

Marc LePage - President & CEO, Genome Canada



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Marc LePage, president and CEO of Genome Canada describes the early days of the organization and talks modern day plans, such as personalized diagnostics for rare diseases, international alliances and genomic data collection and sharing.

Marc, you helped pioneer the creation of Genome in 2000 and led Génome Québec for many years before heading Genome Canada. What were the highlights of Genome Canada's development?

The Human Genome Project started in the nineties and was bustling in countries such as the US, UK, France and China. Many scientific programs were launched at that time. Canada, on the other hand, had only a very small genomics program, and after a restructuring it shrank even further. As a country, we were definitely going the wrong way by not seizing on the opportunity to establish ourselves as a key player in such an important area of science.

Canada formerly had a strong genetics program. In 2000, we redoubled our efforts to stop the brain drain and gain back a meaningful standing on the international scene. Moreover, Genome Canada decided to focus not only on human health, but to equally venture into agriculture, forestry, mining and fishing. Although more than 50 per cent of our activity is focused in the human health field, this broadening of our horizon has allowed us to maximize the use of big genome sequencing platforms across multiple sectors. Fast forward to today, we recruit from Stanford and

Oxford, and Canada is considered a global leader in some areas such as cancer, rare disease, crops, and forestry genomics.

In 2017, Genome Canada is leading several large-scale projects, with teams of 20 to 30 people each. More and more we are trying to gain a clinical orientation, relevant to pharmaceutical corporations amongst others. Those projects attract the investment of venture capital firms. One of our major and most exciting projects at the moment is in rare diseases. We are getting ready for clinical implementation, so really reaching beyond research, as we speak. Rare disease research is indeed a field where diagnostics can be significantly augmented by genome sequencing. As we have all the necessary framework ready – the clinics, a pan-Canadian system for the trials and a centralized database for the support – we expect great results from this project.

Within the Global Alliance for Genomics and Health (GA4GH), Canada leads and/or is a key participant in several of the Driver Projects (CanDIG, ICGC-ARGO and Matchmaker Exchange). Where does Canada in general fit amongst developed countries in terms of its dedication to genomics?

While 20 years ago we were absent on the international radar, we are now ranking amongst the top six countries in the field, in terms of research programs and publications released. Something we try to insist upon are international alliances. Canada has been very active in sending out scientists to partake in global collaborations. As a mid-sized country, we are aware that we are large enough to be interesting, but not big enough to deliver the whole value chain needed in large studies. Global alliances hold a lot of potential, especially in genomics data sharing, something all countries have an interest in. On this point, Canada plays a leadership role in examining the ethical and other societal dimensions of global and national data sharing, among other aspects of genomics.

The Liberal federal government has really made innovation the core of its agenda for 2016 and 2017. How has that added to Genome Canada's activities?

When Genome Canada was facing brain drain issues in the late nineties, we were bold and created a detailed plan to help reverse this trend. The government appreciated our efforts and decided to partially fund our proposal. Our model is based on leveraging the federal investment with co-funding from multiple sources. Today, provincial governments, industry and other partners

contribute co-funding that matches or even exceeds the federal contribution to our research projects. This collaborative model continues today and our funding is regularly renewed on one- to three-year cycles. In Budget 2016, the new Liberal government granted us \$237.2 million – the largest funding amount Genome Canada has ever received in a federal budget. We were thus able to develop new programs and launch great projects in this new phase. Furthermore, the government's support for genomics and the interest of multiple partners to work with us gives us a lot of optimism going forward.

Canada struggles at commercializing the innovation it is producing and taking basic research into industrial applications. How is Genome Canada supporting local companies in their efforts to develop and commercialize breakthrough therapies?

We are sometimes criticized for being too commercially oriented and too focused on applied sciences. But it is worth emphasizing that there is always a commercial and a social benefit to the research we fund. Our research enables the development of new drugs, part of the commercial system.

Especially in the field of human health, we work very closely with start-ups. Our ultimate dream is to help Canada's Google rise. We see one of our objectives as getting start-ups ready for commercialization. We fund some of the foundational work through our large-scale applied science programs, so that they might leave us with something they can build on or attract the interest of a venture capital firm willing to invest. We also encourage academic-industry partnerships through our translational program – the Genomic Applications Partnership Program. Through this program we fund downstream research and development projects that address real world opportunities and challenges identified by industry, government, not-for-profits and other “receptors” of genomics knowledge and technologies.

Our work in personalized diagnostics is but one illustration. At the Montréal Heart Institute, a large pharmaceutical corporation was carrying out a project with supposed big market outcomes in the cardio-vascular area. However, secondary effects during a study were too important and the corporation had to stop its research at an advanced level and after large investments had already been carried out. Nonetheless, some of the researchers involved asked to be allowed to continue the development, as part of the test population showed great results with the product, which they proposed was related to a genomic signature . The corporation licensed its technology and Genome Canada raised CAD \$10 million (USD \$7.87 million) to fund the research. In total, CAD \$150 million

(USD \$118 million) have been allocated to this project, and it has shown indeed that the drug works with amazing effects on 20 percent of the population, but is truly toxic for the remaining 80 percent.

Particularly in genomics it is important that we conduct research in Canada. Genome Canada encourages local research, as few international pharmaceutical companies conduct significant fundamental research in Canadian labs. Most genomic horsepower is in academia. We help bridge industry with academia, helping businesses to manage external knowledge centers.

There is room for improvement with the way the Canadians promote themselves and their excellence. How would you characterize the current international perception of “research made in Canada”?

It is true, we do not brag much about our excellent scientists, but somehow Canadians are always implicated in international research projects. And Canada is becoming more and more engaged at the forefront of cutting-edge innovation. Then again, one might ask, what promotion is desirable? What impact do we really want to create? We do not necessarily need to be on the front page of the daily news but we do want to be known for our research excellence.

We are still actively working on broader branding, wishing to establish ourselves as life sciences specialists in a more focused way in core fields within precision health, agriculture, forestry and other sectors.

What will be the next priorities on your agenda in order to ensure the development of genomics projects in Canada?

The focus on clinical implementation will remain. In less than five years we aim at having in every hospital in Canada—not just the large university hospitals—genomic diagnostics available for rare diseases. This will entail much better patient outcomes by providing a meaningful test to establish the right diagnosis for the 1 million Canadians with a rare disease. In the process, we will also be driving forward our data sharing, so that the collected sequences may be available in each province. The rare disease program is the foundation on which we will build a broader precision health program for Canada. We have been dedicated to implementing precision health in Canada for some time and now we are excited to help usher it into the implementation phase.

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