GUT4HEALTH

IMPACT REPORT 2020

PRESENTED TO

MINING FOR MIRACLES | BC Children's Hospital Foundation

MINING FOR MIRACLES

Supporting child health for over 30 years

Thank you for your unwavering and long standing commitment and dedication to kids throughout the province. It is through your incredible fundraising initiatives and the generous contributions from individuals and companies who support the Mining for Miracles campaign year after year that BC Children's is able to stay at the forefront of pediatric care and research.

Your support of innovative programs and specialized equipment at BC Children's Hospital and the Research Institute is having a tremendous impact on the lives of kids and their families across BC.

In November 2019, Mining for Miracles completed their pledge to support the establishment of Gut4Health. The Gut4Health program aims to further microbiome research and develop new therapies with the goal of making BC Children's the first children's hospital in Canada to use gut bacteria to predict, prevent and treat infections and chronic inflammation in kids. This program is positioned to develop and test new treatments with the goal of finding cures ultimately helping kids get back to being kids. We are so grateful for each and everyone one of you. Your fundraising efforts are ushering in ground breaking research and advances in care that will impact BC's kids for generations to come. Thank you for helping kids shine.

"Through the vision and support of Mining for Miracles, BC Children's Hospital and Gut4Health are leading the way in using gut microbes to develop innovative screening tests and therapies. This will mean improved health and quality of life for children and families across BC. Thank you Mining for Miracles, for your generous support."

– Dr. Bruce Vallance, Gut4Health Lead, BC Children's Hospital Research Institute

THE GUT4HEALTH PROGRAM

The human body is home to trillions of bacteria, ninety per cent of which live inside the gut. This population of gut bacteria, known as the gut microbiome, contains a balance of both good and bad bacteria, and maintaining this balance is crucial to our overall health. An imbalance in the gut microbiome can lead to many chronic diseases, such as asthma, arthritis and inflammatory bowel disease—diseases that cause lifelong pain and suffering to children lasting throughout their lifetime. By studying and understanding the gut microbiome, Gut4Health is on its way to helping the 10,000 kids in BC currently living with chronic inflammatory diseases caused by an imbalance of gut bacteria.

Mining for Miracles committee members at the Gut4Health lab tour on November 18, 2019

GOALS

FURTHER RESEARCH INTO THE USE OF GUT BACTERIA TO PREDICT, PREVENT AND TREAT INFECTIONS AND CHRONIC INFLAMMATION IN KIDS.

DEVELOP AND TEST NEW TREATMENTS WITH THE GOAL OF CREATING CURES THAT WILL WORK FOR A LIFETIME.

PROVIDE THE INFRASTRUCTURE NEEDED TO DRIVE FORWARD MICROBIOME RESEARCH

ACHIEVEMENTS

Thanks to Mining for Miracles' generous $3.725 million contribution, BC Children's was able to establish core Gut4Health facilities. Now, BC Children's Hospital not only has the clinical and scientific expertise to be the Canadian leader in pediatric microbiome research and therapeutic development, but also has Canada's first state-of-the-art facilities and infrastructure needed to drive forward microbiome research.

Gut microbiome profiling core

Currently, the diagnosis and treatment of many chronic diseases involve invasive procedures and medications with serious side effects. The development of the gut microbiome profiling core allows researchers to rapidly analyze patient samples to identify if key good bacteria are missing, if bad bacteria are too numerous and what the bacteria are doing and releasing. This is a significant step towards being able to study the gut microbiome to find better and safer ways to predict and prevent these diseases.

A microbiome culturing and imaging suite

The specialized bacterial culture facility grows bacteria under zero-oxygen conditions to mimic the inside of our intestines. This facility is essential because it will allow doctors to replace any missing good bacteria in the intestine or grow bad bacteria in the lab to test how they interact with human cells, as well as develop precision approaches to remove them from the intestines. This facility is helping to drive microbiome research that develops and tests new treatments that one day may lead to a cure for many diseases.

Anaerobic chamber which allows researchers to grow bacteria under zero-oxygen conditions to mimic the inside of our intestines.

Lyophilizer, which is used to remove water from samples so it can be used in various procedures.

RESEARCH PROJECTS

Mining for Miracles' generous support in establishing core Gut4Health facilities has allowed the program to leverage this initial investment to secure additional funding that is enabling innovative research and collaboration into a variety of different diseases and conditions.

C. difficile Infection

C. difficile is the leading cause of hospital-acquired infections in Canada, and can lead to debilitating or even fatal gut inflammation and diarrhea. The Gut4Health team, in collaboration with Dr. Ted Steiner, infectious disease researcher at BC Children's are exploring the benefits of fecal microbial transplantation (FMT), also known as "stool transplant", to control these recurrent infections. Dr. Steiner is currently conducting clinical trials in adults, and the Gut4Health team are exploring how to assist him in developing FMT protocols for the pediatric population. The Gut4Health team will help select research participants for FMT in the pediatric population, and provide the equipment, as well as other support for creating stool transplants on site.

Epilepsy

The ketogenic diet, a high-fat, low carbohydrate diet has been shown to help control seizures in some children with epilepsy but the underlying reason remains unclear. The Gut4Health team is looking at the role of the gut microbiome to understand why the ketogenic diet helps children with epilepsy and whether or not adding fibre, making it a much healthier diet, will still help control seizures.

Short Bowel Syndrome

The Gut4Health team is supporting Dr. Hannah Piper, general surgeon at BC Children's with research on short bowel syndrome, a condition in which the body is unable to absorb enough nutrients from food due to surgical removal of sections of the small intestine. Dr. Piper is interested in determining how changes to the microbiome impact the growth and metabolism of children with short bowel syndrome. Ultimately, she is searching for treatments to restore a healthy balance of gut bacteria to improve a child's intestinal function, overall nutrition and growth. She is also interested in determining how changes to the gut bacteria impact a child's immune system and overall level of inflammation, potentially predisposing them to infection, liver disease, and blood clots. The Gut4Health team is assisting Dr. Piper with stool collection, DNA extraction and microbiome and metabolomics analysis.

COVID-19

The SARS-CoV-2 virus, which causes COVID-19 disease, is transmitted from person-to-person via sneezing and coughing. However, some research suggests that the SARS-CoV-2 virus may also be transmitted in feces. Studies have shown that a large number of COVID-19 patients experience gastrointestinal (GI) symptoms such as nausea, vomiting, diarrhea and a loss of appetite. This implies that the virus may be able to infect the GI tract as well as the lungs. It has been demonstrated that the gut microbiome plays a key role in controlling the susceptibility and severity of other viral respiratory and GI infections however, to date little is known about the effect the gut microbiome has on SARS-CoV-2 infection.

Members of the Gut4Health team in collaboration with BC Children's researchers have received funding to undertake a study to characterize the gut microbiome of COVID-19 patients. Working with hospitals showing high COVID-19 admissions in Vancouver, Delta and Seattle, fecal samples will be collected from patients during their admission as well as two weeks after they are discharged home. Changes in the gut microbiome will be tracked over time to determine whether a distinctive gut microbiome profile is evident in COVID-19 patients. Researchers also plan to demonstrate whether the SARS-CoV-2 virus is present in fecal samples after discharge. If present, this may suggest that the virus is still able to infect the GI tract even after the respiratory infection has cleared.

A greater understanding of the impact the gut microbiome is having on a child's susceptibility to COVID-19 disease, as well as the severity of the infection, and time to recover may lead to the development and use of innovative microbiome-targeted treatments to help control and manage SARS-CoV-2 infections. It also may give researchers insight into why children are less susceptible, get less severe symptoms and any future spread of the virus among children.

MEET THE GUT4HEALTH TEAM

Thank you for providing this team of experts with the ability to aim higher for children in BC and around the world.

DR. BRUCE VALLANCE, PH.D.
Lead, Gut4Health

Dr. Bruce Vallance is the director of Gut4Health. Dr. Vallance completed his Ph.D. training in gastrointestinal inflammation at McMaster University in Hamilton, Ontario, and then moved to Vancouver in 1999 to pursue his postdoctoral studies on disease-causing bacteria. Dr. Vallance was recruited to the University of British Columbia and BC Children's Hospital as assistant professor in 2003. He has won numerous awards and currently holds the CHILD Foundation Chair in Pediatric Gastroenterology. Dr. Vallance's research focuses on microbe-host interactions within the intestine, including defining the role that gut microbes play in causing chronic intestinal inflammation, as seen in inflammatory bowel disease patients. Dr. Vallance is responsible for overseeing Gut4Health and fulfilling its mandate to become a key resource for microbiome researchers throughout BC.

"Gut4Health is already making a difference in children's health. As the first microbiome profiling core in British Columbia, Gut4Health is supporting a number of clinicians and researchers to identify how gut bacteria control susceptibility to autoimmune, neurological and infectious diseases. Through the generous support of Mining for Miracles, we are on track to ensure that the children of British Columbia are the first to benefit from new microbiome-based tests and therapies for these conditions."

DR. ANDY SHAM, PH.D.
Project Manager

Dr. Andy Sham is the project manager for Gut4Health. Dr. Sham grew up in Vancouver, where he attended the University of British Columbia. He continued his research training as a postdoctoral research fellow at Harvard Medical School where he studied how small molecules resolve inflammation in the lungs. After returning to Vancouver from Boston, he worked as a research scientist with a local biotech company where he led their research team in developing new drugs for the treatment of inflammatory bowel disease. Dr. Sham is responsible for developing projects as well as the general operations for the Gut4Health core.

“It has been a tremendously rewarding experience to help set up Gut4Health. The generous support from Mining for Miracles has allowed us to help both clinicians and scientists to look at the impact of the microbiome in their research. Within a short amount of time, we are already working with clinicians from various research groups from cancer, short bowel syndrome, epilepsy to infection such as C. difficile and even COVID-19. We will continue to work towards supporting microbiome research in the pediatric community.“

DR. CATHERINE CHAN, PH.D.
Technician

Dr. Cathy Chan is the senior lab technician for Gut4Health. She obtained her Ph.D. from the University of Calgary and continued her post-doctoral research at the University of British Columbia. After an extended maternity leave, she joined a biotech company developing novel antibody-based therapeutics to combat animal gastrointestinal diseases. Her expertise in biochemistry and microbial systems is a valuable addition to the continued development of Gut4Health.

"The funding from Mining for Miracles enabled the birth of Gut4Health, allowing researchers to conduct valuable work towards understanding gastrointestinal diseases in children. I am very fortunate to be one of the members of Gut4Health and hope that my research will benefit all those affected by inflammatory bowel diseases."

DR. ALANA SCHICK, PH.D., M.SC.
Bioinformatician

Dr. Alana Schick came to Vancouver from the University of Calgary where she worked as a bioinformatician for the International Microbiome Centre. Previously she had obtained her Ph.D. from the University of Ottawa on the genomics of diversification in microbial populations and her M.Sc. from the University of British Columbia on evolutionary dynamics in E. coli. Using a wide range of computational platforms, she is adept at working with next generation sequence data and metabolomic datasets. Dr. Schick brings expertise in evolutionary modelling to interpreting sequence data and experience in microbiology as well as design and execution of microbial evolution experiments.

"The generous support of Mining for Miracles enables Gut4Health to push the envelope of microbiome-mediated disease research. As a researcher with the Gut4Health team, I am thrilled with the prospect that our work could lead to improved patient care and better lives for children and their families."

LARISSA CELIBERTO, PH.D., M.SC.
Microbiome Research

Dr. Larissa Celiberto is a microbiome researcher for Gut4Health. Originally from Brazil, Dr. Celiberto moved to Vancouver in 2016 to pursue her Ph.D. in Experimental Medicine at the University of British Columbia in collaboration with the Sao Paulo State University. Her background includes a B.Sc. in Nutrition and a M.Sc. in Food and Nutrition. As a consultant for the Gut4Health team, Dr. Celiberto is involved in equipment purchases, microbiome analysis training and support as well as experiments and clinical trials with dietary compounds and probiotic bacteria.

“Gut4Health is truly revolutionizing our approach to health and wellness as each day we discover new mechanisms by which bacteria in the human gut can influence diseases. We are very glad to have the support from Mining for Miracles for such an important initiative that will provide new therapies for several kids thus promoting a better quality of life for the whole family."

GENELLE HEALEY, PH.D.
Microbiome Scientist

Dr. Genelle Healey is a microbiome scientist for Gut4Health. Dr. Healey undertook her Ph.D. in Nutritional Science at Massey University in New Zealand. Prior to commencing her Ph.D., she worked as a registered clinical dietitian for four years primarily caring for patients with renal or gastrointestinal disease, as well as patients pre- and post-surgery – which provided her with valuable clinical experience. In 2017, Dr. Healey moved to Vancouver to pursue a postdoctoral research fellowship with Drs. Bruce Vallance and Kevan Jacobson at the University of British Columbia.

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"The very generous support Mining for Miracles provided to BC Children's Hospital to establish Gut4Health, a state-of-the-art microbiome profiling CORE, allows researchers, such as myself, to undertake novel microbiome specific studies which have the potential to help prevent certain diseases as well as manage and treat children with various inflammatory conditions."

TRAVIS DE WOLFE, PH.D.
Microbiome Research

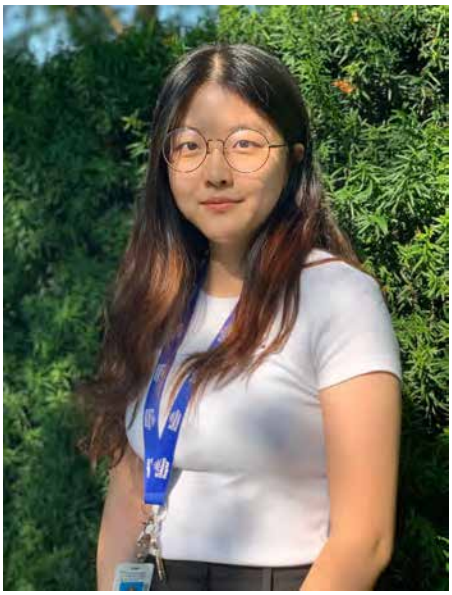
Dr. Travis De Wolfe is a Michael Smith Foundation for Health Research funded postdoctoral fellow with the Department of Pediatrics at the University of British Columbia and BC Children's Hospital. His research interests include inflammatory bowel diseases, C-difficile infection, host-microbe interactions, and ecology of the gut microbiome.
Dr. De Wolfe completed his Ph.D. in the Department of Food Science at the University of Wisconsin - Madison where he studied the impact of probiotics on the gut microbe in C. difficile infection. After graduating, he was awarded a National Institutes of Health Postdoctoral Traineeship through the Department of Biomedical Informatics. With his expertise, Dr. De Wolfe provides laboratory and computational support for projects of the Gut4Health team.

"As a member of Gut4Health, I am incredibly thankful to Mining for Miracles. With their support I have the opportunity to be at the forefront of microbiome research and am honored to play a role in the translation of pediatric microbiome research to the clinic."

SOOMIN LEE
Research Assistant

Ms. Soomin Lee is a co-op student at the Gut4Health Microbiome Core facility. Soomin is an undergraduate student at the University of British Columbia studying microbiology and immunology. She is currently assisting with various research projects related to nutrition and its relationship with the human gut microbiome.

"With the establishment of Gut4Health, we are now able to undertake microbiome specific studies to provide new therapies for children here in BC. This was all made possible with the generous support from Mining for Miracles, and I am thankful for the opportunities given to us."



LOOKING AHEAD

Thanks to Mining for Miracles' support in establishing the Gut4Health program, the Research Institute can now focus on continuing to conduct innovative research projects in collaboration with doctors across the province that will change the face of medicine.

"The possible uses of these state-of-the-art facilities are endless. We rely on the ingenuity of the excellent clinicians and researchers at BC Children's. We are excited to see what the future holds."

—Dr. Vallance

LANDON'S STORY

While first-time parents, Kendra and Cornelis Krol, were at their 20-week ultrasound, they received shocking news. Their son, they were told, would be born with a rare birth defect called gastroschisis—which occurs when the intestine is pushed outside of the body due to a hole in the abdomen.

Kendra was closely monitored for the rest of her pregnancy. When she was 32 weeks, the parents left their home in Agassiz to move to Vancouver. A week later—on April 24 of 2020—Landon was born via emergency cesarian section.

The day after Landon was born, doctors at BC Children's Hospital performed a complex procedure to put his organs back in place, the first of several surgeries.

"It was so hard to see Landon, who was so small, being wheeled away," Kendra said. "Waiting through the five-hour surgery was one of the hardest times of my life."

Although the surgery went well, that was just the beginning of Landon's journey at BC Children's. In addition to gastroschisis, Landon was also diagnosed with enterocolitis, a serious disease that is thought to reflect damage caused by the wrong types of bacteria entering a newborn's intestine.

After his surgery, Landon's intestines were placed in a "silo," a sterile bag that uses gravity to gently push them back into the abdomen. Over the next few months, experts at BC Children's performed three additional surgeries on Landon to treat his complex health challenges.

As Landon's body recovered after each surgery, he wasn't able to be fed by mouth. To give his intestines time to heal, his care team placed a feeding device in him known as a gastrostomy tube. Landon also received antibiotics and nutrients through an IV tube. While these procedures helped Landon heal, new research has suggested that there is room to improve these treatments, since antibiotics and IV feeding can change a child's gut microbes and potentially cause problems over the long term.

After five months in the hospital, Kendra and Cornelis were finally able to bring their son home. However, Landon will continue to be closely followed by a team of health care experts at BC Children's. This will include researchers at Gut4Health, who will study his gut bacteria as he grows older.

Depending on his overall health and development, probiotic bacteria or special diets may be provided to help Landon maintain his intestinal health. Studying how Landon's intestines and bacteria develop over time will help Landon, as well as future children and their families who suffer this serious, but fortunately rare condition.

While the experience has been challenging for Kendra and Cornelis, they are incredibly thankful for the health care providers who have made BC Children's feel like a second home, for the researchers who have devoted their lives to improving outcomes for kids like Landon, and for the incredible generosity of donors who help make all of this work possible.

"We are deeply grateful for everyone at BC Children's Hospital who worked so hard to save Landon and give him the best life possible."

Thank you Mining for Miracles, for helping kids like Landon.

THANK YOU MINING FOR MIRACLES

Thank you Mining for Miracles, for your unwavering commitment to the health and well being of BC's kids. Your support helps to provide the best care, transformative therapies, groundbreaking discoveries, and new hope to children and their families. Through your support of Gut4Health and the countless other initiatives you have provided early funding for, BC Children's is able to leverage additional funding to further amplify your impact. You are helping to change the lives of children across the province and around the world.

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