were treated for 4h with either lipopolysaccharide (LPS, 10ng/mL), IL-1β (10ng/mL) or uric acid crystals (monosodium urate - MSU, 100µg/mL) and incubated 24h or 48h with or without contact with HUVEC. ICAM/VCAM/E-selectin ELISAs were performed to evaluate endothelial activation.

**Results:**
Untreated PBMC from PE showed elevated ICAM secretion compared to NP and HP after 24h of contact with endothelial cells (115.1 vs 29.6 and 38.21 pg/mL respectively, $p<0.05$). LPS-exposed PBMC from NP induced higher VCAM secretion than those from pregnant women (HP or PE) (3337 vs 1287 and 697.6 pg/mL, $p<0.05$). MSU-treated PBMC from HP and PE women were more potent activators of the endothelium than NP (4099 and 1512 vs 288 pg/mL, $p<0.05$). PBMC exposed to IL-1β induced similar endothelial activation, regardless of pregnancy status. Finally, contact between PBMC and HUVEC is essential for activation when PBMC are treated with IL-1β, but not when PBMC are treated with LPS.

**Conclusions:**
These results show that circulating immune cells from women with PE affect the endothelium and support their contribution to the pathology. Different responses are observed when PBMC are exposed to a pathogenic (LPS) vs non-pathogenic (MSU) stimuli depending on their status (HP vs NP). Future studies will address the mechanisms underlying their interaction with the vascular endothelium.

## Poster 195

### UTILIZATION OF A SYNOPTIC REPORT TO IMPROVE PLACENTAL PATHOLOGY EXAMINATION

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**Introduction:**
Placental examination after delivery plays an important role in the continuum of maternal and newborn care. As seen in other areas of pathology, synoptic reporting may improve quality and completeness of pathology reports over narrative reporting. Here, we evaluate if a synoptic reporting format developed from evidence-based guidelines and the 2015 Amsterdam consensus improves the completeness of placental examination compared with conventional narrative reports.

**Methods:**
Placentas from singleton pregnancies sent for Pathology between October 2013 to December 2014 were randomly selected for inclusion (n=100). Histology slides were examined independently by two experienced placental pathologists, who were blinded to previous histological findings. Weighted kappa scores were calculated to assess inter-observer agreement between the pathologists.

**Results:**
The inter-observer agreement for lesion severity between pathologists ranged from -0.033 to 1.0. Higher agreement was observed for well characterized lesions (e.g., chorioamnionitis fetal stage: 0.942 [0.710-0.961]) and for rare lesions (e.g., chorionic hemosiderosis: 1.0 [1.0-1.0]). Lower agreement was observed for less characterized lesions (e.g., distal villous immaturity: 0.316 [0.050-0.488]). As noted in the

Amsterdam criteria, villous maturation, chorioamnionitis, and villitis are of significance clinically and should be examined. While all synoptic reports contained the presence/absence and severity of each of these high prevalence lesions, they were only commented on in 85%, 43% and 24% of narrative reports, respectively.

**Conclusions:**
We have demonstrated that synoptic reporting significantly increased the completeness of placental examinations compared with narrative reports. The findings of low inter-observer agreement for some lesions highlights the inherent challenge associated with assigning discrete severity grades for a continuous morphology and may reflect the need for heightened specialized training focused on the updated diagnostic criteria in the Amsterdam consensus. The report is in the process of revision for lesions with high discrepancies, and agreement scores will be re-assessed. The synoptic template will be adjusted into a user-friendly electronic format.

## Poster 196

### EFFECT OF CARBON MONOXIDE ON VASCULAR ADAPTATIONS DURING PREGNANCY

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**Introduction:**
Preeclampsia (PE) is characterized by abnormal placentation and systemic vascular dysfunction. Carbon monoxide (CO) reduces the risk of PE possibly by increasing uteroplacental vascular growth which has been shown to attenuate PE-like signs in mice. How CO acts to promote vascular changes during pregnancy is unclear. The objective was to determine the effect of low-dose CO on markers of angiogenesis and inflammation, and on histomorphological changes during murine pregnancy.

**Methods:**
Female CD-1 mice were administered 250 ppm CO, or ambient air from gestational day (GD) 0.5 until sacrifice at GD10.5 or GD16.5 (n=5/treatment/time-point). A quantitative real-time PCR array was used to determine expression of angiogenic and inflammatory related genes at GD10.5 and GD16.5 implantation sites. Multiplex cytokine assays (Eve Technologies) were used to measure maternal plasma cytokine levels at GD0.5, GD5.5, GD10.5 and GD16.5, and implantation site cytokine levels at GD10.5. Immunohistochemistry staining for Ki67 (cellular proliferation), cytokeratin (trophoblast invasion) and DBA lectin (uNK cell abundance) were analyzed in GD10.5 and GD16.5 implantation sites. Data were analyzed using the ΔΔCt method, ANOVA and Mann-Whitney U tests.

**Results:**
PCR results indicate that genes encoding VEGF and angiopoietin receptors, eNOS, and cell adhesion molecules were upregulated at the implantation sites of CO treated mice at GD10.5 ($p<0.05$). No significant differences were observed on GD16.5. Furthermore, CO treatment did not reveal any measurable changes in pro-inflammatory or angiogenic cytokines in the plasma or implantation site lysates. Additionally, CO did not alter uNK cell abundance, invasiveness of trophoblasts or proliferative capacity.

**Conclusions:**
These data suggest that CO acts to potentiate uteroplacental vascular growth via the angiogenic axis midgestation, without impacting pregnancy specific adaptations including systemic immune function and histomorphological changes at the maternal fetal interface. Understanding how CO modulates angiogenesis during pregnancy is important to determine if there is a therapeutic potential. (Supported by CIHR and OGS)

## Poster 197

### DIFFERENTIAL MITOCHONDRIAL ACTIVITY RESPONSES OF BEWO VILLOUS TROPHOBLAST CELLS TO PROLONGED GLUCOSE AND FATTY ACID EXPOSURE

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[1]The University of Western Ontario, [2]Lawson Research Institute, [3]Children's Health Research Institute

**Introduction:**
Excessive saturated fatty acids (SFA) and glucose exposure during pregnancy has been well associated with fetal and placental mitochondrial impairments. While gestational diabetes (glucose overabundance) has been shown to elicit placental mitochondrial defects, independent of maternal Body-Mass-Index (BMI), the effects of excessive dietary-fats have been predominately examined in obese pregnancies. However, recent animal studies have highlighted that dietary-FA may be a more important mediator of placental mitochondrial impairments than obesity alone. The objective of this project was to examine individual effects of excess dietary sugars and FA, isolated from the effects of maternal body composition, on placental mitochondrial activity. We postulated that excess SFA and glucose would lead to impaired placental oxidative activity.

**Methods:**
BeWo cells were treated with 25 mM D-glucose (excess glucose), or 100 $\mu$M palmitate (PA), oleate (OA) or a 1:1 molar ratio of PA:OA (P/O) conjugated 2:1 to BSA (excess fat) for 72H. The Seahorse XF$^{e}$24 Analyzer was utilized to quantify mitochondrial activities of treated cells via the Mito Stress Test. The protein abundance and enzyme activities of individual Electron Transport Chain (ETC) complexes was subsequently examined via immunoblotting and colorimetric enzyme activity assays respectively.

**Results:**
No differences were found in mitochondrial activity between high glucose and control treated cells, or in OA-treated cells. However, PA and P/O high fat-treated BeWo cytotrophoblast cells demonstrated significant increases in both basal and maximal mitochondrial activity ($p<0.05$). There was no significant difference in ETC protein abundance or activity in the prolonged treated high glucose and high fat treatment groups.

**Conclusions:**
These results demonstrate that exposure to dietary sugar and FA species with varying degrees of saturation, during critical differentiation processes, have differential effects upon BeWo cell mitochondrial activity. Altered mitochondrial activity from excess dietary SFA suggests a placental metabolic inflexibility that may impede placental function, and ultimately fetal development.

## Poster 198

### THE ROLE OF MITOCHONDRIAL FREE RADICAL FORMATION IN TROPHOBLAST FUSION: IMPLICATION FOR THE MATERNO-FETAL INTERFACE

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**Introduction:**
Complications associated with placentation can profoundly affect both maternal and fetal health. The function of the placenta is dictated by several different lineages of trophoblast cells. The materno-fetal interface is comprised of cytotrophoblasts and syncytiotrophoblasts. Overall placental dysfunction is often associated with altered mitochondrial morphology and function. Since the differentiation of cytotrophoblasts

into syncytiotrophoblasts comprises an important step in establishing and maintaining the materno-fetal interface, we *hypothesized* that mitochondrial dysfunction in these cells would lead to impaired syncytium formation.

**Methods:**
We stimulated reactive oxygen species (ROS) signaling using sub-lethal doses of the mitochondrial electron transport chain inhibitor rotenone in BeWo cells and subsequently quenched the ROS signaling with N-acetylcysteine (NAC) pre-treatment. We analyzed gene and protein markers of mitochondrial dynamics (OPA1, MFN2, DRP), trophoblast fusion (GCM1, syncytin 1, syncytin 2, hCG) and placental endocrine function (hPL, IGF2). ROS and MTS assays were performed to determine intracellular ROS activity and cell viability, respectively.

**Results:**
10nM rotenone treatment ($IC_{50}$) caused a significant increase in mitochondrial fission (decreased mRNA expression of OPA1 by 2.4-fold, decreased MFN2 by 2.7-fold, and increased DRP1 by 6.1-fold) concomitant with significant reductions in markers of trophoblast fusion (reduced mRNA expression of GCM1 by 1.9-fold, syncytin 1 by 2.0-fold, syncytin 2 by 4.8-fold & hCG protein by 12.3-fold). Predictors of placental endocrine function were markedly reduced, as evidenced by a 5.0-fold reduction in hPL along with a 4.4-fold reduction in IGF2 transcripts. ROS levels were significantly increased in the syncytiotrophoblasts population by 1.5-fold, while the levels remained relatively unchanged in the cytotrophoblast population. Importantly, pre-treatment with NAC conferred protection against these changes.

**Conclusions:**
Mitochondrial respiratory chain dysfunction can result in a free radical dependent decrease of the syncytialization process. Biological processes which cause such metabolic stress may impair syncytial function, with possible detriments to fetal development.

## Poster 199

### VALIDATION OF FETAL MRI OXIMETRY AND DEFINING NORMAL OXYGEN SATURATIONS ACROSS THE FETAL CIRCULATION

**Brahmdeep Saini**[1], **Jack Darby**[2], **Sharon Portnoy**[1], **Liqun Sun**[1], **Sunthara Perumal**[3], **Jia Soo**[2], **Mitchell Lock**[2], **John Kingdom**[4], **John Sled**[1], **Christopher Macgowan**[1], **Janna Morrison**[2], **Mike Seed**[1]
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**Introduction:**
Our aim was to combine *in vitro* and *in vivo* MRI T2 oximetry in sheep and human fetuses to validate our approach and define oxygen saturations ($SO_2$) across the normal fetal circulation.

**Methods:**
Pregnant ewes underwent surgery to implant catheters in maternal and fetal arteries and veins. The blood T2 vs $SO_2$ relationship was characterized *in vitro* by T2 mapping of blood drawn from catheterized sheep fetuses and ewes (n=73; 3T Skyra, Siemens) and 3 adult humans (n=32; 1.5T Avanto, Siemens) and plotting the T2 measurements against the true $SO_2$ measured by blood gas analysis. Eight ewes (126 +/- 1d) and 30 women (36 +/- 1wks) underwent fetal MRI, where T2 in major vessels were converted to $SO_2$ and compared between species (unpaired t-test).

**Results:**
The *in vitro* and *in vivo* blood T2 vs $SO_2$ quadratic relationships in sheep are not statistically different (*p=0.06*). Normal fetal $SO_2$ throughout the circulation were calculated (Table 1) from the respective sheep and human blood T2 vs $SO_2$ relationships and were not statistically different (*P=0.32*).

**Conclusions:**
We have validated fetal MRI oximetry using T2 mapping in fetal sheep and quantified $SO_2$ in normal sheep and human fetal circulations. Late gestation fetal MRI oximetry using T2 mapping could be a reliable tool for studying abnormal fetal circulatory physiology.

**Table 1. Normal $SO_2$ across the human and sheep fetal circulation in late gestation measured by MRI T2 oximetry**

| Vessel | Human Fetus *(mean±SD %)* | Sheep Fetus *(mean±SD %)* |
|---|---|---|
| Umbilical Vein | 83±9 | 80±11 |
| Ductus Venosus | n/a | 79±11 |
| Superior Vena Cava | 38±11 | 46±11 |
| Main Pulmonary Artery | 55±12 | 48±8 |
| Ductus Arteriosus | n/a | 49±8 |
| Ascending Aorta | 69±13 | 60±8 |
| Descending Aorta | 56±12 | 52±8 |

## Poster 200

### CORD BLOOD SODIUM, CHLORIDE, POTASSIUM AND CREATININE GESTATIONAL AGE-SPECIFIC REFERENCE INTERVALS AND THEIR ASSOCIATION WITH MATERNAL CONDITIONS

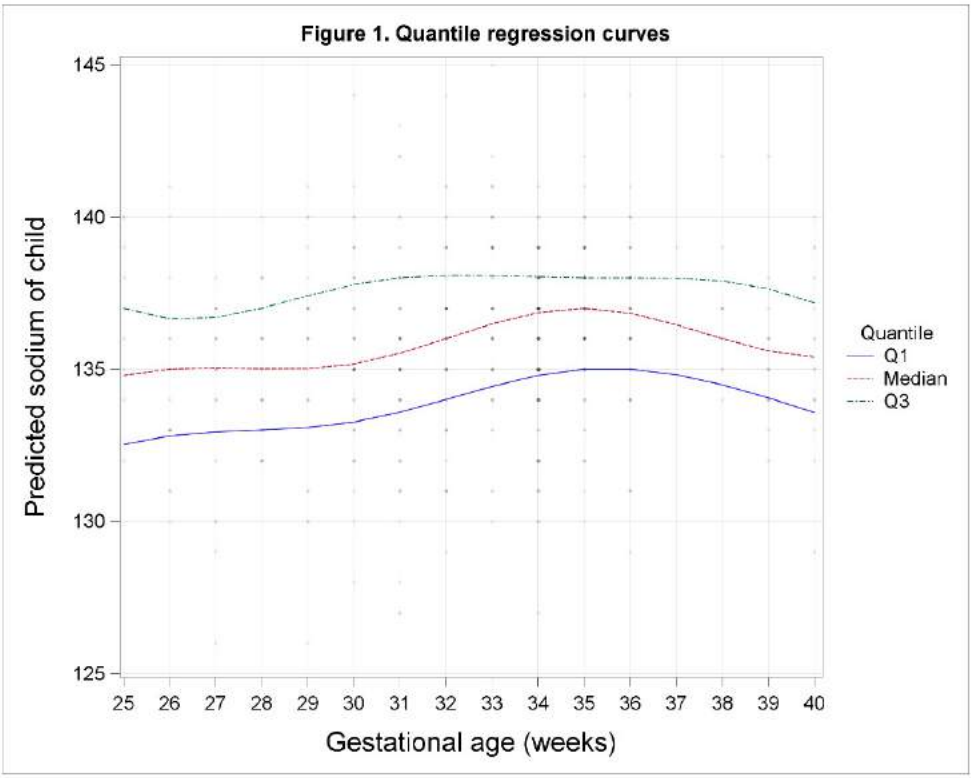
**Rana Ismail**, **Amelie Stritzke**, **Tanis Fenton** (University of Calgary)

**Introduction:**
Few data are available on cord blood values in pathologic pregnancies and preterm infants. Our objective was to develop gestational age specific reference intervals for cord blood sodium, potassium, chloride, and creatinine levels and correlate hyponatremia in cord blood to maternal pathologic conditions.

**Methods:**
Cross-sectional study at a regional high-risk maternal and neonatal referral unit between July 2003 and February 2005. Umbilical cord blood was identified among samples routinely banked (n = 7174), preterm infants were identified and singleton term infants were randomly selected using random number lists. Informed consent obtained from parents by phone. 560 infants (506 preterm and 54 term) were included. 51 excluded due to asphyxia, congenital anoMalies, magnesium-sulfate treatment during labour and infant death prior to discharge. Serum was stored at -70C prior to testing done for the primary study. Secondary analysis of the database for cord blood values was conducted for our study. Data collected included date of birth, gestational age (based on maternal dates and early ultrasounds or the modified Ballard score), gender, birthweight, size for gestational age, mode of delivery, SNAP score on admission, chorioamnionitis/ bacteremia (clinical OR histologic), maternal hypertension, preeclampsia or diabetes mellitus.

**Results:**
SAS version 9.4 is used for all analyses with PROC QUANTREG to perform quantile regression and estimate the reference values. A quantile plot with gestational age on the horizontal axis represents the predicted 5th, 25th, 50th, 75th, and 95th percentiles for the parameter (Na, K, Cl, Creatinine) based on the gestational age, allowing a visual comparison between term and preterm infants. In a sensitivity analysis, the model is adjusted for GA, SGA, maternal PIH/preeclampsia, chorioamnionitis, maternal diabetes. Only preliminary results are currently available showing the intervals for cord blood values amongst different gestational age.

**Conclusions:**
Umbilical cord derived values for Na, Cl, K, and creatinine vary according to birth gestational age.




## Poster 201

### MECHANISMS REGULATING IGFBP-1 PHOSPHORYLATION IN LEUCINE DEPRIVATION: ROLE OF PROTEIN KINASE C

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**Introduction:**
Fetal growth restriction (FGR) is associated with impaired fetal availability of essential amino acids, such as leucine. Insulin-like growth factor binding protein-1 (IGFBP-1) secreted by the fetal liver regulates IGF-1 mediated fetal growth. Phosphorylation of IGFBP-1 increases its binding affinity for IGF-1. We have linked IGFBP-1 hyperphosphorylation to human FGR and have shown casein kinase 2 (CK2) and PKC to be key kinases phosphorylating fetal IGFBP-1. Our objective is to determine whether PKC phosphorylates IGFBP-1

in leucine deprivation to test our hypothesis that PKC modulates IGFBP-1 phosphorylation in tandem with CK2 in leucine deprivation.

**Methods:**
HepG2 cells (model for fetal hepatocyte) were cultured with (450 uM, L450) or without leucine (0 uM, L0). Using phosphorylation-site-specific antibodies (Ser101/169), IGFBP-1 phosphorylation was examined by immunoblot and immunofluorescence-confocal-microscopy. Dual immunofluorescence staining was performed against IGFBP-1 with PKC/CK2. We used BIS (Bisindolylmaleimide, 7.5 uM) to inhibit and PMA (phorbol 12-myristate 13-acetate, 200 nM) to activate PKC in cells.

**Results:**
IGFBP-1 phosphorylation (Ser101+800%, Ser169+600%) was increased in leucine deprivation (ANOVA, Tukey's test (n=3)) (immunoblot) which corroborated immunofluorescence data. Dual immunofluorescence indicated sparse IGFBP-1+PKC but prominent IGFBP-1+CK2β co-localization, which increased in L0. Inhibition/activation of PKC altered IGFBP-1 phosphorylation at CK2 consensus sites (Ser101/119/169); BIS decreased phosphorylation (L450: Ser101 -52%, Ser169-45%; L0: Ser101-43%, Ser169-49%) while PMA increased phosphorylation (L450: Ser101+1181%, Ser169+2595%; L0: Ser101 +70%, Ser169+101%) which was attenuated by BIS (L450: Ser101+158%, Ser169+137%; L0: Ser101+8%, Ser169-30%) ($P < 0.0005$).

**Conclusions:**
We conclude that PKC modulates IGFBP-1 phosphorylation under leucine deprivation. Considering inhibition/activation of PKC altered phosphorylation of IGFBP-1 at sites specific to CK2, we speculate that PKC influences phosphorylation via protein-protein interaction or through a common signalling network with CK2. This work provides justification for further studies to gain insight into the mechanisms by which kinases regulate IGF-I bioavailability which is critical in FGR onset *in utero*.

## Poster 202

### Δ9-TETRAHYDROCANNABINOL INDUCES ENDOPLASMIC RETICULUM STRESS AND MITOCHONDRIAL DYSFUNCTION IN HUMAN BEWO PLACENTAL CELLS

**Tina Lojpur**[1], **Zachary Easton**[1], **Sergio Raez-Villanueva**[2], **Alison Holloway**[2], **Steven Laviolette**[1], **Daniel Hardy**[1]
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**Introduction:**
Cannabis is the most frequently used illicit drug in the world and recent reports indicate that 20% of women (18-24 years) use cannabis during pregnancy. While studies from our laboratory and others have demonstrated that exposure to the main psychoactive component, Δ9-tetrahydrocannabinol (Δ9-THC) alone induces placental insufficiency and fetal growth restriction, the underlying mechanisms remain elusive. Recent studies have suggested that endoplasmic reticulum (ER) stress plays a role in compromised placental development and decreased fetal birth weight. Given that both (i) ER stress in pregnancy and (ii) exposure to Δ9-THC during fetal life leads to placental deficiency, we hypothesized that Δ9-THC may directly induce placental ER stress, initiating downstream apoptotic pathways and mitochondrial dysfunction.

**Methods:**
BeWo human trophoblast cells were treated with Δ9-THC (3-30μM) or its metabolite (11-COOH-THC) for 24 hours. The steady-state mRNA and protein levels of ER stress markers (*i.e.,* Grp78, spliced-Xbp1, Atf4, Atf6) and placental function (e.g., Glut1 and Plgf) were quantified via real-time qPCR and immunoblotting, respectively.

**Results:**
Δ9-THC treatment led to a dose-dependent increase in all ER stress markers and ER-stress mediated apoptotic pathways (e.g. Chop). Moreover, expression of the ER stress-sensitive genes Glut1 and Plgf were also inhibited by Δ9-THC, but not 11-COOH-THC. We further confirmed that Δ9-THC mediated its effects through cannabinoid receptors by blocking with CB1R/CB2R antagonists. Furthermore, co-treatment of Δ9-THC with TUDCA (an ER stress inhibitor) abrogated any Δ9-THC-induced ER stress. Studies with the Seahorse XFe24 also revealed that Δ9-THC treated BeWo cells exhibited diminished basal and maximal mitochondrial respiration, due in part to decreased expression of mitochondrial complex proteins (I,III,IV-V).

**Conclusions:**
These findings indicate that Δ9-THC, acting through the CB1R/CB2R, can directly augment ER stress and impair placental gene expression and mitochondrial function. Further studies are warranted to address whether amelioration of ER stress *in vivo* prevents Δ9-THC-induced placental insufficiency.

## Poster 203

### THE EFFECTS OF EXCESS MACRONUTRIENTS ON TROPHOBLAST AND ENDOTHELIAL CELL INTERACTIONS.

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**Introduction:**
As a fetus develops in utero it requires an increasing supply of nutrients and gases. The regulation of nutrient and gas transport from the mother's circulation to the fetus is carried out by the placenta. Therefore, the establishment of adequate utero-placental blood flow, through spiral artery remodeling, is essential a successful pregnancy. A component of this process is the migration of extravillous trophoblast cells (EVTs) into the decidua where they transform spiral arteries into low resistance conduits of blood by displacing the endothelial cells that line them. Disturbances of this process is a hallmark of many pregnancy complications. One of the biggest risk factors for these gestational complications is maternal obesity. We hypothesize that excess macronutrients, a contributor to obesity, will hinder the ability of trophoblast cells to displace endothelial cells.

**Methods:**
HTR8 EVTs and primary human uterine microvascular endothelial cells (HUtMECs) were cocultured to determine the viability and migratory effects of these cell types on one another in standard culture conditions and in the presence of 25 mM glucose or 0.5 mM palmitic acid. Migration was measured using a transwell system and tube forming assay. Apoptosis and proliferation were measured using TUNEL and crystal violet assay respectively.

**Results:**
HUtMEC and HTR migration were both increased in co-culture conditions ($p<0.05$). While hyperglycermia did not have an effect on this, palmitic acid decreased the migration of both HTRs and HUtMECs in the presence of one another ($P<0.05$). Crystal Violet assay confirmed that this was not due to changes in proliferation in the presence of these macronutrients. The effects of these conditions on apoptosis and tube forming capacity is in progress.

**Conclusions:**
This work will provide a deeper understanding of the interactions that occur between these cells during spiral artery remodeling and the mechanisms that drive them *in vitro.*

## Poster 204

### INFLAMMATION DURING EARLY PREGNANCY RESULTS IN IMPAIRED PLACENTAL DEVELOPMENT AND REDUCED FETAL GROWTH IN RATS

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**Introduction:**
Fetal growth restriction (FGR) affects 8% of pregnancies in Canada, and is a leading cause of fetal mortality. Maternal inflammation is also highly associated with the pathogenesis of FGR; however, the mechanisms by which inflammation causes placental maldevelopment and leads to FGR remain unclear. The objective of this study was to determine the contribution of natural killer (NK) cells, which are the most prevalent immune cells in the uterus during early pregnancy, to placental development and fetal growth during inflammation in early pregnancy.

**Methods:**
Maternal inflammation was induced by injection of the viral mimetic polyinosinic-polycytidylic acid (polyI:C, 10mg/kg) on gestational day (GD) 8.5. To deplete NK cells, rats were injected with asialo GM1 antibodies on GD4.5. Changes in cytokines were assessed by qRT-PCR, and placental morphology and hypoxia was analyzed by immunohistochemistry. Fetal growth was assessed by measuring fetal weight and crown-rump length. Statistical significance was determined using Student's *t*-test and ANOVA ($p<0.05$).

**Results:**
Exposure to polyI:C induced expression of *Il6*, *Ido1*, *Mx1*, *Mcp1*, *Ccl5*, *Cxcl9*, *Cxcl10*, *Cxcl11,* and an increase in hypoxia levels within the uterus 6 h post-injection ($n\geq9$, $p<0.05$). On GD13.5, polyI:C-exposed fetuses weighed 15% less than controls ($n\geq34$, $p<0.05$). Placentas of polyI:C-injected dams also weighed 15% less than controls, and exhibited a 10% decrease in placental area that correlated with a 16% decrease in junctional zone thickness ($n\geq18$, $p<0.05$). On GD18.5, fetuses exposed to polyI:C exhibited decreased brain, liver, and body weight by 9%, 10%, and 9%, respectively ($n\geq20$, $p<0.05$). Depletion of NK cells prior to polyI:C injection caused a 40% decrease in fetal weight compared to controls on GD13.5 ($n\geq18$, $p<0.05$).

**Conclusions:**
Administration of polyI:C to pregnant rats resulted in smaller placentas and FGR that was exacerbated in dams lacking NK cells, suggesting that NK cells have a protective role on fetal development during maternal inflammation.

## Poster 205

### GESTATIONAL WEIGHT GAIN PREDICTS MAXIMUM SPEED REACHED IN AN INCREMENTAL WALKING TEST: RESULTS FROM THE MYOKINE STUDY

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**Introduction:**
It is known that engaging in habitual physical activity (PA) is beneficial for both mom and baby as outlined in the new *2019 Canadian Guidelines on PA throughout Pregnancy*. Previous work suggests that myokines may mediate the benefits observed through engagement in regular PA. We are undertaking work assessing whether moderate PA, is sufficient to increase the concentration of circulating myokines. While our myokine

analysis is ongoing, our preliminary data presented here examined the relationship between maternal anthropometrics and exercise variables.

**Methods:**
Thirteen pregnant women underwent a moderate-intensity incremental treadmill walking test. Following a 3 min warm-up at 2.0mph, the incline was set to 6% with a 0.2 mph increase in speed every minute until the participant reached 40-60% heart rate reserve. When the target intensity was met, the testing phase was initiated and maintained for 30-min. Pre-exercise and post-exercise blood draws were collected and are being analyzed for an array of myokines.

**Results:**
Preliminary findings illustrate a significant negative relationship ($r = -0.66$, $p < 0.05$) between maternal weight gain at the time of the visit and the maximum speed reached (MSR) during the exercise bout. Similarly, percentage of upper-limit of weight gained, according to guidelines, was negatively correlated with MSR ($r = -.59$, $p < 0.05$). The MSR by participants ranged from 2.6mph to 4.0mph, while the average was 3.4mph (SD=0.41). No associations were found between MSR and pre-pregnancy BMI, gestational age or RHR ($p > 0.05$).

**Conclusions:**
These results suggest that the amount of weight gained at the time of the visit, regardless of other factors, is predictive of the maximum speed participants are able to reach in order to attain moderate intensity during a walking session. While these results are significant, the pre- and post- exercise myokine levels remain to be analyzed and will potentially help elucidate their role in pregnancy.

## Poster 206

### TUMOR NECROSIS FACTOR-A (TNF-A) SIGNALS THROUGH THE SPHINGOSINE 1-PHOSPHATE (S1P) PATHWAY TO DECREASE FUSION OF PRIMARY HUMAN TROPHOBLASTS

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**Introduction:**
Pro-inflammatory cytokines increase in preeclampsia (PE), a hypertensive pregnancy disorder. In PE, low fusion rates of trophoblasts (TBs) induced by TNF-α, an inflammatory cytokine, leads to poor maternal-fetal barrier development. Since blocking all TNF-α signalling is not feasible as it regulates fetal development, we are investigating one downstream TNF-α signalling molecule. S1PR2 is a receptor for S1P, a bioactive lipid. S1PR2 is overexpressed in placentas from women with PE. TNF-α increases expression and signals through S1PR2 to induce cytotoxicity in endothelial cells; however, the effect of TNF-α on S1PR2 and TB fusion is unknown. We hypothesized that TNF-α would decrease fusion in an S1PR2-dependent manner and upregulate S1PR2 protein expression in primary term TBs.

**Methods:**
TBs were treated with 0-20ng/mL TNF-α for 24 hrs. S1PR1,2 protein expression was quantified by immunofluorescence (n=5). Dose-dependent TB differentiation was assessed by measuring beta-human chorionic gonadotropin (β-hCG) secretion by ELISA. TBs were syncytialized by treatment with 100μM cAMP in the presence and absence of 1ng/mL TNF-α for 72 hrs (n=3). S1PR2 or S1PR1,3 signaling was blocked using 1μM JTE-013 or 1μM VPC23019, respectively. Syncytialization was assessed by β-hCG ELISA and E-cadherin staining.

**Results:**
Fluorescence analysis revealed that S1PR2 expression increased as [TNF-α] increased to 2.4-fold at 20ng/mL after 24hrs (p=0.0099). S1PR1 expression remained constant. TNF-α decreased β-hCG secretion by 63.7+/-7.52% at 1ng/mL after 24 hrs (p<0.0001) and increased non-syncytialized cell number. Blocking S1PR1,3 in the presence of TNF-α decreased the unfused cell number to control levels without affecting β-hCG secretion.

**Conclusions:**
TNF-α increases S1PR2 protein expression in cultured primary TBs. TNF-α decreases β-hCG secretion in a dose-dependent manner. Contradicting our hypothesis, S1PR2 does not play a role. Alternatively, TNF-α signals through S1PR1,3 in cultured TBs to decrease fusion, implicating S1P signalling in the adverse effects of TNF-α in PE. Funding: MatCH Program and FOMD at UAlberta, CIHR

## Poster 207

### THE IMPACT OF LIFELONG HIGH-FAT HIGH-SUGAR EXPOSURE DURING PREGNANCY ON PLACENTAL STRUCTURE, INFLAMMATION AND OXIDATIVE STRESS IN NON-OBESE GUINEA PIGS

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**Introduction:**
An increasing number of women of childbearing age consume a 'Western diet' (WD) containing high amounts of saturated fatty acids and processed sugars. This WD has been linked to adverse responses in the placenta, including increased inflammation and oxidative stress often in association with maternal obesity. Recent studies have highlighted diet alone, independent of maternal body composition, may promote adverse fetal outcomes, although impacts upon the placenta are ill defined. We postulated WD exposure during pregnancy would be associated with increased placental inflammation and oxidative stress, independent of maternal body composition.

**Methods:**
Female guinea pigs were weaned onto a Control (CD) or WD (46% energy from fat, 10% sucrose, 8% fructose) and mated to control males at six months of age. Pregnant animals were necropsied at 64 days gestation (term ~ 69 days) for gross and histologic examination. Placental histopathology was assessed using hematoxylin and eosin staining. Markers of inflammation (MAC387) and oxidative stress (8-OHdG) were assessed using immunohistochemistry.

**Results:**
While maternal and fetal body weights were unchanged between the two groups, WD placentae were 36% heavier (p=0.02), and displayed large multifocal to coalescing areas of coagulative necrosis throughout, comprising ~ 50% of the tissue area. In contrast, CD placentae showed small multifocal areas of necrosis comprising < 25% of the tissue area. MAC387 analysis revealed the number of macrophages to be increased ~ 11 fold in WD placentae (p=0.02), primarily localized to areas of necrosis. Interestingly, 8-OHdG immunoreactivity as a measure of DNA oxidation was decreased ~ 42% in WD placentae (p<.01).

**Conclusions:**
Maternal lifelong WD consumption independent of body weight results in distinct abnorMalities of placentae architecture occurring with a degree inflammation, but without an increase in oxidative stress. These studies

support the concept of maternal diet alone playing a significant impact upon placental development.

## Poster 208

### HIGH MOBILITY GROUP BOX 1 IMPLICATION IN STERILE INFLAMMATION AT THE MATERNAL-FETAL INTERFACE

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**Introduction:**
Sterile inflammation, caused by damaged-associated-molecular-patterns (DAMP), is frequently observed in pregnancy complications and leads to placental inflammation and dysfunction. One of these DAMPs, high mobility group box 1 (HMGB1), has been associated to preeclampsia and preterm birth. HMGB1 is a nuclear protein released during necrosis and leading to inflammation. Extracellular HMGB1 has two isoforms, one inducing proinflammatory cytokines (HMGB1-disulfide (D)) whilst the other act as a chemoattractant (HMGB1-reduced (R)). We hypothesize that HMGB1 could be secreted by trophoblasts and be implicated in placental inflammation in complicated pregnancies. Our objectives is to investigate the role of HMGB1 at the maternal-fetal interface including its subcellular localization during trophoblast differentiation and pro-inflammatory abilities in both physiological and pathological conditions.

**Methods:**
Term placental explants were used to determine the subcellular localisation of HMGB1 (by immunohistochemistry) during trophoblast differentiation or treated with specific HMGB1 isoforms to determine the impact on inflammation and function (using ELISAs). Alongside, placentas from women with either term uncomplicated pregnancies or preeclampsia (PE) were studied to determine the distribution of HMGB1.

**Results:**
Subcellular localisation of HMGB1 was modulated during trophoblast differentiation with increased nuclear amount and associated decreased cytoplasmic levels. Abrogated nuclear export of HMGB1 or forced translocation into the cytoplasm affected trophoblast differentiation. HMGB1-D treatment led to the secretion of pro-inflammatory cytokines in placental explants (IL-1b $p<0.0001$; IL-6 $p=0.0007$). Neither placental function or cell death was affected. In placentas from pregnancies with PE, increased percentage of trophoblast with cytoplasmic distribution of HMGB1 was observed as compared to the classic nuclear localization predominantly observed in normal pregnancies.

**Conclusions:**
We demonstrated changes in the localization of HMGB1 in association with trophoblast differentiation as well as in pregnancies complicated with PE. We showed that a specific isoform of HMGB1 induced inflammatory cytokines which suggests a role of this DAMP in placental inflammation and function.

## Poster 209

### THE USE OF SYNOPTIC REPORTING TO BRIDGE THE GAP IN PLACENTA PATHOLOGY REPORTING PRACTICES OF SUBSPECIALTY TRAINED PLACENTAL PATHOLOGISTS AND RESIDENT PATHOLOGISTS

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**Sim**[3], **Dina El Demellawy**[4], **David Grynspan**[4], **Shannon Bainbridge**[1]
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**Introduction:**
Clinical placental pathology is an important modality to investigate underlying causes of many adverse pregnancy outcomes. However, this field has been plagued by poor standardization in conducting and reporting evaluations – particularly amongst clinicians with differing degrees of sub-specialty training and experience. We propose that by implementing synoptic reporting practices, the quality and completeness of placenta pathology examinations will be enhanced, particularly when conducted by pathologists-in-training and non-subspecialty pathologists with less experience in the field.

**Methods:**
Placentas from singleton pregnancies sent to the Department of Pathology at CHEO between 2013- 2014 were randomly selected for inclusion (N=100). Histology slides of each case were blindly examined by two non-FRCPC certified resident pathologists and two experienced, sub-specialty trained placental pathologists. Reviews were conducted using an evidence-based synoptic report, assessing the absence, presence and severity of 30 possible placental lesions. Kappa scores were calculated to assess inter-observer agreement between resident and senior pathologists.

**Results:**
Inter-observer agreement between resident and senior pathologists ranged from -0.018 to 1.0. Higher agreement was seen for well-defined lesions (e.g., fetal inflammatory response: 0.916 [0.823-1.0]) and rare lesions (e.g., chorangioma: 1.0 [1.0-1.0]). Lower agreement was seen for lesions poorly defined in the literature (e.g., chorionic hemosiderosis: -0.014 [-0.033 - 0.005], laminar necrosis: -0.018 [-0.048 - 0.012]). 41.4% of lesions assessed had a Kappa score 0.41 (moderate to almost-perfect) agreement.

**Conclusions:**
We have demonstrated that synoptic reporting is an effective tool for standardizing placental examinations between non-FRCPC pathology residents and pathologists with sub-specialty training in placental pathology. We postulate that similar improvement in reporting may be seen with the implementation of a synoptic framework in low-resource settings where sub-specialty training in placental or pediatric pathology is lacking. Our findings emphasize the importance of ongoing global standardization efforts for ensuring consistency in diagnostic criteria and reporting practices in this field.

## Poster 210

### THE EFFECT OF ACTIVATION OF LECTIN LIKE-OXIDIZED-LDL RECEPTOR 1 AND ANGIOTENSIN II RECEPTOR TYPE I ON FETAL ENDOTHELIAL FUNCTION IN PREECLAMPSIA

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**Introduction:**
Preeclampsia is a pregnancy syndrome characterized by new onset hypertension and vascular dysfunction. Preeclampsia causes poor fetal health outcomes including vascular complications in later-life. Increased activity of the lectin-like oxidized-LDL receptor-1 (LOX-1) and angiotensin II receptor type 1 ($AT_1$) has been associated with maternal vascular dysfunction in preeclampsia, and have recently shown to interact by increasing oxidative stress and pro-inflammatory molecules. However, the role of LOX-1 and $AT_1$ in the fetal vasculature is unknown. Our objective is to study whether these pathways are altered in fetal vessels complicated by preeclampsia.

**Methods:**
Human umbilical vein endothelial cells (HUVECs) were isolated from umbilical cords from uncomplicated (n=6) or preeclamptic pregnancies (n=6). Cross-sections of the cords were stained with dihydroethidium to evaluate superoxide levels. Protein expression of LOX-1, AT1, NOX4 and ICAM-1 (inflammatory markers), endothelial nitric oxide synthase (eNOS) and phosphorylated-eNOS (P-eNOS$^{ser1177}$) were assessed by Western blotting in (1) isolated HUVECs and (2) cultured HUVECs (n=5) exposed to 30mg/mL or 60mg/mL oxLDL (LOX-1 ligand) and 10mM angiotensin II (AngII, $AT_1$ ligand), for 8 or 16 hours (hrs), respectively.

**Results:**
Superoxide levels tended to be increased (p=0.0649) in preeclamptic umbilical veins compared to controls. Isolated preeclamptic HUVECs showed increased LOX-1 protein levels compared to control cells by 38±4%. No differences in $AT_1$, NOX4, ICAM-1, eNOS and P-eNOS$^{ser1177}$ were found. In cultured HUVECs, there was no affect of agonists at 8 hrs, however at 16 hrs, oxLDL exposure increased LOX-1 expression by 52±2%. OxLDL and AngII exposure for 16h increased NOX4 protein expression (78±6 and 38±6%, respectively) but did not alter either ICAM-1, eNOS or P-eNOS$^{ser1177}$.

**Conclusions:**
Our studies suggest that fetal endothelial cells from preeclampsia have increased oxidative stress, which may be meditated by LOX-1. These fetal endothelial pathways may contribute to our understanding of later-life vascular complications in offspring from preeclamptic pregnancies.

## Poster 211

### EXAMINING THE IMPACTS OF MATERNAL DIET-INDUCED OBESITY ON EARLY POST-IMPLANTATION PLACENTAL DEVELOPMENT AND UTERINE VASCULAR REMODELLING

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**Introduction:**
Maternal diet-induced obesity (mDIO) during pregnancy increases offspring risk of cardiometabolic diseases, which may be mediated by intrauterine hypoxia and altered placental development. As tissue-resident uterine natural killer (tr-uNK) cells play a known role in promoting proper placental perfusion, we sought to investigate if mDIO impacts the frequency of these cells, downstream vascular remodeling, and placental growth.

**Methods:**
Female C57BL/6J mice were fed standard chow (CON, n=6; 17% kcal fat) or an obesogenic diet (OB, n=9; 45% kcal fat) for 8 weeks prior to and during pregnancy. On gestational day 10.5 (GD10.5) the gravid uterus was collected, fixed, and organ weights recorded. DBA lectin-reactive tr-uNK cell density and implantation site morphometry was assessed using lectin histochemistry and brightfield microscopy. Each pregnancy represented one biological replicate, data were analyzed by parametric t-test or two-factor ANOVA, significance was defined as $p<0.05$.

**Results:**
OB dams demonstrated increased body weight from 3 weeks of dietary intervention until sacrifice at GD10.5, with a 24% increase in total body weight ($p<0.001$), a 3.6-fold increase in gonadal fat mass ($p<0.01$), and increased fasting blood glucose (10.58+/-0.96 vs. 9.35 +/-0.47 mmol/L, $p<0.01$). $DBA^+$ tr-uNK cell density and decidual vascular lumen area were similar between groups but placental cross-sectional area (relative to the entire implantation site) was increased by 20% in conceptuses of mDIO dams ($p<0.01$), without changes to relative proportions of junctional or labyrinthine tissue.

**Conclusions:**
Preliminary results suggest that mDIO resulted in placental hypertrophy, a common sign of impaired placental efficiency and hypoxia, without altering abundance of tr-uNK cells or vascular lumen area. Further examination of morphometry, immunological markers, and sex-based differences in placentation in response to mDIO remain to be conducted in this cohort.

## Poster 212

### DECORIN PRODUCTION DURING DECIDUALIZATION OF HUMAN ENDOMETRIAL STROMAL CELLS

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**Introduction:**
Decidualization involves transformation of uterine endometrial Stromal cells (ESC) into specialized secretory cells that provide a nutritive and immune-protective matrix for successful embryo implantation and placental development. Our lab discovered that "decorin" (DCN), a leucine-rich proteoglycan produced by decidual cells restrains renewal and differentiation of "Stem" trophoblast into hormone-producing syncytiotrophoblast and invasive extra-villous trophoblast (EVT), and also EVT cell invasiveness. DCN overproduction by the decidua was associated with maternal "preeclampsia", a trophoblast hypo-invasive disorder. Furthermore, elevated maternal plasma DCN levels during the second trimester was a predictive biomarker for preeclampsia. Presently it is unknown whether DCN production changes during the process of decidualization of ESC and whether DCN is essential for maintenance of decidualization.

**Methods:**
We used an immortalized human endometrial stromal cell line (T-HESC) and a primary ESC (P-ESC, derived from first trimester decidua) for decidualization *in vitro* in the presence of cAMP and medoxy-progestin. The degree of decidual response was evaluated at day 6 of treatment by the production of decidual markers: insulin-like growth factor-binding protein (IGF-BP)1 and the hormone prolactin (PRL). DCN was quantified at the mRNA level by qPCR and as secreted protein by ELISA of cell culture-supernatants.

**Results:**
At 6 days after decidualization treatment, fibroblast-like THESCs transformed into polygonal secretory-type cells. Also, IGFBP1 and PRL showed significant increases in their respective mRNA levels to 210-fold and 9-fold ($n=3$, $p<0.05$), followed by a decrease on day 12 on withdrawal of treatment. DCN production showed an upregulation on day 6 both at mRNA and protein levels. Preliminary data with P-ESC revealed that DCN production was intimately linked with decidualization markers.

**Conclusions:**
DCN production by hESC increases during decidualization. Ongoing studies using DCN knockdown should reveal whether DCN is essential for maintaining decidualization.

## Poster 213

### CHRONIC HYPOXIA AND FETAL BRAIN DYSMATURATION IN LATE ONSET IUGR

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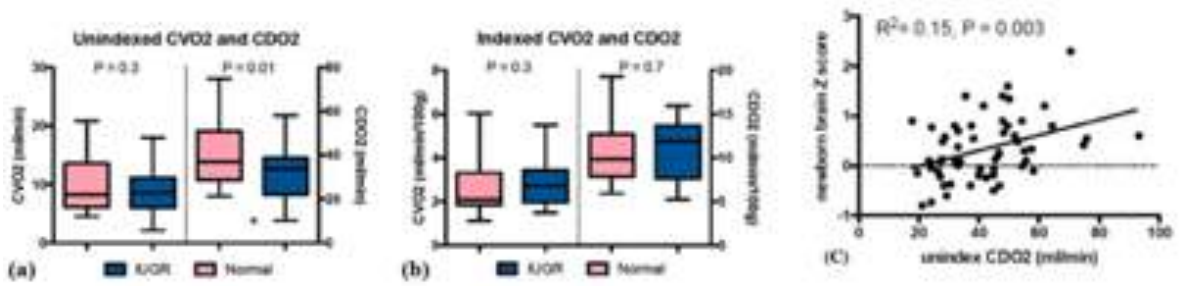
**Introduction:**
Late-onset intrauterine growth restriction (IUGR) results from placental insufficiency, and it has an adverse impact on brain development. We sought to demonstrate the relationship between fetal hemodynamics and brain development in late onset IUGR, using a combination of phase contrast magnetic resonance (MR) and MR Oximetry.

**Methods:**
The major vessels of 45 late gestation normal and 15 late onset IUGR fetuses were studied with MR according to our previously published techniques[1,2] and underwent imaging on a commercial 1.5T MR system (Avanto, Siemens Medical Solutions, Erlangen, Germany). We calculated fetal oxygen delivery ($DO_2$) and consumption ($VO_2$), fetal cerebral $DO_2$ ($CDO_2$) and cerebral $VO_2$ ($CVO_2$) according to previous work[2,3]. The relationship between fetal hemodynamic changes and neonatal brain weight was investigated using Pearson's correlation coefficient.

**Results:**
We found profound reductions in fetal $DO_2$ and $VO_2$ in the IUGR fetuses. Brain-sparing physiology resulted in smaller, but still significant reductions in fetal $CDO_2$. When we compared the percentage of unindexed $CDO_2$ to unindexed total body DO2, IUGR had significantly higher proportion of $DO_2$ supplying the brain ($P < 0.0001$) (Figure a, b). We observed that higher blood flow in the SVC was associated with smaller EBW ($R^2 = 0.31$, $p = 0.0002$). We found a significant association between fetal $CDO_2$ and neonatal brain weight Z-score ($R^2 = 0.15$, $p = 0.003$) (Figure c).

**Conclusions:**
We found higher SVC flow and lower $CDO_2$ in IUGR fetuses in preservation of $CVO_2$ in the setting of IUGR. Fetal $VO_2$ was matched to $DO_2$ through chronic adaptation to hypoxia through slowing of growth. This switch from acute to chronic adaptation has previously been demonstrated in fetal lambs[4,5]. These findings are in keeping with the concept that despite brain sparing physiology, placental insufficiency ultimately affects brain growth.



## Poster 214

### MILK ANALYSIS USING MILK ANALYZERS IN A STANDARDIZED SETTING (MAMAS) STUDY

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**Introduction:**
Human milk analyzers (MA) are increasingly used to rapidly measure the macronutrient content in breast milk for target fortification, to reduce the risk of postnatal growth restriction. However, many MA are used without quality assurance, validation or calibration. Hence, we have launched the MAMAS study to implement standard procedures following good clinical and laboratory practice (GCLP). Objectives: To investigate measurement quality between different MA, test whether accuracy and precision of devices can be improved by establishing individual calibration curves, and assess long-term stability of measurements, following GCLP.

**Methods:**
Breast milk samples were sent to 13 participating centres in North America and Europe (total of 15 devices). The study included 3 sets of samples: A) initial assessment of the device's performance consisting of 10 calibration samples with random replicates; B) long term stability and quality control consisting of 2 batches of samples to be measured every time before the device is used, over 6 months; C) ring trial consisting of 2 samples to be measured monthly. The devices tested were Unity SpectraStar (n=5) and MIRIS Human Milk Analyzer (n=10).

**Results:**
There are significant variations in accuracy and precision between different MA's fat, protein and lactose measurements (Figure 1). However, the accuracy of measurements can be improved by establishing individual correction algorithms. Repeated measurements are more robust when coming from a larger batch volume. Long term stability also varies between devices. GLCP improves the results obtained during ring trials.

**Conclusions:**
The variations in measurements between devices are clinically significant and would impact daily dietary prescriptions, and the outcomes of clinical studies assessing the effect of targeted adjustment of nutrient intake in preterm babies. This study shows that it is crucial to follow GCLP when using MA to ensure proper measurement of macronutrients, similar to what is required of other medical devices.

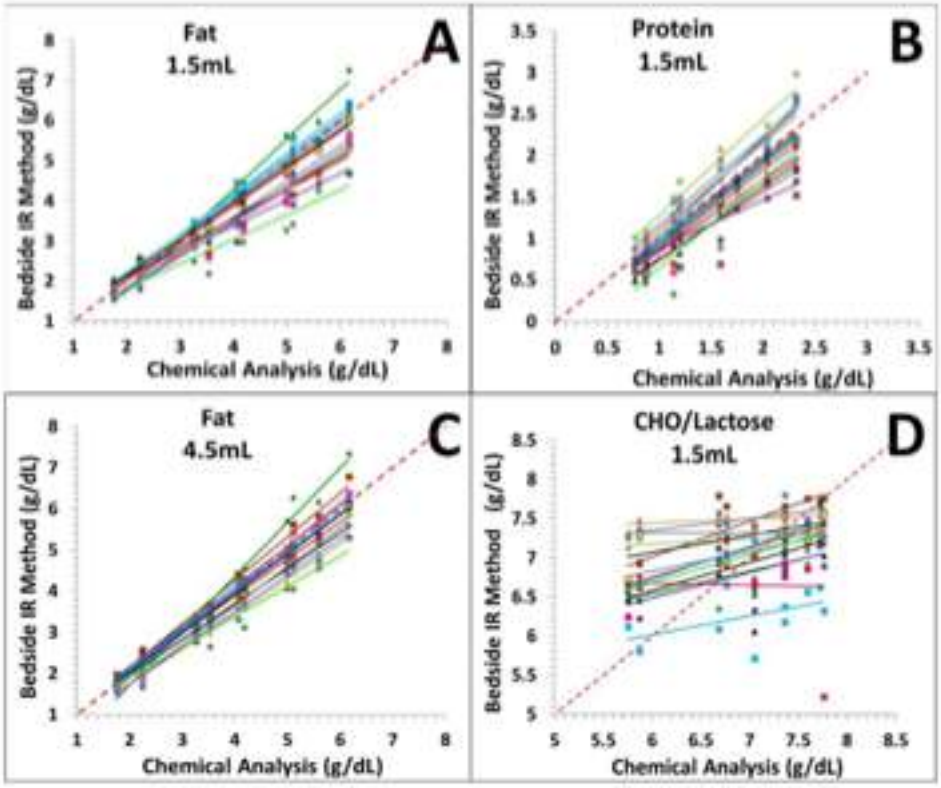


Figure 1: Correlation of uncorrected data for fat, protein and carbohydrate (CHO) content from 15 bedside devices versus reference values. Each device is represented by its own colour consistent in each panel. Panels A, B, and D show mean of fat, protein, and CHO contents obtained from three repeated measurements each drawn from a 1.5mL sample volume set-up. Panel C shows mean of three fat measurements obtained from one 4.5mL sample volume set-up.

## Poster 215

### A TRIAL OF LABOUR COMPARED WITH REPEAT PLANNED CAESAREAN DELIVERY IN WOMEN WITH MORBID OBESITY AND PRIOR CAESAREAN SECTION: IMPACT ON NEONATAL OUTCOMES

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**Introduction:**
Maternal obesity is emerging as a public health problem. We aimed to compare neonatal outcomes of women with morbid obesity and prior caesarean section (CS) that underwent a trial of labour after caesarean (TOLAC) with those who underwent repeat CS.

**Methods:**
Retrospective cohort study of all women class II-III obesity (body mass index >35 kg/m2) and prior CS who had a singleton birth at 38-42 weeks of gestation in Ontario, Canada between April 2012 and March 2014. Data were obtained from the Better Outcomes Registry & Network (BORN) Ontario database. Women who were not candidates for a TOLAC were excluded. The primary neonatal outcome was a composite of any of the following: intra-partum neonatal death, neonatal intensive care unit admission, 5-minutes Apgar score <7, and umbilical artery pH < 7.1. Odds ratios and 95% confidence intervals were adjusted for maternal age, parity, BMI, labour induction, pre-gestational diabetes, gestational age at delivery, birth weight <10th percentile and academic center.

**Results:**
1) Of 281,480 women who gave birth during the study period, 2,337 (0.8%) met enrollment criteria; 458 (19.6%) had a TOLAC and 1,879 (80.4%) had a planned repeat CS. 2) Of the women who underwent a TOLAC, 153 (33.4%) had an intra-partum CS. 3) The rate of primary outcome was similar between the TOLAC and the planned repeat CS groups (16.8% vs. 14.1%, p=0.13). 4) When stratifying outcomes by actual (rather than planned) mode of delivery, a successful TOLAC was not associated with lower or higher odds of composite neonatal outcome (adjOR 0.97, 95%-CI 0.62-1.53) while a failed TOLAC was associated with higher odds of composite neonatal outcome (adjOR 1.77, 95%-CI 1.06-2.95) compared with women who underwent planned CS.

**Conclusions:**

In morbidly obese women and prior caesarean section, neonatal outcome is not affected by the planned mode of delivery.

## Poster 216

### NEONATAL OUTCOMES BY MODE OF DELIVERY IN WOMEN WITH MORBID OBESITY: A TRIAL OF LABOUR COMPARED WITH PLANNED CAESAREAN DELIVERY

**Keren TZADIKEVITCH GEFFEN**[1,2,3], **Nir MELAMED**[1,3], **Ann SPRAGUE**[4], **Cynthia MAXWELL**[3,5], **Jon BARRETT**[1,3], **Elad MEI-DAN**[1,2,3]
[1]Sunnybrook Health Sciences Centre, [2]North York General Hospital, [3]University of Toronto, [4]BORN Ontario, [5]Mount Sinai Hospital

**Introduction:**
Obesity is a major health concern among women in the reproductive age. Our objective was to compare neonatal outcomes of women with class II-III obesity who underwent a trial of labour with those who underwent a planned caesarean section (CS).

**Methods:**
Retrospective cohort study of women with class II-III obesity (BMI>35kg/m$^2$) who had a singleton birth at 38-42 weeks gestation in Ontario, during April 2012-March 2014. Data were obtained from the Better Outcomes Registry & Network (BORN) Ontario, BORN Information System (BIS) database. The primary neonatal outcome was a composite of any of the following: intra-partum neonatal death, neonatal intensive care unit admission, 5-minutes Apgar score <7, and umbilical artery pH <7.1. Odds ratios and 95% confidence intervals were adjusted for potential confounders.

**Results:**
Of 281,480 women who gave birth during the study period, 8,752 (3.1%) met enrollment criteria; 8,433 had a trial of labour and 319 had planned CS. Of the women who underwent a trial of labour, 1644 (19.5%) had an intra-partum CS. The rate of the primary outcome was lower in the trial of labour compared with the planned CS group (15.1% vs. 19.1%, p=0.047, respectively). However, this association became non-significant after adjustment for potential confounders (adjOR, 0.80; 95%-CI 0.59-1.07). When stratifying outcomes by actual mode of delivery, a successful trial of labour was associated with lower odds (adjOR 0.67, 95%-CI 0.50-0.91) while a failed trial of labour was associated with higher odds of the primary outcome (adjOR 1.74, 95%-CI 1.21-2.48) compared with women who underwent planned CS

**Conclusions:**
In pregnant women with class II-III obesity at a gestational age of 38-42 weeks, neonatal outcome is not affected by the planned mode of delivery, although the risk of neonatal adverse outcomes is lowest among women who have successful vaginal birth.

## Poster 217

### PREPREGNANCY SURGERY AND RISK OF NEONATAL ABSTINENCE SYNDROME IN FUTURE NEWBORNS

**Aimina Ayoub**[1], **Jessica Healy-Profitós**[1], **Thuy Mai Luu**[2], **François Carrier**[1], **Nancy Low**[3], **Nathalie Auger**[1]
[1]Centre de Recherche du CHUM, [2]Ste-Justine Hospital, [3]McGill University

**Introduction:**
Risk factors for opioid use in pregnancy are unclear. Prepregnancy surgery may introduce many women to prescription opioids. There is emerging evidence that surgery is associated with prolonged opioid use, but the impact on risk of neonatal abstinence syndrome in future offspring is poorly understood. Our objective was to determine the association of maternal prepregnancy surgery with risk of neonatal abstinence syndrome at a future delivery.

**Methods:**
We analyzed a longitudinal retrospective cohort of 2,182,365 deliveries in Quebec hospitals between 1989 and 2016. The main exposure was maternal prepregnancy surgery. The main outcome was neonatal abstinence syndrome in offspring at birth. We used log-binomial regression models adjusted for maternal comorbidity and pregnancy characteristics to estimate risk ratios (RR) and 95% confidence intervals (CI) for the association of maternal prepregnancy surgery with neonatal abstinence syndrome in newborns.

**Results:**
The prevalence of neonatal abstinence syndrome in the cohort was 10.7 per 10,000 births. Compared with no surgery, prepregnancy surgery was associated with 1.64 times the risk of neonatal abstinence syndrome at birth (95% CI 1.50-1.79). The risk was greater for 3 or more prepregnancy surgeries (RR 2.35, 95% CI 2.09-2.65) and younger age at first surgery. Nearly all surgical specialties increased the risk of neonatal abstinence syndrome, but associations were strongest for cardiothoracic surgery (RR 4.62, 95% CI 2.98-7.16), neurosurgery (RR 3.09, 95% CI 1.61-5.93), and urologic surgery (RR 3.06, 95% CI 2.18-4.28).

**Conclusions:**
Prepregnancy surgery increases the risk of neonatal abstinence syndrome at a future delivery. Prescription opioids for postsurgical pain may result in persistent opioid use and inadvertently lead to neonatal abstinence syndrome in future pregnancies. Closer management of postsurgical pain to prevent opioid addiction may help reduce the risk of neonatal abstinence syndrome.

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- Preterm Birth
- Environmental Health
- Healthy Pregnancy
- Integrated Child and Youth Research and Health Services
- Mental Health

Read our *Refreshed Strategic Plan 2018-2020: Healthy Foundations of Life* for more information: bit.ly/Plan_EN

**Strategic funding:** We support research and capacity building aligned with our strategic priorities through a variety of opportunities. For more information, subscribe to our ebulletin at bit.ly/subscribe_eb and follow @LeeShoo on Twitter.

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- Grossesse en santé
- Recherche et services de santé intégrés pour les enfants et les adolescents
- Santé mentale

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**Our National Training Program creates a learning culture that encourages up and coming Canadian researchers to translate new knowledge into better outcomes for children with neurodisabilities and their families.**

## Our Program

Through partnerships with organizations across Canada, Kids Brain Health offers unique learning opportunities that go beyond traditional training experiences offered in academia. We are the only national program in developmental neurosciences in Canada, supporting curriculum and practical experiences that advance trainees on both academic and non-academic career paths. Our trainees move on to careers as professors, science administrators, researchers, and biomedical and health sector professionals to name a few.

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**Interested? Stop by our table and chat, or reach out to:**

**Doug Swanson, Research and Training Manager**
**Email: dswanson@kidsbrainhealth.ca**
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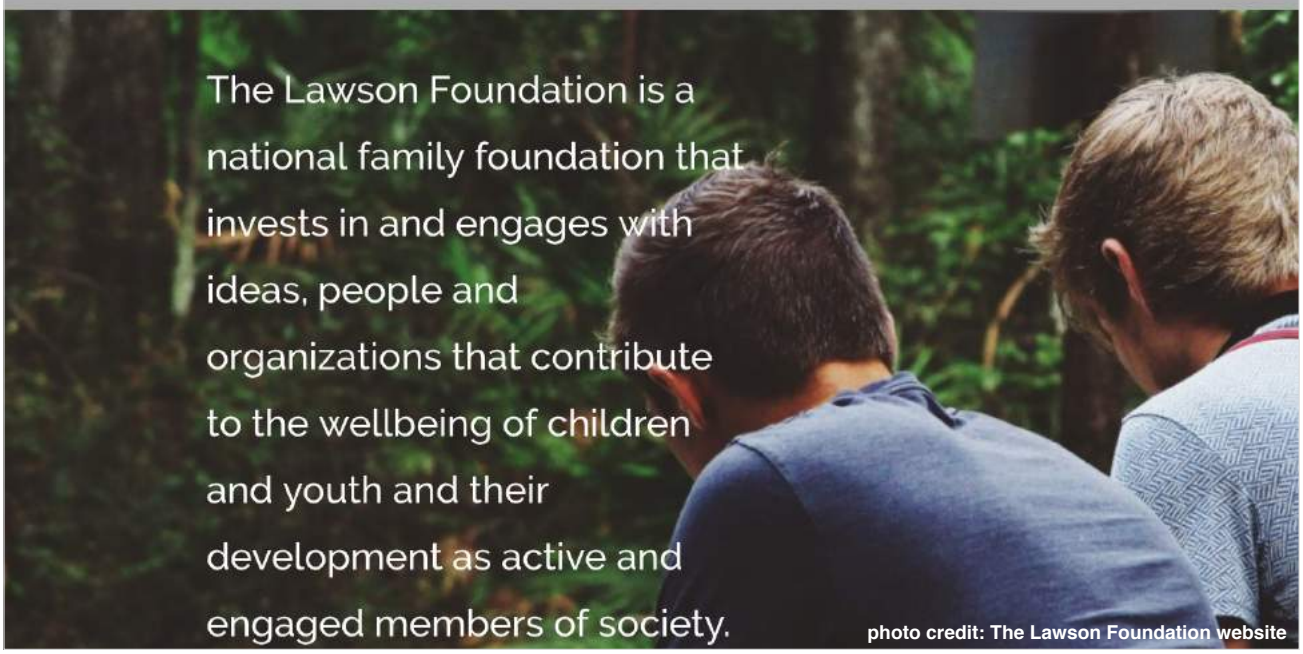


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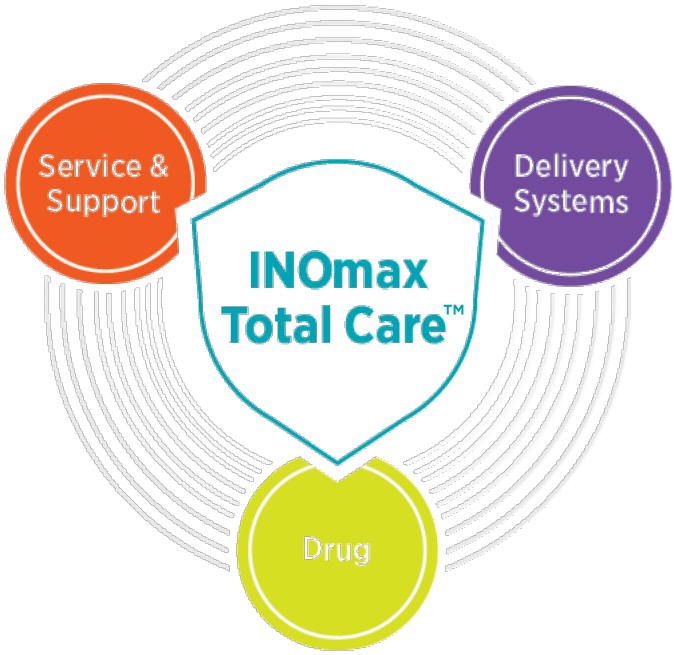


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