

ANNUAL REPORT

Meeting the
Cancer Challenge

2019



**Arnie Charbonneau
Cancer Institute**

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MESSAGE FROM THE DIRECTOR AND THE DEPUTY DIRECTOR

Dear Friends,

This past year has been exciting for cancer research in Calgary. We've had some very important successes, many of which you will read about in this annual report. Notably, our collective success at tri-council grants and the number of papers we publish continue to grow. We've placed a greater emphasis on the trainee experience this year, and we are beginning to become more well known in the community, through outreach events, like our public lectures. Moreover, many of our scientists were recognized with prestigious awards this year. We are thrilled for them and their accomplishments.

This past year we began working with senior leaders at Alberta Health Services and the University of Calgary to strengthen the institutions' collaboration in cancer research. Through a newly strengthened partnership, we anticipate greater opportunities for cancer research in Calgary—more to come in the new year! We are also excited to welcome back our External Advisory Board in Fall 2020, when they will review our progress in addressing the recommendations they made in 2017 and 2018.

We are excited to see what 2020 has in store. The future is bright for cancer research and we have much to look forward to.

Sincerely,



J. Gregory Cairncross, MD
Director, Charbonneau Cancer Institute
Professor, Clinical Neurosciences,
University of Calgary



Jennifer A. Chan, MD
Deputy Director, Charbonneau Cancer Institute
Associate Professor, Pathology & Laboratory
Medicine, University of Calgary



Left to Right: Deputy Director, Dr. Jennifer Chan
and Director, Dr. Gregory Cairncross

THEME 1: IMPROVING TREATMENT FOR CANCER

Discovering How to Stop Lung Inflammation Due to Sepsis Can Shed Light on How to Prevent Cancer From Metastasizing

Recruitment of neutrophils, a type of immune cell, to the lungs during infection can lead to death. However, it was unknown what causes these cells to migrate to the lungs and accumulate there. An understanding of this key mechanism may also inform how cancer metastasizes (spreads) to the lungs and elsewhere in the body.

Drs. Donna Senger and Steve Robbins, with then graduate student Saurav Choudhury and other lead scientists Drs. Liane Babes and Bo Young Ahn, discovered that a protein called dipeptidase 1 is a vascular adhesion molecule in lungs and liver, meaning it attracts and binds immune cells. They found that targeting dipeptidase 1 can reduce death from sepsis in a murine model. The published study in *Cell* (Choudhury et al., 2019, *Cell* 178, 1205–21) was a collaborative effort with a number of investigators at the University of Calgary. Drs. Senger and Robbins have patented the molecule and a Phase I trial in humans is now underway.

Dr. Senger is a Research Associate Professor with the Department of Oncology at the University of Calgary. Dr. Robbins is a Professor with the Departments of Oncology and Biochemistry & Molecular Biology. He is also the Director of the CIHR Institute of Cancer Research. Both are founding members of the Clark Smith Brain Tumour Centre.





Left to Right: Dr. Steve Robbins, Dr. Donna Senger, Dr. Bo Young Ahn

Photo: Kelly Johnston, Cumming School of Medicine



Above: Dr. Ralf Paschke

Photo: Colin Way Photography, Inc.

THEME 1: IMPROVING TREATMENT FOR CANCER

New care pathway to distinguish benign from malignant thyroid nodules can improve quality of life for patients

Over-diagnosis and over-treatment of cancer of the thyroid is a problem, not just in Canada, but elsewhere in the world. It not only places strain on the health system, it can also lead to poor quality of life for patients. Dr. Ralf Paschke, a Professor with the Department of Medicine, along with colleagues from other key disciplines, has developed a care pathway to reduce over-diagnosis and over-treatment of thyroid cancer.

The *Thyroid Nodule and Thyroid Cancer Clinical Pathway* begins with a clinical guideline-based thyroid nodule risk assessment which can rule out 50% of nodules as benign. Suspicious nodules, based on ultrasound, undergo an aspiration biopsy to rule out benign from malignant tumours. However, the biopsy will be indeterminate in 20% of tumours, which will require patients to undergo a diagnostic surgery for definitive diagnosis.

To address this gap, Dr. Paschke and Dr. Markus Eszlinger developed a molecular test to determine the risk of malignancy, using tissue from the biopsy. The test is designed to provide better information to physicians and patients and improve decision making.

The clinical care pathway can reduce the number of diagnostic surgeries, resulting in fewer complications from surgery and improved quality of life for patients.

THEME 1: IMPROVING TREATMENT FOR CANCER

Finding new purpose in an old drug: a targeted treatment for triple negative breast cancer

Breast cancer is classified and treated based on expression of ER/PR and HER2—targeted treatments are available for these receptors. For the 15 to 20% of individuals who do not express receptors, triple-negative breast cancers (TNBC), there are limited targeted treatments available and cytotoxic chemotherapy is associated with minimal efficacy.

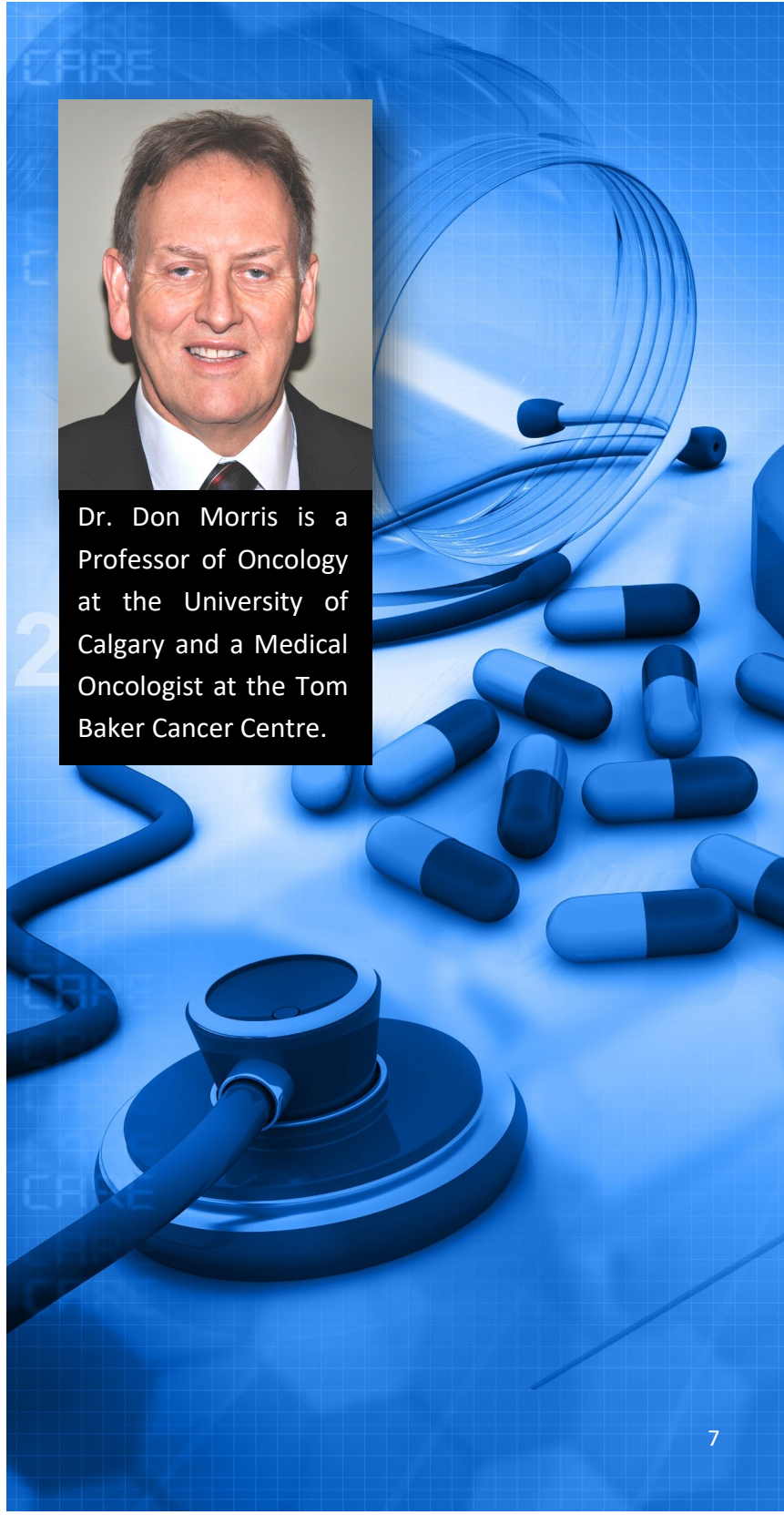
Temozolomide (TMZ) is a cancer drug that is most effective in tumours in which an enzyme called MGMT has been turned off. MGMT can repair damage to tumour DNA caused by TMZ, so when MGMT is turned off, TMZ can promote tumour cell death. In about half of patients with triple negative breast cancer, MGMT is turned off, suggesting that TMZ could work in these tumours.

Dr. Don Morris and colleagues are conducting a phase II trial in which they will give TMZ, along with another drug that prevents the repair of tumour DNA, to patients with triple negative breast cancer. They will evaluate the patients' tumours for additional biomarkers that could predict which patients will receive the greatest benefit.

The study has been funded by an operating grant from the Canadian Institutes of Health Research.



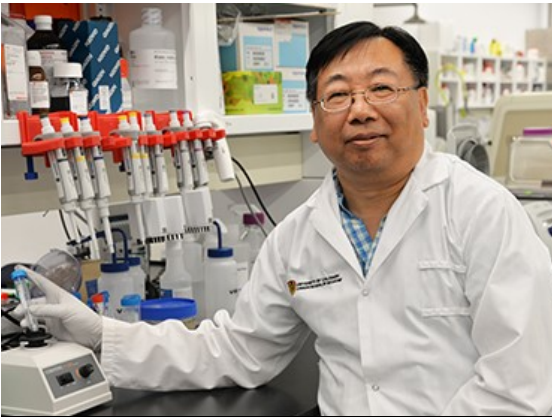
Dr. Don Morris is a Professor of Oncology at the University of Calgary and a Medical Oncologist at the Tom Baker Cancer Centre.



THEME 1: IMPROVING TREATMENT FOR CANCER

Targeting Natural Killer Cells to Improve Response to Immune Checkpoint Therapy

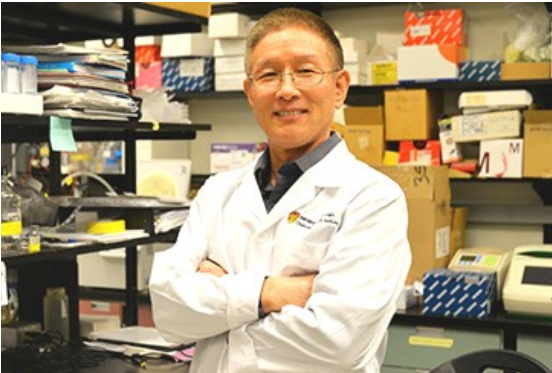
Does heredity play a role in cancer development? If so, is the immune system involved? Dr. Edwin Wang and colleagues showed that individuals with inherited defects in a type of immune cell, called natural killer cells, have a higher risk of developing cancer and that these inherited defects in natural killer cell genes can decrease the response to immune checkpoint cancer therapy. The findings of this work, published in *JAMA Network Open*, have implications for both detecting and treating cancers with germline variants of natural killer cells. By manipulating natural killer cells, it may be possible to improve immune checkpoint therapy response.



Dr. Edwin Wang is a Professor with the Department of Biochemistry & Molecular Biology at the University of Calgary. He is also the AIHS Chair in Genomics/Informatics.

New Biomarkers Could Serve As Future Targets for Acute Lymphoblastic Leukemia

Acute lymphoblastic leukemia (ALL) is a fast-growing cancer of white blood cells, affecting the bone marrow of patients. It is the most common childhood cancer but fortunately, due to research, the five-year survival for children is 85%. Dr. Lee and his team have identified two novel biomarkers called huntingtin-associated protein-1 (HAP1) and opioid receptor mu 1 (OPRM1) that, when under-expressed, can impair the ability of cells to undergo programmed cell death. These biomarkers could represent future therapeutic targets for individuals with ALL. He and his team plan to use these findings to develop a tool to predict resistance to treatment.



Dr. Ki-Young Lee is a Professor of Cell Biology and Anatomy in the Cumming School of Medicine at the University of Calgary.

THEME 1: IMPROVING TREATMENT FOR CANCER

Immunosuppressive Drug Discovered to Also be an Antileukemic Drug

Hematopoietic cell transplantation, also called blood stem cell transplantation or bone marrow trans-plantation, has been used for treatment of blood cancers, like leukemia, for over 40 years. An important side effect of this treatment is graft-vs-host disease, in which immune cells given with the donor graft attack the body of the recipient. To mitigate this side effect, patients receive antithymocyte globulin (ATG), an immunosuppressive mixture of antibodies against immune cells.

Dr. Jan Storek and Dr. Faisal Khan and their team explored whether ATG might also have antileukemic effects, based on observations they had made in cells. They tested this hypothesis and showed that ATG also has an antileukemic effect in patients. Specifically, they found that high blood levels of ATG are associated with a low likelihood of the leukemia relapsing (recurring) after transplantation.

Given this promising finding, the team is currently working towards a clinical trial to determine if higher than usual doses of ATG will result in fewer relapses after transplantation, and thus improved survival. The trial has been funded by the Alberta Cancer Foundation and by the manufacturer of antithymocyte globulin (ATG).

Drs. Khan and Storek are both part of the Childhood Cancer Research Program at the Charbonneau Cancer Institute.



Dr. Jan Storek is a Professor with the Departments of Medicine, Oncology, and Microbiology, Immunology, and Infectious Diseases at the University of Calgary .



Dr. Faisal Khan is an Associate Professor with the Departments of Pathology & Laboratory Medicine and Pediatrics at the University of Calgary. He is also the Barb Ibbotson Alberta Children's Hospital Foundation Chair of Pediatric Hematology.

Photo of Dr. Khan: Bryce Meyer



Left to Right: Dr. Christine Friedenreich and Dr. Darren Brenner

Photo: Kelly Johnston, Cumming School of Medicine

THEME 2: DECREASING CANCER IN THE POPULATION

Excess Weight Among the Five Leading Preventable Causes of Cancer

In a nationwide study aimed at identifying and quantifying the top preventable causes of cancer, Dr. Darren Brenner and Dr. Christine Friedenreich found that almost 40% of cancers can be prevented. The Canadian Population Attributable Risk of Cancer (CompARE) study, funded by the Canadian Cancer Society, also showed that by 2042, the rate of preventable cancers is set to rise to 60%, underscoring the need to address the five leading preventable causes of cancer: smoking tobacco, physical inactivity, excess weight, low fruit consumption, and sun exposure. More information about the CompARE Study, including interactive dashboards to explore data on different types, risk factors, age and sex, and geography, can be found at <https://prevent.cancer.ca>.

Dr. Friedenreich is an Adjunct Professor with the Departments of Oncology and Community Health Sciences at the University of Calgary and Scientific Director of the Department of Cancer Epidemiology and Prevention at Alberta Health Services. She is also the Chair of the Scientific Council of the International Agency for Research on Cancer and was named a 2019 Royal Society of Canada Fellow.

Dr. Brenner is an Assistant Professor with the Departments of Oncology and Community Health Sciences, an Armstrong Investigator in Molecular Epidemiology, and a member of the Robson DNA Science Centre. In 2019, he was awarded the William Rawls Prize by the Canadian Cancer Society for his work to quantify the preventable burden of cancer.

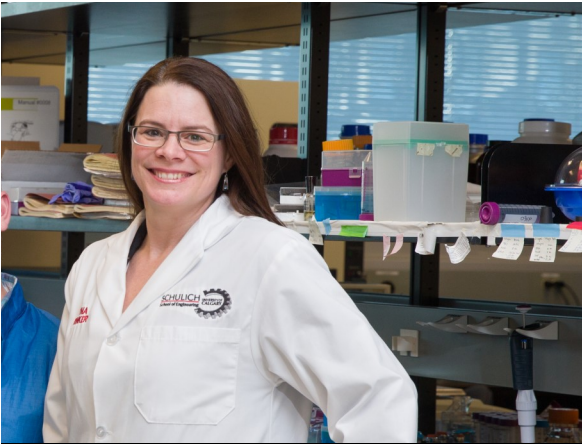


THEME 2: DECREASING CANCER IN THE POPULATION

Early Cancer Detection Holds Promise as a Cancer Control Strategy

Dr. Kristina Rinker is a Co-Founder of Syantra, Inc., a spin-off company from the University of Calgary that is focused on commercializing its blood-based test for rapid breast cancer diagnosis. The firm is currently validating the test's accuracy using blood samples from women in Calgary, Oklahoma City, Manchester UK, and Seoul, South Korea. Syantra, Inc. is funded in part by Alberta Cancer Foundation and Alberta Innovates.

Earlier in 2019, Dr. Rinker was awarded a Parex Resources Innovation Fellowship, which is given to leaders and researchers who are incubating excellent, innovative ideas.



Dr. Kristina Rinker is a Professor with the Departments of Chemical and Petroleum Engineering, Schulich School of Engineering, and Physiology & Pharmacology, Cumming School of Medicine, at the University of Calgary.



Dr. Oliver Bathe is a surgeon with a special interest in cancers of the gastrointestinal tract and a Professor with the Departments of Surgery and Oncology, Cumming School of Medicine, at the University of Calgary.

Dr. Oliver Bathe is the CEO and Founder of a start-up firm focused on reducing overtreatment of cancer through more precise diagnosis. Qualisure Diagnostics Inc. creates tests to guide physicians and patients toward more precise treatment decisions and achieve better cancer outcomes.

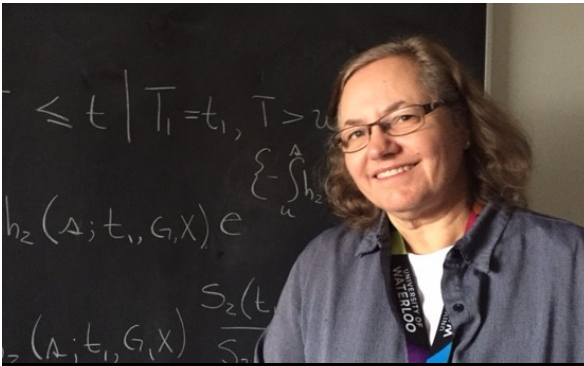
One of the company's tests, Thyroid GuidePx™ categorizes patients according to the risk of recurrence, enabling the care team to create a treatment plan aligned with the patient's own genomic information, rather than on general guidelines. An individualized approach can reduce the magnitude of treatment for up to 85% of patients with thyroid cancer. Dr. Bathe and his team placed 3rd in the 2019 TENET i2c competition and received funding from Alberta Innovates to accelerate Qualisure's momentum.

THEME 2: DECREASING CANCER IN THE POPULATION

HPV Test Can Reduce Invasive Procedures

Despite adequate treatment, up to 25% of women with treated precancerous cervical lesions will have a recurrence. As part of current follow-up, they receive an additional exam, called colposcopy. However, colposcopy is not only invasive and costly, it is not necessary in women at low risk of recurrence. The human papilloma virus (HPV) test can distinguish women at low risk, who do not need this exam.

A study led by Dr. Karen Kopciuk examined the impact of HPV co-testing after treatment. The Alberta Health Services Cancer SCN-funded study, which used micro-simulation, found no worse outcomes or missed incident cancer with HPV co-testing, indicating that low risk women can safely avoid routine colposcopy. The study has enabled the creation of a new cervical treatment care pathway.



Dr. Karen Kopciuk is an Adjunct Associate Professor with the Departments of Oncology, Mathematics & Statistics, and Community Health Sciences at the University of Calgary and a Scientist with the Department of Cancer Epidemiology & Prevention, at Alberta Health Services.



Dr. Miranda Fidler-Benaoudia is an Adjunct Assistant Professor with the Department of Oncology at the University of Calgary and a Scientist with the Department of Cancer Epidemiology & Prevention, at Alberta Health Services.

Improving Cancer Survivorship in Adolescents and Young People

The rate of cancer is increasing, especially among young adults aged 15-39 years, but fortunately survival rates are high. However, survivors must deal with long term effects, such as chronic health conditions, infertility, poor quality of life, and fatigue, among others. Dr. Miranda Fidler-Benaoudia received from the Canadian Institutes of Health Research an Early Career Investigator Award to study the impact of a cancer diagnosis as a young adult on subsequent fertility and chance of pregnancy. She is also interested in determining whether prior cancer treatments increase the risk of complications during pregnancy for both mother and child.



Left to Right: Dr. Fintan Stanley and Dr. Aaron Goodarzi

Photo: Weston Jacques, Evict Radon

THEME 2: DECREASING CANCER IN THE POPULATION

From Understanding the Effects of Radon on DNA to Detecting and Removing it from Homes

The Governor General's Academic Gold Medal was awarded to Dr. Fintan Stanley at the University of Calgary's Fall 2019 Convocation. Dr. Stanley completed his PhD in 2018 under the supervision of Dr. Aaron Goodarzi, Canada Research Chair for Radiation Exposure Disease. Dr. Stanley's PhD focused on radon gas and its impacts on DNA damage and repair and, ultimately, cancer.

Dr. Stanley's work is driving an important legislative change in Alberta, namely Bill 209—the *Radon Awareness and Testing Act*. This bill, once proclaimed, will require that child care facilities be tested for radon before a child care license can be issued or renewed and that the Ministry of Health develops educational materials explaining the health risks associated with radon exposure for the public, and purchasers in residential real estate transactions.

Dr. Stanley and his work have also helped establish Evict Radon (<https://evictradon.org>), a non-profit organization dedicated to solving Canada's substantial and worsening problem of radon gas exposure through multi-disciplinary research.

Dr. Stanley is a Cancer Information Analyst at the cancer non-profit, Macmillan Cancer Support in London, UK.

Dr. Aaron Goodarzi is an Assistant Professor in the Departments of Biochemistry and Molecular Biology and Oncology. He is also the Education Lead for the Arnie Charbonneau Cancer Institute and a founding member of the Robson DNA Science Centre.


“Dr. Stanley's
doctoral thesis
work has
revolutionized
radon gas
awareness,
research,
legislation,
and policy in
Canada”

- Dr. Aaron Goodarzi

THEME 3: IMPROVING THE PATIENT EXPERIENCE

Mindfulness can be an Effective Way to Improve Cancer Recovery


Dr. Linda Carlson, Director of Research and a Clinical Psychologist at the Tom Baker Cancer Centre Department of Psychosocial Resources, was named the Bernard Fox Memorial Award recipient by the International Psycho-Oncology Society. The award honours a psycho-oncology community member who has made an outstanding contribution in the area of psychosocial oncology education or research. Dr. Carlson has published over 200 research papers and book chapters and two books, holds several million dollars in grant funding, and is regularly invited to present her work internationally.



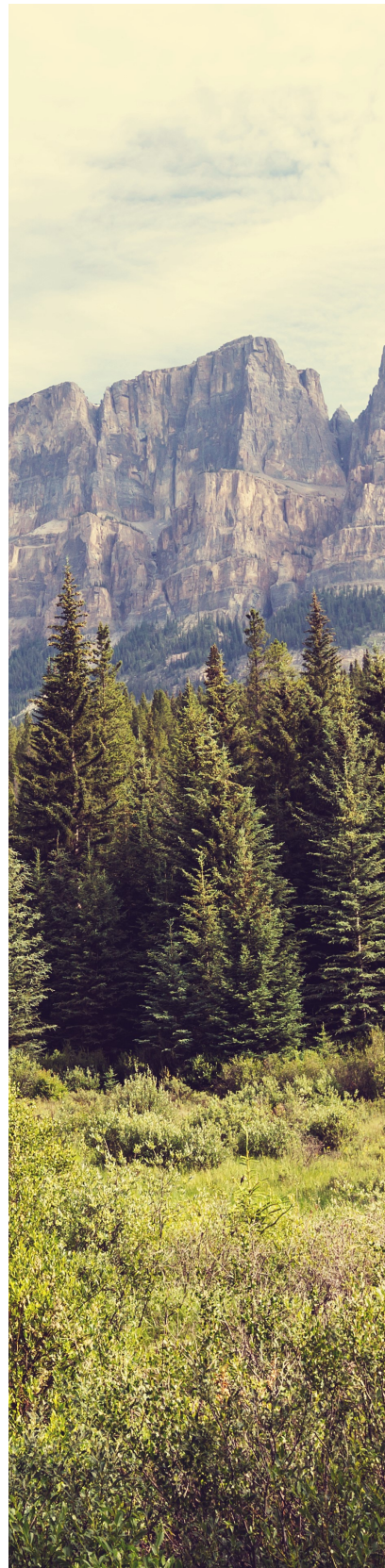
Dr. Linda Carlson is the Enbridge Research Chair in Psychosocial Oncology and a Professor in the Department of Oncology,

Exercise can Improve the Recovery and Wellbeing of Cancer Survivors

Dr. Nicole Culos-Reed, Director of the Health and Wellness Lab/Thrive Centre, was awarded the Canadian Association of Psycho-social Oncology Award for Research Excellence. The award includes support from the CIHR Institute of Cancer Research and recognizes a significant contribution to Psychosocial Oncology research. Her research examines the role of exercise in improving survivors' quality of life. She co-leads the Alberta Cancer Exercise (ACE) program, a provincial initiative to implement exercise in a clinic-to-community model for cancer survivors. With over 1,700 participants to date, the program is building evidence for this new standard of cancer care.



Dr. Nicole Culos-Reed is a Professor of Health and Exercise Psychology and is the Associate Dean Graduate in the Faculty of Kinesiology at the University of Calgary.



THEME 3: IMPROVING THE PATIENT EXPERIENCE

World Congress in Psychosocial Oncology

The Division of Psychosocial Oncology at the University of Calgary partnered with the Canadian Association of Psychosocial Oncology and the International Psycho-Oncology Society to host the 21st World Congress in Psychosocial Oncology in Banff, Alberta.

The meeting was chaired by Dr. Fiona Schulte, Assistant Professor in the Department of Oncology and psychologist in the Hematology, Oncology and Bone Marrow Transplant program at the Alberta Children's Hospital. Drs. Barry Bultz and Linda Carlson were both members of the Conference Steering Committee, and Dr. Carlson chaired the Scientific Program Committee.

Themed, *A Global Call to Action: Implementing Psychosocial Oncology Research for Optimal Cancer Care*, the Congress focused on ways to move evidence-based research into standard care and share research at a global level. The conference program included lectures with themes ranging from patient engagement in cancer research and care to implementation for improved pediatric health research, including a focus on cancer care in indigenous people.

A significant accomplishment of the meeting is that it was, for the first time ever, 'Patients Included', meaning that there was a commitment to incorporate the experience of patients as experts living with cancer, while ensuring that they were neither excluded nor exploited.

The meeting was sponsored, in part, by the CIHR Institute of Cancer Research and Kids Cancer Care Foundation, who provided scholarships to five patient and family members to attend the conference. Over 600 delegates, representing almost 60 countries and each continent, attended the 21st World Congress.



Dr. Fiona Schulte is an Assistant Professor in the Division of Psychosocial Oncology at the University of Calgary.

Banff National Park, Alberta

THEME 3: IMPROVING THE PATIENT EXPERIENCE

Research Team Recognized for Improving Access to Palliative Care for Patients

The Palliative Care Early & Systematic (PaCES) team received the Department of Oncology's Team Award for Innovation in recognition of their creation and implementation of the new clinical practice guideline and pathway, *Integrating an Early Palliative Approach into Advanced Colorectal Cancer Care*. Supported by grants from Alberta Health and the Canadian Institutes of Health Research, the guideline and pathway provide a new standard of care for screening, identifying, and managing unmet needs of patients and their families/caregivers who may benefit from early palliative care. The pathway has now been rolled out in all nine gastrointestinal oncology clinics in Calgary.



The PaCES Team, including Division of Palliative Medicine Faculty, Drs. Aynharan Sinnarajah and Jessica Simon (pictured centre).





Rural Southern Alberta



Dr. Winson Cheung is a Professor of Oncology, University of Calgary, and Director, Health Services Research at CancerControl Alberta.

DRIVING CARE VIA REAL-WORLD EVIDENCE

Reducing Disparities for Vulnerable Populations

Cancer treatment has improved significantly over the past 20 years, such that the average 5-year survival of all patients has reached a remarkable 65%. Despite this important achievement, there are still significant challenges to the delivery of modern, safe, and effective cancer care that is accessible to all. Several vulnerable populations, including rural patients and those with low socioeconomic status or race-related disparities, experience significantly worse access to care.

Supported by a gift from an anonymous donor, Dr. Winson Cheung and his team are working to address disparities in access to cancer care for vulnerable patient groups by focusing on patients

with cancer who live in a rural location (geographically located far from the treatment centre) and those who have a low socioeconomic status or experience race-related disparities, including indigenous populations. In these important subgroups, he and his team are using a mixed methods approach to identify factors that reduce access to care, along with potential strategies to address these factors.

Initial data show disparities in the treatment and outcomes for specific cancers based on rurality and Indigenous status whereby rural (vs. urban) patients and Indigenous (vs. non Indigenous) patients were more likely to wait longer for particular treatments and experience slightly worse overall survival. While these disparities are notable, the other noteworthy feature is that the disparities in treatment patterns and outcomes in Alberta were less pronounced when compared to disparities observed outside of Canada that have been consistently observed based on race and/or immigrant status.

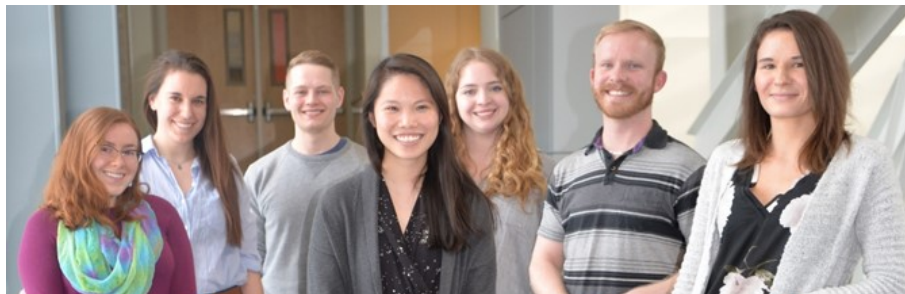
These data will be used to identify potential strategies to improve access to care for these patients and translate findings into new recommendations and policies. In addition to addressing an important care gap for vulnerable cancer populations, this work will enhance capacity for health services research by expanding opportunities for training young scientists and creating capacity for data access and computation.



Charbonneau Trainee Association at Late Night Lab on May 31, 2019

Late Night Lab at Studio Bell Saw a High Turnout for First Two Lectures

In an effort to educate the public about some of the cancer research being done in our city, and to enhance the visibility of our scientists, the Charbonneau Trainee Association launched a new public lecture series, "Late Night Lab at Studio Bell". The first lecture of the series was titled, *Cancer 101: Causes to Cures*, and was held on May 31 with the second lecture, titled *Cancer in Young People*, on October 4. The two events featured talks by some of Calgary's top cancer researchers, including Drs. Darren Brenner, Paola Neri, and Douglas Mahoney for the first lecture, and Drs. Miranda Fidler-Benaoudia, Michael Monument, and Fiona Schulte for the second lecture, and were chaired by Dr. Jennifer Chan. The events included live science demonstrations by our trainees to showcase a few of the techniques we use to study cancer in the lab. The demonstrations covered the topics of bioluminescence, exercise and cancer, DNA extraction and purification, protection from ultraviolet radiation, radon and cancer, and psychosocial oncology. Between both of the events, over 400 people were in attendance and feedback has been very positive. Videos of both lectures are available on the Institute's YouTube channel. The next lecture will be held in early June 2020 at the Calgary Central Library.



Charbonneau Trainee Association (CTA) Executive (left to right): Beth Baretto, Jodi Rattner, Dan Berger, Myra Joy Chen (Chair), Danielle Polan, Dr. Michael Johnston, and Danielle Bozek.

The CTA provides trainee educational opportunities and fosters strong relationships between trainees through social events. This year they hosted a New Student Orientation, Summer Student Research Day, and professional development workshops.

Charbonneau Trainee Awards

Internal Awards

Paul Stewardson—Graduate Student Association Citizenship Award, University of Calgary

Michael Johnston—Clark Smith Postdoctoral Scholarship, Cumming School of Medicine

Aly Abdelkareem—Clark Smith Brain Tumour Scholarship, Charbonneau Cancer Institute

Theodore Verhey—Clark Smith Postdoctoral Scholarship, Cumming School of Medicine

External Awards

Emilie Cutts—Government of Alberta Graduate Excellence Scholarship

Aditya Mojumdar—Best Poster Award, Spatial Genome Organization Conference

Sarah Moradi-Fard—Fred Coles Research Fellowship, Alberta Cancer Foundation

Brooke Russell—Bultz Best Poster Award, 21st World Congress, Psychosocial Oncology

Paul Stewardson—Government of Alberta Graduate Excellence Scholarship

Madison Turk—Alexander Graham Bell Canada Graduate Scholarship, NSERC

Devin Van Elburg—Government of Alberta Graduate Excellence Scholarship



Dr. Sorana Morrissy is a Canada Research Chair in Precision Oncology. She is also an Assistant Professor in the Department of Biochemistry and Molecular Biology, University of Calgary.

ACADEMIC CHAIRS AND AWARDS

Improving Brain Cancer Treatment Through Precision Oncology

The Canada Research Chair program supports investigators who are studying an area that is challenging, but could be significantly impacted by discovery. Dr. Sorana Morrissy was awarded the Canada Research Chair in Precision Oncology. Her work focuses on pediatric brain tumours, which are difficult to treat due to their tendency to evolve and become resistant to treatment.

Dr. Morrissy is a computational biologist by training and her expertise is in bioinformatics, genomics, and tumour evolution. Her research program, as a Canada Research Chair, will examine cancers that over time tend to become resistant to therapy. Her goal is to identify vulnerabilities in the tumour's ability to evolve and then determine how to target these vulnerabilities. She also received an award from the John R. Evans Leaders Fund by the Canadian Foundation for Innovation. Her project is titled, *Molecular Profiles of Brain Tumours at Single-Cell Resolution*.



Dr. Aru Narendran was awarded the Kids Cancer Care Chair of Clinical and Translational Research in Pediatric Oncology. He is also a Professor of Oncology and Pediatrics at the University of Calgary.

Translating Benchtop Discoveries into Hope for Children with Cancer

Dr. Aru Narendran was named Kids Cancer Care (KCC) Chair of Clinical and Translational Research in Pediatric Oncology. His research will focus on developing a type of immunotherapy called a "neoantigen vaccine". When cancer cells arise from a normal cell in the body, they make neoantigens that can be targeted and killed by immune cells. Recently neoantigen vaccines have shown promising results in some of the more difficult to cure adult cancers, especially when given with other therapies. However, their effect in pediatric cancers is less known.

Dr. Narendran's research will utilize novel bioinformatics tools, laboratory techniques, and animal models to identify neoantigens might work as a vaccine to stimulate the immune cells of children treated for cancer and prevent recurrence. Working with cooperative pediatric oncology groups and other researchers, immune vaccine clinical trials are expected in the near future. Through the KCC Chair, he will also develop a training program for physicians to advance their skills and experience and training in translational research in pediatric oncology.

ACADEMIC CHAIRS AND AWARDS

Dr. Garnette Sutherland receives Governor General's Innovation Award for disruptive, interlinked technologies—intraoperative MRI and neuroArm

Dr. Garnette Sutherland, Professor of Neurosurgery at the Department of Clinical Neurosciences, received the Governor General's Innovation Award 2019 for his work to create technology to improve patient outcomes. His early innovation relates to the world's first intra-operative MRI (iMRI), which has allowed acquisition of 3D MR images for surgical planning on the day of surgery, as well as during the surgery as necessary. The commercialized technology is well adopted worldwide with over 75 global sites used on over 40,000 patients. The iMRI system gave rise to neuroArm, the world's first MR compatible tele-operated robot for microsurgery. The technology promises to make surgery less invasive, more precise, safer and standardized, thus improving patient outcomes. For his work, Dr. Sutherland has received multiple recognitions and awards including the Manning Award of Distinction (2004), the Alberta Science and Technology Leadership Foundation award (2007) and the City of Calgary Signature Award (2008). He was awarded the Queen Elizabeth Diamond Jubilee Medal (2012) and the American Astronomical Society and NASA for the earth applications of space technology (2013). The same year, he received the CIHR-CMAJ Top Achievements in Health Research Award for his scientific accomplishments. Dr. Sutherland was also inducted into the Space Technology Hall of Fame for neuroArm (2014), and in 2015, NASA recognized Dr. Sutherland's contributions with the NASA Exceptional Technology Achievement Medal.



Dr. Garnette Sutherland

Photo: *Project neuroArm*, University of Calgary



Above: Dr. Lauren Walker

TOP 40 UNDER 40: DR. LAUREN WALKER

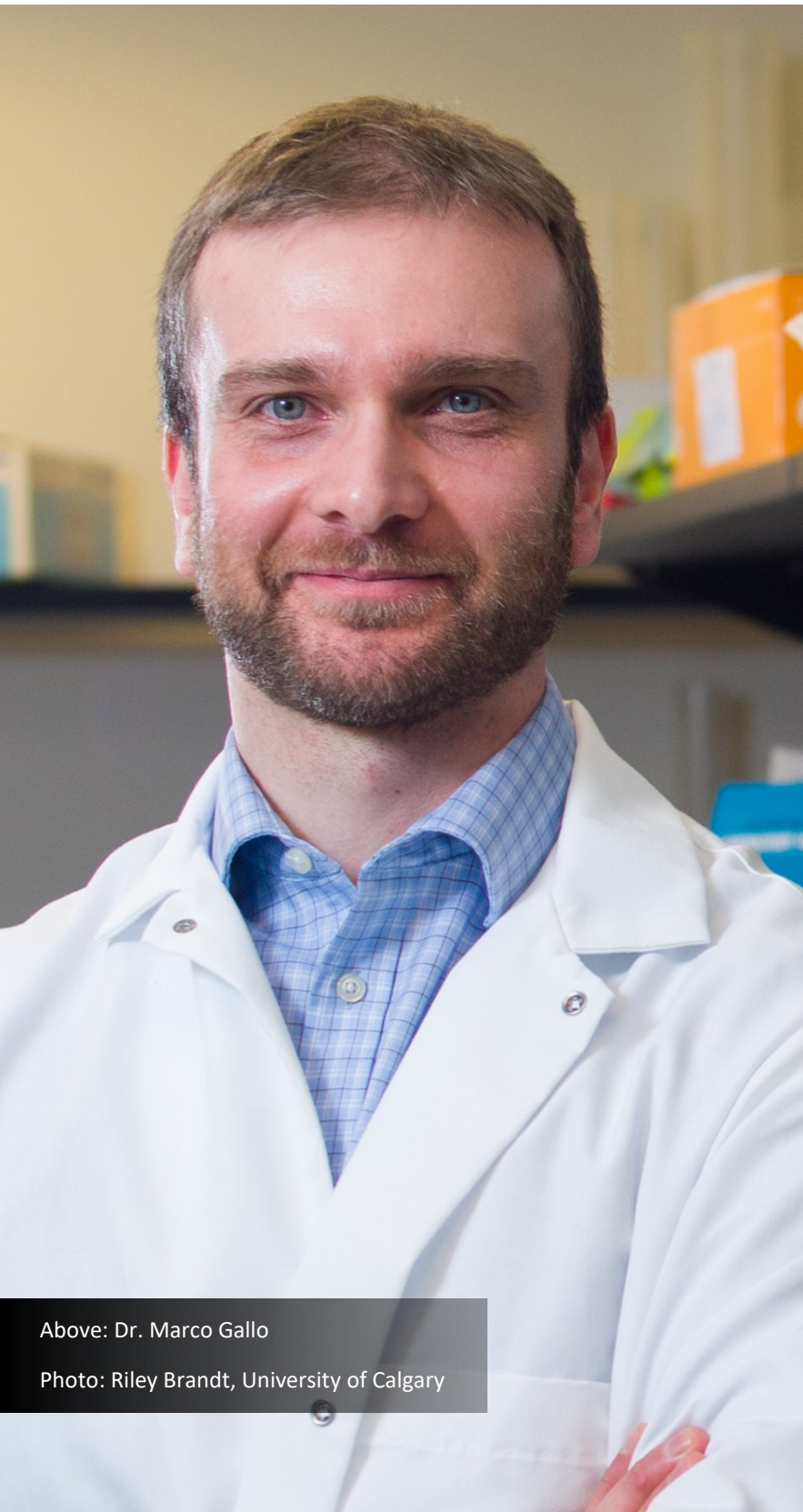
Improving Sexual Health for Patients with Cancer

Women who experience chemotherapy- or endocrine therapy-induced menopause are particularly prone to reduced sexual interest and arousal, and sexual pain. The prevalence of sexual dysfunction after breast cancer treatment is 45-86%. Yet, sexual dysfunction is unlikely to resolve on its own and treatment for individuals with cancer is limited. Evidence shows that mindfulness-based interventions, which integrate elements of education, mindfulness meditation skills, and sex therapy, improve sexual health in individuals who do not have cancer.

Dr. Lauren Walker, a registered psychologist and Assistant Professor with the Division of Psychosocial Oncology, is conducting a study to test a mindfulness-based sexual health intervention in women who have undergone treatment for breast cancer. The findings from her study will inform clinical practice and help to reduce barriers preventing women from receiving effective sexual health treatment after cancer treatment. Dr. Walker's study has been funded by the Canadian Cancer Society Research Institute.

Dr. Walker is also the Director of the Department of Oncology's Oncology Sexual Health Lab. In 2019, she published nine papers in the area of sexual health in oncology and prostate cancer survivorship. She was recognized by the Canadian Association of Psychosocial Oncology for her work to co-lead a pan-Canadian team of prostate cancer researchers and clinicians focused on supporting patients adjust to the treatment side effects of hormone therapy.

Finally, Dr. Walker was selected as one of Calgary's "Top 40 Under 40" for 2019.



Above: Dr. Marco Gallo

Photo: Riley Brandt, University of Calgary

TOP 40 UNDER 40: DR. MARCO GALLO

Uncovering the Origins of Pediatric Glioblastoma

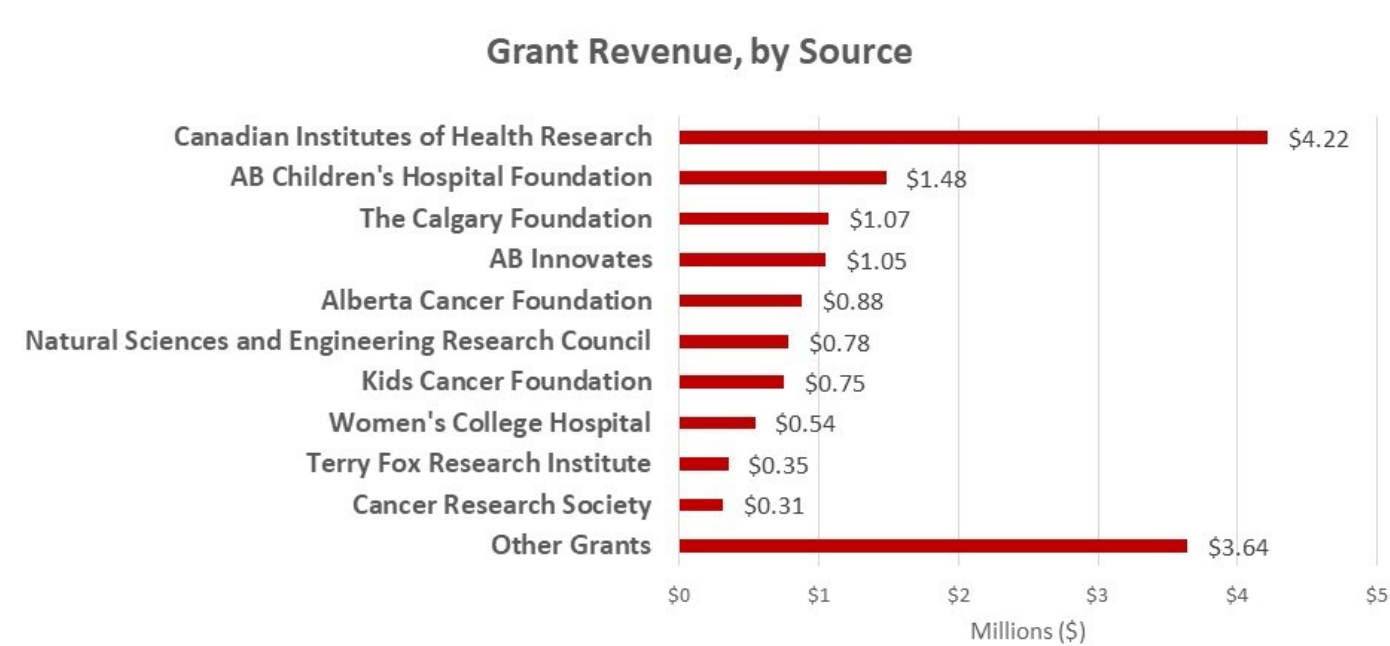
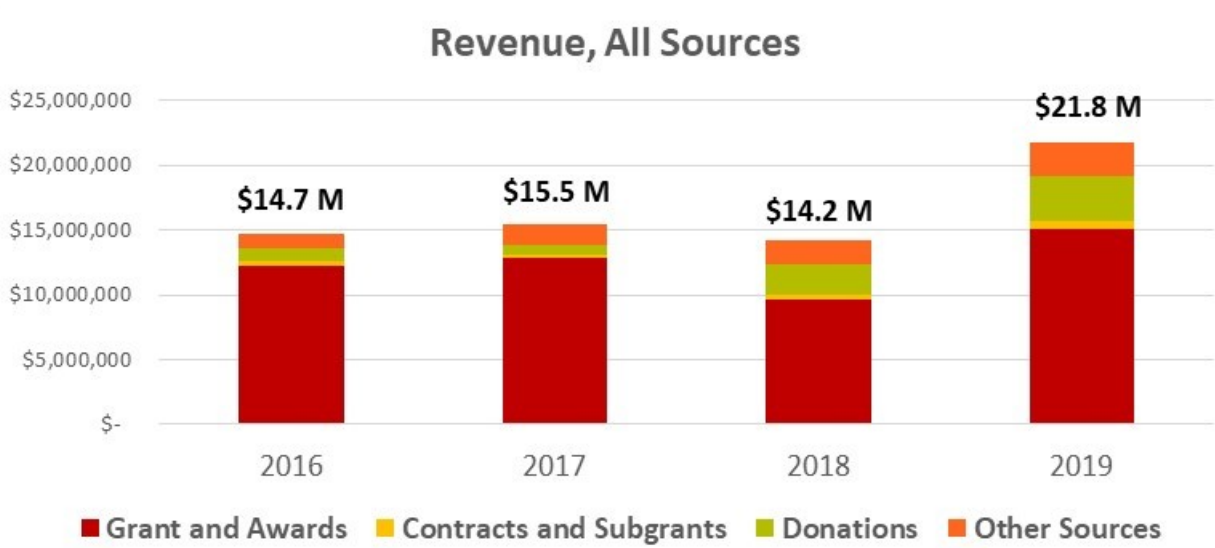
Glioblastoma is a rare tumour, especially in children. Less than 10% of all glioblastomas are diagnosed in children. Yet, this form of brain tumour is devastating, as treatments such as surgery and radiotherapy, may prolong life at best. To date, there are no effective therapies for glioblastoma. One of the reasons brain tumours are difficult to treat is that they can evolve and become resistant to chemotherapy.

Dr. Marco Gallo, an Assistant Professor with the Departments of Physiology and Pharmacology and Biochemistry and Molecular Biology, studies pediatric brain tumours and is interested in stem cell epigenomics. He and colleagues, along with postdoctoral fellows, Dr. Michael Johnston and Dr. Kiran Narta, and graduate trainees, Mary Hoffman, Aaron Gillmor, and Ana Nikolic, conducted a study to understand how these tumours evolve. He and his team performed whole genome sequencing on pediatric glioblastoma samples that had been surgically resected over time. They found that diagnostic and recurrent samples were genetically diverse. By looking at whole genome sequencing data for patients and their parents, he learned that genetic variations can be inherited from a healthy parent, arise as somatic (non-inherited) mutations, or arise as new mutations in the patient's germline. The study highlights the need for new treatments that target these genetic variations in pediatric glioblastoma.

Dr. Gallo is also a Canada Research Chair in Brain Cancer Epigenomics. He was selected as one of Calgary's "Top 40 Under 40" for 2019.

REVENUE FROM GRANTS AND DONATIONS

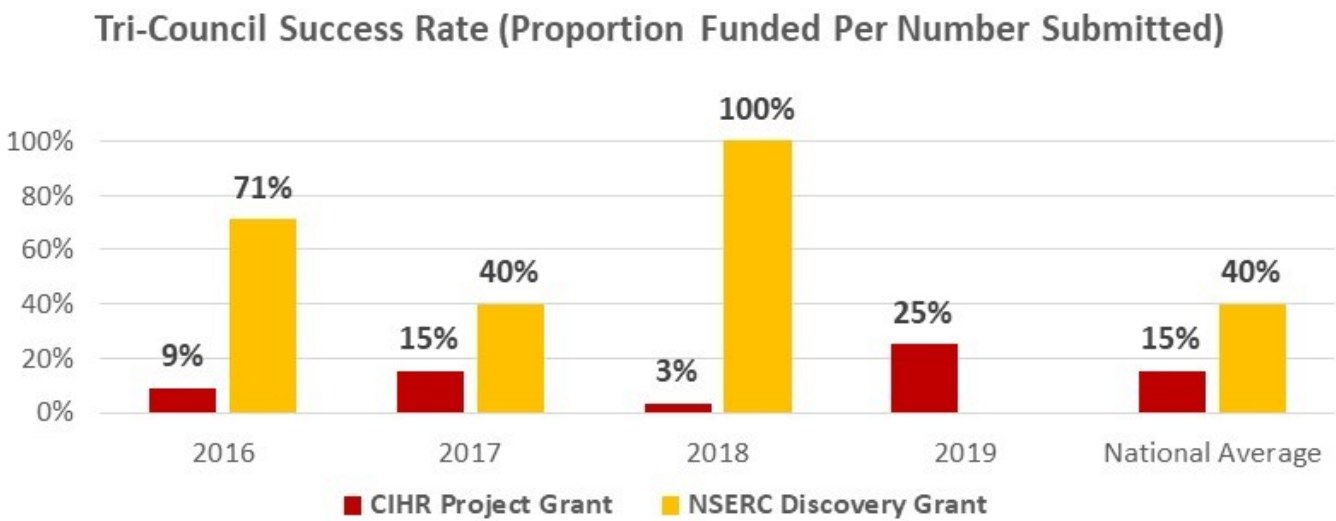
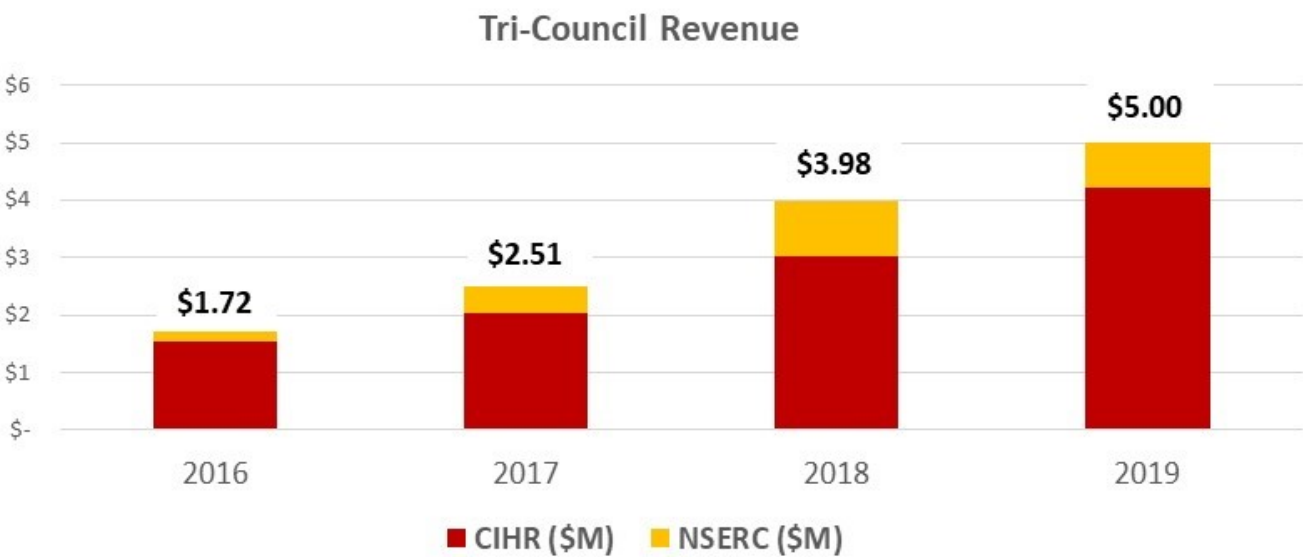
Annual Trend in Revenue from Grants, Donations, and Other Sources



Source: Office of Faculty Analytics, Cumming School of Medicine; Charbonneau Cancer Institute internal administrative data

REVENUE FROM GRANTS AND DONATIONS

Annual Trend in Tri-Council Grant Success and Revenue



Source: Office of Faculty Analytics, Cumming School of Medicine; Charbonneau Cancer Institute internal administrative data

Note: CIHR = Canadian Institutes of Health Research; NSERC = Natural Sciences and Engineering Research Council.

TRI-COUNCIL GRANT RECIPIENTS

CIHR Project, Catalyst, and Operating Grants



Dr. Darren Brenner

Departments of Oncology and
Community Health Sciences

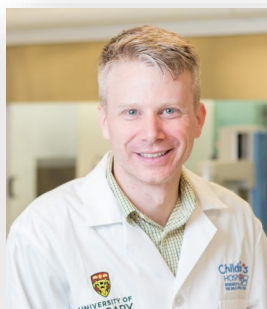
Project title: Predicting the Risk
of Advanced Colorectal Polyps
with Circulating Biomarkers
(P-RAP)



Dr. Robert Hilsden
(Co-I: Dr. Darren Brenner)

Departments: Medicine and Community
Health Sciences

Project title: Fecal Immunochemical Test for
post-polypectomy surveillance to Reduce
Unnecessary eNdoscopy (FIT2RUN Study).



Dr. Douglas Mahoney

Department of Microbiology,
Immunology, and Infectious
Diseases

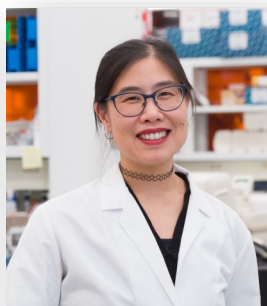
Project title: Mechanisms un-
derlying oncolytic rhabdovirus-
mediated anticancer immunity



Dr. Jason Tay

Department of Medicine and the Alberta
Bone Marrow and Blood Cell Transplant
Program

Project title: Platelet transfusions in
hematopoietic stem cell transplantation—
the PATH phase III trial



Dr. Jennifer Chan

Department of Pathology &
Laboratory Medicine

Project title: Drivers of oligo-
dendrocyte precursor cell dys-
function in the origin and main-
tenance of oligodendroglioma



Dr. Don Morris

Department of Oncology

Project title: MGMT promoter methylated
breast cancer: An opportunity for a targeted
treatment with alkylating agent
temozolomide in combination with existing
breast cancer therapeutics

TRI-COUNCIL GRANT RECIPIENTS

NSERC Grants



Dr. Matthias Amrein

Department of Cell Biology and Anatomy

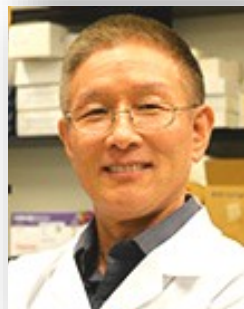
Title: Cell- and Tissue Vibrations



Dr. Juergen Gailer

Department of Chemistry

Title: Probing bioinorganic chemistry processes in the bloodstream



Dr. Ki-Young Lee

Department of Cell Biology and Anatomy

Title: Cdk5 regulation of calcium dynamics



Dr. Susan Lees-Miller

Department of Biochemistry & Molecular Biology

Title: Repair and non-repair functions of the DNA-dependent protein kinase catalytic subunit

Arnie Charbonneau Cancer Institute

Photo: Riley Brandt, University of Calgary



INSTITUTE GIFTS AND FINANCIALS

Thank You to Our Generous Donors

The Institute and its members received over 3.5 million in revenue from donations this past year. Several new gifts from our generous community include:

- ◆ \$841,500 for head and neck cancer research;
- ◆ \$515,000 for brachytherapy research;
- ◆ \$510,000 for next generation sequencing in precision oncology research;
- ◆ 500,000 for cancer immunotherapy research;
- ◆ \$400,000 for childhood cancer research;
- ◆ \$250,000 for early cancer detection research;
- ◆ \$250,000 for precision oncology research;
- ◆ \$169,000 for health services research;
- ◆ \$75,000 for pancreatic cancer research; and
- ◆ several smaller gifts for Institute programs and researchers.

A statement of operations for the Institute is provided below.

Statement of Operations	2018-19 Actuals	2019-20 Budget	2020-21 Forecast
Revenue			
Charbonneau endowment and restricted gifts	\$1,848,012	\$1,482,705	\$1,329,406
Expenses			
Research	\$1,093,572	\$750,043	\$384,644
Education	\$79,513	\$127,500	\$124,000
Administration	\$554,786	\$543,423	\$598,436
Excess revenue over expenses	\$120,141	\$61,739	\$222,326

ACKNOWLEDGEMENTS

Charbonneau Strategic Advisory Board



Ms. Gail O'Brien (Chair)



Ms. Heather Culbert



Mr. Keith MacPhail



Mr. Marvin Romanow



Mr. Allan Ross



Ms. Sharon Siebens



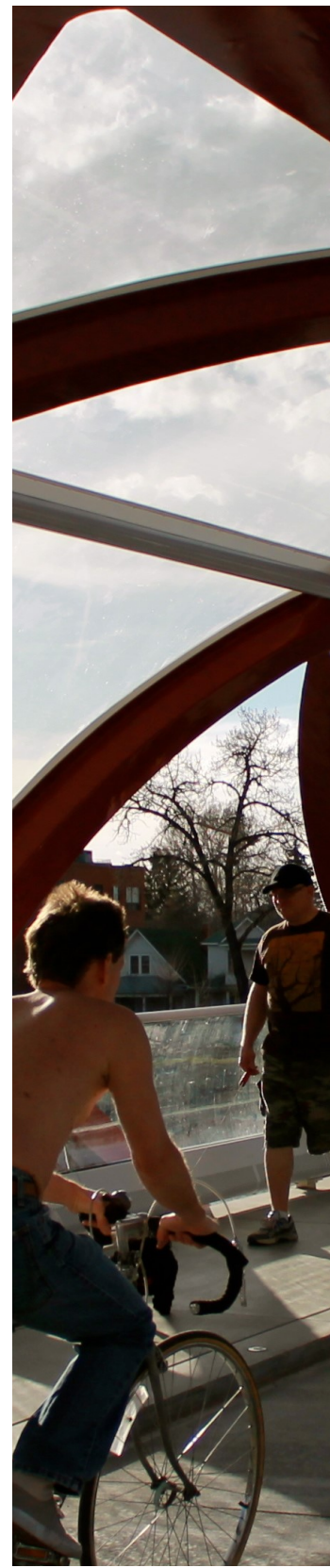
Mr. Tony Smith



Ms. Janelle Wakaruk



Dr. Gerald Zamponi

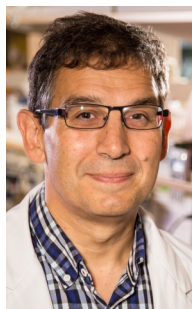




Calgary Peace Bridge

ACKNOWLEDGEMENTS

Charbonneau External Advisory Board



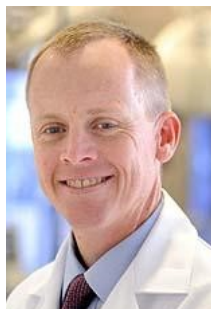
**Dr. Samuel
Aparicio**



**Dr. Cheryl
Arrowsmith**



**Dr. Eduardo
Franco**



**Dr. Donald
William Parsons**



**Dr. Geoff
Porter**



**Dr. Julia
Rowland**



**Mr. Patrick
Sullivan**

Dr. Samuel Aparicio is the Nan & Lorraine Robertson Chair in Breast Cancer Research and Canada Research Chair in Molecular Oncology; Head, Department of Molecular Oncology, BC Cancer Agency; and Professor, Department of Pathology & Laboratory Medicine, University of British Columbia.

Dr. Cheryl Arrowsmith is a Senior Scientist, Princess Margaret Cancer Centre and Senior Scientist at the Ontario Cancer Institute; Chief Scientist, Structural Genomics Consortium – Toronto; and Professor, Department of Medical Biophysics, University of Toronto.

Dr. Eduardo Franco is the James McGill Professor in the Departments of Oncology and Epidemiology & Biostatistics; Director, Division of Cancer Epidemiology; and Chairman, Department of Oncology, Faculty of Medicine, McGill University.

Dr. Donald William Parsons is the Director of the Center for Personal Cancer Genomics and Therapeutics; and an Associate Professor in the Departments of Pediatrics-Oncology, Molecular and Human Genetics, and BCM Human Genome Sequencing Center, Baylor College of Medicine.

Dr. Geoff Porter is the Gibran and Jamile Ramia – QEII Health Sciences Centre Chair, Surgical Oncology; Research Professor, Departments of Surgery and Community Health & Epidemiology; and National Project Lead, Breast Cancer Synoptic Reporting, Canadian Partnership Against Cancer (CPAC)

Dr. Julia Rowland is a Senior Strategic Advisor, Smith Center for Healing and the Arts; (formerly) the Director of the Office of Cancer Survivorship, National Cancer Institute, National Institutes of Health; and Associate Professor and Director, Psycho-Oncology Research, Georgetown University.

Mr. Patrick Sullivan is the President and Director, Team Finn Foundation and a Founding Partner of Taylor Veinotte Sullivan.



Charbonneau Executive Committee

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Dr. Gregory Cairncross

Deputy Director:
Dr. Jennifer Chan

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Dr. Savraj Grewal

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Dr. Aaron Goodarzi

Infrastructure:
Dr. Douglas Mahoney

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Dr. Paola Neri

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 Vogel, Hans
 Walker, Lauren
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 Williams, Gareth
 Yang, Lin
 Yong, V Wee
 Zhang, Qingrun

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 Balogh, Alexander
 Bhindi, Bimal
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 Childs, Sarah
 Chu, Pamela
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 Crump, Trafford
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 de Koning, Jason

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 Dickinson, James
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 Ezeife, Doreen
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 Heng, Daniel
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