



## BRIEF FROM ALS SOCIETY OF CANADA

### Executive Summary

The ALS Society of Canada (ALS Canada) is pleased to participate in the pre-budget consultation process, and appreciates the opportunity to share with the members of the House of Commons Standing Committee on Finance, our thoughts on the future of the Canadian economy. This submission addresses one of the key pillars for economic growth in Canada – a healthy population. Disease and illness are responsible for a significant amount of cost to the Canadian health care system and the Canadian economy.

Amyotrophic lateral sclerosis (ALS) is a fatal neurodegenerative disease and the most common motor neuron disease in adults. People living with the disease become progressively paralyzed due to degeneration of the upper and lower motor neurons in the brain and spinal cord. Most often, death is a result of the eventual paralysis of the muscles in the throat and diaphragm as the patient loses the ability to swallow, cough and breathe. In 90-95% of cases, ALS strikes people with no family history of the disease. It may occur at any age, with the risk increasing as people grow older; however, many people are struck down in the prime of life.

ALS has no known cure or effective treatment yet. For every person diagnosed with ALS, a person living with ALS dies. Approximately 2,500 - 3,000 Canadians currently live with this fatal disease. Eighty per cent of people with ALS die within two to five years of diagnosis.

The vision of ALS Canada is to make ALS a treatable disease by 2024. That vision can only be realized through a commitment to research. Outside of the Ice Bucket Challenge, on average, ALS volunteers raise \$1.5 million annually for ALS research, but we cannot achieve our goal without ongoing, dedicated government funding for ALS research.

Our recommendations are:

1. The federal government should invest \$25 million over five years (\$5 million per year) to maintain the momentum built through the Ice Bucket Challenge and partnership with Brain Canada and the Canada Brain Research Fund.
2. The federal government should invest \$10 million to allow every Canadian living with ALS (approximately 3000), and every stored sample from those who have passed, an opportunity to contribute their sample to Project MinE.

ALS Canada, founded in 1977, is the only national voluntary health organization dedicated solely to the fight against ALS and support for those with the disease. ALS Canada is the leading not-for-profit organization working nationwide to fund ALS research and, with the Provincial ALS Societies, we all work to improve the quality of life for Canadians affected by ALS.

## 1. Sustained Momentum for ALS Research

ALS research has come further in the past five years than the previous century. In 2016, most of the leading researchers and clinicians in the field believe we now have the tools required to understand how ALS is caused, which will ultimately lead to treatments for this fatal disease.

While hereditary ALS accounts for 5-10% of cases, our increased understanding and mapping of genes means that we have new tools to use in the laboratory, which will significantly advance our understanding of the disease. Most leading ALS researchers now believe the limitation to developing treatments in 2016 is merely the resources to study the new investigative opportunities. For example, of the 30+ genes that have been identified and mapped, many have yet to be examined in detail or explored by more than one research facility in the world. In fact, due to the need for prioritization of funding, the majority of research has been focused on the four most prevalent genetic mutations only, in hopes they will tell us enough about the disease to develop treatments.

Canada has an important opportunity to contribute to global research efforts and the search for treatment and cure, but government investment is required. Through the 2014 Ice Bucket Challenge, Canadians came together in an unprecedented way to support ALS research and care, resulting in \$17 million dollars being raised. \$11.5 million of those funds were dedicated to research and then matched \$10 million in a generous program by Brain Canada, as a conduit of the federal government's Canada Brain Research Fund. This \$21.5 million investment in ALS research represents the largest one-time investment in ALS research in history in Canada, but the momentum created with this investment is at risk of dissipating without ongoing funding to sustain it.

Every year (with the exception of 2014), ALS research in Canada is almost entirely supported by grassroots fundraising initiatives. However, the pool of funds that can be raised from the community is usually very small, given the small patient population, the personal financial burden and the fact that there is no survivor community. When compared to larger chronic diseases, like cancer and cardiovascular, which have a large patient population and survivor community, and corresponding fundraising activities, it becomes quickly apparent that fundraising to support research is not a realistic option for ALS. The low prevalence also makes ALS less attractive to pharmaceutical companies and makes competition for CIHR grants more difficult, all resulting in a need for directed support from other sources like the federal government. Due to a Canada Brain Research Fund allocation deadline of March 2017, the funds from the current partnership with Brain Canada will be fully invested by 2016 and the momentum that we have created will become difficult to maintain. Continuing these programs is critical to creating a world where ALS is a treatable disease.

The programs currently operating in the partnership with Brain Canada consist of:

- 1) Hudson Grants – bringing together teams of researchers from multiple institutions to tackle important aspects of ALS understanding and treatment (5-10 grants - \$20 million)
- 2) Discovery Grants – funding the best novel ideas to build a foundation of data – attracts outside-the-box ideas and investigators in other fields applying their expertise to ALS (30 grants - \$3 million)
- 3) Career Transition Awards – funding a scientist at a critical point in their career where they are working to become permanent contributing members of the Canadian ALS research community – the competition yields forward thinking, high impact applications (5 young researchers supported - \$2 million)



These three programs are designed to work together in an innovation pipeline to drive towards continuing the world-class Canadian impact on making ALS a treatable, not terminal disease by 2024. The tools discovered in recent years and can only be utilized to develop therapies as resources are available to pursue them. Discovery Grants fund the innovative understanding of how these things work at the laboratory level, Career Transition Awards are important to nurture young professors whose minds are driving the innovation and will be leaders in the field, and Hudson Grants will accelerate what we've already learned in the past five years into the clinic for development of first line therapies that will be further augmented in effectiveness by what comes next. ALS treatment is becoming much more about 'when' than 'if' and the 'when' will ultimately depend on the financial support to pursue recent breakthroughs.

### **Recommendation**

The federal government should invest \$25 million over five years (\$5 million per year) to maintain the momentum built through the Ice Bucket Challenge and partnership with Brain Canada and the Canada Brain Research Fund.

## **2. Position Canada as a leader in an innovative, global effort to understand the genetic causes of ALS**

Non-inherited (sporadic) ALS makes up nearly 95% of all ALS cases, but we are only starting to have the technology to study sporadic disease directly. Genetic studies of ALS, to date, have examined hereditary (familial) disease, identifying several gene mutations that can be passed on from parent to child. These gene mutations allow researchers to make cell and animal models of the disease to learn about how ALS is caused and develop treatments that will hopefully work for a large percentage of cases.

For the first time in history, the capability exists to feasibly identify the genetic signature underlying sporadic ALS, through whole genome sequencing (WGS), which ultimately provides a readout of every DNA base pair making up a human (3 billion pieces of DNA). The aim is to understand which genetic signatures (rather than just a single gene mutation) might confer ALS or make people in the 95% category of cases more susceptible to getting ALS.

Project MinE ([www.projectmine.com](http://www.projectmine.com)) is a ground-breaking, collaborative, multi-national effort to provide WGS for 15,000 people with ALS and 7,500 controls and will establish a global resource of data that will allow scientists worldwide to understand the genetic signature that leads someone to develop ALS. In addition to learning about genetic causes of sporadic ALS, Project MinE will also provide an ability to analyze genes that influence age of onset, progression of ALS and survival after diagnosis. Given the disparate disease presentation and course for ALS, the learnings from Project MinE will provide the backbone for future personalized medicine therapeutics.

The human genome project (the first full human WGS) cost approximately \$2.7 billion when it was finished in 2000. By 2007, the first direct-to-consumer WGS service, through a company called Knome was available for \$350,000, and the cost per genome has continued to decline as technology has advanced, reaching \$100,000 in 2008 and \$10,000 by 2010. New instrumentation at McGill University has further reduced this cost to between \$1300-\$1500 CAD per genome in 2016. Additional costs of logistics for shipping samples and storing data also exist. This makes the total, global project a very expensive one, but finally within the realm of feasibility, especially when countries work together to



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leverage funds and resources/samples. This leveraging of samples is even more important for a rare disease like ALS where no country could ever achieve this level of statistical significance alone.

In 2016, Canada will become the 17<sup>th</sup> country to join Project MinE, beginning with a commitment from ALS Canada of \$150,000 to sequence approximately 100 genomes. The Canadian component of Project MinE aims to bring together the four leading ALS geneticists located in Vancouver, Toronto, Montreal and Quebec City for their first ever cross-Canada collaboration. Each have led or been part of international consortia that have resulted in some of the most important genetic discoveries in the field. They also represent a geographical balance that would provide a collaborative set of Canadian samples representative of ALS cases across the country.

If the federal government was to invest in Project MinE, it would create an unprecedented opportunity for every Canadian living with ALS, many of their loved ones (as controls), and Canadians who have already passed from the disease to establish a legacy by contributing directly to research that will help us understand the disease better so that we can develop new treatments. Furthermore, it would position Canada as a recognized global leader in the fight to make ALS treatable in a direct and tangible way with defined, reportable results. Inclusion of a large number of Canadian samples to this global pool will genetically enrich the final data, especially given our high level of ethnic diversity. Involvement could possibly even enhance future personalized medicine therapeutic capabilities specifically in this country, not only for ALS, but through use of the control data for studying other diseases. Ultimately, Project MinE will be the first time that scientists will be able to understand the genetic underpinnings of sporadic ALS, a mystery that some believed at one time would never be solved. By having such a large amount of data that no one country could achieve alone, it is expected that we will discover genetic signatures of the disease that will significantly accelerate our understanding of ALS and our ability to advance treatment possibilities that will slow down or stop ALS.

### **Recommendation**

The federal government should make a one-time investment of \$10 million to allow every Canadian living with ALS (approximately 3000), and every stored sample from those who have passed, an opportunity to contribute their sample to Project MinE.