

Insights from the Network

My Manitoba homecoming: launching a cell therapy lab at the nexus between stem cell and cancer research

By Dr. Yale Michaels

Principal Investigator, CancerCare Manitoba Research Institute; Assistant Professor, University of Manitoba

In April, [my lab officially opened at the CancerCare Manitoba Research Institute](#). Looking at the empty benches, I felt proud to start a job I had been working towards for years and excited about the scientific opportunities ahead. I also felt a sense of responsibility for the resources that had been entrusted to me and for the trainees that would soon join the team. But my most palpable reaction was the feeling of returning home from a long journey.

My research career began in junior high school when I started volunteering in the Department of Zoology at the University of Manitoba. While the work was not always glamorous — I spent much of my time mouth-pipetting zebrafish embryos — it was a wonderful exposure to scientific research. I benefitted tremendously from the mentorship of Gunnar Valdimarsson, a kind, intelligent and patient professor who was brave enough to let a 13-year-old into his otherwise-orderly laboratory. The following year, when Gunnar learned that I was interested in Cancer research, he helped me land a volunteer position with David Eisenstat, and subsequently Geoff Hicks, at CancerCare Manitoba.

In the four years I spent volunteering at CancerCare, I learned the basics of cellular and molecular biology, I learned about experimental design, and I learned how to communicate scientific concepts in an accessible way. I also learned science was more than an interest for me, it was a passion. To pursue this passion, I moved from Winnipeg to Cambridge to complete a bachelor's degree at Harvard University.



**Dr. Yale Michaels, CancerCare
Manitoba Research Institute**

The next stop on my long return journey to Manitoba was in Oxford where I undertook a Ph.D. with Tudor Fulga. At the time, genome engineering had recently experienced a major breakthrough with the adoption of the CRISPR/Cas9 system and mammalian synthetic biology was rapidly gaining momentum. The Fulga lab provided great exposure to these technologies. Seeking to harness these engineering tools to improve human health, I joined Peter Zandstra's lab at the University of British Columbia as a postdoc in 2019. During my time in the Zandstra lab, I learned about the vast potential for pluripotent stem cells to provide a renewable, cost-effective supply of cells and tissues for regenerative medicine. Genetically engineered immune cells have a proven track record of successfully treating otherwise-refractory blood cancers. However, obtaining and genetically engineering immune cells from donors in a sterile environment is incredibly expensive, with a single dose of immune cell therapies pricing in at approximately \$500,000. In the Zandstra lab, I helped develop an improved method for producing immune cells from pluripotent stem cells, helping to enable a more affordable source for anti-cancer therapy.



Shortly after completing this project at UBC, I was thrilled to take an independent position at CancerCare Manitoba, giving me the opportunity to do exciting and impactful research, and train the next generation of scientific leaders in the place where my own career got a major boost a decade-and-a-half prior. The vision for my lab is to combine the immune cell differentiation platform that I developed in my postdoc with the cellular engineering tools I harnessed as a Ph.D. student, to create safe, effective, and affordable cell therapies for cancer and immune disease.

Having worked in large scientific hubs, it is tempting to assume that Canadian stem cell research orbits around centres of gravity like Toronto and Vancouver. After all, it was in Toronto where Till and McCulloch first demonstrated the existence of stem cells, and Vancouver is home to STEMCELL Technologies, the nation's largest biotech company.



However, there is also a treasure trove of outstanding research at the scientific nexus of cancer and stem cells here in Manitoba, which, fittingly, is the geographic nexus of Canada's east and west. Within CancerCare Manitoba, Jody Haigh's lab has helped pioneer a reversible reprogramming system to achieve cardiac regeneration in mice. Additionally, the Haigh lab, and Cedric Tremblay's lab, are carrying out ground-breaking research on the gene expression programs that control healthy and leukemic haemopoietic stem cell identity.

At the University of Manitoba, Tamra Werbowetski-Ogilvie's group has performed dogma-altering studies on the stem cell origins of medulloblastoma and Brad Doble's team are world leaders in understanding Wnt signalling in pluripotent stem cells and cancer. In addition to the strengths of these individual research groups (and this list is nowhere near exhaustive), the middle province also benefits from a distinct sense of collegiality and collaboration. As Brad Doble aptly put it "we all need each other to function". There are also local funding sources available for trainees and for investigators. I am deeply grateful to have support from the CancerCare Manitoba Foundation. These funds, together with grants from the Stem Cell Network, are empowering my lab's research program.

Beyond doing great science, each of the aforementioned Manitoba-based stem cell investigators has given their time and wisdom to help me in a meaningful way as I work to setup my lab. As a high school student, I benefitted immeasurably from the support, generosity and mentorship of Manitoba researchers. While regenerative medicine and cancer research have made incredible progress over the past 14 years, I am pleased to see that some things have not changed.

