Ontario is a dynamic centre for stem cell and regenerative medicine exploration. It was in Ontario where Drs. James Till and Ernest McCulloch discovered transplantable stem cells in 1961. Since then, scientists in the province have made critical advances in vision loss, neural and skin repair, and cardiovascular disease research. Since 2001, the Stem Cell Network (SCN) has provided more than $35.6M towards research in Ontario, with $9.6M allocated between 2016 and 2022. SCN investigators in Ontario have also leveraged over $12.8M in partner contributions in that same period. This investment will see new therapies move towards the clinic in the coming years.
Blazing the Trail

SCN’s Innovation Research Program for Early Career Investigators (ECI) supports early-career investigators to develop a stem cell research program with a regenerative medicine focus. Dr. Amy Wong at The Hospital for Sick Children is quickly becoming a leader in the field of cystic fibrosis (CF) research. Dr. Wong, who was recently awarded with an ECI grant, is one of seven women to have received the award in Round 2 funding.

A relatively common genetic disease, CF causes difficulties in breathing and recurrent lung infections which limits and ultimately shortens the lives of children, many before they reach adulthood. Current treatments can be extremely expensive, and some are not even available to younger children. Early intervention in treating the disease can be beneficial to prevent long-term lung damage however further understanding is still required to know how to best target the many different CF genetic mutations which cause the disease.

In 2012 Wong was first to successfully generate human lung tissue in the petri dish derived solely from pluripotent stem cells. Pluripotent stem cells generated from individuals with CF capture the patient disease-causing mutations and serve as a starting point for generating the lung tissue needed for understanding CF disease onset and progression. With the development of additional models, Wong and her team are working to better understand how a defect in CFTR expression, the receptor that is mutated in CF, can impact normal development and long-term lung functions that impact therapy outcomes. The team envisions that early treatment of CF lung disease will translate to meaningful therapeutic outcome that improves the health, economic and social welfare of the patient and benefits our Canadian healthcare system.

Stem cells are our bodies’ building blocks and our master healers. Because stem cells can repair tissues and organs, they are powering the field of regenerative medicine, offering new ways to improve quality of life for patients and reduce the health care burden.

There is enormous potential for stem cell therapies to treat chronic diseases and debilitating illnesses such as:

- Alzheimer’s
- Crohn’s disease
- Liver disease
- Respiratory diseases
- Blood disorders
- Diabetes
- Muscular dystrophy
- Septic shock
- Brain injury
- Heart disease
- Multiple sclerosis
- Vision impairments

The Stem Cell Network is Canada’s foremost stem cell research organization. It is committed to working with researchers from coast to coast to get new therapies and medicines to market and to those who need them most.
Disrupting the Field

Regeneration Capacity

Limb or organ regeneration is relatively common among some invertebrate species of animals, such as salamanders and lizards, sea cucumbers and starfish. Mammals are not so lucky in this respect, where regeneration is limited to the ends of fingers and toes. While the regeneration process in these invertebrates has been well studied, much less is known about how the process works in mammals. Neemat Mahmud, a PhD candidate in the Freda Miller lab at The Hospital for Sick Children (SickKids) in Toronto, is adding to this vital regenerative knowledge through her study of the types, origin and particular characteristics of the cells found in the digit tips of injured and uninjured mammals.

Ms. Mahmud was the recipient of the 2019 Drew Lyall Award of Excellence for her discovery that the cells responsible for regeneration can be found in the digit tips of injured mice and that they are different from those normally found in an uninjured digit. Mahmud’s award-winning research also showed that these regenerative cells were activated only in the presence of an injury and were responsible for the generation of new bone and skin tissues. Such work may one day lead to new strategies to help humans and other mammals recover or heal from severe injuries or disease.

Innovation at Work

Leading stem cell researcher and SCN’s CEO & Scientific Director, Dr. Michael Rudnicki, O.C., FRS, FRSC, has a bold vision to more effectively regenerate muscle tissue, and which formed the impetus for the creation of the biotech company Satellos. Effective muscle repair requires resident stem cells to successfully balance the production of new muscle tissue with replenishment of the stem cell pool. However, this process can become imbalanced by injury, chronic illness, disease or aging, effectively impairing muscle regeneration and function. Satellos’ novel platform uses a pharmacologic approach to restore this balancing act for greater muscle repair and healing. Their current primary area of focus is to restore muscle regeneration in a rare disease known as Duchenne Muscular Dystrophy (DMD) and their initial preclinical studies have demonstrated that their approach can restore the balance between stem cells and the functional progenitor cells resulting in enhanced muscle architecture and functional benefit. This Canadian technology has the potential to enhance regeneration for the treatment of a range of neuromuscular diseases, including DMD.
SCN’s 2016–22 Ontario Partners

SCN’s partners provide important support for stem cell research. Partnerships are critical for ensuring high potential research is funded appropriately. In Ontario, SCN investigators have leveraged over $12.8M in partner contributions on the $9.6M provided by SCN between 2016-22. This investment will see new therapies move more rapidly towards the clinic in the coming years.

2016-22 Partners on SCN Research based in Ontario include:

- AstraZeneca
- BioSpherix
- BioSymetrics
- Birmingham Foundation
- BlueRock Therapeutics
- Canadian Critical Care Trials Group (CCCTG)
- CellCAN
- Centre for Heart Lung Innovation-UBC
- Encellin Inc
- ExCellThera
- Fighting Blindness Canada
- Heart & Stroke Foundation Canada
- The Hospital for Sick Children
- McMaster University
- Medicine by Design (UofT)
- Molly Towell Perinatal Research Foundation (MTPRF)
- Monkman Donation
- Multiple Sclerosis Society of Canada
- Notch Therapeutics
- Novartis
- Ontario Institute for Cancer Research (OICR)
- Ontario Institute for Regenerative Medicine (OIRM)
- Ontario Research Fund (ORF SCORR)
- Ottawa Hospital, Ottawa Hospital Research Institute, Ottawa Hospital Foundation
- Ottawa Methods Centre
- PanCELLa
- Polyplus
- Queen’s University
- St. Michael’s Hospital - Hummel & Krembil Foundations
- Sunnybrook Research Institute
- Technische Universität Dresden
- Toronto Western Research Institute
- University of Alberta
- University of British Columbia
- University of Guelph
- University Health Network
- University of Ottawa
- Vascugen

The Stem Cell Network (SCN) is a national non-profit that supports stem cell and regenerative medicine research, training the next generation of highly qualified personnel, and delivering outreach activities across Canada. SCN’s goal is to advance science from the lab to the clinic for the benefit of Canadians. SCN has been supported by the Government of Canada since inception in 2001. This strategic funding, valued at $118M, has benefitted approximately 196 world-class research groups and over 3,300 trainees and has catalyzed 24 clinical trials.

*Tomorrow’s health is here.*

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