women & children's health research institute

2022 WCHRI Research Day website content & abstracts

WCHRI Research Day will be November 2!

WCHRI will host its annual Research Day on November 2. This year our format will again be entirely online.

WCHRI Research Day brings our members and stakeholders together to share common interests and research outputs on women and children's health and is a great venue for our trainees to communicate their recent work, discuss their research and network with colleagues. Presentations for Research Day will be combined into themed sessions and presented in moderated virtual sessions.

We are delighted to welcome David Nicholas as our keynote speaker. Nicholas is a professor in the Faculty of Social Work at the University of Calgary. He will be discussing his CIHR-funded research on the psychosocial and health consequences of COVID-19 on children with health vulnerabilities and their families.

women & children's health research institute

Important dates

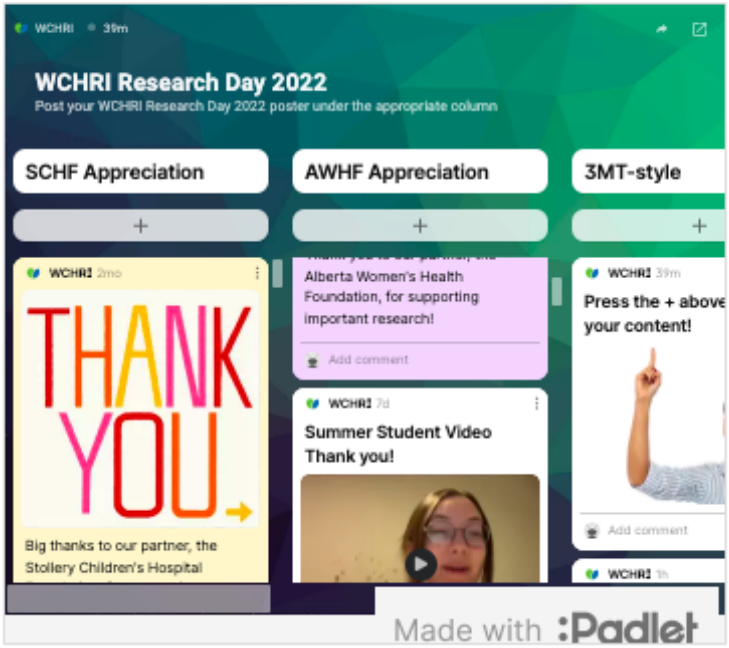
Registration and abstract submission opens	**July 13**
Learning Session: How to prepare your abstract for WCHRI Research Day	**July 21 (11:30 a.m.)**
Abstract submission closed	**September 8 (4 p.m.)**
Learning Session: How to prepare your presentation for WCHRI Research Day	**October 5 (11:30 a.m.)**
Registration closes	**October 30 (4 p.m.)**

women & children's health research institute

Padlet

Padlet is an online platform that we are using to create a WCHRI 2022 Research Day wall to house posts from all of you. We want to create a space to allow you to connect with one another in a new way and share your thoughts on Research Day and the research itself!

Open the Padlet by clicking on the full screen icon on the right corner below, then add your post with the + button in the appropriate column.



See you November 2!

WCHRI Research Day is an open event where photographs of presenters and attendees are taken.

Questions? Contact wcgrants@ualberta.ca.

women & children's health research institute

Presentation schedule

Morning

Three-minute thesis (3MT) style presentations: 9:20 a.m.–10:25 a.m.

Five-minute poster presentations: 10:25 a.m.–noon

Afternoon

10-minute oral presentations: 1:30 p.m.–3:30 p.m.

Five-minute poster presentations: 3:30 p.m.–4:30 p.m.

women & children's health research institute

Abstract relevance criteria

All abstracts to WCHRI Research Day must align with the following relevance criteria to be eligible for posting on our website and presentation at Research Day.

To establish relevance, all abstracts must clearly address the following:

- The research question must specifically target improving outcomes for women and/or children through health research.
- The primary research question must address the unique and distinct health needs of women and/or children. For example:
  - Stating that a particular disease or risk factor is higher in women or in children is not sufficient rationale; the study must explore why prevalence is higher in women or children.
  - If a study is exploring sex/gender comparisons, the comparison must be embedded as the primary research question, not as a secondary outcome.
- Methodology must clearly demonstrate direct applicability to women and/or children's health outcomes. The applicant must provide rationale for their chosen research model, including factors such as sex and age.

The above items are some common considerations; alternative or additional factors may need to be included.

women & children's health research institute

Information & guidelines

Promote your research—virtually!

WCHRI Research Day offers trainees under the supervision of WCHRI academic members the opportunity to showcase their research progress. This year, we look forward to interacting virtually with our academic members, their trainees and our funders, the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation!

WCHRI is hosting Research Day virtually this year using PheedLoop, an interactive event platform.

Please access the WCHRI 2022 Research Day Abstract Submission and Registration Form to submit an abstract and to register for the event.

Click on the section headers below to access information on how to present your research.

women & children's health research institute

Abstract review process

The abstract review process is as follows:

- The WCHRI Research Day abstract review committee is composed of WCHRI academic members and WCHRI funded postdoctoral fellows.
- Abstracts are evaluated for relevance by the committee.
- The committee then recommends one of the following presentation types/ opportunities for each relevant abstract:
  - 3MT-style presentation,
  - (5-minute) poster presentation, or
  - (10-minute) oral presentation.
- Abstracts that meet WCHRI relevance criteria will be published on our website on October 3.
- WCHRI will provide notification to all trainees of the outcome of their abstract submission by October 3.
- Application feedback is not provided for this opportunity.

Abstract submission

- Abstracts must be **submitted** to WCHRI on or before September 8 (4 p.m.).
  - Late submissions are not accepted.
- Abstract submission is open to undergraduate, graduate, fellows and residents under the direct supervision of a current WCHRI academic member.
- One abstract submission per trainee maximum.
  - Where the presenter submits more than one abstract, the abstract submission received closest to the deadline date will be accepted.
- Submitted information is final and not subject to amendment.
- Presentation in the virtual platform is "live" and delivered by the trainee invited to present.

Trainees are to download the abstract details (PDF document) from the submission confirmation page. This download must be retained by the trainee as confirmation of abstract submission.

women & children's health research institute

Abstract preparation outline

Before you start your abstract submission, review the submission and completion requirements. Most trainees develop their abstract in a Word document and copy and paste the abstract into the abstract submission form.

The purpose of your abstract is to:

- condense a large amount into a brief and concise summary.
- engage and promote your work with a broad audience.

Why it's important:

- This will determine the format you are invited to present on Research Day.
- Abstracts will be posted on our website, so it will be a chance to build your professional portfolio.

Structure

For the abstract itself, key components include:

- a title
- an introduction
- methods
- results
- conclusion

Abstracts must also include the:

- authors
- funders

women & children's health research institute

Program opportunity

Abstracts and presentations are scientific and should be accessible to a broad audience.

- Abstract submissions will be allocated to one of the following presentation formats:
  - three-minute thesis (3MT-style) presentation,
  - 5-minute poster presentation, or
  - 10-minute oral presentation.
- Only abstracts that evidence alignment with WCHRI Research Day abstract relevance criteria are eligible for publication and presentation.
- Presentation format is recommended by the WCHRI Research Day abstract review committee and based on reviewer impression of the abstract and commensurate with the following in-training categories/ levels:
  - undergraduate
  - graduate
  - postdoctoral fellows
  - residents,
  - health/ clinical fellows
- Presentations are representative of WCHRI's three research themes:
  - children's health and well-being
  - pregnancy and developmental trajectories and
  - lifelong women's health.

Submission of an abstract to WCHRI constitutes confirmation of the trainee's availability to present on November 2.

women & children's health research institute

Acknowledgement

WCHRI is supported by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation. Without their generous support, our institute would be unable to continue to support the research done by you and your colleagues.

You are required to acknowledge the funding sources that contributed to your research. All research is supported in some way by a financial commitment. If you are unsure of the funding source(s) for your project, please ask your supervisor. All research projects funded by or receiving subsidized research services from WCHRI must acknowledge the support of WCHRI and the appropriate Foundation, including using logo(s) on your presentation slides.

Information on acknowledgement requirements and logo files can be found on our Acknowledgements and logos webpage.

Deadlines

- Abstract submission for WCHRI Research Day closed **September 8** at **4 p.m.**
- Registration for WCHRI Research Day closes **October 30** at **4 p.m.**

Applications must be submitted to WCHRI using the WCHRI 2022 Research Day Abstract Submission/ Registration Form. Late submissions are not accepted.

women & children's health research institute

Learning Sessions

WCHRI will host two learning sessions to help trainees navigate requirements and expectations for Research Day. The first session is to help you prepare your abstract and the second session offers specific details about the components required to deliver an effective presentation.

How to prepare your abstract for WCHRI Research Day

- Event date: July 21, 11:30 a.m. –1 p.m.
- View the presentation slides.

How to prepare your presentation for WCHRI Research Day

- Event date: October 5, 11:30 a.m.–1 p.m.
- View the presentation slides:
  - 3MT-style presentation
  - 5-minute poster presentation
  - 10-minute oral presentation

Please refer to our events page for further information and to register.

women & children's health research institute

Research Day presentation formats

WCHRI Research Day presentation formats offer trainees the opportunity to promote and network their research.

Presentations are attended by a broad audience composed of trainees, academic faculty, research staff and our funding partners and their donors.

3MT-style presentation

Each trainee will be assigned to a presentation space with up to five other presenters. One static, non-animated slide may be used. Trainees have three minutes to present their research followed by two minutes for questions from judges and/or the moderator. Judges may be WCHRI postdoctoral fellows, academic members and/or Stollery Children's Hospital Foundation and/or Alberta Women's Health Foundation representatives.

5-minute poster presentation

Each trainee will be assigned to a poster space with up to three other poster presenters. One dynamic slide may be used to support the presentation. Trainees have five minutes to present their research followed by up to three minutes of questions from poster judges. Poster judges may be WCHRI postdoctoral fellows or academic members.

10-minute oral presentation

Each trainee will be assigned to an oral presentation space with up to five other presenters. Dynamic slides may be used to support the presentation. Trainees have 10 minutes to present their research followed by up to five minutes of questions from presentation participants (judges, moderators and/or audience members, including Stollery Children's Hospital Foundation and/or Alberta Women's Health Foundation representatives). Oral presentation judges and moderators may be WCHRI postdoctoral fellows or academic members.

women & children's health research institute

Access the abstract submission and registration form

Access the WCHRI 2022 Research Day Abstract Submission/ Registration Form.

women & children's health research institute

Padlet

New to our 2022 Research Day, we are incorporating Padlet!

Padlet is an online platform that we are using to create a WCHRI 2022 Research Day wall to house posts from all of you. We want to create a space to allow you to connect with one another in a new way and share your thoughts on Research Day and the research itself!

Below, presenters will find information about how to share their abstracts in four presentation columns: 3MT-style, 5 min poster a.m., 5 min poster p.m. and 10 min oral. All attendees are welcome to post cards to the additional community columns and thank our generous Foundations under the **Foundation appreciation** column.

Check out the posts and please feel free to comment and interact. Let's get some really interesting conversations going! *If you are not a presenter, please do not post a card to our presentation columns.*

Visit the WCHRI 2022 Research Day Padlet!

How to post on Padlet:

To post to Padlet, double-tap or click the **add (+)** button under the column you wish to add a card. Insert your subject (as below) and choose your upload type. Once complete, click **submit** on the top-right corner of the submission tool.

For presenters:

We are encouraging all of our presenters to post information about their abstracts from Wednesday, October 26 to end of day Tuesday, November 1. On October 26, the padlet link will be shared with all Research Day attendees to check out the posts, comment and interact!

What to post by presentation type:

3MT-style presenters

- Post in the **3MT-style** column.
- Post your one presentation slide. Viewers can click on each image to see an enlarged version so no editing is required before posting.

5 min poster presenters

- Post in one of the **5 min poster** columns (a.m. or p.m. depending on the time of your presentation).
- Post an image of your full poster. Dynamic slides can be recorded in PowerPoint and posted as well.
- Viewers can click on each image to see an enlarged version so no editing is required before posting.

10 min oral presenters

- Post in the **10 min oral** column.
- Post your slide presentation.
- You can post a recording but it can be a maximum of 5 minutes long.

How to record your slide presentation:

- PowerPoint: Open your PPT presentation and choose **Slide Show** > **Record Slide Show** > **Record from Beginning**. Audio is not required. You can then upload this file to Padlet.
- Google Slides: To record your Google Slides presentation, you can download the Vidyard extension for Chrome.

The Subject of your posting, regardless of posting type, should be written in the following format: Firstname Lastname – Abstract title

Please allow 1-2 days for each new card posting as a moderator approves each submission.

If you have any questions about Padlet, please contact wchri@ualberta.ca.

women & children's health research institute

Registration

Registrations are open until **October 30 at 4 p.m.**

Please use this link to register.

Please register if you plan to attend.

Abstract submissions closed on September 8.

women & children's health research institute

Keynote Speaker

We are delighted to announce our keynote speaker for 2022 is **Dr. David Nicholas** of the University of Calgary.

His presentation is entitled: **"Examining the Psychosocial and Health Service Impacts of the COVID-19 Pandemic on Children with Health Challenges."**

Dr. David Nicholas is the associate dean of research and partnerships and a professor in the Faculty of Social Work at the University of Calgary. He is cross-appointed to the University of Alberta Department of Pediatrics.

He is the author of over 180 peer-reviewed publications in the area of childhood health and disability. Dr. Nicholas has led multiple studies addressing the COVID-19 pandemic as well as the earlier SARS pandemic, with a focus on psychosocial and health service impacts on children and their families. In 2021, he received the University of Calgary Sustainability Award for the innovation of his research, and in 2022, was named a Killam Annual Professor for impactful achievements in research, teaching and community involvement.

Date: November 2
Time: 12:30–1:30 p.m.
Location: Zoom

– Presentation abstract

Examining the Psychosocial and Health Service Impacts of the COVID-19 Pandemic on Children with Health Challenges

Children with health vulnerabilities have experienced a range of challenges as a result of the COVID-19 pandemic. These experiences and impacts were elicited in a qualitative study in which 336 participants (children with varying conditions, their parents, and health care providers) were interviewed. Psychosocial and health service delivery impacts of the pandemic will be presented, with recommendations for practice and planning in pandemic preparedness and recovery.

women & children's health research institute

Abstracts

Presenters, please use a laptop or desktop when giving your presentation, not a tablet (e.g. iPad, Galaxy Tab, etc.) or mobile device. These devices are fine for attendees but not for presenters.

All abstracts are included below and listed alphabetically. Click on the "presenters" or "supervisors" button to narrow down your search and then choose from the drop-down menu to filter by abstract theme, presentation type and keyword. When you have found the abstract you want to view, click on the "+" symbol to view the full abstract.

Every effort to report the abstract as submitted has been made. Questions may be addressed to wcgrants@ualberta.ca.

A B C D E H J K L M N O P R S T V W X Y

Presenters | Supervisors

Presentation theme | Outcome | Research mesh

Abuetabh, Yasser +

Adesunkanmi, Maryam +

Akter, Aklima +

Al Balushi, Mustafa +

WCHRI Research Day 2022

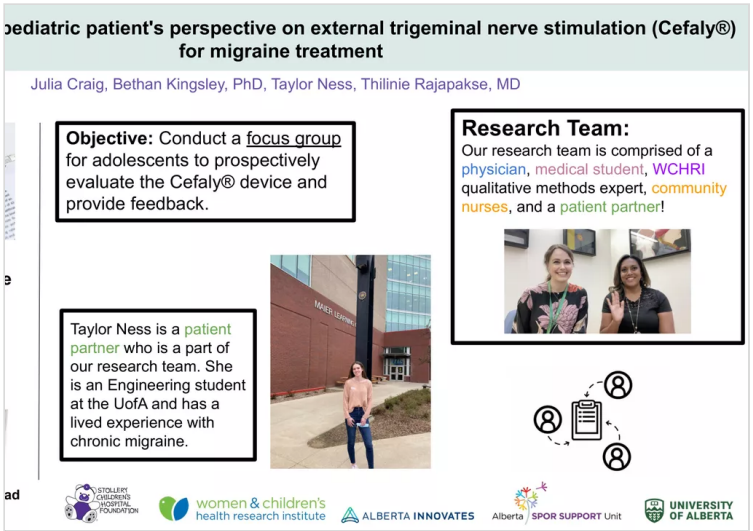
Please remember to add your name to your post!

WCHRI MAY 17, 2022 04:37PM UTC

3MT-style

ANONYMOUS NOV 08, 2022 08:47PM UTC

Julia Craig - Understanding the pediatric patient's perspective on external trigeminal nerve stimulation (Cefaly®) for migraine treatment

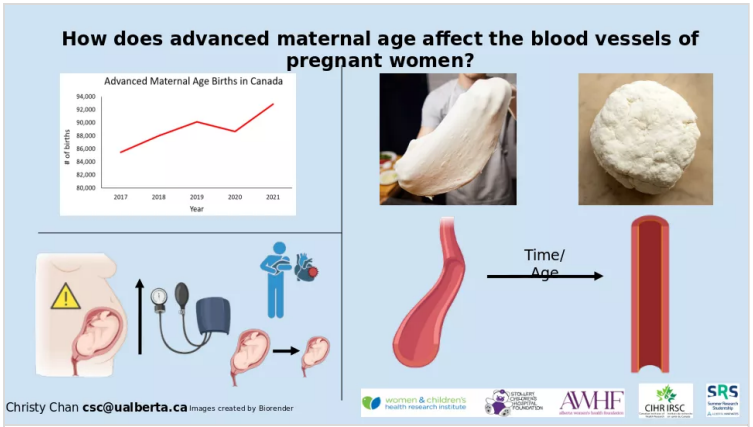


WCHRI_3MT_2022.pdf
PDF document
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Christy Chan - How does advanced maternal age affect the blood vessels of pregnant women?

From Christy Chan



3MT_WCHRI_Presentation.pptx
Powerpoint presentation
PADLET DRIVE

Thank you for sharing your research! Very interesting! Do you plan to assess any functional properties of vessels from those women?
— ANONYMOUS

Hi there! This is Christy - yes, I am continuing this research area in the semesters ahead to probe for targets in vasodilatory/constrictory pathways via immunofluorescence. We will also potentially look at oxidative stress as well! :) — ANONYMOUS

I also have a question regarding the duration of pregnancy of those woman? It is 1st, 2d or 3d trimester? Thanks for sharing today
— ANONYMOUS

Hi there! This is Christy - the arteries were obtained via C-section from these women at term (with their consent) so this would be late 3rd trimester. — ANONYMOUS

FATEMEH NEZARAT NOV 08, 2022 08:47PM UTC

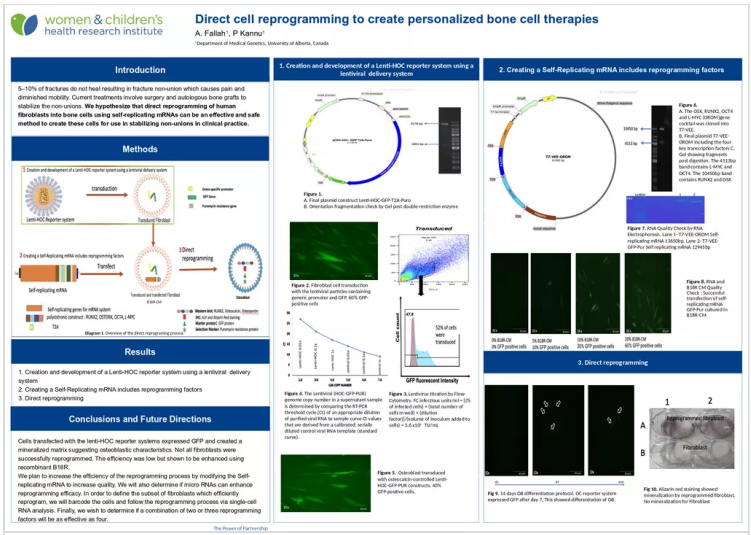
Fatemeh Nezarat-Use of Linear Combination Test (LCT) to identify Stem Cells Molecular Signaling Pathways Associated with Maternal COVID-19

great job presenting! — **ANONYMOUS**

5 min poster AM

AFALLAH NOV 08, 2022 08:47PM UTC

Asghar Fallah-Direct cell reprogramming to create personalized bone cell therapies



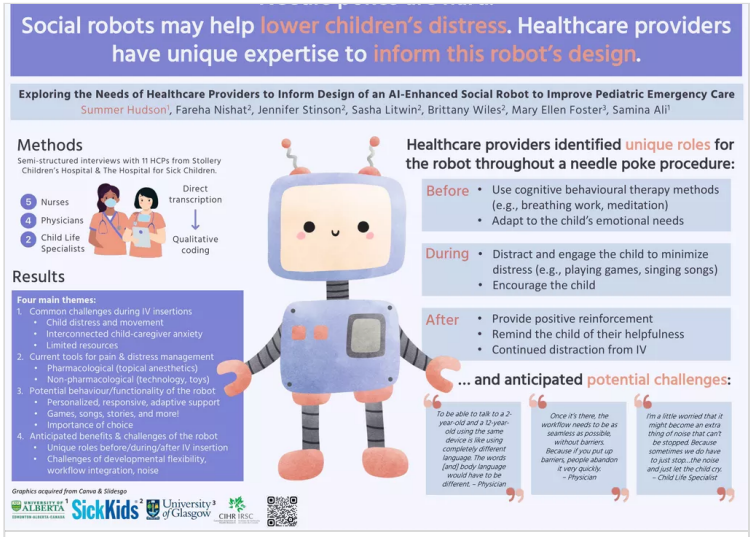
Poster_Asghar_Fallah_2_2pptx.pptx

Powerpoint presentation

PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Summer Hudson - Exploring the Needs of Healthcare Providers to Inform Design of an AI-Enhanced Social Robot to Improve Pediatric Emergency Care



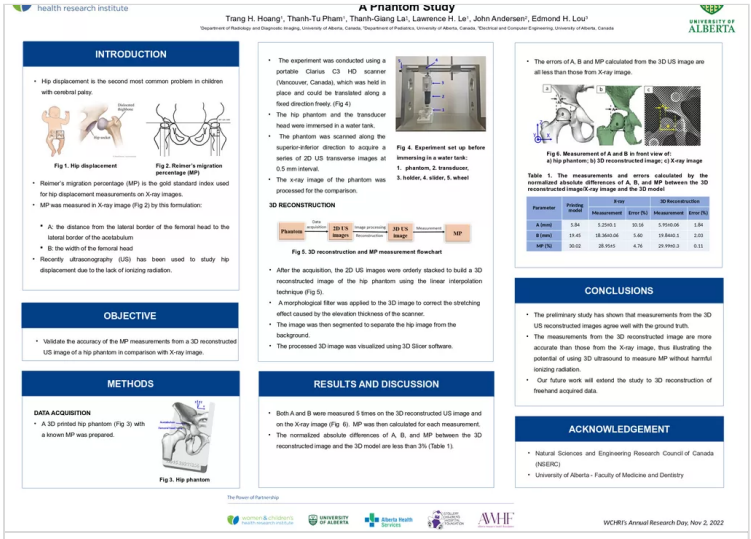
Summer_Hudson___Exploring_the_Needs_of_Healthcare_Providers_to_Inform_Design_of_an_AI_Enhanced_Social_Robot_to_Improve_Pediatric

PDF document

PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Trang Hoang Huyen - 3D Image Reconstruction of Regularly-Spaced 2D Ultrasound Images to Measure Hip Dislocation: A Phantom Study



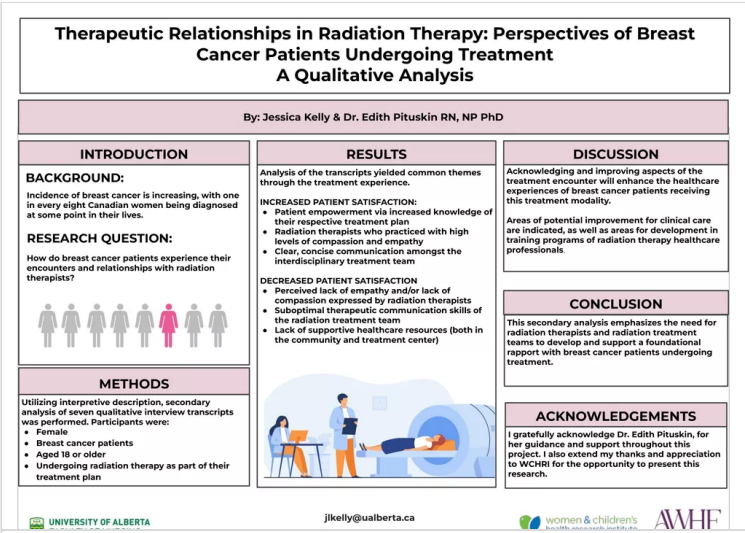
TrangHoang_poster_2022.pptx

Powerpoint presentation

PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

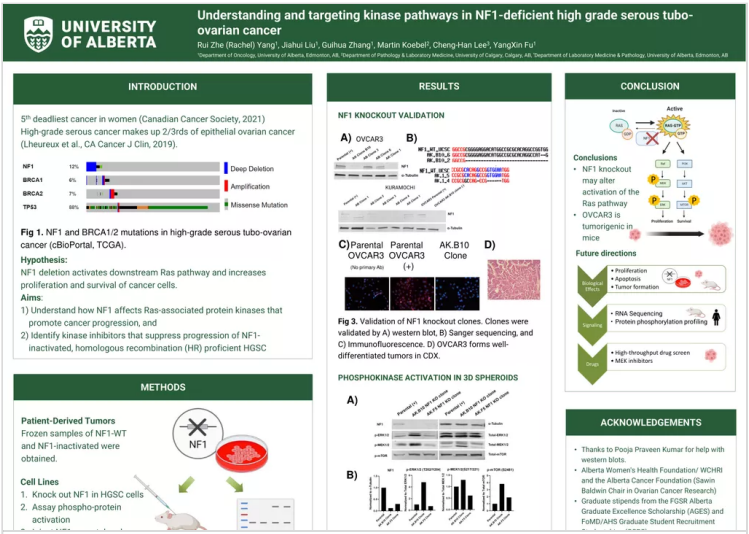
Jessica Kelly - Therapeutic Relationships in Radiation Therapy: Perspectives of Breast Cancer Patients Undergoing TreatmentA Qualitative Analysis



WCHRI_Presentation_Kelly__Jessica.pdf
PDF document
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

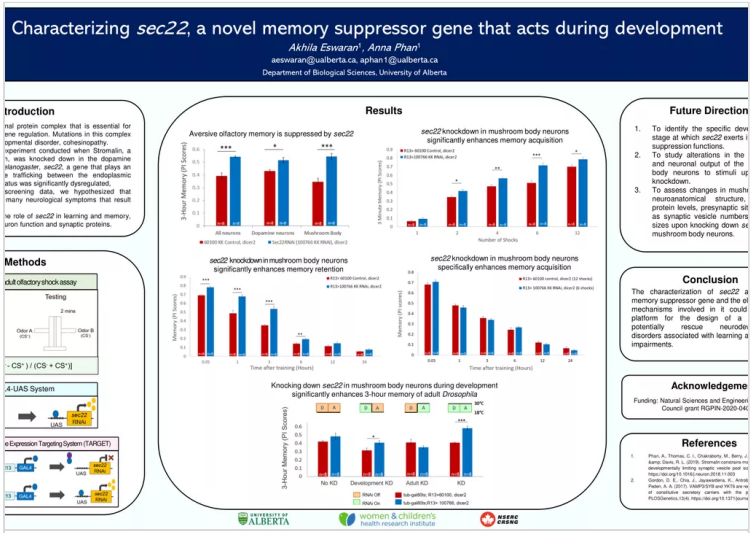
Rachel Yang - Identifying new targets and therapies for NF1-inactivated high grade serous tubo-ovarian carcinoma.



RuiZheYang_WCHRIResearchDay2022_Final.pdf
PDF document
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

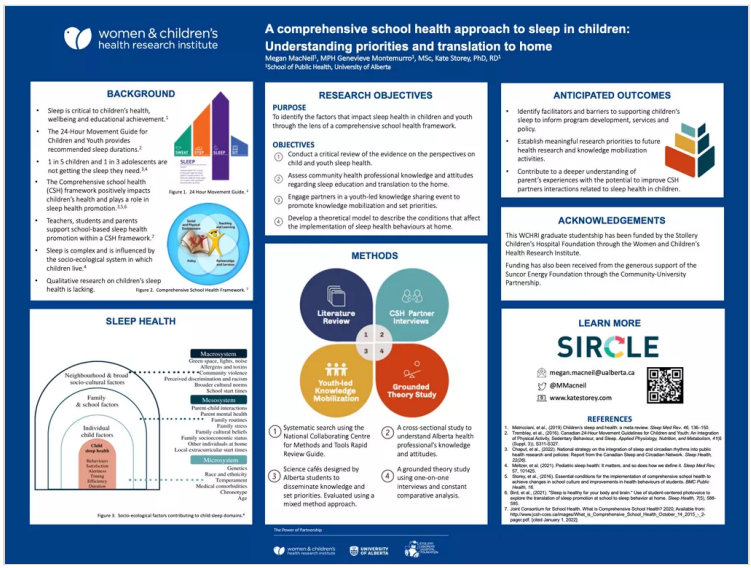
Akhila Eswaran - Characterizing sec22, a novel memory suppressor gene that acts during development



WCHRI_Poster.pdf
PDF document
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

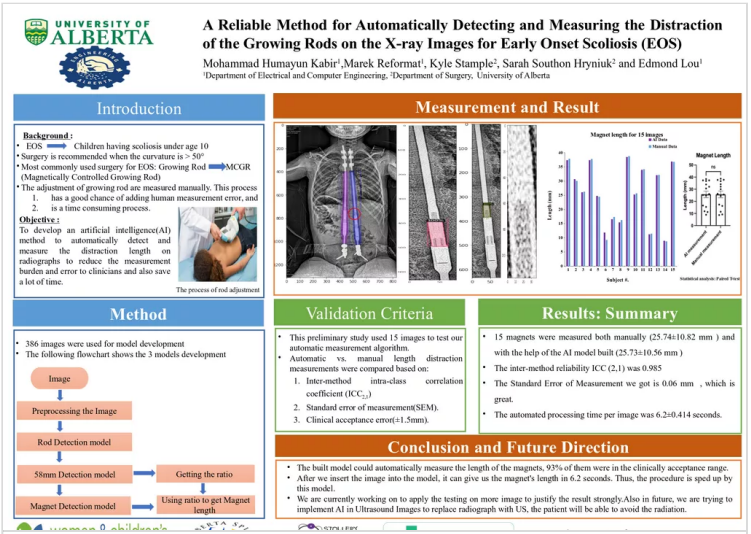
Megan MacNeil - A comprehensive school health approach to sleep in children: Understanding priorities and translation to home



ANONYMOUS NOV 08, 2022 08:47PM UTC

A Reliable Method for Automatically Detecting and Measuring the Distraction of the Growing Rods on the X-ray Images for Early Onset Scoliosis (EOS)

ANONYMOUS NOV 08, 2022 08:47PM UTC



wchri_presentation___Humayun_.pptx

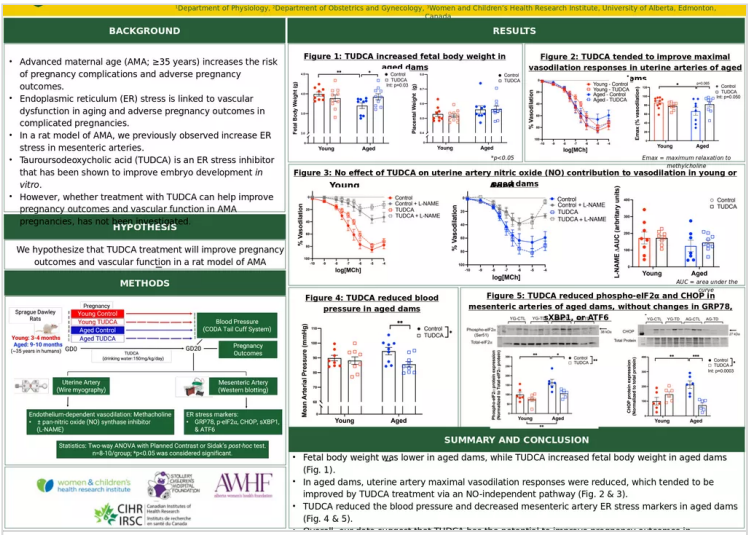
Powerpoint presentation

PADLET DRIVE

Yes, this project has potential to translate, indeed, we have advantage, as TUDCA is natural occurring bile acid in human and have been used safely in pregnancy to treat intrahepatic cholestasis (reduction of bile flow) and also in clinical studies to improve vascular dysfunction in diabetes and obesity patients. Thus, could be safe to use in humans. Nevertheless, we still need to evaluate its safety, efficacy, and dose titration studies to treat pregnancy outcomes in rodents before translating to clinical studies. Thank you.
— ANONYMOUS

ANONYMOUS NOV 08, 2022 08:47PM UTC

Mazhar Pasha - An intervention to improve pregnancy outcomes and vascular function in a rat model of advanced maternal age



Mazhar_Pasha__WCHRI_2022_Poster.pptx

Powerpoint presentation

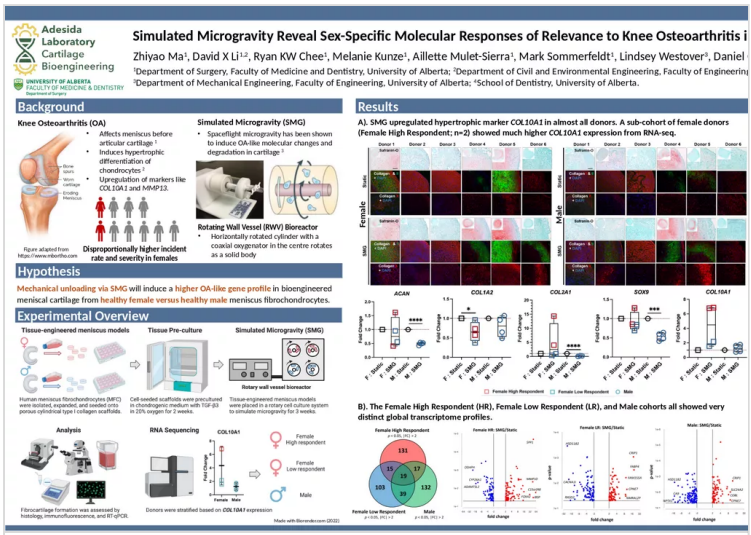
PADLET DRIVE

Very interesting research! Do you think TUDCA intervention has a potential for a translation into clinal setting (potentially in the future)? — ANONYMOUS

Great Question, Thank you. — ANONYMOUS

ANONYMOUS NOV 08, 2022 08:47PM UTC

Simulated Microgravity Reveal Sex-Specific Molecular Responses of Relevance to Knee Osteoarthritis in Human Meniscus Models



WCHRI_Hilda.pptx

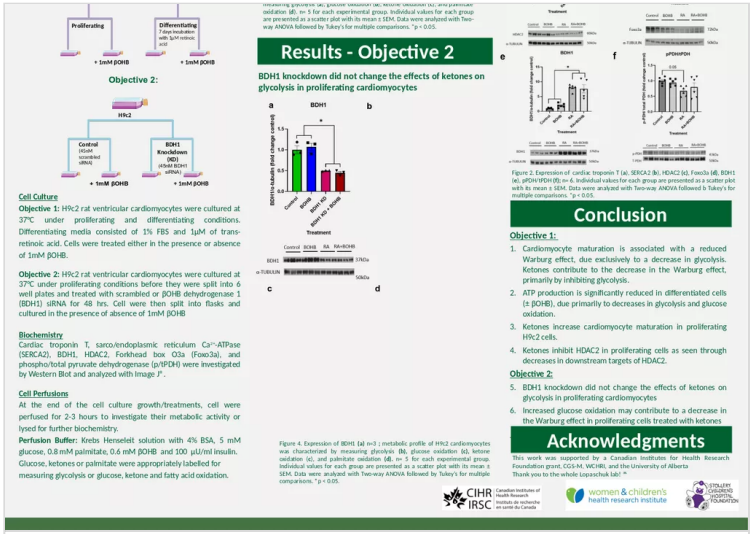
Powerpoint presentation

PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Ketones promote maturation of proliferating H9c2 cardiomyocytes

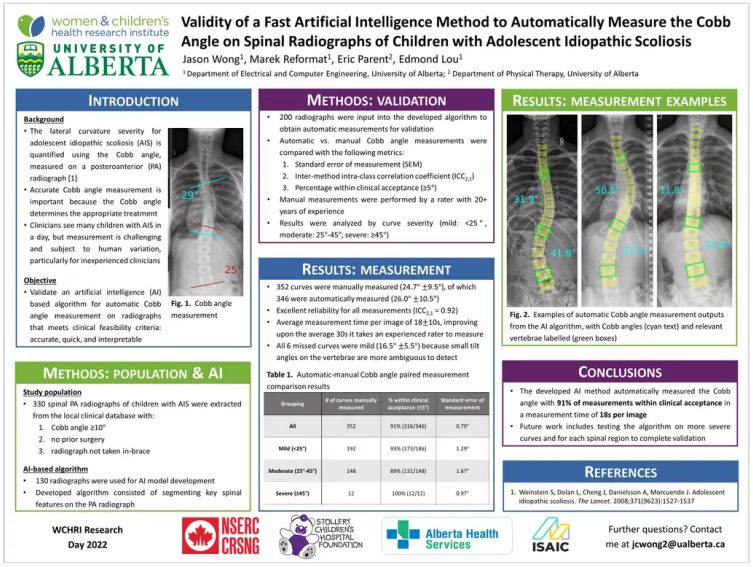
WCHRI Research Day 2022



WCHRI_Poster___Final.pptx

Powerpoint presentation

PADLET DRIVE

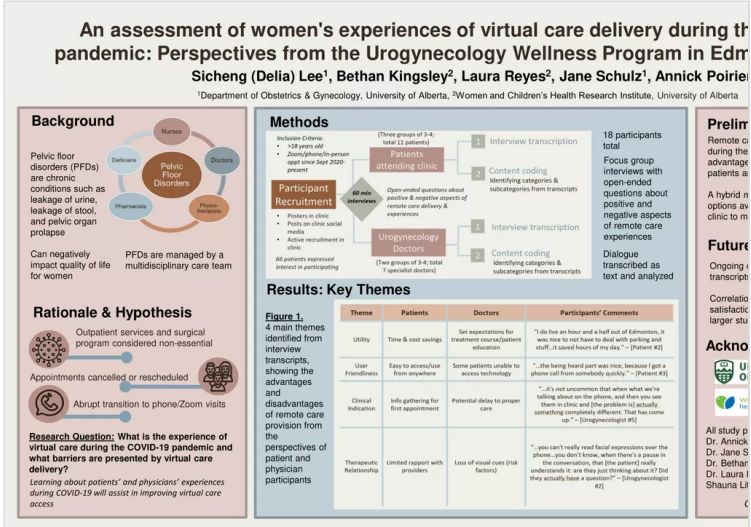


ANONYMOUS NOV 08, 2022 08:47PM UTC

Kim Nguyen - Measuring Alveolar Bone Level in Adolescents: A Comparison Study of Ultrasound and CBCT

ANONYMOUS NOV 08, 2022 08:47PM UTC

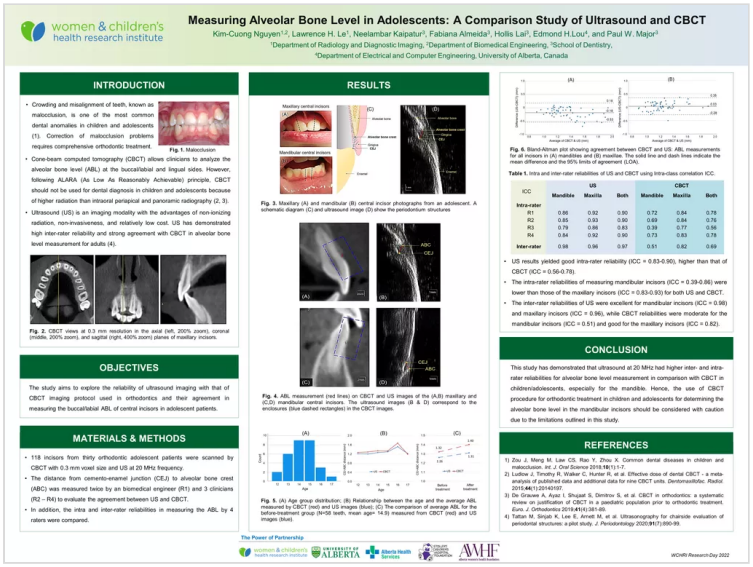
Delia Lee - An assessment of women's experiences of virtual care delivery during the COVID-19 pandemic: Perspectives from the Urogynecology Wellness Program in Edmonton, AB



Delia_Lee_Virtual_Care_in_Urogynecology.pdf

PDF document

PADLET DRIVE



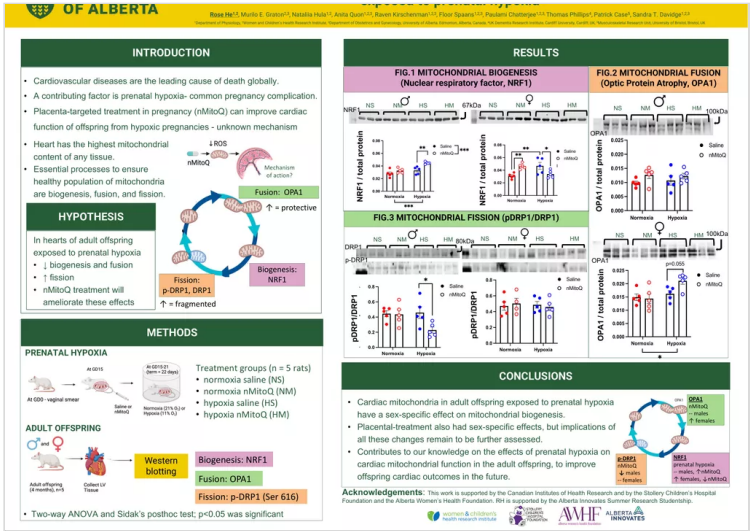
ANONYMOUS NOV 08, 2022 08:47PM UTC

Rose He-Changes in cardiac mitochondrial biogenesis, fission and fusion in adult offspring exposed to prenatal hypoxia

JASON WONG NOV 08, 2022 08:47PM UTC

Jason Wong - Validity of a Fast Artificial Intelligence Method to Automatically Measure the Cobb Angle on Spinal Radiographs of Children with Adolescent Idiopathic Scoliosis

5 min poster PM



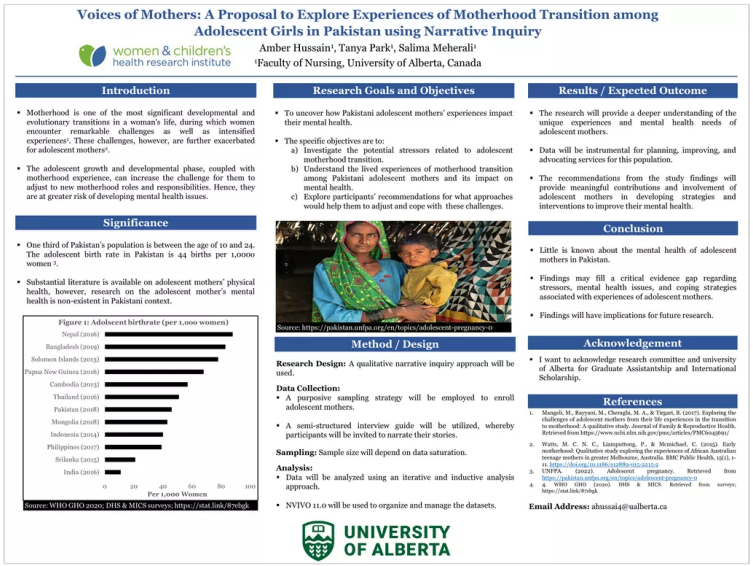
WCHRI_2022_RH_Padlet.pdf
PDF document
PADLET DRIVE

Very interesting study, thanks for sharing today :) What might be your next steps in this topic? Do you plan to assess mitochondrial function to complement your results? Or cardiac function (in vivo, ex vivo)? — **ANONYMOUS**

Hi there, thank you for your question! Yes, another project that's currently ongoing that will compliment these findings is assessing the effect of prenatal hypoxia and nMitoQ treatment on cardiac mitochondrial function through measuring respiration and the complexes of the electron transport chain. Putting these data together will help provide a more holistic picture of the underlying mechanisms :) — **ANONYMOUS**

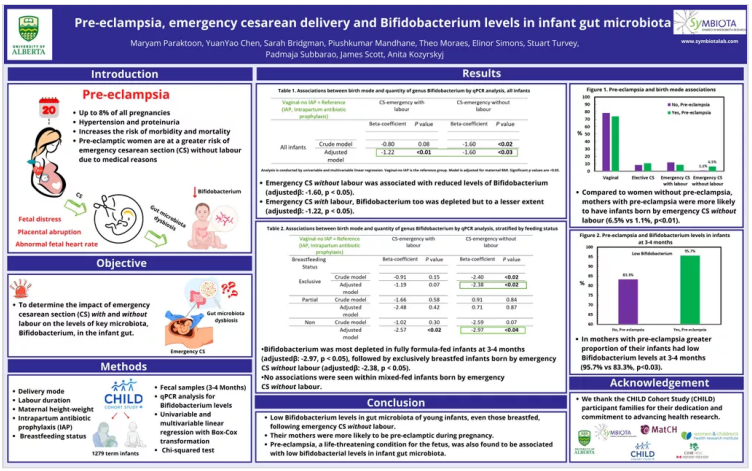
AMBER HUSSAIN NOV 08, 2022 08:47PM UTC

Amber Hussain - Voices of Mothers: A Proposal to Explore Experiences of Motherhood Transition among Adolescent Girls in Pakistan using Narrative Inquiry



ANONYMOUS NOV 08, 2022 08:47PM UTC

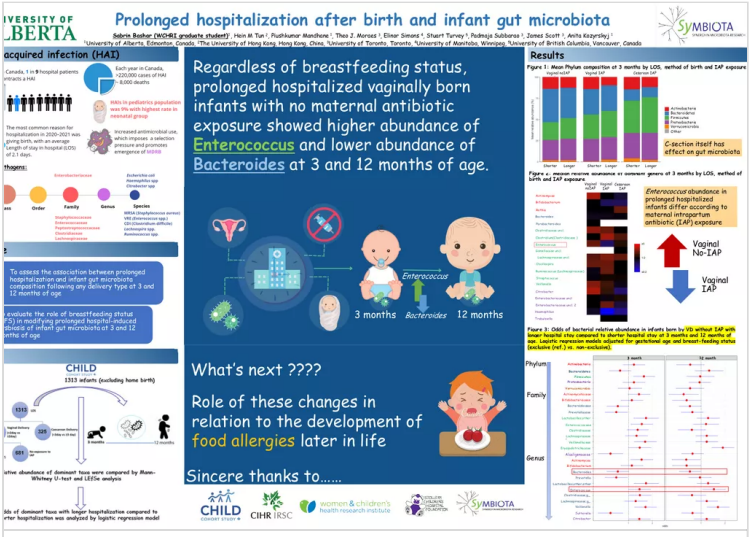
Maryam Paraktoon- Pre-eclampsia, emergency cesarean delivery, and Bifidobacterium levels in infant gut microbiota



ANONYMOUS NOV 08, 2022 08:47PM UTC

Prolonged hospitalization and infant gut microbiota

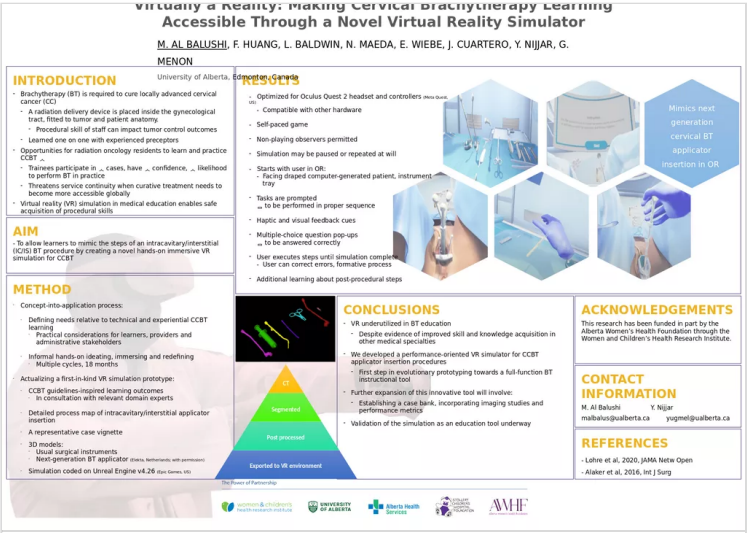
Thank you @WCHRI for giving us wonderful opportunity to share our research :)



WCHRI_SB.pptx
Powerpoint presentation
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

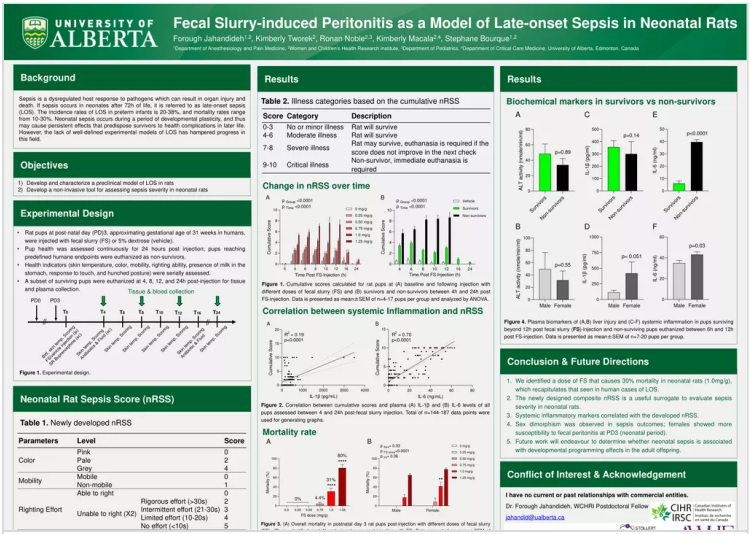
Yugmel Nijjar - Virtually a Reality: Making Cervical Brachytherapy Learning Accessible Through a Novel Virtual Reality Simulator



WCHRI_Poster_2022.pptx

Powerpoint presentation

PADLET DRIVE



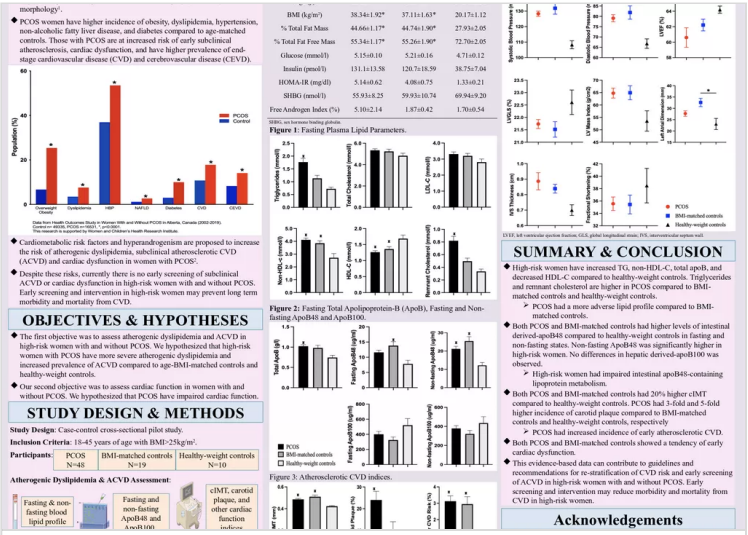
WCHRI_Poster_1_slide_no_animation_2_Nov_22.pdf

PDF document

PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Xiaoying Wu--Detecting Early Atherosclerotic Cardiovascular Disease in High-Risk Young Women with and without Polycystic Ovary Syndrome



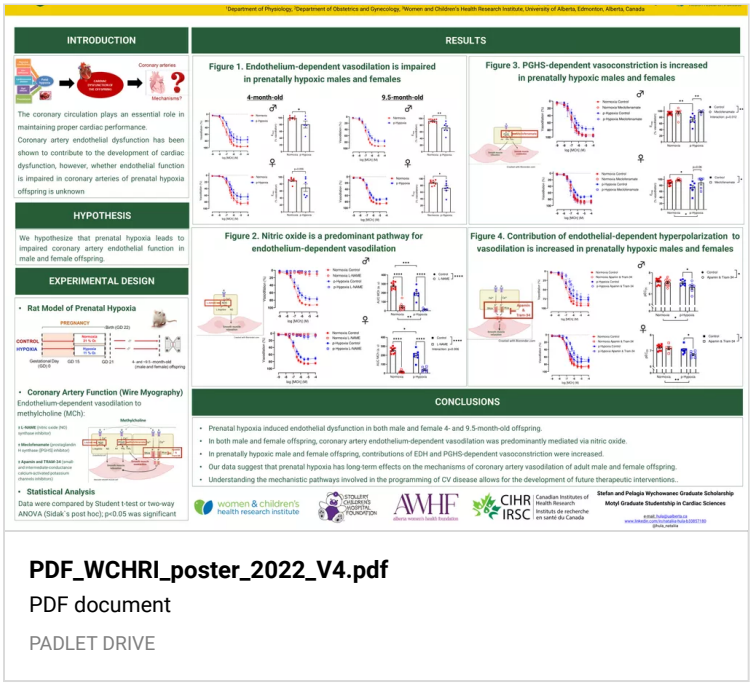
WCHRI_poster_2022__Xiaoying_Wu.pptx

Powerpoint presentation

PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Natasha Hula - The effect of prenatal hypoxia on coronary artery function of adult male and female offspring



PDF_WCHRI_poster_2022_V4.pdf

PDF document

PADLET DRIVE

Very interesting research. Thanks for sharing! — **ANONYMOUS**

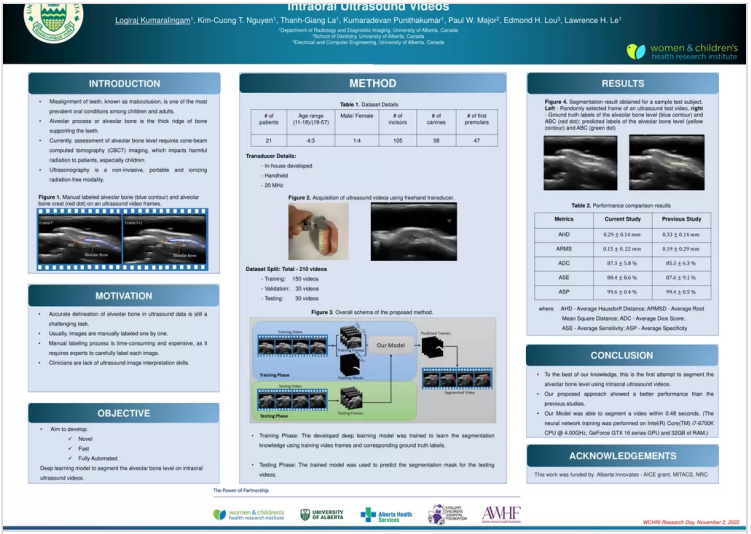
Thank you very much for your feedback! — **ANONYMOUS**

ANONYMOUS NOV 08, 2022 08:47PM UTC

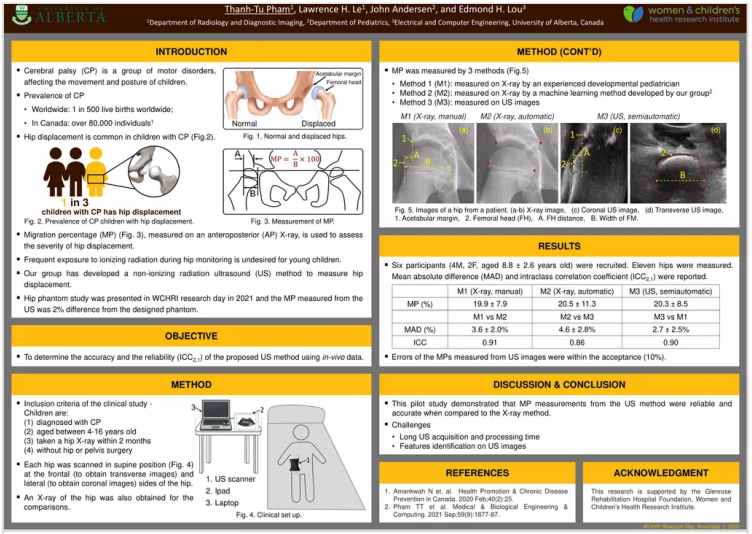
Forough Jahandideh- Fecal Slurry-induced Peritonitis as a Model of Late-onset Sepsis in Neonatal Rats

KUMARALINGAM LOGIRAJ NOV 08, 2022 08:47PM UTC

Logiraj Kumaralingam - A Fast and Fully-Automated Deep Learning Approach to Segment Alveolar Bone on Intraoral Ultrasound Videos



WCHRI_Poster.pdf
PDF document
PADLET DRIVE



Thanh_Tu_Pham_Measuring_hip_displacement_in_children_with_cer
PDF document
PADLET DRIVE

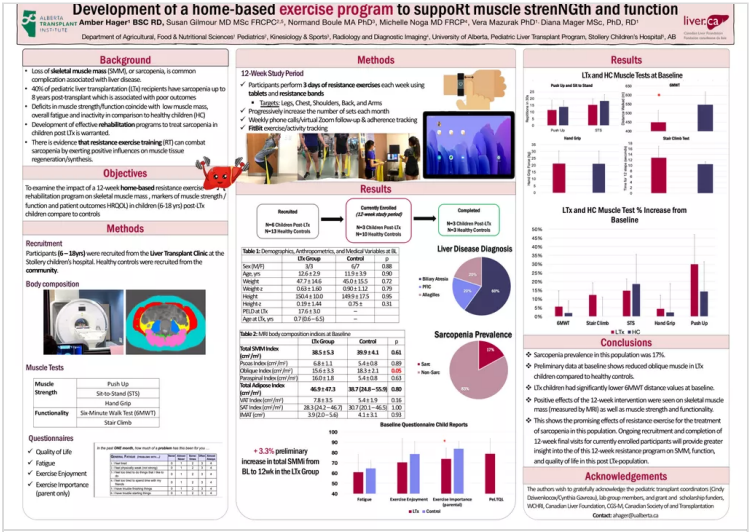
ANONYMOUS NOV 08, 2022 08:47PM UTC

Tamara Dorfman- An examination of the psychosocial consequences experienced by children and adolescents living with congenital heart disease: A scoping review protocol

Final_WCHRI_Research_Day_Poster__2November2022_TamaraDorfman.pptx
Powerpoint presentation
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Amber Hager - Sarcopenia in children post liver Transplant: Development of a home-based exercise program to suppoRt muscle strenNGth and function (STRONG)



WCHRI_2022_Poster.pdf
PDF document
PADLET DRIVE

THANH-TU PHAM NOV 08, 2022 08:47PM UTC

Thanh-Tu Pham - Measuring hip displacement in children with cerebral palsy from 2D ultrasound images: A pilot clinical trial

10 min oral

ANONYMOUS NOV 08, 2022 08:47PM UTC

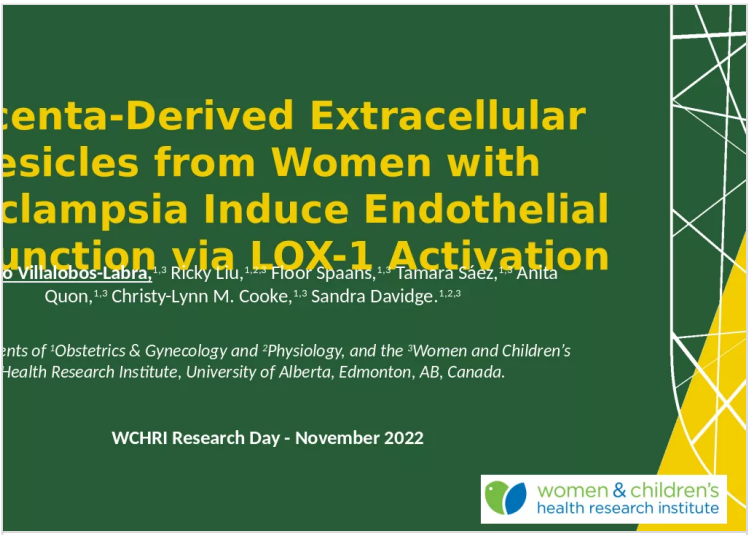
Scott Bennett - Impact of Socioeconomic Status and Remoteness of Residence on Fetal Outcomes in major CHD

Thank you to WCHRI, Azza Darwish Family and Baxter-Langen Family!

WCHRI_ResearchDay.pptx
Powerpoint presentation
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Roberto Villalobos - Placenta-Derived Extracellular Vesicles from Women with Preeclampsia Induce Endothelial Dysfunction via LOX-1 Activation

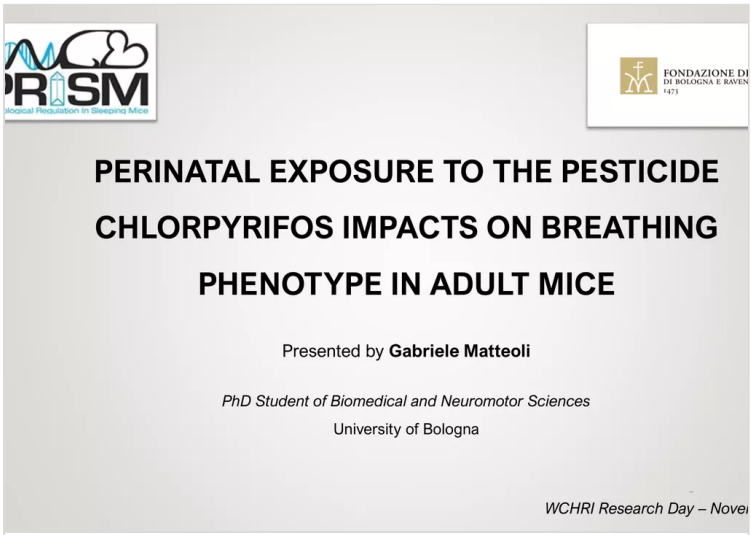


WCHRI_Research_Day_R_Villalobos.pptx
Powerpoint presentation
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

Perinatal exposure to the pesticide Chlorpyrifos impacts on breathing phenotype in adult mice

Gabriele Matteoli, Chiara Berteotti, Sara Alvente, Maria Lavinia Bartolucci, Stefano Bastianini, Viviana Lo Martire, Elena Miglioranza, Roberto Rimondini-Giorgini, Alessandro Silvani, Giovanna Zoccoli



Matteoli_WCHRI2022.pdf
PDF document
PADLET DRIVE

ANONYMOUS NOV 08, 2022 08:47PM UTC

DevynRorem - Finding the Balance: The Influence of Movement Behaviours on Childhood Behaviour Problems

Rorem, D., Ezeugwu, V., Joly, V., Carson, V., Rasmussen, C., Simons, E., Turvey, S., Mandhane P.J., & Pei, J

WCHRI_Day_2022_DR.pdf
PDF document
PADLET DRIVE

I loved that you included some objective sleep measures in your study. I'm am wondering about how you analyzed your actigraphy data. Did you have families keep a sleep diary as well to help reduce artifact? I was also curious is you looked at total sleep time within a 24 hours period or just at night time. I imagine the younger age group had more daytime sleep due to naps, vs. your older age group? Thanks for sharing your research with us :) — ANONYMOUS

Thanks for your question! The movement behaviours were normalized to 1440 minutes and then expressed as isometric log-ratios. We also had the parents keep sleep logs. Total sleep was examined for the 24 hour period and not differentiated between night time sleep and naps - although that would be interesting to look into further! I hope that answers your question. :)
— ANONYMOUS

Participant #: 31
Presenter: Zoë Dworsky-Fried
Supervisor: Ali, Samina
Title: Factors that influence parental decision-making regarding analgesia for their children with acute pain: A qualitative study
Authors: Zoë Dworsky-Fried, Mackenzie Moir, Manisha Bharadia, Manasi Rajagopal, Stephanie Pellerin, Lise Bourrier, Serge Gouin, Scott Sawyer, Naveen Poonai, Michael van Manen, Samina Ali on behalf of the KidsCAN PERC Innovative Pediatric Clinical Trials No OUCH Study Team

Theme: Children's health and well-being

Introduction: Despite significant research in acute pain management, little is known about how analgesics, in particular opioids, are viewed by caregivers. Parents/caregivers are often the gatekeepers to the pharmacologic management of their children's pain. Their concerns and preferences regarding medications influence their children's pain management. An improved understanding of caregiver decision-making regarding analgesia will inform a family-centered approach to communication and shared decision-making in the clinical setting. The primary objective of this study was to explore and understand caregiver decision-making as it relates to pediatric analgesic options, with particular focus on opioids. Methods: This qualitative study was embedded within a larger, ongoing pediatric analgesic efficacy trial (No OUCH: A Study of Non-Steroidal or Opioid Analgesia Use for Children with Acute Musculoskeletal Injuries). Purposeful sampling and one-on-one semi-structured interviews were used to recruit and elicit perspectives of caregivers of children with acute musculoskeletal injuries from 3 pediatric emergency departments (Edmonton, Montréal, Winnipeg). Interviews were conducted via telephone and recorded from June 2019 to March 2021. Verbatim transcription and analyses occurred concurrently with data collection, supporting data saturation and theory development considerations. Three team members completed coding independently and all transcripts were coded twice. Thematic analysis was applied to the data. Results: Twenty-seven interviews were completed with parents/caregivers. Five major themes regarding pain assessment and treatment emerged: a) my child's comfort is a priority; b) every situation is unique; c) opioids only if necessary; d) considerations when choosing opioids; and, e) pain research is important. We found that parents were highly comfortable with their holistic assessment of their child's pain and their threshold for intervention. Non-pharmacological and over the counter analgesics were used as initial pain management strategies by parents before considering escalation to opioid therapy. Participants' willingness to use opioid analgesia for their children was primarily dependent on perceptions of injury and pain severity. For most caregivers, the desire to relieve their child's pain outweighed concerns of addiction, misuse, and adverse events when making decisions about opioid analgesia. Although considerations for opioid use were similar between opioid-averse and opioid-willing families, the trade-offs between maximizing pain relief and minimizing risks were weighed differently. Conclusion: Parents manage their children's pain holistically and with confidence in their ability to both measure intensity and determine the appropriate treatment threshold and interventions. Decision-making around opioid use is family-dependent, case-specific, and multifactorial. These results can inform evidence-based family-centered approaches to co-decision-making of analgesic plans for children with acute pain.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 38
Presenter: Megan Pohl
Supervisor: Hartling, Lisa
Title: Understanding How Youth Search for Mental Health Information Online: A Qualitative Descriptive Study
Authors: Megan Pohl, Sarah A Elliott, Harsimronjoot Sidhu, Sarah Lappin, Ricky Liu, Shannon D Scott, Amanda Newton, Lisa Hartling

Theme: Children's health and well-being

Introduction: Among Canadian youth, the prevalence of perceived poor/fair mental health increased from 2011-2018. Yet, many youth do not access mental health services provided by a health care provider. The most common help-seeking approach for mental health concerns among youth is an online text-based search. While research on the extent of youth mental health help-seeking, and online searching is available, little is known about how youth search for mental health information online. The objective of this study was to understand how Canadian youth search for online mental health information. Methods: The study was qualitative descriptive in design and included youth engagement at the onset of the project to assist in developing study processes that were considered youth-friendly. Study recruitment occurred virtually from June-August 2021 using purposeful sampling was used to identify Canadian youth (aged 15-24 years) with experience searching for mental health information online. Data were collected via semi-structured, individual interviews via Zoom; youth also completed an online demographic survey. Youth were interviewed on how they search for mental health information online, what type of information is helpful, and how they determine what information is trustworthy. A thematic analysis was conducted as described by Braun and Clarke (2006), and data collection and analysis occurred concurrently. An audit trail and reflective journaling were maintained throughout the study to enhance rigor. Youth partners advised on study materials, recruitment strategies, data analysis, manuscript development, and dissemination of the results. Results: Fourteen youth (mean age = 17.6 years) participated in interviews. Youth were most commonly of Asian ethnicity, female, and in high school. Four main themes related to how youth search for mental health information online were developed from the data: (1) Mindset shapes the search process, (2) External factors shaping the search process, (3) Key attributes of helpful information, and (4) Cues affecting trustworthiness of online information. Youth described that their mindset (i.e., an elevated emotional state or curious/learning mindset) influenced key elements of how they searched for mental health information online. Youth also described accessing and using the information that they perceived as helpful and trustworthy. Youth expressed that helpful information has specific characteristics (e.g., the information provides next steps, uses appropriate language, is easy to find, and meets youth's needs) and that specific cues within online information (e.g., links at the top of the search results, information design and format, consistency of information across sources, and the source of the information) affects their perceived trustworthiness. Conclusions: This research generated relevant knowledge for the development of youth-friendly online mental health information that is perceived as helpful and trustworthy by youth. Ensuring youth have access to quality online mental health information, accessible to how they search for it, is critical to the mental health and development of youth.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 43
Presenter: Christy Chan
Supervisor: Davidge, Sandra
Title: Effects of advanced maternal age on the structure of systemic resistance arteries in pregnant women
Authors: Christy Chan, Amy L. Wooldridge, Floor Spaans, Sandra T. Davidge, Christy-Lynn M. Cooke.

Theme: Lifelong women's health

Introduction: During pregnancy, the maternal cardiovascular system undergoes significant adaptations to support the developing fetus. For example, systemic arteries relax more easily to accommodate an increase in blood volume. Advanced maternal age (AMA) is defined as pregnancy at age ≥ 35 and has been associated with a higher risk for pregnancy complications. With aging in general, vessels have more collagen, a structural protein that confers tensile strength, but less elastin, which allows vessels to return to their original shape after stretching, compared with vessels from young counterparts. This results in a decrease in vessel compliance with aging. Previous studies by our lab found that AMA impairs uterine arterial remodeling and is associated with poor pregnancy outcomes in rats. However, little is known about how vessels are impacted by maternal aging in human pregnancies. We hypothesize that omental arteries from AMA women have greater stiffness than their younger counterparts and an increased collagen:elastin ratio. Methods: Omental fat biopsies were obtained from young and AMA women at term undergoing cesarean section (n=5-6/group). Informed consent was obtained from all patients, and those with existing conditions that affected blood pressure were excluded. The arteries (200-300 μm) were isolated from the omental fat biopsies to assess vascular function ex vivo using pressure myography. Calcium-free EGTA was used as the buffer to prevent constriction and assess passive mechanical properties. Circumferential stress (thinning of the vessel wall due to pressure) and strain (percentage change in vessel diameter) were measured to assess the compliance of the vessels. Additional arteries were embedded in Optimal Cutting Temperature compound for cryosectioning into 8 μm slices for histology. Verhoff's staining (for elastin) and Masson's Trichrome staining (for collagen) were performed. Histology images were obtained by light microscopy, and the percentage positive areas for collagen and elastin were assessed using ImageJ software in a blinded manner. Data were analyzed by Mann-Whitney U test; $p<0.05$ was considered significant, and data are reported as mean ± SEM. Results: AMA vessels may have greater stiffness as their stress-strain curve is further shifted to the left compared with the young group. However, no significant differences in mechanical properties (individual circumferential stress, strain, and passive lumen diameter) between groups were found. While there was no difference in collagen expression, vessels from AMA women tended to have lower levels of elastin (0.58 ± 0.04 in young women vs. 0.54 ± 0.03 in AMA women; $p=0.0556$). The collagen:elastin ratio did not differ between the groups. Conclusion: AMA may affect the structure of systemic resistance arteries by lowering elastin levels. Since elastin makes vessels more compliant, this suggests that the vessels may be stiffer, which is similar to what is observed during the process of vascular aging. Ultimately, understanding the compounded effects of aging and pregnancy on the systemic arteries may contribute towards improving pregnancy outcomes in AMA women.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 45
Presenter: Thanh-Tu Pham
Supervisor: Lou, Edmond
Title: Measuring Hip Displacement in Children with Cerebral Palsy from 2D Ultrasound Images: A Pilot Clinical Trial
Authors: Thanh-Tu Pham, Lawrence H. Le, John Andersen, Edmond Lou

Theme: Children's health and well-being

INTRODUCTION: Children with cerebral palsy (CP) are at high risk of hip displacement. The displacement often develops silently and can progress to advanced stages which contribute to hip pain and diminished quality of life. The gold standard to diagnose hip displacement and monitor its progression is to measure migration percentage (MP) from anteroposterior radiographs. However, frequently exposing these pediatric patients to ionizing radiation is undesired. A phantom study on using ultrasound (US) to image hip displacement was validated by our team last year. This pilot study was to determine the accuracy of the proposed US method using in-vivo data. METHOD: Six participants recruited in this study were (1) diagnosed with CP, (2) aged between 5-13 years old, (3) taken a hip X-ray within 2 months, and (4) without hip or pelvis surgery before. Ethics approval was granted. Parental consent and children's assent were obtained prior to the study. A portable US scanner (Clarius Mobile Health, Vancouver) was used to acquire images. Ultrasound gel was applied as coupling at the region of interest. Two US scans were performed on each hip. The first scan was acquired with the US scanner placed at the lateral side of the hip and moved from anterior to posterior. The second scan was acquired from the anterior hip with the US scanner placed perpendicular to the coronal plane and scanned from superior to inferior. Series of coronal and transverse images were acquired from both scans. After the acquisition, the US images were preprocessed by contrast enhancement. The coronal or transverse frames which contained femoral head and acetabulum regions were then selected. Images of the overlying tissues were cropped out manually. The US MP was then calculated based on the ratio of femoral head-acetabulum distance (A) from the coronal images and the estimated width of the femoral head (B) from the transverse image. A comparison of three MP values, measured radiographically by an experienced neurodevelopmental pediatrician (MPX-ray, M1), calculated by a machine learning (ML) based method (MPX-ray, M2), and derived from this proposed US method (MPUS, M3), was conducted. RESULT: Each hip took approximately 5 minutes to scan and 5 minutes to process the data for the MP estimation. The 6 participants (4M, 2F, aged 8.8±2.6 years old) had 11 MP values. The average MP of the 3 methods were 19.9±7.9% (M1), 20.5±11.3% (M2), and 20.3±8.5% (M3) respectively. The interclass correlation coefficient ICC(2,1) between M1 vs M2, M2 vs M3, and M1 vs M3 were 0.91, 0.86, and 0.90, respectively. The mean absolute difference between the M1 vs M3 and M2 vs M3 were 2.7±2.5% and 4.6±2.8%, respectively. All M3 measurements were within the clinical acceptance error (10%) when compared with the M1 measurements. CONCLUSION: This pilot study demonstrated that MP from the US method was safe, reliable, and accurate when compared with the X-ray method. A strong correlation with X-ray measurements and high accuracy has rendered US as a promising alternate imaging modality for monitoring hip displacement. The long US acquisition and processing time can be reduced in the near future by improved scanning operation through experienced US operator and machine learning processing algorithms.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 47
Presenter: Geraldine Huynh
Supervisor: Foulds, Jessica
Title: Miracles in Medicine: A narrative inquiry exploring extraordinary events within Pediatrics
Authors: Geraldine Huynh, MD; Marghalara Rashid, MSc, PhD; and Jessica L. Foulds, MD

Theme: Children's health and well-being

INTRODUCTION: Webster's 1913 dictionary defines a miracle as a "wonder or wonderful thing" or as "an event contrary to the established course of things." We explored stories about miracles from the perspectives of pediatricians. Our aim was to learn how those miracles have informed the pediatricians' care of patients and families at a time when miracles are perhaps stigmatized and underappreciated. METHODS: Using narrative inquiry, we had conversations and explored the experiences of physicians who work directly within pediatric clinical care. We used purposeful sampling by emailing several pediatricians whom we felt might have been interested in the project and may have had experiences with perceived medical miracles. All conversations were conducted over Zoom and recorded. RESULTS: We conducted up to 3 conversations with each participant. During our analysis, we identified three threads. First, there is no one working definition for miracles. Second, there is an internal conflict between personal and professional identities-this became apparent when our participants discussed and labeled miracles. Last, when the hoped-for miracle does not occur, the physician's role often becomes more challenging. CONCLUSIONS: Our retelling of stories informs our past, present, and future experiences and how we will remember them. Through narrative inquiry, we can better appreciate the stories of medical miracles within pediatrics, better understand the social discourses that shape our perception of miracles and our sense of self and, ultimately, recognize the hope and possibility that come from hearing these stories.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 48
Presenter: Claudia Maki
Supervisor: Ali, Samina
Title: Characterizing the emotional and communication needs of caregivers who present to Canadian pediatric emergency departments
Authors: Claudia Maki, Samina Ali, Maryna Yaskina, Asa Rahimi, Keon Ma, Kurt Schreiner, Shannon D Scott, Naveen Poonai, on behalf of the Pediatric Emergency Research Canada Family Needs Study Group

Theme: Children's health and well-being

Introduction: The emotional and communication needs of caregivers during their child's emergency department (ED) visit have not been well described. Our primary objective was to describe Canadian caregivers' self-reported emotional and communication needs and experiences during a pediatric ED visit, and the extent to which these needs were met. Methods: Design: A descriptive cross-sectional survey with medical record review. Setting: This study was conducted at 10 Canadian pediatric EDs from October 2018 - March 2020. A convenience sample of families were enrolled, for 1 week every 3 months, for one year/site. Caregivers completed an electronic survey in the ED, followed by a second survey up to 7 days post-visit. Participants: All consenting caregivers with children aged <18 years, presenting to a participating pediatric ED during study weeks, with any chief complaint, were included. Families were excluded if (a) the child was medically unstable, (b) there was suspicion of child abuse, (c) the child had an altered level of consciousness, or (d) if the accompanying person was not a legal guardian. Main Outcomes/Measures: Primary outcomes were describing caregivers' reported emotional and communication needs/experiences and the extent to which they were met (measured via 5-point Likert scale). We also examined the relationship between emotional needs being met as well as caregiver comfort in caring for their child's illness at the time of discharge with visit characteristics, caregiver experiences, and ED visit details, via multivariate analysis. Brief demographic information, caregiver anxiety score (State-Trait Anxiety Inventory) and health literacy score (the Newest Vital Sign) were also obtained. Results: This study recruited 2005 caregivers who were mostly mothers (74.3%, 1462/1969) and fathers (24.2%, 476/1969); median age was 37.8 years (SD 7.7). 71.7% (1081/1507) of caregivers felt their emotional needs were met. 86.4% (1293/1496) identified communication with the doctor as good/very good and 83.4% (1249/1498) for their child's nurse. Caregiver involvement in their child's care was reported as good/very good 85.6% (1271/1485) of the time. 81.8% (1074/1313) of caregivers felt comfortable in caring for their child at home at the time of discharge. The proportion of caregivers with possible/high likelihood of limited health literacy was 28.5% (558/1957), while mean State Trait Anxiety Inventory score was 37.9 (SD 11.1). Lower caregiver anxiety scores, involvement of the caregiver in their child's care, satisfactory updates, and having questions/concerns adequately addressed positively impacted caregiver emotional needs being met and increased caregiver comfort in caring for their child's illness at time of discharge. Conclusion: Approximately 30% of caregivers have unmet emotional needs, over 15% have unmet communication needs, and 15% felt inadequately involved in the care of their child in the ED. Caregiver involvement in their child's care and adequate communication have been identified as key elements in meeting the emotional and communication needs of families. These can be immediately modified at the individual clinician level, while pursuing more complex systems- level interventions to improve patient experience/satisfaction.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 50
Presenter: Yeongho Hwang
Supervisor: Carson, Valerie
Title: The relative contributions of centre demographic, director, parental, social, environmental, and policy factors to changes in outdoor play in childcare centres during the COVID-19 pandemic
Authors: Yeongho Hwang, Madison Predy, Cody Davenport, Valerie Carson

Theme: Children's health and well-being

Introduction: There has been growing recognition that outdoor play, or time spent outdoors, provides opportunities for young children to move more, sit less, and achieve healthy development. Furthermore, outdoor play following COVID-19 public health measures can help young children get active while minimizing the risk of contracting the virus. The primary objective of this study was to investigate the relative contributions of factors from multiple social-ecological levels in explaining outdoor play changes in childcare centres during the pandemic. Methods: In Alberta, Canada, licensed childcare centre directors (n=160) completed an online questionnaire. For outcomes, changes in the frequency and duration of outdoor play in childcare centres during COVID-19 compared to before COVID-19 were measured. For exposures, centre demographic, director, parental, social, environmental, and policy-level factors were measured. Hierarchical regression analyses were conducted separately for winter (December-March) and non-winter months (April-November). Results: In most instances, factors at each social-ecological level explained a statistically significant amount of unique variance in changes in outdoor play in childcare centres during COVID-19. Full models accounted for more than 26% of the variance in the outcomes. Changes in parental interest in outdoor play was the most consistent correlate of changes in the frequency and duration of outdoor play in both winter and non-winter months during COVID-19. For changes in the duration of outdoor play, social support from the provincial government, health authority, and licensing, and changes in the number of play areas in licensed outdoor play spaces were also consistent correlates in both winter and non-winter months during COVID-19. Conclusion: Factors from multiple social-ecological levels uniquely contributed to changes in outdoor play in childcare centres during the pandemic. Changes in parental interest in outdoor play (parental factor), social support from the provincial government, health authority, and licensing (social factor), and changes in the number of play areas in licensed outdoor play spaces (environmental factor) may serve as important avenues for intervention efforts and public health initiatives related to outdoor play in childcare centres during and after the ongoing pandemic. Future research needs to investigate parental factors more thoroughly and the complex interplay of multi-level factors to address research gaps. Lastly, to support public health initiatives, further information may be needed on the best type of social support for increasing outdoor play in childcare centres.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 52
Presenter: James Benoit
Supervisor: Scott, Shannon
Title: Improving pediatric illness identification in app-based symptom checkers using information from co-created knowledge translation resources.
Authors: James R. A. Benoit, Lisa Hartling, Shannon D. Scott

Theme: Children's health and well-being

Intro Improving parents' ability to accurately recognize and communicate their children's symptoms of illness is important to optimize pediatric health outcomes. mHealth apps (smartphone and tablet applications related to health) are a popular tool with parents, and offer a novel delivery platform for sharing pediatric health information. However, poor symptom communication (as seen in app-based symptom checkers) prevents parents from effectively reaching and using information applicable to their child's illness. This study aimed to create, implement, and evaluate an app-based symptom checker designed for parents that addresses poor symptom communication. Methods We extracted 83 symptoms expected in ten common children's illnesses from 23 knowledge translation (KT) tools that were co-created with parents, healthcare professionals, and researchers. Symptoms were translated into a plain-language list, consolidated, and mapped to affected body systems. Each illness is represented by a unique set of symptoms. Our symptom checker compares the set of symptoms expected for each illness, against a child's actual symptom profile as entered by their parent. This allows us to generate a confusion matrix for expected vs actual symptoms. The four confusion matrix outputs were used to generate a set of performance metrics showing how well that illness's expected symptoms predicted the actual symptoms seen. These metrics were calculated for all ten illnesses, then each performance metric compared between illnesses. The top-performing illness on each performance metric was chosen as the predicted disease. We evaluated this tool by counting how many times the symptom checker matched the correct illness on the first try against eight validated clinical vignettes (covering acute otitis media, bee sting, Rocky Mountain Spotted fever, salmonella, constipation, asthma, UTIs, and Ross River fever), each of which describes an illness covered by our symptom checker. Results A final list of 54 plain-language symptoms was created. The symptom checker was capable of picking, 100% of the time (8/8 vignettes), the matching illness on the first try, using any of five performance metrics. Since performance was equivalent, we chose the mathematically simplest of these five performance measures, precision, when implementing the symptom checker logic in our app. The symptom checker is displayed as a pediatric avatar and alphabetical list of all symptoms, and clicking on one of the avatar's body parts highlights relevant symptoms. Conclusion We created, implemented, and evaluated a symptom checker that is capable of matching expected illness profiles to actual symptom profiles with a high degree of accuracy. These results support further investigation and expansion of our pediatric symptom checker for parents, and evaluation of how our symptom checker affects real-world decision-making and health resource utilization.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 55
Presenter: Rose He
Supervisor: Davidge, Sandra
Title: Changes in cardiac mitochondrial biogenesis, fission and fusion in adult offspring exposed to prenatal hypoxia
Authors: Rose He, Murilo E. Graton, Nataliia Hula, Anita Quon, Raven Kirschenman, Floor Spaans, Paulami Chatterjee, Thomas Phillips, Patrick Case, Sandra T. Davidge

Theme: Pregnancy and developmental trajectories

Introduction:Prenatal hypoxia increases the risk for cardiovascular disease in the offspring. We showed that prenatal hypoxia leads to adult offspring cardiac dysfunction in rats, and that a placenta-targeted treatment in pregnancy (nMitoQ) improved offspring cardiac function in hypoxic pregnancies;however,the mechanisms are not known. Mitochondrial dysfunction may contribute to cardiac dysfunction in prenatal hypoxia. Essential processes for normal mitochondrial function are mitochondrial biogenesis, fission, and fusion; increased fission can cause fragmented dysfunctional mitochondria, while a decreased fusion is associated with cardiac injury. However, the effects of prenatal hypoxia and nMitoQ treatment on adult offspring cardiac mitochondrial biogenesis, fission and fusion are not known. We hypothesize that prenatal hypoxia reduces cardiac mitochondrial biogenesis and fusion, and increases fission, in the adult offspring, and that nMitoQ treatment will ameliorate these effects. Methods: Pregnant Sprague-Dawley rats were exposed to normal oxygen levels (21% O2) or hypoxia (11% O2) during gestational day (GD) 15-21 (term=22 days). On GD 15, animals received 100uL of saline or nMitoQ treatment (125 uM) by tail vein injection. Male and female offspring were aged to 4 months. Expression of proteins involved in mitochondrial biogenesis (peroxisome proliferator-activated receptor gamma coactivator 1, PGC1α, and nuclear respiratory factor 1, NRF1), fusion (optic atrophy protein 1, OPA1, and mitofusin 1, MFN1) and fission (dynamin-related protein 1, total and phosphorylated DRP1, p-DRP1) were assessed by Western blotting in cardiac tissues. Data were analyzed by two-way ANOVA (Sidak's posthoc test); $p<0.05$ was significant. Results: Cardiac PGC1α expression was not different between the male groups. In females, PGC1α was lower in hypoxia compared to normoxia offspring ($p=0.04$), without effect of nMitoQ. Prenatal hypoxia did not alter NRF1 expression in male offspring, however, nMitoQ treatment increased NRF1 expression in the hypoxia group ($p=0.002$). In females, prenatal hypoxia increased NRF1 expression ($p=0.007$), which was prevented by nMitoQ treatment ($p=0.03$). nMitoQ also increased NRF1 in the normoxia females ($p=0.009$). Cardiac MFN1 and OPA1 expressions were not different between the male groups. In females, prenatal hypoxia did not alter MFN1 or OPA1 expression, but nMitoQ treatment increased MFN1 ($p=0.008$) and tended to increase OPA1 ($p=0.055$) in the hypoxia offspring only. Without effect of prenatal hypoxia, nMitoQ decreased p-DRP1 ($p=0.04$) and increased DRP1 ($p=0.0008$) expression only in the hypoxia males. No changes in p-DRP1 or DRP1 expression were found in the females. Conclusion: Our data suggest that nMitoQ treatment can prevent the effects of prenatal hypoxia on cardiac mitochondrial biogenesis in the female offspring. nMitoQ treatment increased cardiac mitochondrial fusion in the female, and decreased fission in the male prenatal hypoxia offspring, but without effects of prenatal hypoxia; the implications of these changes remain to be further assessed. This contributes to our knowledge on the effects of prenatal hypoxia on cardiac mitochondrial function in the adult offspring, to improve offspring cardiac outcomes in the future.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 56
Presenter: Taylor Gill
Supervisor: Montesanti, Stephanie
Title: Healthy pregnancies and beyond: Exploring the experience and teachings of Indigenous grandmothers to promote the health of future generations of Indigenous people in Alberta
Authors: Gill, Taylor

Theme: Pregnancy and developmental trajectories

Introduction: Indigenous people in Canada experience health inequities, resulting in a lower life expectancy and a disproportionate burden of chronic disease largely due to the downstream effects of damaging colonial practices like residential schools and child welfare policies that led to the breakdown of cultural transmission and family structure. One strategy that could positively affect the health of future generations of Indigenous people is to promote healthy environments during pregnancy and early life. The Developmental Origins of Health and Disease is a substantiated theory that explains how the environment during the perinatal period impacts the child's life-long health trajectory. Indigenous grandmothers are a valuable source of support for younger generations and keepers of traditional knowledge about pregnancy, childbirth, early childhood, and parenting. Methods: Five Indigenous grandmothers that collectively represent all the treaty territories in Alberta, and the Métis Nation of Alberta came together in sharing circles to gather traditional knowledge with the goal of strengthening kinship ties and supporting the best possible life for the next generation of Indigenous children. An Indigenist research framework informed participatory approaches to facilitate the exploration of the sacred ceremonies and traditional teaching about pregnancy, childbirth and early childhood with the grandmothers. This project also investigated Indigenous grandmothers' roles and their grandmothering experiences. Sharing circles and Indigenous storytelling were used for data generation. Transcriptions of recordings and/or notes from the sharing circles were analyzed using a qualitative descriptive approach. Results: Preliminary findings highlight the differences and commonalities between the cultural and ceremonial teachings of grandmothers from various Indigenous groups across Alberta. Practical teachings and cultural teachings are crucial to the well-being and feeling of connectedness. A common theme emphasized how precious children are and that they should be celebrated and cherished. The stories of the grandmothers overcoming hardships from their past and giving back to their children, grandchildren and communities underscore their strength and resiliency. Culture is regarded as integral to the health of children by the grandmothers. Teaching traditional language, in which culture is embedded, is crucial to the well-being of children. Conclusion: Supportive early environments including strong communities and connections to kinship and culture can promote children's positive social, emotional and spiritual wellness. The information gathered will be passed on to new Indigenous parents to nurture a healthy environment during the perinatal period and will provide a resource to those Indigenous parents who do not have access to keepers of knowledge. By understanding the roles of the grandmothers and their experience in carrying out these roles, policymakers will be better able to structure support for Indigenous grandmothers in all they do to foster the health of the next generation. This research could have implications for child welfare and maternal, child and youth health policies.

This research has been funded by the Stollery Children’s Hospital Foundation and the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 58
Presenter: Zhiqian (Rita) Jiang
Supervisor: Mager, Diana
Title: Impact of a pediatric gluten-free food guide on diet quality, adherence to the gluten-free diet and quality of life in children and youth with Celiac Disease
Authors: Zhiqian (Rita) Jiang, Dominica Gidrewicz, Margaret Marcon, Justine M Turner, Diana R Mager.

Theme: Children's health and well-being

Background: Celiac disease (CD) is an autoimmune gastrointestinal disease that is caused by intolerance to the gluten in the diet. The mainstay of treatment is a gluten-free diet (GFD). Children with CD on the GFD often have low micronutrient intakes (e.g folate, iron) and high intakes of sugar and fat. To address these nutritional limitations, our team developed a novel GF-food guide (GFFG). The study objective was to compare the impact of dietary education using the GF-food guide combined with standard of care (RD education in group classes) vs standard of care (SOC) alone over six months on diet quality (DQ), adherence to the GFD and quality of life (QoL) in children and youth newly diagnosed with CD. Methods: Children newly diagnosed with CD (5-18 years) and their parents (n=20 parent-child dyads) were recruited from the Celiac Clinics at the Stollery Children's Hospital and South Health Campus and randomized to receive SOC alone vs SOC plus GFFG education (SOC-GFFG). Anthropometric (wt, wt-z, ht, ht-z), demographic (age, sex, age at diagnosis (Dx)), clinical symptoms (e.g. gastrointestinal (GI) symptoms), and serum Antitissue Transglutaminase (ATTG) were obtained from medical chart review. Dietary intake (3-day food records), DQ, adherence to the GFD (self-report, diet), and QoL (Kindle®) was assessed using validated methodologies at study entry, 3 and 6 months. Parental nutrition literacy was assessed using Nutrition Literacy Assessment Questionnaire®. Results: 9 child-parent (11.5 ± 2.7 year, 9F) and 11 child-parent (9.6 ± 3.3 yr, 8F/3M) dyads were randomized into SOC vs SOC +GFFG. No significant differences in demographic (sex, age, age at Dx), anthropometric (wt-z, ht-z) and serum ATTG were noted between groups at study entry ($p<0.05$). GI symptoms were present in 66.7% and 63.6% at the time of CD diagnosis in the SOC and SOC + GFFG groups, respectively ($p>0.05$). The mean score for DQ was characterized by 'needs improvement' (SOC vs SOC + GFFG: 62.5 ± 9.2 vs 67.1 ± 11.5; $p>0.05$) at study entry. There are 4/6 (SOC) and 5/9 (SOC + GFFG) participants with high parental nutrition literacy rates. High parental nutrition literacy was associated with a lower DQ score at the time of DX (58.7 ± 5.9 vs 75.0 ± 7.6; $p=0.001$). QoL was impacted by a recent CD diagnosis whereby children felt different from others in 4/6 (SOC) and 9/9 (SOC+GFFG); $p>0.05$. Conclusions: Children with CD diagnosis may experience significant deficits in DQ and QOL, even with high parental nutrition literacy. Education with a newly developed GFFG combined with RD education may significantly improve DQ, adherence to the GFD and overall QOL. Ongoing results from 3 and 6-month visits will be presented.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 62
Presenter: Fiza Ali
Supervisor: Olson, David
Title: Targeting IL-1β induced chronic low-grade fetal inflammation with HSJ633, a novel IL-6 receptor antagonist
Authors: Authors: Fiza Ali, Carla Sosa, Tania Rodezno, Wendy Xu, Kelycia B. Leimert, Sylvain Chemtob, David M. Olson

Theme: Pregnancy and developmental trajectories

Introduction/Background: Systemic inflammation in the pregnant mother results in fetal inflammation, leading to long-term health issues in the surviving children. IL-1β is a key proinflammatory cytokine that mediates fetal inflammation. It does so by up-regulating the expression and activation of numerous proinflammatory cytokines/chemokines, including IL-6. Low-grade chronic inflammation exposes the developing fetus to these harmful cytokines/chemokines and immune cells, resulting in abnormal organogenesis and long-term health issues. HSJ633 is a novel allosteric antagonist targeting the IL-6 receptor that has been shown to attenuate inflammatory amplification. In this ongoing study, we aim to investigate the efficacy of HSJ633 in attenuating IL-1β-induced chronic low-grade fetal inflammation in a mouse model. This mouse model is designed to better represent the in vivo situation in women, where low levels of inflammation often accumulate over time. We hypothesize that daily injections of IL-1β over four days will increase the expression of proinflammatory cytokines in maternal and fetal tissues without inducing PTB and that HSJ633 will be able to reverse its effects. Methodology: Pregnant CD-1 mice will be randomly assigned and treated with vehicle saline (0.9%) (n=6), IL-1β (0.5 ug/100 uL) (n=6), and IL-1β (1.0 ug/100 uL) (n=6) via intraperitoneal (i.p) injection on gestation days (GD) 14.5, 15.5, 16.5 and 17.5. The last treatment group, lipopolysaccharide (5ug/ gram of body weight) (n=6), will be injected once via i.p injection on GD 16.5. The study will then be repeated while co-treating with HSJ633 (5ug/ gram of body weight) via subcutaneous injection. The mice will be euthanized 6 h after the last injection and tissues collected. RT-qPCR and Multiplex will be used to measure mRNA and protein levels of various cytokines and chemokines, respectively, in the fetal and maternal tissue and in the amniotic fluid. Data will be analyzed using one-way ANOVA, and mean differences will be considered statistically significant if $p<0.05$. Expected results: We expect that prenatal maternal IL-1β administration will increase mRNA and protein expression of proinflammatory cytokines and chemokines in fetal and maternal tissues and amniotic fluid in a dose-dependent manner. Specifically, we expect an increase in IL-6, the IL-1R1 receptor, TNF-α, CXCL1 and CXCL8. We predict that HSJ633 will suppress IL-6-mediated positive feedback interactions, attenuate the IL-1β-induced increase in cytokines and chemokines, decrease fetal inflammation, and protect the fetus from abnormal organogenesis. Conclusions/Relevance: Both IL-1β and IL-6 have established roles in preterm birth and fetal inflammation. Understanding their effects during IL-1β -induced low-grade chronic inflammation will help us to develop strategies to prevent fetal organ damage. HSJ633 has been shown to block preterm delivery and suppress fetal inflammation in acute mouse models of inflammation or infection. This is the first time HSJ633 will be tested in a chronic low-grade model of inflammation in pregnancy. This data will contribute to the pre-clinical testing of HSJ633.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 63
Presenter: Xiaoxin Sun
Supervisor: Mager, Diana
Title: Educational resource development is important in the uptake of a Gluten Free Food Guide in children with Celiac Disease
Authors: Xiaoxin Sun, Rita Jiang, Turner JM, Mager DR.

Theme: Children's health and well-being

Introduction: The gluten-free diet (GFD) is the main treatment of pediatric celiac disease (CD). The current Canadian Food Guide/plate model does not address the unique nutritional considerations of the GFD. A novel GF-food guide (GFFG) using a plate model for children with CD was recently developed to address this limitation. Uptake of food guide recommendations in youth is influenced by the feasibility of educational resources that support guideline content. The purpose of this study was to develop an evidenced-based GF-Cooking Resource to complement the GFFG content. Methods: An internet survey (via RedCap®) was disseminated to members of the community with CD (14 plus yrs.) via social media pages of national and local Celiac Association Chapters. The survey consists of 10 questions that addressed questions related to household demographics, ethnic cuisines consumed, meal and recipe suggestions/submissions. Recipes were reviewed for dietary evaluation for macronutrient, micronutrient, and gluten content using Food Processor Nutrition Analysis Software (SQL 11.0.124, ESHA Research, Salem, USA) and categorized according to meal or snack suggestions, nutrients of concern (e.g., high iron, high folate) according to validated methodologies. Representation of cooked recipes underwent stakeholder sensory evaluation by youth with CD and their parents for taste, smell, and appearance evaluation. Recipes that have an average score of 16/20 were included in the nutritional resource. The nutritional content of recipe content was translated to the GFFG plate model as an additional resource that will support current GFFG recommendations. Results: 253 responses (83=complete; 170=partial) from 8 different provinces and the US were completed between June-August 2022. About 66.4% of participants adopted at least one type of ethnic cuisine within their households. The most popular types of ethnic cuisines consumed within respondent households included 22.6% Italian cuisine, 13.7% Canadian Cuisine, and 13.7% participants consumed multiple ethnic cuisines. A total of 54 recipes were collected. Of these, 32 represented meals (breakfast, lunch, and dinner) 13 represented snack/dessert options, 4 soup-based options, and other suggestions. 26% of participants (n=66) reported challenges related to food preparation when following the gluten-free diet. These challenges included high cost of GF products, difficulties in baking with GF flour, and finding the right substitution of GF ingredients. Conclusions: This study conducted a pre-stakeholder evaluation related to the development of an evidenced-based GF cookbook for children and youth with CD. These resources will provide GF recipes, meal tips, and nutritional education that will support the GFFG recommendations representing a broad range of ethnic cuisines. Future studies including sensory taste evaluation will be conducted on youth with CD and their families to ensure that the cookbook content provided evidence-based recipes which children will enjoy and ensure optimal nutrient intake in children with CD.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 65
Presenter: Tamara Dorfman
Supervisor: Scott, Shannon
Title: An examination of the psychosocial consequences experienced by children and adolescents living with congenital heart disease and their primary caregivers: A scoping review protocol
Authors: Tamara L. Dorfman, MN, RN, NP, Mandy Archibald, PhD, RN, Mark Haykowsky, PhD, FACC, FAHA, and Shannon D. Scott, PhD, RN, FCAHS, FCAN

Theme: Children's health and well-being

Introduction: The chronicity of congenital heart disease (CHD) comes with significant psychosocial consequences for both children and adolescents living with CHD and their primary caregivers. Children and adolescents living with CHD undergo multiple traumatizing invasive surgical and medical procedures, struggle with disabilities resulting from their CHD, face unfair scrutiny and marginalization, and are at risk for mental health issues. Primary caregivers of children and adolescents living with CHD deal with increased stress, fear, anxiety, depression, and financial burden. A knowledge synthesis including all study designs is yet to be completed mapping the current state of knowledge and research activity with regards to the negative psychosocial consequences experienced by children and adolescents living with CHD and their primary caregivers in high income countries. A synthesis of interventions aimed at decreasing these consequences for these two populations in high income countries has also not been completed. The objectives of this scoping review are to 1) determine the current state of knowledge on negative psychosocial consequences experienced by children and adolescents living with CHD and their primary caregivers in high-income countries, and 2) inform research aimed at developing interventions in high-income countries to decrease the negative psychosocial consequences experienced by children and adolescents living with CHD and their primary caregivers. Methods: Databases and grey literature searched will include MEDLINE, CINAHL, EMBASE, PsycINFO, CENTRAL, Scopus, ProQuest Theses and Dissertations, and Google advanced search. Citation mining of included studies and relevant review articles in the review will be completed. Studies will be screened by title and abstract and then full text by two independent reviewers, using pre-defined inclusion and exclusion criteria. Quality analysis will be conducted on all included studies by two reviewers using MMAT Version 2018. Studies will not be excluded due to quality assessment. Data from all eligible studies will be independently extracted by the two reviewers and verified by consensus. Arksey and O'Malley's (2005) framework will be used to guide synthesis of extracted data. The data will be presented and synthesized in evidence tables to examine potential patterns. Results: The results of this review will provide recognition of the psychosocial impact of CHD and its treatments on children and adolescents living with CHD and their primary caregivers. It will also highlight interventions that have been developed to decrease these psychosocial consequences. The results from this review will inform a future integrated knowledge translation study by the first author aimed at decreasing one or more of the negative psychosocial consequences experienced by children or adolescents living with CHD and their primary caregivers. Conclusion: Recognition of the negative psychosocial consequences experienced by children and adolescents living with CHD and their primary caregivers is an essential part of caring for this population and their families. Interventions are needed to reduce these outcomes for both children and adolescents living with CHD and their families.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 66
Presenter: Emma Bedard
Supervisor: Yuksel, Nese
Title: A qualitative exploration of women's experiences around long-acting reversible contraception
Authors: Emma Bedard, Natasha Cameron, Theresa J. Schindel, Nese Yuksel

Theme: Lifelong women's health

Introduction: Long-acting reversible contraception (LARC) includes intrauterine contraception and implants. LARC methods are the most effective reversible contraception, yet only 5% of reproductive-age Canadian women use LARC. Several studies have attempted to determine barriers to LARC use; however, there are limited studies exploring the process of how women decide to access and use LARC methods. The purpose of this qualitative study is to explore women's experiences of accessing LARC for contraception. Methods: This study will follow qualitative description and community engagement frameworks. Semi-structured interviews lasting approximately one hour will be conducted virtually or by telephone. Eligible participants are people with female reproductive anatomy who identify as women, are aged 18 years or older, and have accessed a LARC method for contraception. Participants will be excluded if LARC was chosen for emergency contraception. The interviews will explore how women decided to use LARC, accessed their chosen method, and factors affecting this decision. Participants will be recruited through the AHS Birth Control Center using purposive sampling. Potential participants will be identified at the study site by a clinic nurse during LARC counselling. Potential participants will be given a QR code to scan to contact the researchers, and interviews will be arranged via email. The anticipated sample size is 10 to 15 participants. Results will be analyzed following the Reflexive Thematic Analysis approach. Site staff will provide additional insight during data analysis. Data collection will stop when a rich description of the phenomenon has been developed. Results: A partnership with the study site has been developed for patient recruitment and for consultations during data analysis. Recruitment began in July 2022. Interviews began in August 2022 and will continue with results expected in Fall 2022. This study has been approved by ethics (Pro00116700). Conclusions: This study will explore women's decision to use and access LARC for contraception and will generate an understanding of their experiences. The results from this study will contribute to our understanding of women's LARC needs and provide insight into future practice changes for healthcare providers working with LARC.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 67
Presenter: Maryam Paraktoon
Supervisor: Kozyrskyj, Anita
Title: Pre-eclampsia, emergency cesarean delivery and Bifidobacterium levels in infant gut microbiota
Authors: Maryam Paraktoon, YuanYao Chen, Sarah Bridgman, Piushkumar Mandhane, Theo Moraes, Elinor Simons, Stuart Turvey, Padmaja Subbarao, James Scott, Anita Kozyrskyj

Theme: Pregnancy and developmental trajectories

Introduction: Pre-eclampsia affects up to 8% of pregnancies, leading to significant maternal-fetal morbidity, including fetal distress, abnormal fetal heart rate and placental abruption. These conditions also place pre-eclamptic women at risk of emergency cesarean prior to a trial of labour. Critical gut microbiota and immune system interactions can be affected by microbial dysbiosis following cesarean birth. Therefore, the aim of our study was to determine the impact of emergency cesarean section (CS) delivery without labour or a pre-eclampsia diagnosis on levels of key microbiota, Bifidobacterium, in the infant gut. Methods: From 1279 term infants in the CHILD COHORT STUDY, data on delivery mode, labour duration, and maternal body-mass-index (BMI) and intrapartum antibiotic prophylaxis (IAP) were derived from hospital records. Breast-feeding status was obtained from maternal questionnaire. Infant fecal samples, collected at 3-4 months of age, were profiled by qPCR for levels of total Bifidobacterium. Delivery mode associations were determined from multivariable linear regression after Box-Cox transformations of the absolute quantity of Bifidobacterium. Chi square associations were determined between pre-eclampsia, emergency CS and a binary category of high-low bifidobacterial levels based on 1 SD from the mean. Results: Compared to the reference of vaginal delivery without IAP and adjusting for pre-pregnancy BMI, emergency CS without labour was associated with reduced levels of Bifidobacterium (adjustedβ: -1.60, $p<0.05$). Following emergency CS with labour, Bifidobacterium too was depleted but to a lesser extent (adjustedβ: -1.22, $p<0.05$). Moreover, Bifidobacterium was most depleted in the gut microbiota of infants fully formula-fed at 3-4 months (adjustedβ: -2.98, $p<0.05$), followed by infants exclusively breastfed and born by emergency CS without labour (adjustedβ: -2.38, $p<0.05$). A pregnancy with pre-eclampsia was much more likely to end in emergency CS without labour than with labour (6.5% vs 1.1% $p<0.01$), and to be associated with low Bifidobacterium levels in infant gut microbiota at 3-4 months (95.7% vs 83.3%, $p<0.03$). Conclusion: Our study finds evidence for lowered Bifidobacterium levels in gut microbiota of young infants, even those breastfed, following emergency CS without labour. Their mothers were more likely to be pre-eclamptic during pregnancy. Pre-eclampsia, a life-threatening condition for the fetus, was also found to be associated with low bifidobacterial levels in infant gut microbiota.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 68
Presenter: Juan Garcia Rivas
Supervisor: Clugston, Robin
Title: Single cell transcriptomic analysis of the developing diaphragm: insight into congenital diaphragmatic hernia
Authors: Garcia Rivas, J. F., Clugston, R.D.

Theme: Pregnancy and developmental trajectories

Introduction: The diaphragm serves two main purposes; it is the primary muscle of respiration and it provides a barrier between the abdominal and thoracic cavities. Due to the importance of this muscle, abnormal diaphragm development can lead to lethal birth defects. Congenital Diaphragmatic Hernia is a life-threatening condition with a high level of mortality that affects ~1 in 3,000 newborns. The etiology of this birth defect is not well understood, therefore the goal of this experiment is to identify the different cell populations present in the developing diaphragm, and determine which populations of cells express genes that are known to be involved in the pathogenesis of diaphragmatic hernia. Methods: To isolate the cells of the developmental precursor of the diaphragm, the pleuroperitoneal folds, fetuses were dissected at gestational day 13.5, and the pleuroperitoneal folds were removed and dissociated in trypsin. A single cell suspension obtained from the pleuroperitoneal folds was given to the High Content Analysis core at the University of Alberta to prepare the libraries for scRNA-seq, and then sent to Novogene for sequencing. For the K-means analysis, Cloupe was utilized as our main software. For the UMAP analysis, we utilized R. Results: Our K-means analysis shows that the developing diaphragm has multiple cell populations comprising 7 major cell types, including a large population of mesenchymal cells, as well as myoblasts. Reclustering via UMAP analysis reveals 18 unique clusters of cells. One cluster, which was determined to be mesothelial cells, has a high expression of multiple genes that have been linked with the incidence of diaphragmatic defects, including Wt1, Pbx1, and Slit3. Furthermore, we determined that genes that are involved in the incidence of Bochdalek hernias are primarily expressed in the mesenchymal component of the developing diaphragm; whereas genes that are involved in the incidence of muscular eventration are expressed in the myoblast population of the pleuroperitoneal folds. Conclusion: To our knowledge, this is the first time scRNA-seq technology has been utilized to investigate diaphragmatic development. Our transcriptome analysis showcased that there are many different cell populations in the developing diaphragm, the biggest cluster being mesenchymal cells, and that these cell populations express many genes that are involved in diaphragmatic defects, like Wt1, Pbx1, and Slit3. However, this was not exclusive, as some genes involved in other forms of diaphragmatic defects were not expressed in the mesenchymal clusters but in other clusters. One cluster in particular, the mesothelial cell cluster, had a high level of expression of many genes implicated in hernias, as well as being necessary during diaphragm development according to our cell ontology analysis. This leads us to believe that these cells might be of critical importance for the proper formation of the diaphragm. Overall, our findings shed light into the complexity of diaphragmatic defects, and how multidisciplinary approaches are needed in order to better understand these syndromes.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 70
Presenter: Summer Hudson
Supervisor: Ali, Samina
Title: Exploring the Needs of Healthcare Providers to Inform Design of an AI-Enhanced Social Robot to Improve Pediatric Emergency Care
Authors: Summer Hudson, Fareha Nishat, Jennifer Stinson, Sasha Litwin, Brittany Wiles, Mary Ellen Foster, Samina Ali on behalf of the Canada-UK AI Team

Theme: Children's health and well-being

Introduction: Children commonly experience pain and distress in healthcare settings related to medical procedures such as blood tests and intravenous insertion (IVI). Inadequately addressed pain and distress can result in both short- and long-term negative consequences. The use of socially assistive robotics (SARs) to reduce procedure-related distress and pain in children's healthcare settings has shown promise, however, current options lack autonomous adaptability to each child's unique situation. This study aimed to understand healthcare provider (HCP) needs during IVI to inform the development of an artificial intelligence [AI]-enhanced social robot to be used as a distraction tool to facilitate pediatric IVI. Methods: This study presents a descriptive qualitative needs assessment of HCPs in two Canadian pediatric emergency departments (EDs). Semi-structured virtual individual and focus group interviews were conducted with eleven HCPs (5 nurses, 4 physicians, 2 child life specialists), who were predominately female and had varying years of pediatric emergency care experience (1-21 years). Results: Four main themes were identified: (1) Common challenges during IVI (child distress, inter-connected child and caregiver anxiety, child movement, resource limitations), (2) Current tools for pain management during IVI (pharmacological and non-pharmacological), (3) Potential functionality and appearance of the SAR (unique beneficial roles of the robot before (i.e., personalized and responsive emotional support), during (i.e., adaptive distraction based on child's preferences and responses), and after (i.e. provide continued distraction and positive reinforcement) IVI), and (4) Anticipated benefits and challenges of SARs in clinical spaces (ensuring developmentally appropriate interactions, space limitations, need for HCP champions to promote uptake). Conclusion: These insights will be used to inform the design of an AI-enhanced SAR with custom software. Next steps include development and usability testing of the SAR, followed by evaluation with a randomized controlled trial, and subsequent implementation of the SAR into clinical practice. In parallel, our interdisciplinary team is exploring the practical and ethical implications of such technologies in the pediatric healthcare space.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 71
Presenter: Trina Gartke
Supervisor: Wine, Eytan
Title: The influence of fiber byproducts on bacterial invasion in pediatric inflammatory bowel diseases
Authors: Trina Gartke, Dr. Michael Bording-Jorgensen, Dr. Heather Armstrong, Dr. Eytan Wine

Theme: Children's health and well-being

Introduction: A disturbed gut microbiome has been linked with inflammatory bowel diseases (IBD), but how bacteria contribute to the disease burden is unknown. An altered gut microbiome can lead to impaired fermentation of dietary fibers, leading to a changed microenvironment, including changes in the breakdown products of fibers into short chain fatty acids (SCFAs). Nutritional therapy is a first line therapy for pediatric Crohn disease but is difficult to complete; therefore, further understanding of how diet interacts with the gut microbiome is critical. This study seeks to determine how SCFAs may influence bacterial invasion and cell response and ultimately impact IBD development and progression. Methods: Patient- and lab-derived gut bacteria were used to infect epithelial or macrophage cells in vitro, with cells exposed to SCFAs beforehand (to assess the impact of SCFAs on bacterial invasion and cell response). A gentamicin protection assay (kills only intracellular bacteria) was used to quantify invasive bacteria. Quantitative polymerase chain reaction (qPCR) was used to measure inflammatory gene expression. Different SCFA conditions were compared to control using one-way ANOVA with multiple group comparisons. Results: The SCFAs formate and propionate significantly decreased the rate of intracellular bacterial survival for both adherent-invasive Escherichia coli and commensal E. coli. SCFA exposure did not impact epithelial intracellular bacterial invasion, regardless of SCFA type for either E. coli strain. Bacteroides fragilis cultured from an IBD patient showed increased invasiveness compared to a strain of the same bacterium cultured from a non-IBD patient. B. fragilis from an IBD patient only showed increased epithelial intracellular invasion after exposure to butyrate compared to control, whereas B. fragilis from a non-IBD patient demonstrated increased epithelial intracellular invasion with all the SCFAs studied. Some SCFAs, but not others, significantly changed the gene expression of the following cytokines: IL18, TNFa, CCL2, and the GPR43 receptor in epithelial cells. There was also the trend of increased cytokine expression by epithelial cells infected by IBD bacteria after SCFA exposure versus non-IBD bacteria. Conclusion: Invasion capacity of E. coli depends on cell type and SCFA, with significant decreases measured requiring further probing to clarify clinical significance. SCFAs appear to increase the invasiveness of B. fragilis in a non-IBD environment compared to an IBD environment. However, invasiveness seems to be increased in an IBD setting compared to a non-IBD setting for B. fragilis, regardless of SCFAs. The significant differences seen in cytokine expression with the different SCFAs and bacteria indicate that SCFAs indeed can have a role in influencing epithelial cell response to bacterial invasion, and that SCFAs can cause more of an inflammatory response in an IBD environment as opposed to a non-IBD environment. Ultimately these results suggest the importance of microenvironmental changes and their influence in IBD and the need for further research to help guide appropriate dietary or therapeutic recommendations, which could alter the gut microenvironment and impact disease course.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 77
Presenter: Carina Siu
Supervisor: Adams, Kim
Title: BCI-for-play: How can brain computer interfaces (BCI) and other assistive technology solutions support the play experiences of children with motor impairments?
Authors: Carina Siu, Matin Dokht Taghirad, John Andersen, Kim Adams

Theme: Children's health and well-being

Introduction: Play exists as a fundamental element of a child's life; not only does it support cognitive, behavioral and psychological development in children, but it also functions as one of the main occupations of childhood. Yet, children with significant physical impairments often face profound limitations regarding their play engagement, as they experience markedly diminished voluntary control of movement. Brain computer interfaces (BCI) may offer these children new methods to access play as an assistive technology solution. BCI technology can enable children with disabilities to control computer devices, toys and robots using only their brain signals, thus providing newfound autonomy and control over their environments. Currently there is little research and literature to guide BCI-use for children with disabilities, and their families, who would benefit the most from these technologies. Therefore, it is imperative to understand their current experiences surrounding assistive technology for play, their needs and expectations concerning play, and to examine to what extent BCI can support play and development. This pilot study aimed to interview children with disabilities and their families to understand if BCI could potentially support the play experiences of these children. This project addressed two central research questions: For children with significant physical impairments 1) What are the lived experiences of play? 2) How can BCI best support individualized play-based needs, goals and expectations? Methods: Descriptive qualitative methodology was employed by conducting a semi-structured interview with a child with Cerebral Palsy (CP) and their guardian. Interview questions were based on play theory and the Test of Playfulness (ToP), a standardized test intended to assess the play engagement of children. Graphical elicitation was also employed to scaffold and elicit dialogue during the interview to further add to the understanding of the participant's current play methods. Inductive thematic analysis is being performed to generate themes surrounding the lived experiences of play for children with disabilities and to outline the potential role of BCI in these children's play experiences. Results: The collected data is currently undergoing qualitative data analysis. Conclusion: The next steps will be to finish coding and analyzing the collected data for themes to answer the above research questions. Additionally, subsequent semi-structured interviews will be performed with more children who have significant motor impairments to learn how BCI can best meet their goals, expectations and needs regarding access to play. The results of this pilot study will guide future BCI system development, clinical implementation and inform future patient/ family-orientated research in our BCI program.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 78
Presenter: Olivia Weaver
Supervisor: Proctor, Spencer
Title: Non-fasting remnant cholesterol and cardiovascular disease risk prediction in those with and without diabetes in the predominantly female Alberta Tomorrow Project
Authors: Olivia Weaver, Ming Ye, Jennifer Vena, Dean Eurich, Spencer Proctor

Theme: Lifelong women's health

Introduction: Cardiovascular disease (CVD) is a leading cause of death in Canada, and certain groups including individuals with diabetes mellitus (DM) and women of older age are at increased risk. Traditional CVD-risk screening and treatment involves assessing and targeting (through the use of statins) fasting low-density lipoprotein cholesterol (LDL-C). However, despite reductions in LDL-C concentrations, substantial CVD risk remains. Studies in European general populations have demonstrated that non-fasting remnant cholesterol (RC) can be used to predict CVD. However, few studies have assessed non-fasting RC in the context of DM, or in a Canadian setting. Additionally, despite sex-specific risk factors, there has been a historical lack of female CVD data. Therefore, the objective of this study was to determine the relationship of non-fasting RC with CVD (compared to other traditional lipid markers) in those with and without DM in the Alberta Tomorrow Project (ATP), a largely female Canadian cohort. Methods: ATP participants with prevalent CVD or incident DM were excluded from the present analysis. Data from consenting participants with complete, non-negative non-fasting lipid panels and TG>=4.5mmol/L was linked to Alberta Health administrative databases for individual-level determination of statin usage, as well as DM, comorbidity and CVD diagnosis. RC was calculated as [total cholesterol - high-density lipoprotein cholesterol (HDL-C) - LDL-C] and LDL-C was calculated via the Friedewald formula. CVD was a composite of major CVD diagnoses including ischemic heart disease, heart failure, angina, myocardial infarction, acute ischemic stroke, transient ischemic attack, percutaneous coronary intervention and coronary artery bypass graft. After stratification by DM status, the relationship of RC, LDL-C and other traditional lipid markers with incident CVD was assessed by multivariable logistic regression, adjusting for age, sex, statin use, Elixhauser comorbidity index and (model-dependent) LDL-C or RC. Results: The final sample size was n=13,631, including n=881 with pre-existing DM. The sample was 69.8% female with a mean age of 61.6 years. After approximately 18 years of follow up, 12.2% of individuals with and 7.4% of individuals without DM had CVD diagnoses. The odds of incident CVD per mmol/L increase of RC were significantly increased in those without DM (adjusted OR 1.39; CI 1.16-1.65; p<0.001), and similarly tended to be increased in those with DM (adjusted OR 1.32; CI 0.79-2.22; p=0.29). A mmol/L increase in LDL-C was inversely associated with CVD in those with and without DM (adjusted OR 0.58; CI 0.44-0.78; p<0.001 and adjusted OR 0.79; CI 0.72-0.86; p<0.001, respectively). HDL-C and triglycerides demonstrated traditional patterns for CVD risk prediction in both groups. Conclusion: Within the predominantly female ATP cohort, non-fasting RC was significantly associated with incident CVD in those without DM and followed similar patterns in those with DM, while LDL-C (the traditional CVD lipid risk marker) did not. This suggests that non-fasting RC may be a useful tool for CVD risk prediction in these high-risk groups but warrants further investigation to characterize RC reference ranges for use in a Canadian healthcare context.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 80
Presenter: Jason Wong
Supervisor: Lou, Edmond
Title: Validity of a Fast Artificial Intelligence Method to Automatically Measure the Cobb Angle on Spinal Radiographs of Children with Adolescent Idiopathic Scoliosis
Authors: Jason Wong, Marek Reformat, Eric Parent, and Edmond Lou

Theme: Children's health and well-being

Introduction Adolescent idiopathic scoliosis (AIS) is a three-dimensional spinal disorder that affects 1-3% of adolescents. Scoliosis severity is quantified on a posteroanterior (PA) radiograph using the Cobb angle, a measure of the spine's lateral curvature. Measuring the Cobb angle is crucial to diagnose and decide on treatments for a child with AIS. Therefore, accurate Cobb angle measurements are important to ensure optimal treatment management. Measurement is challenging and subject to large human variation, especially for clinicians who lack measurement experience. Also, since scoliosis clinics see many children with AIS in a day, an automated method is widely sought to reduce clinical workload. The objective of this clinical study was to validate a new artificial intelligence (AI) based algorithm for automatic Cobb angle measurement on radiographs that meets three clinical feasibility criteria: accurate, quick, and interpretable. Methods Ethics approval was granted to extract 330 spinal PA radiographs from the local scoliosis clinic database. The inclusion criteria were: a) Cobb angle ≥10°, b) not taken in-brace, and c) no prior surgery. Among the 330 images, 130 were used for AI model development and 200 were used for validation. Convolutional neural networks (CNN), a type of AI model, were used to segment various spinal features on radiographs so that the Cobb angle could be measured automatically. The 200-image test set comprised of 352 curves with an average Cobb angle of 24.6°±9.7° (range: 10°-52°), manually measured by a rater with 20+ years of experience. The test images were input into the AI algorithm to output the Cobb angle and an image depicting how it was measured. The standard error of measurement (SEM), inter-method intra-class correlation coefficient (ICC2,1), and percent within clinical acceptance (≤5°) between the manual and automatic measurements were calculated. Results were analyzed by curve severity (mild: <25°, moderate: 25°-45°, and severe: ≥45°) to identify any measurement bias. Results Of the 352 curves manually measured, 346 (98%) were detected by the AI method. The SEM of the 346 paired measurements was 0.8° and the ICC2,1 was 0.92, indicating excellent reliability. The average Cobb angles of the 346 manual and automatic measurements were 24.7°±9.5° and 26.0°±10.5°, respectively. The method achieved 91% (316/346) of measurements within clinical acceptance, with 93% (173/186), 89% (131/148), and 100% (12/12) for the mild, moderate, and severe groups, respectively. All 6 missed curves were mild (16.5°±5.5°), which is expected since these curves are more ambiguous. The average measurement time/image was 18±10s, improving upon the average 30s it takes an experienced rater to measure. Conclusion An AI method was developed to automatically measure the Cobb angle on radiographs, which demonstrated excellent reliability and quick measurement time, while providing interpretable outputs to give clinicians confidence in the algorithm's measurements. Future work includes testing the algorithm on more severe curves and for each spinal region to complete validation. Using the developed method in clinics could streamline clinical workflow and offer rigorous measurements to inform treatment decision for children with AIS.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 82
Presenter: Emily Konrad
Supervisor: Hawkes, Michael
Title: Circulating markers of neutrophil activation and lung injury in pediatric pneumonia in low-resource settings
Authors: Emily Konrad, Jeremy Soo, Andrea L. Conroy, Sophie Namasopo, Robert O. Opoka, Michael T. Hawkes

Theme: Children's health and well-being

Introduction Pneumonia is a leading cause of childhood mortality, with especially high burden of disease in low- and middle-income countries. Identifying biomarkers to aid in pneumonia diagnosis could guide management and improve antibiotic stewardship in low-resource settings where other modalities such as chest x-ray (CXR) may not be available. Chitinase 3-like protein 1 (CHI3L1), tissue inhibitor of metalloproteinases-1 (TIMP-1), surfactant protein D (SP-D) and lipocalin-2 (LCN2) are markers of neutrophil activation and lung injury. Here we assess their clinical utility in predicting radiographic primary end-point pneumonia in children in low-resource settings. Methods In this cross-sectional study, we measured plasma levels of CHI3L1, SP-D, LCN2 and TIMP-1 in children under the age of five hospitalized for acute lower respiratory tract infection in Uganda. We determined the association between biomarker levels and primary end-point pneumonia, indicated by alveolar consolidation on CXR. Results We included 89 children (median age 11 months, 39% female). Primary endpoint pneumonia was present in 22 patients (25%). Broad-spectrum antibiotics (ceftriaxone) were administered to 83 patients (93%). We found that levels of CHI3L1, SP-D, LCN2 and TIMP-1 were higher in patients with primary end-point pneumonia compared to patients with normal CXR or other infiltrates. In contrast, patient signs and symptoms did not differ according to CXR findings. Each biomarker was a moderately accurate predictor of primary end-point pneumonia, with area under receiver operator characteristic curves of 0.66-0.70 ($p<0.05$ for all markers). The probability of CXR consolidation increased monotonically with the number of markers elevated above the cut-off. Among 28 patients (31%) in whom all four markers were below the cut-off, only one (3.4%) had CXR consolidation. This corresponds to a negative likelihood ratio of 0.11 (95%CI 0.015 to 0.73) and a sensitivity of 95% (95%CI 76% to 100%) for ruling out primary end-point pneumonia. Conclusions Levels of CHI3L1, SP-D, LCN2 and TIMP-1 are associated with CXR consolidation in children with clinical pneumonia in low-resource settings. Taken together, these four biomarkers may be useful for identifying children at low risk of primary endpoint pneumonia. Although further research is needed, these findings suggest that measuring biomarker levels may be a strategy to improve pneumonia diagnosis and antibiotic stewardship in low-resource settings.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 83
Presenter: Giulia Puinean
Supervisor: Tremblay, Melissa
Title: A qualitative exploration of teen mothers' experiences accessing mental health services
Authors: Giulia Puinean, Dr. Melissa Tremblay, the Terra Centre for Teen Parents

Theme: Lifelong women's health

Introduction: The transition to motherhood carries significant challenges. Teen mothers in particular are at disproportionate risk for mental health challenges such as anxiety and depression, compounded by criticism, judgment, and stereotyping from their peers and others in the community. If not addressed, mental health challenges can negatively affect the mother-child relationship, as well as child development outcomes. Many teen mothers and their children thrive with the proper supports and it is therefore important to explore, from their perspectives, how teen mothers can achieve positive mental health. Through previous research conducted in partnership with the Terra Centre for Teen Parents, families voiced the need for quality mental health supports in order to raise their children in healthy ways. The proposed study will focus on mental health supports for teen mothers, as they are the primary population that Terra serves. Methods: Using a community-based participatory research approach and qualitative descriptive design, the purpose of this study is to: (1) explore teen mothers' experiences with accessing and receiving mental health services; (2) identify facilitators and barriers to access; and (3) determine how mental health service providers can best meet teen mothers' unique needs. Data collection methods consisted of interviews and focus groups with teen parents and Terra staff, including mental health service providers. Results: Teen mothers discussed their experiences with accessing and receiving mental health services, while service providers touched on their experiences working with teen mothers. Participants also provided insight into teen mothers' mental health needs as well as approaches that work best with this population. Conclusion: This study provides insight into a topic that has been significantly under-researched. Drawing on the lived experiences of these stakeholders has the potential to generate meaningful understandings of optimal mental health service delivery, thereby supporting the well-being of teen mothers and their children. Insights gained from this study will be shared with Terra stakeholders and service providers and be further disseminated through academic venues, contributing to the scholarly body of knowledge on teen parenting and informing service delivery within non-profit and government agencies.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 84
Presenter: Shubham Soni
Supervisor: Dyck, Jason
Title: Gestational ketone supplementation protects against the cardiac damage in pups subjected to perinatal maternal iron restriction
Authors: Shubham Soni, Ronan Noble, Si Ning Liu, Claudia Holody, Jad-Julian Rachid, Mourad Ferdaoussi, Stephane Bourque, Jason Dyck

Theme: Pregnancy and developmental trajectories

Introduction: Iron deficiency (ID) is the most widespread nutritional disorder in the world and commonly occurs during pregnancy. Recent evidence suggests that excess oxidative stress due to prenatal ID contributes to the cardiac and renal dysfunction and organ-specific mitochondrial dysfunction in the offspring. Interestingly, a noteworthy characteristic of ID neonates is an impaired ability to produce ketones. Ketones, namely β-hydroxybutyrate (BOHB), are molecules produced by the liver from fatty acids that can be used as a source of energy. However, ketones also have signaling properties that inhibit oxidative stress and inflammation. We hypothesized that gestational BOHB supplementation can reduce the cardiorenal impairments in ID neonates by favorably acting on metabolic, oxidative, and/or inflammatory pathways. Methods: 6-week-old Sprague Dawley rats were fed an iron-restricted (3-10 mg/kg) or iron-replete (37 mg/kg) diet two weeks prior to and throughout gestation. Control dams were subcutaneously injected saline and ID dams were given saline or 300mg/kg body weight BOHB from gestational day 1 to 21. After birth, all dams were fed an iron-replete diet. Neonatal birth outcomes were analyzed. Cardiac function (via echocardiography) was assessed on postnatal day (PD)1, PD4, and P14. Offspring hearts and kidneys were snap-frozen and assessed for transcript markers of ketone metabolism, oxidative stress, inflammation, and organ damage, and fresh tissue was used to assess mitochondrial respiration. Data were analyzed with 2-way ANOVA. Results: Perinatal iron restriction reduced maternal hemoglobin (Hb) in both ID and ketone-treated (KID) dams compared to control. Interestingly, despite the increased demands during pregnancy, ID and KID dams had higher blood glucose and lower blood ketone levels at the end of the 2nd trimester compared to control dams. Relative body weight of ID and KID dams changed at a similar trajectory throughout the pregnancy compared to controls. Similarly, Hb was lower in ID and KID offspring at PD0, PD4, and PD14, and both ID and KID offspring were growth restricted relative to controls. ID and KID offspring also had greater heart:body weights at all timepoints. Interestingly, while liver weight was greater in PD4 ID males, ketone treatment blunted this effect. In addition, blood glucose was lower in PD4 KID offspring but not at PD0 or PD14. Cardiac function was notably impaired in the PD4 and PD14 ID neonates. However, KID offspring were protected from this impairment. Furthermore, markers of cardiac inflammation (Il-1b, Bnip3) were elevated in PD4 ID hearts, but ketone-treated offspring were protected from this inflammatory effect. Conclusion: Altogether, these preliminary data suggest that ketone supplementation in ID mothers is safe for the ID mother and child, and it does not exacerbate ID-induced growth restriction. Moreover, ketone supplementation preserved the cardiac function of PD14 ID neonates. These changes were paralleled by gene markers of inflammation and cell stress. Though ketones may mitigate the deleterious effects of perinatal ID, further work will characterize the effect of cardiac metabolism and elucidate the potential cardioprotective mechanisms.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 87
Presenter: George Slim
Supervisor: Tham, Edythe
Title: RV strain comparisons between repaired tetralogy of Fallot and isolated pulmonary regurgitation
Authors: George Slim, MB BCh, Joseph Pagano, MD PhD, Kumaradevan Punithakumar, B.Sc.Eng. M.A.Sc. PhD, Michelle Noga, MD, Edythe Tham, MBBS

Theme: Children's health and well-being

- Introduction: Pulmonary regurgitation (PR) following repair of tetralogy of Fallot (rTOF) is a common postoperative sequela associated with progressive right ventricular (RV) enlargement and dysfunction, and is an important determinant of late morbidity and mortality. Cardiac magnetic resonance imaging (CMR) guidelines using RV volumes and pulmonary regurgitant fraction have been developed to identify the appropriate timing of valve replacement. However, such information is not available for isolated pulmonary regurgitation (iPR) following balloon dilation for pulmonary stenosis. Our previous study showed that circumferential strain parameters were predictive of criteria for pulmonary valve replacement in rTOF. The aim of this study is to understand whether iPR and PR secondary to rTOF carry similar functional parameters at comparable RV volume loads. - Methods: This study followed the quantitative methodology within the retrospective analytic framework. Patients with iPR and rTOF with PR aged 0 to 30 years-old who had undergone a cardiac MRI to evaluate RV volume, function and PR quantification were identified. Twenty-two patients were enrolled in each of the study arms and were matched 1:1 for age (±12 months) and RVEDV z-score (±1). The RV strain was measured using novel CMR semi-automated segmentation software. Global longitudinal strain (GLS) and strain rate (SR) of the right ventricle were measured from the standard 4-chamber SSFP cine; and global circumferential strain (GCS) and SR from the basal short-axis cine, just below the RV outflow tract. - Results: Patients with rTOF had significantly higher GCS compared to the iPR group (-26.52% vs -22.31%, $p<0.05$), whereas GLS did not differ between groups. In addition, the GLS:GCS ratio was significantly lower in rTOF compared to iPR (1.24 vs 1.53, $p=0.05$). Both global circumferential and longitudinal SR did not significantly differ between groups (CSR -1.1/s vs -1.04/s, $p>0.05$ and LSR -1.51/s vs -1.55/s, $p>0.05$). Within the iPR group, GCS was significantly lower than GLS (-22.3% vs -31.9%, $p<0.05$). This was also true when comparing GCS and GLS within the rTOF group (-26.5% vs -31.5%, $p<0.05$). - Conclusion: Our findings demonstrated that in patients with pulmonary regurgitation of any etiology, the RV shows a predominance of longitudinal strain. These findings suggest that the RVs in rTOF demonstrate greater reliance on GCS in response to the associated increased volumes. The subsequent decrease in GLS:GCS ratio suggests that rTOF RVs display a greater adaptive response to the volume load than iPR and highlights the importance of the relative contributions of both circumferential and longitudinal strain in pulmonary regurgitation in the different clinical contexts.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 88
Presenter: Yuting Sun
Supervisor: Scott, Shannon
Title: Evaluating Social Media Metric Changes on Instagram to Disseminate an Anaphylaxis Tool to the General Public: A Repeated Measures Feasibility Study
Authors: Yuting Sun, Malak El Ashry, Savanna Lubimiv, Lisa Knisley, Dr. Shannon Scott

Theme: Children's health and well-being

Introduction: Social media are convenient and innovative platforms used by researchers and healthcare practitioners to disseminate evidence-based health information. Facebook and Twitter are often the platforms of interest, however, with the rising number of users, Instagram is a potentially effective means to share health information. For parents, anaphylactic reactions can be a cause of significant stress as they can progress quickly and require timely recognition and initiation of therapy. However, a significant percentage of parents and guardians have knowledge gaps on how to manage their children's anaphylactic reactions when evaluated by a questionnaire. Families often use online resources to complement formal supports to improve their health literacy, and social media presents a unique opportunity to mobilize knowledge to the general public. Methods: A repeated measures feasibility design was chosen to measure the user reach and engagement. The pediatric anaphylaxis tool was developed by the research team at Translating Evidence in Child Health to Enhance Outcomes (ECHO) and disseminated on the Translating Emergency Knowledge for Kids (TREKK- a national pediatric emergency network) Instagram account during a 4-week social media campaign. Instagram posts, stories, and reels were created to highlight the key messages of the tool, including information on the symptoms of anaphylaxis, home management, and when to seek emergency care. The posts were disseminated every 2 days at 10 AM, stories were posted every 24 hours at 2 PM and reels were posted every Monday at 12 PM. Social media filtering techniques, such as hashtags, were also used. Instagram metrics were collected at weekly intervals before, during and after the campaign period and ANOVA tests were conducted using SPSS software. Results: The type of content posted and the weekly time period influenced the reach (also known as the number of views) of the campaign material. For the number of shares, the type of content was statistically significant with posts being shared more often than stories and reels. The time period when Instagram content was disseminated did not statistically impact the number of likes and saves. For the number of followers, time has a statistically significant effect on the number of followers with steady increases during the campaign period. Conclusion: This study evaluates the feasibility of using Instagram as a platform for disseminating health information. Throughout our study, we used different mediums to deliver content to users and explored the benefits and challenges of using Instagram. By exploring the different tools within Instagram, our findings would improve future social media campaigns created by researchers and healthcare professionals to disseminate health information to the general public.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 89
Presenter: Tristan Sinnatamby
Supervisor: Funk, Greg
Title: Does the immature hypoxic ventilatory response of newborn mammals and their vulnerability to hypoxia reflect an inability to increase ventilation or decrease metabolic rate?
Authors: Tristan Sinnatamby, Robert J Reklow, Suey van Baarle, Gregory D Funk

Theme: Children's health and well-being

Introduction: Infants born prematurely often suffer from apnea of prematurity (AOP); they have frequent pauses in their breathing (apneas) due to the immaturity of the brainstem network that controls breathing. Long apneas lower blood oxygen levels (hypoxia), triggering the hypoxic ventilatory response (HVR). This involves an initial increase in ventilation (VE) and decrease in metabolic rate (VO2), followed by a central-mediated secondary depressive phase. In adults, VE and VO2 fall in parallel during the secondary phase, so VE/VO2 stays above baseline. Premature mammals, however, cannot mount a sustained adaptive response; VE/VO2 falls below baseline. This creates a life-threatening positive feedback loop - apnea causes hypoxia, hypoxia depresses VE more than VO2 and hypoxia worsens. This continues until interrupted by an intervention or death. Caffeine is the treatment of choice for AOP, but other treatments are needed since caffeine is ineffective or associated with major side effects in ~20% of infants. Understanding the mechanisms behind the powerful hypoxic respiratory depression (HRD) may inform new AOP therapies. Extracellular adenosine (ADOe) is implicated in the HRD since it increases in the brain during hypoxia, it inhibits breathing and caffeine, the main treatment for AOP, is an ADO receptor antagonist. Thus, our work has focused on factors that control ADOe. Adenosine kinase (ADK-S) is an enzyme that helps clear inhibitory ADOe and is minimally expressed in the rodent brainstem at postnatal day 0 (P0), maturing by P20. This led us to hypothesize that a lack of ADK-S at birth contributes to the immature HVR. We tested this with transgenic (ADKtg) mice engineered to express adult levels of ADK-S. The mice had an adult-like HVR at P0 (sustained VE/VO2 increase), but this was due to a VO2 depression. P0 ADKtg and C57BL6 (wildtype) mice had similar VE responses but only ADKtg mice depressed VO2. These data contradicted dogma that the inability of newborn mammals to sustain an elevated VE/VO2 in hypoxia reflects an inability to sustain VE and was inconsistent with the literature showing virtually all newborn mammals respond to hypoxia with a VO2 decrease. Reviewing the literature showed the developmental analysis is incomplete, only including mammals P2 and older. We therefore hypothesized that either C57BL6 mice have an abnormal VE/VO2 response to hypoxia, or P0-1 rodents are unable to depress VO2 during hypoxia. Methods: Using a custom chamber, we tested in C57BL6 and FVB mice and Sprague-Dawley (SD) rats the effects of hypoxia on VO2 from P0-3. VE and VO2 were measured as animals were exposed to room air (15 min) followed by hypoxia (10% O2, 10 min) and then room air (10 min). Results: Surprisingly, none of the species had a VO2 depression in response to hypoxia at P0. C57BL6 mice responded with a VO2 increase until P2; an adaptive VO2 decrease emerged by P6. FVB mice and SD rats showed no VO2 response to hypoxia at P0, but a strong depression at P1. Conclusion: These findings support our hypotheses that C57BL6 mice have a unique HVR, and, contrary to dogma, a major factor in the inability of newborn mammals to mount a sustained increase in VE/VO2 during hypoxia is an inability to depress VO2, not an inability to increase VE.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 90
Presenter: Mazhar Pasha
Supervisor: Davidge, Sandra
Title: An Intervention to Improve Pregnancy Outcomes in Advanced Maternal Age Pregnancies in Rats
Authors: Mazhar Pasha, Raven Kirschenman, Amy Wooldridge, Floor Spaans, Christy-Lynn M Cooke, Sandra T Davidge

Theme: Pregnancy and developmental trajectories

Introduction Advanced maternal age (AMA; ≥35 years) increases the risk of pregnancy complications and adverse pregnancy outcomes, such as fetal growth restriction. Endoplasmic reticulum (ER) stress is linked to vascular dysfunction in aging, and adverse pregnancy outcomes in complicated pregnancies. Moreover, we previously showed that ER stress markers were increased in mesenteric arteries of AMA rats. Tauroursodeoxycholic acid (TUDCA) is an ER stress inhibitor and has been shown to improve embryo development in vitro. However, whether treatment with TUDCA can improve vascular function and pregnancy outcomes in AMA pregnancies is not known. We hypothesize that TUDCA treatment improves vascular function and pregnancy outcomes in a rat model of AMA. Methods Pregnant young (4 months) and AMA (9.5 months; ~35 years in humans) rats were either in the control group or treated with TUDCA in their drinking water (to a calculated dose of 150mg/kg/day from gestational day [GD]0 to GD20). On GD20 (term=22 days) blood pressure was assessed (tail cuff plethysmography), pregnancy outcomes were recorded. In isolated main uterine arteries, endothelium-dependent relaxation to methacholine (MCh) was assessed (wire myography) in the presence/absence of a pan-nitric oxide (NO) synthase inhibitor (L-NAME). In mesenteric arteries, ER stress markers (GRP78, PeIF2α, CHOP, sXBP1, & ATF6) were quantified (Western blotting). Data were analyzed by two-way ANOVA with Planned Contrast or Sidak's post-hoc test, $p<0.05$ was significant. Results Mean arterial pressure (MAP) was decreased by 9±3.1 mmHg in AMA TUDCA-treated vs AMA control dams ($p=0.02$), without changes in young control/TUDCA-treated dams. Fetal body weights were reduced in AMA vs. young dams ($p=0.017$), while TUDCA treatment increased fetal body weight in AMA rats ($p=0.03$). Placental weights, litter size and the number of resorptions were similar in all groups. Uterine artery maximum relaxation to MCh was reduced in AMA dams compared to young dams ($p=0.043$), while TUDCA treatment tended to improve vasodilation in the AMA dams ($p=0.065$). No differences in NO contribution to vasodilation were observed between the groups. Mesenteric artery PeIF2α ($p=0.02$) and CHOP ($p=0.004$) expression was reduced in TUDCA-treated AMA dams vs. AMA control dams, without changes in young control/TUDCA treated dams. However, no differences were found in GRP78, sXBP1, & ATF6 expression. Conclusion MAP was reduced by TUDCA treatment in AMA dams concomitant with reduced expression of ER stress proteins in mesenteric arteries. An increased fetal body weight suggests the potential beneficial effect of TUDCA treatment on pregnancy outcomes. In addition, TUDCA tended to improve uterine artery function in AMA dams, via an NO-independent pathway. Overall, our data indicate that TUDCA has the potential to improve pregnancy outcomes in complicated pregnancies, but future studies are warranted.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 91
Presenter: Kara Terry
Supervisor: Aubrey, Christa
Title: Venous thromboembolism after minimally invasive surgery in gynecologic oncology
Authors: Kara Terry, Jennifer Mateshaytis, Gregg Nelson, Christa Aubrey

Theme: Lifelong women's health

Introduction: Extended postoperative thromboprophylaxis for the prevention of venous thromboembolism (VTE) after open abdominal surgery in gynecologic oncology is universally recommended due to the risk of VTE. However, in the benefit in patients undergoing minimally invasive surgery (MIS) is controversial due to the low incidence of postoperative VTE. Methods: Retrospective cohort study of all MIS for pathologic-confirmed gynecologic malignancy treated at the Tom Baker Cancer Center, between 2014-2019. The primary outcome was incidence of VTE within 90 days of surgery. Secondary outcomes were clinical, pathologic, and operative factors associated with VTE. These variables were collected in a REDCap database. Descriptive analysis of the outcomes were performed. Results: 594 confirmed gynecologic malignancies treated with MIS during the time period met inclusion criteria for our study. Only 6 women (1.01%) developed a VTE and there were no deaths related to VTE events. 218 (36.7%) of woman received pre-operative thromboprophylaxis and 469 (79.0%) received postoperative thromboprophylaxis. Further, 113 (19.0%) of woman wore graduated compression stockings in the operating room and 325 (54.7%) wore these stockings post-operatively in hospital. Only 1 of the 74 women who did not receive thromboprophylaxis (1.35%) developed a VTE. Conclusion: Postoperative VTE following MIS for gynecologic oncology is uncommon. Due to the low incidence, risk factors contributing to the development of VTE in this cohort cannot be determined. These data are part of a pan-Canadian initiative to capture VTE events after MIS gynecologic cancer surgery, with data collection ongoing in an additional five sites. With a larger sample size we hope to develop a risk score to guide recommendations for postoperative VTE thromboprophylaxis.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 95
Presenter: Sicheng (Delia) Lee
Supervisor: Schulz, Jane
Title: An assessment of women's experiences of virtual care delivery during the COVID-19 pandemic: Perspectives from the Urogynecology Wellness Program in Edmonton, Alberta
Authors: Sicheng (Delia) Lee, Laura Reyes, Annick Poirier, Jane Schulz

Theme: Lifelong women's health

Introduction: One in three women experience pelvic floor disorders, complex chronic conditions caused by weakening of the pelvic floor muscles, leading to problems of the urinary and reproductive systems, including urine leakage and positional changes of the pelvic organs. Pelvic floor disorders can have significant negative effects on women's quality of life if left untreated. COVID-19 resulted in the cancellation of in-person visits and the adoption of telephone and Zoom appointments for individuals attending the urogynecology clinic at the Lois Hole Hospital for Women in Edmonton, AB. This clinic provides multidisciplinary care for pelvic floor disorders, including services from specialist doctors and nurses, physiotherapists, pharmacists, and dieticians. As such, our main objectives were to assess patient and physician attitudes and experiences of remote care for pelvic floor problems and identify limitations to remote care. Methods: We conducted a series of one-hour long focus group interviews with women attending the urogynecology clinic about their experiences of care received during the COVID-19 pandemic and with all specialist physicians working at the urogynecology clinic. Questions were open-ended and centered on what was gained or lost through remote care as compared to in-person care and whether what patients and physicians most value from their healthcare interactions was achievable with the implementation of phone and Zoom appointments. Results: Themes emerging from the focus groups with patients attending the clinic included the perception of more limited rapport with healthcare providers with the use of virtual care, the inability to assess certain conditions without having in-person physical examination, and the advantages of remote care delivery, including its ease of access and decreased travel time and costs for individuals living outside of Edmonton. Key themes from the physician groups included the lack of visual cues to identify patients with remote care delivery, concerns about potential delays in proper care access without in-person assessments, and the lack of access to technology to facilitate virtual appointments among patients attending the clinic. Conclusion: Our preliminary data suggest that hybrid models for care may be suitable for use in the urogynecology clinic. Some appointment types may be more conducive to remote care provision than others. Thematic analysis of interview transcriptions is currently ongoing and will inform the use of virtual care to meet patient needs for the urogynecology clinic in the future.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 96
Presenter: Ashton James
Supervisor: Ospina, Maria
Title: Developing indicators of social and emotional well-being in Indigenous children in Australia, Canada, New Zealand, and the United States: A scoping review
Authors: Ashton James, Claire Cordingley, Stuart Lau, Lindsey Shamchuk, Liz Dennett, Reagan Bartel, Kelsey Bradburn, Nathalie Kermoal, Maria-Beatriz Ospina

Theme: Children's health and well-being

Introduction: Existing data on the health and well-being of Indigenous children has been criticized as inadequately reflecting the impact of structural determinants, such as colonialism and sources of healing, on lived realities. There is growing consensus that Indigenous communities must be meaningfully engaged in the creation of culturally responsive indicators to measure Indigenous children's health and well-being. The objective of this scoping review was to identify, describe, and consolidate indicators that have been developed to measure the social and emotional well-being (SEWB) of Indigenous children in Australia, Canada, New Zealand, and the United States (US). Methods: This scoping review was conducted in accordance with the Joanna Briggs Institute methodology for scoping reviews. Search strategies for 7 electronic databases were developed with a librarian at the University of Alberta. The reference lists of included studies and iPortal: Indigenous Studies Portal were hand-searched to identify additional documents. Included were peer-reviewed publications and grey literature sources published in English between 2004 and 2021 that described the development of indicators to measure the SEWB of Indigenous children in Australia, Canada, New Zealand, or the US. Document eligibility was conducted by two independent reviewers. Data extraction was completed by one reviewer and verified by a second reviewer. Data were analyzed descriptively in terms of the SEWB domains addressed in the indicators. Results: From 6,898 references identified in the literature searches, 31 documents (28 peer-reviewed articles and 3 grey literature documents) were included in the scoping review. The median year of publication of peer-reviewed articles was 2015 (IQR = 7). The study designs employed were predominately cross-sectional (n = 18). Most articles focused on Indigenous children living in the US (n = 20). The study populations included Indigenous children from birth to 18 years of age; however, few studies were specific to children younger than 6 years (n = 3). Slightly more than half (n = 16) of the articles reported community engagement in developing the SEWB measures. The included articles provided information on 29 measures corresponding to 56 indicators that have been developed to evaluate the SEWB of Indigenous children. More than two-thirds (n = 20) of measures evaluated the connection of Indigenous children to several domains of SEWB. Measures evaluating the connection of Indigenous children to family and kinship were the most common (n = 16). Grey literature documents selected for inclusion provided information on 3 population-level surveys that were developed to measure the SEWB of Indigenous children in Australia (n = 2) and Canada (n = 1). Conclusion: Preliminary results indicate that, while efforts to create culturally responsive indicators are becoming more frequent, very few culturally responsive indicators have been developed to evaluate the SEWB of Indigenous children, particularly in the early years of life. The findings of this scoping review highlight the need for continued participation of Indigenous communities in the creation of culturally responsive indicators to evaluate the SEWB of Indigenous children.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 97
Presenter: Mansi More
Supervisor: Ospina, Maria
Title: Prenatal exposure to domestic dogs, but not cats, is associated with a reduced likelihood of childhood asthma in the offspring: a systematic review and meta-analysis
Authors: Mansi More, Linn Moore, Sarah Almas, Liz Dennett, Alvaro Osornio-Vargas, Anne Hicks, Maria B. Ospina

Theme: Pregnancy and developmental trajectories

Introduction: Asthma is a common respiratory disease in children. The prenatal period is crucial to lung development, and maternal exposure to polluted air during pregnancy has been linked to an increased prevalence of asthma in the offspring. Animal dander is a common airborne allergen and frequently an asthma trigger; however, the impact of cats and dogs in the home during pregnancy on the risk of asthma in the child is still largely unknown. Objective: This systematic review summarized the scientific evidence on the association between perinatal maternal dog and cat exposure at home and childhood asthma in the offspring. Methods: Seven clinical, biomedical, and environmental databases were searched from database inception through May 10, 2021. Observational studies assessing the association between domestic prenatal cat and dog exposures and the prevalence of childhood asthma (including wheezing) diagnosed anytime between birth and at or before the age of 12 years were included. Study characteristics, number of participants, exposures, length of follow-up, and asthma outcomes were extracted. When available, crude and adjusted risk measures associated with prenatal cat and dog exposure on asthma prevalence were extracted, and raw data were sorted into 2x2 tables. Fixed-effect meta-analyses were performed to calculate pooled odds ratios (OR) with 95% confidence intervals (95% CI) for prenatal exposure to cats and dogs separately. I2 was used to assess between-study heterogeneity within the meta-analyses. The study protocol was registered as Prospero ID #CRD42021232150. Results: Of 5,644 citations (after duplicate removal), six and seven studies assessed the association between prenatal exposure to cats and dogs and childhood asthma prevalence, respectively. A total of 16,585 children had an average follow-up time across all studies of 2.5 years (range: 1-6 years). In addition, data for meta-analysis was available from four studies for each exposure. While there was no impact of prenatal exposure to domestic cats (OR: 1.02; 95% CL: 0.85, 1.23; I2: 77.5%), children born to mothers with dogs in the home during pregnancy were less likely to have asthma (OR: 0.80; 95% CL: 0.66, 0.97; I2: 43.1%). Conclusion: Maternal exposure to cats at home during pregnancy is not associated with asthma in children. In contrast, children born to mothers with dogs at home during pregnancy are less likely to develop asthma in childhood than those without maternal prenatal dog exposure. This study thus suggests that prenatal exposure to cats and dogs at home may be neutral or even beneficial to children's lung health. Pregnant women should not avoid having cats and dogs as pets.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 98
Presenter: Nataliia Hula
Supervisor: Davidge, Sandra
Title: The effect of prenatal hypoxia on coronary artery function of adult male and female offspring
Authors: Nataliia Hula, Ricky Liu, Floor Spaans, Mazhar Pasha, Anita Quon, Raven Kirschenman, Christy-Lynn Cooke, Sandra T. Davidge

Theme: Pregnancy and developmental trajectories

Introduction: Prenatal hypoxia is a common consequence of complicated pregnancies that leads to the development of cardiovascular (CV) dysfunction in the adult offspring. The coronary circulation is essential in maintaining cardiac function. Previous studies indicate that prenatally hypoxic offspring experience vasoconstrictor hyperactivity and an impaired endothelial function in the systemic circulation. An imbalance in the production and action of vasoconstrictor and vasodilator factors in the coronary circulation leads to coronary artery dysfunction, which may impair cardiac function. We hypothesized that prenatal hypoxia leads to an enhanced coronary artery constrictive capacity together with an impaired endothelium-dependent vasodilation in adult offspring. Methods: Pregnant Sprague-Dawley rats were exposed to normoxia (21% O2) or hypoxia (11% O2) on gestational days 15-21 (term=22 days). Offspring were aged to 4 and 9.5 months and left anterior descending coronary artery (n=7-11/group) function was assessed by wire myography. ET-1-mediated vasoconstriction, and endothelium-dependent (methylcholine; MCh) vasodilation were assessed in 4- and 9.5-month-old offspring. To assess the potential mechanisms for impaired endothelium-dependent vasodilation, in a subset of 9.5-month-old offspring, MCh-responses were assessed with inhibitors of nitric oxide (NO) synthase (L-NAME), prostaglandin H synthase ([PGHS]; meclofenamate), or endothelial-derived hyperpolarization (EDH) via small- and intermediate-conductance Ca2+-activated K+ channels inhibitors (apamin and TRAM-34). Data were analyzed by two-way ANOVA (Sidak's post-hoc test); $p<0.05$ was considered significant. Results: ET-1-mediated constriction was similar between the normoxia and prenatal hypoxia 4- months-old offspring. At 9.5 months of age, ET-1-responses were reduced in prenatally hypoxic females compared to the normoxic controls ($p<0.01$). Maximal vasodilation responses to MCh were decreased in 4-month-old prenatally hypoxia males ($p<0.05$) and tended to be decreased in prenatally hypoxic females ($p=0.054$), while at 9.5 months of age, male ($p<0.001$) and female ($p<0.05$) prenatal hypoxia offspring showed reduced coronary artery MCh-induced vasodilation compared to normoxia group. In 9.5-month-old normoxia and prenatal hypoxia males and females, L-NAME almost completely inhibited vasodilation to MCh ($p<0.0001$). In prenatally hypoxic males and females, meclofenamate increased vasodilation to MCh ($p<0.05$), while apamin and TRAM-34 decreased coronary artery sensitivity to MCh ($p<0.05$) in only the prenatally hypoxic females. Conclusions: Prenatal hypoxia reduced coronary artery ET-1 responses in only the 9.5-month-old females and induced endothelial dysfunction in both male and female offspring. In both sexes, coronary artery endothelium-dependent vasodilation was predominantly NO-mediated. However, the impaired vasodilation due to prenatal hypoxia appeared to be mediated via increased PGHS-mediated constriction. Moreover, in the prenatally hypoxic females, contribution of EDH to coronary artery vasodilation was also enhanced. Our data suggest that prenatal hypoxia impairs the vasodilator and vasoconstrictor capacity of coronary arteries in the offspring in a sex-specific manner.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 99
Presenter: Zoë Brody
Supervisor: Ross, Shelley
Title: Examining classification of chest pain symptoms in female and male patients during workplace-based clinical teaching in a family medicine residency program
Authors: Zoë Brody, Shelley Ross

Theme: Lifelong women's health

Introduction: Cardiovascular disease is the leading cause of death for female patients. However, long standing biases regarding the impact of cardiovascular disease on female patients continue to result in female chest pain being classified as 'atypical' at much higher rates than male chest pain. This classification often means delays in appropriate treatment, contributing to higher rates of disability, morbidity, and mortality for female patients presenting with chest pain. An important method to promote change in approach to female patients presenting with chest pain is through education of future physicians. Our objective in this study was to explore how family medicine clinical teachers (preceptors) talk about chest pain presentations that are seen in clinic. We examined brief narrative formative assessment forms (FieldNotes) completed by preceptors to identify how often preceptors h described chest pain as 'atypical', and to compare rates of 'atypical' chest pain designations between male and female patients. Methods: We used FieldNotes as a proxy for workplace-based clinical teaching discussions that happen during residency training. . Each FieldNote includes a brief description of the clinical encounter, as well as a narrative summary of the feedback shared with a resident. All FieldNotes are entered into an electronic portfolio, and are de-identified before use for program evaluation. We extracted data from all archived FieldNotes (July 2010 to June 2022) by using the following search terms: 'chest pain', 'heart', 'MI', 'STEMI', 'NSTEMI' and 'atypical'. All FieldNotes about chest pain were then analyzed to determine the sex of the patient and whether the chest pain was descibed as 'atypical'. Chi-square goodness of fit tested the assumption that the proportion of 'atypical' assignment was equal across sexes Results: A total of 64942 FieldNotes were included in this study. Of those FieldNotes, 677 (1.04%) included narratives about chest pain. In the extracted chest pain FieldNotes, 76 (11.2%) indicated that the symptoms were 'atypical'. . 'Atypical' classification varied by patient gender (male = 11; female = 32; unspecified = 33). A significant difference was found for female patients with 'atypical' chest pain ($X2 = 18.24$; $df = 2$; $p = 0.00011$). Conclusion: Narratives about chest pain seen in the clinic were more likely to describe chest pain symptoms as 'atypical' when describing female patients. This suggests that preceptors may not be applying more recent clinical practice guidelines that highlight differences between how men and women present with chest pain, and may not have changed their approach to female patients presenting with chest pain. This information highlights the need for effective communication and faculty development about approaches to female patients with chest pain that align with best clinical practice. In turn, this will lead to improvements in how family medicine residents are taught about chest pain in female patients. This will aid in deconstructing long standing biases about cardiovascular health in female patients and decrease care discrepancies between the sexes.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 100
Presenter: Nada Mohamed
Supervisor: Westover, Lindsey
Title: Using Convolutional Neural Networks and Surface Topography for Detection of Adolescent Idiopathic Scoliosis
Authors: Nada Mohamed, Mostafa Hassan, Qipei Mei, Lindsey Westover

Theme: Children's health and well-being

Introduction: An abnormal lateral curvature of the spine that can develop during the onset of puberty up until skeletal maturity is known as adolescent idiopathic scoliosis (AIS). AIS may cause back discomfort, breathing difficulties, and poor self-image. Additionally, worsening of the spinal curve is more prevalent in young females with AIS compared to males. The Cobb angle measured from radiographs is the primary outcome for diagnosing scoliosis. For mild curves, observation is usually sufficient, bracing is used for intermediate curves, and corrective surgery is recommended for severe curves. Children who are actively growing require frequent monitoring of the spinal curve. However, ionizing radiation exposure from x-ray assessments can increase a person's risk of developing cancer. In addition, posterior-anterior radiographs have a substantial level of inter- and intra-observer variability, can only capture the 2D curvature of the spine, and are not able to evaluate aesthetics. An alternative tool that does not have adverse side effects is the 3D markerless surface topography technique, which quantifies the severity of trunk asymmetry. The ST technique can potentially be used as a scoliosis screening tool. However, detecting AIS from typically developing individuals is essential before clinical implementation. Therefore, this study aims to distinguish AIS patients from healthy adolescents using asymmetries present in the torsos. Methods: Surface torso scans were available from patients with AIS (n=241) and healthy subjects (n=85). All participants were 10- to 18-year-olds. Participants with AIS were included for all curve types with curves between 10° - 45°. The analysis of the scans involved reflecting the torso's 3D geometry around the best plane of symmetry to highlight the external asymmetry in a deviation colour map image. Using the images as inputs, a convolution neural network (CNN) was developed to classify asymmetry patterns observed in healthy adolescents and those with AIS. The data was split into 60% training, 10% validation, and 30% test sets. The architecture of the CNN model consists of two convolutional layers with a rectified linear activation function. After each convolutional layer, a pooling layer is applied to decrease dimensionality and reduce the size of input parameters. Next, two fully connected linear layers were applied, followed by a 20% dropout layer to avoid overfitting. Finally, a sigmoid layer was applied. 400 epochs and a learning rate of 0.0001 were applied for training. Outputs are probability distribution with outcome bins 0 (i.e., Healthy) and 1 (i.e., AIS). Results: During the model training phase, the training and validation set obtained an accuracy of 89.8% and 87.1%, respectively. The accuracy is characterized as the number of subjects correctly classified to their target output (Healthy or AIS) by the CNN model. Additionally, the testing set's accuracy, sensitivity, and specificity were all 88.9%. The positive predictive value of the testing set was 97.9%. Likewise, a negative predictive value of 57.1% was obtained. Conclusion: To accurately distinguish AIS from healthy people, a CNN prediction model was created. Further work involves Increasing the dataset size to Improving generalization.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 101
Presenter: Maryam Adesunkanmi
Supervisor: Ospina, Maria
Title: Self-reported experiences of Racial Discrimination and Maternal, Perinatal and Neonatal Outcomes: A Systematic Review
Authors: Maryam Adesunkanmi1, Huda Al-Shamali2, Bukola Salami3, and Maria B. Ospina1 1Department of Obstetrics & Gynecology, University of Alberta 2Department of Psychiatry, University of Alberta 3Faculty of Nursing, University of Alberta

Theme: Pregnancy and developmental trajectories

Introduction: Several studies have assessed the link between maternal exposure to racial or ethnic discrimination and maternal, perinatal and neonatal outcomes. One of the most commonly accepted mechanisms by which this occurs is that racial discrimination acts as a psychosocial stressor that upon repeated exposure has detrimental effects on maternal and neonatal health. Maternal and infant health are strong indicators of population health and thus, it is essential to understand the pathways by which racial discrimination could adversely influence maternal and neonatal outcomes. This review aims to appraise existing studies that describe self-reported experiences of racial or ethnic discrimination and their association with a number of birth outcomes. Methods: This systematic review was conducted according to the PRISMA 2020 guidelines and the protocol was registered in the PROSPERO database (Protocol #312529). We performed comprehensive searches on multiple electronic databases from inception to November 2021. We included observational epidemiological studies including pregnant and previously pregnant women who had reported experiences of racial discrimination and at least one of the following outcomes: alterations in duration of gestation and fetal growth, hypertensive disorders of pregnancy, gestational diabetes, mode of delivery, postpartum depression, and NICU admissions. Study screening, selection, data extraction and risk of bias assessments were conducted independently by two reviewers with discrepancies being resolved through consensus. Random-effect meta-analysis were conducted for statistically homogeneous studies and reported using pooled odd ratios (pOR) and 95% confidence intervals (CI). Results: From 3,228 screened studies, 48 were included. The majority of studies were conducted in USA on adult non-Hispanic Black/African-American women. The most commonly examined outcomes were preterm birth, lowbirth weight, and postpartum depression (PPD). A meta-analysis of seven studies showed that maternal experiences of racial discrimination were associated with preterm birth (pOR 1.37; 95%CI 1.06, 1.76). Maternal racial discrimination was not significantly associated with low birth weight (pOR 1.49; 95% CI 0.99, 1.99). A total of 8 articles examined postpartum depression in new mothers. A meta-analysis of data from 3 studies revealed that PPD was higher in women who had reported more experiences of racial or ethnic discrimination (pOR 1.49; 95%CI 1.11, 2.00). The quality of the scientific literature evaluated largely leaned towards low to moderate risk of bias. Conclusion/Significance: Across multiple studies, significant relationships were observed between exposure to racial discrimination and the occurrence of preterm birth and PPD. These results indicate the need to explore systemic, organizational, community, and individual-level factors that lead to adverse pregnancy outcomes among racialized pregnant woman.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 102
Presenter: Irene Chen
Supervisor: Grimbly, Chelsey
Title: Hypertension in Children with X-Linked Hypophosphatemia
Authors: Irene Chen, Jennifer Ringrose, Todd Alexander, Chelsey Grimbly

Theme: Children's health and well-being

Introduction: X-linked hypophosphatemia (XLH) is the most common genetic cause of rickets and is caused by mutations in the PHEX gene. This leads to elevated FGF23, a hormone that causes renal phosphate wasting and impairs activation of vitamin D. Hypertension is a reported adverse outcome in children with XLH and has been associated with hyperparathyroidism and nephrocalcinosis, although reports have been inconsistent. In this study, we aim to explore the rates of hypertension in children with XLH comorbidities and treatment. Methods: This was a retrospective case review of pediatric patients with XLH from the Stollery Children's Hospital in Edmonton, Alberta, Canada. Diagnosis was based on biochemical results, genetic analysis and/or a positive family history. Hypertension was determined by age-based criteria published in the Fourth Report on the Diagnosis, Evaluation, and Treatment of High Blood Pressure in Children and Adolescents, which requires systolic or diastolic blood pressure (BP) measurements above the 95th percentile on three separate occasions. BP values, biochemistry, treatment dosing and renal ultrasounds from patients were obtained and descriptive statistical analyses were undertaken. Results: We evaluated 20 pediatric patients in this study (mean age 10.3 ± 4.6 years, 65% female). On average, the patient cohort exhibited elevated systolic BP (mean BP Z-score = +1.26, 90th percentile) and diastolic BP (mean BP Z-score = +0.56, 71st percentile). Of these patients, four (4/20, 20%) had prehypertension, seven (7/20, 35%) had stage 1 hypertension and 9 had normal BP for their systolic and diastolic measures. Systolic hypertension was more common than diastolic hypertension (10/11, 91%). There were no sex differences in average systolic BP Z-score or average diastolic BP Z-score. 11 patients had nephrocalcinosis which was not observed more frequently in patients with prehypertension or stage 1 hypertension. Four patients had persistent hyperparathyroidism and two had transient hyperparathyroidism, both of which were not observed more frequently in patients with prehypertension or stage 1 hypertension. Conclusion: Pediatric patients with XLH experience high rates of hypertension. Children with XLH should have recurrent BP monitoring and hypertensive patients should be referred for management. Next steps in this study include 24-hour BP monitoring to assess the persistence of hypertension outside of clinic visits.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 103
Presenter: Brianna Fehr
Supervisor: Parent, Eric
Title: Comparison of Spinal Alignment Among Standing Positions in Healthy Adolescents or Adolescents with Idiopathic Scoliosis: A Systematic Review
Authors: Brianna Fehr, Eric Parent, Annika Visser

Theme: Children's health and well-being

Introduction: Adolescent Idiopathic Scoliosis (AIS) is a 3D structural spinal disorder with a lateral curve >10o. AIS is assessed using repeated x-rays during growth. New stereo-radiography systems take frontal and lateral images simultaneously, requiring the arms to be elevated to see the vertebrae laterally. This affects sagittal angles. Imaging positions vary between centres. This study aimed to systematically review literature of the effect of arm positions used during radiography on spinal parameters in adolescents with AIS and healthy spines. Methods: This review was registered in PROSPERO (CRD42022347494). Studies included assessed healthy participants ≥ 10 years old and AIS between 10 and 18 years old with Cobb angles > 10o and compared arm positions in standing. Databases searched from inception to June, 2022 included CINAHL (EBSCO), EMBASE (OVID), MEDLINE (OVID), and WEB OF SCIENCE. The selection of population, imaging methods, measurements and positioning search terms was informed by a scoliosis expert, MSc student, and a librarian. Two reviewers screened titles & abstracts and then full-text articles and conflicts were resolved by a third reviewer. The effect of different arm positions on spinal alignment measurements were extracted. Quality was analyzed using the appraisal tool for Cross-Sectional Studies (AXIS). Meta-analysis was done if 2+ studies reported similar measurements and positions. Summary statements were formulated for other results. Results: We screened 1332 abstracts and 33 full-text and extracted data from 7 studies. The most common positions were habitual standing, fists on clavicle, and active (arms raised unsupported). Kyphosis, lordosis, and sagittal vertical axis (SVA) were most commonly measured. From meta-analysis, limited evidence from 3 low quality studies for a medium to large effect size of 0.78 [0.48,1.09] where kyphosis was smaller, and -1.23 [-1.55, -0.90] where lordosis was larger in the clavicle position compared to standing. Strong evidence from 2 high and 1 low quality studies show a small effect size of 0.06 [-0.32, 0.21] where lordosis is larger in the clavicle position compared to active. Strong evidence from 2 high and 1 low quality study show a small effect size of 0.03 [-0.38, 0.45] where kyphosis is larger in the clavicle position compared to active. Limited evidence from 2 moderate and 1 low quality study showed a posterior SVA shift by 31 [24, 37]mm in the clavicle vs standing position. Moderate evidence from 1 high and 2 low quality studies showed SVA shifts posteriorly by -2 [-3.4,-0.6]mm in active compared to standing. Qualitative review found limited evidence from 1 high or moderate quality study of no difference in curve angle or vertebral rotation between hands on wall and clavicle positions, and smaller T5/T12 kyphosis in the wall compared to the clavicle position. Further, a single study compared kyphosis, lordosis, or SVA for 8 pairs of other positions. Conclusion: Moderate evidence showed that elevated arm positions modify sagittal measurements compared to habitual standing. Most studies did not report on all relevant parameters. While clavicle is most used, it is unclear which position represents habitual standing. Research gaps and heterogeneity justify more research.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 104
Presenter: Xiaoying Wu
Supervisor: Vine, Donna
Title: Detecting Early Atherosclerotic Cardiovascular Disease in High-Risk Women with and without Polycystic Ovary Syndrome
Authors: Wu X, Wilke M, Ghosh M, Raggi P, Becher H, Vine D

Theme: Lifelong women's health

Introduction: Polycystic ovary syndrome (PCOS) is a common reproductive-endocrine disorder that affects 8-13% of women. Dyslipidemia, obesity and insulin resistance are common in PCOS. PCOS is associated with a greater risk of early and end-stage cardiovascular disease (CVD), independent of obesity, however assessment of early atherosclerotic CVD and cardiac function is limited. Our previous study demonstrated young women with PCOS have an exacerbated atherogenic lipid profile with increased plasma triglycerides (TG), apolipoprotein-B (apoB48 and apoB100) in both the fasting and non-fasting state, compared to obese non-PCOS women. The objective of this study was to assess atherogenic dyslipidemia in the fasting and non-fasting state, and the relationship with early atherosclerotic CVD (ACVD) and cardiac function in high-risk women with and without PCOS, and healthy-weight controls. Methods: A case-control study was conducted using the following inclusion criteria; High-risk PCOS and controls: a diagnosis of PCOS (using AEPCOS criteria), BMI≥25 kg/m2; Healthy-weight controls: BMI 18.5-24.9kg/m2. Participants (n=77) age 18-45yrs were recruited and then categorized into PCOS (n=48), BMI-matched control (n=19), or Healthy-weight control (n=10). Fasting (>12hrs) and non-fasting (post-prandial 2-6hrs) plasma lipids and apo-lipoprotein (apo)B (apoB48 and apoB100) were determined using calorimetry and western blot methods. Standard 2D and 3D ultrasound speckled echocardiography was used to determine early ACVD (carotid plaque and intimal medial thickness) and cardiac function. Results: PCOS and BMI-matched controls had higher fasted non-HDL-c (38-42%), TG (48-59%), remnant cholesterol (44-55%), apoB48 (24-43%) compared to healthy-weight controls. PCOS had higher fasting TG (21%), non-fasting TG (31%) and remnant cholesterol (20%) compared to BMI-matched controls. PCOS (0.49±0.008mm) and BMI-matched control (0.51±0.014mm) had higher cIMT compared to healthy-weight controls (0.42±0.005mm). The incidence of carotid plaque was 4-fold higher and 7-fold higher in PCOS compared to BMI-matched and healthy-weight controls, respectively. There was no difference in cardiac function between groups, however PCOS and BMI-matched controls had lower mitral E/A ratio with decreasing trends of deceleration time compared to healthy-weight controls. Conclusion: Our results showed that high-risk women with and without PCOS have an atherogenic lipid profile inclusive of TG, cholesterol remnants and apoB48-lipoproteins, and early ACVD and this is exacerbated in PCOS compared to the BMI-matched controls. Our findings support the need for more research on the pathophysiology of ACVD in PCOS and recommendations for early atherogenic apoB-dyslipidemia and ACVD screening in high-risk women, particularly in those with PCOS.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 106
Presenter: Wendy Duan
Supervisor: Riddell, Meghan
Title: Development of an in vitro explant model for syncytiotrophoblast regeneration in first trimester human placentas
Authors: Wendy Duan, Sumaiyah Shaha, Meghan Riddell

Theme: Pregnancy and developmental trajectories

Introduction: The placenta is a temporary organ that develops during pregnancy to support fetal development. The syncytiotrophoblast (ST) is a multinucleated cell layer that covers the maternal-fetal interface. This cell performs barrier and immune functions, mediates nutrient and waste exchange, and secretes hormones like human chorionic gonadotropin (hCG). Unlike other epithelial layers, the ST must be maintained through continuous fusion of underlying proliferative progenitor cytotrophoblasts (vCT). Poor fusion leading to ST dysfunction is a feature of pregnancy complications like preeclampsia and intrauterine growth restriction. It is appreciated that these conditions start developing in the first trimester, but few studies have examined the mechanisms governing first trimester vCT differentiation. Multiple methods for the removal and spontaneous regeneration of the ST layer in term explants exist to study term vCT to ST differentiation. Therefore, our goal was to optimize a ST regeneration model for use with first trimester tissue. Methods: First trimester human placental tissues of gestational age nine to twelve weeks were cut into approximately 2mm3 explants. Explants were digested with 0.25% trypsin-EDTA for seven minutes and then cultured in medium (IMDM, 5% heat-inactivated FBS, 50µg/mL gentamicin, 1X ITS-X supplement) either at the liquid-gas interface or as floating explant culture. Cultured explants were fixed at 24h, 48h, 72h, 96h and stained with anti-E-cadherin antibody (vCT marker), phalloidin (F-actin marker), and Hoechst (nuclei marker), to identify the vCT and ST using immunofluorescence (IF). The proportion of vCT with apically localized ST, identified by nuclei and F-actin staining above E-cadherin positive vCT, was quantified using Volocity Imaging software and analyzed using unpaired student's t-test (n=3). Results: Multinucleated ST structures above E-cadherin positive vCT were 96.5% removed after 7 minutes of trypsinization and 24h in culture medium. Explants cultured in floating explant culture showed a mean 50.4% ST structure recovery above CT nuclei at 72h post-trypsinization. Comparatively, explants cultured at the liquid-air interface showed a mean 93.4% ST structure loss after 24h and a mean 49.1% ST structure recovery at 72h. Additionally, high numbers of cells in the stroma displayed highly condensed or apoptotic nuclei in explants cultured at the liquid-gas interface. Conclusion: Our data shows that the ST can be stripped from first trimester explants 24h post-trypsinization and can regenerate within 72h post-trypsinization, optimally using floating explant culture. Explants cultured at the liquid-gas interface were generally more unhealthy, evidenced by more apoptotic nuclei, less consistent ST regeneration, and less metabolic activity compared to those cultured in floating culture. Future directions are to assess functional differentiation via hCG secretion in this model and to identify the efficacy of siRNA knockdown on this model. Our current model will serve as an additional method to observe vCT differentiation in first trimester tissue and help identify mechanisms by which fusion occurs, thereby contributing to studies concerning aberrant ST differentiation and dysfunction.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 107
Presenter: Ricardo Suarez
Supervisor: Wine, Eytan
Title: Utility of Machine Learning for Targeting Serum Metabolites Associated with Pediatric Crohn Disease
Authors: Ricardo Suarez, Ganesh Tata, Namitha Guruprasad, Stephanie Dijk, Zhengxiao Zhang, Gili Focht, Víctor Navas-López, Sibylle Koletzko, Anne M Griffiths, David Wishart, Russell Greiner, Dan Turner, Eytan Wine

Theme: Children's health and well-being

Introduction: The pathogenesis of pediatric Crohn Disease pCD remains poorly understood, but evidence suggests roles for genetics, environment, immune response, and gut microbes. Microbial changes can contribute to chronic inflammation and correlate with disease severity. Metabolomics reflects interactions between host immune and gut microbial function by quantifying compounds in biological samples. Therefore, metabolomics provides a unique opportunity to gain insight into pCD pathogenesis. Methods: ImageKids is a multicenter, prospective, cohort observational study, conducted to develop magnetic resonance enterography (MRE) indices for pCD. Paired serum specimens were collected at study initiation (Visit One; V1) and completion (Visit Four; V4; 18 months) for 120 pCD patients. Serum from patients with representative clinical scenarios and paired samples was analyzed at The Metabolomics Innovation Centre (TMIC; University of Alberta) and 130 metabolites were identified. Metabolites were analyzed via Supervised Machine Learning (S.ML) algorithms based on Scikit-learn library in Python. Classifiers were trained to assess explicit importance of metabolites. Results: Results were available for the 56 paired samples. After training different classifiers with S.ML algorithms, metabolites were correlated with disease severity (defined by C-reactive protein, fecal calprotectin, and PICMI score). Tryptophan, Histidine, Lysine, and Tyrosine were the top four compounds associated with disease severity. The accuracy of our classification models was of 80% with false negative rates of 27%. Conclusions: Metabolomic analysis allow relative quantification of the significant functional influence of biomarkers in disease. The application of U.ML classifiers with metabolite data might help predict disease severity among pCD patients. The correlation between metabolomics and disease severity might allow a better understanding of changes in host-microbe interactions and introduce new diagnostic or therapeutic options.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 108
Presenter: Zhiyao Ma
Supervisor: Adesida, Adetola
Title: Simulated Microgravity Reveal Sex-Specific Molecular Responses of Relevance to Knee Osteoarthritis in Human Meniscus Models
Authors: Zhiyao Ma, David Li, Ryan Chee, Melanie Kunze, Aillette Mulet-Sierra, Lindsey Westover, Adetola Adesida

Theme: Pregnancy and developmental trajectories

Introduction: Osteoarthritis primarily affects mechanical load-bearing joints, with the knee being the most common. The erosion of articular cartilage of the knee remains a defining feature of knee osteoarthritis (KOA), leading to loss of mobility and function. However, all tissues of the knee are affected and contribute to the pathophysiology of the disease, including the meniscus, the primary load-bearing tissue of the knee. The prevalence and severity of KOA are disproportionately higher in females. Sex hormones are known to regulate articular cartilage, bone development, and homeostasis in a sex-dependent manner. However, sex hormones alone do not fully account for the disproportionate incidence of KOA. The molecular basis of sex matters in the burden of KOA is unknown. But the cellular and molecular characteristics of KOA resemble articular chondrocytes' (articular cartilage's cells) hypertrophy before endochondral ossification during skeletal development. The characteristics include proliferation, induction of hypertrophy markers (matrix metalloproteinase-13 (MMP-13), and type X collagen (COL10A1). Mechanical loading influences the development and maintenance of articular cartilage. Specifically, intermittent hydrostatic pressure is thought to maintain articular cartilage and prolonged mechanical unloading encourages cartilage destruction and endochondral ossification. The effects of mechanical loading and unloading on articular cartilage have been studied by cyclic hydrostatic pressure and simulated microgravity (SMG), respectively. In our previous study, SMG induced MMP13 and COL10A1 in models of human menisci. However, biological sex was not explored as a variable. The objective of this study is to determine molecular responses of meniscus models from females and males to SMG. Methods: Meniscus fibrochondrocytes (MFCs) were isolated from male and female menisci. MFCs were seeded on collagen-based scaffolds. The resulting meniscus models were precultured for two weeks before another three weeks of culture under normal gravity or SMG. RNA sequencing analyses were performed at the end of the five weeks. Results: SMG induced COL10A1 expression at a significantly higher magnitude in female-derived meniscus models. Tissue level assessment validated the higher expression of type X collagen and the reduction of chondrogenesis by SMG. RNA sequencing, along with gene ontology analysis, revealed that osteoarthritis-associated biological processes, such as ossification and angiogenesis, were only enriched in female-derived meniscus models by SMG. Surfaceome analysis revealed potential markers to predict the propensity of knee osteoarthritis development. Conclusions: SMG induced osteoarthritic-like molecular profiles in human meniscus models but to a higher extent in female-derived models.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 109
Presenter: Amber Hager
Supervisor: Mager, Diana
Title: Sarcopenia in children post liver Transplant: development of a home-based exercise program to suppoRt muscle strenNGth and function (S.T.R.O.N.G TRIAL)
Authors: Hager A, Zafrani R, Guo Y, Boule N, Vera M, Gilmour S, Mager D

Theme: Children's health and well-being

Introduction Sarcopenia is characterized by deficits in muscle strength, skeletal muscle mass (SMM), and physical performance in children up to 10 years after liver transplantation. This has been associated with reduced growth, increased risk for infection and rehospitalization after LTx. There is evidence that resistance exercise (RE) training can combat sarcopenia by exerting positive influences on muscle tissue regeneration/synthesis. The study objective was to develop a 12-week home-based exercise program using video-based technology to treat sarcopenia and optimize health related quality of life (HRQOL). Methods Children (6-18 years) were recruited from the Pediatric Liver Transplant Program at the Stollery Children's Hospital. Primary outcome variables include changes SMM measured by Magnetic Resonance Imaging (MRI), strength (hand-grip (HG), sit-to-stand (STS), push-up (PU)) and muscle functionality (stair climb test (SC), 6-minute walk test(6MWT)). Other secondary outcomes include anthropometrics (height, weight, bmi, skinfolds), biochemical data, physical activity (FitBit), dietary intake, HRQOL (PeLTQL), Fatigue (Peds QL Multi-dimensional fatigue scale), and parent/participant exercise enjoyment and engagement (PPPAICAQ / PACES). The RE program consisted of a warm-up/cool down and exercises targeting five muscle groups (legs, chest, back, shoulders, and arms). Participants performed the progressive intensity RE program for 12 weeks, 3 days per week. The training sessions lasted approximately 20-30 minutes. Participants were followed weekly with telephone calls/zoom meetings. Data was analyzed using SAS 9.4 software. Statistical significance was determined at $p<0.05$. Results Five children post-LTx (2M/3F, 12.5 ± 3.1 yrs) and nine healthy controls [HC] (4M/5F, 13.0 ± 4.1 yrs) were recruited. No differences were noted between groups for age ($p=0.90$) or sex ($p=0.85$). Age at LTx was 2.3 ± 3.5 yrs. Liver disease diagnosis includes biliary atresia (N=4; 80%) and PFIC (N=1; 20%). Three participants (n=2 LTx; n=1 HC) have completed the study (both baseline and follow up visits) and 11 (n=3 Ltx; n=8 HC) have only completed baseline visits. At baseline, no differences between LTx and HC for SMMi were observed ($p=0.41$). LTx children had significantly shorter 6MWT distance (483±51m vs. 560±38m; $p=0.03$) with 75% of LTx children -2SD below mean of normative 6MWT distance data. However, no significant differences for other muscle function or strength tests [SC ($p=0.29$), PU ($p=0.29$), HG ($p=0.63$) STS ($p=0.26$)], body composition measurements [BIA %FFM ($p=0.82$) BIA %FM ($p=0.82$); Skinfold %FFM ($p=0.92$) Skinfold %FM ($p=0.92$)] or questionnaires [PACES total score ($p=0.49$), PPPAICAQ score ($p=0.11$), PedsQL Fatigue ($p=0.14$)] was observed. Conclusion Preliminary data shows no differences in body composition at baseline in LTx children compared to controls despite shorter 6MWT distance. Ongoing recruitment and completion of 12-week final visits will provide insight into the effect of this 12-week RE program on SMM, function, and HRQOL in this post LTx-population.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 110
Presenter: Dania Al-Rimawi
Supervisor: Dyck, Jason
Title: Pharmacological Inhibition of ROMO1 Attenuates Breast and Cervical Cancer Cell Proliferation
Authors: Dania Al-Rimawi, Imane Elmellouki, Matthew D. Martens, Seyed Amirhossein Tabatabaei Dakhili, John R. Ussher, Jason R.B. Dyck.

Theme: Lifelong women's health

Introduction: In Canada, more than 80 women/day are diagnosed with either breast or cervical cancer. Despite our best therapeutic interventions, it is estimated that these cancers are responsible for 16 female deaths per day in Canada. Such high mortality rates suggest a pressing need for more effective chemotherapeutic options for the treatment of women with either breast or cervical cancer. Recent work in other cancer subtypes has suggested that a mitochondrial protein, Reactive Oxygen Species Modulator 1 (ROMO1), activates the nuclear factor-kB (NF-kB) pathway to promote cancer cell proliferation. Based on this, we hypothesized that inhibition of ROMO1 would be an effective anti-tumor agent in breast and/or cervical cancers and that reduced ROMO1 activity would also lessen NF-kB activation. To test this, we developed a novel compound, Rxi1, to pharmacologically inhibit ROMO1 and investigated the ability of Rxi1 to inhibit cancer cell proliferation. In addition, the activation of NF-kB in the presence and absence of high ROMO1 activity was also investigated as a potential mechanism by which ROMO1 can regulate cancer cell proliferation. Methods: Human breast and cervical cancer cell lines were cultured and subsequently treated with either vehicle or Rxi1 (6.25µM). After 24-hour treatment, cellular metabolic activity, which is positively correlated with proliferation, was quantified using colorimetric MTT assays. Given that estrogen is a driver of breast cancer proliferation, we also tested the efficacy of Rxi1 treatment following 10-11M estradiol supplementation, and assessed proliferation via MTT assays. To measure the effect of ROMO1 expression on NF-kB activation, breast cancer cells were transfected with scramble control or ROMO1 targeted siRNA to knockdown ROMO1 levels. After 24 hours, cells were collected and a fractionation was performed. Samples were then subjected to western blot analysis. Statistical analysis was performed using t-test or one-way ANOVA, where appropriate. Results: Breast and cervical cancer cells treated with Rxi1 exhibited a 35.7% (n=3) and 53.4% (n=5) decrease in proliferation, respectively, compared to vehicle-treated control cells. At the same time, breast cancer cells that were treated with estradiol demonstrated a more than 18% increase in proliferation compared to vehicle treated control cells. However, Rxi1 treatment prevented this estradiol-induced increase, resulting in a 50.3% decrease in proliferation compared to cells treated with the estrogen alone (n=3). Consistent with our hypothesis, western blot analysis showed that NF-kB nuclear localization, an indicator of protein activation, was reduced in breast cancer cells transfected with the ROMO1 siRNA, compared to scrambled control. Conclusion: Our data show that pharmacological inhibition of ROMO1 effectively decreases breast and cervical cancer cell proliferation in culture. Furthermore, our data suggest that ROMO1 expression in breast cancer cells may be correlated with increased NF-kB nuclear localization, thereby providing a basis for further investigation into the specific mechanism by which ROMO1 influences cancer cell proliferation. Together, this work could lead to improved clinical outcomes for women with breast or cervical cancer.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 112
Presenter: Aneri Patel
Supervisor: Meherali, Salima
Title: Environmental Scan of Mobile Apps for Promoting Sexual and Reproductive Health of Adolescents in Low- and Middle-Income Countries
Authors: Aneri Patel, Samantha Louie-Poon, Samar Kauser, Zohra Lassi, Salima Meherali

Theme: Children's health and well-being

Introduction: Adolescence (ages 10-19) is a period of emotional, mental, and physical change. To increase health seeking behaviour, reduce risky sexual behaviour, and improve sexual and reproductive health (SRH) knowledge, adolescents require support and access to SRH services. Providing comprehensive and evidence-informed SRH knowledge to adolescents in low- and middle-income countries (LMICs) can be a challenge as many face unique barriers such as lack of confidentiality, fear of refusal, and stigma from cultural norms. Mhealth interventions, specifically mobile apps, are in a unique position to resolve these issues as they can provide information in an accessible, cost-effective, and discreet manner to adolescents. Currently, the increasing availability of mobile apps necessitates a comprehensive evaluation in order to evaluate whether accurate and evidence-based information is reaching adolescents. Failure to provide quality SRH services can have damaging effects throughout their development. Objective: Provide an overview of current adolescent SRH mobile applications targeting adolescents in LMICs by evaluating their quality and classifying their characteristics. Methods: An environmental scan (ES) conducted to identify current SRH mobile applications (hereinafter referred to as "apps"). 21 search terms related to adolescent SRH mobile apps were created and searched in the Apple IOS store and Google Play stores using a custom Python-3 based software. Apps extracted from the search were screened against inclusion and exclusion criteria. Resulting app characteristics were classified and app quality was assessed using the Mobile App Rating Scale (MARS) tool. Data extracted from the MARS was used to rank order each app and identify any gaps in quality. Results: Search strategy yielded 2165 mobile apps. Screening resulted in only 8 apps. The MARS showed that in all 8 apps, Functionality subdomain scored highest at 4.6, while Information scored lowest at 2.5. None of the assessed apps contained information on the MARS items: Evidence-base and Goals. Too Shy to Ask had the highest individual app mean score of 4.1, while e-SRHR scored lowest at 2.3. Conclusions: The goal of this study is to evaluate the effectiveness and usability of mobile apps designed to promote adolescent SRH behaviours and knowledge in LMICs. Numerous apps were reviewed and all of them failed to provide evidence-based and goal oriented SRH information. Strengths include ease of use, navigation, and gestural designs. Weaknesses include evidence base, goals, willingness to pay, customisation, and interactivity. These findings can be used to guide future app development and educate decision makers responsible for policy changes so that adolescent SRH outcomes can be improved.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 113
Presenter: Kehan Li
Supervisor: Zheng, Yao
Title: The Daily Diary Version of the Screen for Child Anxiety Related Emotional Disorders (SCARED): Multilevel Structure and Psychometric Characteristics
Authors: Kehan Li, B.S., Eric M. Cooke, Ph.D., and Yao Zheng, Ph.D.

Theme: Children's health and well-being

Introduction: Anxiety related disorders are prevalent among youth and adults, which adversely affect people's psychosocial functioning, and show high comorbidity with other psychiatric disorders. In place of time-consuming structured interviews, numerous self-report scales have been developed to assess anxiety disorders as well as subclinical symptoms more efficiently. Among them, the Screen for Child Anxiety Related Emotional Disorders (SCARED) scale demonstrates sound reliability and validity across cultures in both youth and adult samples, but only in cross-sectional and conventional longitudinal designs. A growing body of research has begun to measure various psychiatric symptoms in daily life using diary or ecological momentary designs. However, scant research has examined the multilevel structure and psychometric properties of the SCARED scale in intensive longitudinal designs. Methods: Based on their potential to demonstrate substantial day-to-day within-person variation, 8 items from the generalized anxiety disorder (GAD), social phobia (SP), and panic disorder (PD) dimensions assessed in the original SCARED scale were selected into the current modified scale. This study aims to investigate the multilevel structure and psychometric properties of this 8-item SCARED scale in a sample of racially/ethnically diverse freshmen (N = 313, Mage = 18.13 years, 72% female, 69.3% non-White) measured daily consecutively over a month. Depressive symptoms, stress, emotional, and peer problems were included as external validity variables at both between- and within-person levels. Results: Multi-level factor analyses supported a 3-factor between and 2-factor within structure of anxiety symptoms, where the GAD and PD factors were combined into a generalized/somatic/panic (GSP) factor at the within-person level. The GAD, SP, and PD symptoms were positively correlated with all the maladjusted outcomes at the between-person level. At the within-person level, people with higher than their average levels of SP symptoms one day tended to have higher than their average levels of emotional problems the next day. People with higher than their average levels of peer problems one day tended to report higher than their average levels of GSP symptoms the next day. Moreover, SP and GSP symptoms reciprocally and positively reinforced each other across days, and so did SP symptoms and stress. In contrast, people with higher than their average levels of GAD symptoms one day unexpectedly tended to have lower than their average levels of stress and emotional problems the next day, whereas people with higher than their average levels of stress and emotional problems one day tended to have higher than their average levels of GAD symptoms the next day. Conclusion: Findings suggest that the daily diary version of the SCARED scale is a reliable and valid assessment, which could be helpful for future studies to assess anxiety symptoms in intensive longitudinal designs efficiently. Findings also indicate the need to differentiate the distinct dimensional structures of anxiety symptoms at the between- and within-person level, when conducting intensive longitudinal studies to examine anxiety symptoms' dynamic link to people's mental well-being.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 118
Presenter: Megan MacNeil
Supervisor: Storey, Kate
Title: A comprehensive school health approach to sleep in children: Understanding priorities and translation to home
Authors: Megan MacNeil, Genevieve Montemurro, Kate Storey

Theme: Children's health and well-being

Research Question: Children who sleep well benefit from positive physical, mental and social health. Not getting enough sleep leads to poorer overall health and well-being. Despite this, many children are not getting sleep, and when children are not sleeping well, parents are at a greater risk of poorer mental and physical health status. One way to support children in learning about the importance of restorative sleep is through school-based health promotion interventions. Within the internationally recognized Comprehensive School Health (CSH) model, children's well-being is prioritized along with educational outcomes. CSH is an equitable model to address health as it reaches nearly all children during critical development and encompasses school, home, and community partners. We have researched student and teacher perceptions of sleep. However, there is a lack of understanding of the perspectives of parents and clinicians - two critical CSH partners. This project aims to engage CSH partners to understand barriers to translating sleep education to home. The objectives are 1) to examine parents' perceptions related to sleep, where they seek to support, and their perceived barriers, 2) to examine how clinicians perceive their role in promoting sleep, and 3) to engage CSH partners to establish research priorities and knowledge needs. Planned Methodology: This qualitative study is guided by interpretive description (ID) methodology. Objective 1: Data will be generated through semi-structured interviews with 25 health care providers to understand their perception of educating families on sleep. Objective 2: Data will be collected through semi-structured interviews with parents of school-aged children to understand when and how they seek out information related to child sleep and what barriers they face. Participants will be recruited through partnerships with Alberta Health Services, the Stollery Children's Hospital, and school-based partnerships. Interview data will be analyzed using an inductive descriptive thematic approach. Objective 3: We will conduct a priority-setting partnership activity with a committee of CSH partners, including children and parents, to identify and prioritize the most critical unanswered questions. Partners will participate in meetings, surveys, and prioritization activities. This will result in a consensus-building activity to identify the top priorities to inform and establish critical recommendations to strengthen educational sleep initiatives. Significance of Research: Children need parents, teachers, and clinicians to help them learn healthy behaviours around sleep, and this research will help address this. Poor sleep is a growing concern, and the impacts on children's health are broad. This study will be the first to bring together partners from a CSH model to identify facilitators and barriers to supporting children's sleep and set meaningful research priorities to inform future health promotion activities.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 119
Presenter: Lamia Khan
Supervisor: Osman, Mohammed
Title: Impaired DNA repair mechanism promote the progression of systemic sclerosis by novel FOXO1-dependent mechanism in women
Authors: Lamia Khan, Muhammad Elezzabi, Desiree Redmond, Jan Willem Cohen Tervaert, Mohammed Osman

Theme: Lifelong women's health

Introduction: Systemic sclerosis (SSc) is a deadly, incurable disease characterized by immune dysregulation, vasculopathy and fibrosis. Among all rheumatic diseases, it is associated with a 40 % risk of mortality and there is no effective cure. Hence, it is an area of high unmet clinical need. SSc most commonly affects women, however the reason is unknown. The primary cells promoting fibrosis in SSc are human dermal fibroblasts (HDFs) which develop a myofibroblast phenotype associated with increased resistance to apoptosis. We recently showed that HDFs from patients with SSc have increased genomic instability associated with persistent signals γ-H2AX which is associated with double-stranded DNA breaks (DSB). In cancer, dysregulated DNA damage and repair mechanisms (DDR/R) are associated with the activation of the transcription factor forkhead box transcription factor (FOXO). As a result, I hypothesized that HDFs with increased DSBs from women with SSc have increased apoptosis resistance promoted by FOXO1-dependent signals. Methods: Using 4 mm skin biopsies obtained 5 cm from the ulnar styloid, primary human dermal fibroblasts (HDF) was generated from healthy volunteers (HC), pre-fibrotic female patients with early limited SSc patients (elSSc) and female patients with early diffuse severe scleroderma (edSSc). DDR/R activation was determined via immunoblot (IB) detection of γ-H2AX (a DNA damage sensor). Nuclear FOXO1 activation was detected by immunofluorescence microscope (IF) using low passage (< P5) in vitro cultured HDFs from each group. Pro-fibrotic signals (e.g. fibronectin) were determined in edSSc in the presence or absence of a FOXO1 inhibitor. In addition, HDFs from HC were treated with the DNA damage inducing agent etoposide then nuclear FOXO1, and myofibroblast marker were quantified using IB and qRT-PCR. Results: We found that female patients with aggressive edSSc have the highest levels of γ-H2AX compared to HC and elSSc patients. edSSc HDFs also had a substantial nuclear accumulation of FOXO1. This was associated with increased mRNA expression of the known FOXO1 target, pyruvate dehydrogenase kinase 4 (PDK4). FOXO1 inhibition of edSSc HDFs resulted in decreased levels of fibronectin. Intriguingly, etoposide treatment of HDFs from healthy volunteers also resulted in FOXO1 activation with associated increased expression of the myofibroblast marker alpha-smooth muscle actin. Conclusion: Female patients with severe rapidly progressive scleroderma have the highest levels of spontaneous DNA damage. This was associated with activation of FOXO1 and downstream pro-fibrotic signals in a FOXO1-dependent manner. Future studies assessing a role for DNA damage signals and FOXO1 in promoting fibrotic signals and resistance to apoptosis may reveal a novel mechanism that preferentially affects patients with severe SSc. Together, our novel findings may lead to the development of novel therapeutic strategies for patients with SSc which may improve patient outcomes.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 120
Presenter: Tejal Aslesh
Supervisor: Yokota, Toshifumi
Title: Rescue of a severe mouse model for spinal muscular atrophy using DG9-PMO, a novel peptide-conjugated antisense morpholino oligomer that crosses the blood-brain barrier
Authors: Tejal Aslesh, Rika Maruyama, Esra Erkut, Toshifumi Yokota

Theme: Children's health and well-being

Introduction: Spinal muscular atrophy (SMA), the most frequent genetic cause of infant mortality, is caused by the deletion of the survival of motor neuron 1 (SMN1) gene. Humans have a paralogous gene SMN2 that produces the same SMN protein; however, only ~10% of functional SMN protein is produced from SMN2 as ~90% of SMN2 transcripts lack exon 7 due to splicing of this essential exon. Synthetic DNA-like molecules called antisense oligonucleotides (ASOs) are promising agents for the treatment of SMA. Spinraza, the first approved drug for SMA, is an ASO that binds to an intronic splicing silencer region in SMN2 transcripts and restores the production of full-length SMN2 by splicing modulation. Significant problems persist with Spinraza treatment, including injection-site adverse effects and repeated invasive intrathecal injections. More importantly, recent findings revealed that SMA is a multi-organ disorder affecting the heart, liver, thymus, and spleen; however, Spinraza is injected intrathecally to avoid renal toxicity and therefore can treat only motor neurons. As such, a compound providing effective yet safe delivery of ASOs to the central nervous system (CNS) and body-wide organs is needed to prevent SMA-related morbidity and death. Here, we tested our hypothesis that a novel peptide-conjugated antisense morpholino oligomer DG9-PMO is safe and improves the efficacy of the ASO treatment by crossing the blood-brain barrier in a mouse model of SMA. Methods: To improve the uptake of ASOs in vivo, a novel cell-penetrating peptide called DG9 was identified from screening in zebrafish. With a 10-to-100-fold efficiency in cellular uptake compared to other peptides, DG9 was conjugated to a safe ASO called phosphorodiamidate morpholino oligomer (PMO) targeting SMN2. We subcutaneously injected SMA mice with DG9-PMO on postnatal day 0 (PD0). SMN2 expression was evaluated using quantitative PCR and Western blots. We assessed the functional improvement with tests such as rotarod, forelimb grip strength, and righting reflex. To examine the superiority of the peptide in blood-brain barrier (BBB) penetration, mice were injected with fluorescently tagged DG9-PMO at PD5 when the BBB is highly developed. We performed urine and serum analyses at PD30 to examine the toxicity. Results: A single administration of DG9-PMO increased median survival to 58 days (d) compared to 8d for non-treated (NT) and 14d for naked PMO-treated mice. DG9-PMO-treated mice exhibited up to 10-fold and a 5-fold higher expression of full-length SMN2 transcripts compared to non-treated control and unmodified PMO treatments, respectively in the CNS and body-wide tissues. These mice showed significantly increased body weights and improved motor function, accompanied by increased muscle fibre size and innervation at the neuromuscular junction. No apparent toxicity was observed. We also observed the localization of DG9 peptide in the brain and spinal cord when administered even after injection at PD5. Conclusion: DG9-PMO is a promising therapeutic option to treat SMA, overcoming the necessity for invasive injections with a single peripheral administration and treating body-wide tissues without apparent toxicity.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 121
Presenter: Jonathon Osborne
Supervisor: Hornberger, Lisa
Title: Fetal nuchal translucency and chylothorax risk after palliation for single-ventricle congenital heart disease
Authors: Osborne, Jonathon; Eckersley, Luke; McBrien, Angela; Hornberger, Lisa

Theme: Children's health and well-being

Introduction Nuchal translucency (NT) is a subcutaneous fluid collection behind the neck of a fetus, measured in the first trimester on obstetrical ultrasound (US). Increased NT is thought to relate to lymphatic pathology, and is often found in fetuses with genetic conditions that have a high risk for lymphovascular disease postnatally (Linglart and Gelb, 2021). One such genetic disorder associated with increased NT, Noonan Syndrome (NS), has a 10% risk of chylothorax after open-heart surgery (Hemmati et al, 2019) compared to 1-7% in non-syndromic congenital heart disease (CHD) patients (Shakoor et al, 2021). Increased NT, however, can also be seen in non-syndromic CHD. Post-operative chylothorax common with single ventricle (SV) palliation is associated with increased hospital length of stay, cost of hospitalization, and in-hospital mortality (Burke and Datar, 2018). The aim of this endeavour is to determine if increased NT on obstetrical US at 11-14 weeks gestation is associated with an increased incidence of chylothorax after open-heart surgery for staged palliation in SV CHD patients. Methods A retrospective database of fetuses diagnosed with CHD in the Royal Alexandra Hospital Fetal Echocardiography Clinic in Edmonton, Canada was used to find eligible SV CHD patients between 2006 and 2020. Live born fetuses with subsequent surgical care at the Stollery Children's Hospital were included. Exclusions included termination of pregnancy, stillbirth, loss to follow up, or postnatal comfort care. Demographic and diagnostic information were collected from the database. Additional chart review will be completed to collect nuchal translucency measurements on obstetrical US between 11-14 weeks gestation and postnatal diagnosis of chylothorax during the study period. The primary outcome is a diagnosis of chylothorax. Secondary outcomes will include chylothorax duration, therapies, interventions, and hospital length of stay (LOS). Statistical analysis will be performed in SPSS using logistical regression for the primary outcome. Secondary outcomes with be analyzed using linear regression (ie. duration, LOS) and logistical regression (ie. therapies, interventions). A priori level of significance is a p value <0.05. Results A total of 377 fetuses were diagnosed with SV CHD during the study period. Of these pregnancies, 87 were terminated, 14 resulted in stillbirth, 30 were lost to follow up, and 14 resulted in live birth with a comfort care strategy chosen by the parents leaving 226 eligible participants. Further analysis is currently pending following chart review and data analysis. Conclusion Knowledge of the association between increased nuchal translucency and post-operative chylothorax, if it exists, would be important for prenatal counselling and anticipating post-operative chylous effusion. If there is an association, further research could investigate for similar associations in other CHD at risk of chylothorax including Tetralogy of Fallot (TOF) and Transposition of the Great Arteries (TGA). Further research could also be directed at preventative therapies such as mtor inhibition to prevent lymphovascular disease and it's complications.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 122
Presenter: Ren Wang
Supervisor: Field, Catherine
Title: A small amount of docosahexaenoic acid and arachidonic acid supplementation during suckling and weaning period altered intestinal fatty acid composition of 8-week Brown Norway offspring
Authors: Ren Wang, Alan Liang, Dhruvesh Patel, Jaqueline Munhoz, Susan Goruk, Caroline Richard, Catherine J. Field

Theme: Children's health and well-being

Introduction: Arachidonic acid (ARA, C20:4n6) and docosahexaenoic acid (DHA, C22:6n3) are two long chain polyunsaturated fatty acids (LCPUFA) that are essential to our bodies. DHA can be found in fatty fish, fish oil, algae and some genetically modified food sources and ARA can be found in meat, fish, and eggs. Previous research in our lab found that ARA+DHA supplementation during the suckling and weaning period, two crucial periods of infant immune system development, altered splenocyte fatty acid composition, promoted immune system maturation and improved food tolerance in infants. However, the effect of the ARA+DHA supplement on the intestine, which plays an important role in the immune system, remains unknown. Therefore, our aim was to determine the effect of suckling and weaning period ARA+DHA supplementation on fatty acid composition and morphology of the intestine. Methods: Brown Norway dams were fed either a control diet (0% ARA, 0% DHA, n=8) or an ARA+DHA diet (0.45% ARA, 0.8% DHA, n=10) during lactation (birth to week 3). From week 3 to week 8 of age, pups from both groups were subdivided and fed either a control diet (0% ARA, 0% DHA, n=19) or an ARA+DHA diet (0.5% ARA, 0.5% DHA, n=18). At 8 weeks, pups were euthanized, and tissues were collected for further analysis. Fatty acid composition of phospholipids (PL) and triglycerides (TG) in ileum sections were analyzed by gas chromatography. Paraffin-embedded jejunum sections were stained with hematoxylin and eosin (H&E) for histology analysis: jejunum cross sections were captured by Biotek Lionheart LX automated microscope and crypt depth, villi height and villi height/crypt depth ratio were measured using Gen 5.3.12 software. Data were analyzed using a two-way ANOVA by GraphPad Prism. Results: Pups fed with ARA+DHA supplement during the weaning period had a significantly higher level of DHA ($P=0.002$) and total omega-3 fatty acids ($P=0.049$) in the ileum PL compared to the controls. Similarly, DHA level in TG of the ileum significantly increased with ARA+DHA supplement in weaning period ($P<0.0001$). However, the level of alpha-linolenic acid (ALA, C18:3n3) in TG of the ileum decreased in pups supplemented with ARA+DHA during weaning ($P=0.0004$). The ARA level in the ileum PL of pups was not affected by ARA+DHA supplement during the suckling or weaning period. Supplementation of ARA+DHA during suckling but not weaning period decreased the ARA level in TG of the ileum ($P=0.028$). ARA+DHA supplementation during suckling and weaning had no significant influence on the jejunum villi height or villi height/crypt depth ratio of 8-week pups but the pups with a control diet in suckling period and an ARA+DHA diet in weaning period had smaller jejunum crypt depth compared to other groups (P-interaction=0.048). Conclusion: Neither suckling period nor weaning period ARA+DHA supplement influences intestinal structure maturation of 8-week Brown Norway offspring. ARA+DHA supplement during the weaning period increased the DHA level in ileum PL and TG whereas ARA+DHA supplement during the suckling period decreased the ARA level in ileum TG. The incorporation of DHA into the intestine with a very small supplementation might affect their immune function and will be tested in the future.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 123
Presenter: Alexa Ferdinands
Supervisor: Mayan, Maria
Title: Examining the culture of postsecondary education and training in Drayton Valley from young women's standpoint
Authors: Alexa Ferdinands, Dana Wagner, Kirsten Schmidt, Maria Mayan

Theme: Lifelong women's health

Introduction: Postsecondary educational attainment rates for women in Drayton Valley (45%), a rural oil and gas town in Alberta, are lower than the provincial average (65%). Traditional gender roles are entrenched in Drayton Valley's social norms, including those surrounding education. Men are encouraged to enter oil field work straight from high school, while women are expected to stay home and rear children. However, as a social determinant of health, undertaking postsecondary education may help to mitigate the health consequences (e.g., increased stress, anxiety, substance use, family conflicts) for young women growing up in a boom-and-bust economy. To shift social norms, a comprehensive understanding of the local culture of education and training is needed. In this study, conducted in partnership with the Town of Drayton Valley, we aim to explore this culture from the perspective of local young women. Methods: We are using a community-based participatory, focused ethnographic research approach to achieve this aim. Focused ethnography focuses on culture as it pertains to a discrete social phenomenon and context. Since July 2022, we have completed 10 individual interviews (both in person and virtually) with young women living in Drayton Valley aged 16-19. Recruitment for these interviews, via social media posts and posters placed in various community settings, is ongoing. We are purposefully sampling for diversity in participants' identity traits like race, ethnicity, ability, class, sexual orientation, and immigration status. In these interviews, we are asking open-ended questions such as: -What is it like to be a girl growing up in Drayton Valley? -What do you want to do after high school, and how did you come to this decision? -What are your hopes and dreams for your future? -What do you perceive as barriers to and opportunities for postsecondary education and training in your community? This fall, we will further explore these questions by conducting an in-person group Photovoice (arts-based research) project with a subset (n=6-8) of these young women. Qualitative content analysis is being used to analyze findings. Using an iterative approach, we are continuing to collect data to explore emerging ideas identified through initial analyses. Rigour will follow Lincoln and Guba's trustworthiness criteria. Results: Preliminary findings suggest that social media may play an important function in inspiring young women to challenge gender roles and stereotypes traditionally tied to notions of femininity in rural oil and gas communities. We will elaborate on these findings at Research Day. The format of knowledge mobilization products, such as photobooks and community share-backs, will be determined through consultation with Town partners and research participants. Conclusion: Ongoing communication with Town partners will help to ensure knowledge is responsive to their emerging policy and practice needs. Findings will inform Town strategic education planning and be relevant for other rural communities in Canada interested in shifting social norms, including those tied to gender, around postsecondary education and training, as a means of improving young women's health and social outcomes.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 125
Presenter: Logiraj Kumaralingam
Supervisor: Le, Lawrence
Title: A Fast and Fully-Automated Deep Learning Approach to Segment Alveolar Bone on Intraoral Ultrasound Videos
Authors: Logiraj Kumaralingam, Kim-Cuong T. Nguyen, Thanh-Giang La, Kumaradevan Punithakumar, Paul W. Major, Edmond H. Lou, Lawrence H. Le

Theme: Children's health and well-being

INTRODUCTION: Misalignment of teeth, known as malocclusion, is one of the most prevalent oral conditions among children and adults, which can lead to oral function problems, psycho-social problems, and sensitivity to periodontal diseases. Alveolar process or alveolar bone is the thick ridge of bone supporting the teeth. Quantitative assessment of alveolar bone level is a crucial step in assessing orthodontic treatment options and monitoring treatment outcomes. Ultrasonography is a non-invasive, emerging imaging technology without harmful ionizing radiation. However, accurate delineation of alveolar bone in ultrasound data is still a challenging task in dental clinics due to the time-consuming manual labeling process and the lack of ultrasound image interpretation skills. In this work, we developed a novel, fast, and fully automated deep learning architecture to segment the alveolar bone level on intraoral ultrasound videos. METHOD: The ultrasound data consists of 105 incisors, 58 canines, and 47 first premolars from 21 orthodontic patients (4 males, 17 females, and age range: 11-18 (n=12), 19-57 (n=9)). All the patients were scanned with consent using an in-house developed handheld intraoral 20 MHz transducer system. The acquired data was exported as a video file consisting of at least 500 frames and divided into three categories: training (150 videos), validation (30 videos), and testing (30 videos). A deep learning algorithm is developed to learn the segmentation knowledge from the videos through a series of convolutional layers by minimizing the loss function. Finally, the segmentation performance was compared with previous studies by evaluating the average Hausdorff distance, root mean square distance, dice overlap index, sensitivity, and specificity between the ground truth and segmentation results. RESULTS: The testing was performed on 30 videos. The average Hausdorff distance was 0.29±0.14 (current study) vs. >0.33±0.14 (previous studies); the average root mean square distance was 0.15±0.22 (current study) vs. >0.19±0.29 (previous studies); the average dice score was 87.3±5.8% (current study) vs. <85.3±6.3% (previous studies); the average sensitivity (>88%) and specificity (>99%) scores were similar to the previous studies. CONCLUSION: To the best of our knowledge, this is the first attempt to segment the alveolar bone level using intraoral ultrasound videos. Our proposed approach showed a better performance than the previous studies in terms of evaluation metrics and was able to segment a video within 0.48 seconds. Our future study will involve testing the efficacy of the proposed models using larger data set.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 127
Presenter: Yana Kibalnyk
Supervisor: Voronova, Anastassia
Title: Loss of Ankrd11, an epigenetic regulator and KBG syndrome risk gene, causes severe neural crest-mediated cardiac defects
Authors: Yana Kibalnyk, Ronan Noble, Maria Alexiou, Kara Goodkey, Nicole Dittmann, Daniela Roth, Daniel Graf, Stephane Bourque and Anastassia Voronova

Theme: Children's health and well-being

Introduction. KBG syndrome is a rare developmental disorder with about 500 cases known worldwide. It is characterized by multiple organ abnormalities, including brain, craniofacial, and cardiac malformations. It is caused by deficiency of the gene ANKRD11 (Ankyrin Repeat Domain 11), an epigenetic regulator that controls histone acetylation and thereby global gene expression. Our lab previously showed that Ankrd11 regulates brain development and neural crest-mediated craniofacial development. However, its role in heart development is unknown, even though almost half of the KBG syndrome patients display heart defects, which may require open-heart surgery. Both craniofacial and heart development are notably shaped by the neural crest, an embryonic population of progenitor cells that is vital to organogenesis. KBG patients show both craniofacial and cardiac phenotypes consistent with neural crest dysregulation, making the neural crest an ideal target to study cardiac defects in a KBG model. Methods/Results. Using a mouse model with conditional knockout of Ankrd11 in the neural crest (Ankrd11ncko), we performed morphological and functional analysis of the heart and lineage tracing analysis of the cardiac neural crest. Ankrd11ncko embryos display a severe congenital heart defect called persistent truncus arteriosus, where the embryonic outflow tract fails to separate into distinct vessels, the aorta and pulmonary trunk. They also display a ventricular septal defect and a common origin of the brachiocephalic and left common carotid arteries. Micro-computed tomography (uCT) and 3D reconstruction also reveals cardiomegaly (increased heart size), and in utero echocardiography shows decreased ventricular contractility. As Ankrd11ncko embryos die at birth, this suggests a fatally defective heart function. Lineage tracing analysis during the embryonic stages of outflow tract remodeling reveals that Ankrd11ncko cardiac neural crest cells successfully populate the outflow tract but show delayed condensation and improper migration to the outflow tract endocardium, failing to fuse it at the midline and create the aorticopulmonary septum. Conclusion. We show that Ankrd11 is a novel critical regulator of heart development. Ablation of Ankrd11 in the neural crest causes severe cardiac defects, including persistent truncus arteriosus, cardiomegaly, and impaired ventricular contractility. Furthermore, Ankrd11ncko cardiac neural crest exhibits aberrant differentiation by failing to initiate the aorticopulmonary septation process. Our work contributes to our understanding of the role of epigenetic factors, like Ankrd11, in heart development, and demonstrates a mechanism for aberrant heart development in KBG syndrome patients.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 128
Presenter: Qiuyu Sun
Supervisor: Lopaschuk, Gary
Title: Cardiac Energy Metabolism is Disrupted in Older Females with Heart Failure
Authors: Qiuyu Sun, Berna Güven, Cory S. Wagg, Amanda A. de Oliveira, Heidi Silver, Liyan Zhang, Ander Vergara, Brandon Chen, Ezra Ketema, Qutuba G. Karwi, Faqi Wang, Jason R.B. Dyck, Gavin Y. Oudit, Gary D. Lopaschuk

Theme: Lifelong women's health

Background: Heart failure with preserved ejection fraction (HFpEF) is a debilitating disease that is prevalent in our society. HFpEF is prevalent in older women with coexisting obesity, diabetes, and hypertension. Unfortunately, there are few effective pharmacotherapies to treat HFpEF. As such, it is urgent to find new therapeutic targets and to understand the complex pathophysiology of HFpEF. While it is well-accepted that changes in myocardial energetics are involved in heart failure progression, it remains unknown whether alterations in cardiac energetics contribute to HFpEF severity. Therefore, the objectives of this study were to define the cardiac energy metabolic profile in HFpEF using aged female mice and then attempt to lessen the severity of HFpEF by improving cardiac energetics. Methods: Obesity and hypertension were produced in 13-month-old female C57BL/6J mice by subjecting them to 10 weeks of 60% high fat diet (HFD) and 0.5g/L of Nω-nitro-L-arginine methyl ester (L-NAME) in the drinking water. Control mice were fed with regular chow diet. At the end of the study protocol, echocardiography, pressure volume (PV) loops, and glucose tolerance (GTT) test were performed. Isolated working hearts were perfused with radiolabeled energy substrates to directly measure rates of glucose oxidation and fatty acid oxidation. A third intervention group of mice were treated with 40mg/kg/day of pyruvate dehydrogenase inhibitor (PDKi) MMR013 while receiving the HFpEF protocol. Results: HFpEF mice exhibited a significant increase in body weight, glucose intolerance, and elevated blood pressure. Echocardiography revealed that HFpEF mice developed diastolic dysfunction and concentric hypertrophy. In HFpEF mice hearts, glucose oxidation was significantly suppressed, whereas fatty acid oxidation was not decreased. Total cardiac ATP production was reduced in HFpEF hearts compared to healthy control hearts. Acute addition of PDKi to the perfusate increased glucose oxidation rates. PDKi treated mice had improved systolic and diastolic function compared to vehicle treated mice. PDKi treatment also improved vascular function, ameliorated hypertension, and improved overall survival rates. Conclusion: The aged female heart becomes metabolically inflexible and energy deficient in HFpEF, as characterized by a prominent decrease in glucose oxidation with a simultaneous increase in fatty acid oxidation. Stimulation of cardiac glucose oxidation using PDKi lessens the severity of HFpEF and exerts functional benefits. Therefore, targeting cardiac energy metabolism could be a promising therapeutic target for treating HFpEF in older females.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 130
Presenter: Susanna McDermott
Supervisor: Norris, Colleen
Title: The Impact of Biological Sex on the Clinical Characteristics and Outcomes of Adult Patients Diagnosed with SARS-CoV-2 Related Myocarditis: A Systematic Review
Authors: Susanna McDermott, Nicole Tegg, Dr. Colleen Norris

Theme: Lifelong women's health

Introduction: COVID-19 can significantly impact the cardiovascular system, with potential complications of cardiac inflammation. Myocarditis is a serious cardiovascular complication that is prevalent with COVID-19. Recognizing the systemic disparities in female heart health and to promote equity in women's heart health, this systematic review examines biological sex differences in COVID-19 related heart inflammation presentation, progression, severity, and treatment. Methods: A thorough literature search was performed on May 28, 2022, of six databases (Ovid MEDLINE, PubMed, Embase, CINAHL Plus, Scopus, and TRIP Pro), in addition to searching pre-print databases (MedRxiv, ClinicalTrials.gov, Prospero, COVID-END, World Health Organization International Clinical Trials Registry Platform, and ISRCTN Registry), various health society websites, and manually searching citations of relevant literature. Eligibility criteria included primary and secondary research articles, written in English, that focused on adult populations diagnosed with acute COVID-19 associated myocarditis, and reported sex-specific data. Results: 21 articles were included in the systematic review: (7) retrospective observational studies, (6) literature reviews, (5) systematic reviews, and (3) case series. Across the reviews of case studies and the case series, a total of 80 cases, 31(39%) female, 49(61%) male, were included. From the retrospective observational studies, data from a total population of 18,327 people, 10,237(56%) female, 8,073(44%) male, were included. Data on the presentation, characteristics, severity, and treatment of myocarditis in both sexes are currently being synthesized, compared, and narratively summarized. Conclusion: Biological sex is a confirmed factor in COVID-19 disease severity and outcomes, and requires further research. This systematic review aims to address deficits in knowledge of women's heart health, specifically within the context of the persistent COVID-19 endemic; this research on biological sex differences in COVID-19 associated myocarditis will further inform clinical practice, and help to address disparities in female heart health.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 131
Presenter: Aakriti Pandit
Supervisor: Hilario, Carla
Title: Perspectives of South Asian adolescents on their mental health during the COVID-19 pandemic
Authors: Aakriti Pandit, Carla Hilario

Theme: Children's health and well-being

Introduction The COVID-19 pandemic has vastly affected the mental health of youth. Adolescents are at greater risk for developing psychiatric disorders, including depression and anxiety. The public health measures implemented during the pandemic also limited how youth access vital support systems, such as friends, mentors, and extracurriculars. Concurrently, visible minorities may be disproportionately affected by the pandemic. South Asians are the largest visible minority in Canada, and faced high rates of unemployment during the pandemic. Income and employment are significant determinants of health. In addition, the stigmatization of mental health in the South Asian community could act as a barrier to mental health services. These factors emphasize a need to understand the experiences of the South Asian community during the pandemic, chiefly those of youth. This project explored the perspectives and experiences of South Asian adolescents (ages 15-17), in relation to their mental health during the COVID-19 pandemic. The project will address three research questions: 1. What are the perspectives of adolescents on how the pandemic has influenced their lives and mental health? 2. How has the unique background of being a South Asian adolescent influenced this experience? 3. What types of services or supports for mental health have South Asian adolescents used or found helpful during the COVID-19 pandemic? Methods This study followed a qualitative, interpretive description approach. A total of 13 South Asian adolescents were recruited using recruitment posters shared by local South Asian community organizations and the COVID-19 Student Support Network. Participants were also recruited by word of mouth through organizations. Inclusion criteria included self-identifying as South Asian, being 15-17 years old, living in Alberta, Canada, and being able to partake in an online focus group. Data was collected using focus group methods and image based-elicitation. Focus groups were conducted remotely using Zoom, utilizing an interview guide to facilitate discussion. Once focus group sessions were completed, data was analyzed inductively using thematic analysis. Emerging themes are being interpreted within a social determinants of mental health framework. Results There were a total of 13 participants who completed the study over four focus groups. Key preliminary themes identified the influence that change and uncertainty had on the daily lives and mental health of youth during the pandemic. Furthermore, youth social support systems, specifically friends and family, were identified as the greatest sources of support in this age group. Lastly, stigma and stereotypes within and outside the South Asian community shaped experiences during the pandemic. Recommendations to support youth in this community were heavily focused on increasing South Asian representation in media, education, and services. Conclusion The perspectives of South Asian youth provide us first-hand insight into the experiences and needs of youth as a result of the pandemic. This project is a stepping stone to understanding how we can support South Asian youth mental health and inform culturally-relevant services in the future.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 133
Presenter: Bethan Wilson
Supervisor: Riddell, Meghan
Title: Transcriptomic analysis of human decidual endothelial cells identifies gestational age dependent changes and TGF-β1-endothelial cell ligand interactions
Authors: Bethan Wilson, Matthew Shannon, Alexander Beristain and Meghan Riddell

Theme: Pregnancy and developmental trajectories

Introduction: Conversion of endometrial lining into decidua is essential for blastocyst implantation and pregnancy progression. Decidualization requires expansion and remodelling of endometrial vasculature via angiogenesis. Decidual defects are associated with placental malformation, an increased risk of infertility and pregnancy complications. Mouse models show decidualization defects in advanced age pregnancy (AAP). Endothelial cell (EC) aging and poor angiogenic response is a driver of organ ageing, but whether similar patterns of EC ageing are observed in AAP remains elusive. We hypothesize EC intrinsic ageing may be a feature of AAP. We will use single cell RNA sequencing (scRNA seq) of human decidual tissue to examine differences in EC gene expression and cell-cell interactions in young versus AAP across the first trimester. Methods: Isolated first trimester decidual cells (gestational age (GA) 4-12 weeks) are scRNA sequenced using 10X genomics. Bioinformatic processing is performed in RStudio. CD31 positive decidual EC (n=3, 9-10 week; n=4, 12 week) scRNA-seq dataset was created using the Vento-Tormo et al library and differentially regulated EC genes were identified (maternal age unknown). NicheNet computational method for interactome analysis was performed on the dataset (GA 6-13). Results: Dataset analyses revealed 388 differentially expressed genes between 9-10 and 12 week EC (e.g. DLK1, EGFL6, and oxygen transport genes HBG2, HBG1, HBA2). NicheNet analysis revealed TGF-β1/ TGF-β receptor 2 (TGFBR2) pathway as the dominant ligand/receptor acting on decidual EC, with TGF-β1 being produced by extravillous trophoblasts (EVT) and uterine natural killer cells (uNK). Conclusions: Analyses demonstrated that EC adapt their transcriptomes with advancing gestation, and EVT and uNK are key regulators of EC in the human decidua. Further scRNA seq data will be generated to examine AAP-related effects on decidualization for in-depth analysis between young and AAP, and to provide insight into the impact of EC on ageing pregnancies.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 135
Presenter: Jordyn Cox
Supervisor: Davenport, Margie
Title: Physical activity levels in individuals pregnant with twins
Authors: Jordyn Cox, Victoria Meah, Áine Brislane, Rshmi Khurana, Craig Steinback, Lisa Hornberger, Margie Davenport.

Theme: Pregnancy and developmental trajectories

Introduction While physical activity is an essential component of a healthy pregnancy, extensive evidence shows that physical activity levels drop across gestation. However, these data are almost exclusively based on singleton pregnancies and there is limited information on physical activity patterns in individuals pregnant with twins. We aimed to examine subjective and objective measures of physical activity from pre-conception to late pregnancy in singleton compared to twin pregnancies. We hypothesized physical activity levels would drop from pre-conception to late pregnancy in both groups but the reduction would be greater in women carrying twins compared to singleton pregnancies. Methods Thirty participants (32.2 ± 3.7 years and 25.9 ± 5.0 weeks gestation) were recruited. Participants carrying twins (n=15) were matched for maternal age, gestational age and pre-pregnancy BMI to participants carrying singletons. Subjective measures of pre-conception and current moderate-to-vigorous physical activity (MVPA) were assessed using the Godin Leisure-Time Exercise Questionnaire. Objective measures of MVPA were collected over a 7-day period using an accelerometer (wGTX3-BT; ActiGraph LLC, Pensacola, FL). Comparisons were made using independent t-tests. Results Subjective measures of pre-conception MVPA were not different between groups (twin 83 ± 46 min per week , singleton: 123 ± 78 min per week; P=0.10; moderate effect size). During pregnancy, individuals pregnant with twins had a greater reduction in self-reported MVPA from pre-conception levels (ΔMVPA pre- to during pregnancy; twin: -67 + 52 min/week, singleton: -28 ± 48 min/week; P=0.04; moderate effect size). Compared to objectively measured MVPA (accelerometry), self-reported MVPA was not different in twins (accelerometer: 18 ± 25 min/week; questionnaire: 17 ± 27 min/week; P=0.92), but was higher in singletons (accelerometer: 41 ± 32 min/week; questionnaire: 93 ± 54 min/week; P<0.01; large effect size). Conclusion Self-reported physical activity levels from pre-conception to during pregnancy decline to a greater extent in individuals carrying twins compared to singletons. Future research examining barriers to, as well as enablers of physical activity in twin pregnancy pregnant are warranted.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 136
Presenter: Paulami Chatterjee
Supervisor: Davidge, Sandra
Title: Effect of a placenta-targeted antioxidant treatment on cardiac mitochondrial function in adult offspring exposed to prenatal hypoxia
Authors: Paulami Chatterjee, Raven Kirschenman, Claudia Holody, Murilo Graton, Floor Spaans, Thomas Phillips, Patrick Case, Hélène Lemieux, Sandra T. Davidge

Theme: Pregnancy and developmental trajectories

Introduction: Exposure to prenatal hypoxia increases the risk of the development of cardiovascular disease in adulthood. We previously reported impaired cardiac function in the adult male and female rats exposed to prenatal hypoxia. We also showed that a maternal placenta-targeted treatment during pregnancy with the mitochondrial antioxidant nMitoQ was able to improve cardiac recovery from an ischemia/reperfusion insult in adult prenatal hypoxia offspring. However, the exact mechanisms are not known. Recently, mitochondrial respiration was shown to be impaired in the hearts of prenatally hypoxic adult mice/guinea pig offspring. However, if the cardiac dysfunction in prenatal hypoxia offspring is due to mitochondrial dysfunction in our model, and if nMitQ treatment is able to reverse this, is not known. Therefore, we hypothesize that cardiac mitochondrial function is impaired in adult prenatal hypoxia offspring, and that this is improved by nMitoQ treatment. Methods: Pregnant Sprague-Dawley rats were exposed to either hypoxia (11% O2) or normoxia (21% O2) from gestational day [GD] 15-21 (term=22 days), after i.v. injection with a single dose of saline (control) or nMitoQ (100 µL of 125 µM) on GD15 (n=6-11 dams per group). Adult (4-month-old) male and female offspring were used. Mitochondrial respiration through the LEAK states and the oxidative phosphorylation (OXPHOS) states- NADH (N-) pathway (through complex I), simultaneous N- and Succinate (S-) pathways (NS-pathway through complex I and II), S-pathway (through complex II) and complex IV were assessed in permeabilized fibers from left ventricles by high-resolution respirometry (OROBOROS Oxygraph-2k; in triplicates). Data were expressed as oxygen (O2) flux per unit tissue mass. A two-way ANOVA with Sidak's post-hoc test was used to analyze the data; $p \leq 0.05$ was considered significant. Results: Prenatal hypoxia did not alter any of the mitochondrial respiration pathways taken individually (expressed in O2 flux per mass) in male or female offspring. However, in females, nMitoQ treatment increased the O2 flux for the N-pathway in both hypoxia and normoxia groups (main effect; $p=0.0303$). When assessing the ratios between NADH or succinate pathways over complex IV, the capacity of the S-pathway was lower in hearts of male offspring exposed to prenatal hypoxia compared to normoxia males ($p=0.0411$), and this was improved with nMitoQ treatment ($p=0.0162$). The same ratios over complex IV were unaffected by hypoxia or nMitoQ in the females. Conclusion: In the hearts of male offspring exposed to prenatal hypoxia, there was a decrease in the capacity of the S-pathway relative to a marker of mitochondrial content (complex IV), suggesting a decrease in complex II activity. This may affect the OXPHOS capacity and energy production. In addition, nMitoQ treatment improved the capacity of the S-pathway relative to complex IV activity in the prenatally hypoxic male offspring cardiac tissue. However, cardiac mitochondria in the females appear to be protected from the adverse effects of prenatal hypoxia. These data show that the impact of prenatal hypoxia on adult offspring cardiac mitochondrial function is sexually dimorphic, and can be prevented by maternal nMitoQ treatment for the affected male offspring.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 137
Presenter: Pooja Sinha
Supervisor: Tham, Edythe
Title: Correlation of atrial and ventricular strain with single ventricular volumetrics, myocardial and hepatic tissue characteristics on Cardiac MRI post-Fontan procedure
Authors: Pooja Sinha, Edythe Tham, Michelle Noga, Joseph Pagano

Theme: Children's health and well-being

Introduction: The Fontan procedure has given a new lease of life to patients with congenital heart disease destined for a single ventricular route of palliation such as those born with hypoplastic left heart syndrome. Although it does improve survival and quality of life for patients with single ventricle physiology, Fontan patients experience significant long-term morbidity and mortality with heart failure being the most common cause of death. These patients require close monitoring and medical and interventional supports throughout their lives. The timing of initiation and escalation of heart failure therapies, especially as a pre-emptive measure before symptoms and clinical deterioration set in - when they are most effective - are reliant on measures of ventricular performance on routine clinical follow-up of Fontan patients. However, this becomes difficult due to the practical issues with quantifying single ventricular function on echocardiography owing to the complex varying ventricular geometry and the often-poor echo windows in these patients post multiple cardiac surgeries. Also, once objective measures of single ventricular function are obtained, for example using cardiac MRI (CMR), interpretation of the same is hindered by the lack of normative cut-offs for normal ventricular function or ejection fraction in Fontan patients. Hence, the need for non-single ventricular ejection fraction-based parameters of assessment of welfare of the Fontan circulation to guide successful life-long management of these challenging patients. This research project will aim to study alternative metrics of cardiac function on follow-up post-Fontan palliation such as CMR-based atrial and ventricular strain, myocardial and hepatic tissue characteristics, and investigate correlations with CMR-based accurate measures of single ventricular volume, ejection fraction, and cardiac output towards the ultimate objective of identifying their usefulness as surrogate markers of cardiac performance in Fontan patients. Methods: In this research project, we will study the atrial and ventricular volumes, function, strain, myocardial and hepatic T1, in 45 patients post-Fontan procedure undergoing follow-up MRI in our institution. This will be a cross-sectional observational study based on retrospective chart review and cardiac MRI post-processing of all patients post-lateral tunnel/extracardiac Fontan completion who have undergone a Cardiac MRI with myocardial T1 imaging. Anticipated Results: We anticipate that the Fontan patients studied in this research project will demonstrate abnormal atrial strain on CMR consistent with the frequently associated single ventricular diastolic dysfunction, and will have associated impairments of ventricular strain, single ventricular dilatation and dysfunction, inevitably found in the palliated single ventricle physiology. We also expect abnormalities in myocardial and hepatic T1 suggestive of subtle cardiac and liver fibrosis in this population. Conclusion: This research aims at establishing a better understanding of the interaction between atrial and ventricular mechanics, and therefore, the clinical relevance underlying the role of atrial function and atrial strain in patients with a Fontan circulation.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 138
Presenter: Chelsea Gilbert
Supervisor: Hicks, Matt
Title: Necrotizing enterocolitis: understanding the differing characteristics and outcomes in surgical vs. non-surgical patients
Authors: Chelsea Gilbert, Zosia Czarnecka, Matthew Hicks, Chloe Joynt, Kumar Kumaran, Bryan Dicken

Theme: Children's health and well-being

Introduction: Necrotizing enterocolitis (NEC) is one of the most common neonatal surgical emergencies and is associated with significant morbidity and mortality. Diagnosis is challenging as early signs are non-specific. Once diagnosed, NEC can be severe, requiring surgery. Our objective was to evaluate whether clinical and metabolic perturbations were associated with NEC in early stages and predict which patients would require surgical intervention. If predictive factors could be identified, clinicians would be supported in diagnosing NEC, allowing for earlier intervention and potentially better outcomes. Methods: A retrospective cohort study was conducted of all neonates diagnosed with NEC in Edmonton from 2015 to 2020. Charts were reviewed for laboratory, radiologic, demographic, and clinical variables using standardized data collection sheets. Neonates diagnosed with NEC treated medically were compared to those who underwent surgery. Univariate statistics were used to describe the cohort. Bivariate analysis and multiple logistic regression were used to explore the association between clinical and metabolic variables and NEC-related outcomes. A p-value <0.05 was considered significant. Results: From 2015 to 2020, 82 NEC cases were identified. 41 (50%) underwent operative intervention while 41 (50%) were managed conservatively. Prior to symptom onset, there were no significant differences in metabolic or radiologic signs between groups but patients who underwent surgery were more frequently on inotropes, mechanical ventilation, and required more fluid resuscitation. At time of diagnosis there were higher rates of thrombocytopenia in the surgical group (50.0%) compared to the control group (27.3%) but this did not reach statistical significance (p=0.079). At all time points (prior to, at, and after symptom onset), the mean C-reactive protein (CRP) values in the surgical group were approximately double that of the non-surgical group. Multivariate logistic regression revealed three risk factors for surgical NEC: never receiving mother's breast milk, pneumoperitoneum on presentation, and inotropes. Modelling also revealed that factors that predicted survival were tachycardia over 170 at symptom onset, and pneumoperitoneum on diagnosis, suggesting that the sicker neonates had earlier recognition and intervention. A subset of patients had Penrose drains placed but almost all (9/10) required subsequent surgery. This Penrose population were 1/3 less likely to die than patients who underwent surgery without prior Penrose. Conclusions: Early recognition of surgical NEC is associated with better patient outcomes. Variables associated with surgical intervention include never receiving mother's breast milk, pneumoperitoneum, use of inotropes, and elevated CRP at symptom onset. Penrose drains ultimately do not preclude patients from surgery, but they are useful as a temporizing measure to stabilize the neonate and improve survival at eventual surgery. Tachycardia and pneumoperitoneum at symptom onset were also associated with survival. We anticipate other indicators for surgery exist, and plan to carry out sensitivity and specificity and Classification and Regression Tree analyses. Our data may help with surgical decision making and parental counseling.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 139
Presenter: Saloni Sharma
Supervisor: Andrews, Saadet
Title: Genetic landscape of primary mitochondrial disorders due to pathogenic variants in the nuclear and mitochondrial genome in children
Authors: Saloni Sharma, Dan Zhang, Taryn Athey, Alicia Chan, Shailly Jain-Gai, Komudi Siriwardena, Andrew Muranyi, Saadet Mercimek-Andrews

Theme: Children's health and well-being

Introduction: Mitochondrial disorders are inherited metabolic disorders with an estimated prevalence of 1 in 5000 individuals. There are more than 1000 different genetic defects that can affect mitochondrial function. Mitochondria are present in almost every cell in the body. Their primary function is to produce energy to power the body's vital organs, including the brain, heart, muscles, and eyes. When mitochondria fail to produce sufficient energy, these vital organs fail. Individuals with mitochondrial disorders can present with a wide range of clinical features involving multiple organs. These phenotypes range from prenatal lethal neurodegenerative disease to adult onset ophthalmoplegia (eye paralysis). Human has two genomes including nuclear and mitochondrial. Primary mitochondrial disorders can arise due to pathogenic or likely pathogenic variants affecting either mitochondrial genome or nuclear genome. The mitochondrial genome is maternally inherited and is a double-stranded circular DNA which encodes 37 mitochondrial genes. Nuclear genome contributes to the integrity of mitochondrial genome. Both mitochondrial and nuclear genome defects affect the function respiratory chain enzymes giving rise to the energy deficiency. Methods: All pediatric patients (<18 years of age) with suspected mitochondrial disorders are included into the study. We reviewed patient charts for clinical features, biochemical investigations, molecular genetic investigations, cardiac assessments, neuroimaging, treatments, and outcomes. Results: There were 105 patients fulfilling inclusion criteria. They underwent different genetic tests including microarray, nuclear mitochondrial genetic test panel, targeted mitochondrial variant tests, mitochondrial genome sequencing, cardiomyopathy genetic test panel and exome sequencing. The average current age was 7.73+5.2 years standard deviation (range 1 month- 17 years). There were 17 patients with a genetically confirmed mitochondrial diagnosis including 12 patients with a nuclear mitochondrial defect (pyruvate dehydrogenase deficiency, n=2; DNAJC19 disease, (n=3), MEGDEL disease, n=1; RMDN1 disease, n=1; MSTO1 disease, n=1; SUCLA2 disease, n=1; APTX, n=1; ATAD3 disease, n=1; PMPCB disease, n=1) and 5 patients with mitochondrial genome defect (ND6 disease, n=1; MELAS, n=2; complex 1 deficiency, (n=2). There were 12 different primary mitochondrial disorders in 17 patients. Additionally, there were 19 patients (18.1%) with 16 different genetic diseases in our study cohort who were initially thought to have primary mitochondrial disorder, however various genetic investigations confirmed the diagnosis of other genetic diseases. Conclusion: We had a genetic diagnosis in 34.3% of our study cohort. The diagnostic yield of primary mitochondrial disorders was 16.2%. Other genetic diagnoses was 18.1%. It seems that even the initial suspected diagnosis is primary mitochondrial disease, there are other genetic disorders mimicking primary mitochondrial disorders.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 140
Presenter: Katherine Souter
Supervisor: Graf, Daniel
Title: Investigating fine control of cranial base development by Bmp2
Authors: Katherine Souter, Daniela M. Roth, Daniel Graf

Theme: Children's health and well-being

Introduction: The cranial base sits beneath the brain and is important for proper craniofacial development. It consists of several bones separated by cartilaginous regions (synchondroses) that allow growth via endochondral ossification, whereby cartilage is replaced by bone. Bone morphogenetic protein 2 (Bmp2) is a critical growth factor implicated in osteogenesis. Bmp2 mutant mice form bone but suffer from spontaneous fractures that cannot heal. A distinct role of Bmp2 in endochondral ossification has not yet been investigated. In this project, we investigate how Bmp2 regulates cranial base growth, with a focus on the sphenoid bone. We hypothesize that Bmp2 is involved in chondrocyte differentiation, bone maturation, and bone remodelling. Methods: We studied mouse embryos with conditional neural crest-specific deletion of Bmp2 (Bmp2ncko) using a Wnt1-cre mouse line. We characterized Bmp2 distribution in the cranial base from embryonic day 13.5 (E13.5) to E15.5 and stained for markers of cartilage and bone maturation at E18.5. Micro-CT analysis and skeletal preparations were used to assess the skeletal phenotype of E18.5 embryos. Haematoxylin and eosin staining was used to examine the structure of bone and cartilage, and TRAP staining revealed osteoclast activity. Immunofluorescence staining for collagen II and collagen X was used to assess chondrocyte differentiation. Results: Bmp2 expression in cranial base chondrocytes was first observed at E15.5. Bmp2 expression was polarized, predominantly aligned along the width of the cranial base. Bmp2ncko embryos revealed a distinct morphological cranial base phenotype; skeletal preparations supported results. Mutant embryos had small, disrupted bones of the sphenoid. Histology revealed that bone formation was strongly compromised in Bmp2ncko mutants. TRAP staining indicated an absence of bone remodelling in the anterior, neural crest-derived aspect of the Bmp2ncko cranial base. Immunostaining for markers of cartilage and bone differentiation revealed impaired bone maturation with a loss of Bmp2. Expression of collagen II, a key component of the cartilage matrix, appeared weaker and less compact in mutants compared to controls. The Bmp2ncko had a more abrupt drop in collagen II expression compared to a more gradual decline from cartilage to bone in the control. Collagen X, a marker of hypertrophic chondrocytes, was weaker in the Bmp2ncko than controls. Conclusions: Bmp2 is expressed at various stages of chondrocyte differentiation including immature chondrocytes. Its polarized expression indicates a spatially restricted function. The differentiation of the growth plate is altered, and the transition from hypertrophic chondrocytes to bone is more abrupt. This may indicate a problem with chondrocyte to osteoblast trans-differentiation. Interestingly, Bmp2 appeared to be required for the initiation of bone remodelling. In its absence, no osteoclast activity was observed. Compromised bone remodelling may explain the spontaneous non-healing fractures previously reported in Bmp2-mutant mice. These findings indicate essential roles for Bmp2 in the process of endochondral ossification and bone remodelling. As such, the action of Bmp2 is more complex than just being an inducer of bone-formation.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 141
Presenter: Linn Moore
Supervisor: Ospina, Maria
Title: Proximity to industrial emitting facilities during pregnancy and childhood asthma control
Authors: Linn E. Moore, Jesus Serrano-Lomelin, Alvaro Osornio-Vargas, Anne Hicks, Maria B. Ospina

Theme: Children's health and well-being

Background: Asthma is the most common chronic condition in Canadian children. Achieving and maintaining proper asthma control in childhood can be challenging. Poor asthma control in childhood has been linked to long-term respiratory morbidity. Exposure to poor air quality during pregnancy and living near industrial emitting sources have been linked to an increased risk of developing childhood asthma and other poor health outcomes. It is unknown if the proximity to industrial emitting facilities during pregnancy is also important for asthma control in childhood. Objective: The purpose of this study was to assess the association between asthma control in early childhood and the distance between maternal residence and industrial emitting facilities during pregnancy. We evaluated asthma control both in relation to nearest emitting site and to the number of emitting facilities within a 10km radius. Methods: This population-based retrospective cohort study used linked administrative data from children born in Alberta 2010-2012 with follow-up data until 2019 who were diagnosed with asthma before the age of five, and their mothers. Maternal postal codes at delivery as an estimation for residence during pregnancy were linked to data from the National Pollution Release Inventory (NPRI). The proximity to emitting facilities (postal code of facilities emitting hazardous pollutants to air) were established as a) the distance to nearest emitting facility as under or over the median distance of all households, and b) number of emitting facilities with a 10km radius of each residential postal code at birth (per SD). Childhood asthma control was assessed during the two years immediately following the initial diagnosis according to the Pediatrics Asthma Control Index and categorized as adequately or poorly controlled. The likelihood of poorly controlled vs adequately controlled asthma in relation to exposures was analyzed using logistic regression analysis and reported as odds ratios (OR) and 95% confidence intervals (95% CI) following adjustment (aOR) for potential confounding factors, including sex, season of birth, socioeconomic status, gestational diabetes, and maternal asthma. Results: Of the 7,158 children with asthma, 5,410 (76%) children had adequately controlled asthma and 1,748 (24%) were poorly controlled. The mean age at diagnosis was 2.6±1.2 years. Living within 3.2km (median) of an emitting facility during pregnancy was associated with an increased odds of the child having poorly controlled asthma (OR: 1.15; 95% CI: 1.00, 1.32); however, the association was no longer statistically significant following adjustment for confounders (aOR: 1.12; 95% CI: 0.97, 1.30). The number of emitting facilities within 10km of the residence was not associated with the level of childhood asthma control in unadjusted (OR: 0.96; 95% CI: 0.91, 1.01) or adjusted (aOR: 0.97; 95% CI: 0.91, 1.03) analyses. Conclusion: The relationship between the proximity to nearest emitting facility and number of emitting facilities within 10km during pregnancy and poor asthma control in childhood can be explained largely by child and maternal factors. These findings help inform the complex relationship between exposure to emitting facilities and childhood respiratory morbidity.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 144
Presenter: Chentel Cunningham
Supervisor: Scott, Shannon
Title: Parental knowledge needs and experiences caring for a child with heart failure: a meta-synthesis
Authors: Cunningham C., NP MN; Schroeder K., RN BScN; Plesuk T., RN BScN MLIS; & Scott SD., RN PhD

Theme: Children's health and well-being

Introduction: Treatment strategies for children with heart failure have evolved over the last few decades, improving outcomes and resulting in children with heart failure needing complex care within the home setting. Despite increased collaboration and knowledge translation strategies between health care providers, knowledge translation of complex daily management has not kept pace for parent audiences giving rise to a huge knowledge gap in their understanding of their child's heart failure. Therefore, the purpose of this meta-synthesis was to search, analyze and appraise studies relating to parents' knowledge needs and experiences caring for a child with heart failure. The goal of conducting this meta-synthesis is to develop an evidence-based, knowledge translation tool for parents and caregivers about their child's heart failure. Methods: Using the meta-synthesis methodology developed by Sandelowski & Barroso, a systematic approach was developed to search, synthesize and appraise qualitative studies about parents' experiences and knowledge needs relating to childhood heart failure. Criteria for study inclusion were informed by the PICOS tool and limited to English language studies. Consultation with two librarians occurred prior to the search. Three main concepts were identified and formed the search strategy: parents/caregivers, pediatric heart failure, and health information needs and experiences. The search was conducted in June 2021, in seven medical, psychological, and socially based databases (Ovid MEDLINE, Scopus, EMBASE, PsycINFO, and a combined search in Cumulative Index to Nursing and Allied Health Literature (CINHAL), Educational Resources Information Centre (ERIC), & Education). Search results were imported into Microsoft Excel spreadsheet and de-duplicated for analysis for review and comparison by two independent reviewers who have extensive experience in the area of children's heart failure care. The original search retrieved 4223 studies. After duplicates were removed, 3156 articles remained for title and abstract screening. All studies that included care of congenital pediatric patients were included in the full-text screen in case references to their child needing heart failure care was an aspect. Defined inclusion and exclusion criteria were developed prior to the title and abstract screen phase, which left 246 articles for full-text review. The full-text screen excluded all studies based on the detailed inclusion and criteria. Results: No studies remained for critical appraisal and synthesis, highlighting an empty review. Conclusion: This meta-synthesis was the first of its kind in the field of pediatric heart failure. No articles met inclusion criteria, highlighting a significant knowledge gap about evidenced-based literature pertaining to parents' knowledge needs and experiences caring for their child diagnosed with heart failure. This study demonstrates a knowledge that solidifies the need for qualitative interviews with parents who have cared for a child with heart failure, which is our subsequent current study.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 146
Presenter: Jenna Lakhani
Supervisor: van Manen, Michael
Title: Considerations for practice in supporting parental bereavement in the NICU - a systematic review
Authors: Jenna Lakhani Michael van Manen Cheryl Mack Dianne Kunyk

Theme: Pregnancy and developmental trajectories

Introduction: Parental bereavement after the death of an infant in a neonatal intensive care unit (NICU) is a complex and nuanced experience. Support from healthcare practitioners can have a significant impact on bereavement experiences in the short- and long-term. Although several studies exist exploring parental perceptions of their experiences of loss and bereavement, there has not been a contemporary systematic review of common themes of the literature. Methods: This systematic review includes empirical research to identify considerations that ought to guide caregiving practices of healthcare professionals to support parental bereavement. Data was collected from studies identified in MEDLINE, Embase, and CINAHL. The search was limited to English-language studies describing parental bereavement in the NICU population from January 1990 to November 2021. Results: Of 581 studies initially identified, 45 studies of varying geographic locations were included in the review. Various themes surrounding healthcare support in parental bereavement were identified including ensuring the opportunity for parents to spend time caring for their child, understanding their perception of infant suffering, recognizing the impact of communication experiences with healthcare providers, and offering access to alternative means of support, all of which have been described as suboptimal. Parents generally want the opportunity to say goodbye to their infant in a private and safe space, be supported through their decision-making and be offered bereavement follow-up after loss. Conclusion: This review identifies methods of support in parental bereavement based on first-hand parental experiences and routine implementation of these strategies may be beneficial in supporting parents through their bereavement after the loss of a baby in the NICU.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 147
Presenter: Amy Brightwell
Supervisor: Riddell, Meghan
Title: The impact of maternal metabolic dysfunction on regulation of lipid and glucose metabolism in the liver
Authors: Amy Brightwell, Taylor Scheidl, Meghan Riddell, Jennifer Thompson

Theme: Pregnancy and developmental trajectories

Introduction Obesity rates for women of reproductive age have increased four- fold since the 1970s, resulting in 27.5% of this demographic being considered obese. This is particularly concerning as pre-pregnancy obesity is linked to gestational diabetes, fetal macrosomia, and pre-eclampsia. Obesity is a characterizing feature in the development of non-alcoholic fatty liver disease (NAFLD), in which free fatty acids accumulate in the liver and disrupt hepatic metabolism. Obesity-associated hyperlipidemia results in an increased risk of NAFLD pathogenesis. Previously published research has revealed that a metabolically adverse gestational environment produces offspring who experience early onset obesity and adipose tissue dysfunction. To explore the association of this phenotype with the development of NAFLD, we assessed the genetic level changes occurring in offspring born to metabolically adverse pregnancies to investigate whether a high-fat diet would impact the regulation of genes involved in hepatic lipid and glucose metabolism. Methods Female mice with a heterozygous mutation for leptin receptor deficiency (Hetdb) were mated with C57BL/6J wild type (Wt) males and resulting Wt offspring were collected for study. At seven weeks of age, offspring born to Hetdb and Wt dams were separated into two dietetic groups: high-fat/high-fructose diet (HFFD) or a control diet (CD). Offspring were maintained on diet until euthanasia at 22 weeks of age. Whole liver samples were collected and flash frozen. RNA was extracted from the liver samples to be used in cDNA synthesis for quantitative real-time PCR to quantify expression of genes important for lipid (Pepck and G6pc) and glucose (Cpt2, Fatp5, Fatp2, and G6pc) metabolism. Differences in offspring gene expression were assessed using a one-way ANOVA and Tukey's post-hoc test, with a p-value < 0.05 considered to be statistically significant. Results Offspring fed the HFFD who were born to Hetdb dams experienced significant upregulation of genes involved in gluconeogenesis when compared to both the offspring of Wt and Hetdb dams fed CD (n=7-9 per group). These same offspring experienced a significant downregulation of genes involved in lipogenesis when compared to the two groups fed CD. Conclusion Maternal metabolic dysfunction, here demonstrated by the Hetdb mouse model, seemingly programs a vulnerability into the offspring during development, resulting in an upregulation of genes involved in glucose synthesis but a downregulation of genes involved in fatty acid formation. Genetic dysregulation of these metabolic genes has historically been identified as the result of selective insulin resistance, common among those with NAFLD. Poor dietary habits, such as those introduced by the HFFD, seemingly amplifies the dysregulation seen through the Hetdb model. Further investigation using Western blotting will be critical in understanding the protein expression resulting from such genetic dysregulation, and may help identify the mechanistic basis of these changes. Improving the knowledge gap between genetic inheritance and disease pathology, as demonstrated here, is critical for a comprehensive understanding of maternal and fetal health outcomes.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 148
Presenter: Forough Jahandideh
Supervisor: Bourque, Stephane
Title: Fecal Slurry-induced Peritonitis as a Model of Late-onset Sepsis in Neonatal Rats
Authors: Forough Jahandideh, Kimberly Tworek, Ronan Noble, Kimberly Macala, Stephane Bourque

Theme: Children's health and well-being

Introduction: Neonatal sepsis is a dysregulated host response to pathogens which can result in organ injury and death. Late-onset sepsis (LOS), defined as sepsis onset after 72h of life, is a leading cause of mortality in neonates. The incidence rates for LOS in preterm infants is 20-38%, and mortality rates range from 10 to 30%. Neonatal sepsis occurs during a period of developmental plasticity, and thus may cause persistent effects that predispose survivors to health complications in later life. However, the lack of well-defined experimental models of LOS has hampered progress in this field. The aim of this study was to develop a preclinical model of LOS along with a non-invasive scoring system to assess sepsis severity in neonatal rats. Methods: At postnatal day 3, approximating gestational age of 31 weeks in humans, rat pups were injected with fecal slurry (FS) at doses of 0.25, 0.5, 0.75, 1.0, and 1.25mg/g to induce sepsis; control pups received vehicle (5% dextrose). All pups received subcutaneous injections of buprenorphine at the time of injection, as well as antibiotics (Ampicillin 20mg/kg and Gentamicin 4mg/kg) and fluids at 4h and 16h post-FS. Pup health indicators (color, mobility, righting reflex, presence of milk in the stomach, scattering, breathing, and hunched posture) were assessed every 2h for the first 16h post-FS injection, and then twice daily thereafter for 72h. In collaboration with veterinarian, pups reaching humane endpoints were euthanized and classified as non-survivors. A subset of surviving pups was euthanized at 4, 8, 12, and 24h, post-FS injection for plasma and tissue collection. Results: All non-surviving pups were identified and euthanized between 4 and 12h post-FS injection; no pups reached humane endpoints beyond 12h post FS-injection. Mortality rate for FS at 0.25, 0.5, 0.75, 1.0, and 1.25mg/g was 0±0%, 0±0%, 4.4±2.4%, 31.9±5.4%, and 80.4±3.0%, respectively ($P<0.001$). We developed a novel neonatal rat sepsis score (nRSS), based on the skin color (scoring from 0-4 for pink to grey); mobility (scoring as 0 and 1 for mobile and non-mobile); and righting effort/ability (scoring as 0-5 for vigorous effort [>30s] to no effort [<10s]). Cumulative overall scores correlated with general health; controls scored lowest (1.2±0.6), while septic survivors and non-survivors invariably scored higher (3.6±0.6 and 9.8±0.2, respectively, $P<0.001$). Plasma markers of liver injury (alanine aminotransferase) and systemic inflammation (IL-1β and IL-6) were also correlated with the severity of sepsis ($P<0.0001$ for all markers) as well as time ($P<0.0001$ for all markers). Among the studied biomarkers, only plasma IL-6 levels were higher in non-survivors (39.60±2.01) compared to their time-matched surviving littermates (8.34±2.98, $P<0.0001$). Conclusions: We identified a dose of FS that causes 30% mortality in neonatal rats (1.0mg/g), which recapitulates that seen in human cases of LOS. We also designed a novel composite nRSS which is a useful surrogate to evaluate sepsis severity in neonatal rats. Sepsis biomarkers of organ injury and systemic inflammation correlated with the developed nRSS. Future work will endeavor to determine whether neonatal sepsis is associated with developmental programming effects in the adult offspring.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 149
Presenter: Zachary Meyer
Supervisor: Zheng, Yao
Title: Gene-environment transactions between peer tobacco use, parental supervision, and Chinese adolescent tobacco initiation
Authors: Zachary Meyer, BSc., Jennifer B. Unger, Ph.D., Frühling Rijsdijk Ph.D., Yao Zheng Ph.D.

Theme: Children's health and well-being

Introduction: Tobacco use continues to cause preventable disease and death that stresses healthcare systems globally. Tobacco initiation in adolescence can increase the risk for tobacco use maintenance and abuse of other substances in later life. Low parental supervision (PS) and high peer tobacco use (PTU) are risk factors for adolescent tobacco initiation (ATI). Twin research has suggested a shared genetic etiology between PS, PTU, and ATI, yet few studies have explored these factors concurrently. Extant research primarily focuses on Western populations, with scant studies examining Chinese twins. This study explored gene-environment interactions (G×E) and correlations (rGE) involving PS and PTU with ATI in a large sample of Chinese twins observed from early to mid-adolescence. We hypothesized that: 1) shared environmental influences on ATI would be larger in Chinese adolescent twins than in Western populations; 2) rGE between ATI, PTU, and PS would show common genetic factors partially explaining the links between them; and 3) PS and PTU could moderate genetic influences on ATI in Chinese adolescents, where higher levels of supervision would suppress, while high levels of PTU would magnify genetic influences on ATI. Methods: 602 Chinese twin pairs (52% female) were assessed at 2 time points (Mage = 12 and 15 years). Participants reported lifetime tobacco use, parental supervision, and peer tobacco use via paper-pencil questionnaires at each timepoint. Univariate biometric models decomposed the phenotypic variances of each variable into genetic (A), shared (C), and non-shared (E) environmental components. Bivariate biometric models examined both phenotypical associations as well as the extent to which common genetic and environmental factors influenced the links between ATI, PS, and PTU. To examine G×E, bivariate moderation modelling was implemented to explore the moderating effects of PS and PTU on both genetic and environmental influences on ATI. Results: Univariate modelling indicated that genetic influences on ATI increased over time, while both shared and non-shared environmental influences decreased. Bivariate modelling showed that at both timepoints, the phenotypic correlations between PTU and ATI were larger than those between PS and ATI. There was a significant negative genetic correlation between PS and ATI at time 2, while all other common genetic or environmental correlations at each timepoint were nonsignificant. PTU moderated the unique genetic contributions to ATI only at time 2, such that genetic influences on ATI increased at higher levels of PTU. Conclusion: The amplifying effects of PTU on the genetic influences of ATI is consistent with the diathesis stress model. Peers appear to exert larger influences on ATI than parents. Peer influences are often conceptualized primarily as social processes; however, the current findings also illustrate their role in modulating biological mechanisms of behavioural development. The significant G×E of PTU at time 2 but not time 1 is noteworthy as this suggests G×E ×development, wherein G×E between PTU and ATI is contingent upon an individual's current developmental stage, thus offering a potential window for prevention.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 150
Presenter: Leila Rittey
Supervisor: McBrien, Angela
Title: Reliability of fetal echo from 10-15 weeks of gestation - A single centre experience
Authors: Leila Rittey - Fetal and Neonatal Cardiology Fellow Cleighton Boehme - MSc student Luke Eckersley - Fetal and Neonatal Cardiologist Lisa Hornberger - Fetal and Paediatric Cardiologist Angela McBrien - Fetal and Paediatric Cardiologist

Theme: Children's health and well-being

Introduction Early fetal echo (EFE) at <16 weeks of gestation has been carried out as part of routine clinical practice by the University of Alberta Fetal and Neonatal Cardiology Program since 2009, followed by mid-trimester fetal echo for ongoing pregnancies. Reliability of EFE is essential, as findings are used to reassure high risk families and for prognostication for those with abnormal findings. The aim of this study is to review the accuracy of EFE conducted in our centre. Methods Our electronic database was searched to identify all fetal echoes carried out from 10+0-15+6 weeks of gestation from January 1, 2009 to December 31, 2018. EFE results were classified as normal or abnormal. We described the EFE as normal if a balanced 4 chamber view and two great arteries crossing over with no obvious septal defects was reported. All those with an abnormal EFE result were reviewed in more detail to assess the gestational age at diagnosis and for any changes to the diagnoses on follow up scans, if they occurred. Of the group with normal EFE results, a random sample of 432 was taken to determine if any cardiac anomalies were detected on subsequent fetal echocardiograms. To determine EFE accuracy, we compared the EFE result to subsequent fetal echo undertaken from 18 weeks onwards. Any patient who did not have a fetal echo from 18 weeks gestation onwards was excluded from the accuracy analysis. Results During the study period, 965 EFEs were carried out. 72 (7.5%) had cardiac pathology of which, 24 had a subsequent fetal echo □ 18 weeks of gestation. 3 of these cases were not structural heart disease and resolved at follow up. In the 21 with congenital heart disease this was confirmed on later scan. Of the 432 normal EFE studies analysed 94.7% (409/432) had a normal follow up scan, 21 were lost to follow-up and 1 had a fetal demise. In 26 cases with a normal EFE, follow-up scans were abnormal. These included 10 with structural heart disease (7 with ventricular septal defects, 1 with a complete AVSD, 1 with a right aortic arch, 1 with suspected partial anomalous pulmonary veins and a sinus venosus defect), 6 with a suspicion of coarctation of the aorta, 4 who developed arrhythmias (2 developed a degree of atrioventricular block in monitoring for SSA antibodies, 2 with regular atrial ectopics beats), and 6 with minor or progressive structural heart disease (3 with mild ventricular hypertrophy, 1 with mild pulmonary stenosis, 1 with a mildly dysplastic aortic valve, 1 with restrictive cardiomyopathy and ventricular tachycardia). Based on the data we currently have the positive predictive value of EFE is 100%, the negative predictive value was 94%. For those with structural heart disease sensitivity was 67.7% with a specificity of 97.6%. Conclusion This study has shown that EFE from 10-15 weeks is accurate in skilled hands; both at correctly identifying and excluding congenital heart disease. This can reliably provide reassurance to those families attending for fetal echo at this early gestation.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 151
Presenter: Elise Kammerer
Supervisor: Ali, Samina
Title: Advocacy as a method to improve children's pain experience at the Stollery Children's Hospital
Authors: Elise Kammerer, Joelle Fawcett-Arsenault, Lexyn Iliscupidez, Katie Caldwell, Joshua Eszczuk, Samina Ali

Theme: Children's health and well-being

Background: In Canadian hospitals, children's pain is often undertreated. The Stollery Children's Hospital (SCH) is committed to improving children's pain through research and quality improvement (QI) and, supported by a partnership with Solutions for Kids in Pain (SKIP), is working towards ChildKind International certification. This certification will demonstrate SCH's dedication to children's comfort and pain care. Methods: This project seeks to understand how advocacy can help improve children's pain at SCH. Qualitative data was elicited through interviews with 18 healthcare professionals (HCPs), 12 patient-caregiver dyads, and 344 caregivers who completed a survey on pain management in the SCH emergency department, from Fall 2020 to Summer 2022. Qualitative and open-ended data from all studies was thematically coded using a codebook, which was co-developed by EK, LI, and KC. Coding reliability was confirmed with two-person coding. Data coded to the themes of advocacy, collaborative care, and family-HCP interactions across studies were further analyzed into sub-themes. This QI initiative received ethics exemption from the Research Ethics Board (University of Alberta). Results: Our team identified three sub-themes that suggest how advocacy may improve children's pain care at SCH: 1. increased knowledge mobilization tools to improve patient and caregiver awareness of pain management strategies that they can advocate for; 2. improved emphasis on collaborative care between the HCP, child, and caregiver that values and centres the patient voice; and 3. better education for HCPs on multimodal pain management strategies so that they may advocate for better pain care for children. Together, these themes encompass patient, family, and HCP experiences, and emphasize the importance of working together to improve children's pain care. Conclusions: Participants identified that improved advocacy by HCPs, children, and their caregivers can improve children's pain care. Advocacy, however, can feel unsafe to patients of families if HCPs receive this advocacy poorly or dismiss it. The results of this study will support patient-centred care and the implementation of collaborative care models to provide a safe space for advocacy to improve children's pain at SCH.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 153
Presenter: Alexa Thompson
Supervisor: Charlton, Carmen
Title: Syphilis coinfection among prenatal patients infected with HCV in Alberta: a retrospective cross-sectional study
Authors: L.Alexa Thompson, Sabrina S. Plitt, Jennifer Gratrix, Carmen L. Charlton

Theme: Pregnancy and developmental trajectories

Introduction Hepatitis C virus (HCV) was added to the Alberta Prenatal Screening Program for Select Communicable Diseases in 2020 as part of a pilot project. Concomitantly, a syphilis outbreak was declared in Alberta, resulting in a surge of congenital syphilis infections. We aimed to identify the prevalence of syphilis coinfection among prenatal patients diagnosed with HCV during the pilot program and analyze the distribution of demographic factors among coinfected individuals. Methods HCV test results were extracted from the ProvLab Laboratory Information System (ProvLab LIS) 21 months after implementing the pilot universal HCV screening program. Prenatal patients testing positive for HCV RNA were used to generate a cohort of individuals with active HCV infection. Prenatal syphilis test results were extracted from the ProvLab LIS for all HCV positive individuals and analyzed for coinfection, defined by a newly positive Treponema pallidum particle agglutination (TPPA) result or ≥4-fold increase in rapid plasma regain (RPR) titres for those with previous infections. Descriptive statistics were analyzed for all HCV/syphilis coinfected patients. Results Over a 21-month period, 87 prenatal patients tested positive for HCV. Of those, 17 were confirmed to have active syphilis infection (19.5% coinfected). Six coinfected patients had a first-time positive syphilis infection (newly reported TPPA reactivity) while 11 were re-infected with syphilis (at least a 4-fold increase in RPR titres from previous serological testing). The majority of coinfected patients resided in the Edmonton zone (58.8%), were from the lowest income quintile neighbourhoods (47.1%), and were previously positive for HCV (82.4%) and syphilis (64.6%) in the ProvLab LIS. Conclusion The prevalence of HCV/syphilis coinfection is high in Alberta. A high rate of previous positivity in the public health laboratory system suggests more work is needed to engage patients infected with HCV and syphilis into care prior to conception. In order to prevent congenital outcomes across the province, diagnosis and treatment of sexually transmitted and bloodborne infections should remain a priority during pregnancy.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 154
Presenter: Keatton Tiernan
Supervisor: Storey, Kate
Title: Blazing the path from within: understanding the perspectives of Indigenous youth on leadership and educational opportunities for wellbeing, health and Mino-Bimaadiziwin/Mino Pimatisiwin (the way of the good life)
Authors: Keatton Tiernan, Genevieve Montemurro, Kate Storey

Theme: Children's health and well-being

Introduction: Studies have shown that increased leadership skill development in adolescence is positively correlated to increased educational attainment. Education is a crucial social determinant of health and is known to be linked to prominent health outcomes, including life expectancy, chronic disease risk, and quality-adjusted life years. Few studies describe evidence-based best practices for youth-oriented leadership skill development programs in Indigenous youth; and even fewer describe the youths' perspectives on the role that leadership skill development and educational attainment play in their lives. Initiatives serving Indigenous youth must first center the voices of youth. One such program is The Indigenous Youth Mentorship Program (IYMP). IYMP is a community-based peer-led after school program that promotes wholistic wellness, prevents type 2 diabetes and promotes positive mental health including Mino-Bimaadiziwin/Mino Pimatisiwin (the way of the good life). Currently offered in 50 communities across Canada, IYMP is based on a communal mentorship model in which Indigenous youth mentors (students in grades 7-12, ages 14-19 years old) deliver programming for their Indigenous elementary-aged peers (grades 4-5, ages 9-10 years old). This study aims to understand the perspectives of Indigenous youth mentors involved in IYMP, specifically related to leadership skill development and educational attainment, to inform the future development of supports and programming. Methods: Fifteen participants (youth mentors) with experience delivering IYMP in the provinces of Quebec, Ontario, Manitoba, Saskatchewan, and Alberta will be purposefully sampled. Focused ethnography will be used as our guiding method. Data will be generated using one-on-one semi-structured interviews. The interviews aim to understand the youth's relationship with leadership skill development and educational attainment. Specifically, the impact their leadership role with IYMP has had on their relationship with education and their evaluation of the current educational supports offered to them. The interview guide will be developed in partnership with communities and the IYMP research team. The interviews will be audio-recorded and transcribed, and content analysis will be used to identify patterns within the data. Results: Recruitment and data generation have not yet occurred; however, based on previous collaboration with the youth of IYMP, we anticipate results will provide rich insights into the ways systemic barriers, community involvement, resiliency and reconciliation have played in the participants' experiences with leadership and education opportunities. Conclusion: There is a lack of knowledge and understanding of Indigenous youth's perspectives on leadership skill development and educational attainment. This study will provide context to the complicated relationships Indigenous youth have with colonial institutions, such as education, and serve to inform evidence-based programs that focus on supporting the health and Mino-Bimaadiziwin/Mino Pimatisiwin of Indigenous youth.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 155
Presenter: Kara Goodkey
Supervisor: Voronova, Anastassia
Title: Contribution of abnormal oligodendrocyte development to neurodevelopmental KBG syndrome
Authors: Kara Goodkey, Imre Papp, Yana Kibalnyk, Tim Footz, Anastassia Voronova

Theme: Children's health and well-being

INTRODUCTION: KBG syndrome is a rare neurodevelopmental disorder (NDD) caused by mutations in the chromatin regulator gene ANKRD11 (ankyrin repeat domain 11). Chromatin regulators modify epigenetic signatures on many genes; therefore, mutations cause changes in global gene expression. KBG syndrome patients display aberrant brain development, global developmental delay, autism, and intellectual disability. The brain is built by neural stem cells, which must generate neurons and glia (non-neuronal cells oligodendrocytes and astrocytes) in a strict spatio-temporal manner. Our lab previously showed Ankrd11 regulates embryonic neural stem cell (NSC) proliferation and neurogenesis (formation of neurons). However, the role of Ankrd11 in glial cell formation is not known. This is an important question to address as oligodendrocytes (OL) are the only brain cells that form myelin (major white matter component), which is required for efficient neural communication. Aberrations in oligodendrocyte and myelin formation are linked to NDD pathology and symptoms. Oligodendrocytes can also be targeted pharmacologically to restore behaviour and cognition in NDD mouse models. Thus, the major objective of my project is to determine the role of Ankrd11 in oligodendrocyte and myelin development. METHODS: I used a novel mouse model where Ankrd11 is conditionally knocked out in NSCs using a Cre/Lox system (NestinCreERT2; Ankrd11fl/fl or Ankrd11nscKO). Ankrd11 knockout was induced with tamoxifen injection at embryonic day (E) 14, a time point prior to the start of oligodendrogenesis but after the formation of most neurons. Brain development was then analyzed during embryonic, postnatal, and adult time points. RESULTS: Oligodendrocytes develop from NSCs via a 2-step mechanism: 1) NSC to OPC (oligodendrocyte progenitor cell) commitment; and 2) OPC to OL differentiation. First, we corroborated that Ankrd11-deficient NSCs isolated from our novel KBG syndrome mouse model displayed reduced proliferation. I then showed that Ankrd11 knockout in embryonic NSCs does impact NSC commitment to OPCs but does lead to increased OPC proliferation in vitro and in vivo. By postnatal day P15, when OLs first develop, there was a significant increase in the density of mature OL in the white matter tracts (corpus callosum) of Ankrd11nscKO mice. This result was corroborated in vitro. Finally, Ankrd11nscKO mice displayed major brain structural changes during juvenile development, including enlarged lateral ventricle, which may be indicative of hydrocephaly. I am currently analyzing myelination in these mice using electron microscopy. CONCLUSIONS: We show Ankrd11 plays a key role in oligodendrocyte lineage cell formation. These results could help explain the mechanism of common phenotypes in patients and may provide novel paths for pharmacological intervention in children with KBG syndrome or other similar NDDs.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 157
Presenter: Jessica Kelly
Supervisor: Pituskin, Edith
Title: Therapeutic relationships in radiation therapy: perspectives of breast cancer patients undergoing treatment: a qualitative analysis
Authors: Jessica Kelly & Edith Pituskin

Theme: Lifelong women's health

Introduction. Incidence of breast cancer is increasing, with one in every 8 Canadian women diagnosed at some point in their lives. Accordingly, the need to better understand and address issues faced while navigating the treatment path is evident. Over half of women with invasive breast cancer undergo radiation treatment, commonly involving multiple (16-25+) planning and daily treatment visits guided by radiation therapists and radiation therapy treatment team. This secondary analysis aimed to evaluate experiences voiced by women who received radiation therapy as part of their curative breast cancer treatment. Methods. Utilizing interpretive description, secondary analysis of seven qualitative interview transcripts was performed. Participants were female breast cancer patients aged 18 or older undergoing radiation therapy as part of their treatment plan. Results. Analysis of the transcripts yielded common themes through the treatment experience. Those themes correlated to increased patient satisfaction included patient empowerment via increased knowledge of their respective treatment plan; radiation therapists who practiced with high levels of compassion and empathy; and clear, concise communication amongst the interdisciplinary treatment team. Decreased patient satisfaction was associated with themes of: perceived lack of empathy and/or lack of compassion expressed by radiation therapists; suboptimal therapeutic communication skills of the radiation treatment team; and lack of supportive healthcare resources (both in the community and treatment center). Conclusion. This secondary analysis emphasizes the need for radiation therapists and radiation treatment teams to develop and support a foundational rapport with breast cancer patients undergoing treatment. Areas of potential improvement for clinical care are indicated, as well as areas for development in training programs of radiation therapy healthcare professionals. Acknowledging and improving aspects of the treatment encounter will enhance the healthcare experiences of breast cancer patients receiving this treatment modality.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 158
Presenter: Shivani Solanki
Supervisor: Storey, Kate
Title: Using arts-based research to explore the relationship between smoking behaviours and mental health of youth in Canada
Authors: Shivani Solanki, Genevieve Montemurro, Kate Storey

Theme: Children's health and well-being

Introduction: Schools are ideal settings for health promotion as they reach diverse youth, shape healthy behaviours at an early age, and can support educational outcomes. Students Together Moving to Prevent Tobacco Use (STOMP) program, is a national school-based smoking cessation and prevention program led by Physical and Health Education Canada currently being delivered in 8 school communities. STOMP takes a comprehensive school health approach, and prioritises youth engagement as part of the intervention. Previous research has highlighted a link between smoking and mental health in youth. Youth voice is important in understanding and addressing smoking behaviours and mental health. The purpose of this research is to gain an understanding of the experiences and perceptions, specifically those relating to smoking and its relationship with mental health, among youth within STOMP schools using a qualitative arts-based, participatory action research (PAR) approach. Methods: This study will utilise a focused ethnographic approach with focus groups and arts-based research (ABR) guiding the data generating strategies and guided by critical theory. ABR is a way to explore and understand participants' experiences using creative arts such as photographs, collages, and drawings. Participants from grades 7 to 12 will be recruited from all eight STOMP schools across Canada. Schools are diverse in geography (urban, rural, remote) and youth demographics. Qualitative data will be generated through focus groups (n=4-8 participants x 8 schools), art projects, and a group discussion. Focus groups will be transcribed and data will be analysed using inductive thematic analysis. Youth will reflect on and depict their experience through an art project guided by the topic of the relationship between smoking behaviours and their mental health. Youth will participate in a group discussion where they will share and describe their art project to the group. The arts-based data will be initially analysed with the youth to identify common themes and experiences, to include youth contributions to data interpretation. Results: Data interpretation and results presentation will be completed with youth engagement in 2022-2023. Final interpretations and findings will be shared with youth before dissemination, incorporating their insights and suggestions for knowledge sharing. Conclusion: Findings from this research study will contribute to a better understanding of youth perceptions related to smoking behaviours and mental health. This research study may be used to inform future interventions to support youth mental health within smoking prevention and cessation programs.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 159
Presenter: Si Ning Liu
Supervisor: Bourque, Stephane
Title: Neonatal sepsis increases mitochondrial respiration in the liver but not kidneys at 4 hours after sepsis induction
Authors: Si Ning Liu, Forough Jahandideh, Jad-Julian Rachid, Kimberly Tworek, Ronan Noble, Claudia Holody, Hélène Lemieux, Kimberly Macala, Stephane Bourque

Theme: Children's health and well-being

Introduction: Neonatal sepsis is the dysregulated host response to infection which can lead to organ dysfunction and death. Late-onset sepsis (LOS) is defined as sepsis which occurs after 72h of birth. LOS commonly occurs in preterm infants with an incidence of 20-38% and a mortality rate of 10-30%. The inflammatory response during sepsis onset may alter host energy metabolism. As the primary site of cellular energy production, mitochondria play a fundamental role in maintaining metabolic homeostasis. Although the impact of sepsis on mitochondrial function in adults has been explored to some extent, the consequences of LOS on newborn mitochondrial function remains unknown. Here, we sought to explore the acute effects of LOS on mitochondrial function in highly metabolic organs such as liver and kidney. Methods: LOS was induced in 3-day-old Sprague Dawley pups (approximately equivalent to 31 weeks gestation in humans) by injecting fecal slurry (FS, 1.0 mg/g body weight), intraperitoneally; controls received vehicle (5% dextrose in water). We have shown this dose of FS causes ~30% mortality in postnatal day 3 pups within 24h post injection. All pups received sustained release buprenorphine (0.5mg/kg, subcutaneous) for pain control. Pups were euthanized at 4h post-injection of FS, which precedes the most severe manifestations of sepsis in pups. Pups were euthanized, and the left lateral lobe of the liver and the left kidney were harvested and homogenized for assessment of mitochondrial function by high resolution respirometry (Oroboros O2K System). The remaining liver and right kidney were flash frozen for RT-qPCR and isolation of genomic DNA to assess the ratio of mitochondrial DNA/nuclear DNA (mtDNA/nDNA) as an indicator for mitochondrial content. Results: Liver mitochondrial respiration was significantly increased in FS-injected pups compared to controls. Male and female livers of FS-injected pups showed an 81.9% and 30.8% increase in NADH pathway respiration ($P=0.017$ and $P=0.0003$, respectively) as well as a 65.0% and 32.8% increase in succinate pathway respiration ($P=0.045$ and $P=0.027$, respectively). Liver complex IV respiration did not differ between control and FS-injected pups. Interestingly, kidney mitochondrial function was largely unaffected at 4h post FS-injection in either sex. Changes in liver mitochondrial respiration was accompanied by a 4.2-fold ($P<0.0001$) upregulation of Pgc1α (master regulator of mitochondrial biogenesis) for both sexes. However, Tfam, which regulates transcription and replication of mitochondrial DNA, was downregulated by 19% ($P=0.007$) and 20% ($P=0.02$) in the septic male and female liver, respectively. Additionally, Fis1, which encodes a protein involved in mitochondrial fission, is also downregulated by 24% ($P=0.02$) in livers of septic males and females. Finally, the ratio of liver mtDNA/nDNA was not different between vehicle and FS-injected pups at 4h post-injection. Conclusion: FS injection caused liver-specific changes in mitochondrial respiration at 4h post-FS injection. Whether these mitochondrial changes are adaptive or maladaptive is still under investigation, but this work may identify the mitochondrion as a target for intervention in the treatment of LOS.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 160
Presenter: Sumaiyah Shaha
Supervisor: Riddell, Meghan
Title: Elucidating the role of atypical protein kinase Cs in syncytiotrophoblast fusion
Authors: Sumaiyah Shaha, Josiah Kwong, Wendy Duan, Meghan Riddell

Theme: Pregnancy and developmental trajectories

Introduction The syncytiotrophoblast (ST) is the terminally differentiated epithelial cell that forms the human placenta maternal/fetal interface. It is therefore a critical cell for health of the placenta and pregnancy. Recently, trophoblast stem cell (TSC) differentiation into ST was shown to be regulated by atypical protein kinase-C (aPKC). There are two major forms of aPKC: aPKC-ι and aPKC-ζ. APKC-ι knock-down in TSC blocked ST differentiation. Importantly, compensation for aPKC-ι by aPKC-ζ is well described, but aPKC isoforms can also act redundantly. Recently, we found that the human placenta expresses two aPKC-ζ isoforms in addition to aPKC-ι. Thus, we examined the expression of aPKC-ζ isoforms in TSC and primary human cytotrophoblast progenitors (CTs) and assessed the role of total aPKC activity in ST differentiation. Methods Human CTs were isolated from 6-7 week gestational age or elective caesarean section term placentas. RT-PCR analysis was used to assess PRKCZ isoform 1 and 2 mRNA expression in CTs and TSC cultured in Okae TSC maintenance medium. EdU proliferation assays were performed in CTs and TSCs +/- total aPKC inhibitor and the proportion of nuclei with incorporated EdU were manually counted. Additionally, first trimester and term human isolated CTs, and TSCs were assessed for ST fusion +/- total aPKC inhibitor. To form ST, CTs were cultured with Br-cAMP for 24 hours, then for an additional 48 hours without Br-cAMP and TSCs were differentiated using the 6 day Okae ST protocol. Cultured cells were fixed and stained using anti-E-cadherin antibody and Hoechst (nuclear stain) to demarcate cell borders and multinucleate ST formation was measured by counting the proportion of fused nuclei. Students T-test was used for all statistical analyses. Results First trimester CTs cultured in Okae TSC medium expressed significantly higher levels of PRKCZ isoforms than TSCs ($n=3$, $p<0.05$). First trimester CTs cultured in TSC medium with aPKC inhibitor had a 51.3% decrease in proliferation ($n=3$, $p<0.05$), yet, TSC proliferation was not affected. ST fusion was not significantly decreased with aPKC inhibitor in first trimester CTs, term CTs, and TSC cell lines. Conclusion Choice of model to study physiologic functions in trophoblasts are key when understanding trophoblast biology. The significantly higher mRNA expression levels of PRKCZ isoforms in human CTs compared to TSCs suggests long term passaging and culture of TSC cell lines alter physiologic cell signalling in this cell line. Total aPKC inhibitor did not inhibit human first trimester CTs, term CTs, and TSCs ST fusion as previously described during single aPKC-ι knock-down in TSCs. Thus, aPKC isoform specific roles will be important to understand as they control key processes in trophoblast lineage differentiation. A future direction is to perform aPKC isoform specific siRNA mediated knock down to address the contributions of individual isoforms to ST fusion. Understanding the detailed mechanisms controlling ST fusion will fill key knowledge gaps about ST homeostasis maintenance. Since ST differentiation is often disrupted in pregnancy complications, this could unveil potential therapeutic targets for treatment of placental pathologies and healthier mothers and children in the future.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 161
Presenter: Yiqun Wu
Supervisor: Zheng, Yao
Title: Daily acculturation processes in ethnic/racial minority Canadian freshmen: The role of agreeableness, inter-ethnic contact, and perceived discrimination
Authors: Yiqun Wu, Jingyi Xu, Yishan Shen, Yijie Wang, & Yao Zheng

Theme: Children's health and well-being

Introduction: Acculturation, more specifically the acquisition of a mainstream cultural orientation, is a vital developmental task for ethnic/racial minority adolescents during the transitions into university. Scarce research has examined acculturation processes among Canadian adolescents and young adults at a micro daily timescale. Despite the similarity to the US populations in multiple aspects, Canadian populations could provide unique insights given Canada's distinct population demographics and immigration policies. Daily diary studies have suggested that personality and acculturation processes can change in response to daily experiences and situational factors. As such, this study examined how individual (i.e., agreeableness) and interpersonal (i.e., inter-ethnic contact, perceived discrimination) factors are associated with acculturation as dynamic daily within-person processes. Methods and Results: A total of 209 ethnic/racial minority (52.72% Asian, 5.43% as Black or African, 4.79% as Multiracial, .96% as Aboriginal, .96% as Latino or Hispanic, and 5.43% as Other) freshmen (Mage = 18.X years, 69% female) completed an online baseline survey (~ 40 minutes) followed by 30 consecutive days of daily surveys (~ 15 minutes daily). Multilevel structural equation models with Bayesian estimation were constructed and showed a positive indirect effect between agreeableness and acculturation through inter-ethnic contact at both within- and between-person level. At the within-person level, discrimination moderated the link between agreeableness and acculturation, such that for students on days with lower discrimination, higher levels of agreeableness were associated with higher levels of acculturation; this link nonetheless was suppressed on days with higher levels of discrimination. Conclusions: Agreeableness, inter-ethnic contact, and racial/ethnic discrimination jointly contribute to the dynamic acculturation process at daily level with inter-ethnic contact serving as a promotive factor while discrimination as a risk factor. To promote ethnic/racial minority adolescents' and young adults' well-being and successful adaptations into the mainstream environment, we should encourage them to engage in inter-ethnic contact, but also inform them the potential discrimination experience that may occur along the way, in which case they should learn how to protect themselves from the detriments of discrimination. Moreover, those low on agreeableness are at particular risk for having lower levels of inter-ethnic contact, and we should be mindful of these individuals and situations when individuals feel low on agreeableness. The intensive longitudinal data leveraged in the current study demonstrated that it may be worthwhile to continue utilizing the multilevel approach in future research on adolescent and young adult acculturation processes at a micro timescale. Future studies that assess other personality traits (e.g., culture-related openness to experience) and capture wider forms of inter-ethnic contact and discrimination are needed to replicate and extend our findings.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 162
Presenter: Jenna Richardson
Supervisor: Clugston, Robin
Title: Dietary Vitamin A Intake versus Hepatic Vitamin A stores in Determining the Vitamin A Status of Offspring
Authors: Richardson JM, Sanchez Enkerlin A, Clugston RD. Department of Physiology, University of Alberta, Edmonton, Alberta, CA Woman and Children's Health Research Institute, Edmonton, Alberta, CA

Theme: Children's health and well-being

Introduction Vitamin A (VA) status is an important health determinant. Deficiency of this micronutrient is a serious global health issue and is the leading cause of preventable blindness in children and a significant contributor to long-term morbidity and mortality. Nutritional demands for VA are highest during stages of life such as pregnancy, lactation, and early childhood. The objective of this study is to assess the primary determinant of VA reserves in offspring, by examining the contribution of maternal VA stores versus dietary VA intake during gestation and lactation. Methods In our diet study (Study 1), wild-type pregnant mice were split into two groups, one receiving a VA sufficient diet (25 IU VA/g), and one receiving a VA deficient diet (VAD; 0 IU VA/g), during pregnancy and lactation. Tissues were collected from birth (postnatal day [P]1), during lactation (P7), weaning (P21), and two weeks post-weaning (P35). Tissue retinol and retinyl ester concentrations (VA content) were determined by high performance liquid chromatography (HPLC) analysis and compared using an unpaired Student's t-test. In our genetic intervention study (Study 2), VA was measured from hepatic tissues using HPLC collected from the offspring of Lrat-/- and wild-type female mice at P1, P7, and P21. Utilizing Lrat-/- dams ensured no maternal hepatic stores would be present, allowing us to examine diet as the exclusive contributor to offspring reserves. Results Our results show a direct relationship between maternal VA intake and mean liver retinol and retinyl ester content in offspring. In Study 1, offspring from dams consuming a VAD diet had consistently lower hepatic VA levels than control. The livers from P7 pups displayed a 50% reduction of retinol ($p<0.001$), but no significant change in retinyl ester. At P21, there was a 42% reduction of hepatic retinol ($p<0.01$), and 78% reduction of retinyl ester ($p<0.001$). Remarkably, these changes persisted two weeks post-weaning, despite weaned pups consuming the same amount of dietary VA: at P35, there was a 68% reduction of hepatic retinol ($p<0.001$) and 95% reduction of retinyl ester ($p<0.001$). All other physical parameters (body weight, liver weight, age, litter size) displayed no significant differences between dams and pups of different groups. In Study 2, we observed no significant reductions in the hepatic VA status of heterozygous offspring born to Lrat-/- females versus wild-type females, despite Lrat-/- females lacking hepatic VA stores. Conclusion Our studies support the hypothesis that maternal dietary VA intake is critical in establishing adequate VA reserves in offspring, with dietary intervention suggesting that maternal hepatic stores cannot compensate for a VAD diet. Genetic dissection using Lrat-/- dams reinforces that appropriate maternal dietary VA intake is crucial, allowing the development of adequate VA reserves in offspring despite the absence of maternal hepatic stores. Moreover, we report low hepatic VA reserves do not recover post weaning in offspring from dams consuming a VAD diet. These studies generate new knowledge of VA transfer between mother and offspring and has the potential to be translated into improved approaches to mitigate the effects of childhood VA deficiency.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 163
Presenter: Ehsan Misaghi
Supervisor: Waskiewicz, Andrew
Title: An Initial Characterization of Novel Contributors to Superior Coloboma and the Closure of the Superior Ocular Sulcus During Development
Authors: Misaghi, Ehsan; Yoon, Kevin; Wilson, Melissa; Herzog, Jens; Waskiewicz, Andrew

Theme: Children's health and well-being

Introduction: The superior ocular sulcus (SOS) is a transient developmental fissure that forms within the superior eye. Improper closure of this structure can result in a phenotype in zebrafish that resembles the human condition superior coloboma, an atypical form of ocular coloboma. Coloboma results from improper closure of the choroid fissure and is the cause of 3-11% of congenital blindness in children. Even though the choroid fissure and coloboma of the inferior eye have been widely studied, the mechanisms involved in the formation and closure of the SOS and the genetic causality of superior coloboma remain largely understudied. Methods: We have used whole exome sequencing to identify genetic variants in patients with superior coloboma. Using zebrafish as a model organism, we have investigated the roles of these genes in the formation and closure of the SOS during development. We are also using RNA sequencing to identify novel candidate genes involved in this process. Results: We have demonstrated the potential importance of Bmp-dependent ocular dorsal eye patterning in SOS closure. We have also uncovered variants in the mTOR regulator, TSC2; the ventral eye patterner, VAX2; and the planar cell polarity (PCP) gene, SCRIB. Our current investigations show that loss of tsc2, vax2, and the PCP gene, vangl2, independently, result in delays in SOS closure in zebrafish. Through RNA sequencing, we have also identified multiple novel candidate genes whose roles in the formation and closure of the SOS have not yet been studied. Conclusion: Taken together, our results have extended our knowledge of the regulation of SOS closure by implicating the possible roles of the PCP pathway, mTOR signaling, and ventral eye patterning. However, these results also affirm that the causes of superior coloboma are likely combinatorial and that multiple pathways might be involved in its causality. Our eventual goal is to determine the gene(s) and/or pathway(s) responsible for the closure of the SOS and to create an ultimate zebrafish model of superior coloboma.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 164
Presenter: Nazanin Arjomand Fard
Supervisor: Wine, Eytan
Title: Virulence Traits of Bacteria Isolated from Non-inflamed sections of the Colon in Pediatric IBD Patients.
Authors: Nazanin Arjomand Fard, Michael Bording-Jorgensen, Jesse Webb, Simona Veniamin, Troy Perry, Eytan Wine.

Theme: Children's health and well-being

Background and Aims: As inflammation can impact microbes, our lab has focused on non-inflamed bowel sections of pediatric patients with inflammatory bowel diseases (IBD) and found bacterial alterations in the terminal ileum. We are also interested in the appendix given the involvement of the peri-appendicular region and effects of appendectomy in ulcerative colitis. In this study, we aimed to identify and evaluate microbes from the appendix and non-inflamed regions of the colon in pediatric IBD patients. We hypothesized that microbes originating from the non-inflamed sections of the colon or appendix are more invasive and could trigger inflammation in IBD patients. Methods: 16S DNA Sanger sequencing was performed on bacteria, aerobically and anaerobically cultured from tissues of the appendix, peri-appendicular region, cecum, and ascending colon, collected from the resected colons of 5 pediatric IBD patients. The invasive capacity of the identified bacteria was evaluated by gentamicin protection assays on Caco-2, intestinal epithelial cells in vitro. The presence of select invasive or adhesive genes in the bacteria was assessed by PCR. Results: Escherichia coli was the most frequently cultured species in the aerobic cultures; additional aerobic species included Enterococcus and Klebsiella. Bifidobacterium and Erysipelatoclostridium were identified among the anaerobic cultures. Gentamicin protection assays indicated that Klebsiella isolated from the peri-appendicular region was significantly more invasive (mean ~3000 CFU/ml) than HB101 (~1000 CFU/ml; non-invasive control; $P<0.05$). Enterococcus avium and Enterococcus faecalis were also more invasive than HB101 in the peri-appendicular region (~10000 CFU/ml) and cecum (~4000 CFU/ml; $P<0.05$), respectively. E. coli isolated from the appendix showed a higher invasive potential (~3000 CFU/ml) than E. coli isolated from other sections. Additionally, PCR showed that E. coli obtained from different sections, except the ascending colon of one the patients, had the fimH gene while the other types of bacteria did not. None of the isolated bacteria had Hemolysin (hlyA) or attaching and effacing (eaeA) genes. Conclusion: Bacteria, especially E. coli, from non-inflamed bowel in pediatric IBD (including the appendix) appear to have increased invasive potential. This suggests that the microenvironment in these regions could be altered, resulting in increased invasion of bacteria or the gut harboring more invasive microbial populations in pediatric IBD patients. As a result, inflammation could be triggered or exacerbated through this reservoir of pathobionts.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 165
Presenter: Sabrina Fox
Supervisor: Waskiewicz, Andrew
Title: BMP3/bmp3 is a novel regulator of jaw development
Authors: Sabrina C. Fox, Pranidhi Baddam, Daniel Graf, Andrew J. Waskiewicz

Theme: Children's health and well-being

Introduction: Craniofacial abnormalities, including abnormalities affecting the lower jaw, represent 1/3 of all congenital abnormalities and can cause serious difficulties with speaking, breathing, and eating in affected children. However, how craniofacial development is regulated during embryogenesis is incompletely understood. More specifically, the factors and signaling pathways that shape the cartilage that gives rise to the craniofacial skeleton remain poorly characterized. Here, we characterize the role of bone morphogenetic protein 3 (BMP3/bmp3) in embryonic jaw development. Methods: CRISPR/Cas9 mutagenesis was used to create bmp3 mutant zebrafish. The cranial morphology of adult zebrafish was visualized using micro-Computed Tomography (uCT) scans, and Alcian blue staining was used to visualize cartilage in larval zebrafish. The localization of bmp3 mRNA was visualized using wholemount in-situ hybridization. Smad3 phosphorylation was detected using immunofluorescence with a phospho-Smad3 (pSmad3) primary antibody. Smad3 phosphorylation was inhibited by treating embryos with 3uM specific inhibitor of Smad3 (SIS3) (or an equivalent volume of DMSO as a control). Chondrocyte morphology was visualized using Wheat Germ Agglutinin conjugated to an Alexafluor 647 fluorophore. Results: Adult bmp3 mutants have altered cranial morphology compared to wild type siblings, and uCT scans of adult zebrafish indicate that bmp3 mutants display significantly shorter premaxillae, maxillae, and mandibles compared to wild type siblings. Additionally, Alcian blue staining of larval jaw cartilage indicates that the chondrocytes of Meckel's cartilage (the cartilage element that forms the lower jaw) are disorganized in bmp3 mutants compared to wild type controls, further implicating bmp3 as a regulator of jaw development. In-situ hybridization reveals that bmp3 is expressed adjacent to the jaw at 66 hours post fertilization (hpf), and pharmacological inhibition of Smad3 (the intracellular protein activated by Bmp3) in 12-hour intervals from 24 to 84 hpf indicates that bmp3 is likely regulating jaw development from 60-72 hpf. Accordingly, Smad3 (the intracellular protein activated by Bmp3) is phosphorylated in Meckel's cartilage from 60-72 hpf. Given that this is a window where significant cell rearrangements are taking place, it is likely that bmp3 is a regulator of cell polarity in the developing jaw. Consistent with this, treatment with SIS3 from 60-72 hpf causes changes in chondrocyte morphology and organization compared to controls. Additionally, several components of the non-canonical Wnt/planar cell polarity pathway (fzd3b, fzd7a, vangl2, ankrd6b, and prickle1a) are downregulated in bmp3 mutants compared to wild type controls, suggesting that bmp3 may regulate chondrocyte polarity via this pathway. Conclusions: These results strongly implicate bmp3 as a novel regulator of cell polarity in the developing jaw. Future investigation will include assessing the polarity of developing chondrocytes and analyzing the spatial distribution of planar cell polarity components in SIS3-treated and bmp3 mutant embryos. Taken together, this research will contribute to our understanding of the factors necessary for shaping craniofacial cartilage during embryogenesis.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 166
Presenter: Christopher Spence
Supervisor: Khoury, Michael
Title: High intensity interval training in pediatric heart transplant recipients: Evaluating a novel telemedicine video game-linked exercise platform
Authors: Dr. Christopher Spence Amanda Krysler Samira Rowland Rae Foshaug Dr. Jennifer Conway Dr. Simon Urschel Dr. Andrew Mackie Dr. Michael Stickland Dr. Pierre Boulanger Dr. Michael Khoury

Theme: Children's health and well-being

Introduction: Heart transplantation remains the cornerstone of management in children with advanced, medically refractive heart failure. Pediatric heart transplant recipients (PHTRs) and adult heart transplant recipients (AHTRs) demonstrate reduced exercise capacity relative to the general population. The mechanisms for this are multifactorial and include denervation of the transplanted heart, cardiac dysfunction, increased vascular resistance, and decreased vasodilatory capacity, skeletal muscle mass, mitochondrial density, and oxidative capacity. Previous studies have demonstrated post-transplant recovery and cardiac reinnervation to be associated with improved VO2peak, mortality, cardiac function, functional capacity, heart rate response as well as a decreased risk of re-transplantation. Unfortunately, exercise capacity has been observed to be sub-optimal in PHTRs. PHTRs also experience lower physical activity (PA), health-related quality of life (HRQoL), and self-efficacy towards PA relative to their peers. Cardiac rehabilitation post-transplant has been associated with decreased hospital readmission and improved long-term outcomes in AHTRs. Early trials of exercise interventions in PHTRs demonstrate improvements in the six-minute walk test, VO2peak, endurance time, muscle strength, body mass index and endothelial function. While most post-transplant exercise rehabilitation focuses on moderate-intensity continuous exercise, there is emerging evidence in the AHTR population that high-intensity interval training (HIIT) may yield superior improvements in cardiorespiratory fitness. However, HIIT interventions remain understudied in PHTRs. Objectives: The primary objective is assessment of feasibility (patient eligibility, enrollment, session completion and dropout) and safety of a 12-week, home-based HIIT intervention in PHTRs. Secondary objectives will evaluate the impact of the intervention on 1) exercise capacity; 2) physical activity; 3) HRQoL and self-efficacy towards PA; and 4) sustained changes in secondary outcomes at 6- and 12-months post-intervention. Methods: A feasibility assessment of a single-center randomized crossover trial evaluating a home-based exercise intervention with remote physiologic monitoring in PHTRs using a video game-linked cycle ergometer. Following enrollment, baseline assessments for secondary outcomes will be completed and participants randomized to the control or intervention arms. The intervention is a 12-week, three times weekly HIIT program. Each session is 24 minutes; a 5-minute warm-up and cool-down, and four 2-minute HIIT intervals interspersed with 2-minute breaks. All testing will be repeated after 12-weeks in the immediate control arm prior to crossing into the intervention and at 6- and 12-months post-intervention for all. Anticipated Results and Conclusion: We anticipate that the home-based HIIT program will be feasible and safely yield sustained improvements in exercise capacity, physical activity, HRQoL, and self-efficacy toward physical activity in PHTRs. Next steps would include a formal, multicenter, randomized crossover trial. Ultimately, this data could help serve as the foundation for cardiac exercise rehabilitation programs for PHTRs and the congenital heart disease population.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 167
Presenter: Faith Trinh
Supervisor: Law, Hiu Yan (Brenda)
Title: Evaluating the human factors of automated, volume-targeted mask ventilation using neonatal ventilator for neonatal resuscitation: A simulation study
Authors: Faith Trinh, Tina Madani Kia, Georg Schmölzer, Brenda Hiu Yan Law

Theme: Children's health and well-being

Introduction Initial breathing support is key to optimizing the long-term health of extremely preterm infants with positive pressure ventilation (PPV) serving as the cornerstone of respiratory support. PPV, routinely provided via a T-piece resuscitator, is challenging for healthcare providers (HCPs) to perform in extremely preterm infants. Volume-targeted ventilation (VTV) may offer an optimal solution for delivering safe tidal volumes during delivery room resuscitations, with the potential to reduce lung and brain injury as well as mortality. In this study, we aim to compare mask ventilation guided by a ventilator, with mask ventilation using a T-piece resuscitator during simulated neonatal resuscitations and analyze the workload and perspectives of those performing resuscitation. Methods This is a prospective randomized crossover simulation study, carried out at the Royal Alexandra Hospital, Edmonton, Canada. HCPs were eligible to participate if they were trained in neonatal resuscitation per neonatal resuscitation program (NRP) within the last 2 years, and had experience acting as team leader and performing mask ventilation in the delivery room. Two similar neonatal resuscitation scenarios were developed, one using VTV-PPV and the other using T-piece PPV. Each participant performed one scenario as per their initial randomization, then performed the other scenario immediately after. SURG-TLX surveys were completed after each scenario, with an overall post-simulation survey completed at the end. The primary outcome was total SURG-TLX workload score, an instrument used to measure subjective workload. Freetext comments were subject to thematic analysis and visual attention was analyzed for each scenario. For visual attention and SURG-TLX metrics, repeated measures ANOVA was used to compare the two PPV methods, using randomization as a between subjects factor to account for possible crossover effect. Results Thirty HCPs participated in the study. Participants reported higher SURG-TLX scores in mental demand (8.2/20 vs 5.6/20, $p<0.001$), physical demand (6.6/20 vs 5/20, $p=0.024$), task complexity (8.2/20 Vs 6/20, $p<0.001$), and situational stress (8.3/20 vs 5.9/20, $p=0.002$) for VTV-PPV compared with T-piece PPV. Temporal demand was similar (6.7/20 in VTV-PPV vs 6.2/20 in PPV, $p=0.372$), as were distractions (5.6/20 vs 4.9/20, $p=0.227$). In general, participants had a positive rating of VTV-PPV and reported being comfortable with switching to VTV-PPV in clinical practice. Participants also recognized barriers to implementation, identifying physical ergonomics, effects on user cognition, and effects on teamwork as potential challenges. Comparing VTV-PPV and T-piece PPV, participants dedicated similar visual attention to the mannikin and T-piece gauges or ventilator screen. There was a crossover effect in the visual attention directed towards the vital signs monitor. Conclusion Using a neonatal ventilator to perform mask ventilation using a non-synchronized volume-targeted strategy is feasible for HCPs to perform, but human factors of this novel approach need to be considered to ensure that it is successful in the clinical setting.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 168
Presenter: Md Nur Ahad Shah
Supervisor: Yokota, Toshifumi
Title: Antisense oligonucleotide-mediated exon 44 skipping leads to restoration of dystrophin protein expression and improvements in muscle function in a humanized mouse model of Duchenne muscular dystrophy
Authors: Md Nur Ahad Shah, Toshifumi Yokota

Theme: Children's health and well-being

Introduction: Duchenne muscular dystrophy (DMD) is the most common lethal genetic disorder affecting 20,000 children worldwide every year. The mean age of death is around 25 years. The DMD gene consists of 79 exons and encodes the protein Dystrophin that supports the muscle membrane. Out-of-frame mutations in this gene lead to the loss of dystrophin protein which predisposes muscle fibres to damage. While there are some relieving methods like corticosteroids and respiratory care, there is no cure for this disease. Exon skipping is a novel technique that employs synthetic DNA-like molecules called antisense oligonucleotides (AOs) to skip over the frame-disrupting part of the DMD gene. AOs bind to the critical splicing sequences in DMD transcripts, excluding frame-disrupting exons and restoring the reading frame. This allows for the production of truncated but functional dystrophin. Although 4 AOs have been approved for the treatment of DMD since 2016, none is targeted for exon 44. In this study, we developed AOs to skip exon 44 that can effectively treat approximately 6% of DMD patients, and tested whether the AO treatment results in restoration of dystrophin protein expression and improves muscle function in a humanized mouse model of DMD. Methods: We have evaluated the activity of multiple AOs designed based on our in silico analysis that can be used for the treatment. We carried out in vitro experiments on immortalized DMD patient muscle cell lines (myotubes) that have an exon 45 deletion in the DMD gene resulting in the lack of dystrophin. The efficacy of exon 44 skipping and restoration of exons 44-45 skipped in-frame products were evaluated using RT-PCR and Western blot analysis. Based on these results, the best AO was tested in humanized DMD model mice carrying the human DMD gene sequence with an out-of-frame exon 45 deletion. Functional assessments including grip strength and endurance were tested to determine the efficacy of AO. To evaluate the biological effects and toxicity, western blotting, RT-PCR, immunohistochemistry, and tissue histology were carried out. Results: From our in silico analysis, we have selected 8 AOs that have a high potential for inducing successful exon skipping. From in vitro RNA analysis, the most efficient AO at skipping exon 44 and restoring exons 44-45 skipped in-frame mRNA was further tested in humanized model mice. Functional analysis revealed that treatment with AO improved muscle function including total grip strength and endurance. Currently, we are conducting molecular analysis to determine the safety and efficacy of AO. Conclusion: We identified a promising AO that resulted in improvements in muscle function in a humanized DMD mouse model in vivo. This study will lead to the identification of promising AOs for clinical trials.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 169
Presenter: Rebecca Tan
Supervisor: Alexander, R Todd
Title: Calcium-sensing receptor signaling is amplified in patients with a FAM111A gene mutation
Authors: Rebecca Tan, R Todd Alexander

Theme: Children's health and well-being

Introduction: A nine-year old female presented to the Stollery Emergency Department with seizures and was found to have low blood calcium (Ca^{2+}) levels (0.72 mM ionized), low parathyroid hormone (PTH) and increased urinary Ca^{2+} excretion. She was diagnosed with Autosomal Dominant Hypocalcemia (ADH), a childhood disorder characterized by low blood Ca^{2+} and inappropriately low PTH. She had no mutations in the genes known to cause ADH (Ca^{2+}-sensing receptor (CASR) and G-protein subunit alpha 11 (GNA11)). Consequently, we performed whole exome sequencing and a trio analysis that identified a novel FAM111A gene mutation (c.1454G>A, p.C485Y). FAM111A is a putative serine protease with functions largely unknown. However, FAM111A gene mutations are known to cause Kenny Caffey syndrome (KCS) and Osteocraniostenosis (OCS), conditions characterized by low blood Ca^{2+}, low PTH, short stature and bony abnormalities. The molecular mechanism mediating these phenotypes are unknown. However, we hypothesize that mutations in FAM111A cause increased CASR signaling, resulting in low blood Ca^{2+} and high urine Ca^{2+} levels. The CASR is a G-protein coupled receptor, which upon activation by extracellular Ca^{2+}, initiates signaling cascades that increase intracellular Ca^{2+} levels. CASR activation also increases the expression of the tight-junction protein claudin-14 (CLDN14). In the kidney, CLDN14 blocks Ca^{2+} reabsorption leading to increased urine Ca^{2+} excretion and lower blood Ca^{2+}. Our objective was to determine if FAM111A wild-type (WT) and mutants affect CASR signaling. Methods: HEK293 cells were transfected with empty vector (EV) as a control, CASR and EV, FAM111A WT with EV or CASR and FAM111A WT or mutants (C485Y, ADH; Y511H, KCS; R569H, KCS; T338A, OCS; P527R, OCS; D528G, OCS; S541A, inactivated protease). We performed Fura2 AM imaging of intracellular Ca^{2+} in transfected cells in the presence of increasing extracellular Ca^{2+} (0.5-11.3 mM) levels. Also, as an indication of CASR activity, we measured CLDN14 expression in transfected cells incubated in 0.5 mM or 5 mM extracellular Ca^{2+}, via a dual luciferase assay. Results: The change in the peak intracellular Ca^{2+} concentration was approximately two times higher ($p<0.05$) in cells with CASR plus EV or FAM111A mutants, compared to EV alone or FAM111A WT plus CASR. Similarly, luciferase activity as an indication of CLDN14 levels, was significantly higher ($p<0.05$) in CASR plus EV compared to EV and FAM111A WT plus CASR. Some mutants (C485Y, T338A, P527T, D528G, S542A) had similar CLDN14 levels to CASR plus EV, while others (Y511H, R569H) showed similar levels to FAM111A plus CASR. Conclusions: FAM111A WT attenuates CASR activity. All FAM111A mutations assessed, enhanced CASR activity when measured by an increase in intracellular Ca^{2+}. Some mutants increase CLDN14 expression, while others may affect a different CASR signaling pathway. Elucidating the mechanism of how FAM111A affects CASR activity and Ca^{2+} homeostasis will provide a better understanding of our patient's condition as well as those with KCS or OCS.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 170
Presenter: Junsheng Chen
Supervisor: Simmen, Thomas
Title: Thioredoxin-related protein 2 (TMX2) mutations regulate mitochondrial membrane dynamics and give rise to childhood epilepsy and alter brain development
Authors: Junsheng Chen, Megan C. Yap, Arthur Bassot, Thomas Simmen

Theme: Children's health and well-being

Introduction: TMX2 is a 296 amino acid protein that has a single cysteine in a conserved SNDC catalytic site within a thioredoxin domain. Mutant TMX2 has been associated with brain developmental abnormalities and microlissencephaly. However, the causative mechanism of this TMX2 syndrome is currently not well understood. To investigate the cause of this genetic disease, we characterized TMX2 localization and function in cells of the central nervous system (CNS). We found that a portion of TMX2 localizes to mitochondria-associated membranes (MAMs). The normal functioning of CNS requires the active role of mitochondria, which work as cellular power plants, providing energy for synapses and the survival of brain cells.Our study aims to detect and investigate the redox-dependent functions of TMX2 in cells from affected individuals. Methods: As a first approach, we performed Percoll-based subcellular fractionation to confirm the localization of TMX2. TMX2 and relevant MAM protein expression levels in healthy control and TMX2-mutant skin fibroblast (P1:c.164A>C, p.Asp55Ala; c.391dup, p.Leu131Profs*6) lysates were detected by western blot. We quantified MAM types on electron micrographs, and mitochondrial network was assessed using the fluorescent probe MitoTracker Red. We performed high-resolution respirometry to assay the respiratory capacity of mitochondria and mitochondrial ATP production. To investigate whether these effects were MAM-dependent, we transfected patient fibroblasts with the "MAM spacer" fetal and adult testis-expressed 1 (FATE-1) and measured cytosolic reactive oxygen species (ROS) with flow cytometry. Results: We found TMX2 showed localization predominantly to the bulk ER and, to a lesser degree, to the MAM. Next, it was observed that TMX2 abundance dramatically decreased in TMX2 mutant fibroblasts, indicating the protein stability of TMX2 could be impaired. We found that compared to the control group, the mitochondria of TMX2 mutant fibroblasts tend to be fragmented. Then we found that similar to TMX2 knockout, the mutant fibroblasts showed an increase in the frequency of tight MAMs as well as mitochondrial respiration. We observed that the increase in cytosolic ROS in the mutant fibroblasts was significantly alleviated after FATE-1 transfection, indicating TMX2 regulates mitochondrial metabolism in a MAM-dependent manner. Conclusion: TMX2 modulates mitochondrial metabolism in patient fibroblasts by regulating ER-mitochondria tethers.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 171
Presenter: Maria Sharkova
Supervisor: Hocking, Jennifer
Title: Role of calyceal processes in Usher syndrome pathogenesis: A zebrafish study
Authors: Maria Sharkova, Constantin Mouzaaber, Erica Chow, Jennifer Hocking

Theme: Children's health and well-being

Introduction Babies born with Usher Syndrome Type 1 have severe hearing loss and balance problems. As a terrible disease progression, they develop vision loss starting at about age 10. Mutations in USH1 genes result in degeneration of the retinal light-sensing cells, rod and cone photoreceptors. However, the cause of photoreceptor loss in these children is unknown, thereby obstructing the search for a cure. Photoreceptors have a large sensory ending, the outer segment (OS), which is a modified cilium precisely tailored to capture light. Surrounding the OS and accommodating several USH1 proteins are photoreceptor microvilli or calyceal processes (CPs) - fine finger-like protrusions with a core of actin filaments. Despite the close association between CPs and the OS, our knowledge of CP development, structure, and, above all, functions remains elusive. Photoreceptors cannot regenerate, but the OS undergoes constant renewal through growing proximally and shedding portions distally. We hypothesize that CPs maintain alignment and integrity of the OS during the renewal process; in USH1, CPs are disrupted, which leads to destabilization of the OS and eventual photoreceptor death. Methods In this project, we use zebrafish as a model to investigate the structure and function of CPs and the contribution of USH1 proteins to CP and OS stability. Zebrafish have a large repertoire of genetic tools and a retina highly homologous to the human macula. We perform confocal imaging of immunostained eye sections of the zebrafish retina and transmission electron microscopy for detailed visualization of CPs and OS. Mutant fish were generated using CRISPR-Cas9 mutagenesis. Tol2 transgenesis was used to introduce overexpression. Results Our detailed imaging revealed that zebrafish CPs enclose initially formed OS during development. By analyzing adult zebrafish retina, we have determined CP number, absolute length, length relative to OS height, and organization. Although CP length is comparable between rod and UV cone photoreceptors, there is a stark difference relative to the respective OS height, suggesting some cells may be more reliant on CPs and prone to disruption. Indeed, rods have relatively short CPs and typically degenerate before cones in Usher Syndrome. Next, we inspect OS response to modified CP length. Our lab previously observed the actin crosslinker and USH1 protein, Espin (USH1M), colocalizing with CP actin in developing and adult fish. Microvilli in other tissues lengthen upon overexpression of Espin and shorten with loss of Espin. We generated an Espin mutant fish and created a cone photoreceptor-specific construct for an overexpression phenotype. We will examine the effect of aberrant Espin expression on CP length and OS morphology across different ages and photoreceptor subtypes. Moreover, we will perform electroretinograms to test visual function. Conclusion In summary, we characterized CPs in zebrafish and are utilizing these findings to explore the role of Espin in retinal development and homeostasis. As children with mutations in Espin suffer from photoreceptor loss, this project will uncover possible causes of degeneration and options for intervention to prevent vision loss in USH1.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 172
Presenter: Adrianne Watson
Supervisor: Voronova, Anastassia
Title: Immune molecule fractalkine modulates neural stem cells during brain development and regeneration
Authors: A. Watson, M. Almeida, N. Dittmann, Y. Li, P. Torabi, T. Footz, G. Vetere, D. Galleguillos, S. Sipione, A. Cardona, A. Voronova.

Theme: Children's health and well-being

INTRODUCTION: Children with neurodevelopmental disorders (such as autism spectrum disorder and schizophrenia) display deficits in myelin, which comprises white matter, and oligodendrocytes, cells responsible for myelin production. Restoration of oligodendrocytes/myelin has been identified as a key therapeutic target for these disorders. This can be achieved by engaging resident neural stem/precursor cells (NPCs) in the subventricular zone (SVZ), which produce oligodendrocytes throughout life. If we identify signals instructing NPCs to become oligodendrocytes, we could utilize this to engage NPCs, regenerate oligodendrocytes/myelin, and restore healthy brain function. My project focuses on the immune signalling molecule fractalkine (FKN). Mutations in FKN receptor (CX3CR1) are present in patients with autism spectrum disorder and schizophrenia. While CX3CR1 is highly expressed in brain immune cells (microglia), recent reports suggest NPCs also express this receptor, although at a lower level. However, the role of FKN-CX3CR1 signalling axis in postnatal and young adult NPCs is not known. METHODS: To address this knowledge gap, we analyzed oligodendrogenesis from NPCs isolated from postnatal SVZ niche in the presence of FKN or FKN function-blocking antibodies. We then infused FKN into murine brain and analyzed its in vivo ability to engage NPCs for oligodendrocyte formation. Finally, we examined how a human pathogenic variant of the fractalkine receptor (hM280/I249) affects NPC biology. RESULTS: We show postnatal SVZ NPCs express Cx3cr1 and bind FKN in vivo. In microglia-free NPC cultures, FKN 1) enhances NPC to oligodendrocyte precursor cell (OPC) commitment; and 2) accelerates OPC to oligodendrocyte differentiation. Importantly, infusion of FKN into the brain enhances OPC and oligodendrocyte genesis from SVZ NPCs in vivo. Inhibition of FKN signalling inhibits oligodendrocyte differentiation from NPCs (Watson et. al. Stem Cell Reports. 2021). Furthermore, infusion of FKN into a demyelinated brain enhances regeneration of oligodendrocytes and myelin (de Almeida, Watson et al. in revisions). We also cultured NPCs from mice expressing human pathogenic variant of CX3CR1 (hM280/I249), which disrupts FKN signalling. Our preliminary data demonstrate NPCs expressing pathogenic CX3CR1 show aberrant activation, differentiation, and cytokine secretion. We are currently corroborating this in vivo. CONCLUSION: We demonstrate i) FKN-CX3CR1 signalling is critical for oligodendroglial formation from NPCs; ii) mutations affecting FKN-CX3CR1 signalling may lead to dysfunctional NPCs and aberrant brain development seen in children with neurodevelopmental disorders. Thus, our results identify FKN as a promising potential therapeutic target for enhanced oligodendrogenesis.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 174
Presenter: Sara Amiri
Supervisor: Dinu, Irina
Title: Assessing Neurocognitive and Functional Outcomes Trend using Propensity Score and K-Means Clustering
Authors: Sara Amiri1, Morteza Hajihosseini1, Charlene Robertson2,3, Ari Joffe2, Joseph Atallah2, Gonzalo Guerra2, Gwen Bond3, Heather Switzer4, Irina Dinu1

Theme: Children's health and well-being

Introduction In recent years, the number of survivors of congenital heart disease (CHD) has increased with improvements in cardiac surgery. However, there are still reports of neurocognitive and functional inabilities after complex cardiac surgery. We reasoned that this could be an underestimation due to a lack of practical statistical methods. We proposed an analytical approach to adjust for pre-operative and intra-operative differences among children using propensity score and k-mean clustering. Method The propensity score (PS) adjustment and k-mean clustering were used to assess the impact of confounders and compare them with crude results. Two hundred thirty-five children at age ≤ 6 weeks were included in the analysis at the Stollery Children's Hospital in Edmonton, Alberta, between 1997 and 2016. Preoperative, intraoperative, and postoperative variables were collected from the first palliative surgery. PS was calculated based on age at surgery, total ventilation days, deep hypothermic circulatory arrest (DHCA) time, and total days chest open. Result Neurocognitive and functional outcomes' linear trend lines showed that 4.5 years after surgery, FSIQ scores stayed the same, VMI scores increased, and GAC scores decreased over time in high-risk children. Conclusion This study showed that using PS adjustment with clustering may reduce the underestimation of neurocognitive and functional outcomes by discriminating children based on the severity of their condition driven by pre-operative and intra-operative measurements.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 175
Presenter: Murilo Graton
Supervisor: Davidge, Sandra
Title: Effects of prenatal hypoxia and nMitoQ treatment on vasoconstrictor responses in mesenteric arteries of the adult offspring
Authors: Murilo E. Graton, Floor Spaans, Raven Kirschenman, Paulami Chatterjee, Thomas Phillips, Patrick Case, Sandra T. Davidge

Theme: Pregnancy and developmental trajectories

Introduction: Prenatal hypoxia is a pregnancy complication that increases the risk of cardiovascular disease in the offspring in adult life, but the mechanisms are unknown. Prenatal hypoxia was shown to increase responsiveness to endogenous vasoconstrictors, such as big endothelin-1 (bET-1) and thromboxane (Tx) A2, in mesenteric arteries (important for blood flow and blood pressure control) from the adult offspring. Nitric oxide (NO) is an endogenous vasodilator, however, a reduction in NO bioavailability can increase vasoconstrictor responsiveness. We previously showed that a placenta-targeted antioxidant treatment (nMitoQ) during pregnancy can improve offspring cardiovascular outcomes. However, whether nMitoQ can improve vasoconstrictor responses in the mesenteric arteries of prenatal hypoxia offspring, and the role of NO, is not known. We hypothesize that prenatal hypoxia increases vasoconstrictor responses via decreased NO modulation in mesenteric arteries of the adult offspring, which is improved by nMitoQ treatment. Methods: Pregnant Sprague-Dawley rats were exposed to normoxia (21% O2; Normoxia) or hypoxia (11% O2; Hypoxia) on gestational days (GD) 15-21 (term=22 days). Dams received a single i.v. injection of vehicle (Saline) or nMitoQ (100 □l of 125 □M) on GD15. Male and female offspring were aged to 4 months. Vasoconstriction responses to U46619 (a TxA2 receptor agonist) and bET-1 were assessed by wire myography in isolated mesenteric arteries. To assess the contribution of NO, vessels were pre-incubated in the absence or presence of L-NG-Nitro arginine methyl ester (L-NAME), a pan nitric oxide synthase inhibitor. Data were analyzed by two-way ANOVA (Sidak's post-hoc test); $p<0.05$ was considered significant; n=5-11/group. Results: In mesenteric arteries of the female offspring, prenatal hypoxia increased responsiveness to U46619 ($p=0.009$), which was decreased by nMitoQ treatment ($p=0.03$). In addition, L-NAME increased U46619 responsiveness in the normoxia saline ($p=0.003$) and nMitoQ-treated female offspring ($p=0.0003$), and in the hypoxia nMitoQ group ($p=0.005$), but not in the hypoxia saline-treated females. In the male offspring, prenatal hypoxia tended to increase in U46619 responsiveness compared to the normoxia males ($p=0.055$), without effects of nMitoQ treatment. L-NAME increased U46619 responsiveness in all male groups ($p<0.05$). Vasoconstriction responses to bET-1 were not altered by prenatal hypoxia or nMitoQ in female or male offspring. However, L-NAME increased responsiveness to bET-1 in only the hypoxia nMitoQ-treated male and female offspring. Conclusions: Prenatal hypoxia increases responsiveness to the TxA2 agonist U46619, but not to bET-1, in systemic mesenteric arteries in male and female offspring, which was reduced by nMitoQ treatment in the hypoxia female offspring only. This reduction in U46619 responsiveness by nMitoQ in the female hypoxia offspring appears to be due to an increase in NO contribution. nMitoQ also increased NO modulation to bET-1 responses in the hypoxia offspring. These results expand our knowledge on how complicated pregnancies can program cardiovascular disease in the offspring in adult life and provides evidence that placenta-targeted treatment can improve later-life outcomes.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 178
Presenter: Aislinn Ganci
Supervisor: Parent, Eric
Title: Inter-evaluator Agreement for Sagittal Measurements Using the Spinous Process Method Compared to the Center of Lamina Method on 3D Ultrasound Images of Healthy Females in Standing with Varying Arm Positions.
Authors: Aislinn Ganci, Miran Qazizada, Brianna Fehr, Ana Vucenovic, Edmond Lou, Eric Parent

Theme: Children's health and well-being

Introduction: Adolescent Idiopathic Scoliosis (AIS) is a three-dimensional (3D) structural disorder of the spine with a lateral curvature >10o. AIS affects 2 to 4% of adolescents. 3D Ultrasound (3DUS) imaging is a radiation-free alternative to x-rays to measure spinal alignment in all three anatomical planes. 3DUS can produce reliable sagittal measurements in stabilized natural standing, and can non-invasively compare imaging positions. It is unclear whether the Center of Lamina (COL) or the Spinous Process (SP) method offers better reliability. This study aimed to compare the inter-evaluator reliability of the COL and SP methods to obtain sagittal angle measurements from the same 3DUS images of healthy females in standing with two arm positions. We hypothesized that the COL method would have better reliability for both positions. Methods: Twenty-two healthy female volunteers over 10 years old were recruited via emailed ads. The spine (C7-S1) was scanned during one session using a 3DUS imager with position and orientation tracking. The CHIN position commonly used for X-rays, consisted of forward arm elevation, placing the distal phalanges to the chin. The abduction position (ABD) consisted of placing the hands open beside the head, with the middle finger touching the ear. COL and SP measurements were obtained with custom software. The COL method involves connecting, in the sagittal plane, a line between the centers of the left and right laminae shown in the frontal view (and verified in the transverse view) for the top two and bottom two vertebral levels defining the sagittal measurements of interest. The SP method relies on digitizing the tip of spinous processes (T1-T2, T11-T12 and L4-L5) to obtain similar measurements. Whole thoracic kyphosis (T1-T12), T5-T12 kyphosis and lumbar lordosis were measured. Three evaluators measured images from both positions using each measurement method once. Bland-Altman inter-evaluator biases and 95% limits of agreement were calculated. Differences <11° were adequate for research. Results: Participants were 21±3 (13-25) years old, with a height of 163±5cm and a weight of 58±7kg. In both positions, the bias for all measurements for both methods (COL=0-4.2 o, SP=0-8.5o) and the standard deviation of the differences for both kyphosis methods were adequate (<11o) using the COL method. However, three lordosis measurements in the ABD and one in the CHIN position presented errors exceeding the 11o threshold (11.5-13.5o, 3COL vs. 1SP). The SP method also had standard deviations of measurement differences >11° for whole kyphosis in the CHIN position for all evaluator pairs (12-14°); for whole kyphosis in the ABD position for R2-R3 (12°); and for lordosis in the CHIN position for R2-R3 (13°). T5-T12 kyphosis measurements met the threshold using both methods in both positions. Conclusion: The inter-evaluator reliability for thoracic kyphosis by novice evaluators was adequate for research using the COL method and did not differ significantly between positions. Many SP kyphosis measurements had differences exceeding the accepted standard, particularly in the CHIN position. For best reliability, we recommend using the SP method for lordosis and the COL method for kyphosis measurements.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 180
Presenter: Akhila Eswaran
Supervisor: Phan, Anna
Title: Characterizing sec22, a novel memory suppressor gene that impairs neurodevelopment
Authors: Akhila Eswaran Anna Phan

Theme: Children's health and well-being

Cohesin is a multifunctional protein complex that is essential for many basic cellular processes. As such, mutations in the cohesion complex of proteins can result in detrimental effects like the neurodevelopmental disorders, cohesinopathies. Stromalin, a component of the cohesin complex, was recently characterized as a novel memory suppressor that impairs learning by transcriptionally regulating genes during development to suppress synaptic vesicle formation. Through an RNAi memory screen conducted in Drosophila Melanogaster to investigate the genes downstream of the cohesin complex that leads to neurodevelopmental disorders, sec22, a member of the SNARE family of genes was identified as a novel memory suppressor. This project focuses on the characterization of sec22 and its underlying mechanisms as a novel memory suppressor gene. To identify where, when and what aspects of learning and memory are affected by sec22, the Drosophila adult olfactory shock assay was used. When the memories of the flies were assessed based on their performance index (PI) scores, it was found that sec22 knockdown in the mushroom body neurons during the developmental stage significantly enhances learning. Further tests will be conducted to functionally and neuroanatomically investigate the mechanisms through which sec22 acts as a memory suppressor. For this, functional imaging, expansion microscopy, and immunohistochemistry will be used to observe the live neuronal function and synaptic communication (numbers, content and pre-synapses) in flies having sec22 knocked down in their mushroom body neurons during the developmental stage. It is postulated that the characterization of sec22 as a memory suppressor gene and the elucidation of mechanisms involved in it could provide a platform for the potential design of a therapy to rescue cohesinopathies and other neurodevelopmental disorders associated with learning and memory impairments.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 181
Presenter: Roberto Villalobos
Supervisor: Davidge, Sandra
Title: Placenta-Derived Extracellular Vesicles from Women with Preeclampsia Induce Endothelial Dysfunction via LOX-1 Activation.
Authors: Roberto Villalobos-Labra, Ricky Liu, Floor Spaans, Tamara Sáez, Anita Quon, Christy-Lynn M. Cooke, Sandra T. Davidge.

Theme: Pregnancy and developmental trajectories

Introduction: Preeclampsia (PE) is a pregnancy complication affecting ~5% of all pregnancies worldwide, characterized by new-onset hypertension during pregnancy and end-organ damage. While PE is known to be a major cause of maternal and neonatal morbidity/mortality and a risk factor for long-term cardiovascular disease in the offspring, the exact pathophysiology of PE is still unknown. Maternal vascular endothelial dysfunction is thought to play a key role and may result from the release of syncytiotrophoblast-derived extracellular vesicles (STBEVs) into the maternal circulation by a dysfunctional placenta. STBEVs from normal pregnancies were shown to induce vascular dysfunction via activation of the lectin-like oxLDL receptor 1 (LOX-1), a scavenger receptor expressed higher in the vasculature from PE women and induces endothelial dysfunction involving the activation of NADPH oxidases. However, STBEVs that come from PE placentas (PE STBEVs) are different in composition to NP STBEVs, and whether PE STBEVs induce vascular dysfunction via LOX-1 is still unknown. We hypothesize that PE STBEVs induce vascular dysfunction via LOX-1. Methods: PE STBEVs were isolated from PE placentas (n=4) by placental perfusion, and were pooled. Human umbilical vein endothelial cells (HUVECs) were isolated from umbilical cords of normal pregnancies (n=5). HUVEC cultures were pre-incubated (30 min) ± TS20 (LOX-1 blocking antibody) and then incubated with PE STBEVs (100 µg/mL, 30 min). LOX-1 activation was evaluated by the phosphorylation of the downstream kinases ERK1/2 by Western blotting. Mesenteric arteries were isolated from pregnant rats on gestational day 20 (term=21 days; n=7-9), and incubated overnight ± TS20 or apocynin (a NADPH oxidase inhibitor) and PE STBEVs (100 µg/mL). Endothelium-dependent vasodilation to methylcholine [MCh] was evaluated by wire myography. Data are presented as mean±SEM; assessed by one-way ANOVA with Sidak's posthoc test; $p<0.05$ was considered significant. Results: In HUVECs, the incubation with PE STBEVs increased ERK1/2 phosphorylation (2.8±0.2 fold increase vs. non-treated cells; $p=0.0043$), which was prevented by pre-incubation with TS20 ($p=0.0077$). Mesenteric arteries incubated overnight with PE STBEVs showed reduced maximal vasodilation to MCh compared to non-treated vessels (%max. vasodilation [Emax]: non-treated: 96.4±0.9 vs PE STBEVs: 84.1±2.3; $p<0.0001$), which was prevented by co-incubating the vessels with TS20 (Emax: TS20+PE STBEVs: 93.0±0.9; $p=0.0011$). Co-incubation with apocynin did not improve the effect of PE STBEVs on MCh responsiveness (Emax: Apocynin+PE STBEVs: 80.9±3.6). Conclusions: Our data showed that PE STBEVs activate LOX-1 in endothelial cells and impair vascular function via LOX-1 but without the involvement of NADPH oxidases. The latter suggests other downstream pathways of LOX-1 than NADPH oxidases contribute to the effect of PE STBEVs on vascular function. This study expands on the mechanisms leading to vascular dysfunction in PE and proposes LOX-1 as a potential target to prevent vascular dysfunction, thus contributing to future interventions to ameliorate PE-related adverse outcomes.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 182
Presenter: Yasser Abuetabh
Supervisor: Leng, Roger
Title: UBE4B Phosphorylation is Required to Stabilize p53 in Response to DNA Damage
Authors: Yasser Abuetabh, H. Helena Wu, Habib Al Yousef, Sujata Persad, Consolato M. Sergi, and Roger Leng

Theme: Lifelong women's health

Background and Aim: The tumor suppressor p53 is well known for its fundamental role in the detection and eradication of different oncogenic insults by promoting cell cycle arrest, DNA repair, and apoptosis. Ubiquitination factor E4B (UBE4B) plays a pivotal role in negatively regulating p53 during homeostasis and after DNA damage. UBE4B is frequently overexpressed in many cancers, including breast and brain cancers. We showed that phosphorylated p53 is targeted by UBE4B for degradation in response to DNA damage. Thus, UBE4B inactivated the p53 response to DNA damage, which led to cell cycle progression and apoptosis attenuation. However, the regulation of UBE4B in response to DNA damage in cancer is still largely unknown. We aimed to determine whether UBE4B is regulated through the phosphorylation/dephosphorylation process in response to DNA damage. Material and Methods: We used several molecular techniques, including coimmunoprecipitation, western blotting, ubiquitination assays, and flow cytometry analysis. Results: Our data demonstrated that the UBE4B protein was phosphorylated in response to DNA damage preferentially through upstream ATR-mediated signaling. Phosphorylation of UBE4B decreased its affinity binding with p53 and led to the accumulation of p53 protein. Furthermore, we identified that Wip1 reversed UBE4B phosphorylation. UBE4B dephosphorylation by Wip1 seemed to be an important step in stabilizing the activity of the UBE4B protein in response to DNA damage. Inhibition of Wip1 led to a significant increase in UBE4B phosphorylation, p53 accumulation, and cell cycle arrest. Conclusions: Understanding how UBE4B is regulated in cancer cells in response to DNA damaging agents may lead to the development of novel therapeutic strategies that could improve the prognosis of cancer patients.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 183
Presenter: Amber Hussain
Supervisor: Park, Tanya
Title: Voices of mothers: a proposal to explore experiences of motherhood transition among adolescent girls in Pakistan using narrative inquiry
Authors: Amber Hussain, Tanya Park, Salima Meherali

Theme: Pregnancy and developmental trajectories

Introduction: Motherhood is one of the most significant developmental and evolutionary transitions in a woman's life. During this period, women encounter remarkable challenges as well as intensified experiences. These challenges, however, are further exacerbated for adolescent mothers. The adolescent physical and psychological growth and development phase is a period of brain remodeling associated with exploration, and the initiation of health-related behaviors that are lifetime determinants of physical and mental health. This growth and developmental phase, coupled with motherhood experience, can increase the challenge for adolescent mothers to adjust to new motherhood roles and responsibilities. Hence, they are at greater risk of developing mental health issues. The prevalence of adolescent pregnancy in Pakistan accounts for 43.7%. The experience of motherhood transition among adolescent girls and its effect on mental health has not been studied among adolescent mothers in Pakistan. Our research objectives are to 1. Uncover the experiences of motherhood transition among Pakistani adolescent mothers 2. Understand the impact of motherhood transition on their mental health, and 3. Explore participants' recommendations for what approaches would help them successfully adjust and cope. Methods: We will follow a qualitative narrative inquiry approach to study the complex phenomena in depth. A purposive sampling strategy will be employed to enroll adolescent mothers (ages 13-19 years). Recruitment may occur with the help of community representatives and distributed posters within the communities. A semi-structured interview guide will be utilized, whereby participants will be invited to narrate their stories and construct their own voices. We will also work with participants to co-construct a visual representation of how their experiences have shaped their daily lives using photographs and other artifacts. NVIVO 11.0 will be used to organize and manage the datasets generated in the study. Results: Data will be presented thematically to explore participants' collective experiences and their mental health needs. The findings from the participants' recommendations would also provide a solution-based approach for co-designing interventions for adolescent mothers. Conclusion: It is expected that the research will provide a deeper understanding of the unique experiences and mental health needs of adolescent mothers. The knowledge gained from the research will be instrumental for planning, improving, and advocating services for this population. Furthermore, the recommendations from the study findings will provide meaningful contributions and involvement of adolescent mothers in developing strategies and interventions to improve their mental health.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 184
Presenter: Jenna Evanchuk
Supervisor: Field, Catherine
Title: Second trimester maternal iron and vitamin D biomarker concentrations are associated with third trimester maternal mental health outcomes in the APrON cohort
Authors: Jenna Evanchuk, Elnaz Vaghef Mehrabani, Shujun Lin, Natalie Hanas, Susan Goruk, Anita Kozyrskyj, Yvonne Lamers, Gerald Giesbrecht, Rhonda C. Bell, Catherine J. Field

Theme: Pregnancy and developmental trajectories

Introduction The sufficiency of both iron and vitamin D status may be crucial for optimal mental well-being but few studies have investigated the relationship between these nutrients and maternal depression. The objective of this research was to determine whether maternal iron [hepcidin, serum ferritin (SF), soluble transferrin receptor (sTfR)] and vitamin D [25-hydroxyvitaminD3 (25(OH)D3), 3-epi-25-hydroxyvitaminD3 (3-epi-25(OH)D3)] biomarker concentrations during pregnancy are associated with maternal depression symptoms during the 3rd trimester (3rdTri) and at 3-months postpartum. Methods From 2009 to 2012, pregnant women (n=2144) were recruited into the Alberta Pregnancy Outcomes and Nutrition (APrON) prospective cohort study in Edmonton and Calgary. Detailed nutritional and medical data were collected. Maternal blood samples were drawn at each trimester of pregnancy and at 3-months postpartum. Maternal concentrations of SF were measured using chemiluminescent microparticle immunoassays whereas hepcidin and sTfR concentrations were quantified using enzyme-linked immunosorbent assays. Liquid chromatography with tandem mass spectroscopy was utilized to determine maternal 25(OH)D3 and 3-epi-25(OH)D3 concentrations. A 10-item Edinburgh Depression Scale (EDS) was administered to pregnant participants during the 3rdTri and at 3-months postpartum to estimate symptoms reflective of maternal depression. Generalized linear models and multivariate regression models, adjusted for covariates such as maternal age, socioeconomic status, and inflammatory conditions, were conducted via SPSS. Results The maternal APrON cohort was highly educated (>87% had post-secondary education) and had a generally high socioeconomic status (80.2% were white; 55% had an annual household income of ≥$100 000). However, nearly 14% had insufficient vitamin D (25-hydroxyvitamin D (25(OH)D) <75 nmol/L) and over 60% had low iron stores (SF <15 ng/mL) during the 2nd (2ndTri) and 3rdTri, respectively. During the 3rdTri, the median (range) maternal EDS score was 4 (0-23) out of 30 (higher scores suggest a higher severity of depressive symptoms) and 10% (n=192) had probable depression (EDS score >10). At 3-months postpartum the median (range) score was 4 (0-22) and 8.9% (n=162) had probable depression. After adjustment, higher 3rdTri EDS scores were associated with lower maternal hepcidin (p=0.015) and 25(OH)D3 (p=0.033) concentrations in the 2ndTri. Accordingly, when 3rdTri EDS scores were separated by the threshold of probable depression, participants with scores >10 had significantly lower concentrations of both hepcidin (p=0.0031) and 25(OH)D3 (p=0.0055) during the 2ndTri compared to those with EDS scores ≤10. There were no associations between other maternal biomarkers and the 3rdTri or 3-month postpartum EDS scores. Conclusion The results suggest that higher maternal statuses of both iron and vitamin D during mid-pregnancy are associated with less depressive symptoms during the 3rdTri in a cohort of pregnant women with low socioeconomic risk. Although more research is required, updated clinical screening practices and dietary recommendations aimed at improving the nutritional adequacy of these nutrients may have significant implications for maternal well-being.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 185
Presenter: Jenae Gauthier
Supervisor: Gokiert, Rebecca
Title: Evaluation Capacity Building for Improved Early Childhood Practices, Programs, and Policies
Authors: Jenae Gauthier, Rebecca Gokiert

Theme: Children's health and well-being

Early experiences and environments play a critical role in healthy childhood development. Consequently, high-quality early childhood programs lay the foundation for the social-emotional and physical wellbeing of adult Canadians. Despite significant investments in early childhood programs, indicators reveal shortfalls in child development in Canada. Evaluation is a systematic process of generating informative evidence for program improvement. With evaluation, we can gather data that can be used to create stronger, more sustainable initiatives that will improve the lives of children and families across Canada. The Evaluation Capacity Network (ECN) is a research partnership that seeks to build evaluation capacity in the early childhood field. The ECN offers experiential learning courses that connect students to community organizations to co-create evaluation plans. These courses provide students with hands-on experience in evaluation, while community stakeholders receive a ready-to-implement evaluation plan for their program. A major challenge is the capacity of organizations to implement these evaluation plans; highlighting a gap in evaluation use and influence. Through this WCHRI project, we worked with one initiative, the Alberta Vulnerable Infant Response Team (AVIRT) to implement their evaluation plan. This included developing data collection tools, collecting and analyzing data, as well as providing recommendations for improved programming. This capacity enabled them to execute an evaluation that otherwise would not have been possible. The findings of this research will provide AVIRT recommendations to enhance service delivery. To date, we have conducted a survey and individual interviews with 26 staff members and are currently in the data analysis and reporting phase of this project, which includes a final report, presentation, and infographic.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 186
Presenter: Claudia Holody
Supervisor: Bourque, Stephane
Title: Perinatal iron deficiency causes sex-specific mitochondrial effects in neonatal rat hearts
Authors: Claudia D. Holody, Chunpeng Nie, Andrew G. Woodman, Rowan Carpenter, Ronan M.N. Noble, Hélène Lemieux, Stephane L. Bourque

Theme: Pregnancy and developmental trajectories

Introduction: Iron deficiency (ID) during gestation has been shown to alter growth and developmental trajectories, consequentially increasing the risk of long-term cardiovascular dysfunction in offspring. The heart becomes energetically dependent on mitochondria soon after birth and disturbances in energy metabolism could impact cardiac development. Given that iron is essential for oxygen transport and an important component of the electron transport system, we hypothesized that perinatal ID would alter cardiac mitochondrial function in the neonatal period. In hearts of neonatal control and iron-deficient offspring, we sought to (1) perform untargeted proteomics analysis; (2) assess changes in mitochondrial function and reactive oxygen species generation, and (3) explore the mechanisms of iron metabolism underlying these changes. Methods: Female rats were fed an iron-restricted or an iron-replete diet before and during pregnancy. Hearts from neonatal male and female pups underwent quantitative shotgun proteomics analysis. Mitochondrial content and function were assessed by citrate synthase activity and high-resolution respirometry, respectively. Superoxide levels were assessed using dihydroethidium fluorescence. Antioxidant and iron metabolism genes were assessed by RT-qPCR. The effects of ID and postnatal day (PD) were analyzed by fitting a mixed-effects model. Results: Hemoglobin levels were reduced in ID pups at PD0.5 and PD14.5, but recovered by PD28.5. Body weights of ID pups were reduced at all time points, while heart weights (normalized to body weight) were increased. Shotgun proteomics revealed upregulation of mitochondrion organization proteins in ID male hearts. In ID male hearts only, the mitochondrial content, shown by the citrate synthase activity, was increased by 25% while the mitochondrial respiration through the NADH-pathway, succinate-pathway, and FAO-pathway, expressed per citrate synthase activity units, was reduced by up to 50%. ID did not change superoxide or antioxidant enzyme mRNA levels in either sex. Transferrin receptor-1 mRNA was increased in ID females; upregulation of this protein was confirmed by proteomics at PD0.5. Conclusion: Although male and female neonates experience a similar insult with maternal iron-restriction, only male hearts showed reduced mitochondrial efficiency and compensation by increased mitochondrial content. Lack of changes in other parameters indicate that mitochondria in male ID hearts are likely functional but may have an abnormal protein composition. Further, females may have a greater capacity to prioritize iron for the heart by increasing iron import during ID.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 187
Presenter: Olivia Sadilek-Thring
Supervisor: Clugston, Robin
Title: Mechanisms of Perturbed Vitamin A Mobilization from the Liver of Young Iron-Deficient Rats
Authors: Sadilek-Thring, O.S. Holody, C.D. Bourque, S.L. Clugston, R.D.

Theme: Pregnancy and developmental trajectories

Introduction: Iron deficiency (ID) is the most common nutritional deficiency worldwide and is notably prevalent among pregnant women and young children due to the demands imposed by growth and development. During fetal and child development, the signaling molecule retinoic acid (derived from dietary vitamin A) also plays a fundamental role in development. Multiple kinetic studies suggest that ID disrupts the movement of vitamin A from the liver to the circulation, thus interfering with its signaling capacity. However, the mechanism by which ID achieves this effect is unknown. This research project aims to identify the molecular mechanism underlying impaired hepatic vitamin A mobilization in ID rats, and tests the working hypothesis that ID inhibits hepatic secretion of Retinol binding protein (RBP). Methods: Three week old male and female rats were fed either a control diet or an iron-deficient diet (3 mg/kg) for six weeks. Hemoglobin, hematocrit and plasma were collected bi-weekly, and after six weeks on the diet the rats were euthanized and tissues were collected. Reverse-phase HPLC was used to calculate retinol and retinyl ester concentrations in plasma, liver, lung, and white adipose tissues. RNA was extracted from liver samples, and purified RNA was then reverse-transcribed into cDNA to be used for qPCR mRNA expression analysis. Plasma RBP concentrations were determined with an RBP ELISA Kit. Results: Serial blood sampling throughout the experimental time course revealed a significant decline in plasma hemoglobin levels in male and female rats. HPLC data shows that in male ID rats plasma retinol was significantly decreased, while hepatic retinyl esters were increased. Surprisingly, this effect was not observed in female ID rats. ELISA revealed that there is a significant decrease in ID male plasma RBP when compared to the control. Using qPCR to quantify the expression of various genes in the vitamin A metabolic pathway, it was found that Dhrs3, Dhrs4, Rdh, Cyp26a1, Ttr, and Rarb expression decreased in ID. In contrast, Cyp26b1expression increased in ID. Conclusion: Our findings support the model that ID impairs hepatic vitamin A mobilization. In agreement with our hypothesis, we have shown for the first time that ID also lowers circulating RBP4 levels, suggesting the hepatic secretion of this protein is central to the effect of ID. Our qPCR results provide insight into the effect of ID on vitamin A-related gene expression in the liver, suggesting that hepatic retinoic acid signaling is decreased by ID. The effect of ID is most pronounced in male rats, suggesting that females can better compensate for the lack of iron in the diet. Mechanistic studies into the effect of ID on hepatic vitamin A metabolism and its sex-specific effects are on-going. Due to the high global co-occurrence of ID and vitamin A deficiency, it is important that further research on their relationship is conducted in order to identify how deficiencies in these nutrients interact to impair child development.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 189
Presenter: Fatemeh Nezarat
Supervisor: Dinu, Irina
Title: Use of Linear Combination Test (LCT) to identify Stem Cells Molecular Signaling Pathways Associated with Maternal COVID-19
Authors: Fatemeh Nezarat Sara Khademioureh Morteza Hajihosseini Pyne Saumyadipta Irina Dinu

Theme: Pregnancy and developmental trajectories

Background Invasion of pathogenic organisms such as the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) to host cells affects critical molecular signaling pathways, thus evoking COVID-19 symptoms and maternal and neonatal complications, such as preterm birth as well. Today, genomic studies receive considerable attention in identifying these pathways for a variety of diseases by demonstrating differential gene expression in cases vs. controls. Transcription factors like GATA binding protein 2 (GATA2) regulate gene expression and are involved in stem cell maintenance. Previous studies have suggested that GATA2 and its regulator, lncRNA GATA2 antisense RNA 1 (GATA2-AS1), can be implicated in tumorigenesis. In this research, we investigated the impacts of maternal COVID-19 on stem cells' molecular signaling pathways, considering 457 gene sets and GATA2-AS1 and GATA2 as outcomes. Data Description To demonstrate highly affected biological pathways in the neonates born to mothers infected with COVID-19, we used a gene expression dataset accessed on the Gene Expression Omnibus database (GEO accession number: GSE 165193) consisting of 36,597 genes and 25,970 cells from a previous study where single-cell RNA-sequencing and T-cell receptor sequencing on cord blood mononuclear cells (CBMCs) from newborns of infected mothers in the third trimester of three cases, or without SARS-CoV-2 infection of three controls. Methods One of the limitations of current genomic studies is gaining biological insight from the generated data and putting results into practice. To resolve this shortcoming, we used the Linear Combination Test (LCT) to explore differentially expressed genes and gene-set collections as regulators of biological pathways. Cellular processes are often associated with changes in the expression patterns of groups of genes that share common biological attributes, so are more robust for addressing complex questions in system biology, in addition to assessing individual genes. The Linear Combination Test (LCT) was used to assess 36,597 genes, as well as 457 gene sets, previously derived from experimentally identified signatures of gene expression in human embryonic stem cells, in association with a bivariate outcome consisting of GATA2-AS1 and GATA2 gene expression measurements. Results and Conclusion Four hundred and ninety-eight individual genes were associated with GATA2 (p-value and false discovery rate q-value < 0.001), which may significantly contribute to altered signaling pathways due to SARS-CoV-2 during pregnancy. The elucidation of unknown perturbed molecular pathways caused by maternal COVID-19 will facilitate drug development, better enable treatment planning, and decrease the burden of the disease on women and their newborns. Keywords: Maternal COVID-19, Differential Gene Expression, Linear Combination Test (LCT), GATA2 Transcription Factor, Infants

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 190
Presenter: Satomi Shirakaki
Supervisor: Yokota, Toshifumi
Title: Antisense-mediated exon inclusion for the treatment of giant axonal neuropathy
Authors: Satomi Shirakaki, Rohini Roy Roshmi, Scott David Bittner, Stanley Woo, Rika Maruyama, Hanna Kolski, Hong Moulton, Toshifumi Yokota

Theme: Children's health and well-being

Introduction: Giant axonal neuropathy (GAN) is a rare neuromuscular disease caused by an abnormality in the GAN gene with an autosomal recessive mode of inheritance. The disease presents as a prominent sensorimotor neuropathy in early childhood and commonly progresses to affect both the peripheral and central nervous systems. GAN mutations lead to a loss of functional gigaxonin protein, which is involved in the ubiquitin-proteasome system responsible for the degradation and turnover of intermediate filaments (IFs). Presently there is no effective treatment for GAN, and patients typically die in the 3rd decade. Our goal is to use synthetic DNA-like molecules called antisense oligonucleotides (AONs) for the treatment of GAN. Here we tested our hypothesis that our designed AONs induce splice modulation and restore the full-length GAN expression in a patient-derived cell model of GAN. Methods: We obtained fibroblasts from a person with GAN carrying a biallelic mutation in the GAN gene. The mutation in intron 4 leads to premature skipping of exon 5 of the GAN gene transcript. We first designed patient-customed AONs that target intron 4 of the GAN gene to induce exon 5 inclusion into the mature transcript. The efficacy of AON-induced exon 5 inclusion was tested at 10 uM and 15 uM concentrations in the patient's skin fibroblast using reverse-transcription polymerase chain reaction (RT-PCR). We also examined the effects of oligonucleotide activity enhancer 1 (OAE1), a small molecule we recently identified that increases the efficacy of AONs by changing its intracellular distribution, on the efficacy of exon 5 inclusion in vitro. Results: One of the AONs designed showed significant exon 5 inclusion in the patient fibroblast in vitro at 15 uM. In addition, the ASO treatment with OAE1 led to significant exon 5 inclusion at 15 uM concentrations, as well when compared to non-treated patient cells. Conclusion: We demonstrated for the first time that the AON treatment resulted in splice correction and restoration of full-length GAN expression in patient-derived cells in vitro. This study encourages further investigations to determine the safety and efficacy of gene expression modification via AONs in vitro and in vivo for the future clinical trial.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 191
Presenter: Mohammad Humayun Kabir
Supervisor: Lou, Edmond
Title: A Reliable Method for Automatically Detecting and Measuring the Distraction of the Growing Rods on the X-ray images for Early Onset Scoliosis.
Authors: Mohammad Humayun Kabir, Marek Reformat, Kyle Stample, Sarah Southon Hryniuk and Edmond Lou

Theme: Children's health and well-being

INTRODUCTION: Magnetically Controlled Growing Rod (MCGR) technique has been proved to be a tremendous treatment method for immature children with progressive early onset scoliosis because it eradicates repetitive surgeries when compared to the traditional growing rod surgery. The MCGR system allows for lengthening of the growing rod non-invasively to compensate the normal physical growth in an outpatient clinic. During the rod lengthening process, clinician needs to take time to measure the rod length on x-ray images before and after the adjustment. Manual measurements introduce human errors and variability, and it also reduce clinician to spend time with patients. Therefore, we would like to develop an artificial intelligence method to automatically detect the rod length from the spinal x-ray images to improve measurement efficiency. The end goal of the program is to calculate the change of rod length automatically. In this study, we focused on the determination of the accuracy and reliability of the automated rod length measurement when compared to the manual measurement. METHOD: A convolution neural network machine learning algorithm was developed to extract the rod length from the X-ray images. Filtering, detection of region of interest, cropping, magnification, and edge detection were implemented in the algorithm. The final model was completed and trained with 277 X-ray images. To validate the model, this pilot study used 15-rod length measurements from a rater with 3 years of experience and compared with the automated measurements. The rods were detected from 15 randomly selected spine X-ray images. The interclass correlation coefficient with two-way random model ICC (2,1) was calculated. The mean absolute differences (MAD) and its standard deviation (SD) between the manual-automated measurements were reported. A Bland-Altman analysis was also performed to quantify the agreement between the two measurements. RESULT: Among the 15 rods, 13 rods were from the left-side and 2 from the right-side. The average rod length on manually measure was 25.74±10.82 mm (ranged from 8.7 to 38.7 mm). The inter-method reliability ICC (2,1) was 0.985 (95% CI = 0.957-0.995). The MAD±SD was 0.52±0.63mm. Among the 15 measurements, 93% (14/15) were within the clinical acceptance error (±1.5 mm). From the Bland-Altman analysis, there was no bias on the two measurements in which the average difference was 0 mm and the SD was 0.8 mm. Fourteen measurements were with the 95% confidence interval. The automated processing time per image was 6.2±0.414 seconds. CONCLUSION: This pilot study reported an artificial intelligence method which could measure the rod length accurately and reliably. The automated measurement showed no significant difference when compared with an experience rater. The next step will be testing on more cases and implement the automatic rod change calculation into the process.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 192
Presenter: Liliana Vertel
Supervisor: Kannu, Peter
Title: CRISPR/Cas9 induced COL2A1 mutations in hiPSC lines to model type II collagenopathies
Authors: Liliana Vertel, Peter Kannu

Theme: Children's health and well-being

INTRODUCTION: The hallmarks of Type II collagen disorders (Type II collagenopathies) include disproportionate short stature due to an abnormal skeleton, distinctive eye abnormalities, cleft palate, small jaw, and hearing loss. The phenotypic picture ranges from severe perinatal lethal disorders that present antenatally to mild presentations in the postnatal period. Premature osteoarthritis (OA) is the mildest of all type II collagen phenotypes. Glycine to serine substitutions are the most frequent COL2A1 mutations and the only type of mutation reported to cause premature OA. Glycine is the smallest amino acid and as such is the only one that fits in the center of the collagen triple helix. Therefore, glycine substitutions are likely to have a deleterious effect on the formation of the protein. We wish to define the cartilage differences resulting from glycine to serine mutations in the collagen type II gene which cause specific phenotypes. Since it is difficult to obtain cartilage samples from patients, we plan to first create the cartilage in a dish. METHODS: We use human Induced Pluripotent Stem Cells (hiPSCs) and CRISPR/Cas9 technology to create type II collagen mutations in vitro human cartilage. We use a hiPSC line containing a GFP reporter at the COL2A1 locus. The differentiation protocol follows the mesodermal lineage. Following expansion of the hiPSCs, we use a 13-day induction to direct the fate of the stem cells towards chondroprogenitors. Cellular differentiation occurs between days 14 to 28 with the formation and maturation of a chondrogenic pellet. In order to confirm a cartilage phenotype, histology sections were prepared from the pellets for staining and immunofluorescence (IF). We also extracted RNA to measure cartilage-specific gene expression markers. To generate a heterozygous COL2A1 mutation in the iPSCs we will use the Homology Directed Repair method. First, we will transfect the necessary CRISPR components into the cells using lipid nanoparticles. Since the crRNA is RFP labeled, we will FACS-sort positive cells. The induction and differentiation of HiPSCs will follow the same protocol described above. We will compare the in vitro cartilage produced by the WT and edited iPSCs. RESULTS: We have successfully differentiated hiPSCs into cartilage. The chondrogenic pellet showed GFP expression at day 12 of differentiation. The extracellular matrix stained positive for Safranin - O which are proteoglycan markers. IF and RNA expression analysis of cartilage markers (ACAN, COL2A1, and SOX9) is in progress. CONCLUSION: The GFP reporter confirmed the expression of collagen type II indicating that chondroprogenitors were producing type II collagen-like chondrocytes. The H&E and Safranin-O staining demonstrated the presence of chondrocytes and proteoglycans in the extracellular matrix. We expect to see positive IF for COL2A1 in the cells and a high expression of the cartilage gene markers in the differentiated iPSCs. Future experiments are underway to optimize the transfecting protocol for the creation of our edited iPSC line.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 193
Presenter: Zorica Nakevska
Supervisor: Yokota, Toshifumi
Title: Enhancement of the efficacy of antisense oligonucleotide-mediated therapy for spinal muscular atrophy using oligonucleotide activity enhancer
Authors: Zorica Nakevska, Tejal Aslesh, Toshifumi Yokota

Theme: Children's health and well-being

Introduction: Spinal muscular atrophy (SMA), the most common genetic cause of infantile death, is caused by a mutation in the survival of motor neuron 1 gene (SMN1), leading to the death of motor neurons and bodywide tissues. If left untreated, most children will not survive past 2 years of age without permanent ventilation support. Although humans possess a paralogous gene SMN2 that produces the same SMN protein, only 10% of functional SMN protein is produced from SMN2 since 90% of SMN2 transcripts lack exon 7 due to splicing of this exon. An FDA-approved antisense oligonucleotide (ASO) nusinersen targets SMN2 to make more functional SMN protein via splice-switching. However, it faces the challenge of systemic delivery. A novel oligonucleotide activity enhancer (OAE), a small molecule that can improve ASO delivery, was identified by our collaborator through screening in cell models. Here, we examined our hypothesis that OAE is safe and can improve the efficacy of the ASO treatment in a mouse model of SMA. Methods: We injected SMA model mice with 20 mg/kg of ASO + 2 mg/kg of OAE, ASO only, or saline on their day of birth. We performed rotarod test to evaluate muscle function. Toxicity of the OAE was evaluated using kidney injury molecule-1 (KIM-1) assay, serum analysis, and examining bodyweight and survival trends. Results: Our results showed that OAE was well tolerated; all treated SMA model mice and healthy control mice survived more than two months, the full period of observation, while all non-treated mice died within 14 days. Mice treated with ASO + OAE showed significantly increased body weight compared to non-treated mice and performed significantly better in the rotarod test compared to non-treated mice and mice treated with ASO only. Conclusion: In conclusion, the treatment with ASO + OAE was safe and significantly improved motor performance. Further study is needed to evaluate whether co-injection can improve the survival of mice and increase SMN expression.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 195
Presenter: Harry Wilton-Clark
Supervisor: Yokota, Toshifumi
Title: Characterization of a cardiac mouse model for Duchenne muscular dystrophy
Authors: Harry Wilton-Clark, Ahad Shah, Toshifumi Yokota

Theme: Children's health and well-being

Introduction Duchenne muscular dystrophy (DMD) is a debilitating and lethal genetic disorder affecting young boys, with a prevalence of approximately 1/5000 males. DMD is caused by a mutation in the DMD gene which encodes for a structural muscle protein called dystrophin, and is characterized by progressive muscular weakness and degeneration. Despite modern advances in the medical care of DMD, the median lifespan of DMD patients is still only 28 years, typically due to DMD-related cardiomyopathy. No cure yet exists for DMD, and the current steroidal treatment methodology has numerous undesirable side effects. In recent years, several exciting genetic treatment approaches have been developed to better treat DMD. Regrettably, these treatments demonstrate poor efficacy in the heart, which is a critical target given the high mortality of DMD-related cardiomyopathy. Thus, an urgent unmet medical need exists for DMD therapies specifically treating the heart. Our lab specializes in genetic therapies for DMD and much of our research is conducted in MDX mice, a mouse model containing a point mutation in the Dmd gene that results in a DMD-like phenotype. However, a key disadvantage of this model is that they do not display the same severity of heart defects as might be expected in human DMD patients. This lack of cardiac phenotype makes it difficult to properly assess for the impact of potential therapies on the heart, hindering research efforts. Therefore, establishing a model which displays a similar cardiac phenotype to human patients is essential to facilitate the development of effective DMD therapeutics addressing cardiomyopathy. We hypothesize that a mouse with a complete knockout of the DMD gene rather than a point mutation would display a more severe dystrophic heart phenotype than MDX by eliminating the production of potentially cardioprotective dystrophin isoforms, serving as a better model to enable the creation of improved DMD therapeutics. To this end, we aim to assess the natural history of a DMD knockout mouse model, called DMDnull, and compare it to MDX mice to determine which is a better model for studying DMD. Methods Mice will be monitored over the course of 12 months across a variety of functional, cardiac, and cellular endpoints. Grip strength, treadmill, rotarod, echocardiogram, and electrocardiogram data will be analyzed every 3 months. At the 6- and 12-month points, we will additionally visualize heart and skeletal muscle cells with immunohistochemistry to complement our functional testing. For each assessment, tests will be conducted using DMDnull mice, MDX mice, and wild-type mice as a control. Statistical analysis will be conducted with ANOVA and post-hoc Tukey's test. Results & Conclusion While this study is in the early stages, preliminary analysis has demonstrated no significant difference in the cardiac performance of DMDnull, MDX, and WT mice at 3 months or 6 months, as assessed with echocardiogram. We remain hopeful that a distinct cardiac phenotype will arise as the mice age and the disease progresses further, which will be measured in our later time points.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 197
Presenter: Danielle Klassen
Supervisor: Storey, Kate
Title: "It trickles into the community": understanding how schools that promote health also influence community environments and practices to help children thrive
Authors: Danielle Klassen, Genevieve Montemurro, Jenn Flynn, Kim Raine, Kate Storey

Theme: Children's health and well-being

Introduction: Schools are a setting where children spend a considerable amount of time during their developmental years. School-based health promotion provides children access to healthy choices and environments as they grow and learn. Comprehensive School Health (CSH) is an internationally recognized and evidence-based framework to promote the wholistic health of school communities. The success of the CSH approach relies on the interconnectedness of the school, home, and community. Research has shown that healthy behaviours learned at school can influence change beyond the school walls, at home and elsewhere. The extent that health promoting behaviours originating in the school can create community-level change has not yet been studied. The Canadian CSH intervention, APPLE Schools, promotes healthy school communities across vastly different settings including cities and rural and remote schools. APPLE Schools impacts the lives of 30,000 children annually in 87 schools. The objective of this research was to understand if and how the values of APPLE Schools have impacted the community environment from the perspective of community members. Methods: An instrumental case study was used for this study. One exemplary community was chosen to understand the impact of APPLE Schools on the community. Due to existing buy-in for the program across both school districts, all 21 elementary schools in the city were APPLE Schools. Each of the elementary schools had joined APPLE Schools at different timepoints within the last decade. A snowball sampling approach was used to identify community partners who participated in semi-structured telephone and zoom interviews (n=17). Partners represented diverse sectors including: recreation and leisure, health services, food services, and non-profit organizations. Additionally, document analysis of policies, school websites, and online news articles was used to contextualize the interview data. All interviews were audio-recorded and transcribed verbatim. Data analysis is ongoing using inductive content analysis. Results: Preliminary findings suggest school-based health promotion creates impact at a community-level and community awareness of APPLE Schools fostered opportunities to help children thrive. Local businesses interacted more with schools and changed their own practices (providing donations, supplying healthy food, volunteering, promoting community services to students). As well, change occurred in learning spaces outside APPLE elementary schools (daycares, pre-schools, middle schools, high schools, and afterschool care settings). Conclusions: Our findings to date emphasize the importance and benefit of fostering close school and community partnerships to strengthen health promotion both within and outside the school environment. School-based health promotion can raise greater awareness of health promotion and by building and maintaining relationships with businesses and organizations in non-school learning spaces, create healthier school communities.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 198
Presenter: Sana Amjad
Supervisor: Ospina, Maria
Title: Association between Social Determinants of Health and Pediatric Emergency Department Utilization: A Systematic Review
Authors: Sana Amjad, Courtney Tromburg, Maryam Adesunkanmi, Jannatul Mawa, Nazif Mahbub, Sandra Campbell, Radha Chari, Brian H. Rowe, Maria B. Ospina

Theme: Children's health and well-being

Introduction: Social determinants of health (SDOH) contribute to health disparities and we hypothesized may contribute to inequalities in the frequency, characteristics, and outcomes of emergency department (ED) visits in pediatric populations. We conducted a systematic review to synthesize the evidence on the association between SDOH and ED outcomes in pediatric populations. Methods: This systematic review was conducted in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses-Equity Extension (PRISMA-E) guidelines. Comprehensive searches were performed using eight electronic databases from inception to July 2022. Observational epidemiological studies were included if they examined at least one SDOH from the PROGRESS-plus framework in relation to ED outcomes among children aged less than 18 years. Study selection, risk of bias, and data extraction were independently performed by two reviewers. Effect direction plots were used for narrative results and pooled odds ratios (pOR) with 95% confidence intervals (CI) for meta-analyses. Results: Fifty-eight studies published between 1995-2022 were included in the review, involving 17,275,090 children and 103,296,839 ED visits. Race/ethnicity was the most commonly reported SDOH. Compared to Caucasian children, children identified as African American/Black were at least three times more likely to utilize the ED (pOR:3.16, 95% CI 2.46, 4.08) whereas children identified as Indigenous had visits that were more likely to result in incomplete care (pOR:1.58, 95% CI 1.39, 1.80). Public insurance, low income, neighborhood deprivation, and proximity to ED were also important predictors of ED utilization. Low English proficiency of a child's caregiver was linked with longer LOS and increased likelihood of hospital admission. Conclusion: Our findings revealed that SDOH play important roles in ED care-seeking patterns of children, particularly racialization, socioeconomic deprivation, proximity to an ED, and language. Overutilization of ED services by children from racialized and lower SES groups may indicate limitations in access to primary health care. An intersectional approach is needed to better understand the trajectories of disparities in pediatric ED outcomes.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 199
Presenter: Anna Marosi
Supervisor: Mackie, Andrew
Title: Acute Kidney Injury After Fontan Surgery
Authors: Anna Marosi, Rae Foshaug, Alyssa Chappell, Jennifer Conway, Catherine Morgan, Andrew Mackie.

Theme: Children's health and well-being

Introduction: Acute kidney injury (AKI) is a common complication following Fontan surgery. However, the duration and outcomes of AKI are not well known. Our objectives were to describe the incidence of AKI and phenotypes of renal recovery post-Fontan, and evaluate its impact on postoperative outcomes. Methods: Single-center retrospective cohort study. Inclusion criteria were children undergoing Fontan surgery between 2009-2022. We excluded those with no preoperative serum creatinine within 90 days of surgery (n=2). Every postoperative serum creatinine was collected until the time of discharge, or 30 days postoperatively, whichever came first. Data regarding postoperative outcomes was collected from the medical record. Results: One hundred and forty-one subjects met eligibility criteria. AKI occurred in 100 (71%) patients. AKI was transient (duration <48 hours) in 48 (48%), persistent (duration 2-7 days) in 40 (40%), and resulted in acute kidney disease (duration > 7 days) in 12 (12%). Median hospital length of stay was 11 days [IQR 8-18] among patients with AKI vs. 8 days [7-10] among those not having AKI (p=0.0011). Duration of pleural drainage was 8 days [IQR 6-12] for those with AKI vs. 7 days [IQR 5-9] among those without AKI (p=0.0274). Those with persistent AKI or AKD experienced greater hospital length of stay (median 13 days [IQR 9-30]) relative to those with transient AKI (median 9 days [IQR 8-13], p=0.001). Sternal wound infections occurred in 7 (13%) of those with persistent AKI or AKD, vs. 0 (0%) of patients with transient AKI (p=0.013). Conclusion: AKI after the Fontan operation is very common, and more than half of the subjects in this study experienced AKI lasting more than 48 hours. AKI and the duration of AKI have significant impacts on total hospital length of stay, and those with persistent AKI or AKD have a greater risk of sternal wound infection postoperatively as compared to those with transient AKI. Further research is needed to uncover the risk factors associated with developing AKI post-Fontan.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 200
Presenter: Camille Yearwood
Supervisor: Kelly, Erin
Title: Do periurethral injections with Bulkamid for the treatment of stress urinary incontinence truly fail at 24 months?
Authors: Camille Yearwood, Erin Kelly, Alykhan Rajwani

Theme: Lifelong women's health

Introduction: Stress urinary incontinence (SUI) is the most common type of urinary incontinence in women. Patients with SUI experience involuntary leakage of urine with increases in intra-abdominal pressure. The prevalence rate of SUI ranges from 29-75% depending on age, with a peak incidence between 45-49 years of age. First-line treatment of SUI consists of conservative management such as lifestyle modifications and pelvic floor muscle training. If conservative treatment fails, surgical management is the most effective treatment option. Unfortunately, these surgical procedures are invasive and carry several potential complications. Urethral bulking is becoming an increasingly common second-line treatment option for SUI. Bulkamid® (polyacrylamide hydrogel) is a urethral bulking agent and is the only injectable bulking agent currently approved for use in Canada to treat SUI. Bulking agents have been shown to have increasing failure rates after 24 months post-treatment. Thus, the primary purpose of this study was to determine the failure rate, and time to failure for Bulkamid® periurethral injections. Secondarily, we aim to study the risk factors associated with the failure of the procedure. Methods This was a retrospective study, reviewing 227 charts of all patients who have undergone periurethral bulking with Bulkamid® for SUI at the Lois Hole Hospital for Women, Royal Alexandra Hospital, and Kaye Edmonton Clinic in Edmonton, Alberta from January 1, 2014, until December 31, 2019. Multiple logistic regression will be used to evaluate the bivariable relationship between the discussed and agreed upon patient and procedural characteristics, and the risk of Bulkamid® treatment failure. Expected outcomes/benefits of the research: We hope the results of this research will establish an initial database of information regarding Bulkamid® use and outcomes in Edmonton, Alberta, which will enable us to better understand the role that Bulkamid® plays in the management algorithm of SUI. Exploring certain risk factors that may affect outcomes of Bulkamid® treatment will provide insight into prognostic factors in the treatment of patients presenting with varying degrees of SUI. Finally, the results of this study may influence the need to determine the role of Bulkamid® injections as a concurrent and adjuvant treatment to first-line surgical procedures to aid in the development of optimal management regimens.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 201
Presenter: Devyn Rorem
Supervisor: Pei, Jacqueline
Title: Finding the Balance: The Influence of Movement Behaviours on Childhood Behaviour Problems
Authors: Devyn Rorem, Victor Ezeugwu, Vannesa Joly, Valerie Carson, Carmen Rasmussen, Elinor Simons, Stuart Turvey, Piush Mandhane, Jacqueline Pei

Theme: Children's health and well-being

Introduction: The release of the Canadian 24-hour movement guidelines has led to an increased focus on movement behaviours over the course of the 24-hour period. Movement behaviours include all daily activities within the 24-hour period, such as sleep, screen and non-screen sedentary behaviour, and physical activity at light, moderate, and vigorous intensities. Though the associations between different movement behaviours and childhood behaviour problems have been well-established, researchers have primarily examined these behaviours in isolation. Methods: We examined the composition and combination of movement behaviours in children within a 24- hour period and how they relate to parent-reported levels of internalizing, externalizing, and total behaviour problems at ages 3 and 5. A subset of the CHILD study birth cohort with valid childhood behavioural problem data was enrolled at age 3 (N Age3 = 541, 48.1% girls) and followed through to age 5 (N Age5 = 575, 49.6% girls). Children wore an accelerometer for up to 7 days and parents completed the preschool Child Behavior Checklist (CBCL). Compositional isotemporal substitution models predicted change in internalizing, externalizing, and total behaviours with reallocating time between movement behaviours. The associations between longitudinal change in movement behaviours and CBCL outcomes were tested using mixed-effects models. Results: Overall, we found a lower incidence of clinically significant behaviour problems than is estimated in the general population, which may be reflective of environmental and demographic factors in our sample. Screen time was associated with greater externalizing behaviours at age 3 and greater internalizing and total problem behaviours at ages 3 and 5. . In particular, through the one-to-one reallocation analyses, we found that increased screen time at the cost of decreased sleep or non-screen sedentary time was particularly detrimental. Reallocation of time from screen to non-screen sedentary time was associated with reductions in internalizing and total behaviour problems at 3 and 5 years and reductions in externalizing behaviours at age 3. Contrary to previous findings, proportional increases in moderate to vigorous physical activity were associated with increased externalizing and total problem behaviours at age 5. Conclusion: Rather than concentrating efforts on promoting specific movement behaviours, clinicians should support families to find an appropriate balance.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 202
Presenter: Chelsea Morin
Supervisor: Schmolzer, Georg
Title: Sustained inflation during cardiopulmonary resuscitation in asphyxiated pediatric piglets - A randomized controlled animal study
Authors: Chelsea MD Morin MD, Po-Yin Cheung MBBS, PhD, Tze-Fun Lee PhD, Megan O'Reilly PhD, Georg M Schmölzer MD, PhD

Theme: Children's health and well-being

Introduction Respiratory arrest is the leading cause of pediatric cardiac arrest. Pediatric CRP guidelines therefore focus on respiratory support during CPR, but the optimal approach to oxygen delivery and coronary perfusion during pediatric CPR is not known. Animal studies reported that chest compressions superimposed with constant high distending pressure, or sustained inflation (CC+SI), significantly reduces time to return of spontaneous circulation (ROSC) compared to 3:1 chest compressions: ventilation in neonatal piglets or chest compressions with asynchronous ventilation (CCaV) in pediatric piglets. During CC+SI, both cardiovascular and respiratory parameters were improved, which resulted in the faster time to ROSC. In the current study, we hypothesized that CC+SI, compared to CCaV, would reduce time to ROSC in pediatric piglets with asphyxia-induced cardiac arrest. Methods and Results Twenty-eight pediatric piglets (21-24 days old, 7.5-9.2 kg) were anesthetized, intubated, instrumented, and exposed to 30 min normocapnic hypoxia followed by asphyxia. Piglets were then randomized to, and received, either CC+SI or CCaV for resuscitation (n=14 per group). Resuscitative efforts were continued until ROSC was achieved, or up to a maximum of 10 min. Hemodynamic parameters were monitored throughout the experiment and up to 30 min post-ROSC. Overall, the mean time to ROSC was 208±190 sec with CC+SI and 388±258 sec with CCaV (p=0.045). There was a 100% increase in the number of piglets achieving ROSC with CC+SI compared to CCaV (CC+SI n=12 versus CCaV n=6, p=0.046). Median minute ventilation in the CC+SI group was 2,315 mL/min compared with 354 mL/min in the CCaV group (p=0.0001). Both systolic and diastolic blood pressure were higher in the CC+SI group, compared to the CCaV group throughout resuscitation. Conclusions CC+SI improved time to ROSC and increased the number of piglets achieving ROSC. There was significantly higher minute ventilation with CC+SI, compared to CCaV, and both systolic and diastolic blood pressure were higher throughout resuscitation with CC+SI compared to CCaV. Studies in pediatric patients using CC+SI are warranted.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 203
Presenter: Farin Mir
Supervisor: Yokota, Toshifumi
Title: Enhancement of antisense oligonucleotide-mediated gene knockdown and exon skipping using an FDA-approved small molecule in human cell models of genetic diseases
Authors: Farin Mir, Saeed Anwar, Toshifumi Yokota

Theme: Children's health and well-being

Introduction: Antisense oligonucleotides (ASOs) are synthetic DNA-like molecules that have therapeutic uses to treat genetic diseases. Since 2013, more than 10 ASOs have been approved for the treatment of childhood genetic diseases worldwide. However, ASO-mediated therapies face a common major challenge: limited in vivo delivery. A novel small molecule called oligonucleotide activity enhancer (OAE1), a molecule that can improve ASO delivery, has been recently identified through screening in cell models. Here, we tested our hypothesis that OAE1 can improve the efficacy of the ASO treatment in three human cell models of childhood genetic diseases, including facioscapulohumeral muscular dystrophy (FSHD), fibrodysplasia ossificans progressive (FOP), and dysferlin-deficient muscular dystrophy called dysferlinopathy. Methods: FSHD and FOP are autosomal dominant diseases caused by aberrant expression of the DUX4 gene and a missense mutation in the ACVR1 gene, respectively, while dysferlinopathy is an autosomal recessive muscular dystrophy caused by dysferlin deficiency. We sought to knock down the expression of DUX4 and ACVR1 using a class of ASOs called gapmers, chimeric ASOs that knock down mRNA by inducing RNase H, for the treatment of FSHD and FOP. On the other hand, we employed ASOs we published recently that significantly increase the expression of dysferlin through exon skipping in dysferlin-deficient patient cells. Exon skipping is a technique to boost truncated yet functional protein production by skipping frame-disrupting exon(s) using ASOs. For each disease case, patient-derived muscle cells or fibroblasts were transfected with ASOs with or without OAE1. The levels of gene knockdown and exon skipping were measured by qRT-PCR and RT-PCR. Results: Compared to the ASO-treated groups without OAE1, a significant decrease in gene expression was seen in all treated groups with ASO and OAE1 in FSHD and FOP cells, respectively. In addition, the treatment with ASO and OAE1 for dysferlinopathy resulted in a significant increase in exon skipping compared to the treatment with ASO only. The effect of OAE1 was dose-dependent and even higher than that of commonly used transfection reagents including lipofectamine and endo-porter. Conclusions: OAE1 increased the effectiveness of both gapmers and exon skipping ASOs in all three diseases tested in vitro. The use of this FDA-approved agent could be applied clinically to improve ASO therapies. These results encourage further work to examine its effects in vivo in mouse models of these diseases.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 204
Presenter: Martha Moran
Supervisor: Lin, Lily
Title: Symmetric leaflet expansion with mild progressive leaflet tethering is a normal developmental feature of tricuspid valve maturation during youth: a quantitative three-dimensional echocardiography (3DE) study
Authors: Martha Moran, Tuqa Al Lawati, Nee S. Khoo, Timothy Colen, Richard Thompson, Justin Grenier, Lily Lin

Theme: Children's health and well-being

Background Recent study on mitral valve development in healthy children suggest developmental differences between leaflets, with greater relative expansion of the anterior leaflet while maintaining annular saddle shape. To our knowledge, there is no published literature on developmental changes of the tricuspid valve (TV). In adult tricuspid valves, pathologic series suggest a qualitatively larger anterior leaflet with variability in the size of both posterior and septal leaflets. Using 3DE we aim to quantify developmental changes of the TV annulus and leaflets. Methods This cross-sectional study used prospectively acquired TV 3DE volumetric datasets in 51 healthy children between 0 and 18 years of age. Using a custom designed TV MATLAB software, annular dimensions, sphericity index (lateral width/anteroposterior annular dimension ratio) and bending angle were analyzed in mid-systole. TV leaflets were segmented into anterior (AL), septal (SL) and posterior (PL) to measure regional areas, prolapse and tethering volumes. Subjects were divided into 3 age groups: 0-5, 6-12 and 13-18 years. Between group comparison was performed using the Kruskal-Wallis test with significance at $p<0.05$. Results Between group comparisons for TV annulus and leaflet 3DE parameters were detailed in Table 1. With increasing age and size, TV annulus enlarged in both the anteroposterior and lateral dimensions. This annular growth occurred symmetrically such that annular sphericity index remained unchanged. Furthermore, the "saddle-shape" geometry of the annulus, quantified using the annular bending angle, was also maintained across groups. There was size-proportionate expansion of TV leaflets with increasing age (stable total leaflet area indexed by BSA). Individual leaflets also expanded symmetrically. There was no significant change in leaflet prolapse with increasing age, but a modest increase in leaflet tethering ($p=0.01$) was demonstrated. This progressive leaflet tethering was more pronounced in the AL and SL over PL. Conclusion Our study suggests that preservation of annular geometry occurred with normal TV maturation. Contrary to adult TV pathologic series, there was symmetric leaflets expansion during youth. Interestingly, there was also concurrent mild progressive leaflet tethering. Whether leaflet tethering is the result of physiologic differences in growth potential between leaflets and subvalve tensor apparatus or an adaptive biologic stimulus for leaflet growth, warrants further exploration.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 205
Presenter: Asghar Fallah
Supervisor: Kannu, Peter
Title: Direct cell reprogramming to create bone cells
Authors: Asghar Fallah

Theme: Lifelong women's health

Introduction: Over 5-10% of all fractures do not heal or fail to truly unite resulting in fracture non-union causing pain and diminished mobility. The risk of a fracture is higher in women affected by osteoporosis. Fracture non-union is treated surgically to stabilize the bone since no effective medical therapies exist. Autograft and allograft stem cells have recently been used to fill the non-healing bone defects in fracture-non-union since stem cell transplantation enhances bone cell differentiation. However, there are challenges in the production of human stem cells. We hypothesize that direct reprogramming (DR) of human fibroblasts into bone cells using self-replicating mRNAs can be an effective and safe method to create these cells for use in clinical practice. Our non-integrative and non-teratogenic approach is safe for clinical applications. Methods: First, we created a reporter system to monitor bone cell (osteoblast, OB) differentiation to track the transformation of fibroblasts into OBs. We subcloned the human osteocalcin promoter sequence into a lentivirus transfer plasmid containing green fluorescent protein (GFP) and puromycin selection marker genes. To determine the volume of reporter system needed for transduction, we measured the titer of the viral reporter system using QPCR. Fibroblasts were then transduced with the reporter system Secondly, we created a self-replicating mRNA system to drive OB differentiation. We designed a polycistronic construct containing OB specific transcription factors (RUNX2, OSTERIX, OCT4 and L-MYC). Construct orientation was checked by EcoRI-SmaI restriction enzymes digestion. Sanger sequencing was used to check for plasmid replication-induced coding errors. Following in vitro transcription of the construct, a 5' cap and poly(A) tail were added to the self-replicating mRNA. RNA purification and quantification were checked by NanoDrop and RNA size was checked by gel electrophoresis. The self-replicating mRNA was then transfected into the transduced fibroblasts containing the reporter system. Results: OB differentiation was confirmed by GFP expression in the reporter system and verified through the expression of OB-specific genes (COL1A1 and Osteocalcin) by QPCR. We also confirmed protein expression of COL1A1 and Osteocalcin by Western blot. Alizarin red staining was used to show mineralization by the OBs. Discussion: Our work demonstrates that DR using an mRNA system is efficient as shown by GFP expression. Our iOBs express the typical markers seen in osteoblasts. However, we do not know how stable the iOBs are and are presently culturing these cells for an extended time period. Since our long-term goal is to treat fracture non-union, our next experiments will focus on demonstrating the use of iOBs in an in vivo murine fracture repair model. Conclusion: This study utilizes DR of cells for bone regeneration. The induced pluripotent stem cell approach to tissue regeneration is time-consuming and involves the transition through an intermediate pluripotent state which risks the induction of malignancy in the cells. Our use of DR to create OBs in a dish is the first step in a long journey toward creating alternative safer methods to create human cells for medical therapeutics.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 206
Presenter: Danielle Mattson
Supervisor: Pei, Jacqueline
Title: Self- and caregiver-reported behavioural and mental health differences in youth with and without prenatal alcohol exposure (PAE)
Authors: Danielle Mattson, Daphne Nakhid, Catherine Lebel, Carly McMorris, W. Ben Gibbard, Christina Tortorelli, Jacqueline Pei

Theme: Children's health and well-being

Introduction: Individuals with prenatal alcohol exposure (PAE) experience much higher than typical rates of behavioural and mental health challenges (Weyrauch et al., 2017). Such difficulties may exacerbate existing PAE-related impairments as well as increase affected individuals' susceptibility to the other adverse psychosocial outcomes commonly observed within this population (McLachlan et al., 2020). However, there is currently a paucity of research examining the specific patterns of behavioural and mental health differences experienced by Canadian youth with PAE relative to their peers, particularly from both their own and their caregivers' perspectives. As understanding such patterns is critical for informing effective prevention and intervention efforts, the present study aimed to answer the following questions: (a) Do youth with PAE see themselves as experiencing significantly different behavioural and mental health difficulties than youth without PAE? (b) Do the caregivers of youth with PAE see their children as experiencing significantly different behavioural and mental health difficulties than youth without PAE? (c) Do age and/or sex have an effect on any patterns of difficulties observed for youth with PAE? Methods: Youth with and without PAE aged 7 to 18 are currently completing self- and caregiver-reported measures of behaviour and mental health as part of a longitudinal research project called the Prenatal Exposure And Child brain and mental Health (PEACH) study (see Lebel et al., 2021 for details). Broadband symptoms of each are being measured using a social-emotional questionnaire, the Behavior Assessment System for Children, 3rd Edition (BASC-3). The Multidimensional Anxiety Scale for Children, 2nd Edition (MASC-2) and the Children's Depression Inventory, 2nd Edition (CDI-2) are also being used to measure participants' symptoms of anxiety and depression in greater detail. Results: Preliminary study findings suggest that youth with PAE and their caregivers report higher scores (more difficulties) on a number of scales measuring behavioural and mental health functioning relative to participants without PAE, with caregivers reporting more concerns overall. However, as the PEACH study is a multi-site project with ongoing participant enrollment, results will be updated closer to the date of the symposium in order to ensure the most robust data possible is presented. Conclusion: Youth with PAE appear to experience different patterns of behavioural and mental health difficulties than youth without PAE. Establishing a clearer understanding of youth's functioning from both their own and their caregivers' perspectives is critical for promoting healthy development in this unique population as such findings can be leveraged to help inform prevention and intervention efforts going forward.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 207
Presenter: Negar Heidari
Supervisor: Hornberger, Lisa
Title: Natural History of Atrial Septal Defects Diagnosed in Term and Preterm Neonates
Authors: Negar Heidari, Dr. Lisa K. Hornberger

Theme: Children's health and well-being

Introduction: Atrial septal defects (ASD) are a commonly found congenital heart disease through echocardiography, where the wall between upper chambers of the heart (atria) has a hole. Secundum ASDs are the most common type of ASD based on location and etiology. ASDs can cause multiple health issues if untreated, and, as such, knowledge about their natural history is important for timely monitoring and intervention. Additionally, increasing use of echocardiography in neonatal intensive care units has enhanced our ability to diagnose ASDs in newborns, making it imperative to establish the natural history of ASDs for more appropriate triaging in pediatric cardiology follow-ups. While data is not established among preterm neonates, a study of term infants suggested that secundum ASDs <3mm spontaneously close whereas those ≥3mm may not. With this knowledge, all newborns with ASDs ≥3mm receive cardiology follow-up, which may lead to unnecessary resource use if they are likely to close or not require intervention. We hypothesized that 1) the majority of secundum ASDs ≥3mm identified at <1 month age undergo spontaneous resolution; 2) smaller ASDs are more likely to undergo spontaneous resolution; 3) ASDs in preterm neonates are less likely to spontaneously resolve, potentially due to the well-documented diastolic dysfunction among this population. Methods: To assess our hypotheses, we performed a retrospective cohort study of all term newborns who underwent echocardiography, were diagnosed with an ASD ≥3mm within the Royal Alexandra Hospital from 2010-2018, and had at least one repeat echo. We assessed 155 preterm neonates (<36 wks gestation) and 154 term neonates (≥36 wks gestation). Median age at last follow-up in term neonates was 9 months (range= 1-128) and in preterm neonates was 5 months (range= 1-94). Spontaneous resolution was defined as closed ASD or ASD ≤3 mm in size, not warranting further follow-up. Results: Among term neonates, the rate of spontaneous resolution was 95% in small ASDs (3-5 mm), 86% in moderate ASDs (5.1-8 mm), and 60% in large ASDs (>8 mm). By comparison among preterm neonates, the rate of spontaneous resolution was 79% in small, 77% in moderate, and 67% in large ASDs. A chi-square test of independence showed significant association between size and likelihood of ASD resolution in term neonates ($p<.05$) but not preterm neonates ($p>.05$). Furthermore, overall ASD resolution rate was higher in term neonates (88%) compared to preterm neonates (78%) (chi-square test, $p<.05$). Finally, 2 term neonates compared with 11 preterm neonates required ASD closure interventions (chi-square test, $p<.05$). Conclusion: Our findings confirm that 1) the majority of term and preterm neonates with ASDs experience spontaneous resolution; 2) smaller ASDs are more likely than larger ASDs to spontaneously resolve, significantly so among term neonates; 3) preterm neonates have an overall lower rate of spontaneous ASD resolution and higher need for ASD closure intervention. These findings suggest that follow-up monitoring in asymptomatic term neonates with ASDs <8mm in size can be discontinued while preterm neonates with ASDs>3 mm are likely to benefit from continued follow-up echocardiographic studies.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 208
Presenter: Aklima Akter
Supervisor: Clemente-Casares, Xavier
Title: Understanding the role of prior exposure of virome and its effects on pediatric viral myocarditis outcomes
Authors: Aklima Akter, Megan Lee, Kasia Dzierlega, Masoud Akbari, Sue Tsai, and Xavier Clemente-Casares

Theme: Children's health and well-being

Introduction Pediatric viral myocarditis is a rare but often life-threatening disease. For unknown reasons, children are particularly susceptible to the development of viral myocarditis, with only ~30% surviving. Of those that survive, about 50% develop severe chronic heart disease, which ultimately leads to dilated cardiomyopathy (DCM). Similar to humans, adult mice suffer minimal heart damage and fully recover from infections compared to pediatric mice. Although extensive research has been done to investigate the role of different types of immune cells in the context of adult mouse models of viral myocarditis, very little is present for pediatric or adolescent mice. Therefore, our goal is here to study how prior exposure to the virus determines the outcome of cardiac infections in pediatric mice and compare those determinants with adult mice. Methods To determine the pathophysiology of pediatric myocarditis susceptibility and study the role of immune cells in the pediatric heart during viral infection, we infected adult and pediatric mice with a cardiotropic virus, encephalomyocarditis virus, variant D (EMCV-D). We then monitored the mice until day 14, collected tissues, processed for flow cytometry and histology. Results We found that while pediatric mice were highly susceptible to viral myocarditis, adults were fully protected. Our histological data suggested that young mice developed a higher fibrosis level than the adult mice. However, we have also noticed that if mice are previously exposed to another virus such as murine norovirus (MNV), the disease susceptibility of viral myocarditis in pediatric mice is reduced. The mice that were not exposed to MNV reached 90% mortality within 14 days following infection compared to the mice that were positive for MNV. Additionally, MNV (-) mice showed a significant level of hind limb paralysis and a higher level of body weight loss than the MNV (+) mice. However, our histological and immunological analysis revealed no differences in fibrotic lesions and immune cell population in the heart between MNV (+) and MNV (-) groups of mice. Conclusion Our data suggested that although pediatric mice are susceptible to viral infections in heart compare to adult, but prior exposure to other pathogens reduce those susceptibility. However, further research needs to be done to determine the outcome of cardiac infections in pediatric mice and compare those determinants with adult mice.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 209
Presenter: Vaishvi Patel
Supervisor: Ross, Sue
Title: Assessing young adults' menopause knowledge to increase understanding of symptoms and help improve quality of life for women going through menopause; a student survey.
Authors: Vaishvi Patel, Beate C Sydora, Sue Ross

Theme: Lifelong women's health

Introduction: Due to menopause being a largely invisible and under-discussed topic in wider society, women often deal with menopause-related complications on their own. Social support and education have been shown to reduce negative menopausal experiences and improve quality of life; however, lack of menopause knowledge particularly among younger people may deter support for women suffering from menopause symptoms. This study aims to assess the level of knowledge young adults have on menopause to be able to create interventions that target knowledge gaps and increase understanding of women's experiences and difficulties during their menopause transition. Methods: We created an electronic questionnaire based on menopause literature and guidelines from Menopause Societies (IMS and NAMS). It was pilot tested on menopause clinicians (n=5), young people of target group age (n=14; 7 male and 7 female) and women experiencing menopause (n=4) to collect feedback. The final survey included questions on participant demographics, general menopause knowledge, and options to support menopause management. A knowledge self-assessment scale was provided at the beginning and the end of the survey. A nine-point scoring system of evidence-based questions was also created to compare menopause knowledge between groups. The questionnaire was distributed to University of Alberta students through student digest newsletters; answers over a two-week period were collected anonymously in the secure web-based application REDCap. Descriptive statistics were applied to characterize participants, define menopause knowledge, and identify gaps. Results: Survey responses were collected from 828 (76 graduate and 752 undergraduate) students; the average age was 22.1±5.1 and 83.6% were female. Participants belonged to all faculties and included students from a variety of family settings and living conditions. While most students had a good understanding of the basic menopause physiology, knowledge was not consistent and there were gaps in understanding of symptoms and management. There was a significant difference in menopause knowledge between the sexes (X^2 (1, N = 780) = 11.9, p = .02); females demonstrated higher knowledge levels than males. There was also a significant difference (X^2 (1, N = 787) = 15.7, p = .003) in menopause knowledge between those who had close contact with a woman in the menopause stage and those who did not. Both males and females reported increased knowledge confidence at the end of the survey; on average females reported higher levels of confidence than males. Conclusion: Our results indicate gender, as well as a personal connection to menopausal women, affect the degree of menopause knowledge in young adults. We also found that young adults have a general baseline knowledge of menopause and its symptoms, and are open to learning strategies to help support these women. Our findings will assist in developing targeted educational resources to increase social support and awareness in a cost-effective and sustainable manner, reducing stigma and mitigating complications, improving the quality of life in menopausal women and helping prepare younger women for their future menopausal journey.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 210
Presenter: Lise Hermant
Supervisor: Pagliardini, Silvia
Title: Sleep and Breathing characteristics in newborn rats exposed to prenatal cannabinoids
Authors: Hermant Lise Biancardi Vivian Janes Tara A. Pagliardini Silvia

Theme: Pregnancy and developmental trajectories

Introduction The legalization of cannabis use has stimulated a major interest in the assessment of harms and benefits of cannabis use among the Canadian population. Cannabis is composed of close to 500 natural constituents called cannabinoids. Amongst the most abundant cannabinoids, there are Cannabidiol (CBD), Cannabichromene (CBC), Δ9-THC. Our project focused on investigating the development of respiratory and sleeping function in neonatal rats (from postnatal day, P0 to P10) following a chronic prenatal exposure to selected cannabinoids. Methods In order to investigate how prenatal cannabinoids exposure would affect the postnatal development of respiratory and sleep-awake patterns, we implanted pregnant rats with an Alzet osmotic pump at embryonic day 5(E5) to deliver either vehicle, CBC or CBD through the rest of gestation (E5-21). Newborn rats were instrumented with neck EMG electrodes and video recorded while inside a whole body plethysmograph in order to determine their sleeping behaviors (wake, active and quiet sleep) and their respiratory activity. Results We have analyzed sleep and breathing patterns at postnatal day (P) 0, P1-2, P3-4 and P5-6 Our preliminary findings indicate that through the first postnatal week rats gradually increase the time they spend in quiet sleep, precursor of NREM sleep and reduce the time they spend in active sleep (precursor of REM sleep). Furthermore, prenatally CBC-treated rats spent more time in wakefulness and less time in quiet sleep compared to control, sham and CBD-treated rats. Interestingly, the breathing rate of prenatally CBC-treated rats was reduced in comparison to the other litters in both quiet and active sleep, with the largest difference observed at P0. Conclusion Our preliminary results indicate that prenatal CBC (2.5 mg/kg/day) has an effect on both sleeping and breathing functions in newborn rats. Further experiments will be necessary to confirm our preliminary findings and compare the CBC/CBD effects to the other major cannabinoid components.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 211
Presenter: Scott Bennett
Supervisor: Hornberger, Lisa
Title: Impact of socioeconomic status and remoteness of residence on fetal outcomes in major congenital heart disease
Authors: Scott Bennett Lisa K. Hornberger Luke G. Eckersley Deborah Fruitman Amanpreet Kaur

Theme: Pregnancy and developmental trajectories

Background • Social determinants of health impact outcomes in congenital heart disease (CHD), specifically increased remoteness of residence (RoR) and lower socioeconomic status (SES) are associated with later prenatal diagnosis • Timing of prenatal diagnosis may affect parental decision-making regarding continuation of pregnancy • We explored the impact of RoR and SES on termination of pregnancy (TOP), adjusting for syndromic diagnoses (syn) and gestational age at time of prenatal diagnosis (GADx) Methods • We retrospectively identified all fetal cases of major CHD (mCHD) in Alberta from 2008-2021 • We determined Chan index SES, and RoR from closest fetal cardiology unit • We categorized outcomes as TOP or intention to continue pregnancy (live birth, intrauterine fetal demise, still birth) • We analyzed direct and indirect effects on outcome overall and stratified by presence of syndromes (mCHD+/-syn). Analysis was done with structured equation modelling and statistical mediation analysis Results •1097 pregnancies with a prenatal diagnosis of major CHD • 56 of 268 +syn (20.9%) and 147 of 823 -syn (17.9%) resulted in TOP • If GADx was before 22 weeks TOP rate was 27.9%, if GADx was after 22 weeks TOP rate was 8.8% (p<0.0001) • mCHD+syn: ROR (p=0.025) and SES (p=0.007) associated with later GADx • RoR: • RoR was associated with later GADx (p=0.017) with no direct effect on outcome • GADx completely mediated the impact of RoR on outcome overall and in mCHD+syn • SES: • Lower SES trended towards later GADx (p=0.063) with no direct effect on outcome • GADx trended toward complete mediation of SES on outcome overall, and showed complete mediation of SES on outcome in mCHD+syn Conclusion • We found that later GADx is a mediator of the impact of RoR and potentially SES on pregnancy choice • The effect of SES and ROR on gestation was most apparent in those with mCHD+syn • Further investigations are needed to determine how to reduce barriers to equitable care prior to 22 weeks gestation

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 212
Presenter: Chelsey Grimbly
Supervisor: Alexander, R Todd
Title: Chiari 1 malformations and craniosynostosis in X-Linked Hypophosphatemia
Authors: Grimbly C, Jaremko L, Girgis R, Rosolowsky E, Doulla M, Ward LM, Alexander RT

Theme: Children's health and well-being

Introduction: X-linked hypophosphatemia (XLH) is the most common genetic cause of hypophosphatemia and is most often due to a mutation in the PHEX gene. This leads to elevated FGF23, a hormone that induces renal phosphate wasting. XLH has a well-recognized bone phenotype including rickets, lower limb bowing, and bone pain. XLH has associated neurologic complications including craniosynostosis and Chiari 1 Malformations (CM1) that can present with acute or permanent neurologic deficits including increased intracranial pressure, papilledema, or nerve radiculopathy. The prevalence of neurologic complications is unclear. Our primary aim was to prospectively evaluate the rates of CM1, craniosynostosis and syringomyelia in children and adults with XLH, and to assess if craniosynostosis is a risk factor for CM1. Methods: We performed a prospective study evaluating brain imaging on individuals with XLH. Inclusion criteria included a known diagnosis of XLH based on genetic or biochemical profile. Individuals underwent a brain and spine MRI and CT of the skull. Chiari 1 malformation was defined as cerebellar protrusion ≥5 mm below the foramen magnum measured on MRI. CT was employed to visualize skull sutures. Craniosynostosis was defined as loss of visible sutures. The cranial index is a ratio of skull width to length that may predict craniosynostosis. It was measured on CT images. A clinical questionnaire was conducted for details on diagnosis, treatment history, and symptoms. Descriptive statistical analysis was performed. Results: 22 individuals were enrolled (median 22.7 years, 77% female, 50% were <18 years of age). The mean pediatric height Z-score was -1.69 (SD 1.3) and the mean adult height was 156.1 cm (SD 4.6 cm). PHEX mutations were identified in 16/22 individuals (73%). Three participants had a Chiari 1 malformation (3/22, 14%) and ten participants had craniosynostosis (10/22, 45%). Only one individual had both a Chiari 1 malformation and craniosynostosis. Headaches were present in 1/3 individual with CM1 and 6/10 individuals with craniosynostosis. The cranial index was the same in individuals with or without craniosynostosis (0.77). No participant had syringomyelia. Conclusion: Craniosynostosis is very common in patients with XLH and as is CM1 although less so. CM1 and craniosynostosis can be asymptomatic, and CM1 can occur in the absence of craniosynostosis. Headaches were not a useful predictor of CM1 or craniosynostosis and cranial index was not a reliable marker of craniosynostosis. These malformations can have potentially severe clinical outcomes and we recommend routine screening via imaging in all individuals with XLH.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 213
Presenter: Mustafa Al Balushi
Supervisor: Menon, Geetha
Title: Virtually a Reality: Making Cervical Brachytherapy Learning Accessible Through a Novel Virtual Reality Simulator
Authors: Mustafa Al Balushi, Fleur Huang, Lesley Baldwin, Nathanial Maeda, Ericka Wiebe, Julie Cuartero, Yugmel Nijjar, Geetha Menon

Theme: Lifelong women's health

Introduction: Locally advanced cervical cancer (LACC) is curable only when sufficient radiation dose can be delivered to tumor. This requires brachytherapy (BT), a complex procedure to place a radiation delivery device inside the gynecological tract, fitted to tumor and patient anatomy. How BT is performed impacts tumor control outcomes. High quality BT relies on clinical acumen and technical skills acquired through hands-on experience. Diminishing opportunities for learners to participate in BT is a recognized barrier to development of a critical skillset. It also threatens service continuity when curative treatment needs to become more accessible globally to women with LACC. Virtual reality (VR) has been shown to improve acquisition of practical knowledge and skills transferable to the operating room (OR). In a first-in-kind application of VR to the problem of CC BT training, we built an interactive VR simulator, conceived to allow learners to mimic the steps of an intracavitary/interstitial (IC/IS) BT procedure for LACC. Methods: An informal needs assessment was undertaken, surveying relevant stakeholders on current clinical training requirements and desired specifications for a training tool for CC BT. Procedure specific learning outcomes were then crafted, after review of institutional and international guidelines. A case vignette was developed to reflect a typical LACC treatment scenario. The procedural steps of IC/IS BT, using a latest-generation applicator (Elekta, Netherlands; with permission), were coded in a process map. Surgical instruments used during BT were scanned on CT, and modelled in-house: each was delineated in the radiotherapy workspace (Varian, US), then image-processed (Autodesk, US) before export (filmbox format) to Unreal Engine v4 (Epic Games, US), a game engine supporting VR platforms. The simulation (sim) was developed iteratively to resemble actual BT procedures. Results: The prototype sim has been optimized for use with Oculus Quest 2 (Reality Labs, US) but is compatible with other commercially available headsets. The sim begins with the user in the OR, next to an instrument tray and a computer-generated patient. A sequence of text instructions and pop-up questions enable users to proceed at their own pace through the sim. Performing maneuvers with correct hand/body orientation, in the correct order, and selecting appropriate instruments are examples of user actions that trigger the sim to advance. At the end of the procedure, the user is provided with information regarding post-procedural processes. Haptic (controller vibration) and visual (instruments snapping into place, text boxes) feedback cues mark the successful completion of each step. No penalty was built in for incorrect actions, the intent being a formative experience: the user practices and problem-solves until a correct sequence is performed. The user view can be projected real-time onto an external monitor for an audience of learners or advisors. The sim can be paused at any time. Conclusion: A novel immersive VR sim for CC BT was developed. Future work will focus on increasing versatility and establishing content validity. VR sim in BT holds great promise to expand the accessibility of both BT learning and service delivery for women with LACC

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 215
Presenter: Rohan Persad
Supervisor: Turner, Justine
Title: Impact of trophic peptides on intestinal permeability in neonatal piglets with short bowel syndrome: a pilot study
Authors: Co-Authors: Rohan Persad; Mirielle Pauline; Evan Labonne; Caitlin Huynh; Pamela Wizzard; Kun Wang; Patrick N. Nation; Justine M. Turner; Paul W. Wales; Donna F. Vine

Theme: Children's health and well-being

Introduction : Short bowel syndrome (SBS) is the most common cause of intestinal failure in infants. In SBS the intestinal absorptive capacity of nutrients or fluid is inadequate to support survival and growth. SBS leads to changes in intestinal mucosal barrier and function. This may result in increased intestinal permeability, allowing bacterial translocation across the epithelium into the bloodstream, leading to life threatening infection in the neonate. The aim of this pilot study was to determine the impact of the trophic peptides glucagon like peptide-2 (GLP-2) and insulin like growth factor-1 (IGF-1), alone and in combination, on intestinal permeability in a SBS piglet model. Methods: Neonatal piglets aged 2-5 days with SBS (75% distal bowel resection including ileum and ICV, with jejunal-colonic anastomosis), were randomized to one of 4 groups: GLP-2 analogue given subcutaneously (TED, n=5), IGF-1 given via gastric tube (IGF, n=3), both GLP-2 and IGF-1 (IGF/TED, n=3) and saline control (SAL, n=4) for 7 days. Animals were supported with parenteral nutrition and 20% enteral nutrition to promote intestinal adaptation. A terminal laparotomy was performed and jejunum used to measure intestinal permeability of polyethylene glycol (PEG) (Mr: 4000) and mannitol (Mr: 180) using Ussing techniques (gold standard ex-vivo method). Data was analyzed via Mann-Whitney. Results: There was no difference in mucosal-to-serosal (M-S) permeability for Mannitol or PEG between treatments. Mannitol permeability was not different comparing IGF (p=0.72), IGF/TED (p=0.72), or TED (p=0.81) to control. PEG permeability was not different for IGF (p=0.72) or TED (p=0.33), however was increased 3-fold for IGF/TED as compared to SAL (p=0.034). There was no difference for PEG permeability between TED and IGF (p=0.66), TED and IGF/TED (p=0.053) or IGF/TED in comparison to IGF (p=0.050). Conclusion: Permeability represents a key functional outcome, given permeability to PEG is akin to large size particles being able to move across the epithelium, like bacteria and their toxins; while permeability to mannitol represents access for smaller particles, like nutrients. In this pilot study, combination IGF-1 and GLP-2 treatment increased permeability of large particles, which could have unintended clinical consequences, like increasing bacterial translocation. This research is in progress and will both increase the sample size and culture mesenteric lymph nodes going forward.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 216
Presenter: Gabriele Matteoli
Supervisor: Pagliardini, Silvia
Title: Perinatal exposure to the pesticide Chlorpyrifos impacts on breathing phenotype in adult mice
Authors: Gabriele Matteoli, Chiara Berteotti, Sara Alvente, Maria Lavinia Bartolucci, Stefano Bastianini, Viviana Lo Martire, Elena Miglioranza, Roberto Rimondini-Giorgini, Alessandro Silvani, Giovanna Zoccoli

Theme: Children's health and well-being

Introduction. Chlorpyrifos (CPF) is an organophosphate pesticide, which was widely used in agriculture, gardening, and animal care for pest control. Hence, CPF represents an important food and environment contaminant, that can be transmitted to the fetus via the placenta or to newborns via breastfeeding. CPF acts as a potent acetylcholinesterase inhibitor, and thus its presence may cause excessive levels of cholinergic neurotransmitter at synapses. Since acetylcholine is a neurotransmitter tightly involved in the respiratory regulation (PMID: 19651660), respiratory activity could be influenced by cholinergic hyperstimulation. The perinatal exposure to CPF may impact through different mechanisms on adult health, as recently reported for perinatal exposure to nicotine in mice (PMID: 34903845). Therefore, although its use has been recently banned due to its potential risk for health, the aim of the present study was to explore the long-term effects of perinatal CPF exposure on the respiratory pattern in adult mice. Methods. CPF (5mg/kg per day) or its vehicle (peanut oil) were administered to dams from mating until weaning by intraoral gavage. Pups were never directly treated with CPF. Adult female and male mice (17-18 weeks of age) born to CPF- (female, n=13 and male, n=15) or vehicle-treated (female, n=13 and male, n=13) dams underwent surgery for the implantation of electrodes capable of recording the electroencephalographic and electromyographic signals for the continuous behavioural state monitoring (wakefulness, non-rapid eye movement sleep, rapid eye movement sleep). Following recovery from surgery (7 days), mice were recorded for 8 hours in a whole-body plethysmography chamber for the simultaneous measurement of ventilatory and behavioural signals. Data were analyzed with ANOVA on log-transformed values with sex and treatment as factors and with a threshold for statistical significance set to $P < 0.05$. Results. The apnea occurrence rate during sleep was increased in mice born from CPF-treated dams with respect to control mice ($P = 0.0004$) and was higher in females than in males ($P = 0.0380$), with no significant interaction between treatment and sex ($P = 0.8046$). Conclusions. These results indicate that perinatal exposure to CPF produced an altered breathing phenotype in adult mice. Thus, humans might likewise exhibit a long-lasting altered reprogramming of breathing patterns during sleep in adulthood.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 217
Presenter: Amber Ali
Supervisor: Newton, Amanda (Mandi)
Title: Partnerships to design communication instructions for mental health visits to the pediatric emergency department
Authors: Amber Ali, Bruce Wright, Joelle Fawcett-Arsenault, Janet Curran, Amanda Newton

Theme: Children's health and well-being

Introduction: The emergency department (ED) is an important place of care when a child or youth experiences a mental health crisis. Common reasons for seeking ED care are suicidal ideation, panic attacks, and aggressive behaviours that risk hurting others. The aim of this project was to improve the conversations that healthcare providers and families have about what to do after the ED visit. This conversation-based intervention is called discharge communication. Methods: The project was conducted in two phases using the principles of experience-based co-design (EBCD). In the first phase (Sept 2021 to Jan 2022), four meetings were conducted with a co-design team of parents, healthcare providers and researchers. The team identified two changes needed to improve discharge communication: 1) an interactive discussion between health care provider and family before leaving the ED, and 2) the need for communication after the ED visit. The team used the behavior change wheel, a theoretical framework, to create strategies - a pamphlet for families and healthcare providers to use together during the visit, and a text messaging system for families after the visit - to support the two changes. After the last design meeting, team members completed the patient and public engagement evaluation tool (PPEET). In the second phase (Apr to Jul 2022), the usability of the pamphlet and text messaging system was evaluated. Youth and parent participants completed tasks related to using the pamphlet and provided feedback on text message content and timing. ED physicians and nurses used the pamphlet to complete tasks related to communicating discharge instructions and answering youth/parent questions. Usability testing participants also completed user satisfaction surveys. The feedback from the usability evaluation was then used by the co-design team to improve the final versions of the pamphlet and text messaging system that will be used with families in the ED. Results: This project resulted in two discharge communication strategies for ED mental health visits. In phase 1, all PPEET items were rated positively with a mean engagement score of 4.5/5. Results from phase 2 usability testing included high user satisfaction with both discharge communication strategies. Design changes revealed during brochure usability testing included providing written instructions on how to fill it out and who to fill it out with, as well as identifying walk-in mental health resources for families. Suggested changes to the text messaging system included re-phrasing the text for clarity on what is being provided, and sending out the text to families within 24-48 hours of presenting to the ED. All suggested changes were incorporated into the final versions. Conclusion: EBCD is a meaningful way to create change to healthcare services. The new discharge communication strategies produced by this study will be used in the stollery children's hospital ED with families who come to the hospital in crisis for their child's mental health concern. Follow-up studies will be conducted to evaluate the impact of the discharge communication on patients and parents/caregivers, and healthcare system use after the ED visit.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 218
Presenter: Jad-Julian Rachid
Supervisor: Bourque, Stephane
Title: Cardiovascular outcomes in maternal iron deficiency anemia with pre-existing hypertension
Authors: Jad-Julian R. Rachid, Si Ning Liu, Claudia D. Holody, Alyssa Wiedemeyer, Ronan M.N. Noble, and Stephane L. Bourque

Theme: Pregnancy and developmental trajectories

Introduction: Iron deficiency (ID) is the most common nutritional deficiency worldwide with pregnant mothers most at risk. If left untreated, ID alone has been shown to be associated with a number of pregnancy complications. Additionally, anemia is identified as a modifiable risk factor of hypertensive disorder in pregnancy (HDP) with recognizable decreases in hemoglobin (Hb) levels observed. Often times pregnancy is the first-time hypertension is identified in mothers by obstetricians, and therefore, the likelihood of these two morbidities co-existing within the pregnant population is high and underreported. During pregnancy, the pregnant mother undergoes anatomical and physiological changes, including expansion of blood volume and a decrease in total peripheral vascular resistance (TPVR) to maintain the growing conceptus. However, these changes are blunted in HDP which can impair oxygen delivery to the fetus. Interestingly, anemia has been shown to cause systemic vasorelaxation which is accompanied by an increase in cardiac output. Experiments using rat models of essential hypertensive have shown that dietary ID anemia reduces blood pressure and confers cardiovascular protection. However, to our knowledge, no studies have examined the effects of maternal ID anemia superimposed with hypertension during pregnancy. Whereas ID anemia has classically been seen as a pregnancy complication, here we hypothesized that dietary ID anemia would confer protection during pregnancy in spontaneously hypertensive rats (SHR). Methods: Female SHR are fed either an iron-replete (37mg/kg) or an iron-restricted (3mg/kg) diet prior to and during pregnancy. Blood pressure measurements were performed using tail-cuff plethysmography at gestational day (GD) 0, 7, 14 and 21; uterine blood flow assessments and echocardiography were also performed at these times. Pregnant SHRs were then euthanized at GD21 and tissues were collected, and flash frozen for gene expression patterns assessed by RT-qPCR. Results: Perinatal ID caused a decrease in maternal Hb levels compared to control. Despite this, no changes in maternal growth parameters including relative heart and kidney weight were evident between ID and control SHRs. Maternal ID reduced diastolic, systolic and mean arterial pressure throughout gestation compared to untreated SHR dams. Fetal hemoglobin decreased in both ID male and female pups; however, female fetal body weight was unaffected while male counterparts showed decreases. Interestingly, fetal placental weights were not affected by ID. RT-qPCR in the heart showed no increases in p53, albeit Bax and BAD were increased, as well as Bcl-2 and Caspase 3 gene expression. This was accompanied by an upregulation of antioxidant genes SOD1 and Catalase within the heart. These increases point to the possible elevation of intrinsic apoptosis pathways and oxidative stress in ID hearts. No such changes were apparent within the kidney of ID SHRs. Summary: These preliminary results suggest that while ID may positively impact pregnancies with pre-existing hypertension, there are also deleterious outcomes. Although additional experiments are needed, the results could advance how clinicians treat ID and anemia in persons with HDP.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 219
Presenter: Wendy Xu
Supervisor: Olson, David
Title: Sterile inflammatory amplification in human fetal membranes is inhibited by novel allosteric IL-6 receptor antagonist, HSJ633
Authors: Wendy Xu, Shezel Muneer, Kelycia B. Leimert, Xin Fang, Sylvain Chemtob, David M. Olson

Theme: Pregnancy and developmental trajectories

Introduction: Preterm birth (PTB) represents the leading cause of childhood morbidity and mortality globally as current therapeutic options remain limited in efficacy. One major cause of PTB is sterile intrauterine inflammation induced by damage-associated molecular patterns (DAMPs) in the absence of bacterial or viral infection. The cytokine interleukin (IL)-6 is a key mediator of this often subclinical, silent inflammatory amplification. Our novel allosteric antagonist of the IL-6 receptor (IL6R), HSJ633, effectively attenuates inflammation in human cell lines and delays PTB in mice. In this study, we investigated the efficacy of HSJ633 in attenuating inflammatory responses in human fetal membranes (hFM) stimulated by the DAMP, high mobility group box 1 (HMGB1). Methods: Placentas were collected from non-labouring women undergoing elective caesarean sections at term at the Royal Alexandra Hospital in Edmonton, Alberta. 12mm tissue explants were excised from the fetal membranes and treated with 0, 10, 50, 100, or 200ng/mL HMGB1 with or without 10uM HSJ633 for 24h. Cytokine mRNA expression in the hFM was measured via RT-qPCR (n=8) and cytokine output into the culture medium was measured using multiplex assays (n=8). Statistical analysis was performed using two-way ANOVA. When a significant F value was achieved ($p<0.05$), differences between treatment means were further explored using Tukey's post-hoc test. Results: HMGB1 stimulation significantly upregulated the release of IL-1B ($p<0.0001$), IL-6 ($p<0.001$), tumor necrosis factor (TNF)-a ($p<0.0001$), and CCL15 ($p<0.001$) from hFM in a dose-dependent manner. Upregulation of CXCL1, CCL24, and CCL27 outputs did not reach significance. Co-treatment with HSJ633 significantly attenuated the release of IL-1B ($p<0.05$), IL-6 ($p<0.01$), TNFa ($p<0.05$), CCL15 ($p<0.05$), and CXCL1 ($p<0.01$). mRNA expression of IL6 ($p<0.05$) and CXCL10 ($p<0.0001$) was significantly upregulated by HMGB1 stimulation in a dose-dependent manner, but changes in IL6R, CCL2, CXCL8, and MMP9 expression did not reach significance. HSJ633 co-treatment significantly attenuated the mRNA expression of IL6 ($p<0.05$). Conclusion: HSJ633 effectively inhibits IL-6-associated inflammatory responses in hFM, including output and mRNA expression of IL-6 itself and its upstream cytokines. This suggests that IL-6 plays a significant role in the inflammatory amplification of PTB through positive feedback regulation. Importantly, our findings indicate that HSJ633 is efficacious in human tissues and may be an effective PTB therapeutic that targets the inflammatory cascade triggering uterine activation and labour.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 220
Presenter: Trang Hoang Huyen
Supervisor: Le, Lawrence
Title: 3D Image Reconstruction of Regularly-Spaced 2D Ultrasound Images to Measure Hip Dislocation: A Phantom Study
Authors: Trang H. Hoang, Thanh-Tu Pham, Thanh-Giang La, Lawrence H. Le, John Andersen, Edmond H. Lou

Theme: Children's health and well-being

INTRODUCTION Hip displacement is the second most common problem in children with cerebral palsy (CP). The medical condition poses a high risk of pain and disability to children, degrading their quality of life. Reimer's migration percentage (MP) is the gold standard used for hip displacement measurements on X-ray images. Recently ultrasonography (US) has been used to study hip displacement due to the lack of ionizing radiation. Expanding our 2D US study, we have considered 3D US imaging method to estimate the MP measurement. The objective of this preliminary study is to validate the accuracy of the MP estimate using the 3D reconstructed image from a hip phantom. METHODS A 3D printed hip phantom with a known MP was prepared. The experiment was conducted using a portable Clarius C3 HD scanner (Vancouver, Canada), which was held in place and could be translated along a direction freely. The hip phantom and the transducer head were immersed in a water tank. The phantom was scanned along the superior-inferior direction to acquire a series of 2D US transverse images at 0.5 mm interval. After the acquisition, the 2D images were orderly stacked to build a 3D reconstructed image of the hip phantom using the linear interpolation technique. A morphological filter was applied to the 3D image to correct the stretching effect caused by the elevation thickness of the scanner. The image was then segmented to separate the hip image from the background. Finally, the processed 3D image was visualized using 3D Slicer software. To estimate the MP value (A/B), the 3D Slicer software was used to measure the distance from the lateral border of the femoral head to the lateral border of the acetabulum (A) and the width of the femoral head (B) on anterior view image. A comparison of the measured A, B, MP values with the model value was reported. RESULTS Both A and B were measured 5 times on the 3D reconstructed image, and MP was then calculated for each measurement. The average MP for the 3D reconstructed image is 29.99±0.3%. The A, B and MP for the 3D model are 5.84 mm, 19.45 mm, and 30.02% respectively. The normalized absolute differences of A, B, and MP between the 3D reconstructed image and the 3D model are less than 3%. (1.84%, 2.03% and 0.11% respectively) CONCLUSION The preliminary study has shown that measurements from the 3D reconstructed images agree well with the ground truth, thus illustrating the potential of using 3D ultrasound to measure MP without harmful ionizing radiation. Our future work will extend the study to 3D reconstruction of freehand acquired data.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 221
Presenter: Christiane Bilodeau
Supervisor: Schmolzer, Georg
Title: A digital simulator improves adherence to neonatal resuscitation guidelines in labor and delivery nurses
Authors: Christiane É.D Bilodeau, Maria Cutumisu, Georg M. Schmölzer

Theme: Children's health and well-being

Introduction: Neonatal resuscitation is a stressful event for healthcare practitioners (HCPs), where technical and non-technical skills influence the outcome of the resuscitation. Currently, Labor and Delivery (L&D) nurses only receive 4 hours of training every 2 years through the Neonatal Resuscitation Program (NRP). Therefore, there is little to no opportunity for practical learning experiences in between training sessions. Although the NRP utilizes the highly effective simulation-based medical education (SBME) approach, this approach is resource-, time-, and cost-intensive. We developed the RETAIN digital simulator (RETAINLabs Medical, Edmonton, Canada), a computer game to practice neonatal resuscitation. Contrary to the NRP, the RETAIN online digital simulator presents an alternative form of SBME without such limitations, yet still has the potential to improve knowledge retention and skills in HCPs. RETAIN allows HCPs to practice over fifty possible neonatal resuscitation scenarios with varying gestational age, risk factors, and difficulty levels. Neonatal nurses who trained with RETAIN had improved adherence to the neonatal resuscitation algorithm. However, the RETAIN digital simulator has not yet been studied in L&D Nurses. We anticipate that L&D nurses who play the RETAIN digital simulator will have improved adherence to neonatal resuscitation guidelines compared to L&D nurses who receive a 15-minute lecture. Methods: We performed a randomized controlled trial, enrolling 42 L&D nurses from the Royal Alexandra Hospital in Edmonton, AB. Participants completed a pre-training simulation of neonatal resuscitation to assess current knowledge and skills. Next, they were randomly assigned to standard training (lecture) or digital simulator training. In both groups, participants had a total of 15 minutes to either play the digital simulator or listen to the lecture. After the teaching, they performed a post-training simulation to assess immediate changes in knowledge. Only if all steps (on pre- and post-test) were performed (=100%) correctly, the simulation was included in the final analysis. Data analysis compared the initial simulation to the post-training simulation to assess changes in knowledge of the neonatal resuscitation algorithm. Results: A total of 42 HCPs (female=42) with a median (IQR) of 3.5 (1-4.9) years of experience participated in the study. Five (12%) participants achieved 100% in the pretest (RETAIN n=2 (10%), standard training n=3 (14%)). In the post-test, 13 (62%) participants in the RETAIN group and 13 (62%) in the lecture group (p=1.9) achieved 100%. Conclusion: The RETAIN digital simulator is an effective alternative to teaching neonatal resuscitation in between NRP training sessions.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 222
Presenter: Julia Craig
Supervisor: Rajapakse, Thilinie
Title: Understanding the pediatric patient's perspective on external trigeminal nerve stimulation (Cefaly®) for migraine treatment
Authors: Julia Craig, Bethan Kingsley, Thilinie Rajapakse

Theme: Children's health and well-being

Introduction: An average of 1 in 10 children and adolescents experience migraine during their developmental years, contributing to school absences and a lower quality of life. Migraine is primarily managed with pharmacotherapies that have varying efficacy and side effects. An emerging alternative to treat migraine is neurostimulation. One such promising therapy is Cefaly®, a wearable medical device that provides electrical impulses to the trigeminal nerve branches in the forehead involved in headache generation. Cefaly® was FDA and Health Canada approved for migraine treatment in adults, where clinical trials found Cefaly® to be an effective treatment with numerous advantages. Cefaly® does not require emergency room visits or specialized medical personnel present, allowing patients to self-administer treatment and obtain care virtually. Based on these findings, it is reasonable to further investigate the safety and efficacy of the Cefaly® device as an acute treatment for migraine in adolescents. Prior to the execution of this clinical trial, we plan to conduct a pilot focus group for adolescents to provide feedback about the practicality of using Cefaly® as a treatment. Methods: This focus group will be conducted virtually, allowing for the representation of adolescents from rural and remote communities. Ten adolescents ages 12-21 in Alberta who meet diagnostic criteria for migraine with or without aura will be recruited from both the Stollery Clinical Headache program and the Alberta Strategy for Patient-Oriented Research (AbSPOR). In order to recruit a diverse patient pool, recruitment postings will be shared via AbSPOR with patient and community networks, on social media, and with the AbSPOR Youth Advisory Council. Participants will partake in a 1-hour virtual, semi-structured focus group where they will be asked open-ended questions regarding their impression of the Cefaly® device, barriers to use, and more. Participants will be asked to choose the gender group they want to participate in: male, female, or non-binary. Participants will also be allowed to change their Zoom title ahead of the virtual meeting to include their first name only, initials, and/or pronouns in order to prioritize patient discretion. Compensation for participation will be provided in the form of pre-paid gift cards at a rate of $25 per hour. The discussion will be transcribed and interpreted using thematic analysis and following qualitative research methodology. Results: Focus group results will be forthcoming and ready for dissemination at WCHRI Research Day 2022. We will also present the conceptual framework for creating patient-oriented pediatric migraine research. Conclusion: Traditional migraine research has been directed based on expert consensus rather than stakeholder input. Khayata and colleagues (2022) recently conducted a focus group to investigate patient preferences in pediatric migraine treatment. Building off of their work, this focus group will provide valuable input as to adolescents' impressions on neurostimulation for migraine management. This information is critical for designing future studies that achieve clinically meaningful results in patients' lives.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 223
Presenter: Grant Bruno
Supervisor: Zwaigenbaum, Lonnie
Title: Indigenous Autism in Canada: A Scoping Review
Authors: Bruno, Grant; Titus, Chan; Zwaigenbaum, Lonnie; Nicholas, David.

Theme: Children's health and well-being

Introduction: The current landscape of autism in Indigenous populations in Canada is a severely under researched area. The current scoping review is still a work in progress and aims to gather and synthesize all the known literature as it pertains to autism, Indigenous peoples, and Canada. Methods: We conducted a scoping review to capture the breadth and nature of the literature. Databases searched include: MEDLINE, CINAHL, ERIC, PsycINFO, Web of Science, Cochrane Library, PubMed, and Google Scholar. Additionally, authors included North American Indigenous research databases: iPortal (Indigenous Studies Portal - University of Saskatchewan), Circumpolar Health Bibliographic Database, Bibliography of Native North Americans, and Native Health Database. Inclusion and exclusion criteria were collaboratively defined in iterative fashion to ensure relevance of literature reviewed. We then applied Harfield's Aboriginal and Torres Strait Islander Quality Appraisal Tool (QAT) to all original research articles to assess quality of health information from an Indigenous perspective. Results: The initial database search yielded 112 articles, and after removing 35 duplicates, we had 77 articles remaining. Both authors independently screened out 50 articles through title and abstract review. From the 27 remaining sources, the authors excluded 8 through full-text review as they did not meet the inclusion criteria (e.g., irrelevant study, lack of Canadian context). A total sample of 19 articles met the criteria for this scoping review Most articles either do not focus on autism or Indigenous peoples respectively. The QAT showed that only 2 articles met the criteria to be considered high quality. Themes that have come up include lack of peer reviewed research, unknown prevalence rates, barriers to diagnoses and services, no lived experienced research. Conclusion: This scoping review shows the critical need for research that is focussed on autism and Indigenous peoples in Canada. It also shows that the research must be Indigenous led or have substantial Indigenous input. Moving forward research must reflect the wants and needs of Indigenous communities in Canada.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 224
Presenter: Tuqa Al Lawati
Supervisor: Khoo, Nee Scze
Title: Development of left atrioventricular valve regurgitation in children with usual valve morphology and two papillary muscles is associated with greater tethering despite increased leaflet growth
Authors: Tuqa Al Lawati Martha Moran Lily Lin Nee Scze Khoo

Theme: Children's health and well-being

Background Left atrioventricular valve (LAVV) regurgitation is a significant morbid risk factor post complete atrioventricular septal defect (cAVSD) repair with a high risk of surgical re-repair. A postulated mechanism of LAVV failure in a subset of LAVV with usual valve and subvalve morphology, is leaflet maladaptation during maturation. This study aimed to document LAVV leaflet changes in children with repaired cAVSD, contrasting LAVV that develop regurgitation with those that did not. Methods Retrospective study of 18 patients with repaired balanced cAVSD with LAVV with 2 papillary muscles and no outflow abnormalities. We reviewed two dimensional echoes < 1 month after initial repair and at latest follow-up or before surgical re-repair. We measured M mode left ventricular (LV) size and function; and parasternal long axis view LAVV jet vena-contracta (VC) width, annular diameter, anterior (AL) and mural (ML) leaflets tenting area and lengths, indexed to body surface area (BSA). All patients had no or mild regurgitation at < 1 month post cAVSD repair. At follow up, 10 patients continue to have no or mild regurgitation (control) and 8 had progressed to moderate or greater regurgitation (LAVVR). Comparisons were made between groups at < 1 month post repair and at follow up using Mann-Whitney test. Change in LAVV parameters "within" each group were assessed using Wilcoxin signed ranked test. Results are expressed as median [IQR]. Results At < 1 month post repair, no difference in age, BSA, LV size and function, and VC width between control vs LAVVR. At follow up of median 7.5 years [2.5,10.3], LAVVR group had smaller BSA, but dilated LV and greater VC width. The ratio of AL to ML length is unchanged for both groups during between and within group comparisons. The control indexed AL and ML lengths were reduced at follow up while LAVVR leaflets did not. LAVVR indexed AL and ML leaflets were both longer than their control leaflets at follow up as were the indexed tethered areas. Conclusions LAVV failure in a subset of LAVV with usual valve and subvalve morphology with cAVSD has symmetric but greater overall leaflets expansion for somatic growth. Despite this, its LAVV has a greater degree of tethering than competent LAVVs, suggesting potential subvalve maladaptation during maturation, and warrants investigation.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 226
Presenter: Kaya Persad
Supervisor: Lopaschuk, Gary
Title: Ketones promote maturation of proliferating H9c2 cardiomyocytes
Authors: Kaya L. Persad, B. Güven, M. Houncaren, J. Greenwood, GD. Lopaschuk

Theme: Children's health and well-being

Introduction: Proliferating cardiomyocytes (CMs), such as fetal cardiomyocytes, have a high Warburg effect, a metabolic state in which there are high rates of glycolysis uncoupled from glucose oxidation. This Warburg effect decreases during maturation, such as in the newborn period. Proliferating CMs treated with ketones (β-hydroxybutyrate- βOHB), also show a reduced Warburg effect. Objective: To understand how ketones influence maturation and the Warburg effect in proliferating CMs if ketone oxidation is impaired. Methods: siRNA was used to knockdown ßOHB dehydrogenase 1 (BDH1 KD), the first enzyme involved in ßOHB oxidation, in proliferating H9c2 CMs. Cells were then cultured in the presence or absence of 1 mM βOHB for 6 days. Results: Proliferating cells treated with βOHB showed increased PPARα, BDH1 and SERCA2 expression. Glycolysis rates decreased with the addition of βOHB in both control and BDH1 KD CMs, with no change in glucose oxidation rates. However, ketone oxidation rates were significantly impaired in BDH1 KD H9c2 CMs. Adding βOHB also led to an increase in ketone oxidation selectively in control CMs. Conclusion: The addition of βOHB increased maturation and decreased the Warburg effect in proliferating CMs. BDH1 KD did not change the effects of ketones on glycolysis in proliferating CMs. This suggests other factors, possibly endogenous inhibition of histone deacetylase 2, could be the reason ketones decrease the Warburg effect. These results have potential implications in understanding the maturation of cardiomyocytes in the newborn period.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 227
Presenter: Matthew Gervais
Supervisor: Steinback, Craig
Title: Cardioautonomic control in pregnant individuals with advanced maternal age
Authors: Matthew Gervais Craig Steinback Margie Davenport

Theme: Pregnancy and developmental trajectories

Introduction: Nearly 1 in 10 women have first births occurring at an advanced maternal age (AMA; ≥ 35 years). AMA is associated with an increased risk of gestational hypertension, preeclampsia, and gestational diabetes mellitus (GDM). Moreover, gestational hypertension, preeclampsia, and GDM are risk factors (as strong as smoking) for maternal cardiovascular disease (CVD) following pregnancy. In pregnancy-related cardiovascular complications and CVD, impairments in cardioautonomic control are commonly observed, specifically a reduction in heart rate variability (HRV), and left ventricular contractility (LVC), concurrent with increased blood pressure variability (BPV). Since AMA pregnancy is a risk factor for pregnancy-related cardiovascular complications and CVD, perhaps similar alterations in cardioautonomic control are evident in healthy AMA pregnancy. To determine if AMA is associated with altered cardioautonomic control in otherwise healthy pregnant women, this study compared baseline cardioautonomic control between pregnant women ≥ 35 years (AMA) and pregnant women < 31 (YOUNGER) who were not previously diagnosed with pregnancy-related cardiovascular complications or CVD. We hypothesized that the AMA group would exhibit lower HRV, higher BPV, and higher LVC than the YOUNGER group, indicating globally increased sympathetic influences and decreased parasympathetic influences in cardiac and vascular autonomic control. Methods: Ten minutes of continuous baseline heart rate (lead II electrocardiogram) and beat-by-beat blood pressure (photoplethysmography) were collected in 33 AMA pregnant women and 34 YOUNGER pregnant women (matched for pre-pregnancy body mass index and gestational age) to analyze time- and frequency-domain measures of HRV, dispersion and sequence indices of BPV, and rates of arterial blood pressure changes as indices of LVC. Statistical significance was determined using unpaired t tests (all 2-tailed) with Welch's correction that does not assume equal standard deviations, and correlative analyses were performed using Pearson Correlation Coefficient (r) to assess for covariance between variables (α= 0.05). Effect sizes were reported as Cohen's d. Results: On average, the AMA group was 8 years older than the YOUNGER group (AMA 37 ± 2 vs. YOUNGER 29 ± 2). Both groups had similar baseline hemodynamics and HRV. In the AMA group, measures of diastolic and mean BPV were either statistically lower with a medium effect size (Cohen's d > 0.5) or not statistically different but trending lower with a small effect size (Cohen's d > 0.2). The AMA group also exhibited statistically lower LVC. Conclusion: Our findings suggest that AMA pregnancy may be associated with reductions in sympathetic influences, but these reductions are not global across the body. Instead, the reduced sympathetic influences may apply to the peripheral vasculature and the heart myocardium, but they do not affect overall vasomotor tone of the peripheral vasculature or the heart's sinoatrial node. Future microneurographic studies that directly measure sympathetic influences are required to conclude how cardioautonomic control is altered in AMA pregnancy.

This research has been funded by the Stollery Children’s Hospital Foundation and the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 228
Presenter: Kimberly Tworek
Supervisor: Macala, Kimberly
Title: Examination of Long-term Metabolic Effects of Neonatal Sepsis
Authors: Kimberly Tworek, Ronan Noble, Forough Jahandideh, Stephane L. Bourque, Kimberly F. Macala

Theme: Children's health and well-being

Background: Neonatal sepsis is a dysregulated host response to pathogens which can result in organ injury and death. It is a significant cause of mortality in young newborns and may result in long-term morbidity including metabolic dysfunction. However, the long-term effects of this developmental insult have yet to be explored. Here, we sought to examine the long-term metabolic effects of late-onset neonatal sepsis in adulthood using a rodent model. Methods: Using an established model of neonatal sepsis in Sprague Dawley rats, we induced sepsis via intraperitoneal injection of fecal slurry (0.1mg/kg) in neonatal rats at 3 days of age; controls received saline. SR buprenorphine was also administered subcutaneously to all animals (0.5mg/kg) at the time of fecal slurry injection for long-acting pain management. The animals then were assessed using our neonatal Rat Sepsis Score (nRSS) 4 hours post injection and then every 8 hours for 24 hours. We used antibiotics based on fecal slurry culture and antibiotic sensitivity (Prairie Diagnostic Services Inc., Saskatoon, SK). Ampicillin (20mg/kg, SC, every 12 hours) and gentamicin (4mg/kg, SC, every 24 hours) were administered starting 4 hours post fecal slurry injection. Saline was administered SC every 12 hours for a total volume of 5mL/kg/day of fluids. Pups reaching humane endpoints were euthanized and classified as non- survivors. At 6 months of age, surviving pups underwent metabolic assessments, including waist circumference and crown-rump length measurements, body composition by ECHO-MRI, as well as glucose tolerance tests (GTT) and insulin tolerance tests (ITT). Prior to GTTs, rats underwent a 16h fast, and blood glucose was measured at baseline, and then at 15, 30, 60, 90 and 120 minutes following glucose administration (2g/kg by oral gavage). ITTs were performed after a 4 hour fast and blood glucose measurement were performed at 0, 15, 30, 60, 90 and 120 min following injection of insulin (1 unit/kg, SC). All data sets were analyzed by two-way ANOVA for the effects of sex and prior exposure to sepsis, with Sidak post hoc test. Results: All non-surviving pups were identified and euthanized between 6 to 12 hours post-FS injection; no mortalities were observed beyond 12 hours post- fecal slurry injection. Body measurements, fat and lean body mass in sepsis survivors compared to controls aged to 6 months of age were not different and no overall effect of sex was identified. GTT and ITT assays revealed comparable results between all groups. Conclusion: At six months of age, no apparent differences were identified between septic and control animals and no sex-specific differences have been observed. However, given their young age, it is conceivable that underlying metabolic differences have not yet manifest. Consequently, we will continue to monitor survivors for metabolic changes at 12 and 18 months of age as metabolic sequelae of disease are often insidious and delayed in onset. In addition, we are currently exploring the lasting cardiovascular effects of neonatal sepsis in these animals.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 229
Presenter: Tania Rodezno Antunes
Supervisor: Olson, David
Title: Leukocyte chemotaxis plays a role in labour preparation in multiple mammalian species
Authors: Rodezno Antunes T, Sosa Alvarado C, Leimert KB, Olson DM

Theme: Pregnancy and developmental trajectories

Introduction Term labour is characterized by a sterile inflammatory response, where maternal peripheral leukocytes infiltrate into the uterus, placenta, and cervix. The migration of leukocytes from the capillaries into these tissues is stimulated by chemotactic factors (CF) released from the myometrium, decidua, and fetal membranes, which increase significantly shortly before delivery. After infiltrating the uterine tissues, leukocytes release several pro-inflammatory mediators that contribute to uterine activation. We developed a leukocyte migration assay (LMA) based on this chemotactic interaction. The LMA measures the rate of migration of leukocytes through a Boyden chamber in response to stimulation from homogenized human fetal membrane (hFM) or uterine extracts that contain CFs. It can predict delivery at term within 7 days with >91% positive predictive value. We have developed LMAs for women and mice with remarkably similar characteristics, introducing the question: how similar are the CF and responsiveness of leukocytes across different mammalian species? We hypothesize that the chemokines and cytokines involved in leukocyte priming, extravasation, and tissue infiltration are evolutionarily conserved in mammals. In addition, we also predict that CFs from different mammals will attract human leukocytes and human CF will attract mouse leukocytes. To address this, we compared the ability of CF extracted from various mammalian species (cow, sheep, mouse, and pig) to attract human leukocytes isolated from labouring pregnant women at term. We also investigated the chemoattraction of mouse term pregnant leukocytes to human fetal membrane CF. Methods CF was extracted by homogenizing fetal membranes, cotyledons, and/or lower uterus from term labouring mouse (n=10), sheep (n=4), cow (n=4), pig (n=3) and human (n=15) in PBS (100mg/mL). Extracts were standardized to a total protein content of 1ug/mL. Whole blood was drawn from the arms of women (n=15) and from cardiac puncture in mice (n=5), then leukocytes were isolated using Hetasep. Leukocyte migration was assessed using a Boyden chamber as described above, counting the number of cells that migrate into the lower chamber in response to CF. Data were analyzed using GraphPad Prism one-way ANOVA followed by Tukey's post-hoc testing, and significance was determined at $p<0.05$. Results Peripheral leukocytes from pregnant women at term migrated in response to cow, pig and sheep fetal membrane CF ($p<0.05$) as well as mouse lower uterus CF ($p<0.01$). Human fetal membrane CF stimulated migration of pregnant mouse (GD18.5) leukocytes ($p<0.01$). Human fetal membrane CF and mouse uterus CF elicited migration of pregnant mouse (GD18.5) leukocytes to a similar degree. Conclusion These data suggest that leukocyte migration mechanisms at term delivery are evolutionarily conserved across several mammalian species, and the CFs from these species have a similar molecular composition. Increased CF production is a universal mechanism involved in signaling the end of pregnancy and initiation of labour. The data also suggest that the fetus signals the timing for its delivery.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 230
Presenter: Stella-Ann Shelton-Sayer
Supervisor: Pagliardini, Silvia
Title: Model of neural crest-specific deletion of Bmp7 maintain normal ventilatory responses to gas challenges, despite presence of spontaneous apneas
Authors: Stella-Ann Shelton-Sayer, Vivian Biancardi, Daniela M Roth, Daniel Graf, Silvia Pagliardini

Theme: Children's health and well-being

Introduction Approximately 1-5% of children are affected with pediatric obstructive sleep apnea (pOSA), a common sleep respiratory breathing disorder often caused by anatomical obstruction or collapse of the nasal and/or pharyngeal airways. This results in sleep disruption, intermittent hypoxia, and subsequent systemic morbidities; cardiovascular, metabolic, and behavioural dysfunctions. The multifactorial etiology reflects the challenges clinicians are facing for treatments. Our data suggests that juvenile mice with neural crest-specific deletion of Bmp7 (Bmp7ncko) recapitulates many observed pOSA features, including craniofacial abnormalities that contribute to nasal airway obstruction and were associated with respiratory irregularities in 50% of the mice, such as an increase of spontaneous apnea (SA) and prolonged post sigh apnea (PSA) events, lower breathing frequency and normal ventilatory response to low O2 levels (hypoxia). Based on this, our objective was to evaluate if the apneic phenotype impacts the Bmp7ncko mice ability to respond to an increased respiratory drive, such as during high CO2 levels (hypercapnia) in juvenile (postnatal [P] day 30) and aged mice (P270-360) to track respiratory behaviour progression. Methods To test this objective, whole-body plethysmography was used for breathing recordings and indirect calorimetry for metabolic recordings during 60 minutes of normoxia (21%O2) exposure followed by 20 minutes of hypercapnia exposure (10 minutes each of 5% and 7%CO2). Results Despite the greater frequency of SA and PSA events during normoxic conditions in the Bmp7ncko mice, the length of these apneas were similar to control mice. Bmp7ncko mice showed greater increase in ventilation (VE) during 7%CO2 exposure, due to a greater increase in respiratory frequency (FR) from a significantly lower baseline FR, compared with control mice. However the hypercapnia-induced hyperventilation, measured by VE changes related to their O2 consumption and CO2 production (VE/VO2 and VE/VCO2), were not affected. Therefore the overall hypercapnic ventilatory response was similar between Bmp7ncko and control mice. These results suggest that Bmp7ncko mice breathe according to their metabolic demands during a hypercapnic challenge, and thus their CO2 homeostasis is preserved. As the mice age, both control and Bmp7ncko mice showed an increased frequency of SA events in normoxia compared with juvenile mice from the same group. However, the Bmp7ncko aged mice showed longer SA events and an increase in the prolonged PSA events compared with age-matched control mice. Conclusions This study demonstrates that despite the Bmp7ncko juvenile mice apneic phenotype, the length of the apnea events were similar to that of controls. As the mice aged, the number of SA events increased in both control and Bmp7ncko mice, however the Bmp7ncko mice showed longer SA and PSA events during baseline that could indicate a progression in their apneic phenotype. Nevertheless, both juvenile and aged Bmp7ncko mice maintain their ability to control CO2 homeostasis. Further investigation is needed to determine if these SAs have an obstructive origin, and whether the apnea occurrences are caused by craniofacial abnormalities or defects in the brainstem respiratory network.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 231
Presenter: Kineshta Pillay
Supervisor: Martin, Andrew
Title: Development of in silico child airway models
Authors: Kineshta Pillay, Warren Finlay, Andrew Martin

Theme: Children's health and well-being

Introduction The effective treatment of respiratory diseases requires targeted drug delivery directly to the lungs. Inhalation delivery devices can provide this targeted delivery by administering prescribed drugs directly to the airways of the patient, usually via oral inhalation. However, while there has been significant investigation into inhaled drug delivery for adults, there have been comparatively fewer studies focused on inhalation drug delivery for children. Children form a subject group with specific needs and characteristics in inhaled drug delivery. Since their lungs and breathing capacities are still growing, their airways continuously undergo changes in number and proportion as they age. Other delivery and inhalation factors particular to children include their comparatively lower lung volumes and highly variable breathing patterns. While the need for additional information regarding inhalation drug delivery to children's lungs is clear, guidelines from the European Medicines Agency (EMA) state that in vivo (in-person) lung deposition studies are inappropriate to conduct in children due to concerns about safety and efficacy. It follows to reason then, that in order to characterize the drug dose delivered to children from inhalation delivery devices, other methodologies must be used. Methods Building on existing studies, we have developed computational, i.e. in silico, models using fluid dynamics and idealized lung geometries to predict regional aerosol deposition in the airways of children. These models have been developed based on measured lung and airway geometries in previous studies of the paediatric lung, as well as correlations that relate lung size to age, sex and height. We developed lung models for children aged six, eight, ten and twelve, for both boys and girls. Results Preliminary results describing variation in lung model airway dimensions and volumes with age and sex will be presented. Deposition sensitivity to airway dimension will be compared, along with differences in the deposition of the airways based on sex. Conclusion Model predictions are expected to be useful for development of inhaled therapeutics specifically for children, and for streamlining bioequivalence approaches for inhaled drugs. Applying the proposed in silico methodology to the characterization of inhaled drug delivery in children will ultimately contribute to safer diagnosis and treatment of respiratory diseases.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 232
Presenter: Rui Zhe Yang
Supervisor: Lee, Cheng-Han
Title: Understanding and targeting kinase pathways in NF1-deficient high grade serous tubo-ovarian cancer
Authors: Rui Zhe (Rachel) Yang, Jiahui Liu, Guihua Zhang, Martin Koebel, Cheng-Han Lee, YangXin Fu

Theme: Lifelong women's health

Tubo-ovarian cancer is the 5th deadliest cancer in Canadian women, and almost two-thirds of ovarian cancer patients are expected to die from the disease. The high-grade serous carcinoma (HGSC) subtype accounts for most of these deaths, and is often diagnosed at late stage, representing a need to find better treatments. The neurofibromin (NF1) protein is more often inactivated in HGSC than in other cancers and inhibits the Ras pathway, which is a pathway important in cell proliferation and survival. Our objective is to understand how this protein contributes to the development of HGSC. We knocked out the NF1 gene using CRISPR-Cas9 in HGSC cell lines, and then assayed the activity of downstream kinases by western blot. Preliminary data suggest that NF1 deletion leads to greater activation of the MEK/ERK pathway. Early observations also suggest that 2D cell growth increases when NF1 is deleted. Next, we plan to identify additional kinases activated by NF1 deletion in paired NF1-intact and NF1-knockout 3D spheroids and cell line-derived xenograft (CDX) mouse models. These results will allow us to select small molecule drugs that inhibit the activated kinases and slow progression of HGSC. A subset of promising drug candidates will be tested in the CDX models. This project has the potential to inform clinical trials of anti-cancer drugs for tubo-ovarian cancer patients who need more effective treatments.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 233
Presenter: Jimmy Lu
Supervisor: Lemieux, Joanne
Title: Determining the role of rhomboid protease GlpG in pathogenic bacteria colonization: a potential solution to recurrent bacterial infections
Authors: Jimmy Lu, Elena Arutyunova, Heather Armstrong, Steven Verhelst, Etyan Wine, M. Joanne Lemieux

Theme: Lifelong women's health

Extra-intestinal pathogenic E. coli (ExPEC) colonization occurs naturally in the gut microbiome, however, when these strains spread to non-native niches, it leads to pathologies such as skin and urinary tract infections (UTI). If untreated, UTIs can spread further, resulting in a more serious condition: pyelonephritis, an infection in one or both of the kidneys. In the case of pregnant women, UTIs can result in vertical transmission to neonates leading to sepsis and morbidity, which is a significant problem in developing nations. Currently, UTIs are one of the most prevalent bacterial infections in women, with a predicted 1 in 2 women experiencing a UTI in their lifetime. This is largely due to their shorter urethra, giving bacteria a shorter distance to travel to the bladder. Treatments available today for UTIs are limited to antibiotics. This can lead to recurrent urinary tract infections as bacteria become resistant to the administered antibiotics. In order to investigate new, novel therapeutics to combat the problem of antibiotic resistance, a deeper understanding of the mechanism behind UTIs and bacterial infections is necessary. Recent studies have shown that glpG, the rhomboid protease gene, is essential for ExPEC colonization in the mouse gut suggesting GlpG could be a potential target to inhibit bacterial colonization as a means to combat bacterial infections. Our preliminary data shows that when the glpG gene is inactivated in a laboratory E. coli strain using CRISPR/Cas9 mutagenesis, the bacteria display reduced pili formation on the other surface relative to the wild-type strain when visualized by transmission electron microscopy. Pili are long, filamentous appendages that assist bacteria in adhering to surfaces, such as host epithelial cells, subsequently leading to bacterial invasion . Our in vitro model measuring bacterial invasion in a human bladder cell line showed that when the glpG gene is inactivated in laboratory strain E. coli, there is significantly lower levels of invasion compared to the wild-type strain. These findings suggest that the GlpG protease plays a key role in bacterial virulence by influencing pili formation and and may be a strong target for therapeutics against bacterial infections. To test if GlpG can be inhibited in live bacteria, we developed an assay to first measure GlpG activity in living E. coli cells. Using inhibitors specific to GlpG developed by our collaborators, we have shown that enzymatic activity is inhibited up to 50% in live E. coli. These inhibitors will be optimized using molecular GlpG-inhibitor modeling/crystallography to achieve greater inhibition of GlpG. Together, this is aimed to facilitate rational drug design as alternatives to conventional antibiotics for the purpose of treating UTIs and recurrent UTIs.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 234
Presenter: Sabrin Bashar
Supervisor: Kozyrskyj, Anita
Title: The impact of hospital length-of-stay after birth on infant gut microbiota
Authors: Sabrin Bashar, Hein Min Tun, Piushkumar Mandhane, Theo Moraes, Elinor Simons, Stuart Turvey, Padmaja Subbarao, James Scott, Anita Kozyrskyj

Theme: Children's health and well-being

Introduction: Infants delivered by cesarean section normally stay longer in hospital after birth and are treated with antibiotics, both of which promote hospital-acquired infection with Enterococcus spp., and enterobacterial species of the Proteobacteria. How prolonged exposure to a hospital environment affects infant gut microbial development and ultimately, health is still unknown. Objective: The study aimed to assess the association between prolonged hospitalization following any delivery type and infant gut microbial composition at 3 and 12 months of age. Methods: This was a study of 1313 infants in the Canadian Healthy Infant Longitudinal Development (CHILD) Cohort Study, excluding home births. Infant gut microbiota was characterized by Illumina 16S rRNA sequencing of fecal samples collected at 3 months and 12 months of age. The gut microbial profile of infants hospitalized for >1 day in vaginal birth (VB) and ≥3 days in cesarean delivery (CD) were compared to profiles of infants with shorter-length hospitalization. Vaginally delivered infants were further stratified based on a maternal intrapartum antibiotic (IAP). Relative abundances of dominant taxa were compared by Mann-Whitney U-test and LEfSe analysis. Associations between prolonged hospitalization and gut microbiota composition were determined by logistic regression, adjusting for gestational age and breastfeeding status. Results: Prolonged hospitalization after VB was associated with persistent enrichment of family Clostridiaceae, namely Clostridium; Veillonella; and species of Proteobacteria: Citrobacter (p=<0.01, 3 months) and Sutterella (p=<0.01, 12 months). There was an over-representation of Veillonella, and several Enterobacteriaceae after CD but at 12 months only. At 3 months, beneficial bacteria Bacteroides (p=0.03) were depleted in VB infants and Bifidobacterium (p=0.025) in CD infants. Already depleted in CD [median abundance=0.0008, IQR (0.0003 - 0.0056)] versus VB [median abundance=0.301, IQR (0.001-0.597)] at 3 months (p=<0.01), prolonged hospitalization following CD further lowered the abundance of Bacteroides (0.47 [95% CI:0.28-0.80], p=<0.01) at 12 months. In the absence of IAP exposure, VB term infants with a longer hospital stay and non-exclusively breastfed were more likely to have a higher abundance of Enterococcus in their gut both at 3 months (aOR=1.35 [95%CI:0.99-1.85], p=0.059) and 12 months (aOR=1.42 [95%CI:1.02-1.97], p=0.036) of age. The same group of infants with longer hospital stays also had higher abundances of Citrobacter (aOR=1.39 [95%CI: 1.02-1.898], p=0.037) and lower abundances of Bacteroides (aOR=0.73 [95%CI: 0.54-1.00], p=0.05) at 3 months. Conclusion: Prolonged infant exposure to the hospital microbial environment after birth can lead to over-representation of gut microbiota associated with hospital-acquired infections, as well as the depletion of several beneficial microbiota.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 235
Presenter: Ammar Al-aghbari
Supervisor: Yokota, Toshifumi
Title: Investigating the role of Aquaporin-1 and Aquaporin-4 in skeletal muscle function in Duchenne Muscular Dystrophy
Authors: Ammar Al-Aghbari, Tejal Aslesh, Toshifumi Yokota

Theme: Children's health and well-being

Introduction: Duchenne muscular dystrophy (DMD), one of the most common lethal genetic disorders in childhood, is caused by an X-linked recessive mutation in the dystrophin (DMD) gene. DMD is characterized by progressive muscle degeneration and weakness due to a lack of a muscle-supporting protein called dystrophin. Water channel aquaporin-1 (AQP1) is overexpressed in skeletal muscle and aquaporin-4 (AQP4) expression is significantly reduced in DMD; however, their pathological roles are poorly understood. Methods: To examine the role of AQP1 and AQP4 in skeletal muscle, we investigated the effect of knocking out the AQP1 and AQP4 genes on skeletal muscle function in vivo, and tested our hypothesis that the lack of water channel AQP1/4 leads to impaired muscle function in the mouse models. We first performed functional testing, including grip strength and open-field activity analysis, and assessed if there is any phenotypic difference between AQP1 or AQP4 knockout (KO) mice and wild-type mice regarding skeletal muscle activity at 2-months of age. Mice were subjected to a mild exercise using a treadmill and the open-field activities before and after the exercise were recorded for 4 consecutive days. In addition, we used quantitative reverse transcription polymerase chain reaction (RT-qPCR), western blotting alongside immunostaining to determine the levels of AQP4 and AQP1 and the subsequent changes, if any in localization in mouse models. Results: When measuring the effects of endurance testing on the open field activity, AQP1 KO mice showed a significant reduction in activity prior to and post-exercise when compared to AQP4 deficient and wild-type mouse models, although grip strength was not significantly different among wild-type, AQP1 KO, and AQP4 KO mouse models. The result of RT-qPCR and western blotting demonstrated upregulation in AQP1 protein levels in AQP4 KO, suggesting a potential compensatory role. We also confirmed that AQP1 and AQP4 are the only AQPs expressed in the skeletal muscle using RT-qPCR. Conclusion: We demonstrated for the first time that the loss of AQP1 leads to reduced activity in mice. The overexpression of AQP1 might be involved in pathophysiology of DMD.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 237
Presenter: Julia Wolf
Supervisor: MacDonald, Shannon
Title: Measurement of equity characteristics regarding pediatric vaccination uptake: a comparative scoping review of Canadian, Australian, and New Zealand literature
Authors: Julia Wolf (co-first author), Kaylee Kim (co-first author), Robin Humble, Shannon E. MacDonald

Theme: Children's health and well-being

Introduction: In 2020, the National Advisory Committee on Immunization (NACI) of Canada published an Equity Matrix to allow for increased acknowledgment of various diversity characteristics that may affect vaccination coverage in Canada. This scoping review analyses the gaps in Canadian literature regarding equity factors compared to Australia and New Zealand to bring awareness to Canada's strengths and shortfalls and highlight any need for change. The characteristics assessed include ethnicity, Indigeneity, language, immigration/refugee status, and religion. Methods: Eligibility criteria included peer-reviewed journal articles of original research published in the last ten years, written in English, and conducted in Canada, Australia, or New Zealand that focus on determinants of childhood vaccination for children aged 17 years and younger. Health-focused databases such as (Medline) Ovid, CINAHL, Scopus, Cochrane Library, Proquest, and EMBASE were searched. Grey literature was also assessed if it met the inclusion criteria. Results: A total of 69 articles were included in this scoping review: 28 Canadian, 21 Australian, and 20 from New Zealand. Assessment of diversity characteristics varied by country. For instance, ethnicity measurement occurred in 64.3% of articles from Canada, 85.7% from Australia, and 100% of studies from New Zealand. Indigeneity was assessed in 17.9% of Canadian articles, 81% of Australian, and 90% of New Zealand studies. Language was assessed in 53.6% of studies from Canada, 23.8% from Australia, and 10% from New Zealand. Immigration/Refugee status was assessed in 60.7% of studies from Canada, 47.6% for Australia, and 25% for New Zealand. Lastly, religion appeared in 35.7% of Canadian studies, 23.8% from Australia, and 25% from New Zealand. A comparison of the ten-year progress reflects a rise in the presence of equity factors in the literature for both Canada and Australia. Conclusion: Findings indicate that Canada is excelling in its assessment of ethnicity yet is lacking in its specific portrayal of Indigeneity. Comparatively, Australia and New Zealand prominently assessed Indigeneity and lacked measurement of language and immigration/refugee status. Canadian researchers should expand the focus on Indigeneity as a factor of pediatric vaccination uptake, as it is the responsibility of inhabitants of this land to ensure that Indigenous perspectives are present in pediatric research. Increased awareness of the diversity of the population will allow for more transferable findings and equitable solutions for improving childhood vaccination coverage in Canada.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 238
Presenter: Adam Purificati-Fune
Supervisor: Bell, Rhonda
Title: "Deadly Dads": Developing Supports for Nêhiyew Napew (Cree men) During Pregnancy and Parenting
Authors: Adam Purificati-Fune, Rick Lightning, Cliff Potts, Dylan Lightning, Sonny Lightning, Jerry Young, Grant Bruno, Josh Littlechild, Robbie Potts, Kacey Yellowbird, Randy Littlechild, Rhonda C. Bell, Richard T. Oster

Theme: Pregnancy and developmental trajectories

Introduction: Involving fathers in pregnancy and parenting has been shown to have positive impacts on the wellbeing of mothers and the developmental trajectory of children. Through a long-standing community-based participatory research partnership (CBPR) aimed at supporting healthy pregnancies in the Nêhiyew (Cree) Nations of Maskwacîs, the "Deadly Dads" project emerged. The overall aim is to support positive actions of Nêhiyew napew (Cree men) during pregnancy and parenting via community-led, culturally-appropriate, and strengths-based supports. The objective of this phase of research was to understand the impact of coming together from the perspective of involved men. Methods: We utilized a CBPR framework anchored in community ways of knowing, ceremony, and trusting relationships. All aspects of the research were developed and guided by a Community Advisory Committee (CAC) that included university-researchers, community members and organizers, men and fathers, and Mosoms (grandfathers). Over the span of 12 months, a series of activities were developed and made available to men in the community, including regular meetings and meals, sweatlodge ceremonies, a round dance, cultural camps, sports (hockey, golf, bowling, etc.), horse therapy, and participating/volunteering in a variety of community events. As a first step of data collection, informal discussions were captured in field notes and a Wisdom Circle was audio recorded and transcribed. A total of nine participants took part in the Wisdom Circle. Data analysis and interpretation followed a circular approach guided by the CAC whereby coded data was continuously and iteratively refined through discussions with the CAC. Future data collection will include one-to-one interviews. Results: Preliminary findings indicate having a variety of ways to consistently come together as Nêhiyew napew provides a powerful way of rekindling kinship networks and reconnecting with existing supports in the community. Opportunities to connect and learn from other men were extremely important for knowledge sharing around parenthood and supporting mental health, especially for new fathers. These networks of support, when fostered through ceremony, arose from the effort put into the relationships. Thus, participants felt everyone involved in this work, including those who joined as researchers, should internalize, and take home the lessons passed on through ceremony. Despite positive impacts, participants were concerned about the sustainability of the "Deadly Dads" network given that Western systems and institutions tend to devalue the time needed for men to learn from grandparents and for the development of trusting research relationships, create pressures to prioritize outputs over ceremony, and provide finite funding dependent upon evaluations that do not fully capture the priorities expressed in the community. Conclusion: Supporting connections between Nêhiyew napew for parenting knowledge to be passed down and shared may foster stronger family systems to better support women and children. As equal partners, researchers have responsibilities to learn from lessons taught in ceremony and challenge Western systems such that Indigenous ways of knowing are heard, understood and respected.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 239
Presenter: Asna Latif
Supervisor: Bhavsar, Amit
Title: TLR4 promoter variation is associated with protection against hearing loss in cisplatin chemotherapy
Authors: Asna Latif, Abhinav Thakral, Erika Scott, Jong Lee, Geoff Liu, Bruce Carleton, Colin Ross, Amit Bhavsar

Theme: Children's health and well-being

Introduction Cisplatin is an indispensable chemotherapeutic used to treat a wide range of solid tumours. However, it is associated with irreversible hearing loss in up to 60% of pediatric patients. This has significant long-term repercussions on patients and impacts the language, social, and emotional development of pediatric patients. Additionally, this interferes with cancer therapy regimens as dosages need to be adjusted to protect against toxic effects. The incidence of cisplatin-induced ototoxicity (CIO) varies from person to person due to a genetic contribution to susceptibility and it is difficult to predict which individuals will be more likely to develop CIO, so identifying genetic targets would allow for personalization of therapeutic regiments. Potential therapeutic targets have included the Toll-like Receptor 4 (TLR4), which has recently been found to exacerbate cisplatin-induced inflammation and cell death; however, the relationship between TLR4 and genetic susceptibility to CIO is not defined. In order to improve long-term health outcomes of cancer patients, it is essential to determine the relationship between genetic differences at the TLR4 gene locus and susceptibility to CIO. Methods Candidate studies on the TLR4 gene locus were conducted in pediatric and adult cisplatin-treated patient cohorts to investigate the relevance of single nucleotide polymorphisms (SNPs) in rendering protection from CIO. Subsequent functional analyses in a luciferase reporter system were used to investigate the relevance of these variants in vitro. Results SNPs at the TLR4 promoter in both adult (P= 1.68x10-4, OR=0.348 (0.201,0.603)) and pediatric cohorts (P= 0.0029, OR=0.316 (0.148,0.674)) were associated with protection from CIO. They were also shown to suppress TLR4 upregulation by cisplatin in functional assays. Conclusions TLR4 presents as an important therapeutic and prognostic target that can predict an individual's susceptibility to CIO during cancer treatment in order to optimize cancer treatment and minimize the risk of hearing loss in treated patients.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 240
Presenter: Tate Erickson
Supervisor: West, Lori
Title: Enzymatic removal of ABO-A-antigen in a mouse model of ABO-incompatible transplantation
Authors: Tate Erickson, Bruce Motyka, Lai Xu, Kesheng Tao, Jean Pearcey, Peter Rahfeld, Stephen G. Withers, Lori J. West

Theme: Children's health and well-being

Introduction: Crossing the ABO blood group barrier in solid organ transplantation (Tx) is usually not performed as this can lead to hyperacute rejection due to preformed natural ABO antibodies. However, due to a lag in ABO antibody production, ABO-incompatible (ABOi) Tx can be safely performed in infants and young children. A reduction in A/B donor antigens may be one approach to allow safe ABOi Tx in older age groups. The utility of FpGalNAc deacetylase and FpGalactominidase (Azymes) to convert blood group A-antigen to H-antigen in an ex vivo human lung perfusion model was recently demonstrated. However, as A-glycosyltransferase is constitutively expressed (converts H to A antigen), the duration of A-antigen removal remains unclear. A-transgenic (Tg) mice constitutively express A-antigen on vascular endothelium and erythrocytes and have been used to model ABOi Tx. Using this model, we assessed A-antigen removal and re-expression following Azyme administration in vitro and in vivo. Methods: Azyme function was studied using A-Tg BALB/c (n=7) and A-Tg C57BL/6 (n=3) mice (both sexes, 10-44 wk). In vitro: Erythrocytes were assessed for A- and H-antigen expression by hemagglutination (anti-A monoclonal antibody, A1 lectin or H lectin) at various times (0.5-4 hr) post-Azyme treatment (5-450 µg/mL) of whole blood. In vivo: A-Tg mice were treated with endotoxin-free Azyme by i.v. injection (0.4-0.8 mg/kg); blood was sampled at various times and erythrocytes were tested for A -antigen by flow cytometry (anti-A antibody) and for A- and H-antigen by hemagglutination (anti-A antibody, A1 lectin and H lectin). Heart and lung tissue was harvested at various times (2-96 hr post-injection) and assessed for expression of A- and H- antigen by immunohistochemistry (anti-A and anti-H antibodies). Results: In vitro, Azyme treatment cleaved A-antigen from A-Tg mouse erythrocytes and created H-antigen. This occurred at and above 50 µg/mL Azyme with incomplete A-antigen removal at lower doses. In vivo, Azyme treatment resulted in the absence of A-antigen and the appearance of H-antigen on erythrocytes from 15 min to 2 hr post injection, with detection of A-antigen reappearing after 4 hr. Heart and lung tissue showed a reduction, but not complete removal of A-antigen at 2 and 4-hrs post-injection. Later time points post-injection did not show a marked reduction in A-antigen in heart or lung. Conclusion: Preliminary data suggest success in using an A-Tg mouse model to evaluate removal and subsequent re-expression of A-antigen after Azyme treatment. In vivo Azyme treatment resulted in the complete but temporary conversion of A-antigen to H-antigen on erythrocytes, and partial conversion on tissues. Future studies will assess the efficacy of higher doses of Azymes and the resulting re-expression timing. Clinical application of A-zyme technology has the potential to increase expansion of ABOi organ Tx allowing: 1) life-saving treatment to individuals who would otherwise be ineligible for Tx and 2) use of donated organs that would otherwise be discarded due to lack of compatible recipients.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 241
Presenter: Meng Yuan
Supervisor: Graf, Daniel
Title: Investigating the role of Ankrd11, the gene associated with KBG syndrome, in tooth development
Authors: Daniela Roth*, Meng Yuan#*, Katherine Souter*, Maria Alexiou, Pranidhi Baddam, Anastassia Voronova, Daniel Graf (*=equal contribution, #=presenter)

Theme: Children's health and well-being

Introduction: KBG syndrome is a rare, complex congenital condition caused by mutations/loss of Ankrd11. Ankrd11 interacts with histone deacetylases and in consequence its loss affects epigenetic control of cell differentiation. Some of the most common anomalies in KBG syndrome patients are tooth anomalies, including macrodontia of the upper incisors, fused teeth, missing teeth, root duplications, or 3 sets of dentitions. Mineral anomalies have also been reported, while crowding might be the consequence of insufficient midfacial or mandibular growth. Tooth development is based on the reiterated use of signaling pathways and epithelial-mesenchymal interactions. Little is currently known on the epigenetic control of tooth shape, mineralization, root formation, accessory teeth or succession teeth. Methods: Neural crest-specific Ankrd11 mutant mice (Ankrd11ncko) were obtained by mating an Ankrd11flx allele with the neural crest-specific Wnt1-Cre2 driver. Embryos were obtained following timed matings, whereby detection of a vaginal plug was counted as embryonic day (E) 0.5 Embryos were isolated between E13.5 and postnatal day (P) 0, fixed in 4% paraformaldehyde and processed for microCT or histology/immunofluorescence following embedding in paraffin blocks. To obtain mature teeth, E15.5 tooth buds were isolated and transplanted under the kidney capsule of an adult recipient mouse. After 4 weeks, the transplanted tooth was isolated and subject to analysis. MicroCT analysis was performed at the School of Dentistry using a Milabs UHT-CT system. Antibodies used for immunofluorescence were Bmp2, Bmp7, Sp7, Runx2, Non-phospohrylated beta catenin (Abcam). pSmad1/5/8 (Cell Signaling Technologies), Dsp (Santa Cruz), Ankrd11 (gift from Dr. Voronova). Histological analysis was done using hematoxylin and eosin (H/E), picrosirius red, imaged under polarized light to reveal birefringence. Results: Ankrd11 is expressed in the developing teeth from at least e13.5 onwards. Expression is dynamic and is first predominantly observed in dental epithelium, but shifts to the dental mesenchyme at later stages. We previously published that mice with one Ankrd11 copy deleted mimic discrete manifestations observed in KBG syndrome patients. Complete neural crest-specific Ankrd11 mutants (Ankrd11ncko) die at birth and show severe craniofacial developmental anomalies. Late embryonic teeth show abnormal pulp and odontoblast differentiation. Expression of Col1 and Runx2 appeared reduced in odontoblasts. Some mild odontoblast and pulp disorganization were observed. Levels of acetylated Histones H3 and H4, with which Ankrd11 interacts, were increased. Upon transfer of E14.5 tooth germs under the kidney capsule, we observed size anomalies of the resulting teeth. The first molar was similar in size as the third molar, while the second molar was largest.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.

Participant #: 242
Presenter: Lucy Harris
Supervisor: Tham, Edythe
Title: Fostering community during a pandemic through the implementation of virtual Fontan heart camps
Authors: Lucy E Harris, Katie J Du, Danielle E Harake, Lily Q Lin, Elina Williams, Alanna L Ash, Carolina A Escudero and Edythe B Tham

Theme: Children's health and well-being

Introduction Children with a Fontan operation represent a unique subset of those with congenital heart disease requiring multiple surgeries and procedures with an uncertain long-term outcome. Given the rarity of congenital heart disease requiring this operation, many children with a Fontan do not know any others like them. As medically supervised heart camps to connect these children were canceled due to the COVID-19 pandemic, we organized two physician-led virtual day camps for children with a Fontan operation to connect with others in their province and across Canada. Methods The virtual Fontan heart camp is a free, 1-day, online camp for children aged 8-15 years. We collected registrations via Google Forms™ and delivered the camps via Zoom™. With funding from the Western Canadian Children's Heart Network, we mailed activity packages to registrants two weeks prior to the camps. We arranged diverse activities to target various interests and areas of health and wellness, including physical activity through dance and scavenger hunts, creativity through crafts and cookie decorating, and education through Fontan testimonies, cardiologist question and answer periods, and trivia games. We evaluated the camps with voluntary, anonymous online surveys via Google Forms™. Participants completed the surveys immediately after the camps, with reminders at two and four days post-camp. Results We received 37 registrations for each camp with a total of 51 children participating in at least one of two camps. Our participant group was diverse across seven Canadian provinces and territories, including 37% from remote communities. Prior to the camp, 70% of registrants reported they did not know anyone else with a Fontan. We received survey responses from 64% of participants at the first camp and 53% of participants at the second camp. From those responses, 86-94% reported learning something new about their heart and 95-100% reported feeling more connected to other children like them. Additionally, success of the camps was evidenced by 94-95% of respondents reporting a willingness to return for subsequent camps and 62% returning to the second camp following the first. Conclusion We have demonstrated the feasibility and success of a virtual heart camp to promote community and grow the support network for children with a Fontan operation across a wider geographical area. In doing so, we aim to promote healthy psychosocial adjustments through inclusion and relatedness. We continue to expand these connections with local in-person picnics and educational events and an upcoming virtual pan-Canadian heart camp.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 243
Presenter: Tara Janes
Supervisor: Pagliardini, Silvia
Title: Update: can a progestin-based drug rescue breathing in a rodent model of central chemoreflex impairment?
Authors: Tara A. Janes, Silvia Cardani and Silvia Pagliardini

Theme: Lifelong women's health

Introduction: Congenital central hypoventilation syndrome (CCHS) is a rare disease caused by the mutation of a single transcription factor gene, PHOX2B, important for the development and function of autonomic neurons. The most life-threatening symptom in CCHS patients is shallow breathing and recurrent apnea, particularly during sleep. Animal research suggests that a population of brainstem Phox2b+ CO2-sensing neurons critical for respiration fail to develop when the mutated protein is expressed. Indeed, CCHS patients show little or no ventilatory responsiveness to inhaled CO2, which may contribute to respiratory instability. Remarkably, a serendipitous discovery found that a progestin contraceptive, etonogestrel, restored CO2-sensitivity in two female CCHS patients, but follow-up studies have provided ambiguous results. We previously hypothesized that etonogestrel would restore respiratory responses to CO2 in a rat model of central chemoreflex impairment. Here, we provide updated data for this project. Methods: To replicate the important phenotype of CCHS patients, loss of CO2-sensing ability, we ablated primary CO2-sensing neurons in the brainstem of adult female rats using a neuron-specific toxin (saporin). Respiratory impairment was confirmed by using whole body plethysmography to measure ventilatory parameters (minute ventilation, tidal volume, breathing frequency). Rats were then implanted with etonogestrel (s.c.) for 4 weeks; controls received sham surgery. Respiratory measurements were made once per week; at the end of the protocol brain tissues were collected for histology. Results: Animals were grouped according to lesion size (moderate vs. severe) following histological analyses. We found a positive correlation between lesion size and magnitude of ventilatory impairment. Animals with severe lesions had increased breath frequency in room air and greater ventilatory impairment during inhaled CO2 (FiCO2=0.05, 0.072) due to reduced tidal volume and frequency. Moderate lesions produced more modest impairment primarily due to reduced tidal volume. Hypoxic ventilatory response was not affected by the lesion (FiO2=0.10). Four weeks of etonogestrel treatment "rescued" CO2 responsiveness by enhancing tidal volume and frequency responses, but only in animals with moderate-sized lesions. Animals with severe lesions and shams receiving no etonogestrel showed no ventilatory recovery. Conclusions: These data support our hypothesis that etonogestrel can "rescue" CO2-sensing in a rodent model of central chemoreflex impairment. The clinical use of etonogestrel for CCHS treatment has produced ambiguous results; our rodent data suggest that the magnitude of ventilatory impairment may be one important consideration in the effectiveness of pharmacological intervention. Our next lines of inquiry will seek to understand the site(s) of action of etonogestrel within the brainstem and the mechanisms by which progestins enhance ventilation in health and disease.

This research has been funded by the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 244
Presenter: Huda Al-Shamali
Supervisor: Zhang, Yanbo
Title: Treating peripartum depression with repetitive transcranial magnetic stimulation (rTMS): A Systematic Review.
Authors: Huda Al-Shamali, Amara Hussain, Liz Dennett, Bo Cao, Lisa Burback, Andrew Greenshaw, Yanbo Zhang

Theme: Pregnancy and developmental trajectories

Background: Depressive symptoms with onset during the peripartum period not only directly impacts the mother's emotional and physical health, but also indirectly impact the social, cognitive, language, and self-concept development of their child as they are less capable of caring for their emotional and physical needs. Currently, peripartum depression is typically treated through psychotherapy, electroconvulsive therapy (ECT), and pharmacotherapy. These treatments are limited by their effectiveness or their side effects that can negatively impact the mother-child relationship. Repetitive transcranial magnetic stimulation (rTMS) is a new treatment option with promise as an effective and safe treatment for postpartum and peripartum depression. Objective: We completed a systematic review to assess the effectiveness and safety of rTMS as a treatment option for peripartum depression. Design: On December 13, 2021, MEDLINE, PsycINFO, EMBASE, CINAHL, Scopus, The Cochrane Library, Theses and Dissertations Global database were searched. We included randomized and non-randomized studies that used rTMS as the primary treatment option for women with peripartum depression as defined by the DSM or ICD. This review abides by the PRISMA 2009 guidelines. Results: A total of 537 articles were identified by the search, and seven articles met the inclusion criteria of the review accounting for a total of 110 participants. Four of the studies assessed rTMS as a treatment for postpartum depression, and three studies assessed rTMS as a treatment for depression during pregnancy. All seven articles suggest that rTMS is a safe and promising treatment option, however, the two existing randomized controlled trials did not observe any statistically significant results regarding its effectiveness. Conclusions and Implications: RTMS appears to be an effective and safe treatment with limited and tolerable side effects and low dropout rates. However, the existing research on rTMS as a treatment for peripartum depression is limited and underpowered. More randomized controlled trials with larger sample sizes are needed to better assess the efficacy of rTMS as a treatment option for peripartum depression.

This research has been funded by the Stollery Children's Hospital Foundation and the Alberta Women's Health Foundation through the Women and Children's Health Research Institute.

Participant #: 245
Presenter: Saeed Anwar
Supervisor: Yokota, Toshifumi
Title: Lipid nanoparticle-mediated delivery and nucleoside modification enhances the efficacy and safety of gapmer antisense oligonucleotides for the treatment of facioscapulohumeral muscular dystrophy
Authors: Saeed Anwar, Rika Maruyama, Dominik Witzigmann, Karen Y.T. Chan, Pieter R. Cullis, Toshifumi Yokota

Theme: Children's health and well-being

Introduction: Facioscapulohumeral muscular dystrophy (FSHD) is one of the most common forms of muscular dystrophy (MD). It causes progressive weakness and deterioration in the muscles of the face, shoulders, arms and legs of males and females. The disease has variable onset; symptoms usually manifest during childhood, and its infantile form has a more severe disease course. FSHD is linked to aberrant expression of DUX4 in muscle, which is cytotoxic in non-germline adult tissues. Unfortunately, there is neither a cure nor a treatment specific to FSHD in the clinic to date. Antisense oligonucleotide (ASO)-based therapies offer a promising strategy for effectively knocking down genes. Several reports have demonstrated the feasibility of ASOs in inhibiting DUX4 expression. While these studies are promising, there remains a need to knock down DUX4 expression more effectively and safely before it can be translated to clinics. Here, we tested our hypothesis that a chemical modification of ASOs and the use of lipid nanoparticles (LNPs) significantly improve the efficacy of ASO-mediated knockdown of DUX4 expression and its safety profile in cell and mouse models. Methods: Using an in silico tool developed by our lab, we have designed several gapmers, a class of ASOs, targeting DUX4. To improve the efficacy and safety profile, we introduced a 2'-O-methyl (2'-OMe) modification of the second nucleoside from the 5' wing-gap junction of the gapmers. Also, we have created a mini-library of lipid nanoparticles (LNPs) to deliver these gapmers efficiently. We transfected different doses of gapmers with or without 2'-OMe modification in bare and LNP-encapsulated forms into patient-derived myotubes and assessed the in vitro efficacy of gapmers using reverse transcription-quantitative polymerase chain reaction (RT-qPCR). Further, we examined the biodistribution and safety of the treatments in wild-type adult mice post-systemic injection with different doses of the gapmers using ELISA-based methods and serum chemistry analyses. Results: Our in vitro studies on the patient-derived myotubes revealed that the gapmers designed were highly efficient in inhibiting DUX4, resulting in near-perfect (>99%) knockdown of the gene 24 hours post-treatment at only 100 nM dose ($p < 0.0001$). At a 10 nM dose, we observed a significant reduction in DUX4 expression (33.35-62.57%; $p < 0.0001$). TGapmers with 2'-OMe modifications had better or comparable efficiency in knocking down DUX4. Also, the assessment of the LNPs in potentiating the gapmers identified 3 LNP formulations that improved the level of DUX4 transcript knockdown by gapmers at 10 nM dose (13.63-21.86%; $p < 0.001$). We then show that the 2'-OMe modification and the use of the LNP shuttle system enhanced the uptake rate of the gapmers by the muscle cells in vivo. Finally, serum chemistry outcomes demonstrate that the 2'-OMe modification and the LNP shuttle system improved the safety parameters in vivo. Conclusions: The use of 2'-OMe modification and LNPs enhances the efficacy and safety of gapmers. It provides preliminary evidence that the efficacy and safety of gapmer-based antisense therapies can be enhanced by introducing chemical modifications within the gapmer sequence and using LNP-based shuttle systems.

This research has been funded by the Stollery Children’s Hospital Foundation through the Women and Children’s Health Research Institute.

Participant #: 246
Presenter: Jaslyn Rasmuson
Supervisor: Sia, Winnie
Title: Physician Knowledge and Management of Cardiovascular Risk in Patients with a History of Preeclampsia
Authors: Jaslyn Rasmuson, Winnie Sia

Theme: Lifelong women's health

Introduction: Preeclampsia is a maternal pregnancy complication characterized by high blood pressure and damage to organ systems. Importantly, preeclampsia increases the risk of cardiovascular disease (CVD) later in life. This provides an opportunity for physicians to intervene and help patients reduce their risk of CVD. The Postpartum Preeclampsia Clinic (PPPC) at the Lois Hole Hospital for Women was created to help fill this need through personalized lifestyle goals and medical management. Upon discharge from the clinic, letters are sent to patients' family physicians with recommendations for follow-up. As specialist clinics such as the PPPC are not able to see all patients with a history of preeclampsia, most long-term management occurs in primary care. However, current national and international guidelines are inconsistent and lack specific recommendations. This makes the management of these patients highly dependent on individual physician practices, which are currently not well understood. This project will assess physicians' understanding and clinical management of the long-term cardiovascular risks of preeclampsia. We will also evaluate whether knowledge varies between physicians who had a patient attend the PPPC and physicians who did not. Methods: An anonymous REDCap survey was sent to family physicians, obstetricians, internists, and cardiologists in Edmonton, Alberta to assess their knowledge of preeclampsia as a risk factor for CVD. The survey also assessed the physicians' long-term management in terms of patient education, risk reduction counseling, and follow-up. Data from the REDCap database was used for statistical analysis. Results: Preliminary results show that physicians have some knowledge of the long-term risks of preeclampsia, answering an average of 73% of questions correctly. Specialists tended to have more knowledge than family physicians. Physicians who had a patient attend the PPPC tended to have more knowledge, but this was not statistically significant. Physicians' responses to management questions were highly variable. Two thirds of physicians reported asking about maternal pregnancy complications more than half the time when taking a history. Even fewer reported counseling patients with a history of preeclampsia on their increased risk of CVD, and a minority of physicians reported following up with these patients. Conclusion: While physicians have some knowledge of the long-term risks of preeclampsia, there is a need for education to improve understanding across all groups. Furthermore, clinical management was highly varied. This may be due to a lack of clarity in the guidelines about how patients should be counseled and screened for CVD. The results of this study found that follow-up was especially lacking. As lifestyle changes and regular screening for CVD risk factors are important strategies for risk reduction, regular follow-up is critical to support these efforts. Overall, this study has identified gaps in physician knowledge and management of patients with a history of preeclampsia. Addressing these gaps by increasing education and clarifying guidelines may help reduce the disproportionate cardiovascular morbidity and mortality that these patients face.

This research has been funded by the Alberta Women’s Health Foundation through the Women and Children’s Health Research Institute.

Participant #: 247
Presenter: Kim Nguyen
Supervisor: Le, Lawrence
Title: Measuring the Alveolar Bone Level in Adolescents: A Comparison of Ultrasound and Cone Beam Computed Tomography
Authors: Kim-Cuong T Nguyen, Lawrence H. Le, Neelambar R. Kaipatur, Fabiana T. Almeida, Hollis Lai, Edmond H.M Lou, and Paul W. Major

Theme: Children's health and well-being

Introduction: The significant incidence of aggressive periodontal diseases and occurrence of alveolar bone loss in children and adolescents relating to poor oral hygiene, medication and medical health conditions, systematic and genetic disorders, and orthodontic treatment are the major concerns for pediatric dentists. Cone-beam computed tomography (CBCT) is an imaging modality which is used routinely in orthodontic diagnosis and treatment planning but delivers much higher radiation than conventional dental radiographs. Ultrasound is a non-invasive imaging method that creates an image without ionizing radiation. This study aimed to investigate the reliability and agreement of ultrasound and CBCT in measuring the alveolar bone level on the buccal/labial side of the incisors in adolescent orthodontic patients. Methods: 118 incisors from thirty orthodontic adolescent patients were scanned by CBCT with 0.3 mm voxel size and ultrasound at 20 MHz frequency. The distance from cemento-enamel junction (CEJ) to alveolar bone crest (ABC) was measured twice to evaluate the agreement between ultrasound and CBCT. In addition, the intra and inter-rater reliabilities in measuring the alveolar bone level by 4 raters were compared. Results:The mean alveolar bone level of ultrasound measurement in maxilla was 1.32 mm, in agreement (ICC = 0.84, $p > 0.05$) with that of CBCT (1.28 mm) while there was a significant difference (ICC = 0.70, $p < 0.05$) between ultrasound (1.25 mm) and CBCT (1.43mm) measurements in mandible. In comparison, ultrasound had higher intra-rater (ICC = 0.83-0.90) and inter-rater reliabilities (ICC = 0.97) in alveolar bone level measurement than CBCT (ICC = 0.56-0.78 for intra and ICC = 0.69 for inter-rater reliabilities). Conclusion: CBCT parameters used in orthodontic diagnosis and treatment planning in adolescents may not be a reliable tool to assess the alveolar bone level for mandibular incisors. On the other hand, ultrasound imaging, an ionizing radiation-free, inexpensive, and portable diagnostic tool, has potential to be a reliable diagnostic tool in assessing the alveolar bone level in adolescent patients.

This research has been funded by the Stollery Children's Hospital Foundation through the Women and Children's Health Research Institute.