**Project**

# Understanding the impact of cutting-edge genomic technologies on breeding strategies for optimum genetic progress in Canadian dairy cattle

**DAIRY RESEARCH CLUSTER 3**
FOR A PRODUCTIVE, INNOVATIVE AND SUSTAINABLE SECTOR

**Principal Investigator:**
Christine Baes (University of Guelph)

**Co-Investigators:**
Flavio Schenkel, Getu Hailu, Angela Canovas (University of Guelph)

**National Dairy Research Strategy investment priorities targeted:**
• Dairy cattle genetic improvement (disease resistance, fertility, productivity, feed efficiency)
• Dairy cow reproduction

**PERIOD: 2018-2022**
**TOTAL BUDGET: $908,723**

## Why this research is important:

Novel phenotypes (e.g. feed efficiency), genotyping technologies (e.g. genotyping-by-sequencing), and tools (e.g. gene editing) are emerging at an unprecedented rate in the dairy sector. Some of these have already been implemented, are currently in development, or are still undergoing regulatory analysis. There is potential for each of these technologies to improve production efficiency and sustainability if applied on a large scale. Therefore, it is important to assess their prospective benefits, understand the economic costs, and the impact on genetic diversity of the dairy cattle population.

The research outcomes have the potential for both immediate and long-term impacts on the dairy industry by providing cost-benefit analyses of using new technologies and optimizing breeding programs to accelerate genetic progress for increased dairy farm sustainability. The information gained will enable dairy farmers to make more informed decisions about using new technologies, methods and breeding strategies on their farms.

## Research objectives:
• Analyze and compare various strategies and novel tools for Canadian dairy cattle breed progress from both economic and genetic improvement perspectives; and,
• Provide recommendations to the dairy cattle sector on how to optimally incorporate prospective new technologies and novel traits into existing selection programs to maximize genetic gains while ensuring sustainable future genetic improvement.

## Project overview:
A first step in this project will be to perform an appraisal of the current breeding structure in Canadian dairy cattle by characterizing selection groups, information sources, current use of technologies, economic aspects of the breeding strategy, and genetic parameters.

Using simulation studies, the researchers will investigate anticipated changes in the breeding structure caused by the adoption of new technologies and introduction of novel traits in terms of cost, feasibility of implementation, and expected monetary gain from the resulting genetic improvement. Jointly, management strategies for the unwanted side-effects of breeding, including inbreeding and genetic diversity, will be evaluated. The ideal size of a reference population of animals with genotypes and novel trait phenotypes along with strategies to collect phenotypes to obtain accurate breeding values will be documented.

## Expected outcomes:
Recommendations will be given on how to best incorporate prospective new technologies and novel traits to optimize Canadian dairy cattle breeding programs, as well as important considerations for their adoption to help fully understand the long-term effects of altering the current breeding scheme.

**FUNDING PARTNERS:**

CANADIAN AGRICULTURAL PARTNERSHIP

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