UNIVERSITY OF CALGARY | Alberta Health Services

CANCER RESEARCH

IN CALGARY AND SOUTHERN ALBERTA

Annual Report to the Community

2021

CANCER RESEARCH IN CALGARY AND SOUTHERN ALBERTA

2021 Report to the Community

A joint report by the Arnie Charbonneau Cancer Institute, the Tom Baker Cancer Centre, and Cancer Care Alberta

Calgary, Alberta | January 2022

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MESSAGE FROM CALGARY AND SOUTHERN ALBERTA'S CANCER RESEARCH LEADERS

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Dear Friends and Colleagues,

Despite the ongoing challenges of the pandemic, this has been an incredibly exciting and successful year for cancer research on many fronts and we are absolutely thrilled about all your personal successes—as patient partners, community partners, researchers, clinicians, trainees, staff, and friends—over this past year. You are an integral part of our collective effort as a cancer research community, to truly take cancer and "make it ours" (a nod to our exciting *OWN.CANCER* campaign).

We are eager to build on these and past successes and will make every effort, through the cancer research partnership between the University of Calgary and Alberta Health Services, to enable all of us to achieve our individual and collective vision of meeting the cancer challenge—through the research we conduct, the education and training we deliver, and the service we provide to the community of Calgary and Southern Alberta.

The next couple of years will continue to be busy, as we prepare for the new cancer centre and work to leverage the tremendous opportunity it will afford for world-class cancer research and ongoing advancements to cancer care. We are grateful to all of the champions and supporters we have in our corner, whether they are working on planning the research space within the new centre or working to raise critical funding for care and research. These efforts will undoubtedly expand our impact and ability to deliver research that improves the well-being of patients with cancer in Calgary and beyond.

Sincerely,

Jen, Don, and Paula

MAJOR 2021 HIGHLIGHTS: *Connection, Creativity,*

1 Progress Continues at Excellent Pace for New Cancer Centre, on Track for Opening in 2023

The Calgary Cancer Centre is well on its way to completion. As of December 2021, the following key milestones were reached:

- Seating has been installed in the Knowledge Exchange Centre. The Knowledge Exchange Centre is a lecture theatre which facilitates an educational component of patient care and cancer research.
- Glass balustrades have been installed at the Radiation Therapy lightwells. The glazing allows light to penetrate two levels below grade into the Radiation Therapy department into the patient waiting areas outside the Linear Accelerator vaults.
- Duct cleaning of the HVAC in the main building is 75% complete.
- Air balancing of the HVAC systems in the main building is 35% complete.

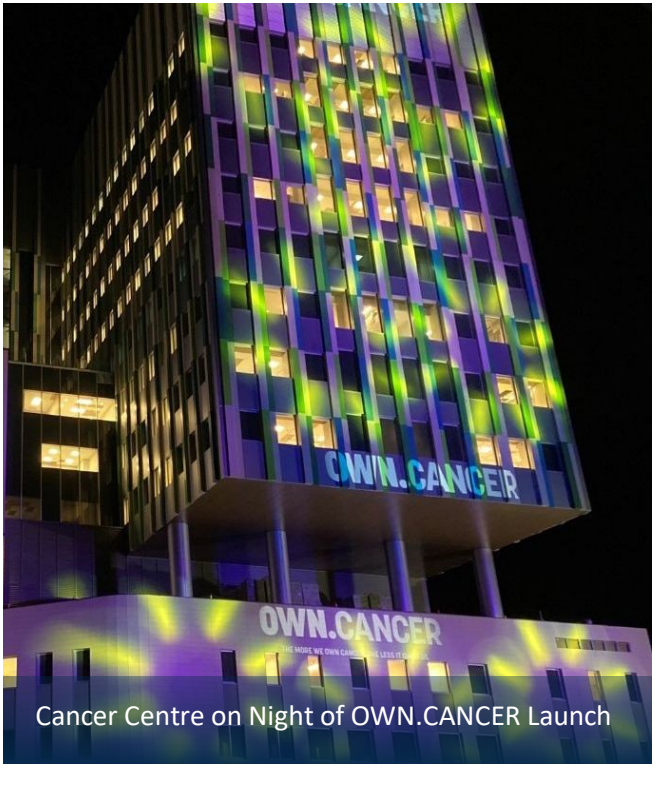
The Knowledge Exchange Centre in the Calgary Cancer Centre

*Original information provided by **Building Hope Brief**, Volume 11, December 2021*
*Sign up to receive quarterly updates.

Accountability, and Continuous Improvement

The Connector, linking the Foothills Medical Centre, the University of Calgary, and the Calgary Cancer Centre

Sod Installation Around the Building and Connector



Cancer Centre on Night of OWN.CANCER Launch

MAJOR 2021 HIGHLIGHTS: *Connection, Creativity,*

2 Prairie Cancer Research Consortium, Invited to Join National Marathon of Hope Network

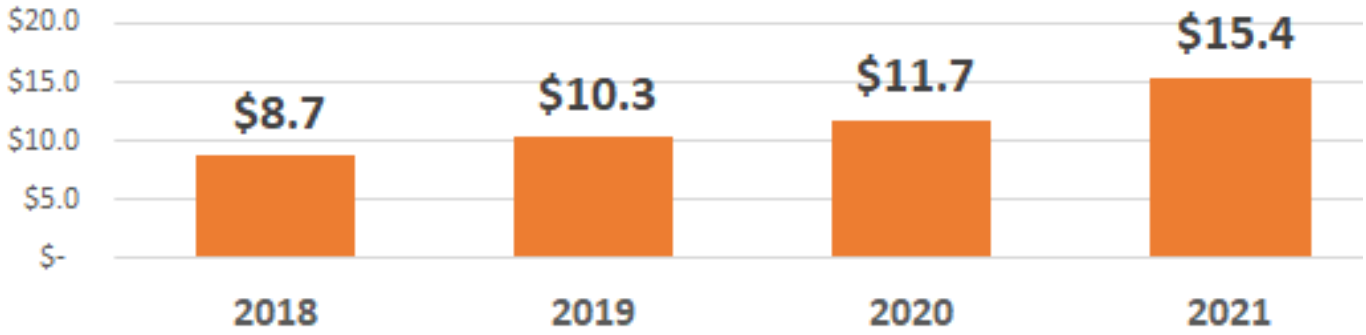
Stimulated by federal funding provided to the Terry Fox Research Institute, we led a multi-centre application across the prairie provinces of Alberta, Saskatchewan, and Manitoba for designation as a consortium and inclusion in the national Marathon of Hope Cancer Centres Network (MOHCCN). We are thrilled to share that the 'Prairie Cancer Research Consortium', which includes Alberta representation from the Universities of Alberta and Calgary and Cancer Care Alberta, has officially been invited to join BC Consortium, Montreal Consortium, and the Princess Margaret Hospital Consortium, as the latest addition to the network. An Atlantic Consortium is also pending.

Designation as a Consortium within the MOHCCN includes funding totaling $1.5M in the first year (2021-22), which requires and has secured local matching—this level of funding is anticipated to ramp up over the next 3-4 years, as the network develops. The focus of the MOHCCN is precision cancer medicine and in year 1 the initiative will provide for the sequencing of samples from 150 patients from the following four patient cohorts: prostate cancer (PIs: Dr. John Lewis, UofA, and Dr. Tarek Bismar, UofC); myeloma (PIs: Dr. Nizar Bahlis, UofC, and Dr. Paola Neri, UofC); sarcoma (PIs: Dr. Michael Monument, UofC, and Dr. Sorana Morrissy, UofC); and glioblastoma (PIs: Dr. Sorana Morrissy, UofC, and Dr. Jennifer Chan, UofC). Funding will also support management of Prairie Cancer Research Consortium and the development of new data infrastructure, with enhanced integration of genomic and clinical and administrative datasets, as one of the goals of the network is to facilitate data sharing across the country.

We would like to acknowledge the special partnership between Cancer Research & Analytics (Cancer Care Alberta), the UofA's Cancer Research Institute of Northern Alberta, and the Charbonneau Cancer Institute on this initiative. This success is only possible with great partners and we look forward to more opportunities in the future for collaboration between our institutions.

Accountability, and Continuous Improvement

3 Federal Funding Earned by Calgary Cancer Researchers Hit Another All-Time High in 2021

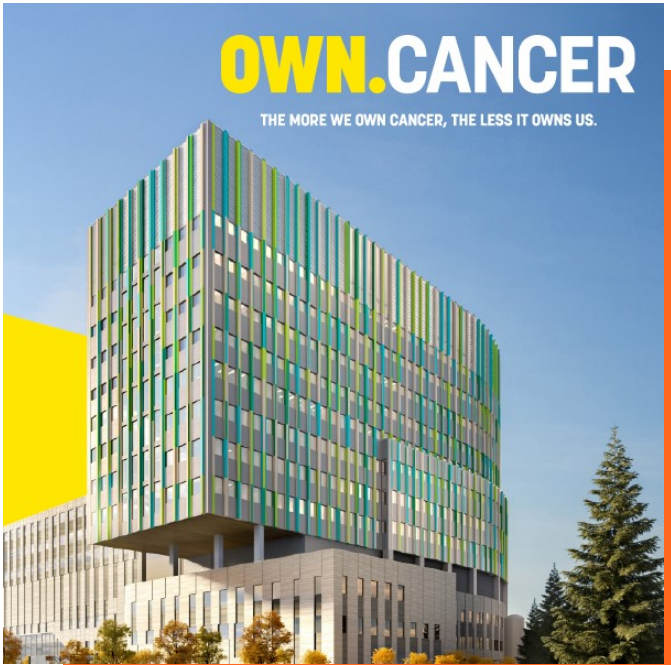


Federal funding refers to competitive grants awarded by the Canadian Institutes of Health Research, Natural Sciences and Engineering Research Council, and Social Sciences and Humanities Research Council.

4 OWN.CANCER Launches

The University of Calgary, Alberta Health Services, and the Alberta Cancer Foundation launched a joint cancer fundraising campaign co-chaired by community leaders, **Heather Culbert**, **John Osler**, and **Deborah Yedlin**. With a goal to raise $250M for excellent care and research within the new Cancer Centre, set to open in late 2023, the campaign has already attracted (as of December 2021) over $70M in pledges since construction commenced in 2017.

The campaign focuses on the areas of improving cancer treatment, decreasing the burden of cancer in the population, improving patient experiences, improving patient outcomes, and attracting the best and brightest to Calgary. owncancer.ca



MAJOR 2021 HIGHLIGHTS: *Connection, Creativity,*

5 University and Health System Partners Set the Stage for Future Success in Cancer Research

In 2020, the University of Calgary and Alberta Health Services signed a memorandum of understanding (MOU) regarding cancer research in Calgary. This document set the stage for greater collaboration between our institutions, including the sharing of infrastructure, highly qualified personnel, and equipment, as well as the leveraging of strategic investments in cancer research.

Work is beginning to get underway to collaboratively develop an integrated cancer data platform that will seamlessly link university-generated genomic, proteomic, and other multi-'omic' data with clinical and administrative data held within the health system. This work leverages our rich data environment and is already being fueled by the generosity of our philanthropic community.

The MOU, however, is only the beginning. As the new Calgary Cancer Centre continues to take shape, the University of Calgary and Alberta Health Services will play a role in supporting an excellent cancer research environment within the new facility. A companion document, The Collaboration Agreement on Cancer Research, was recently developed in partnership by the Charbonneau Cancer Institute, the Tom Baker Cancer Centre, and Cancer Care Alberta. This document defines how our institutions will work together on research in the Cancer Centre, including the collaborative nature of decision making. This partnership is very important to us and will enable important and impactful cancer research.

6 Alberta Cancer Research Conference, "Zooming Forward" Fills Desire for Greater Connectivity

The breadth and depth of cancer research excellence in Alberta was showcased at the inaugural Alberta Cancer Research Conference held virtually from October 25-28, 2021. The event, which was chaired by Dr. Christine Friedenreich, arose from a desire to provide cancer researchers from across all institutions and sites in Alberta the opportunity to increase their knowledge and understanding of the research happening in our province. An additional objective was to increase opportunities for collaboration and networking. The conference partners included Alberta Health Services and the Universities of Alberta, Calgary, and Lethbridge.

The conference included three plenary sessions that highlighted research in immunotherapy, data resources for research available in Alberta, and the global impact of COVID-19. Two panel discussion sessions provided an overview of funding opportunities for cancer research in Canada and the Cancer Foci Report prepared by the Cancer Strategic Clinical Network. There were 20 oral concurrent sessions, 70 poster presentations, several early morning roundtables and plenary sessions, and a public evening event that covered the entire span of cancer research. Over 600 registrants at the conference and more than 250 members of the public learned about the outstanding cancer research in Alberta. In total, 40 members of the cancer research community were involved in organizing this virtual conference that was assessed as a very successful event.

ACCOMPLISHMENTS BY RESEARCH THEME

Theme 1: Improving Cancer Treatment

Molecular Information About Pancreatic Cancer Uncovered

Dr. Oliver Bathe co-led an important international study that was published in the prestigious journal, *Cell*, in September 2021. The study sought to determine the impact of genomic alterations on protein expression, signaling pathways, and post-translational modifications in pancreatic adenocarcinoma, a highly aggressive cancer with a poor prognosis. The study analyzed 140 pancreatic cancers and 76 normal tissues using whole-genome, whole-exome sequencing, and other genomic analyses to determine the impact on proteins, signaling pathways, and genetic modifications.

By characterizing pancreatic adenocarcinoma at the molecular level, researchers and care teams can begin to identify new strategies for detecting pancreatic cancer earlier, at a more treatable stage, and for identifying new targets for therapy.

Overall, this work represents a critical step forward for one of the deadliest cancers and being able to improve outcomes for patients.

Calgary Niacin Trial for Glioblastoma Continues Enrolment

Dr. Gloria Roldan Urgoiti, Associate Professor of Medical Oncology is leading a first in human Phase I-II clinical trial in patients with glioblastoma. Based on local preclinical research by neuroscientist Dr. Wee Yong, Professor in the Departments of Clinical Neurosciences and Oncology, the study is evaluating the efficacy and safety of niacin (vitamin B3) added to first line radiotherapy and chemotherapy in patients with glioblastoma, a very aggressive brain tumor. Earlier work by the team, including Neuro-Oncology Program Leader Dr. Paula de Robles, showed that niacin can stimulate the brain's immune cells, microglia, to stop tumour growth. This led to a clinical trial, funded through grants from the Canadian Institutes of Health Research and the Alberta Cancer Foundation via the Kvisle Foundation.

Theme 1: Improving Cancer Treatment

Liquid Biopsy Personalizes Lung Cancer Care, Reduces Costs

Personalized medicine has profoundly impacted the management of advanced lung cancer. Liquid biopsy is a less invasive blood test that enhances the ability to practice personalized medicine and access targeted therapy in cancer patients. Dr. Doreen Ezeife's work on the cost of liquid biopsy was recently featured in the *New England Journal of Medicine (NEJM) Journal Watch* series. Dr. Ezeife collaborated with researchers in Calgary, The Princess Margaret Centre in Toronto, and four other cancer centres in Canada to study the impact of liquid biopsy on the cost of care in advanced non-small cell lung cancer (NSCLC) patients.

Dr. Ezeife found that implementing liquid biopsy can significantly reduce health care system costs, resulting from more patients receiving personalized therapy. The study results were published and presented as an oral abstract at the 2021 IASLC World Conference on Lung Cancer. The results were so innovative that the NEJM Group covering the meeting interviewed Dr. Ezeife to highlight the study findings and its implications.

ExCELLirate Canada to Boost National Immunotherapy Effort

Dr. Douglas Mahoney, PhD, is leading a team of University of Calgary investigators in a pan-Canadian effort to coordinate the development of new cancer cell therapies. The effort, funded by a Canadian Foundation for Innovation federal grant, is being led by the Canadian Cancer Trails Group (CCTG) at Queen's University and includes researchers from McMaster University, the University of Ottawa, the University of Montreal, and Canadian Blood Services.

The ExCELLirate Canada platform will enable the development and testing of locally made cellular therapies for cancer. By sharing resources and coordinating activities, the resulting discoveries will be translated into life saving therapies at faster pace.

Made-in-Calgary Technique Could Reduce Lymphedema

Lymphedema is chronic limb swelling that can occur after lymph node surgery for cancer. Lymphedema negatively impacts the physical, psychological, recreational, social, occupational, and financial aspects of survivorship. Dr. Claire Temple-Oberle and team have introduced a novel technique using lymphaticovenous anastomosis (LVA) at the time of lymph node surgery as a preventative approach. LVA uses a special imaging system and microsurgical techniques to attach the lymphatic system to the venous system, giving the disrupted lymphatic system a new drainage route.

Thanks to funding from the Tom Baker Investigator Initiated Trials Units and the Jennifer Gardiner Award in Surgical Oncology, the team will be embarking on a phase III trial to establish whether this intervention prevents lymphedema. We wish to thank Carmen Webb, the team's brilliant research coordinator, who is retiring this year. Carmen has been the cornerstone of the team, co-authoring 20 publications and guiding the team's studies and scientific writing. She will be dearly missed.

New Vaccine Guidance for Childhood Cancer Survivors

Dr. Greg Guilcher is the Chair of the Hematopoietic Cell Transplantation/Immune/Dermatology Late Effects Taskforce for the Children's Oncology Group (COG), the largest clinical trials consortium for children with cancer in the world. In this role, he led a scoping review of immune function in childhood cancer survivors, resulting in a new position statement on the evaluation of vaccine titres and revaccination of children who receive chemotherapy. This article was published in the journal *Lancet Child and Adolescent Health* and will inform new guidelines for the survivorship care and the basis for an upcoming prospective study of immune recovery.

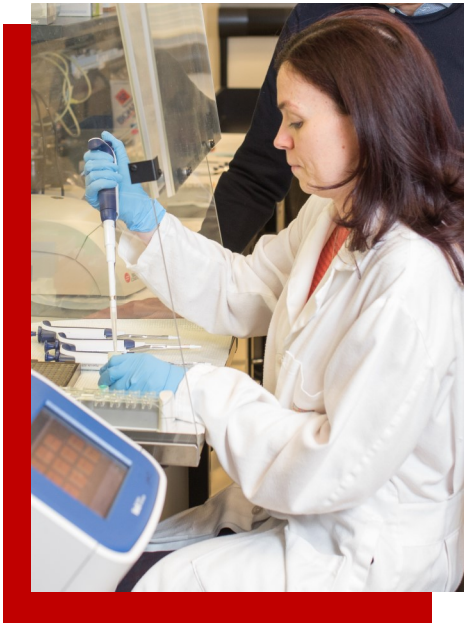
CALGARY'S CANCER RESEARCH THEMES

Theme 1: Improving Cancer Treatment

Research Platforms to Provide Samples, Molecular Analysis, and Data Integration for Translational Oncology Consortium

The Prairie Cancer Research Consortium (PR2C) is a newly designated member of the Terry Fox Marathon of Hope Cancer Centres Network. The PR2C comprises cancer centres in Alberta, Saskatchewan, and Manitoba. Several research platforms in Calgary are working together to supporting the PR2C's work in precision medicine.

The Precision Oncology Hub, under the scientific leadership of Dr. Paola Neri, supports cancer researchers seeking to determine biologic correlates of their patient, clinical, and other laboratory findings. The Hub also helps with developing collaborative partnerships between scientists, physician investigators, and industry in the area of translational cancer studies, and promotes innovation and commercialization activities in Alberta for the betterment of cancer care. The Hub has recently taken on a new role working closely with the Centre for Health Genomics and Informatics led by Drs. Francois Bernier and Paul Gordon at the University of Calgary, as the lead site for genomic testing and analysis for the (PR2C) and will sequence samples from our partnering Provinces.



Under the direction of Drs. Winson Cheung and Darren Brenner, and in collaboration with Dr. Sorana Morrissy, Calgary is also developing a data integration platform that will automate the collection of administrative, clinical, and behavioral data to complement the genomic data generated from DNA and RNA sequencing and analysis. This platform will feed the data into a central repository hosted by the Terry Fox Research Institute where it will be available for researchers from across the country to use.

Underpinning this work and of critical importance to the sustainability of national collaborative efforts, is the Alberta Cancer Research Biobank. The Biobank, a collaboration between Calgary and Edmonton, supports the collection, processing, storage, distribution, and analysis of biospecimens annotated with clinical data. Together, our robust cancer research infrastructure is a driver of successful engagement in national initiatives.

Theme 1: Improving Cancer Treatment

Developing Anticancer Vaccines to Treat Currently Untreatable Cancers in Children

Since the development of a vaccine against the small pox virus in 1796 by Edward Jenner, vaccines have effectively treated, and even eradicated, some of the most devastating infectious diseases. More recently, vaccines using the molecular information of the SARS-CoV-2 virus to stimulate the immune system have become lifesavers in the pandemic.

Dr. Narendran is clinician scientist in pediatric oncology with a focus on the development of novel therapeutic agents and clinical trials for difficult to treat childhood cancers. His laboratory is investigating a similar vaccine strategy for high-risk, refractory cancer in children. Malignant cells can generate unique mutant proteins not found in normal healthy cells. These distinct molecules, known as neoantigens, are feasible targets for the generation of new immunotherapies in children with currently incurable malignancies. Recent clinical trials have shown early evidence for the effectiveness of anti-cancer vaccines against some adult tumors. Though encouraging, it is critical that this new knowledge is appropriately developed to account for the unique nature of pediatric cancer biology.

He and his team have generated sequencing data from tumor and normal samples of high-risk pediatric patients and used distinct bioinformatics programs to select and test candidate neoantigens. Their initial vaccine development against high-risk childhood leukemia was presented published recently in the journal, *Human Vaccines and Immunotherapeutics*. They are currently using what they learned to develop and test effective anticancer vaccines for difficult-to-cure brain tumors, leukemias, and sarcomas in children. Recently, this work received the recognition of Innovate Calgary by the *Evolve to innovate (e2i)* award. Most importantly, The Narendran Lab is part of one of the first FDA-approved pediatric cancer vaccine trials to treat children with a specific brain tumor.

New Breast Cancer Trial Funded by the Canadian Institutes of Health Research Approved by Health Canada

Breast cancer is classified and treated based on the patient's expression of hormone receptors (e.g., estrogen receptor and progesterone receptor status) and HER2 status. 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. Researches have discovered that In about half of patients with triple negative breast cancer MGMT is turned off, suggesting that TMZ could work in these tumours.

To test the effectiveness of TMZ in patients with triple negative breast cancer, Dr. Don Morris and his team are conducting a made-in-Alberta clinical 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 in Calgary and Edmonton. They will evaluate patients' tumours for additional biomarkers that could predict which patients will receive the greatest benefit.

The study, titled *A Randomized Phase II Study of Temozolomide Monotherapy or in Combination with Olaparib in Patients with METHYLATED 06-Methylguanine-DNA Methyltransferase (MGMT) Pre-Treated Triple Negative Breast Cancer*, has been funded by an operating grant from the Canadian Institutes of Health Research and was just approved by Health Canada to begin enrolling patients. Recruitment is set to begin in 2022.

Theme 2: Improving the Patient Experience

Compassion Lab Finds that Compassion in Care Can be Taught, but More Comprehensive Training is Needed

Dr. Shane Sinclair, PhD, Associate Professor in the Faculty of Nursing, is the director of the Compassion Research Lab at the University of Calgary. As part of a systematic review of compassion training for health-care practitioners, Sinclair and his team used an empirical model developed in his lab and created in consultation with health-care providers and patients to create a benchmark for what encompasses compassion and to assess the comprehensiveness of the teaching content of the training programs reviewed. "By having a blueprint of what compassion is, we were able to apply the model to the training programs and say, 'So what exactly are the components of compassion that these training programs are teaching and what are the outcomes?" says Sinclair.

"We need to mature in our training programs to move beyond simply nurturing feelings of compassion to actually providing practitioners with the tangible evidence-based clinical skills and behaviours to provide compassion to patients in a more meaningful, robust and sustainable way," he says. The results of his review suggest that the effectiveness of compassion training needs to primarily be evaluated through patient assessment or patient-reported measures, as they are the ultimate target of such training. Compassion training needs to be an ongoing part of a health-care practitioner's development, and it needs to be encouraged and fostered by the health-care systems in which they work.

*Original article by **Brennan Black**, UCalgary Advancement*

Mobile Health Physical Activity Intervention May Promote Healthy Lifestyle for Adolescent and Young Adult Survivors

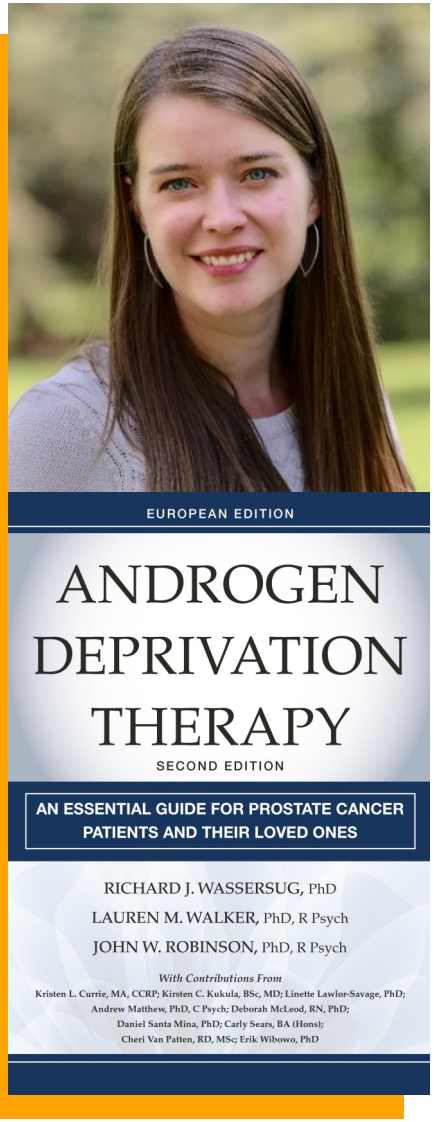
Cancer in adolescents and young adults (AYAs) is increasing; however, when combined with the relatively favorable prognoses of these types of cancer, this young cancer survivor population is also growing in numbers. As treatments for cancer are known to cause physical and psychosocial late effects, it is important to understand how these risks can be prevented or reduced.

Recognizing that exercise is an important lifestyle factor to improve physical fitness and quality of life after cancer, Dr. Fidler-Benaoudia, a Cancer Epidemiology and Prevention Research Scientist at Cancer Care Alberta, and her team launched the *Adolescents and Young Adults Becoming Physically Active after Cancer Trial*, or *AYA-PACT*, with funding from CIHR and internal funding, as well as the Michael Garrett Banks Endowment. The overall aim of the study is to see how a mobile health (mHealth) physical activity intervention supports a healthy life-style for AYA cancer survivors using a two-centered (Edmonton and Calgary) randomized controlled trial of 320 participants. AYA cancer survivors aged 15-39 years at diagnosis and within a year of treatment completion are eligible. Recruitment began in October 2021.

Ultimately, this study could provide AYA cancer survivors with a simple and affordable mHealth intervention that benefits their physical and mental health. To learn more about the trial, visit www.ayapact.com.

Theme 2: Improving the Patient Experience

A Made-in-Calgary Educational Program for Prostate Cancer Androgen Deprivation Therapy Expands into Europe



Led by Drs. Lauren Walker and John Robinson of the University of Calgary and Dr. Richard Wassersug of the University of British Columbia, the Androgen Deprivation Therapy (ADT) Educational Program supports prostate cancer patients undergoing hormone therapy. The program includes a 1.5-hour, professionally facilitated class, and a book designed to help patients and partners manage treatment side effects (e.g. weight gain, muscle loss, osteoporosis, hot flashes, and sexual dysfunction).

After 8 years of success in Canada, and recognition in 2019 with a Team Innovation Award by the Canadian Association of PsychoOncology, the program is now set to launch in Europe in December 2021. Supported by the European Association of Urology and an unrestricted educational grant from Astellas Pharma Europe and Bayer AG, Phase I of expansion brings the "ADT Programme" to 8 sites across the United Kingdom, Ireland, and the Netherlands. Fourteen prostate cancer advanced practice nurses have been trained as ADT Programme Facilitators. To support the expansion, an updated edition of the book, *Androgen Deprivation Therapy: An Essential Guide for Prostate Cancer Patients and Their Loved Ones, European Edition*, was recently published for a European audience. Continued expansion throughout 2022 and 2023 is anticipated to other European countries. Ultimately, this international collaborative initiative will help patients from across the globe to participate in a standardized program to support self-management of ADT side effects.

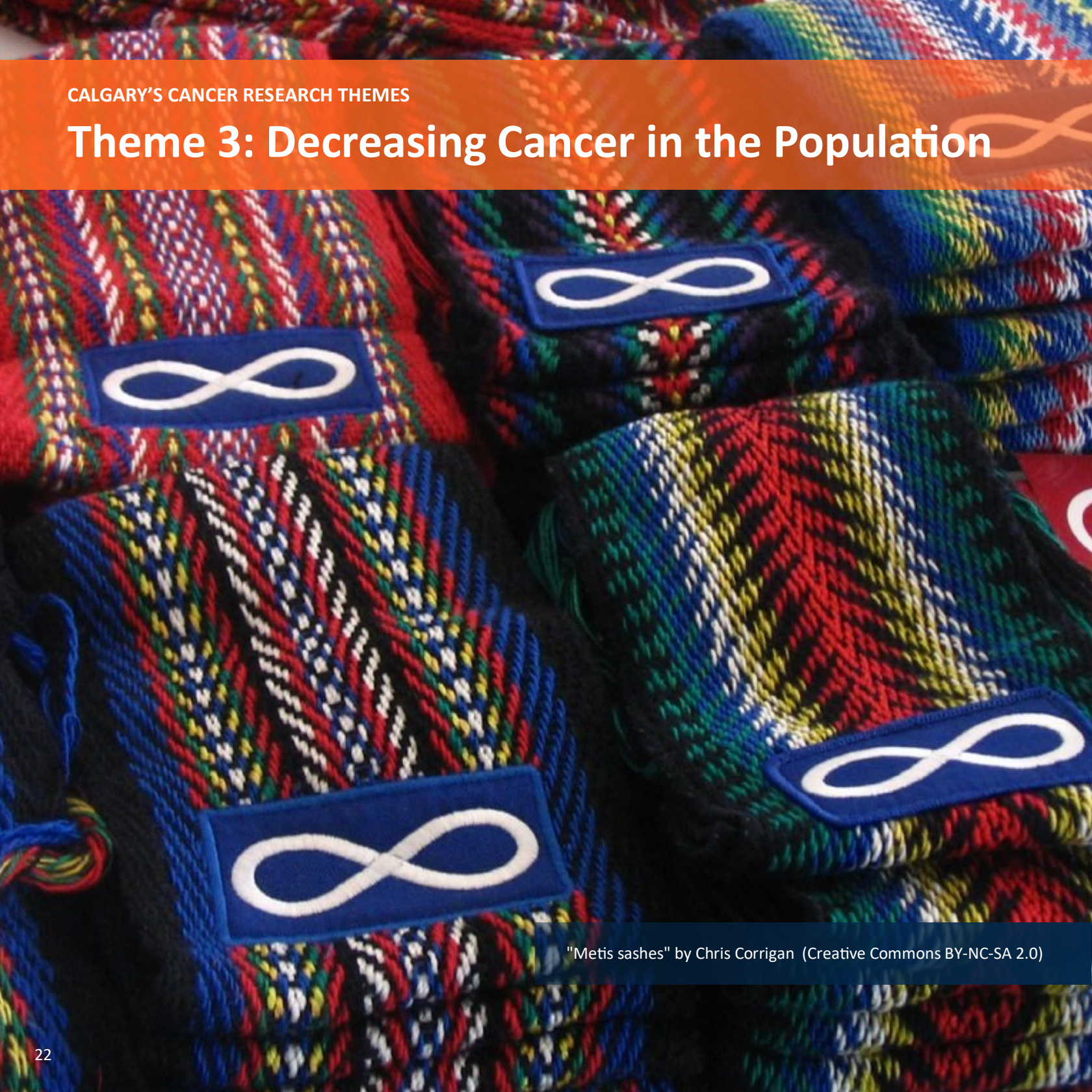
Enhancing Survival and Well-Being for Young Women with Breast Cancer

Approximately 5.4% of all breast cancers occur in women 40 years of age and under. Given their life stage, these women face unique challenges including potential loss of fertility, prolonged hormonal treatment and managing young families and careers during treatment. Young women living with breast cancer often experience anxiety, difficulty coping, and social isolation, which lead to poorer psychosocial outcomes. *Preparing to Survive* is a response to these needs.

Funded by the Canadian Cancer Society, Canadian Institutes for Health Research, and the Alberta Cancer Foundation, the 'Preparing to Survive' project is developing an online self-management tool (an app) to support the unique needs of this group of women. We interviewed 34 women diagnosed with breast cancer at age 40 or younger, who were at least one year on from finishing their active treatment for the disease (surgery, chemotherapy and/or radiation). Women who were Interviewed identified key needs for the app: age- and cancer stage-specific one-on-one peer group support, education to enable management of their own psychosocial health, age-specific sexual health and fertility education, and increased support when living beyond the end of treatment.

'Preparing to Survive' is being led by Dr. May Lynn Quan, General Surgeon.

Theme 3: Decreasing Cancer in the Population



"Metis sashes" by Chris Corrigan (Creative Commons BY-NC-SA 2.0)

Nishtohtamihk li kaansyr (Understanding Cancer): Cancer Screening, Outcomes, and Experiences of Métis People

With a desire for a deeper understanding of Métis experiences related to cancer prevention and screening, a collaboration for a co-designed study began in 2021. Co-led by Reagan Bartel, Director of Health with the Métis Nation of Alberta (MNA), Dr. Karen Kopciuk, Cancer Epidemiology and Prevention Research Scientist (Cancer Care Alberta), and Dr. Huiming Yang, Medical Director of Screening Programs (SP), Alberta Health Services, this study is now gathering information from Métis Albertans about their knowledge of cancer screening and their cancer screening experiences, including facilitators and barriers to participating in screening programs. A second aim will compare Métis Albertans to their non-Métis Albertan counterparts using cancer screening program data to identify inequities at the population levels.

The health of Métis peoples, like all of Canada's Indigenous peoples, continues to suffer from the effects of colonialism. However, substantially less is known about the health of Métis peoples, including cancer, because they have not been included in most health research to date. This CIHR-funded project will provide important knowledge for the MNA and SP to understand barriers and inequities to cancer screening. The hope is that this work will help enable the community to identify solutions that, in partnership with SP, can begin to address these inequities.

SCREENING FOR LIFE.CA

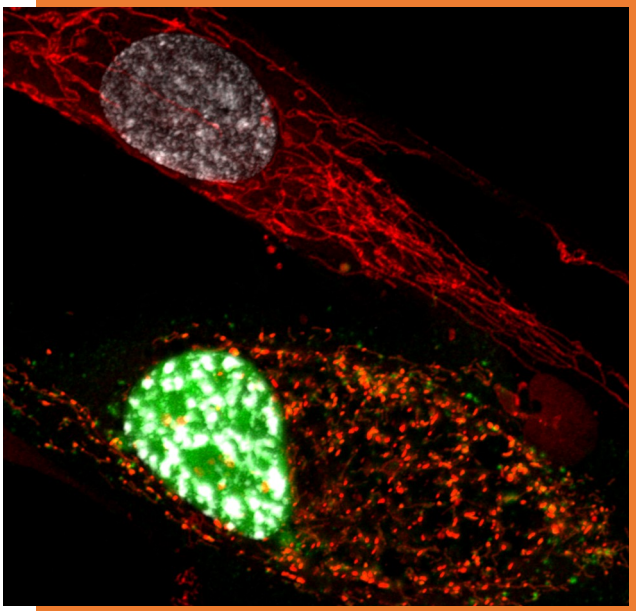
Theme 3: Decreasing Cancer in the Population

Harnessing the Cellular Aging Process to Prevent Cancer

Age is the strongest factor correlating with cancer incidence in both men and women for all major cancer types. Determining how our cells age can provide us with the tools to extend our healthy lifespan and delay the occurrence of numerous, if not all cancers.

Dr. Karl Riabowol and his team have determined that levels of the protein ING1a, which affects how our DNA is packaged within cells, is greatly increased as cells age. This increase of ING1a in turn makes cells more susceptible to DNA damage and misreading of the DNA code—both of which are hallmarks of cancer.

The figure below shows that cells are radically altered when they express higher levels of ING1a for even short (24 hour) time periods. Dr. Riabowol's group was funded by CIHR in the Spring 2021 Project Grant competition to explore the link between cell age and cancer susceptibility, by identifying the mechanism used by the ING1a protein to alter cells, and to determine what tissues in the human body undergo such aging changes in response to ING1a.



Microscope image (right): Normal human skin (fibroblast) cells stained for DNA (white) in the nucleus (N) and mitochondria (red) in the cytoplasm (M) in the absence (top cell) and the presence (bottom cell) of increased ING1a (green).

Transdisciplinary Canadian Radon Exposure Science to Transform Lung Cancer Prevention

The prevention of cancers caused by environmental carcinogens is a priority of the Robson DNA Science Centre, and the team of Dr. Aaron Goodarzi has been focusing on how radioactive radon gas drives Canadian lung cancer. Indeed, radon inhalation is the 2nd leading cause of all lung cancer, leading to one new diagnosis in Alberta every 23 hours.

In 2021, Dr. Goodarzi, alongside Charbonneau researchers Dr. Linda Carlson, Dr. Darren Brenner, and Dr. Cheryl Peters, as well as Prof. Joshua Taron from the School of Architecture, Planning, and Landscape Design published three articles using a transdisciplinary approach to understand radon exposure in terms of radiation dosimetry and population health, geology-to-architecture, and behavioural psychology. These joint ventures were released in the Nature Publishing Group's transdisciplinary journal, *Scientific Reports,* and found that: (1) there are biases in how people occupy the residential environment, such that younger Canadians are exposed disproportionately to the most radon; (2) current approaches to radon risk communication fail to promote health-seeking behaviour in an inclusive manner, with inequalities on the basis of age, sex/gender, and profession; and (3) radon levels have risen substantially in Canada over the 20th and 21st centuries, despite having decreased in other cold-climate countries over the same period.

This work has been the basis for attracting over $2M in infrastructure funds from the Canada Foundation for Innovation and the Alberta Cancer Foundation, and will nucleate the formation of a national centre for radon exposure science and lung cancer prevention, which will be built at the Arnie Charbonneau Cancer Institute within the University of Calgary's Heritage Medical Research Building footprint in 2022-2023.

Theme 3: Decreasing Cancer in the Population

Forzani and MacPhail Colon Cancer Screening Centre Uses Data Science to Advanced Analytics to Understand Risk

The Forzani and MacPhail Colon Cancer Screening Centre is a leader in colorectal cancer screening. Through its research and clinical care, it has emerged as a leading national facility.

"Our goal is to improve screening for colorectal cancer and, ultimately, patient outcomes," says Dr. Robert Hilsden, MD. "First, we want to better understand who is at high risk for colorectal cancer and who is not, so we know who needs to be screened and how best to do it. Next, we want to improve the experience to maximize participation."

The team is building unique data repositories that include the collection of biospecimens (blood, urine, normal colon tissue) and information about participants' medical history, lifestyle, physical activity and diet. "More than ever before, this research is allowing us to use data science and advanced analytics to understand colon cancer risk," says Dr. Darren Brenner, PhD. "From this work we can develop and advocate for improved policy, practice, and personal change to bend the curve and reduce cancer burden in Canada. The work has the potential to save lives and have a positive economic impact."

The Forzani and MacPhail Colon Cancer Screening Centre, located at the Teaching, Research, and Wellness Building at the Foothills Hospital, was initiated by a generous donation by The Forzani Group Foundation and the MacPhail Family and is the only publicly funded centre in Canada dedicated to colorectal cancer screening.

*Original article by **Kyle Marr**, Cumming School of Medicine*

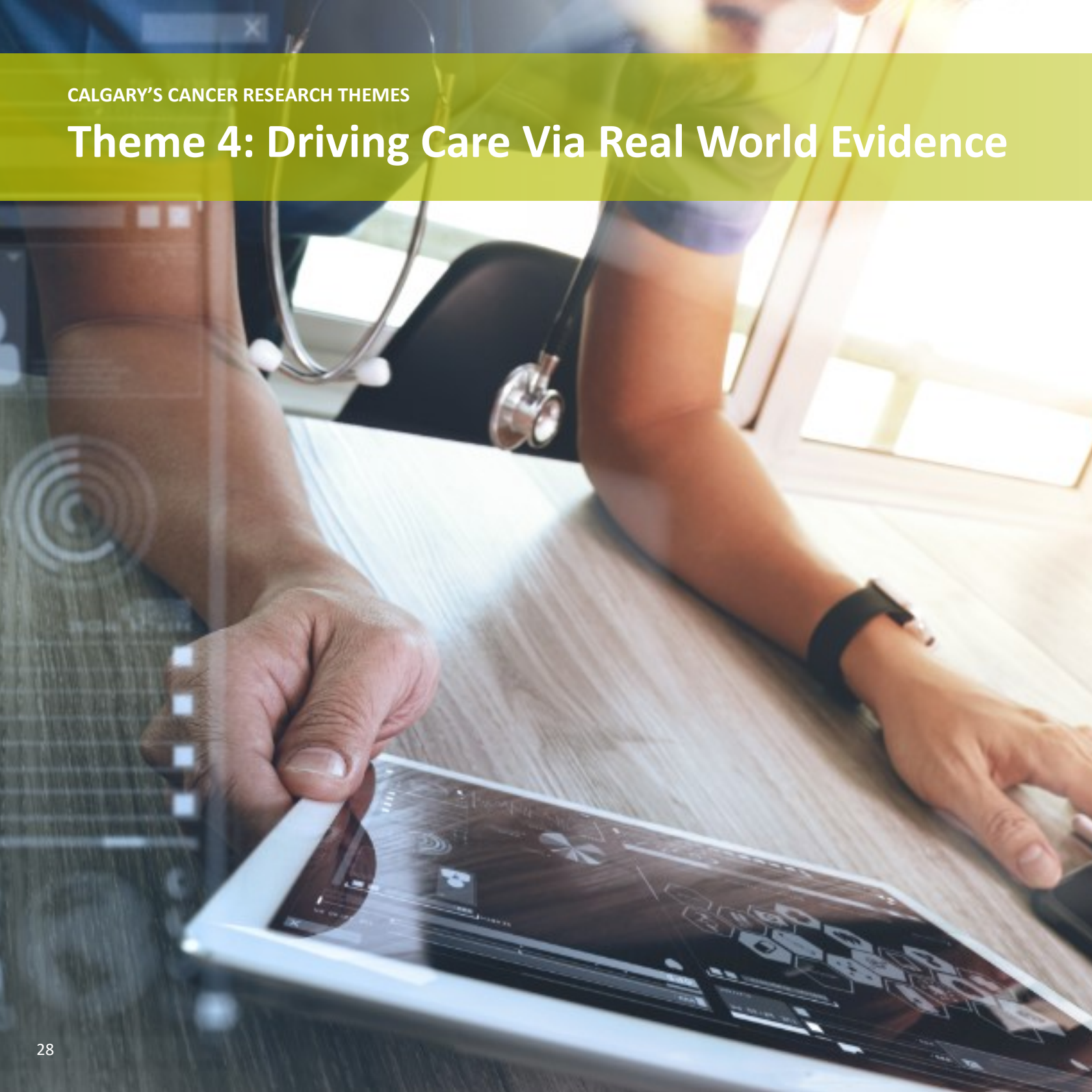
Unravelling the Relationship Between Cancer and Aging and the Role of Double-Strand Breaks in DNA

Genomic instability is a hallmark of cancer. The genome is under constant assault with numerous DNA lesions occurring per day in each human cell. One of the most cytotoxic forms of damage is a DNA double-strand break (DSB), which occurs from both endogenous sources such as replication-associated defects, and environmental sources such as and chemotherapeutic drugs and ionizing radiation. There are two central ways DNA repairs itself and several other less efficient ways. If DNA repair is unsuccessful, leaving unrepaired or mis-repaired DSBs, this can cause errors that will eventually lead to tumour formation, progression, and malignancy. Therefore, a precise control of the DSB repair pathway choice is advantageous to preventing cancer.

Dr. Aditya Mojumdar, a researcher in Dr. Jennifer Cobb's Laboratory has been studying the role and regulation of the factors that maintain genome stability during repair. They have discovered an interplay of various factors that are essential for a precise DSB repair. Recently, they have discovered that as cells age the active DSB repair pathway switches from error-free to error-prone, leading to more mutations. This may explain why cancer occurs with age.

Dr. David Schriemer of the Robson DNA Science Centre is assembling a team of scientists to answer that very question using advanced technologies and novel molecular imaging approaches. Along with Dr. Susan Lees-Miller, also of the Robson DNA Science Centre, his multidisciplinary, multi-institutional team of experts from Alberta and British Columbia will submit a proposal to the Canadian Foundation for Innovation in 2022. This multi-year project would be the first of its kind in Canada for DNA sciences and structural proteomics, bringing with it new state-of-the-art equipment to Calgary.

Theme 4: Driving Care Via Real World Evidence



Using Big Data to Mimic a Cancer Clinical Trial

Randomized controlled trials (RCTs) are the gold standard of study design when evaluating a new cancer drug or treatment. In RCTs, researchers randomly assign participants to receive one therapy or another, to compare the relative effectiveness. While very valuable, such clinical studies are not always feasible to conduct because they can be too expensive to run, can last decades, or may not be ethical.

Now a team of researchers in Alberta believe they've proven that equally accurate conclusions can be drawn more quickly and easily, without needing to interview and track patients face to face over months or years. "Our goal is not to replace an RCT, which is still the ideal study design for testing new interventions" says Dr. Winson Cheung. "If a trial can be done, then yes, we should still do it. What we set out to prove was whether studying real-world data could allow us to mimic or mirror the design of an RCT, without actually doing one."

The approach is called "target trial emulation" and relies on huge databases containing diverse health information about many people. Alberta has several administrative databases; combined with the analytical expertise to interpret them, they provide real-world evidence to support better clinical decision-making, improvements to the quality of care, and research. The project was led by Dr. Devon Boyne, CIHR Fellowship recipient in 2020.

*Original article by **Sharon Basaraba**, Cancer Care Alberta*

Tomorrow's Cancer Research Leaders

Charbonneau Trainee Association Aims to Enhance the Experience of Postdoctoral Fellows and Graduate Students

The Charbonneau Trainee Association (CTA) is an organization of postdoctoral fellows and graduate students at the Arnie Charbonneau Cancer Institute. The purpose of the CTA is to improve the overall experience of trainees in Charbonneau Labs and beyond. To accomplish this, the CTA hosts academic events that provide educational and networking opportunities, encourages trainees to become active members of the community through some of the Institute's outreach events, and fosters relationships between trainees through social events.

In December 2021, the CTA hosted with the Institute Leadership Team a celebratory lunch event to acknowledge trainees and thank them for their hard work and commitment to cancer research and education throughout the second full year of the pandemic. The event was well-attended by trainees and their supervisors, with many awards of excellence and prizes given out to acknowledge various accomplishments in 2021.

The 2021 CTA includes (shown left to right below): Alexis Philippot (Social Lead), Peter Brownlee (Outreach Lead), Ryan Bianchini (Education Co-Lead), Hiba Omairi (Chair), Mehul Kumar (Co-Vice Chair), Aly Abdelkareem (Education Co-Chair), and Julie Deleemans (Co-Vice Chair).

Charbonneau Trainee Association

Recognition of Trainee Excellence

Canadian Institutes of Health Research Graduate Scholarship Doctoral Award
Mariel Kleer (Dr. J. Corcoran)

Cumming School of Medicine Postdoctoral Scholarships
Robson DNA Scholar – Dr. Jérémie Fages (Dr. P. Billon)
Ohlson Scholar – Dr. Ayan Chanda (Dr. P. Bose)
Charbonneau Scholar – Dr. Anita Brobbey (Dr. C. Peters)

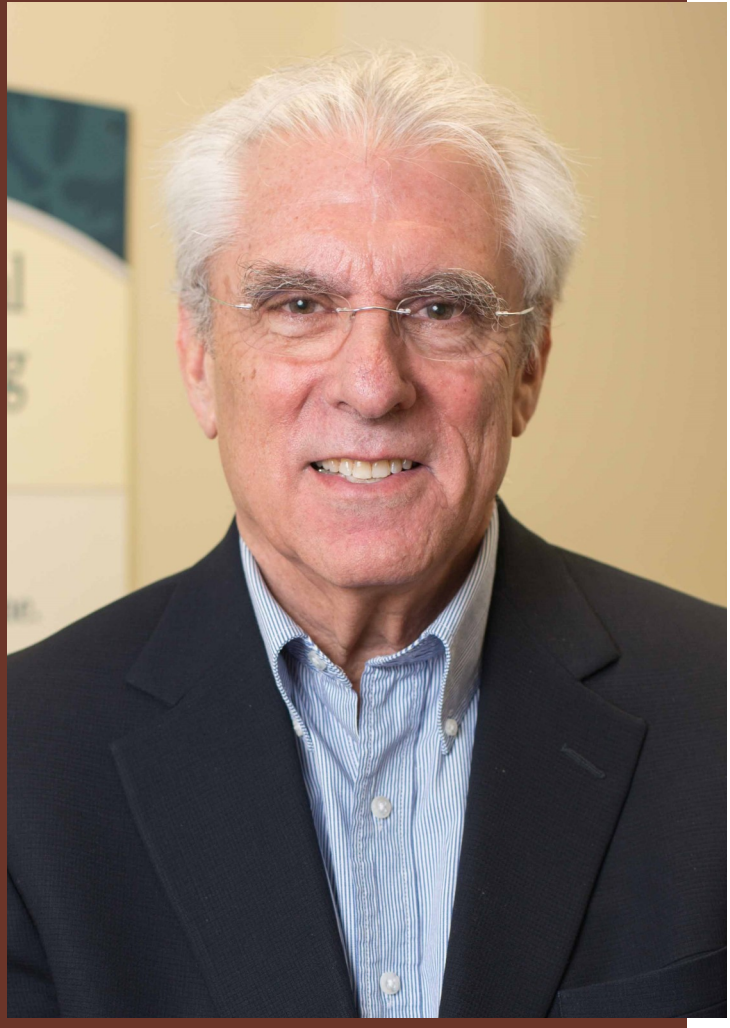
The Izaak Walton Killam Doctoral Scholarship
Julie Deleemans (Dr. L. Carlson)

2021 Howard Research Excellence Awards
Dr. Aditya Mojumdar (Dr. J. Cobb)
Dr. Dylan O'Sullivan (Dr. D. Brenner)
Dr. Dustin Pearson (Dr. A. Goodarzi)
Victoria Armstrong (Dr. O. Bathe)
Robert Basmadjian (Dr. D. Brenner & Dr. W. Cheung)
Sara Cho (Dr. F. Schulte)
Natasha Cholowsky (Dr. A. Goodarzi)
Amy Frederick (Dr. M. Roumeliotis & Dr. S. Quirk)
Alexandra Guebert (Dr. S. Quirk & Dr. T. Meyer)
Karys Hildebrand (Dr. M. Monument)
Jesse Irvine (Dr. A. Goodarzi)
Selim Khan (Dr. A. Goodarzi)
Mariel Kleer (Dr. J. Corcoran)
Joseph Madamesila (Dr. E. Tchistiakova & Dr. N. Ploquin)
Dr. Sarej Moradi Fard (Dr. G. Williams & Dr. J. Cobb)
Justin Simms (Dr. A. Goodarzi)
Kailyn Stenhouse (Dr. P. McGeachy & Dr. M. Roumeliotis)
Liam Sutherland (Dr. D. Brenner)
Devin Van Elburg (Dr. T. Meyer & Dr. M. Roumeliotis)

FACULTY AWARDS AND RECOGNITION

Dr. Barry Bultz Appointed an Officer of the Order of Canada

Dr. Bultz, the Daniel Family Leadership Chair in Psychosocial Oncology and Professor and Head of the Division of Psychosocial Oncology at the Cumming School of Medicine was recognized for his dedication to identifying and treating distress, 'the Sixth Vital Sign', in patients with cancer.



Appointments to the Order of Canada are given by the Governor General to Canadians "whose service shapes our society, whose innovations ignite our imaginations, and whose compassion unites our communities." in 2021, Dr. Bultz was recognized for his 40+ years of dedication to understanding cancer -related distress in patients and supporting them to live well with cancer". As a result of his work, distress is now something that Alberta's cancer system routinely screens for in patients, to ensure they receive timely support. His work has led to an uptake in the recognition of and screening for cancer-related distress across the globe.

Dr. Bultz holds the Daniel Family Leadership Chair in Psychosocial Oncology and is Professor and Head, Division of Psychosocial Oncology, at the Cumming School of Medicine. He founded the Department of Psychosocial Oncology at Tom Baker Cancer Centre in Calgary in 1981. Dr. Bultz co-founded and was the Past President of the Canadian Association of Psychosocial Oncology and served as President of the International Psycho-Oncology Society from 2012-2014. He was awarded the Alberta Order of Excellence in 2016 .

Researchers Recognized for Excellence in Cancer Research

At the 2021 Alberta Cancer Research Conference, Drs. Gregory Cairncross, Linda E. Carlson, Marco Gallo, and Darren Brenner, were recognized with Alberta Awards for Excellence in Cancer Research

Alberta Lifetime Contribution in Cancer Research Award: **Dr. Gregory Cairncross, MD**
Dr. Cairncross was celebrated for his discoveries in neuro-oncology, for enhancing the cancer research landscape, and for significantly benefiting those affected by cancer.

Alberta Oncology Research Excellence Award: **Dr. Linda Carlson, PhD**
Dr. Carlson was recognized for her leadership in psychosocial and integrative oncology, having established screening for distress, and the first mindfulness meditation program for cancer survivors worldwide.

Alberta Early Career Award in Biomedical Cancer Research: **Dr. Marco Gallo, PhD**
Dr. Gallo was recognized for leading a highly interdisciplinary research group focused on developing new treatments for brain cancers.

Alberta Early Career Award in Oncology Research: **Dr. Darren Brenner, PhD**
Dr. Brenner was recognized for his research is focused on the intersection of lifestyle, genetics and molecular pathways in the development of cancers.

FACULTY AWARDS AND RECOGNITION

Recognizing Remarkable Leadership and Impact in Cancer Research and Care

Dr. Janice Pasieka receives the Oliver Cope Meritorious Achievement Award of the American Association of Endocrine Surgeons

Internationally renowned surgeon Janice L. Pasieka, MD, received the Oliver Cope Meritorious Achievement Award from the American Association of Endocrine Surgeons (AAES) in 2021. The Cope Award, which is the highest acknowledgement by the AAES, has been given only nine times before. The ceremony took place in April 2021, during the annual meeting. The American Association of Endocrine Surgeons wrote in their coverage of the event, "The change we all need toward a more human cultural paradigm owes much to role models like Dr Pasieka. Her leadership, integrity, vision, productivity, and generous mentorship, as well as her feisty loyalty, are truly extraordinary. She is a genuine AAES giant."

Dr. Paola Neri receives the Ken Anderson Young Investigator Award from the International Myeloma Society

Dr. Paola Neri interrogates the myeloma genome to elucidate mechanisms of drug resistance to anti-MM agents, identify druggable therapeutic targets, and discover new biomarkers of response to novel agents. In September 2021, she was recognized for her outstanding contribution to bench from bedside research in multiple myeloma and was awarded the Ken Anderson Young Investigator award virtually at the International Myeloma Workshop held in Vienna.

Dr. Neri's work has already impacted the field and her continued contributions will play a significant role in the coming years to achieve discoveries and make important advancements that will benefit patients with multiple myeloma.

Success in Canadian Institutes of Health Research (Federal) Funding Reaches an All-Time High for Cancer Researchers

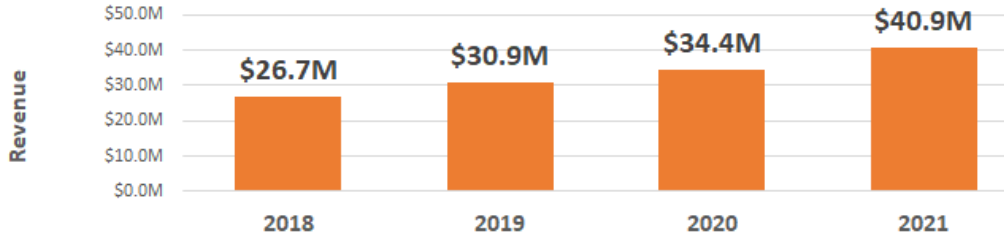
Charbonneau Members were principal investigators on 17 Canadian Institutes of Health Research (CIHR) federal grants awarded in 2021, representing over **$18M** in new funding over the next 4-5 years. In the CIHR Project Grant competition announced this past spring, Charbonneau researchers achieved a success rate of 41%, more than twice the national average of 15%.

These prestigious, highly competitive grants went to the following Institute members in 2021.

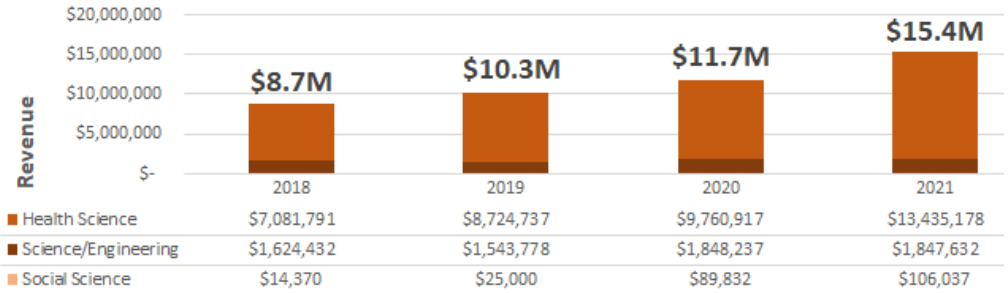
- **Tavis Campbell**, PhD | Online intervention to improve protective behaviours against COVID-19
- **Linda Carlson**, PhD | A smartphone app-based mindfulness intervention for cancer survivors
- **Winson Cheung**, MD, MPH | Chronic opioid use in cancer patients
- **Jennifer Cobb**, PhD | Dyskerin in DNA double-strand break repair
- **Jennifer Cobb**, PhD | Nej1 in double-strand break repair pathway choice
- **Miranda Fidler-Benaoudia**, PhD | Adolescents and young adults becoming physically active after cancer
- **Aaron Goodarzi**, PhD | Novel bio-dosimetry to measure personalized, lifetime radon gas exposure
- **Frank Jirik**, PhD | A putative mouse model for 'STING-associated vasculopathy with onset in infancy'
- **Karen Kopciuk**, PhD | Cancer Screening, Outcomes and Experiences among Métis People in Alberta
- **Ki-Young Lee**, PhD | L-asparaginase-induced mechanisms of acute lymphoblastic leukemia apoptosis
- **Michael Monument**, MD | Harnessing STING activation for the treatment of sarcoma
- **Cheryl Peters**, PhD | The impact of sex and gender in occupational disease prevention
- **Karl Riabowol**, PhD | ING1a mechanisms of cell senescence
- **David Schriemer**, PhD | Modeling of a master end-sensing synapse in double-strand break repair
- **Shane Sinclair**, PhD | Compassion training for healthcare providers caring for older adults
- **Yuan Xu**, PhD | EMR-based algorithms to identify hospital adverse events

REVENUE FROM GRANTS AND DONATIONS

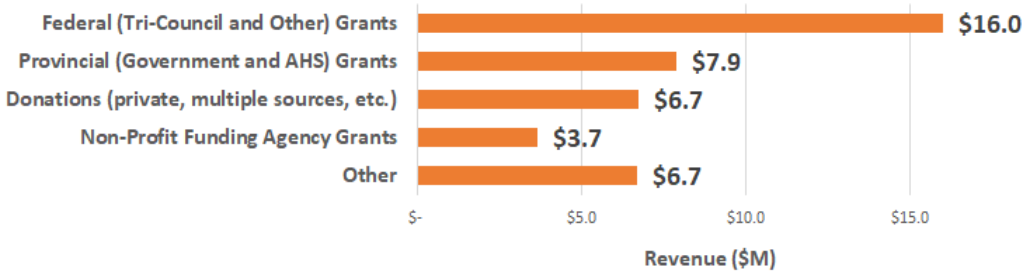
Annual Trend in Cancer Research Revenue at the University of Calgary



Annual Trend in Tri-Council (Federal) Grants as a Component of Cancer Research Revenue



Cancer Research Revenue at the University of Calgary in 2021, by Source



Source: Office of Faculty Analytics, Cumming School of Medicine

Thank You to Our Generous Community

Institute programs and members were pledged **$9 million** in new donations in 2021. Several new gifts from our community have supported research on:

- Cancer immunotherapy
- Lung cancer prevention and treatment and training in lung cancer
- Novel therapeutics for glioblastoma
- Cancer data platform
- Head and neck cancer research
- Childhood cancer research
- Multiple myeloma research
- Other important prevention, treatment, and patient-focused research

A statement for the Institute's $1.2M annual operating fund is provided below.

Statement of Operations	**2021 Actuals**
Revenue	
Charbonneau endowment and unrestricted gifts	$1,100,000
Cumming School of Medicine allocation	$51,000
Cost recovery for facilities and equipment usage	$83,000
TOTAL REVENUE	**$1,234,000**
Expenses	
Research	
Laboratory/equipment services, repair, upkeep	$140,800
Investigator support and start-up	$182,200
Infrastructure leveraging (e.g., CFI backstops)	$92,200
Pending commitments for new programs and start-ups	$150,000
Education	
Fellowships, awards, stipends, activities	$71,100
Pending commitment for cancer research symposium	$20,000
Public outreach and communications	$22,200
Office and facilities staff salaries and supplies	$460,600
TOTAL EXPENSES	**$1,139,100**
Re-Investment in Research and Education for 2022	**$94,900**

ACKNOWLEDGEMENTS

Charbonneau Strategic Advisory Board

Ms. Gail O'Brien (Chair)
As a Director of the Gairdner Foundation, Chair of Children First Canada, and past Trustee of SickKIds and Director of SickKids Foundation, Ms. O'Brien has devoted herself to the not-for-profit sector focusing on children, medicine, and arts from across Canada.

Mr. Marvin Romanow
Mr. Romanow is a Corporate Director, Executive in Residence at the Univ. of Saskatchewan, and past President and Chief Executive Officer of the oil and gas company, Nexen Inc.

Ms. Chanel Avarello
Ms. Avarello is a lawyer and supports charitable organizations that deal with cancer research and the reduction of gender-based violence.

Ms. Kate Fischer
Ms. Fischer brings more than 15 years of experience in Canada and abroad in governance, compliance, corporate law, and commercial law. Currently, she is the Director, Compliance for AltaGas Ltd., where she leads global compliance and supports ESG plans. She lends her time to many charitable and community initiatives.

Mr. Keith MacPhail
Mr. MacPhail is a director of NuVista Energy Ltd. and previously served as a director of Bonavista Energy Corp. He was appointed as a Member of the Order of Canada in 2019.

Mr. Kamil Umar
Mr. Umar is a business-minded lawyer focusing on commercial real estate. He began his legal career on Bay Street in Toronto, worked at a national firm in Calgary and then joined Bishop & McKenzie's Calgary office where he is currently a partner. When he's not practicing law, Kamil is passionate about mentorship and spending time with his family.

Mr. John Ross
Mr. Ross is the president and founder of ReportBack, a company dedicated to simplifying how we consume digital data for the purposes of taking action. Previous to his role at Report-Back, John founded Alberta Branded (a small retail clothing company). He graduated from St. Francis Xavier University and continues to broaden his horizons through online courses.

Ms. Heather Culbert (on leave)
Ms. Culbert co-chairs OWN.Cancer.

Mr. Arif Hirani
Mr. Hirani has 20 years in human-centric strategy and design. He's the Head of Client Engagement at Evans Hunt, a full service digital agency. Arif has lived in Calgary for 40 years, has a BComm from the UofC, and sat on the board of Calgary Pride from 2019 to 2021.

Mr. Paul Wright
Mr. Paul Wright is a Professional Engineer (Mechanical). Mr. Wright is originally from Gander, New-foundland and moved to Calgary in 1985. He has been an owner and director of a junior oil and gas company since 1991. Mr. Wright is also a licensed land agent in the Province of Alberta.

Dr. Don Morris
Medical Director, Tom Baker Cancer Centre; Head, Dept. of Oncology

Ms. Janelle Wakaruk
Executive Director of Development, Cumming School of Medicine

Dr. Jennifer Chan (ex officio)
Director, Charbonneau Cancer Institute; Associate Professor, Pathology & Laboratory Medicine

Thank you to our outgoing members for their thoughtful guidance, time, and talents:

Mr. Tony Smith **Mr. Allan Ross** **Ms. Sharon Siebens**

Calgary Cancer Research Leadership Group

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Tom Baker Cancer Centre
Dr. Don Morris

Executive Director,
Tom Baker Cancer Centre
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Cancer Care Alberta, AHS
Dr. Paula Robson

Executive Director,
Cancer Research & Analytics, AHS
Ms. Amanda Davison

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Charbonneau Cancer Institute
Dr. Jennifer Chan

Associate Director, Strategy & Partnerships, Charbonneau Cancer Institute
Ms. Melissa Shea-Budgell

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Dr. Savraj Grewal

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Dr. Savraj Grewal

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Ms. Shilpa Salgia

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Education and Trainee Development:
Dr. Jennifer Corcoran
Dr. Gareth Williams

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Dr. Paola Neri

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Ms. Melissa Shea-Budgell

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Ms. Carmen Coelho

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Xu, Yuan
Yang, Hua
Yang, Lin
Yong, V Wee
Zhang, Qingrun
Zheng, Xi-Long

For Jane and Tony Smith

The generous giving by the Smith Family to the Clark Smith Brain Tumour Centre will be forever remembered.

Tom Baker Cancer Centre

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