Released May 26, 2017

BACKGROUNDER

Genomic Applications Partnership Program
Funded Projects – Round 7

The Genomic Applications Partnership Program (GAPP) funds translational research and development projects that address real-world challenges and opportunities as identified by industry, government, not-for-profits, and other "receptors" of genomics knowledge and technology. The following five projects have been selected for funding in Round 7 of GAPP, for a total investment of $17 million ($6 million from Genome Canada and $11 million from co-funding partners including provincial governments, private sector and not-for-profit organizations). Backgrounders on previous projects funded under the program are available on Genome Canada's website.

Integrating Pediatric Pharmacogenomic Testing into the Canadian System

Project leaders: Yvan Coté, Dynacare (receptor); Bruce Carleton, University of British Columbia (academic)
Genome Centre: Genome British Columbia
Total funding: $2.96 million

Adverse drug reactions (ADRs) are a major problem of modern medicine, responsible for as many as 30 per cent of hospital admissions and $14-$18 billion in healthcare costs each year in Canada. Pharmacogenomic testing can reduce ADRs while advancing the transition to precision health.

Dynacare, one of the largest medical diagnostic laboratories in Canada, is working with Dr. Bruce Carleton, researcher at the University of British Columbia and CEO of the Canadian Pharmacogenomics Network for Drug Safety, to develop and commercialize cutting-edge pharmacogenomics tests for a range of commonly prescribed drugs, and to support their integration into health practice. The project will endeavour to validate the accuracy and clinical utility of three test panels for the most frequently prescribed therapeutic classes of drugs for children: antibiotics, analgesics (for pain relief) and mental-health medications. Testing will be available to patients through physicians and the results will be provided to pharmacists to ensure appropriate medications are prescribed and dispensed. The company will also make significant investments in educational programming to inform patients, physicians and pharmacists about the relevance of the tests.

Dynacare projects volumes of 15,000 tests per year paid for out-of-pocket by consumers, for revenue of more than $3 million in the first five years after the project's completion. It also predicts government reimbursement within 24 to 36 months from launch, further expanding the reach of the tests. The

Canadian health-care system will accrue significant cost-saving benefits estimated at more than $10 million per year.

Development of Genomic Crossbred Estimate Breeding Values (GCEBV) to maximize profitability for Canadian pork producers

Project leaders: Robert Kemp, Genesus Inc. (receptor); Graham Plastow, University of Alberta (academic)
Genome Centre: Genome Alberta
Total funding: $3.4 million

Pork producers in Canada buy their breeding stock and genetic material from pig genetic companies such as Genesus Inc. Their profitability, as well as that of Genesus, depends on the ability to create and transfer genetic improvements from the nucleus purebred population to commercial crossbred animals. Presently, the selection of desirable purebred animals is done using Estimated Breeding Values (EBVs), a measure of presumed genetic fitness that incorporates phenotypes and pedigree information of the animals. However, with EBV tools, only about 70 percent of the genetic improvement transfers to commercial crossbred animals.

Genesus is working with Dr. Graham Plastow of the University of Alberta to develop and validate GCEBV, or Genomic Crossbred Estimate Breeding Values. Adding genomics to the EBV selection tool is expected to increase the accuracy of the EBV tool by 20 percent. Further, adding phenotypes and genotypes of commercial crossbred animals will increase genetic improvement by another 30 per cent, for a total increase of 50 percent improvement in the transfer of genetic improvements to commercial producers. A successful project will increase Genesus' competitiveness while having an economic impact on the industry of $17.25 million per year within five years of project completion. In addition, improvement in the feed conversion ratio of pigs as a result of the genetic improvements would reduce the land footprint of pork production, releasing more land for human food production.

Increasing Yield in Canola Using Genomic Solutions

Project leaders: Matthew Crisp, Benjamin Gray, Benson Hill Biosystems (receptor); Peter Pauls, University of Guelph (academic)
Genome Centre: Ontario Genomics
Total funding: $3.4 million

The world's population is growing and so is demand for the crops to feed it, among them canola. The canola industry in Canada accounts for nearly a third of the gross production value of all Canadian crops, generating $19.3 billion and nearly 250,000 jobs across Canada. The industry has set a goal of increasing yield by 53 per cent in the next 10 years. Traditional breeding techniques are not sufficient to meet this goal; new technologies are needed.

Dr. Peter Pauls and collaborators at the University of Guelph have identified the genetic links of traits that can be incorporated into canola. The new traits are expected to significantly enhance crop productivity by increasing photosynthetic capacity, without negatively impacting seed quality. The researchers are working with Benson Hill Biosystems (BHB), an innovative crop genetics firm, combining their strengths to produce game-changing varieties of canola for producers across Canada.

The results of this project will enable commercialization of the improved plants through licensing or collaborative development agreements. Increasing the yield of the canola crop benefits growers and

others across the value chain, growing industry revenues by $3-$4 billion per year. BHB will also establish a Canadian subsidiary, CanolaCo, for this project that will result in newly created jobs for Canadians.

Translating OMICS for competitive dairy products

Project leaders: Maria Pepe, Parmalat Canada (receptor); Gisele LaPointe, University of Guelph (academic)
Genome Centre: Ontario Genomics
Total funding: $1.3 million

Aged cheddar is a classic of cheese boards, pairing with everything from apple pie to zinfandel. Parmalat Canada is the number one producer of premium-quality aged cheddar that has been winning many cheese contests including the 2016 world cheese championship. Demand for aged cheddar is projected to steadily increase in the future, requiring Parmalat to increase its manufacturing capacity. Trade deals (such as CETA) make it more urgent for Parmalat Canada to gain efficiency and protect its market share.

To achieve this goal, Parmalat Canada is working with Dr. Gisele LaPointe of the University of Guelph, a well-known scientist in the field, to validate and implement metagenomic, metaproteomic and metabolomics tools modified to meet the technical requirements of cheese production. The project will improve manufacturing processes and controls to overcome current bottlenecks and significantly increase the production capacity of high-quality, competitive aged cheddar cheese.

With over 120 years of brand heritage in the Canadian dairy industry, Parmalat Canada is committed to the health and wellness of Canadians and markets a variety of high-quality food products that help them keep balance in their lives. Parmalat Canada produces milk and dairy products, fruit juices, cultured products, cheese products and table spreads, employing more than 3,000 people, with 16 operating facilities across the country.

This project will bring the Canadian knowledge base related to cheese making processes into a new era. With increased production of high quality cheese, Parmalat will contribute even more to the Canadian economy. At the same time, our dairy farmers will benefit significantly from the increased demand for and utilization of Canadian milk and increased revenues for dairy farmers of about $28 million a year.

Application of genomic selection in turkeys for health, welfare, efficiency and production traits

Project leaders: Dr. Ben Wood, Hybrid Turkeys, a Hendrix Genetics Company (receptor); Dr. Christine Baes, University of Guelph (academic)
Genome Center: Ontario Genomics
Total funding: $6 million

Dr. Christine Baes of the University of Guelph and Ben Wood of Hybrid Turkeys will be collaborating to adapt and apply genomic tools developed in other livestock species to improve the health, welfare and productivity of Canadian turkeys. Hybrid Turkeys' parent company, Hendrix Genetics, has already implemented genomic selection in layer chickens and pigs and it will now adapt and apply the technology to achieve improvements in feed efficiency, bodyweight, yield, egg production and livability in commercial turkeys. This will lead to estimated economic gains for the Canadian turkey industry of

$39 million over the next five years. The project will also have environmental benefits due to improved feed efficiency and reduced manure and greenhouse gas production.

Hybrid Turkeys is part of Hendrix Genetics, a multi-species breeding company with primary activities in layers, turkeys, pigs, aquaculture, and traditional poultry. Its R&D headquarters is located in Kitchener, Ontario. By applying advanced genomic selection, Canada's role as a supplier of turkey genetics to the world will be secured. By more accurately estimating the genetic potential of selection candidates, the rate of genetic gain can be increased from 15 per cent to 60 per cent, depending on the trait chosen. These improvements will provide value across the production chain, from breeders and farmers to turkey processors and, ultimately, to consumers.