GenomeCanada

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BACKGROUNDER

Genomic Applications Partnership Program
Funded Projects – Round 6

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 six projects have been selected for funding in the sixth round of GAPP. Backgrounders on previous projects funded under the program are available on Genome Canada's website.

Cedar Enhanced Durability and Resistance (CEDaR): Sustainability of Canada's Western Redcedar Forestry Sector

Project leaders: Joerg Bohlmann, University of British Columbia; John Russell, BC Ministry of Forests, Lands and Natural Resource Operations
Administrative Lead Genome Centre: Genome British Columbia
Total funding: $2.1 million

The western redcedar (WRC) industry, currently valued at over $1B is facing a decline that could potentially reduce revenues significantly. This decline is precipitated by the shift from old growth to second growth forests and climate-driven challenges. Second-growth forests are nowhere near as productive or valuable as old growth forests, producing less volume and wood that is less durable for outdoor wood products.

Current breeding strategies for WRC can take decades to produce the desired traits. Dr. Joerg Bohlmann of the University of British Columbia is working in partnership with John Russell of the BC Ministry of Forests, Lands and Natural Resource Operations, to apply genomic selection to reduce that time by up to 30 years. Because the key producers of these trees are actively participating in the project, uptake of the results will be rapid.

The project will result in a next generation of WRC that has the high-value attributes of old growth trees, is more resistant to pathogens and browsing wildlife, and is better adapted to future climates.

Bridging the ProteoGenomics Gap for Personalized Medicine Using Transformative Mass Spectrometry Technologies

Project leaders: Pierre Thibault, Université de Montréal; Jean-Jacques Dunyach, Thermo Fisher Scientific
Administrative Lead Genome Centre: Génome Québec
Total funding: $1.7 million

The emergence of new genomics technologies has been a key driver towards the development of personalized medicine to deliver a treatment tailored to the patient's needs.

Mass spectrometry (MS) offers new perspectives in personalized medicine by providing a high throughput technology, enabling the identification and the profiling of mutations in patient specimens. However, the instrument performance has been mitigated by the overwhelming sample complexity that limits the comprehensiveness and dynamic range of MS analyses.

Recent work conducted by Thermo Fisher Scientific and the lab of Dr. Pierre Thibault of the Université de Montréal has pointed toward a way to overcome these limitations, by combining a new form of ion mobility to MS. Now they are building on this work to deliver a new instrument to identify subtle mutations in individual patients' cancer cells, an application of significance to cancer immunotherapy.

This new technology could lead to a transformation in discovering and targeting disease-relevant biomarkers from human cancer cells, providing intellectual property that can be a source of revenue generation from licensing fees, as well as increased sales of this new form of mass spectrometry. The result will be new platforms to accelerate discoveries in health and medical research that will benefit Canadians.

Chips for better chops: Commercial application of genomics for accelerated swine genetic improvement

Project leaders: Claude Robert, Université Laval; Claude Vielfaure, HyLife Ltd.; Marquis Roy, Olymel S.E.C./L.P.; Brian Sullivan, Canadian Centre for Swine Improvement Inc.
Administrative Lead Genome Centre: Génome Québec
Total funding: $6.5 million

A chicken in every pot? That's *so* 20th century. In the 21st century, it's a pork chop on every plate. And Dr. Claude Robert of the Université Laval is working with leaders from the pork industry in Canada to make that happen.

Pork is already big business, generating $23.8 billion of economic activity for Canada and employing more than 100,000 people. Pig meat is an important driver of the Canadian economy as two thirds of the domestic production is exported. Over the past two decades, genetic improvements to key traits such as litter size, growth rate, feed efficiency and carcass composition have benefited the Canadian industry to achieve a favorable edge on the highly competitive global export market. But the addition of genomics to the mix promises faster improvement and opens new avenues for additional traits to meet consumer demands such as meat quality, improved animal health and welfare and lowering environmental impacts.

Dr. Robert and his collaborators are seeking to integrate genomic information related to economically important traits into current genetic evaluation programs, with the ultimate goal of producing more efficient, higher-quality hogs and pork tailored to the needs of pork producers, processors and consumers. This project will integrate current genomics technology into the Canadian Swine Improvement Program and is a stepping stone for application of additional rapidly developing genomics technology in the years ahead.

Standardization of Molecular Diagnostic Testing for Non-Small Cell Lung Cancer

Project leaders: David Stewart, The Ottawa Hospital and the University of Ottawa; Craig Ivany, Eastern Ontario Regional Laboratory Association
Administrative Lead Genome Centre: Ontario Genomics
Total funding: $2 million

Non-small cell lung cancer is the most common type of lung cancer, accounting for 85 per cent of cases. Specific genetic mutations in a patient's tumour can determine which drug will work best for that patient. As new targetable genetic mutations become known, it is more important than ever to be able to carry out genetic analysis of patient samples.

Dr. David Stewart, from The Ottawa Hospital and the University of Ottawa, is working with the Eastern Ontario Regional Laboratory Association (EORLA) to develop an assay that can accurately detect important genetic mutations in the very small biopsy samples that can be obtained safely from most patients with advanced lung cancer. The assays will test for multiple genetic variations at once, for a more timely result than is possible with current sequential testing strategies.

Patients will benefit from the rapid availability of information that will permit them to receive the most appropriate treatment. The financial benefits are also significant. If this new assay is implemented across the country, it could result in savings of $35.9 million in testing costs and $151.4 million overall due to the elimination of ineffective treatments. The project team will assemble a national advisory board to drive national translation of its technology so that these savings can be realized.

Clinical development and translation of genomics-driven paediatric cancer diagnostics using NanoString Technology

Project leaders: Cynthia Hawkins and John Racher, The Hospital for Sick Children (SickKids); Barney Saunders, NanoString Technologies
Administrative Lead Genome Centre: Ontario Genomics
Total funding: $1.9 million

Over the past decade, there have been many high-impact, genomics-driven cancer discoveries. The overriding challenge, however, lies in making the transition from the laboratory to the clinic – literally, bench to bedside.

Toronto's SickKids is a leader in the discovery and implementation of clinical diagnostics for children's health. NanoString Technologies is a leader in providing tools to individual labs to enable laboratory-developed tests. Now, their individual strengths are being brought together to develop additional tools for diagnosing cancer in children that will deliver key information in a targeted, cost-effective and timely way. Led at Sick Kids by Dr. Cynthia Hawkins and Mr. John Racher, in partnership with NanoString Technologies, their initial work will focus on low-grade glioma (brain tumours), leukemia and soft-tissue sarcoma, for which no comprehensive tests currently exist. Further along, the tests can be expanded to adult cancers as well.

Within three-to-five years, their work will result in marketable diagnostic tests for pediatric cancer. This will improve survival times and quality of life for children with cancer, reduce healthcare costs and generate licensing revenue, which will be shared between the partners. This is a market with high demand and low competition, underscoring the importance of this product.

Integrated pathogen management of co-infection in Atlantic salmon

Project leaders: Matthew Rise, Memorial University of Newfoundland; Richard Taylor, EWOS Canada, a subsidiary of Cargill
Administrative Lead Genome Centre: Genome Atlantic
Total funding: $4.5 million
Mitacs partnership

Aquaculture plays a significant role in the Canadian economy, comprising 14 per cent of total Canadian fisheries production and 33 per cent of its value. In Atlantic salmon aquaculture, it is not uncommon for fish to be infected with multiple pathogens, including sea lice, bacteria and viruses. This can cause severe economic losses for aquaculture farmers and the industry.

The scientific team, led by Dr. Matthew Rise of Memorial University of Newfoundland, Dr. Richard Taylor of Cargill Innovation Centre, and Dr. Mark Fast of the University of Prince Edward Island, is using functional genomics tools to identify co-infection biomarkers (i.e., genes that respond to co-infection). EWOS/Cargill will use this information to develop therapeutic diets that reduce salmon disease and mortality due to co-infection. The project builds upon earlier work by the partners, funded through Genome Canada's Genomic Applications Partnership Program, focused on individual pathogens.

The integrated pathogen management system that results from this research will benefit the broader Canadian salmon industry. Its uptake and application could reduce co-infection losses by as much as 20 per cent overall and by as much as 50 per cent for some diseases. This could translate into savings of up to $57 million annually for the Canadian aquaculture industry. Reduced disease will also enhance consumer acceptance of farmed salmon products, decrease the use of chemical treatments, and minimize the risk of transmitting pathogens to wild salmon populations.