Stem Cell Network
Réseau de cellules souches

Catalyzing tomorrow's breakthroughs
Catalyseur de l'innovation

Stem Cell Network Submission to the House of Commons Standing Committee on Finance

The Stem Cell Network would like to thank the House of Commons Standing Committee on Finance for this opportunity to provide input into the 2016 pre- budget process and specifically address the theme: *What federal actions would assist Canada's businesses – in all regions and sectors – meet their expansion, innovation and prosperity goals and thereby contribute to economic growth in the country?*

Introduction

> *"Stem cell science was pioneered in Canada, and has the potential to be an iconic Canadian contribution to medical science."*
>
> *Dr. Michael Rudnicki, OC*
> *Scientific Director, SCN*

More than 50 years ago, Canadian researchers Drs. James Till and Ernest McCulloch first proved the existence of stem cells; their seminal studies launched the international field of stem cell research. Stem cells have the unique ability to develop into any cell and repair damaged and diseased tissues or organs. They hold great promise for the development of new therapies and treatments for diseases such as heart disease, diabetes and multiple sclerosis – diseases that take Canadians out of the workforce and out of active economic participation.

Supporting and building Canada's stem cell and regenerative medicine sector has been the *raison d'etre* for the Stem Cell Network (SCN) since its inception in 2001 as a Network of Centres of Excellence supported by the Government of Canada. Over the past 15 years, it has become Canada's premier research organization dedicated to enabling the translation of stem cell research into clinical applications, commercial products and public policy. SCN has built and supported the Canadian stem cell community, providing approximately $85 million for innovative translational research. By 2015, SCN supported over 130 world-class researchers and 2,500 trainees from across Canada. Additionally, SCN catalyzed 12 clinical trials and 11 start-up companies, leveraged more than $80 million in partner contributions and incubated several international and Canadian research networks and organizations.

Current SCN Activity

> *"…to further support Canadian strengths in this highly promising field, Budget 2016 proposes to provide up to $12 million over two years, starting in 2016–17, to support the Network's research, training and outreach activities."*
>
> *Growing the Middle Class, 2016 Federal Budget*

In March 2016 the Government of Canada made a multi-million dollar investment in stem cell research through the SCN, for two years, as a transitional measure. The community welcomes, and thanks the government for, this investment. Since receiving this support, the organization has moved quickly to flow the

funding to the research community through three research programs. SCN has since received approximately 100 applications to fund new research in areas such as kidney and heart disease, diabetes and breast cancer. Based on a rigorous peer review, SCN will fund only the best science. Its support will help move research out of the lab and closer to clinical application, thereby improving the health of Canadians.

The impressive number and strength of the research proposals SCN has received is a clear testament to Canada's stem cell and regenerative medicine excellence. This is a community at the leading edge of science and internationally competitive.

Moving Forward: The Health & Economic Imperative

Today, innovative countries such as Japan, the U.K. and the United States are all vigorously pursuing stem cell research and development in the hopes of leading the field globally. Like Canada, they recognize the power stem cells hold for improving health and lowering costs associated with the treatment and care of chronic diseases – including economic loss from workplace under-participation. In Canada, chronic diseases absorb 67 percent of all direct healthcare costs and their burden on the health-care system continues to outpace economic growth. Treating chronic disease costs a staggering $68 billion a year, 3.6% of GDP. However, this is a story that will change, as stem cell based treatments and therapeutics begin to enter the market place and are more commonly available to clinicians and patients.

There is enormous potential for the use of stem cell therapies for treating chronic diseases & debilitating diseases such as:

Parkinson's disease
Leukemia & other cancers
Crohn's disease
Respiratory diseases
Muscular dystrophy
Brain Injury
Kidney disease
Diabetes
Septic shock
Heart disease
Multiple sclerosis
ALS

Estimates suggest today's total global stem cell and regenerative medicine market, even in its infancy, is approximately $3.8 billion. With an annual growth rate of 21%, it is projected to grow past US$20 billion by 2025. Canada is well positioned to excel and compete in this market in the years ahead.

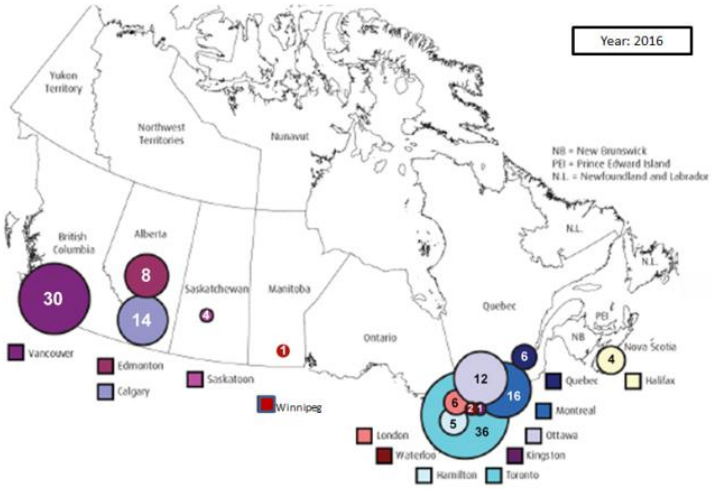
Stem Cell Research & Global Excellence

In March 2016 the federal government announced its intention to provide $800 million for innovative networks and clusters, starting in 2017-18. In stem cell research and regenerative medicine, Canada already has a strong and innovative national network to build on, with the combined expertise of SCN and the Centre for the Commercialization of Regenerative Medicine (CCRM), a federally funded centre of excellence for commercialization and research.

CCRM works with government, business and regenerative medicine experts to enable the commercialization of research discoveries that might otherwise never reach the marketplace and patients. CCRM connects researchers with business leaders and corporate partners to accelerate commercialization. CCRM also provides industry with access to state-of-the-art discoveries, facilities and expertise. Finally, they offer investors risk management and capital efficient product development.

SCN and CCRM, along with their partners, have developed an integrated, end-to-end national cluster that has the potential to compel economic growth over the next decade and make a real difference in the lives and health of Canadians.

Figure 1: SCN Research Network



In 2001, SCN supported 50 research groups across Canada. That number increased over time, and today that number stands at just under 150 research groups from coast to coast. (Figure 1). Those leading investigators are doing important work that will benefit patients in the foreseeable future. For example:

- Dr. Tim Kieffer and his team at the University of British Columbia have developed a protocol that can turn stem cells into insulin-producing cells in a matter of weeks. As a result, we are one step closer to having an unlimited supply of insulin-producing cells to treat patients with Type 1 diabetes. Dr. Kieffer's research has been supported by SCN throughout the years; he is one of the many health research superstars that Canada can claim as its own.

- Dr. Freda Miller from the University of Toronto, also supported by SCN, is best known for proving skin can be a viable source of stem cells. This ground breaking discovery opened the door to learning how to treat injured nervous systems, more specifically spinal cord injuries. Today, Dr. Miller and her team are conducting a promising clinical trial using the diabetes drug metformin to treat children with acquired brain injury following treatment for brain tumors. The results are promising and offer hope for clinical application.

- Drs. Harry Atkins and Mark Freedman from the Ottawa Hospital Research Institute had their major breakthrough for treating early, aggressive forms of multiple sclerosis published in *The Lancet* this June. The procedure uses stem cells and chemotherapy to eradicate MS in a small subset of patients. The results are promising and with more research could benefit a larger population of MS patients.

Canadian stem cell researchers are not only making important discoveries, they are also moving their findings into products and services to meet global demand and need. For example, Montreal and Toronto-based ExCellThera, started by two SCN investigators, is growing blood stem cells for therapeutic use, ensuring that greater numbers of cancer patients have access to blood stem cell transplantations. Vancouver-based STEMCELL Technologies employs more than 800 highly skilled workers (the majority based in Vancouver) to satisfy global demand for high-quality stem cell culture media. They offer more than 2,000 cell biology research tools. These two companies are just the tip of the iceberg; there is significant opportunity for further stem cell-based treatments, products and technologies to come to market.

An emerging area of demand is for facilities that focus on cell-therapy manufacturing, such as the new Toronto-based BridGE@CCRM. This $40-million partnership amongst CCRM, GE Healthcare and FedDev Ontario will result in a state-of-the-art facility that will accelerate the development and adoption of cell-manufacturing technologies that will ultimately improve patient access to novel therapies for chronic diseases and illnesses. Currently, there are seven facilities across Canada, all led by SCN investigators. While other countries, such as the U.S., are vying to become the leading global providers of cell therapies, Canada is well-positioned to establish and maintain a strong global position.

> *"The health of Canadians is a priority. We believe that supporting this new, world-class Facility will have significant benefits for innovative health-related technology in Canada and around the world."*
>
> *Prime Minister Trudeau on the announcement of the CCRM operated*

Supporting cell-manufacturing facilities, innovative biotech companies and labs requires highly skilled workers. SCN has played a critical role in training the next generation of stem cell and regenerative medicine researchers. Trainees have been able to learn about the latest scientific advances, how to identify research findings that have commercialization potential, and how to pursue clinical trials and ensure their goal directed work moves from bench to bedside. These are the individuals whose STEM skills will be

> *SCN's trainees have the STEM skills that will be critical in the years to come as S&T advances are made, resulting in new labour markets & economic opportunities.*

critical in the years to come as scientific and technological advances are made, resulting in new labour markets and economic opportunities.

Recommendation

To leverage past investments and build an innovative and globally competitive stem cell and regenerative medicine sector, sustained support from the Government of Canada is required.

SCN is proposing a modest and realistic federal investment of $50 million over five years that will be matched through research partnerships.

It is anticipated that SCN research projects with a product or market focus may be commercialized with support from CCRM, thereby seeing a further leveraging of the government's investment.

Federal funding will ensure that Canada is able to remain competitive in global science, encourage health innovation, facilitate economic growth within the sector and train the next generation of highly qualified personnel able to compete and succeed.

> *Through research advances more Canadians will be able to actively participate in the workforce, fulfill personal & career aspirations, and contribute to Canada's long-term productivity.*
>
> *Andrew McKee, Chair, Board of Directors, SCN*

Sustained funding will also allow SCN to continue to deliver on its mandate to *act as a catalyst for enabling the translation of stem cell research into clinical applications, commercial products and public policy*. A full suite of research programs that will move research from discovery to clinical application will be available, including programs that will support early career investigators who are just launching their research programs. It will also allow Canadian researchers to lead or participate in global research projects that have a socio-economic benefit for Canada. With sustained funding, proven programs that are leading to treatments for those with cancer, brain injury, MS, diabetes and many other chronic diseases or debilitating illnesses, will continue.

SCN has a proud history of bringing all facets of the research community together to collaborate and exchange knowledge, including those experts who focus on the most pressing ethical, legal, social and policy issues. With sustained funding, SCN will be well-positioned to continue this work, ensuring that both scientists and policy makers benefit from a deeper understanding and evidence base relevant to stem cell research and regenerative medicine.

Finally, a multi-year commitment will send an important message around the world that Canada recognizes the potential for stem cell research and regenerative medicine as an economic driver as powerful tool for treating and curing disease.

The key federal action that will help to support this emerging national sector is a sustained commitment for innovative, translational research in the area of stem cell research and regenerative medicine. A strategic focus in this area will help drive research out of the lab and into the clinic and market, leading to improved health, health system savings and economic benefits stemming from new companies, products and services.

Conclusion

Stem cell science was pioneered in Canada, and has the potential to be an iconic Canadian contribution to medical science. As an international S&T leader with a collaborative and multi-disciplinary approach for conducting research, Canada is well placed to lead, with the Stem Cell Network continuing to serve as a central vehicle for driving the sector, and achieving global science excellence.