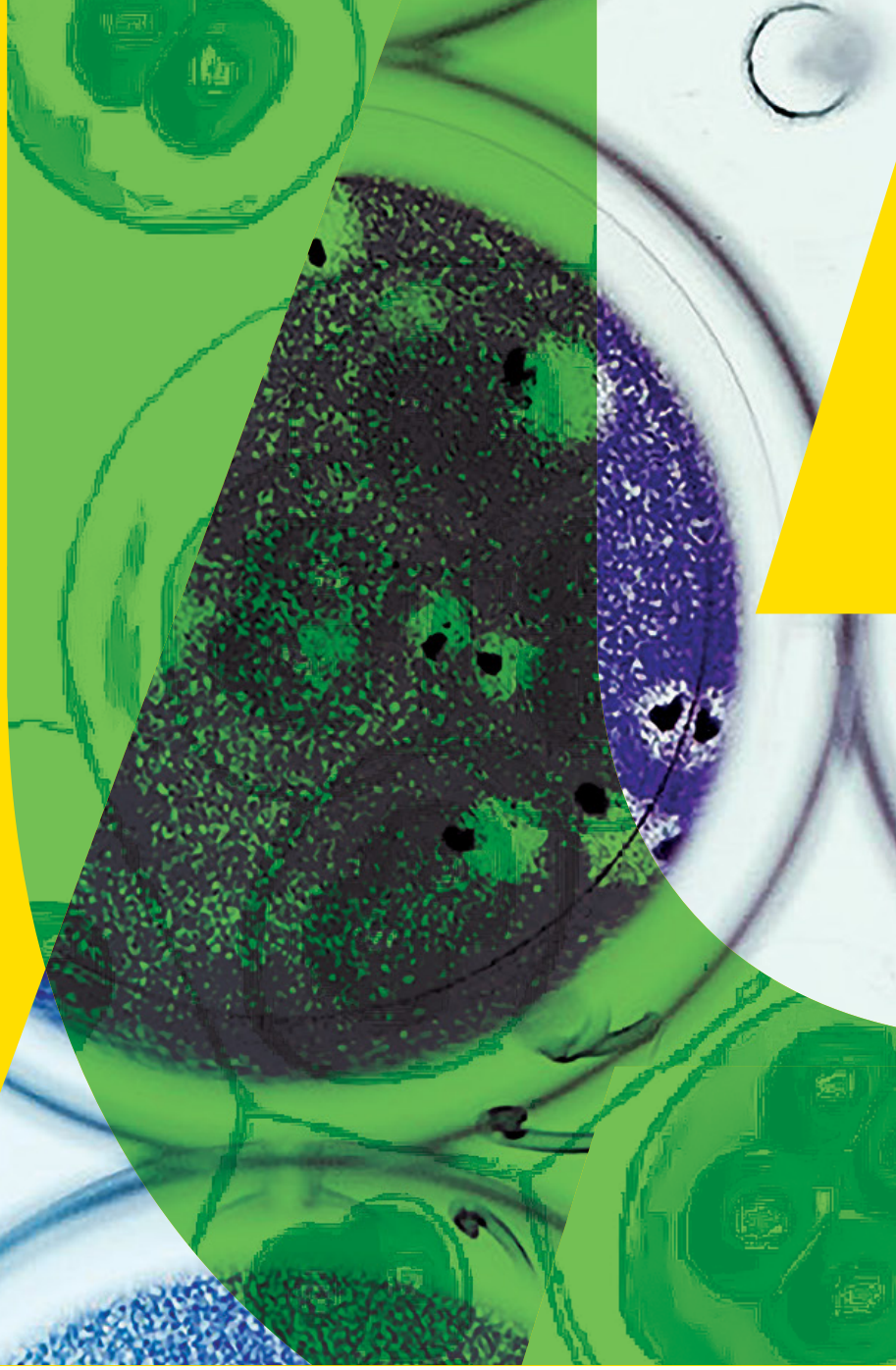

UNIVERSITY OF ALBERTA

2026

Lilian McCullough Chair in Breast Cancer Research

Dr. Ing Swie Goping | 2026 Chair Report
Faculty of Medicine & Dentistry, Department of Biochemistry

The University of Alberta respectfully acknowledges that we are located on Treaty 6 territory, a traditional gathering place for diverse Indigenous peoples including the Cree, Blackfoot, Métis, Nakota Sioux, Iroquois, Dene, Ojibway/Saulteaux/Anishinaabe, Inuit, and many others whose histories, languages, and cultures continue to influence our vibrant community.

A special thank you

Dr. Ing Swie Goping

The tireless support of the McCullough family inspires me. Their incredible generosity embodies how teamwork, community, and relationship-building make for a better tomorrow. With this guiding vision, my team and I are dedicated to tackling fundamental problems in breast cancer, building broad multidisciplinary research teams, creating collaborative platforms to strengthen our research community, and supporting the next generation of breast cancer researchers.

Thank you!

Dr. Goping is a member of the Cancer Research Institute of Northern Alberta (CRINA) and the Women's and Children's Health Research Institute (WCHRI).

Overview

Our research is driving the next generation of personalized breast cancer treatments, tailored to each patient's unique molecular profile. By bringing world-class expertise in genetic and molecular analysis to patients in Edmonton, we are uncovering the mechanisms that shape how each tumour behaves and responds to therapy.

We are building powerful new platforms and model systems that enable bold, innovative investigations and fuel multidisciplinary collaboration across the breast cancer research community. At the same time, we are training emerging scientists and strengthening global research capacity, ensuring that the advances we make today will translate into better, more precise care for patients around the world.

Impact + Outcomes

I am thrilled to share the following highlights from the past year.

BAD protein equals good results

We are advancing knowledge of how breast cancer cells migrate and cause metastasis. Our team uncovered a biological pathway that promotes the spread (metastasis) of breast cancer. Within this pathway, we identified a key enzyme, BAD, that, when active in a specific form, can block breast cancer invasion in animal models. BAD is best known as a cell death activator that regulates cell survival and programmed cell death, but in our studies, it also triggered a powerful, multi-pronged anti-tumour response. This protein transitions between phosphorylated and unphosphorylated states to act as molecular "on/off" switches. Phosphorylation (adding a phosphate group) alters a protein's shape and charge, turning its function on or off, while dephosphorylation (removing it) resets it. We found that BAD in the unphosphorylated state activates strong anti-tumour activity.

Phosphorylation can dramatically change a protein's structure and function. In breast cancer, patients with high levels of phosphorylated BAD have very poor outcomes, while those with unphosphorylated BAD do much better. This prompted us to search for drugs that could shift BAD from its phosphorylated to unphosphorylated state. In the lab, we found that inhibiting the kinase ERK1/2 increased unphosphorylated BAD and reduced tumour invasion, suggesting that targeting ERK1/2 in patients with high phosphorylated BAD may offer a promising new treatment strategy. These findings were published in several high-impact journals (Githaka et al., 2025, *Oncogene*; Githaka et al., 2025, *Communications Medicine*).

Guiding therapy using 3D technology

Our team is sequencing tumours from Alberta breast cancer patients and helping power a national effort to understand cancer at its most basic, molecular level. By reading each tumour's unique genetic and molecular "fingerprint," we can start to see why one patient's cancer behaves differently from another's.

We have created 3D "avatars" of patients' tumours—tiny living models grown from their own cancer—to test how each tumour responds to different treatments. These avatars can be grown and studied within weeks and used to compare multiple therapies side by side. Together, they form a shared biobank that researchers at the University of Alberta and across Canada are already using to drive discoveries and design more personalized care.

With your support and competitive grants, this work is ongoing and expanding. Every donated tumour sample adds to our biobank and data resources, bringing us closer to truly personalized breast cancer treatment, where therapies are chosen based on how an individual patient's tumour is most likely to respond.

We characterized this 3D culture system in the *Journal of Proteome Research* and contributed to a pan-Canadian precision oncology initiative published in *Cancer Cell*. Our team has also received grants from the U of A's Faculty of Medicine & Dentistry and

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- Dr. Ing Swie Goping

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Publications

the Terry Fox Research Institute–Marathon of Hope Cancer Centres Network to further analyze and molecularly characterize these models.

Fostering Collaboration

We continue to develop new collaborations and expand our colleagues' research scope. Recently, we worked with Dr. Roseline Godbout (Faculty of Medicine & Dentistry) on a study exploring a strategy brain glioblastoma cells use to migrate. These cancers use a subcellular structure called a microtube to extend protrusions. The molecular mechanisms were shown to involve the proteins FABP7, PKC and GAP43. Knowing the molecular players may help identify drug vulnerabilities. Our findings were published (Choi et al., 2025, *Neuro Oncol*).

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Trainees

Trainees

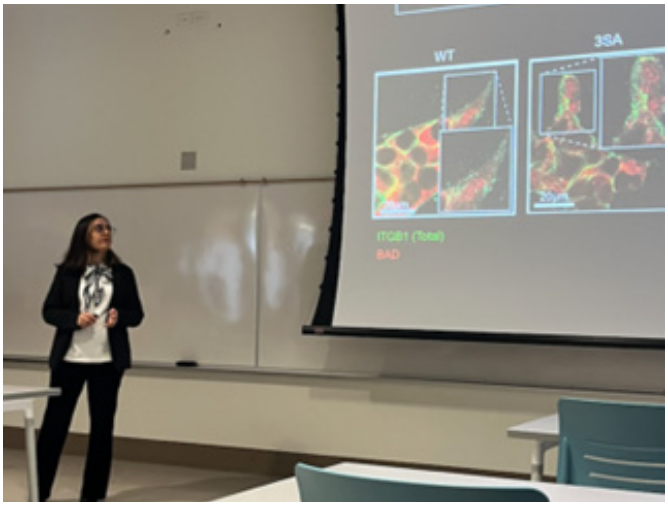
We have a robust training environment for undergraduate, graduate, and postgraduate learners, and I mentor them all the way to Faculty and leadership positions.

In the past year, our team included six trainees, and I am thrilled to share our team's major accomplishments.

Leila Pirayeshfard, a doctoral student, successfully defended their thesis, and our research associate, Dr. John Githaka, took a position as Service Assistant Professor and Director of the Organoid Core at the University of West Virginia, U.S.

Public Presentations and Community Connections

Presenting our research is important for disseminating discoveries, sharing and gaining multidisciplinary insights, and fostering collaborative projects. I was the keynote speaker at the Saskatchewan Cancer Research Conference and an invited speaker at the Northern Alberta Breast Conference. These meetings fostered collaborations and knowledge exchange between fundamental scientists and breast cancer clinicians.



Public PhD thesis presentation from graduate student Leila Pirayeshfard (left). PhD examining committee photo after the successful thesis defense from Dr. Leila Pirayeshfard (right).

Community engagement is also an important educational forum for sharing breakthroughs, listening to and incorporating cancer patients' perspectives in our research, and embracing support and gratitude from our collective community.

- Our research work was featured in the University of Alberta *Folio* and *New Trail* publications.
- My team hosted a lab tour for the Canadian Cancer Society, where we shared our research highlights and patient/survivor/caregiver experiences.
- I was a panel member at an educational outreach event hosted by the Telus World of Science, called Science on Tap: Understanding breast cancer, a public gathering with fellow panel members who were researchers, breast cancer surgeons, and breast cancer patient survivors.

Expert panel during educational community event organized by the Telus World of Science "Science on Tap: Understanding breast cancer."

What's next?

I will continue to lead efforts to expand breast cancer research and collaborations across the Faculty of Medicine & Dentistry and the Cancer Research Institute of Northern Alberta. By leveraging matching funds — including the Lilian McCullough Chair research funds — we can secure competitive external grants and strengthen collaborative projects.

A key driver of this growth is our patient-derived organoid (PDO) biobank. Few groups at the University of Alberta initially used PDO models, and ours was the only team applying them to breast cancer. Since establishing this living biobank, we have enabled at least nine collaborative projects, some of which have secured external funding. By sharing PDO materials, high-dimensional sequencing data, and methodological and analytical expertise, we will continue to support multidisciplinary teams within and beyond the U of A, broaden access to this powerful model system, and accelerate the development of new treatment options for patients.

Leading with Purpose.

UNIVERSITY OF ALBERTA

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