

Department of Pediatrics Research Report

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Research Report!



Dr. Darryl Adamko

Airway Disorders: Diagnosis Through Urine Metabolomics

Dr. Darryl Adamko

Asthma causes cough and wheeze, missed time at school or work, and reduced exercise and activities. Asthma is the most common chronic disease in children, and is usually the result of allergic inflammation, which can get worse seasonally. As the inflammation and obstruction worsen (i.e. an asthma exacerbation), a hospital visit may be required. Predicting and preventing these exacerbations is a key goal for doctors. Differentiating asthma from other breathing disorders (e.g. Cystic Fibrosis, viral bronchiolitis) is another challenge doctors face, since these diseases all cause obstruction of breathing tubes and share similar symptoms. However, the type of inflammation causing airway obstruction is different (i.e. asthma is usually from allergic inflammation, while diseases like Cystic Fibrosis (CF) are not), and as such, each disease requires different treatment.

Diagnosing lung disease and predicting exacerbations is challenging for doctors in a primary care setting. They do not have the ability to measure lung function or airway inflammation accurately in clinic. A simple, non-invasive test for primary care doctors is currently not available. Thus, in most clinical settings doctors simply rely on patient history and give trials of therapy. This leads to recurrent hospitalizations, worsening disease, expenses for the health care system, and stress on families.

Metabolomics is the study of small

molecules generated from cellular metabolic activity. As diseases are based on specific cell types and inflammatory activity, these metabolites should be a reflection of the specific disease. Asthma has negative effects within the body, in the respiratory organs and beyond. People with asthma have different types of airway cells, and these cells produce different metabolites. Our general hypothesis is that the presence of disease induces cellular stress and a change in cellular metabolism. This is well-established in clinical medicine with the use of biofluid monitoring for the presence of disease. For example, patients with diabetes adjust medications based on measured changes of glucose in their blood and urine.

Urine is an excellent biological fluid for metabolomic studies due to its ease of collection in medical settings in patients of all ages, and the richness of its chemical composition. Over 1000 metabolites have been identified in urine. While there are many technologies available for metabolomic work, we initially chose Nuclear Magnetic Resonance (NMR) spectroscopy to quantify specific chemical constituents within body fluids. The main advantage of using NMR over other techniques like mass spectroscopy (MS) is its ability to provide a rapid but accurate screen of the metabolic profile with little pre-treatment of samples. Using commercially available software, NMR

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Image of Interest

We evaluated tracheal palpation to guide endotracheal tube (ETT) insertion depth. During intubation, an investigator palpated the trachea with three fingertips side-by-side extending upward from the suprasternal notch. The ETT was advanced until the ETT tip was felt at the finger closest to the sternal notch. Final ETT position was determined by bronchoscopy. The ETT was palpable at the sternal notch in all 50 patients, and led to satisfactory placement in 49 of 50 patients, too deep in 1 of 50 patients. Number needed to treat is 6.3 for improvement over the Pediatrics Advanced Life Support (PALS) method.

Gamble JJ, McKay WP, Wang AF, Yip KA, O'Brien JM, Plewer CE. Three-finger tracheal palpation to guide endotracheal tube depth in children. Pediatric Anesthesia. 2014;24:1050-1055.

Kids' Well-Being Key to Refugee Families Adapting

Dr. Nazeem Muhajarine



The heartbreaking photo of little Alan Kurdi's lifeless body on a beach in Turkey in September brought the plight of the Syrian refugees to the world's attention. Sadly, this one well-publicized death is emblematic of a much larger problem, with hundreds of other children perishing as their families attempt to flee the war in Syria. Thousands of displaced children linger in camps, losing their innocence with each passing day. When some eventually arrive here, are we prepared and willing to do what we can to make their lives right?

The statistics on displaced children trickling out of the United Nations High Commission on Refugees are staggering. Of the 2.2 million refugees fleeing Syria, just over half are children. Two out of three are under the age 12. Almost a quarter have a dead or missing close family member.

A majority of displaced children aren't attending school where they are temporarily sheltered; many work instead to support their families. It's the lucky among them who survive the arduous process of escape and are resettled in countries like Canada.

Canadians are currently mobilizing to provide these refugee families with homes, clothes, and other basic necessities. However, to help them integrate into our society successfully, we also must be mindful of their mental health needs, in particular the impact of trauma on children. Major adverse events in early life, such as witnessing violence, loss of family members, and displacement can significantly harm children's ability to grow into healthy, well-functioning adults. Many of the newcomers who will be settling in our communities are families with young children. To give these youngsters the best chance of reaching their full potential, we need to be prepared to provide appropriate, timely treatment, and support.

Some may question how we can do this when the resources of many communities are already stretched as they try to meet the health, social, and educational needs of their children. Yet, as a nation we have sufficient wealth to provide for our children and to absorb the care of newcomer children, if we decide that this is a societal priority.

Research into the impact of the early years on later functioning consistently shows that investments during this critical period pay off seven-fold. Conversely, if we fail to address the needs of children—especially those who have experienced trauma—we are likely to experience increased future costs from underachievement in school and mental health problems to anti-social behaviour, including violence and crime.

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Featured Child Health Researcher

Dr. Salah Almubarak



After completing medical school at Arabian Gulf University in Bahrain (1993-1999), Dr. Almubarak continued on to specialty training in Pediatric Neurology at the University of British Columbia, Vancouver (2003-2008). He then had a two year fellowship at British Columbia Children's Hospital, Vancouver (2008-2010) and became a Specialist in Pediatric Clinical Neurophysiology. He is certified by the Canadian Society of Clinical Neurophysiologists (CSCN) in EEG. Dr. Almubarak had developed a strong research background after training in diagnostic epilepsy surgery during a fellowship at the Cleveland Clinic Foundation, Cleveland (2010-2011). He also received training in Magnetoencephalogram (MEG) and Intracranial EEG (ICEEG) for pre-surgical evaluation of intractable epilepsy patients. Dr. Almubarak is certified by the American Board of Clinical Neurophysiology (ABCN) with specialty in epilepsy monitoring. He worked as the director of the MEG research lab at King Fahad Medical City, Riyadh (2011-2014), and developed all the required protocols for pre-surgical evaluation of the patients with intractable epilepsy or

those who require brain mapping with brain tumor.

Dr. Almubarak's clinical research interests include epilepsy outcome in correlation with EEG findings. In 2008, Dr. Almubarak studied the neurological and epilepsy outcomes in neonates/infants who had abnormal EEG findings. He found that neonatal EEG is useful in predicting clinical prognosis, specifically that the presence of abnormal EEG background (particularly generalized suppression) during the first month of life may be predictive of unfavorable outcome. Overall impression of neonatal EEG (based on several parameters) may be predictive of outcome, even when individual parameters are not predictive. Other neonatal EEG parameters such as interictal spikes do not appear to be predictive of outcome. The study clarified and extended results previously reported in the past few decades with a new advanced vision of clinical interpretation. The prognosis of the infant EEG findings provides a rational basis for considering a change in our current thinking regarding the significance of EEG abnormalities such as epileptiform discharges in the first year of life. In 2010, Dr. Almubarak undertook further training in epilepsy source localization by using MEG and ICEEG recording. He studied the agreement between MEG and ICEEG results, to determine the characteristics that lead to concordance, and to assess how these

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Our Partners: Children's Hospital Foundation of SK

The Children's Hospital Foundation of Saskatchewan (CHFS) continues to be a generous supporter of child health research in the province. Recently, the CHFS made a substantial funding commitment to support the Department of Pediatrics Visiting Lectureship Program. This generous support will allow eminent national and international child health researchers to visit Saskatchewan to share their knowledge and expertise with students, faculty and the general community. We gratefully acknowledge the CHFS and its many donors for supporting the Visiting Lectureship Program.



CHILDREN'S
HOSPITAL
FOUNDATION

Clinical Investigator Program (CIP) for Residents

The CIP at the University of Saskatchewan is available to residents enrolled in a Royal College accredited residency program who have interest and potential for a career as a clinician investigator or clinician scientist. CIP offers two streams: A Graduate stream for participants enrolled in a graduate (M.Sc. or Ph.D.) program, and a Postdoctoral Stream for residents who already hold a Ph.D. and are interested in undertaking a structured research program. For further information about CIP, please contact Dr. Alan Rosenberg, alan.rosenberg@usask.ca.

can accurately quantify metabolites without pre-designed internal standards. This allowed us to measure metabolites with less work compared to MS. Thus, using NMR we were able to study a large range of cellular pathways with accuracy. This work was done with several collaborators (investigators at the University of Alberta, University of Saskatchewan, University of Manitoba, McMaster University, Queen's University, The Chest Research Foundation, Pune, India, Manchester University, UK, University of Wisconsin, and Harvard University), and has had continuous funding from 2005-present through various applications to the AllerGen NCE, Sick Kids Foundation, the Women and Children's Health Research Institute of Alberta, Grand Challenges Canada, and The Cystic Fibrosis Foundation. Our work has helped establish the metabolome from urine of healthy adults, an animal model of asthma, a metabolome of asthma in children, and most recently a metabolome that can differentiate asthma from an asthma-like disease called COPD (chronic obstructive pulmonary disease).

Since moving to the University of Saskatchewan, Dr. Adamko has established a new lab in collaboration with Dr. Anas El-Aneed, PhD (College of Pharmacy and Nutrition, U of S). The purpose of this lab is to transition the metabolomic diagnostic to a mass spectrometry platform. This lab has received funding from Saskatchewan Health Research Foundation, Children's Hospital Foundation of Saskatchewan, and The Western Diversification Program. MS will be

more accurate than NMR and will be more amenable to a commercial lab. We now fund and co-supervise a technician, Hanan Awad, and a PhD track graduate student, Mona Hamada, as they develop the MS methods.

In the last 2 years, we are excited to report that we have developed the ability to measure about 30 metabolites in a single urine sample using a process that takes about 1-2 hours. Such methods for analysis of multiple metabolites in urine have not been previously perfected. This spring we will begin analyzing urine samples we have stored on previous subjects from the past NMR work (over 300 samples). We also have been recruiting samples from subjects at the University of Saskatchewan, both adult and pediatric.

We are expecting that MS will be even better than NMR at such analysis. We expect that this will allow us to translate our findings into a commercially viable diagnostic test. Our lab in Saskatchewan is expected to become a metabolomics platform for respiratory researchers across the world. Through the Universities of Alberta and Saskatchewan, Dr. Adamko is CEO of a developing company called Respirlyte. The mandate for this company is to utilize our metabolomic data and create a diagnostic test for adults and children with asthma and asthma-like diseases.

Dr. Darryl Adamko is an Associate Professor in the Department of Pediatrics, University of Saskatchewan

Coming Events

FEB THU 4	Evaluation and Management of Chest Wall Deformities Dr. Chris Milbrandt Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH	FEB THU 11	Geographic Variability in Childhood Asthma Prevalence Dr. Joshua Lawson Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH	FEB THU 18	The MEND Program Dr. Carol Rodgers Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH	FEB THU 25	TBA Dr. Krista Baerg Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH
FEB MON 29	Children's Hospital Foundation of Saskatchewan Equipment Grant Deadline Professional Development Grant Deadline	MAR THU 3	TBA Dr. Munier Nour Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH	MAR THU 10	Veterinary Social Work: Implications for Child Health Ms. Erin Wasson Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH	MAR THU 17	Participatory Research in Action: The Green Light Program Dr. Vivian Ramsden Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH
MAR THU 24	Child Health Research Trainee Day Graduate Student Commons (Emmanuel and St. Chad, 1337 College Drive) 11am-3pm Call for Abstracts Coming Soon	MAR THU 30	Morbidity and Mortality Rounds Dr. Vicki Cattell Pediatric Grand Rounds 11am-12pm East Lecture Theatre RUH	APR WED 20	CIHR: New Investigator Research Grants in Child and Youth Health Deadline https://www.researchnet-recherchenet.ca/rnr16/vwOpprntnyDtls		

Recent Publications & Presentations from U of S Child Health Researchers

- Diogo R, Esteve-Altava B, Smith C, Boughner JC, Rasskin-Gutman D. Anatomical Network Comparison of Human Upper and Lower, Newborn and Adult, and Normal and Abnormal Limbs, with Notes on Development, Pathology and Limb Serial Homology vs. Homoplasia. PLoS One. 2015;10:e0140030.
- Gagnon KB, Caine S, Samadi N, Martinson M, van der Loop M, Alcorn J, Chapman LD, Belev G, Nichol H. Design of a mouse restraint for synchrotron-based computed tomography imaging. J Synchrotron Radiat. 2015;22:1297-300.
- Gerds V, Wilson HL, Meurens F, van Druenen Littel-van den Hurk S, Wilson D, Walker S, Wheler C, Townsend H, Potter AA. Large animal models for vaccine development and testing. ILAR J. 2015;56:53-62.
- Ghemlas I, Li H, Zlateska B, Klaassen R, Fernandez CV, Yanofsky RA, Wu J, Pastore Y, Silva M, Lipton JH, Brossard J, Michon B, Abish S, Steele M, Sinha R, Belletrutti M, Breakey VR, Jardine L, Goodyear L, Sung L, Dhanraj S, Reble E, Wagner A, Beyene J, Ray P, Meyn S, Cada M, Dror Y. Improving diagnostic precision, care and syndrome definitions using comprehensive next-generation sequencing for the inherited bone marrow failure syndromes. J Med Genet. 2015;[Epub ahead of print].
- Gruner D, Pottie K, Archibald D, Allison J, Sabourin V, Belcaid I, McCarthy A, Brindamour M, Augustincic Polec L, Duke P. Introducing global health into the undergraduate medical school curriculum using an e-learning program: a mixed method pilot study. BMC Med Educ. 2015;15:142.
- Katapally TR, Rainham D, Muhajarine N. Factoring in weather variation to capture the influence of urban design and built environment on globally recommended levels of moderate to vigorous physical activity in children. BMJ Open. 2015;5:e009045.
- Pahwa P, Abonyi S, Karunanayake C, Rennie DC, Janzen B, Kirychuk S, Lawson JA, Katapally T, McMullin K, Seesequasis J, Naytowhow A, Hagel L, Dyck RF, Fenton M, Senthilselvan A, Ramsden V, King M, Koehncke N, Marchildon G, McBain L, Smith-Windsor T, Smylie J, Episkew JA, Dosman JA. A community-based participatory research methodology to address, redress, and reassess disparities in respiratory health among First Nations. BMC Res Notes. 2015;8:199.
- Sellers EA, Hadjiyannakis S, Amed S, Dart AB, Dyck RF, Hamilton J, Langlois V, Panagiotopoulos C, Dean HJ. Persistent Albuminuria in Children with Type 2 Diabetes: A Canadian Paediatric Surveillance Program Study. J Pediatr. 2016;168:112-7.
- Spurr S, Bally J, Ogenchuk M. Integrating oral health into pediatric nursing practice: caring for kids where they live. J Spec Pediatr Nurs. 2015;20:105-14.
- Wakayo T, Belachew T, Vatanparast H, Whiting SJ. Vitamin D deficiency and its predictors in a country with thirteen months of sunshine: the case of school children in central Ethiopia. PLoS One. 2015;10:e0120963.

Refugee Families

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Just as the early years are critical for children's development, the weeks and months following settlement are a crucial time to provide health interventions to those who have had horrific experiences. Addressing the psychological and mental health consequences of trauma must therefore be a top priority, recognizing that the needs of children are not simply scaled-down versions of adult needs.

Unfortunately, medical personnel who are experienced in specialized care for newcomers are few, and their clinics and programs are already overburdened and under-resourced. Some cities have in place or are setting up refugee health clinics or programs. This is a good first step, but it takes time and resources to establish such services and coordinate them with other agencies. Given the urgency, health authorities need to redouble their efforts and fast-track the process of setting up these programs.

Other forms of support also will be needed. Children need to rediscover the joys of playing and learning to simply experience a normal childhood again. Centre-based early childhood programs that are sensitive to the needs of those who have fled life-threatening situations play an important role. Older, school-age children will need specialized mentoring programs, before- and after-school programs such as language classes, arts, cultural, and recreational programs.

All these activities enable them to integrate into society, and to connect deeply and meaningfully to their new communities, which benefits not only them but their whole family. The success of children in any newcomer family is a singular symbol of having "arrived" in a new land, the likelihood of future prosperity of that family and a reminder of how much things have changed for the better since leaving their home countries.

As we move forward in the process of reconciliation with our Indigenous peoples, we will build a strong future by continuing to make this land hospitable for newcomers from all corners of the world.

Dr. Nazeem Muhajarine is a Professor of Community Health & Epidemiology, and Director, Saskatchewan Population Health & Evaluation Research Unit, UofS. Reprinted with permission (Saskatoon Star Phoenix, January 9th, 2016).

Research Project Opportunities

"Survey of Kawasaki Disease awareness among Saskatchewan physicians"

Study format: Survey

Contact: Dr. Alan Rosenberg, alan.rosenberg@usask.ca

"Relationship of ESR and CRP with inflammatory cytokine biomarkers"

Study format: Database analysis

Contact: Dr. Alan Rosenberg, alan.rosenberg@usask.ca

contact us

For more information about The Department of Pediatrics Research, SPRING, or to contribute content to The Department of Pediatrics Research Report, please contact:

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Next submission deadline is March 11, 2016!

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pediatrics/research/newsletter](http://www.medicine.usask.ca/pediatrics/research/newsletter)



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Book Review:

"Teamwork, Leadership, Communication-
Collaboration Basics for Health Professionals"

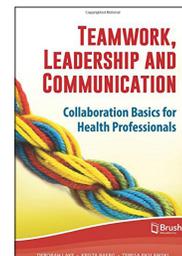
by Deborah Lake, Krista Baerg, and Teresa Paslawski

Reviewed by Dr. Robin Erickson, Department of Pediatrics

The poet, John Donne expressed, "No man is an island entire of itself..." This observation holds particularly true in health care and research. We work in an environment where we rely upon individuals with special skill sets coming together and contributing their knowledge towards a common task. There is however a mistaken assumption that this unification is a spontaneous process that requires little thought. This is likely a reflection of the lack of training in team dynamics that we receive in our education programs.

"Teamwork, Leadership, and Communication: Collaboration Basics for Health Professionals" by Lake, Baerg, and Paslawski recognizes this and explores each of these aspects of professional collaboration. The book is deceptively small but provides a starting point to explore many other resources—some websites, and other published tools that deal with the issues of collaboration amongst professionals in the healthcare setting. The book takes a workbook style approach to exploring these resources and encourages the reader to contemplate their practice and how the tools and information from these external resources can be applied to change practice. Although the book is focused primarily on clinical care, the concepts are universal and can be applied beyond the walls of the hospital, and extend to the conference room or the lab.

Dr. Krista Baerg and Dr. Robin Erickson are Associate Professors in the Department of Pediatrics, University of Saskatchewan



Dr. Salah Almubarak

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factors relate to favorable epilepsy surgery outcome. The study revealed that the anatomical concordance of both MEG/ICEEG and the complete resection of the MEG foci significantly increased the chance of seizure-free outcomes following epilepsy surgery in specific conditions.

Currently, Dr. Almubarak is also exploring health economic research studies in order to determine the required medical care resources which would provide the best care to pediatric patients with epilepsy.

Dr. Salah Almubarak is an Assistant Professor in the Department of Pediatrics, University of Saskatchewan

YOUR OPINION PLEASE!

We would appreciate your opinion about the Department of Pediatrics Research Report and suggestions for future editions.

Please complete a brief survey at:

<https://www.surveymonkey.com/s/NQVV6SB>.

Thank you!

The Children's Health Research Trust Fund (CHRTF) was established in 1983 to help raise funds to support child health research at the University of Saskatchewan. As all donated funds are endowed, the CHRTF has continued to grow to become an important partner in helping advance research in the Department of Pediatrics. For further information about the CHRTF: <http://www.medicine.usask.ca/pediatrics/research/CHRTF>. To **Donate** to the CHRTF: <http://give.usask.ca/online/chrtf.php>

