



2019 Research Highlights



Governance

The Canadian Dairy Research Council (CDRC) directs Dairy Farmers of Canada's (DFC) investments in dairy production and human nutrition and health research in accordance with the National Dairy Research Strategy and the annual research budget approved by DFC's Board of Directors.

The CDRC members include:

- six dairy farmers from DFC's Board of Directors (voting)
- technical representatives from member and partner organizations (non-voting)



David Wiens, Chair
Dairy Farmers of Manitoba



Reint-Jan Dykstra
Dairy Farmers of New Brunswick



Albert Fledderus
Dairy Farmers of Ontario



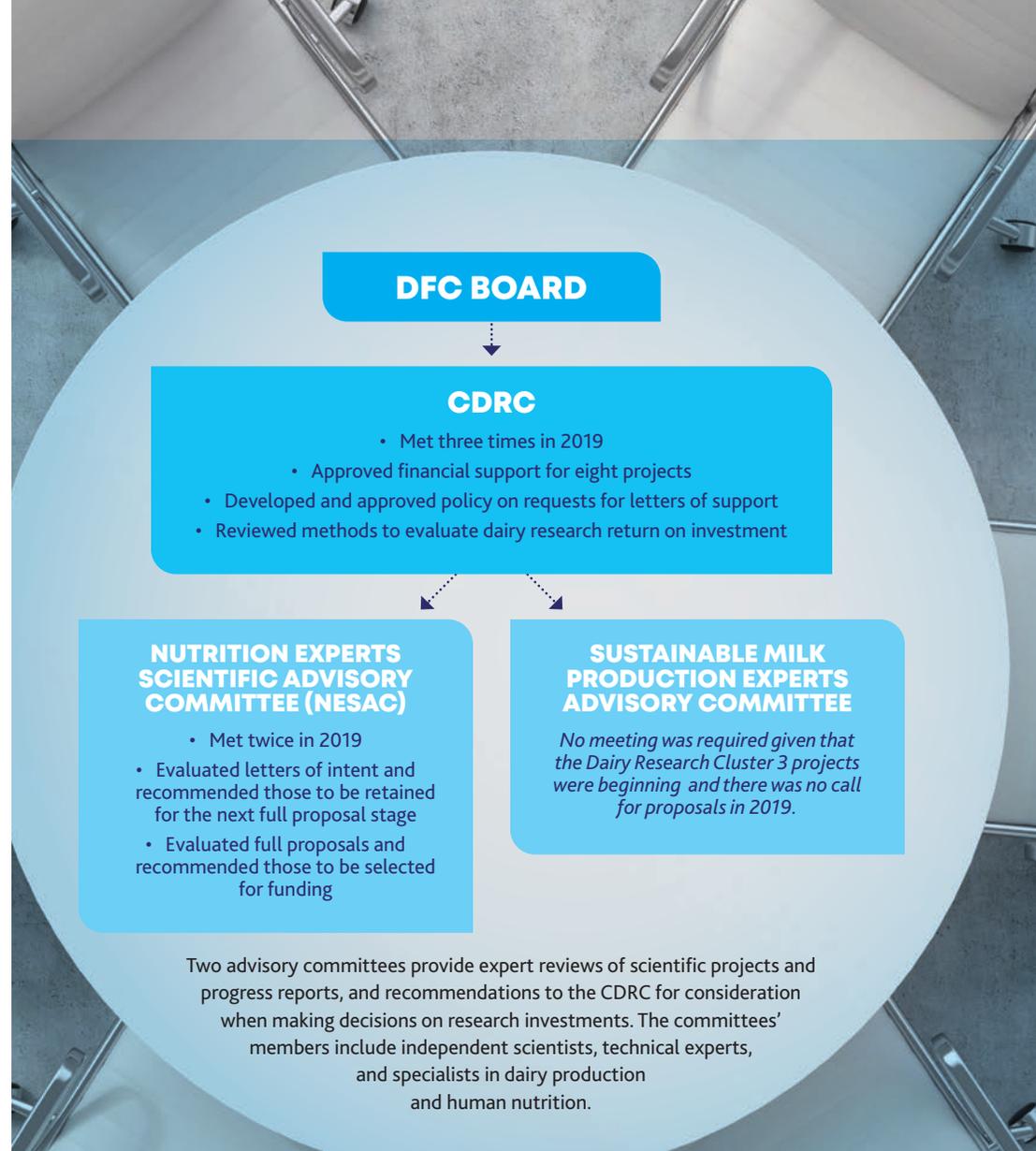
Ed Friesen
Lactanet



Blaine McLeod
SaskMilk



Peter Strebel
Les Producteurs de lait du Québec

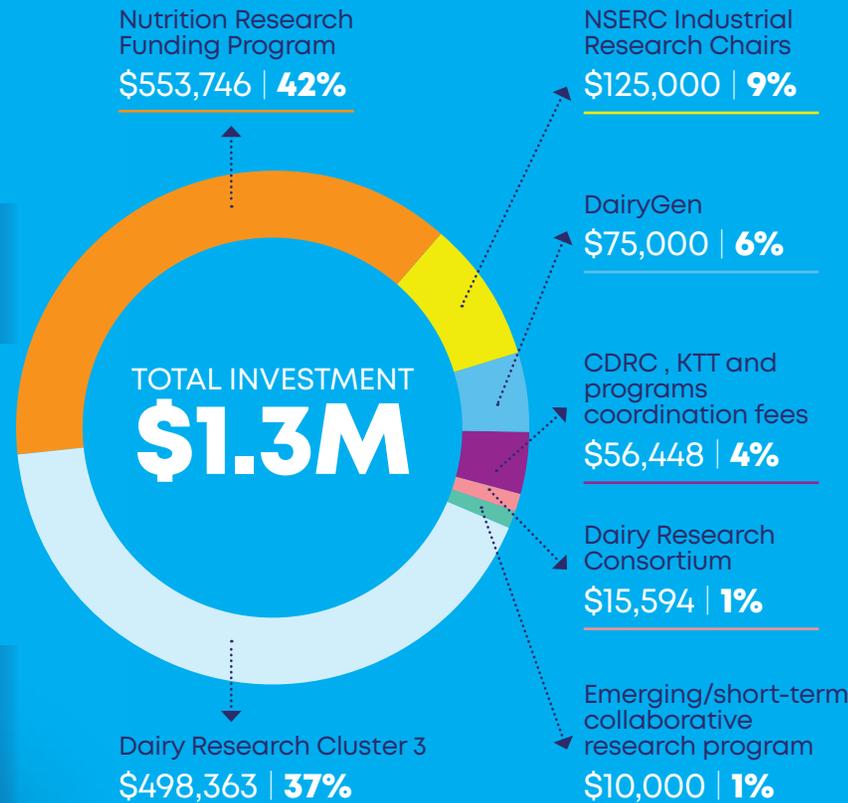


DFC is proud to fund independent, credible research that is subject to a rigorous scientific peer-review process by external experts.

2019 Research Investments



DFC investments by funding program



Funding programs and partners

- 
Nutrition Research Funding Program
 Managed by DFC to support research projects on the role of dairy products in nutrition, health and sustainable diets.
- 
Dairy Research Cluster 3
 Led by DFC, in collaboration with Lactanet, Novalait and other partners, to support national multidisciplinary research projects in dairy production and human nutrition and health through Agriculture and Agri-Food Canada's (AAFC) AgriScience Clusters program.
- 
Natural Sciences and Engineering Research Council (NSERC) Industrial Research Chairs
 Industry-driven partnership programs managed by NSERC and funded by NSERC and dairy sector partners to develop research capacity in Canadian universities focusing on the sector's research priority areas.
- 
Dairy Cattle Genetics Research and Development (DairyGen) Council
 Managed by Lactanet and funded by Lactanet, DFC and dairy cattle improvement organizations from artificial insemination and breeds, DairyGen supports research in dairy cattle genetic improvement.
- 
Dairy Research Consortium
 An international partnership of dairy organizations that fund pre-competitive research projects on the nutrition and health benefits of dairy products. Members include: DFC, Danish Dairy Research Foundation, Dutch Dairy Association, Centre national interprofessionnel de l'économie laitière, Dairy Australia and the Dairy Research Institute.
- 
Emerging/short-term collaborative research program
 Managed by DFC to provide a framework for collaborative research funding between DFC and its members for common priority issues.

Investing in Our Dairy Future

Dairy Farmers of Canada, collaboratively with its members and partners, **invests in scientific research** that focuses on the dairy sector's priorities in the [National Dairy Research Strategy](#).

RESEARCH PRIORITIES (2017-2022)



Dairy farm efficiency and sustainability

TARGETED OUTCOMES ✓

- new technologies and practices to optimize farm productivity and longevity of dairy cows
- best management practices to minimize the environmental impact of milk production and enable adaptation to climate change
- best management practices to support on-farm programs (i.e. proAction®)

INVESTMENT PRIORITIES 💰

- genetic improvement
- reproduction
- dairy cattle nutrition
- forage breeding and management
- reduced environmental footprint



Animal health and welfare

TARGETED OUTCOMES ✓

- reduced on-farm economic losses from production limiting diseases with zoonotic potential
- improved health and welfare of cows, optimized productivity and longevity
- better assessment of the impact of the evolving milk production environment on cows

INVESTMENT PRIORITIES 💰

- calf management
- infectious diseases mitigation
- lameness
- transition period
- pain mitigation and euthanasia
- sustainable barn design
- barriers to adoption of best management practices



Milk composition, quality and safety

TARGETED OUTCOMES ✓

- identified methods to naturally modulate milk composition to improve its quality and value, and potentially develop new products
- reduced use of antimicrobials while maintaining farm biosecurity, dairy cattle health and welfare

INVESTMENT PRIORITIES 💰

- microbiology
- assessment of antimicrobial use in Canadian dairy herds
- development of alternatives to antimicrobials use



Milk products and their components in human nutrition and health

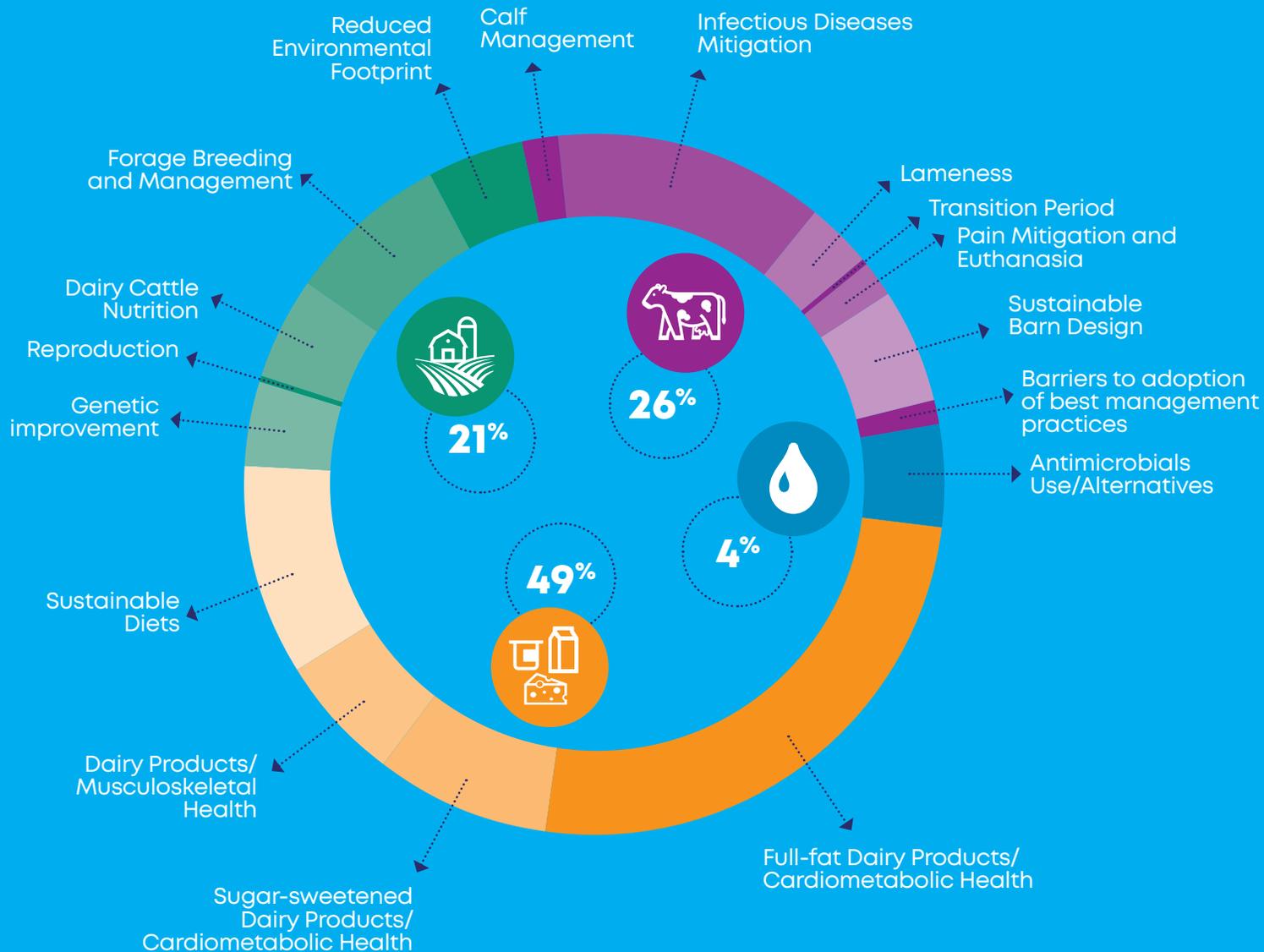
TARGETED OUTCOMES ✓

- clarified the role of milk products in cardiometabolic health and healthy aging
- provided data on the role of sugar-sweetened milk and yogurt on diet quality and health outcomes
- strengthened role of milk products in musculoskeletal health
- better understanding of the value of dairy products in healthy, sustainable diets

INVESTMENT PRIORITIES 💰

- full-fat dairy products and cardiometabolic health
- sugar-sweetened dairy products and cardiometabolic health
- dairy products and musculoskeletal health
- sustainable diets

Investments by Research Priority



31
research projects

34
research institutions

142
scientists

81
students (MSc, PhD, Postdoc)

23
investment partners

2,000
dairy farms collaborating on projects

List of Projects



Dairy farm efficiency and sustainability

1. Integrating genomic approaches to improve dairy cattle resilience: A comprehensive goal to enhance Canadian dairy industry sustainability (2019-2022)
Principal Investigators (PIs): Christine Baes, University of Guelph, Paul Stothard, University of Alberta, Ronaldo Cerri, University of British Columbia, and Marc-André Sirard, Université Laval
2. Accelerating genetic gain for novel traits in Canadian Holstein cows (2018-2022)
PI: Flavio Schenkel, University of Guelph
3. Understanding the impact of cutting-edge genomic technologies on breeding strategies for optimum genetic progress in Canadian dairy cattle (2018-2022)
PI: Christine Baes, University of Guelph
4. Optimizing health and production of cows milked in robotic systems (2018-2022)
PI: Trevor DeVries, University of Guelph
5. Reducing the water footprint of milk production in current and future climates (2018-2022)
PIs: Andrew VanderZaag, Agriculture and Agri-Food Canada (AAFC)-Ottawa and Robert Gordon, University of Windsor
6. Increasing the production and utilization of alfalfa forages in Canada (2018-2022)
PIs: Annie Claessens, AAFC-Québec and Bill Biligetu, University of Saskatchewan
7. Identifying best management practices for high quality silage production (2018-2022)
PIs: Nancy McLean, Dalhousie University and Linda Jewell, AAFC-St. John's
8. Development and validation of genetic markers for resistance to ketosis in dairy cattle (2017-2019)
PI: Jim Squires, University of Guelph



Animal health and welfare

1. NSERC Industrial Research Chair on Dairy Cattle Welfare (2019-2023)
Chairs: Dan Weary and Marina von Keyserlingk, University of British Columbia
2. NSERC Industrial Research Chair in Infectious Diseases of Dairy Cattle (2019-2023)
Chair: Herman Barkema, University of Calgary
3. NSERC/Novalait/DFC/Lactanet Industrial Research Chair in Sustainable Life of Dairy Cattle (2015-2020)
Chair: Elsa Vasseur, McGill University
4. Categorize practices and identify obstacles and limitations related to management of non-ambulatory cattle and euthanasia on farms (2018-2020)
PI: Luc DesCôteaux, Université de Montréal
5. Unraveling genetic susceptibility to John's disease (2018-2022)
PIs: Nathalie Bissonnette, AAFC-Sherbrooke and Kapil Tahlan, Memorial University of Newfoundland
6. Extending cow longevity on dairy farms by improving calf management practices in the first year of life (2018-2022)
PIs: Greg Keefe and J Trenton McClure, University of Prince Edward Island
7. Providing opportunities for movement to dairy cows by redefining indoor and outdoor spaces and best management practices (2018-2022)
PI: Elsa Vasseur, McGill University



Milk composition, quality and safety

1. Surveillance of antimicrobial use and resistance to improve stewardship practices and animal health on dairy farms (2018-2022)
PIs: Javier Sanchez and Luke Heider, University of Prince Edward Island
2. Mastitis Network: Continuing the advancement of milk quality in Canada (2018-2022)
PIs: Simon Dufour, Université de Montréal and Pierre Lacasse, AAFC-Sherbrooke



Milk products and their components in human nutrition and health

1. Comparison of cheese, yogurt and milk effects on glucose homeostasis in rats fed a high fat diet (2019-2020)
PI: Catherine Chan, University of Alberta
2. Role of dairy products in a healthy sustainable diet: modelling and comparing the carbon footprint and nutritional contribution of Canadian dietary recommendations (2019-2020)
PI: Julie-Anne Chayer, Groupe AGECCO
3. Sensory and glycemic properties of chocolate milk and fermented dairy products with reduced content of added sugar (2019-2020)
PI: Bodhan Luhovyy, Mount Saint Vincent University
4. Beneficial effects of dairy fat on postprandial intestinal and systemic immune function (2019-2020)
PI: Caroline Richard, University of Alberta
5. Novel effects of dairy in protecting against metabolic and inflammatory insults (2019-2020)
PI: David Wright, University of Guelph
6. Effects of long-term consumption of dairy products on satiety, body weight and glycemic control (2019-2023)
PI: Harvey Anderson, University of Toronto
7. Role of dairy products on body weight and metabolic health in families (2019-2023)
PIs: Angelo Tremblay and Vicky Drapeau, Université Laval
8. Dairy product intake and cognitive function in free-living older adults (2018-2019)
PI: Stéphanie Chevalier, McGill University
9. Dietary protein quality assessment of milk in school-age children to meet the nutritional need for the most limiting amino acid, lysine, when combined with cereals (2018-2019)
PI: Rajavel Elango, University of British Columbia
10. Students, schools, and society: Using a multi-level systems approach to understanding milk product consumption and reasons for under-consumption among Canadian high school students (2018-2019)
PI: Shannon Majowicz, University of Waterloo
11. Dairy consumption and cardiovascular disease in diverse populations (2018-2019)
PI: Andrew Mente, McMaster University
12. Whole milk to augment muscle protein synthesis in elderly women: A randomized, controlled trial (2018-2019)
PI: Stuart Phillips, McMaster University
13. The importance of milk and dairy products as determinants of vitamin B₁₂ status (2018-2019)
PI: Nancy Presse, Université de Sherbrooke
14. Cardiometabolic effects of butter and other fats and oils in Framingham Offspring Study Adults (2017-2019)
PI: Lynn Moore, Boston University, USA

In the organization's research agreements, aside from providing financial support, DFC has no decision-making role in the design and conduct of the studies, data collection, and analysis or interpretation of the data. Researchers maintain complete independence in conducting their studies, own their data, and report the outcomes regardless of the results. The decision to publish the findings rests solely with the researchers.

KEY RESULTS

Dairy Farm Efficiency and Sustainability



Genomics of Feed Efficiency

Genetically selecting cows for their feed efficiency and low methane emissions will soon be possible in Canada.

Researchers have been developing methods for identifying and genetically selecting cows for high feed efficiency and low methane emissions. A high number of records have been collected from more than 5,000 cows with over 1 million dry matter intake records and 1,223 cows with 11,444 records of methane emissions. The research team developed a model to evaluate the feed efficiency of cows in two different lactation periods, 5-60 days and 61-305 days in milk. Lactanet is planning to launch the genetic/genomic evaluation for feed efficiency in Holsteins in April 2021, with a test run planned for December 2020.

Feed efficiency and methane emissions data will continue to be collected from four herds (one commercial and three research stations) in Canada, as well as from herds partnering in the project from Australia, Denmark, Germany, Spain, Switzerland and the United States. Ongoing data collection will continue for another four years to increase the number of records to about 14,000 cows with feed efficiency records and 5,000 with methane emissions records.

The results of the project will enable farmers to select genetically superior animals for feed efficiency and low methane emissions, providing opportunities to lower feed costs and manure waste, and mitigate the greenhouse gas footprint of milk production.

Project: Increasing feed efficiency and reducing methane emissions through genomics: A new promising goal for the Canadian dairy industry (2015-2019), Genome Canada

PIs: Filippo Miglior/Flavio Schenkel, University of Guelph and Paul Stothard, University of Alberta

New Evidence - Cows in Canada emit less methane

Dairy cows in Canada emit less methane than previously reported in national and international greenhouse gas emissions (GHGs) reports.

New evidence from Dairy Research Cluster 2 research revealed that methane (CH₄) emitted from energy losses from Canadian dairy cattle when they digest their feed averages 5.79%. This result is lower than the default value of 6.5% recommended by the Intergovernmental Panel on Climate Change, 2006 (IPCC Tier 2 methodology) for the calculation of inventories of enteric methane emissions from dairy cattle. The new evidence is being reviewed by Environment and Climate Change Canada and the IPCC prior to including it in a revised inventory report.

The researchers published their evidence in a high impact scientific journal titled, [Development of an equation to estimate the enteric methane emissions from Holstein dairy cows in Canada](#) in May 2019, describing their methodology and calculations to predict methane emissions from dairy cattle fed typical Canadian diets in Canadian conditions. The article by Drs. Chaouki Benchaar, Édith Charbonneau and Doris Pellerin was selected as one of the Canadian Journal of Animal Science (CJAS) Editors' Choice papers in 2019.

Project: [Mitigation of enteric methane production from dairy cows and impact on manure emissions: filling knowledge gaps](#) (2013-2018), Dairy Research Cluster 2

PIs: Chaouki Benchaar, AAFC-Sherbrooke and Rachel Gervais, Université Laval

New genetic and management tools improve hoof health

A Dairy Research Cluster 2 research project on improving hoof health in Canadian dairy herds resulted in the development of two new tools for farmers to improve their cows' hoof health.

A new genetic selection tool called the Hoof Health Index is available to farmers to select dairy cattle for resistance to eight lesions for better hoof health. Using the research results combined with the Hoof Health Index, Lactanet developed and released an innovative management report that farmers can use to monitor their animals' hoof health and take action if animals need attention. The management report provides benchmarks for the five most common lesions affecting hoof health in Canadian herds. Hoof trimmers, veterinarians and dairy farmers can share the data for the best possible monitoring and interventions to improve cow health.

Project: [Improving hoof health in Canadian dairy farms](#) (2013-2018), Dairy Research Cluster 2

PI: Filippo Miglior, University of Guelph



KEY RESULTS

Animal Health and Welfare



Bedding and stall changes can have a big impact on cow comfort and farm performance

Results of multiple studies from the [Industrial Research Chair in the Sustainable Life of Dairy Cattle](#) provide recommendations on how farmers can make changes to adapt their tie-stall systems to improve cow comfort and longevity for better farm performance. Modifications like deeper bedding, longer and wider tie-stalls and longer tie lengths have shown improvements in cow resting times, reduced injuries, improved cleanliness, less cases of mastitis and improved cow longevity.

Study recommendations for stall modifications:

- Deepening bedding (3" of straw) in tie-stalls by adding a bedding guard, combined with increasing the stall length, resulted in increased lying times, less hock injuries with overall improved cow comfort.
- Increasing the tie-stall tie length from 1 metre to 1.4 metres gave cows more room for movement in a stall.
- Widening stalls gave cows more space to rest in different positions, validating that current recommendations for stall width must be met at a minimum.

Project: NSERC/Novalait/DFC/Lactanet Industrial Research Chair in the Sustainable Life of Dairy Cattle (2015-2020)

Chair: Elsa Vasseur, McGill University

Farmers demonstrate how they modified their tie-stall systems for better performance

Videos produced by Novalait demonstrate how two dairy farm families modified their tie-stall systems based on recommendations from the Chair's research results.



Owners of Ferme Roy in Coaticook, Quebec upgraded their existing tie-stalls and improved their cows' comfort. They pushed forward the tie rail in their barn, built a six-inch wall to keep feed in the area where their automatic feeder passes, added dividers between the animals so cows had their own space for lying down and added mats and mattresses to stalls. They observed that cows spent more time lying down and rested better, improving their farm's performance.



The René Dupuis farm increased tie-stall widths to between 5 and 5½ feet, increased straw bedding by adding a bedding keeper and refreshed bedding often. They observed that their cows lied down up to two hours more per day, minimized injuries, were cleaner, and minimized mastitis infections. They kept cows longer as a result, not only improving comfort but also the longevity of their lactating cows in the herd. Their proAction® animal care assessment results showed the farm rated in the green zone for all animal-based measures.



YouTube | Dairy Research Cluster Channel

KEY RESULTS

Milk Composition, Quality and Safety



Reducing antibiotic use – National surveillance system for antimicrobial stewardship and resistance



Researchers developed a surveillance program and research platform called the Canadian Dairy Network of Antimicrobial Stewardship and Resistance (CaDNetASR). Still in its testing phase, the platform follows the Federal Action Plan on Antimicrobial Resistance and Use in Canada, and the Food Safety and Biosecurity modules of proAction®. The platform allows for the collection of data and measures antimicrobial use (AMU) and its relation to animal health and antimicrobial resistance (AMR).

There are 142 dairy farms from BC, Alberta, Ontario, Quebec and Nova Scotia providing data for the project. The outcomes of this national project and network will support farmers in continuing to use antimicrobials responsibly, institute efficient antimicrobial stewardship practices and assure the health and welfare of dairy animals and the safety of food for consumers.

Project: [Surveillance of antimicrobial use and resistance to improve stewardship practices and animal health on dairy farms \(2018-2022\)](#), Dairy Research Cluster 3

PIs: Javier Sanchez and Luke Heider, University of Prince Edward Island

Selective dry cow therapy – A strategy for udder health and milk quality

Researchers from the Mastitis Network found that quarter-based selective dry cow therapy is a farm management strategy with the potential to reduce antibiotic use at dry-off by an average 60%. They concluded that selective dry cow therapy can be used to treat cows known or suspected to have an infection, with an antimicrobial only or with a combination of an antimicrobial plus a teat sealant at the end of a cow's lactation. Uninfected cows receive a teat sealant only. With this approach, antimicrobial use at dry-off could drop considerably without compromising udder and animal health.

The researchers also developed [an on-farm kit](#) and procedures that farmers can use to test animals suspected of having an udder infection at dry-off. The kit has a Petrifilm™ plate used to measure bacteria growth of a small milk sample from a cow's udder. Any growth observed in bacterial colonies on the plate may indicate infection. Farmers can quickly identify and treat an animal, in consultation with their veterinarian, for better animal health while reducing the need for the broad application of antimicrobials.

Project: [Canadian Bovine Mastitis and Milk Quality Research Network \(2013-2018\)](#), Dairy Research Cluster 2

PIs: Mario Jacques and Simon Dufour, Université de Montréal



KEY RESULTS

Milk Products and their Components in Human Nutrition and Health

Diets containing dairy products can reduce the risk of Metabolic Syndrome, Cardiovascular Disease and Type 2 Diabetes

New knowledge with Canadian data reported that diets containing dairy products can reduce the risk of Metabolic Syndrome, Cardiovascular Disease and Type 2 Diabetes. An article published in 2019 titled, [Type 2 diabetes prevalence among Canadian adults — dietary habits and sociodemographic risk factors](#), reported on the findings of research on the prevalence of Type 2 diagnosed diabetes, undetected (undiagnosed) Type 2 diabetes, and prediabetes of Canadian adults, and evaluated whether individuals with diagnosed diabetes have different dietary intakes compared with the other groups, using data from Canadian Health Measures Survey Cycles 1 and 2. The article was selected as one of the Journal of Applied Physiology, Nutrition and Metabolism Editors' Choice papers in 2019.

Project: [Association Between Dietary Intakes and Cardiovascular Risk of Canadians using the Canadian Health Measures Survey Cycles 1+2 \(2013-2018\)](#), Dairy Research Cluster 2
PI: Susan Whiting, University of Saskatchewan



Vitamin B₁₂ is better absorbed from milk and dairy products

Researchers found that vitamin B₁₂ is much better absorbed when consumed in cow's milk than when taken in vitamin supplements and that cheddar cheese is one of the best natural sources of vitamin B₁₂, after cow's milk. The researchers gave pigs (pigs have a similar digestive system as humans) either cow's milk or vitamin B₁₂ supplements to compare the absorption rates of this vitamin. They found that vitamin B₁₂, which is naturally present in cow's milk, is absorbed two times better than synthetic vitamin B₁₂. In another study, pigs were fed a meal of cheddar cheese, Swiss cheese, yogurt, tofu (completely free of vitamin B₁₂) or tofu with added synthetic vitamin B₁₂. Researchers compared the levels of vitamin B₁₂ in the pigs' blood in the following hours and discovered that Vitamin B₁₂ from the cheese was two times more bioavailable than the synthetic vitamin B₁₂ in the enriched tofu.

Project: [Milk and dairy products, outstanding sources of vitamin B₁₂: a farm to fork approach \(2016-2018\)](#), Dairy Research Cluster 2
PI: Christiane Girard, AAFC-Sherbrooke



Dairy product consumption is associated with lower risk of mortality, cardiovascular events and Type 2 diabetes

A team of researchers found **dairy consumption, especially of whole fat dairy, was associated with a lower risk of mortality and major cardiovascular disease (CVD) events in a diverse multinational population.** The study called PURE is a landmark 21-country multinational cohort study of individuals aged 35-70 years old. It tracked dietary intakes including consumption of milk, yogurt, and cheese of 138,484 individuals over time as well as mortality and total major cardiovascular events (i.e. major CVD, stroke, myocardial infarction). The researchers assessed any associations between total dairy and specific dairy product consumption with mortality and CVD events.



New data from the PURE study and published in a scientific journal in May 2020 assessing dairy intake (total, whole fat and low fat) with prevalence of Metabolic Syndrome (MetS) and incidence of hypertension and Type 2 diabetes also found:

- Higher intake (at least two servings/day compared with zero intake) of total dairy was associated with a lower prevalence of MetS.
- Higher intake of whole fat dairy consumed alone or consumed jointly with low fat dairy was associated with a lower MetS prevalence. Low fat dairy consumed alone was not associated with MetS.
- Higher intake of total dairy was associated with a lower incidence of hypertension.
- With regards to diabetes, higher intake of whole fat and low fat dairy consumed jointly was associated with a reduced risk.

The PURE study is mainly funded by the Population Health Research Institute (PHRI) as well as several government agencies and pharmaceutical companies. This specific study was also co-funded by DFC (via the Nutrition Research Funding Program) and the National Dairy Council (US).

Project: Dairy consumption and cardiovascular disease in diverse populations (2018-2019)
PI: Andrew Mente, McMaster University

New evidence: Dairy products are an important part of adolescent girls' diet for bone health

Research supported by DFC found that 3-4 servings of dairy products per day improved bone health in overweight/obese adolescent girls.

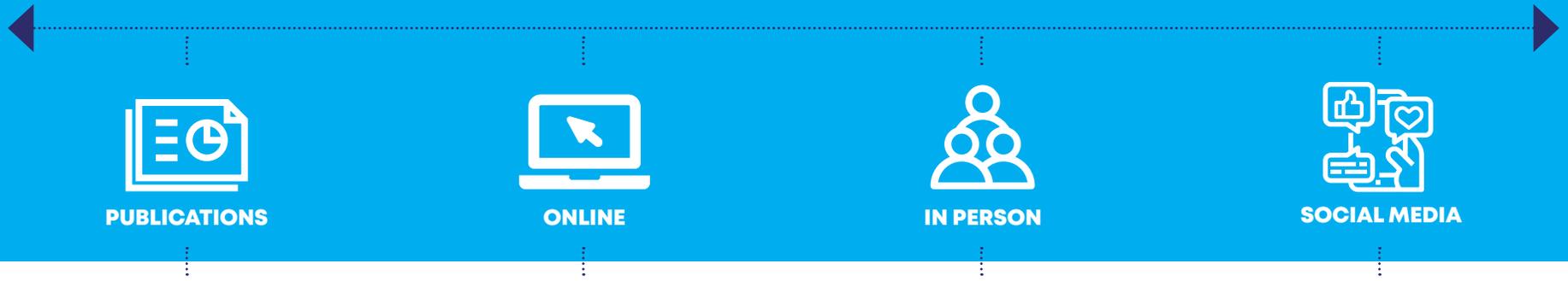
The researchers demonstrated that adolescent girls, a group that usually does not consume enough dairy products, also improved their Body Mass Index (BMI) and nutrient intakes with the inclusion of dairy products in their diets. The researchers recommend that 3-4 servings of dairy products per day should continue to be encouraged for this age group, especially in light of the fact that Canada's new Food Guide does not provide specific advice for recommended servings of foods.



Project: Effects of a Weight Management Intervention with Increased Dairy Intake on Body Composition and Bone Health in Overweight and Obese Girls (2016-2019), Nutrition Research Funding Program
PI: Andrea Josse, York University

Communications and Knowledge Translation and Transfer

DFC developed and adopted a communications and knowledge translation and transfer (KTT) strategy in 2017.



PUBLICATIONS



ONLINE



IN PERSON



SOCIAL MEDIA

121 articles

published in magazines, newsletters and blogs

~11,000 health professionals

subscribed to DFC's monthly newsletter NutriNews®

39 summaries

of research projects developed

3 research reports

produced and widely distributed to partners

3 fact sheets

For dairy farmers: Footbaths for the prevention and control of digital dermatitis

For health professionals: Milk products and bone health

For consumers: Surprising things you may not know about Calcium

1,602 health professionals

attended 2 DFC dairy nutrition webinars

Average of 25% growth in visits

by users on DairyResearch.ca, DairyNutrition.ca and DairyResearchBlog.ca

New MastitisNetwork.org website

launched with resources, tools for the prevention, management, and treatment of mastitis

1,157 attendees

at DFC's annual symposium on nutrition and health

1,500 people reached

with DFC's Dairy Research kiosk at **five events** targeting dairy farmers and dairy stakeholders

Average of 15% increase

in followers for the Dairy Research Blog, YouTube, Facebook and Twitter channels

Weekly postings made by DFC nutrition team

on dedicated social media channels targeting health professionals

In 2019, more than 200 communications and KTT products in both languages were developed and disseminated to the user audiences targeted for dairy production and human nutrition and health research results.



Blog | dairyresearchblog.ca



Web | dairyresearch.ca | dairynutrition.ca



Twitter | @dairyresearch



Facebook | @dairyresearch | @DFCDairyNutrition



YouTube | Dairy Research Cluster Channel

