Alberta Children’s Hospital Research Institute
Report to the Community
Highlights 2018
Our first decade has brought forward some remarkable innovations and discoveries to improve the lives of children. Our researchers have initiated more accurate and rapid diagnoses for diseases, developed personalized therapies for chronic illness and created new knowledge to inform health services and programs for children to learn and grow in communities.

In this community report, we will celebrate our award-winning child health research. We feel privileged to have the opportunity to connect with families through the Alberta Children’s Hospital and the many philanthropic organizations supporting specific child health care research initiatives. We provide this community report as part of our outreach efforts. Thank you for allowing us to build relationships which both inform our research and provide communities with new knowledge.
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Better Diagnosis and Care of Children with Gastroenteritis

The Silent Genome Project

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Unlocking the Brain’s Potential in Children

Establishing the BioCORE at the Alberta Children’s Hospital

Chairs and Professorships

In Gratitude - Dr. Brent Scott
“ACHRI is grounded in cross-cutting initiatives across University of Calgary faculties to improve the lives of children and their families.”
Leadership Message

Dear ACHRI members and child health researchers,

Over the past year, the passionate and diverse community of exceptional researchers, educators, quality improvers, trainees and academic clinicians has moved child health forward. You have opened the doors to a better understanding of rare and common childhood illnesses and have identified important factors that impact child and family wellness, as well as new effective solutions for problems common to children. Because of your efforts, there are children living healthier lives through the integration of innovative research.

I am immensely proud of all of you; your dedication and your brilliant work in the many different areas of child health research. Thank you for the huge privilege of allowing me to serve you as the new director. I offer my gratitude to Dr. Brent Scott for his outstanding leadership and his passion in serving the institute over the past ten years.

We are thrilled to contribute to the University of Calgary’s new cross-cutting Child Health and Wellness Initiative. We strive to develop and implement a transformative partnership and framework that will empower interdisciplinary research teams to address child health challenges at all scales.

Thanks to community

These efforts would not be possible without the generous support of the community through the Alberta Children’s Hospital Foundation, a pillar of support helping to create opportunities and partnerships in our community. We are so grateful for this continued support which reflects our shared respect for research and its impact on child health.

Sincerely,
Dr. Susa Benseler, Director of ACHRI

Scientific Directors:
Basic Science - Dr. Benedikt Hallgrimsson
Clinical Science - Dr. Marinka Twilt

Did you know?

ACHRI’s original name was the Institute for Maternal and Child Health. The Institute was rebranded in 2009 as the Alberta Children’s Hospital Research Institute.
Achievements

$150 Million in research revenue in the last five years

60 Rising stars
Recruited to Institute in the last ten years

1099 New scientific publications

*Full and associate members

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Who We Are

Healthy Outcomes

To give our children the best opportunities, the researchers and clinician scientists in the Healthy Outcomes theme group focus on clinical research in the realm of disease prevention, appropriate intervention and improved outcomes for acute and chronic childhood diseases. Our researchers collaborate with national and international networks to ensure the most robust and comprehensive research, that will lead to significant changes in policy and practice at the individual and community level both here in Canada and globally.

Theme leads:
Amy Metcalfe, PhD
Tyler Williamson, PhD
Susan Samuel, MD

Behaviour and the Developing Brain

Scientists in the Behaviour and the Developing Brain theme group are making great efforts to understand the inner workings of the dynamically changing developing brain, in order to treat brain and mental health conditions in the most effective way. The right intervention at an early age – the time of high brain plasticity – will allow for a better chance to lead a healthier, productive and fulfilling life.

Theme lead:
Catherine Lebel, PhD

Genes, Development and Health

Today at the Alberta Children’s Hospital and across Canada, a significant number of children are in hospital due to an underlying genetic condition. To treat and potentially cure these diseases associated with the abnormal gene changes that occur, we need to understand the mechanisms behind these abnormalities – a task that the researchers of the Genes, Development and Health theme group at the Alberta Children’s Hospital Research Institute have taken on.

Theme lead:
Myriam Hemberger, PhD
Lana Clyde suffered mild depression on and off for fifteen years. But a few weeks after her second child was born, she was hit with severe postpartum depression and anxiety. “There is no sugar-coating, it was the worst depression I ever experienced,” the Calgary mother admits. “I felt like I wasn’t capable of looking after my children.” Clyde decided to enroll in a project called VID-KIDS led by Dr. Nicole Letourneau, PhD, RN, a professor and researcher in the Faculty of Nursing and Cumming School of Medicine. VID-KIDS is a video interaction feedback program for mothers with postpartum depression and their infants. The project aims to address the bonding between mom and infant by educating mothers on recognizing cues from their babies, what they may mean and how they can best respond.
Dr. Letourneau’s research aims to provide evidence-based therapies to help mothers like Clyde live with their symptoms and even possibly recover. The two-year, nurse-administered trial will recruit between 150 and 200 mothers, screened by public health nurses in Calgary for postpartum depression, who have agreed to take part in the study. The mothers are then videotaped interacting with their child and watch the playback with a trained RN who offers positive feedback and suggests ideas and social supports.

Dr. Letourneau is also involved in research to refocus family relationships by increasing support, especially spousal support, to ensure a healthy relationship with their babies. “We actually know through periodical studies that children’s brain development and their brain architecture is built based on the quality of ‘serve and return’ relationships. So that’s why we say it’s a family affair.”

‘Serve and return’ is when a baby serves a cue for a need such as a full diaper, hunger or wanting to play. In return their caregiver should be able to respond. However, parents who are depressed may not respond or identify cues accurately.

Research:

Treatments for postpartum depression are particularly important to prevent adverse effects on the mother-child relationship and limit the potential impact on child development.

- Dr. Nicole Letourneau

Lana Clyde plays with her two children during a park outing. The Calgary mother experienced postpartum depression a year ago and was part of Letourneau’s VID-KIDS study.

The VID-KIDS study is supported by a Canadian Institutes of Health Research grant. Dr. Letourneau holds the Alberta Children’s Hospital Foundation Chair in Parent-Infant Mental Health and is a professor in the Faculty of Nursing and Cumming School of Medicine.
Problem
For most women, pregnancy and birth are a time for celebration. But complications in pregnancy such as pre-eclampsia, preterm birth, miscarriage, and still birth can overshadow this period. The placenta is thought to be behind these complications.

A unique organ, the placenta develops during pregnancy and supplies the fetus with everything it needs. But if any of these tasks don’t work properly, pregnancy complications arise. Recent research has shown that many birth defects may originate in abnormalities of the placenta.
Knowledge of the placenta is limited because of a lack of good experimental models. Dr. Myriam Hemberger, PhD, is working to gain novel insights into pregnancy disorders by establishing new cellular models. These models would mimic the earliest stages of pregnancy when placental development take place. This developmental time has been notoriously difficult to study because of ethical considerations and because humans are so unique.

Recently, Dr. Hemberger, together with a team of collaborators at the University of Cambridge, managed to derive human placental stem cells or mini-organs that enable researchers to study cellular events in the first few weeks of pregnancy. This ground-breaking research is published in the journal *Nature*.

*Dr. Hemberger is a professor in the departments of Medical Genetics and Biochemistry and Molecular Biology. She is the recipient of the 2018 Magee Prize for Women’s Health.*

*This research is also supported by community donations through the Alberta Children’s Hospital Research Foundation.*
One of the most striking accomplishments of the preschool years is the child’s development of speech and language. As children enter school, they are expected to use these newly developed language skills as tools for learning and social negotiation.

In Canada, one in four children in kindergarten has difficulty in at least one of five key developmental domains. These early-emerging developmental issues are often long-lasting and have cascading effects over their maturing years. In addition to academic difficulties, several studies have shown elevated rates of behaviour problems among children with language impairment.
It’s difficult to identify those kids who might be following a different path and who might need early intervention in terms of their language skills.

- Dr. Susan Graham

Research

Dr. Susan Graham’s research program examines child development during the infancy and preschool years with specific attention on delineating the interactive trajectories of early language, cognitive, and social-cognitive development. Understanding how children typically develop language skills is of crucial importance. That knowledge helps educators identify those children whose language development may be challenged. “It’s difficult to identify those kids who might be following a different path and who might need early intervention in terms of their language skills,” says Graham. “Any kind of language problem has long term implications and early intervention is the key to giving these children a better life-long outcome.”

Did you know?

- The Owerko Centre opened in May of 2015 as a new space at the university’s Child Development Centre, made possible thanks to a generous gift from Calgary philanthropists Stan and Marge Owerko to the Alberta Children’s Hospital Foundation.

Dr. Susan Graham, PhD, is a professor in the Department of Psychology and the director of the Owerko Centre at the Alberta Children’s Hospital Research Institute. Dr. Graham held the Canada Research Chair in Language and Cognitive Development from 2003 until 2015.
Problem

Stem cell transplants are performed on children who suffer from blood cancers or other disorders like thallasemia. In this treatment, patients are first treated with invasive therapies such as chemotherapy and/or radiation therapy to eliminate cancers and cancer-causing stem cells. A healthy donor’s stem cells are then transplanted into the patient, which reaches the child’s bone marrow and starts to produce healthy blood cells again. However, in nearly 50 per cent of patients, the donated stem cells, also known as graft, start to attack the patient’s own body cells. This condition is called graft-versus-host disease or GvHD. While some children have a mild form of the disease, for others it may be life-threatening.
Research

Treatment of GvHD is highly successful if managed early. This is only possible if there is a way to provide an accurate identification of patients having a high risk of developing GvHD. While substantial research has identified clinical, genetic and proteomic risk factors, few researchers have sought to develop risk prediction tools that quantify absolute risk of both acute and chronic GvHD. Dr. Faisal Khan, PhD, and his trainee Amit Kalra are advancing ground-breaking research which would successfully predict which patients go on to develop acute GvHD disease. In an ongoing project, the researchers are studying a panel of 579 genes with immunity-related functions. In this study, the research team has identified 12 genes that reliably predict who will develop the disease as early as one month after the transplant. There are plans to validate this research in a larger pediatric and adult population. A predictive tool would help immensely in ensuring these children recover from cancer.

Dr. Faisal Khan is an associate professor in the departments of Paediatrics and Pathology and Laboratory Medicine at the Cumming School of Medicine. He is the holder of the Barb Ibbotson Chair in Pediatric Hematology. This research is supported by the Canadian Donation and Transplantation Research Program, C17 - Children’s Cancer & Blood Disorders network, Alberta Innovates, Alberta Cancer Foundation, Alberta Public Laboratories, Alberta Children’s Hospital Foundation, and the Barb Ibbotson Chair in Pediatric Hematology.

We are very excited with our findings and are hopeful to soon bring this important GvHD predicting tool in clinical practice in Alberta and elsewhere.

- Dr. Faisal Khan
Seeing Isabella DeSouza-Cook today, chatting away like any other 17-year-old, you’d never guess she struggled at birth to stay alive. The teenager was born premature, weighing less than one-and-a-half pounds or 680 grams. About 350 infants are born annually in Canada at this weight. “The specialists told us she may not live and I was very worried,” says her mom Melanie DeSouza-Cook. Melanie was an older mom when she delivered Isabella. While in the neonatal intensive care unit at Foothills Medical Centre, Isabella was enrolled in a groundbreaking mom-infant study led by Dr. Suzanne Tough, PhD.
We have a responsibility to be able to provide optimal medical care to patients and their families, which includes being able to handle high-risk pregnancies.

- Dr. Suzanne Tough

Did you know?

The Alberta Birth Common Dataset or ABCD contains biological and social data from over 12,000 moms, dads and children in Alberta. The ABCD is a collaboration of two well-established cohorts led by Drs. Tough and Nicole Letourneau.

Research

Dr. Tough and a provincial research team, which included the University of Alberta, University of Calgary and Alberta Health Services, had launched a definitive study in the mid-1990s to better understand the impact of Alberta’s high rate of preterm deliveries – one of the highest rates in Canada. The study was believed to be the first in the province to look at this rate and the relationship to delayed childbearing age. The study findings were published in the journal Pediatrics and helped clinicians better prepare for the delivery of high-risk babies and educate parents on their outcomes. Dr. Tough’s contributions also became part of new guidelines issued by the Society of Obstetricians and Gynaecologists to better inform clinician.

Dr. Suzanne Tough is a professor in the Cumming School of Medicine’s departments of Paediatrics and Community Health Sciences. She holds a Senior Policy Fellow with the Burns Memorial Fund and Max Bell Foundation.

Her research has received support from the Alberta Heritage Foundation for Medical Research, the Sinneave Family Foundation and community donations through the Alberta Children’s Hospital Foundation.
Problem
Violence against girls and young women is one of the most widespread, persistent and devastating human rights violations across the globe. Statistics show that one in twenty Canadian teens may experience physical dating violence. This violence has the potential for both immediate and often long-lasting impacts on a person’s physical and mental health. To stop this violence before it starts, it is increasingly important for youth to learn about healthy relationships and ways to prevent gender-based violence.
Dr. Deinera Exner-Cortens, PhD with the Faculty of Social Work and Cumming School of Medicine is supported by Public Health Agency of Canada (PHAC) funding.

Research

In partnership with the Centre for Sexuality, Dr. Deinera Exner-Cortens, PhD, has received a Public Health Agency of Canada grant to evaluate an existing teen and youth dating violence prevention program created by the Centre. The unique program, called WiseGuyz, is delivered in schools throughout the year. The program is designed to help 14- to 15-year-old boys to prevent violence and to improve mental and sexual health. The program works to identify and breakdown health-harming gender norms by exploring the issues that young men face during their teens, and by building on young men’s strengths. Through youth engagement, the program offers opportunities to raise awareness of the causes of teen dating violence while promoting healthier and positive ways of being a young man. Dr. Exner-Cortens works with a number of community-based research partners on program evaluation projects to promote healthy relationships and positive mental health.

“If we can support young men and boys to be engaged in advancing gender equality, including supporting healthy and inclusive gender norms and relationships, we will be building a better community.”

- Dr. Deinera Exner-Cortens
**Problem**

Sexting is known as the sharing of sexually explicit images and videos through the internet or via electronic devices such as smartphones. Teenage brains are still developing. Their capacity to critically analyze the digital tools and apps they are using may not be enough to keep them safe. Sexting is becoming a more common way for young people to explore sexuality and intimacy.

Problems can arise when it’s coerced, or when sexts are shared without permission. In these instances, it can feel a lot like cyberbullying, with potential dangerous mental health and even physical health consequences.

**Research**

Dr. Sheri Madigan, PhD, who holds the Canada Research Chair in the Determinants of Child Health, focuses on understanding how social stressors and adversities can influence children’s social, emotional and cognitive development. In 2018, Dr. Madigan led groundbreaking research that provided a greater understanding of the kinds of stress influencing children and teenagers in our society. Her research on sexting gained world-wide media attention. Dr. Madigan conducted a meta-analysis of 39 existing studies and was able to determine that sexting among teens was far more prevalent than previously thought. The findings showed that about a quarter of teens have received sexually explicit texts or pictures while at about one in seven were sending them. The research was published in the journal *JAMA Pediatrics*.

*Dr. Sheri Madigan is a child development psychologist at the Owerko Centre at the Alberta Children’s Hospital Research Institute and an associate professor in the Department of Psychology in the Faculty of Arts.*

*This research is supported by the Canada Research Chair Program, the Social Sciences and Humanities Research Council, and community donations through the Alberta Children’s Hospital Research Institute.*
To safeguard children and teens, parents and teachers should have open conversations with them about sexuality and appropriate behaviour when it comes to digital communication.

- Dr. Sheri Madigan

Excessive Screen Time Linked to Developmental Delays

Dr. Madigan carried her research forward with a second major study in 2018, analyzing the impact of time spent on digital screens and the development of young children. Examining the practice of children in 2,500 Alberta homes between 2011 and 2016, the findings showed that high levels of screen time in preschoolers was associated with delays in achieving developmental milestones such as language, communication, and gross motor skills in early childhood.
New Guideline on Children’s Concussions

Problem
Concussions, also called mild traumatic brain injuries, are typically caused by a bump or jolt to the head. The impact causes the brain to bounce or twist, potentially damaging brain cells. Because their brains are growing, children are more vulnerable to the changes in brain function that happen as a result of a concussion.

Research
Dr. Keith Yeates, PhD, is the co-lead author on a U.S. government report and a new guideline for the diagnosis and management of mild traumatic brain injuries in children. The report was initiated by the U.S. Centers for Disease Control and Prevention and is expected to dramatically change care for children. In creating the guideline, scientists and leading experts in the field undertook the most extensive review on the science of pediatric mTBI diagnosis and management to date. The guideline was published in the prestigious journal, *JAMA Pediatrics*.

The systematic review identified factors that promote or impede children’s recovery. “There are three sets of factors that have been identified as important in concussion recovery,” says Dr. Yeates. “One is the severity of the injury itself. Two is what the child brings to the injury, such as ADHD, a prior concussion or a history of migraines. Three is the environment. The family, the community, the school – these can all contribute to a child’s recovery.”

Among the 19 practice-changing points of the guideline were recommendations against the use of routine X-rays, CT scans and blood tests for diagnosis, for the use of age-appropriate symptom scales to diagnose, and for the gradual return to non-sports activities after no more than two to three days of rest. The recommendations were all based on the latest evidence, reviewed in a companion systematic review also published in *JAMA Pediatrics*.

The goal in developing the guideline was to help improve and standardize care for kids with these injuries, not just in the United States, but, hopefully, worldwide.

- Dr. Keith Yeates

Dr. Yeates is the lead of the UCalgary’s Integrated Concussion Research Program and holds the Ronald and Irene Ward Chair in Pediatric Brain Injury. Dr. Yeates is a professor and head of the Department of Psychology at the University of Calgary and holds adjunct appointments in the Departments of Pediatrics and Clinical Neurosciences. He is a member of ACHRI and the Hotchkiss Brain Institute.

This research is supported by grants from the Canadian Institutes of Health Research and community support through the Alberta Children’s Hospital Foundation.
Dr. Yeates is also leading a project jointly funded by Alberta Health Services (AHS) and Brain Canada to study the implementation of a clinical pathway for pediatric concussion in emergency department settings. The pathway involves standardizing care in the ED and providing a web portal that families and children can use to obtain information and advice to promote recovery.
Recognition

ACHRI Members Named to Canadian Women in Global Health 2018

Dr. Nalini Singhal, MD

Dr. Singhal is a neonatologist and professor who co-leads Helping Babies Survive programs that include Helping Babies Breathe, Essential Care for Every Baby, and Essential Care for Small Baby. These hands-on low-tech simulation-based programs are being used in over 80 countries.

Dr. Jennifer Brenner, MD

Dr. Brenner is a pediatrician and clinical associate professor who has over the past two decades led numerous large implementation, research, and policy-related health and development projects in East Africa, including Healthy Child Uganda and Mama na Mtoto.

Dr. Nalini Singhal and Dr. Jennifer Brenner were honoured with this award developed by the Canadian Society for International Health and the Government of Canada. The award is inspired by a broader global movement to recognize the achievements and expertise of women in global health.
Dr. Patten was named on the Web of Science’s Highly Cited Researchers 2018 list which recognizes scientists who rank in the top one per cent by citations for their field and are making an impact in solving the world’s biggest challenges. Dr. Patten holds the Cuthbertson-Fischer Chair in Pediatric Mental Health.

**Dr. Scott Patten, MD, PhD**

Dr. Samuel was elected to lead the Canadian Child Health Clinician Scientist Program (CCHCSP). Dr. Samuel is a paediatric nephrologist and clinician scientist in the Section of Nephrology at the Alberta Children’s Hospital. She is the first-ever Western Canadian Director of the national program. The program trains the next generation of clinician scientists in child health and wellness. A highly accomplished CCHCSP graduate herself, Dr. Samuel served as the past curriculum chair of CCHCSP.

**Dr. Susan Samuel, MD**
Recognition

Leading Pan-Canadian Study of Concussion

Dr. Emery is an international leader in concussion research who will lead a pan-Canadian team on concussion research in youth sport supported by a $12 million grant from the National Football League’s scientific advisory board. The University of Calgary is the only institution in Canada to receive funding from this program. Led by Dr. Emery, the program SHRed, Surveillance in High Schools to Reduce Concussions and Consequences of Concussions in Youth, will provide a national platform for concussion surveillance to evaluate novel and sustainable solutions for concussion prevention.

Dr. Carolyn Emery, PhD

Royal Society of Canada College of New Scholars

Dr. Kirton has been elected a 2018 fellow to the Royal Society of Canada in the College of New Scholars and Scientists. The College provides the Royal Society of Canada with a multi-generational capacity to help Canada and the world address major challenges and seize new opportunities including those identified in emerging fields. Dr. Kirton is the Director of the Calgary Pediatric Stroke Program, the Alberta Perinatal Stroke Project and the Alberta Children’s Hospital Pediatric Non-Invasive Brain Stimulation Laboratory.

Dr. Adam Kirton, MD
United Nations International Women’s Day

Dr. Tough was recognized by the United Nations for contributions in mentoring and empowering women. Dr. Tough is one of 100 women to receive this honour. A pioneer in child maternal health, Dr. Tough is a Senior Policy Fellow with the Burns Memorial Fund and Max Bell Foundation.

Dr. Suzanne Tough, PhD

American Academy for the Advancement of Science

Dr. Hallgrimsson was elected as a fellow of the American Academy for the Advancement of Science (AAAS). This year’s Fellows, who represent a broad swath of scientific disciplines, were selected for diverse accomplishments that include pioneering research, leadership within their field, teaching and mentoring, fostering collaborations and advancing public understanding of science. Dr. Hallgrimsson is the ACHRI Scientific Director of Basic Science and the head of the Department of Cell Biology & Anatomy.

Dr. Benedikt Hallgrimsson, PhD
Influencing Health Policy

Problem
Energy drinks are becoming increasingly popular, especially among young people. Many of these drinks contain high amounts of caffeine. Although energy drinks are not intended for consumption by children under 18 and carry a Health Canada-mandated label to that effect, there is a high prevalence of energy drink use among youth, especially young male athletes.

Children and adolescents appear to be at particularly high risk of complications from energy drinks due to their small body size.

Research
In 2018, Dr. Jane Shearer was a leading author of the new 2018 guidelines by the American College of Sports Medicine (ACSM) on energy drink use. According to the ACSM’s recommendations, energy drinks should not be used for hydration before, during or after physical activity. The message that these beverages are not intended for children needs to be re-enforced and widely disseminated, Shearer explains.

New Approach to Manage Diabetes
Dr. Shearer is currently studying whether some fermented products could be incorporated into diets to control blood glucose, particularly for patients with diabetes. Early results show some types of fermentation in food encourages lower blood-glucose responses, influence insulin levels and benefit the bacteria in the gut.

Influencing Health Policy

Energy drinks loaded with caffeine are not a sports drink. Many parents do not recognize this difference.

- Dr. Jane Shearer

and the Department of Biochemistry and Molecular Biology in the Cumming School of Medicine.

This research is supported by the Canadian Institutes of Health Research (CIHR) and the Natural Sciences and Engineering Research Council (NSERC).
Problem

Abdominal pain is among the top reasons parents bring their child to the Emergency Department and emergency doctors will tell you that one of parents’ biggest worry is appendicitis. Every day at the Alberta Children’s Hospital, at least one child is admitted for appendicitis surgery.

Appendicitis is a serious medical condition for children. If left untreated, the appendix may burst and at times, be fatal. The clinical challenge is to diagnose appendicitis early enough to prevent progression to a perforation and to identify those children who require surgery.
Picking out a child with appendicitis among all those with abdominal pain is sometimes like finding a needle in a haystack.
- Dr. Graham Thompson

Research

Dr. Graham Thompson, MD, and a multi-disciplined research team took a very aggressive approach to finding a solution. They tested hundreds of proteins and by-products of metabolism, narrowing their scope to a bio-profile of 16 compounds that were found to be highly specific for pediatric appendicitis. The profile gave a ‘fingerprint’ of a patient with the illness. The team went on to ask 121 children with abdominal pain, some with appendicitis and some without, to give urine and blood samples to use for analysis to re-test these biomarkers. The study resulted in a clear differentiation between those with the illness and those without.

Importantly, the profile also identified children with a perforated appendix, important information for clinicians in determining the best treatment for their patients. The research is published in the journal Scientific Reports.

Thompson is now leading a large, national multi-site trial in pediatric emergency departments across Canada through the Pediatric Emergency Research Canada (PERC) network. The goal is to develop a rapid bed-side test, similar to a finger-prick blood glucose test for diabetics, allowing for critical diagnostic information to be in the hands of a child’s healthcare team within an hour.

Did you know?

ACHRI has 147 full members and 148 associate members.

Dr. Graham Thompson is a pediatric emergency medicine physician at the Alberta Children’s Hospital and an assistant professor in the Department of Pediatrics at the Cumming School of Medicine.

This research is supported by grants from the Canadian Research Health Institutes (CIHR), Alberta Health Services Strategic Networks, the Alberta Sepsis Network, and community donations through the Alberta Children’s Hospital Foundation and its support of the Pediatric Emergency Medicine Research Associate Program.
Better Diagnosis and Care of Children with Gastroenteritis

Problem
Gastroenteritis is an infection of the intestines caused by viruses or bacteria that can cause diarrhea and vomiting. The symptoms of an infection can last up to ten days and may lead to dehydration, which can be serious, particularly in young children. Some bacterial strains such as E.coli can cause other severe symptoms and even be life-threatening.

Research
As part of a research project, Dr. Stephen Freedman’s team is evaluating a technology that identifies the genetic signature of 22 different bacteria and viruses in just one hour. Three-year-old Olivia Matthews came to the Alberta Children’s Hospital very sick. Her kidneys were failing, and the health care providers didn’t have a clear explanation. Dr. Freedman’s research team was able to help.

Within an hour and a half of the initial call for assistance, Dr. Freedman’s team collected a stool sample, tested it on the technology and successfully delivered an answer. The research team found a rare bacteria, Shiga toxin-producing Escherichia coli (STEC). This finding allowed her doctor to provide the appropriate therapy, saving Olivia’s kidney.

After 13 days in the hospital, Olivia was discharged with improving kidney function.

Standard testing could not explain her illness and additional testing would take days, days Olivia did not have as her kidneys were rapidly failing.

- Dr. Stephen Freedman

Dr. Stephen Freedman, MD, is a pediatric emergency medicine physician with Alberta Health Services, holder of the Alberta Children’s Hospital Foundation Professorship in Child Health & Wellness and an associate professor in the Department of Pediatrics at the Cumming School of Medicine.

This research is supported by funding through Alberta Health Services, the Canadian Institutes of Health Research (CIHR), the National Institutes of Health (NIH) and community support through the Alberta Children’s Hospital Foundation.
Dr. Freedman is part of an Alberta-wide research team that has received an Alberta Innovates grant to introduce an innovative model of acute pediatric mental health and addictions care to the province. The team’s care model will introduce triage tools for healthcare providers and new services and processes to improve healthcare system efficiencies, navigation and transitions. The ACHRI members who are part of this 31-member team are: Drs. Gina Dimitropoulos, Gerald Giesbrecht, Frank MacMaster, Maria Santana, Antonia Stang, and Jennifer Thull-Freedman.
The Silent Genome Project

Problem
Right now, children from Indigenous communities have limited access to cutting-edge genomic technologies to help in diagnosing diseases that have a genetic origin. These technologies are becoming routinely available to other Canadians. But it would be difficult for doctors to effectively apply these advances for diagnosis because of the lack of information on normal genetic variation of Indigenous populations. The unequal access to healthcare for Indigenous communities in the past has left a large gap in the history of common conditions experienced by this population. The Silent Genomes project is attempting to work toward providing a level of equity in the system by bringing access to genomics to Indigenous families affected by genetic diseases.

Research
Through four distinct but overlapping activities, the Silent Genomes project aims to bring life-changing genomic diagnoses to Indigenous children with genetic disease and create a database of background genetic variations for Canadian Indigenous populations. Ensuring a culturally appropriate way to approach the research, including Indigenous-led governance over biological samples and health data is top of mind for the research team, which includes Indigenous partners, scholars and physicians.

With Dr. Anna Lehman from the University of British Columbia, Dr. Tarailo-Graovac co-leads ‘Precision Diagnosis’, one of the project activities. The main goal is to bring state-of-the-art whole genome sequencing approaches to at least 200 Indigenous families across Canada affected by a suspected genetic disease. In particular, Dr. Tarailo-Graovac and the team are looking for better ways to detect and interpret genome variants in order to maximize diagnostic capacity of genome sequencing.

Silent Genomes is an outstanding partnership between members of a diverse team of clinicians, scientists and Indigenous partners.

- Dr. Maja Tarailo-Graovac

Dr. Maja Tarailo-Graovac, PhD, is an assistant professor in the departments of Biochemistry and Molecular Biology and Medical Genetics.

This research is supported by the Canadian Institutes of Health Research (CIHR).
A New Method of Drug Discovery to Treat Epilepsy

Problem
For more than a third of children living with epilepsy, the currently approved medications do not stop their seizures. This statistic has not changed for the past five decades, despite the development of many new anti-seizure drugs. Dr. Deborah Kurrasch, PhD, a neuroscientist and Dr. Jong Rho, MD, a pediatric neurologist, wondered about the reasons for the slow progress and started questioning the methods used to develop new medications. “For many years, the focus has been on finding drugs that block membrane channels and receptors in the brain that affect the way signals are sent between cells. We wanted to find new drugs for the epileptic children who don’t respond to current medications, and this required a wholly different approach,” says Kurrasch.

Research
Their investigation led to the development of a drug screening platform that focuses on measuring abnormal mitochondria activity in brain cells – a completely different path to drug discovery. The description of this novel platform, which uses zebrafish as an experimental model, was published in the journal Brain. Mitochondria serve as the powerhouse of a cell and are known to be important in seizure control. Dr. Rho’s research has shown that dietary therapies, that enhance energy production in the mitochondria, can be used as a therapy for diverse neurological disorders. Their top drug, vorinostat, is being tested in clinical trials involving children with treatment-resistant epilepsy at Alberta Children’s Hospital. The team is also validating other lead drugs for later clinical studies. Dr. Kurrasch is a co-founder and CEO of Path Therapeutics, a biotech company that develops drugs for rare, pediatric epilepsies.

It’s encouraging how quickly we can move from the lab to a potential treatment to help children with epilepsy.
- Dr. Deborah Kurrasch

Dr. Deborah Kurrasch is an associate professor in the departments of Medical Genetics and Biochemistry & Molecular Biology. Dr. Jong Rho is the holder of the Dr. Robert Haslam Chair and a professor in the departments of Paediatrics, Physiology and Pharmacology and Clinical Neurosciences. Dr. Rho is the Section Chief of Pediatric Neurology at the Alberta Children’s Hospital.

This research is supported by a grant from Brain Canada, Canadian Institutes of Health Research (CIHR) and generous community donations through the Alberta Children’s Hospital Foundation.
Dr. Jong Rho, Dr. Kingsley Ibhzehiebo, and Dr. Deborah Kurrasch develop a drug screening platform that focuses on measuring abnormal mitochondria activity in brain cells – a completely different path to drug discovery.
Problem

Children living with conditions such as a stroke, spinal cord injury or cerebral palsy can suffer from severe limitations in their mobility and capacity to communicate. Fully aware and capable but unable to walk, use their hands or speak, these children are trapped in their bodies. Treatment options are limited.

Dr. Adam Kirton, MD, started the Calgary Pediatric Stroke Program at the Alberta Children’s Hospital to provide state-of-the-art diagnosis, treatment and support to children with stroke-related brain injuries and give them the opportunity to participate in leading clinical research initiatives. A new direction in this research aims to help these most severely disabled children better interact with the world, in ways they’ve never done before – through brain-computer interface (BCI) technology.
Some children with the most severe physical disabilities - unable to walk, talk, or use their hands - are highly intelligent and capable. We have to push the limits of advanced technologies like BCI to help them realize their full potential.

- Dr. Adam Kirton

Research

Dr. Kirton and his team at the Alberta Children’s Hospital are among only a few centres in the world conducting research on novel brain-computer interface (BCI) systems for children. These systems have the potential to engage children, who otherwise cannot communicate, in learning and play.

The software and technology can allow children to operate various devices simply by thought commands via a non-invasive electroencephalogram (EEG) which captures thought-related electrical activity of the brain. Modern BCI systems can recognize changes in thought patterns and transmit them to control device such as a computer cursor, communication system or video game. The overall goal is to find new ways for children with severely limited movement and speech but intact intellect to express themselves, interact with their environment, and gain independence.

Dr. Adam Kirton is a professor of Pediatrics and Clinical Neurosciences at the University of Calgary and an attending Pediatric Neurologist at the Alberta Children’s Hospital.

This research is supported by the Child-Bright Network, the Canadian Institutes of Health Research (CIHR), Alberta Innovates and community support through the Alberta Children’s Hospital Foundation.
Establishing the BioCORE at the Alberta Children’s Hospital

The BioCORE facility was established under the umbrella of the acclaimed NeuroCritical Care (NCC) program, a collaborative initiative to bring translational research to the bedside for patients with brain injuries in the pediatric and neonatal intensive care units.

“The Alberta Children’s Hospital had all of the pieces in place to build this program, we just needed to put it all together,” says Dr. Michael Esser, pediatric neurologist and Director of both the NCC program and the BioCORE. The BioCORE was built from within the NCC program and the hospital, capitalizing on the complementary expertise of various groups, including but not limited to...
Outcomes are vastly improved when you have dedicated programs to care for these children.

- Dr. Michael Esser

pediatric neurology, pediatric intensive care, neonatology, neurosurgery, and rehabilitation medicine. The facility is a partnership with the Biochemical Genetics Lab led by Dr. David Sinasac, who is also Director of Operations for the BioCORE, and aims to provide guidance and support for researchers within the Department of Paediatrics and the Alberta Children’s Hospital Research Institute.

The BioCORE facility houses state-of-the-art technology, including a biobank repository which stores and catalogues biological samples. These samples are collected as part of research studies and transferred to the BioCORE for preservation in ultra-low temperature freezers, allowing researchers to safely store, organize, and access these samples for later analysis. Cutting-edge technology, including Multiplex Immunoassay and high resolution analytical chemistry techniques, can uncover virtually any molecule from a research sample and unearth relevant biomarkers for a multitude of conditions, such as those involved in brain injury, epilepsy, inflammation, and cancer.

“The ultimate goal would be integration of this platform into clinical care, with the ability for clinicians to send samples right to the BioCORE for rapid processing,” explains Esser, an innovation that he says could be used by any subspecialty within the hospital to provide real-time diagnoses and therapeutic monitoring for patients. For now, the BioCORE continues to be an invaluable research tool with the potential to aid clinicians in providing focused care for the children who need it most.

Both the BioCORE and the overarching NCC program have been funded by generous community donations through the Alberta Children’s Hospital Foundation.
Chairs and Professorships

Alberta Children’s Hospital Foundation Chairs and Professorships

Susa Benseler
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AIHS Translational Chair in Cancer Genomics
We are grateful to Dr. Brent Scott who served with dedication and commitment as institute director for the past ten years. Dr. Scott transformed the institute into a force of high-calibre research to help inform and change practice and policy in Alberta.

Through the efforts of Dr. Scott, ACHRI opened the Owerko Centre, a community-funded centre devoted to understanding neurodevelopment and child mental health. Dr. Scott’s efforts positioned the institute to contribute to Alberta’s vision for precision health, in part through the establishment of the Centre for Health Genomics and Informatics. In addition, Dr. Scott developed an education platform, in collaboration with the Canadian Institutes of Health Research and the Alberta Children’s Hospital Foundation, to support the academic training of hundreds of young scholars in the area of child health.

A big part of the success of ACHRI hinges on effective advocacy for pediatric research, education and care. Dr. Scott provided a compelling and constant case for the need to address the health of developing babies, children and youth. In recognition of his work, Dr. Scott received the Alan Ross Award in 2016 for Canada’s top pediatrician by the Canadian Pediatric Society. In addition to his award, Dr. Scott has been an exceptional mentor to physicians, students and other professionals working to advance child health within a culture of collaboration and innovation.

As we celebrate our 10th Anniversary, we express our gratitude to Dr. Scott for his exceptional leadership and his passion to ensure that children receive the very best healthcare possible.
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