Medicago Submission

House of Commons Standing Committee on Finance

Introduction

Medicago greatly values the opportunity to provide input to House of Commons Standing Committee on Finance, as part of the 2018 budget preparation process. Medicago is a proud Canadian biopharmaceutical company, headquartered in Quebec. We are pleased to provide comments within the framework of this year's budget themes: productivity and competitiveness. Our submission concentrates on domestic rapid response capabilities for pandemic infectious disease. Strengthening Canada's industrial base would protect the Canadian population from economic disruptions posed by emerging infectious disease, and create opportunities for Canada's biomedical industry to compete at the global stage.

The Problem

Over the past decade, Canada's health system, along with others around the globe, have felt the impact of infectious disease outbreaks. Such diseases not only pose a threat to our health, but also to our economy and way of life. Factors such as climate change and global mobility only compound the risks associated with the emergence of new diseases. In the fight against emerging infectious disease, our nation lacks the tools and strategies to win the battle. Canada is among many countries that rely on an old technology to produce vaccines in eggs. Some inherent weaknesses in egg-based production are the lengthy times required to make a vaccine as well as the strain drift that could lead to a mismatch with a circulating virus. If a pandemic strain is of avian origin, this can further compromise the yields from egg-based vaccine production. Most importantly, the method of stockpiling to prepare for an emergency gives our nation a false sense of security. Viruses constantly mutate, rendering stockpiles ineffective against significant public health threats.

Our tools must be more effective, while strategies must deliver a more rapid public health response. While Canada has made notable investments in R&D and infrastructure, the domestic industrial base must evolve to provide a response network that is both efficient and self-sufficient.

> "Advances in medicine have transformed our defenses against the threat of infectious disease. Better hygiene, antibiotics, diagnostics, and vaccines have given us far more effective tools for preventing and responding to outbreaks. Yet the severe acute respiratory syndrome (SARS), the Middle East respiratory syndrome (MERS), and the recent West African Ebola outbreak show that we cannot be complacent. Infectious-disease outbreaks that turn into epidemics and potential pandemics can cause massive loss of life and huge economic disruption."
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> **Sands, P., Mundaca-Shah, C., & Dzau, V. J. (2016). The neglected dimension of global security—a framework for countering infectious-disease crises. *New England Journal of Medicine*, *374*(13), 1281-1287.**

The Opportunity

Due to trends in emerging infectious diseases, there is heightened global demand for medical technologies that are more effective in treating pandemic diseases and rapidly scalable to address urgent public health threats. International organizations such as the World Health Organization, Bill and Melinda Gates Foundation and national governments have begun to embrace the concept of investing in platform technologies that enable a more effective response to disease epidemics. Medicago is deeply invested in developing a new platform using plant-based technologies, which can quickly identify and produce a vaccine matching circulating strains as well as overcome the issue of strain drift. Canada has an opportunity to make strategic investments in research, technology and production capacity to meet both domestic and international demands. Such investments can focus on areas that increase competitiveness and productivity in Canada's biomedical sector. In turn, Canada's enhanced industrial base for pandemic response could not only service the needs of the Canadian population, but also export products and services to supply other jurisdictions. A near term opportunity relates to enhancing vaccine production capabilities for pandemic influenza.

Establishing Canada's Rapid Response Capability

(1) Ensure new countermeasures are positioned to meet Canada's public health needs

New vaccines, therapeutics and diagnostics under development today carry great potential to dramatically improve a nation's ability to address both anticipated (ex. influenza) and unanticipated (ex. Ebola, Zika virus) emerging infectious diseases. At the same time, new countermeasures may require specific studies, including clinical studies and post-market demonstration projects, to meet requirements of Canadian public health authorities.

Canada's National Microbiology Laboratory (NML) performs an important function, in partnering with industry on studies that bridge the development of new countermeasures to support public health needs in Canada and the world. Additional support for NML will ensure the laboratory has the resources necessary to accelerate the translation of new innovative approaches to better protect Canadians from infectious disease outbreaks. Furthermore, NML's partnerships with domestic suppliers could be encouraged, to both strengthen the security of Canada's medical supplies, and provide scale-up resources for local innovators and entrepreneurs.

For example, the H7N9 pandemic influenza strain in current circulation presents a concern for public health officials. While the current strain has not shown to be transmissible from human-to-human as of today, additional studies will help ensure the country is sufficiently prepared with a domestic vaccine supply solution, should the H7N9 strain mutate to human-to-human transmission.

(2) Enhance Canada's domestic scale-up manufacturing capability

Currently, Canada offers some production capacity to support rapid development of vaccines, therapeutics or diagnostic materials. Filling specific gaps can ensure Canada offers an end-to-end approach to address future pandemic outbreaks on Canadian soil, strengthen security around

Canada's medical supplies, while also increasing the productivity and competitiveness of Canada's biomanufacturing sector.

One opportunity could include establishing capacity within Canada to fill vaccine vials at a large scale for domestic and international use. Currently, the ability to fill and finish vaccine vials is limited to locations outside of Canada. Establishing a capacity in Canada would support domestic needs, while also allowing the country to export product to jurisdictions outside Canada. Investment in scale-up manufacturing will contribute to job creation and R&D for Canadian companies and academic institutions.

(3) Test Canada's rapid distribution network for medical countermeasures

Canada's large landmass, coupled with the existence of remote communities, makes rapid response especially challenging in the event of an emerging infectious disease outbreak. For this reason, there is a need for Canada to test rapid response and dose-sparing capabilities within our domestic supply chain.

In 2012, Medicago was proud to participate in a "rapid-fire challenge" set by the U.S. Defense Advanced Research Products Authority (DARPA), where the company successfully achieved a DARPA goal by producing 10 million H1N1 monovalent vaccines in 30 days.

Canada could create a related "rapid-fire challenge" but focussed on distribution-speed as opposed to volume-speed. The challenge may support the goals of *Innovative Solutions Canada*, a strategic procurement initiative announced in Canada's Budget 2017, which aims to support in part late stage projects for Canadian innovators and entrepreneurs.

Partners could include distribution companies, government departments, First Nations communities and health professional associations. The test challenge could be designed to impact regions across Canada and encourage collaboration to address logistical challenges posed by Canada's size and environmental diversity.