GenomeCanada

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BACKGROUNDER

Genomic Applications Partnership Program
Funded Projects – Round 3

The Genomic Applications Partnership Program (GAPP) funds research projects that address real world challenges and opportunities as identified by industry, government, not-for-profits, and other "users" of genomics research. The following projects have been selected for funding in the third round of GAPP.

Toward a national framework for clinical cancer genome profiling in Canadian hospitals

Project Leaders: Suzanne Kamel-Reid, Princess Margaret Cancer Centre (University Health Network); Jeff Sumner, LifeLabs Medical Laboratory Services
Lead Genome Centre: Ontario Genomics Institute
Total project funding: $6 million

Approximately 200,000 Canadians are diagnosed with cancer each year. More than one in four of these patients can benefit from targeted treatment based on a genomic analysis of their tumours. Indeed, genome-based tumour profiling helps treat patients with the right drug at the right time, improving outcomes and saving lives. However, at present this breakthrough testing is not widely available and is currently only being used in a clinical trial setting for patients with advanced cancers at one Toronto Hospital, and its collaborators.

This genomics project between Dr. Suzanne Kamel-Reid of Princess Margaret Cancer Centre (University Health Network) and LifeLabs Medical Laboratory Services, Canada's leading diagnostic lab company, is the first step in providing national market access to this potentially vital information.

In addition to saving lives, personalized cancer medicine data can reduce healthcare costs significantly, as the cost of treatment can be up to 10 times more than the cost of laboratory genomic cancer testing. Projected to total Canadian healthcare expenditures, genomic tumour profiling is expected to save the healthcare system hundreds of millions of dollars annually.

The genomics project aims to develop a cloud-based cancer genome analysis infrastructure and shared interfaces between Princess Margaret and LifeLabs that will make this vital information available to all Canadians.

Novel Rapid Diagnostic Tools for Lung Transplantation: Bringing Omics to the Bedside

Project Leaders: Shaf Keshavjee, University of Toronto; Thomas Hartnett, United Therapeutics (Lung Bioengineering Inc.)
Lead Genome Centre: Ontario Genomics Institute
Total project funding: $6 million

A considerable number of patients needing a lung transplant die due to a lack of donor organs deemed suitable for transplant. Now, a proposed genomics approach to assessing donor lungs has the potential to save thousands of lives while reducing healthcare costs.

The project, led by Dr. Shaf Keshavjee of Toronto's University Health Network (UHN) in collaboration with the U.S. biotech firm Lung Bioengineering Inc., a subsidiary of United Therapeutics Corp., intends to develop a genomics-based diagnostic test to determine whether a donor lung meets transplant requirements. At present, such evaluations are based on physiological assessments alone. As a result, less than 15 per cent of lungs, the healthiest, are deemed suitable for transplant, leaving unused countless "marginal" lungs that also could save lives. A genomics-based analysis could increase the number of transplant-acceptable lungs to nearly 50 per cent, resulting in a greater number of patients receiving this life-saving intervention. Using diagnostic test kits, donor lung conditions would be precisely monitored through biomarker analyses. Under Dr. Keshavjee's research leadership, some biomarkers have already been isolated that can predict lung quality. Building on these findings, this new initiative will result in the creation of rapid diagnostic tools that could be used in transplant centres around the world.

The world's first successful clinical lung transplant took place at Toronto General Hospital in 1983. Today's genome project has the potential to further cement Canada's global leadership in this high-tech medical sector. This initiative may also reduce the economic burden on the Canadian healthcare system while improving overall quality of life for lung-transplant patients.

Fast tests for rating and amelioration of conifers (*FastTRAC*)

Project leaders: Jean Bousquet, Université Laval; Guy Smith, FPInnovations/Canadian Wood Fibre Centre
Lead Genome Centre: Génome Québec
Total project funding: $3.4 million

New genome markers could provide a $300 million annual boost to Canada's forest sector. A

research partnership between the Canada Research Chair in Forest Genomics of Université Laval and FPInnovations, the world's largest private, non-profit forest research centre, along with the Canadian Wood Fibre Centre and various users of the forest sector, intends to use the latest genomics findings to grow better trees that can help the Canadian industry compete more effectively on a global level. Specifically, the partnership is looking to develop more efficiently spruce trees that will grow faster, have a higher wood quality and are more resistant to insect pests.

Spruces are Canada's most reforested species with 400 million seedlings planted annually, some 60 per cent of total plantings. Conventional tree improvement breeding can take in excess of 30 years to deliver better plantation stocks. Using genomics to select the best stock could eliminate much of that time. By linking trees' genomic profiles with their attributes, one can rapidly assess a tree's value at the seedling stage, thus reducing the need for expensive field testing over long periods of time. As a result, improved trees could be planted much faster and spruce stock value could increase by up to 20 per cent over time, or $300 million per year.

This project aims to harness the knowledge derived from previous Genome Canada-funded research to fast track the applications of genomic selection tests called *FastTRAC*, and tailor Canadian forests to meet new market needs and environmental challenges. Specifically, the new genomic profiling and selection tools will be applied to white and Norway spruce planting stocks of three major forest sector users—the Québec Ministry of Forests, Wildlife and Parks, J.D. Irving Ltd and the New Brunswick Tree Improvement Council. Once validated at the operational scale, the new technology will become available to other members of the Canadian forest sector.

Application of Genomics for Increasing Seed Oil Content in Soybean

Project Leaders: Randall Weselake, University of Alberta; Vic Knauf, Arcadia Biosciences
Lead Genome Centre: Genome Alberta
Total project funding: $0.3 million

How to squeeze more oil out of protein-rich soybeans? That's the challenge taken up by a leading international agricultural biotechnology company and a University of Alberta scientist.

Canada's soybean sector is growing in importance and value. Soybean oil, typically comprising some 18-20 per cent of its seed, is used increasingly as a cooking oil, in processed foods, or for industrial purposes. Soybeans that produce more oil means more money for farmers, seed companies and processors. Experts estimate that genomics could increase a soybean seed's oil content by up to 25 per cent. Such a breakthrough, they add, could capture one-quarter of the growing global soybean seed market now worth as much as $4.5 billion annually.

Building on findings by Dr. Randall Weselake of the University of Alberta, this project intends to use genome analysis to isolate soybean seed trait targets with the potential to stimulate enhanced oil production without negatively affecting protein levels. Arcadia Biosciences, a

U.S.-based agricultural technology company, will leverage proprietary non-genetically modified tools and genetics resources to rapidly validate the best target or targets and lead commercializing the findings throughout North and South America.

For Canada's soybean agricultural sector, the higher producing seeds are expected to produce up to $68 million in additional annual value. At the same time, higher oil yields should lead to great land efficiency, thereby increasing environmental sustainability.