ANNUAL REPORT

2020
2021

Novalait
Research Catalyst

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Conception and credits

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Design: Isabelle Jobin, graphiste

Photos:
• Agrinova
• Audrey Gilbert
• Hugo Dufour
• Les Producteurs de lait du Québec
• Mérilie Gagnon
• Novalait
• Université Laval
• Université McGill

COMPANY PROFILE

A STRONG VISION

Created by **Quebec dairy farmers** and **processors**, **Novalait** is accelerating the development of **scientific knowledge** and **skills** for the dairy industry of tomorrow.

A UNIQUE BUSINESS MODEL

Novalait brings together all businesses that produce or process milk in Quebec – from small-scale cheese factories to family farms to multinational companies – making contributions to the research investment fund equivalent to ¢1.27/100 l of managed milk. They are represented within Novalait by three groups of shareholders. Les Producteurs de lait du Québec holds 50% of Novalait's shares. Agropur Cooperative, which represents dairy cooperatives, and the Conseil des industriels laitiers du Québec, which brings together private dairy processors, split the other half of Novalait's shares.

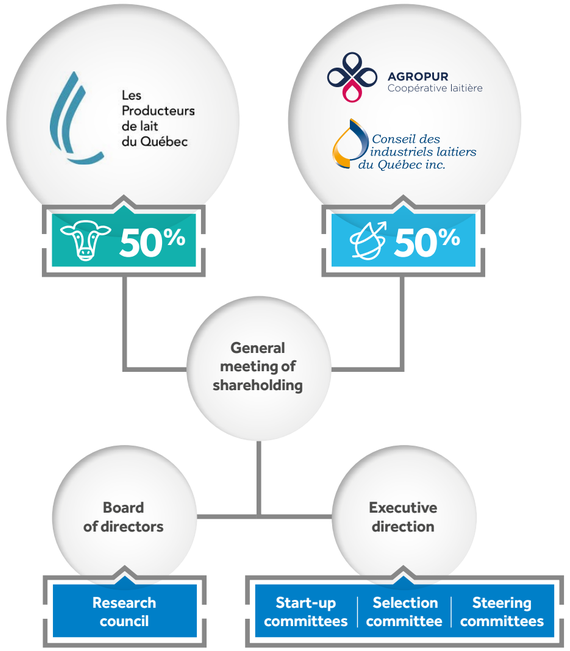
Calling upon the creativity and expertise of researchers from all disciplines and horizons, Novalait ensures that it meets its shareholders' research priorities. Novalait's committees evaluate the proposals received according to the potential for commercial opportunities and applications on farms and in plants. Novalait invests in the development and monitoring of the R&D projects selected.

It collaborates with actors in the sector to valorize and transfer the research results. In everything it does, Novalait aims to optimize research benefits.

Novalait involves its shareholders in all of its activities, including:

Establishing research priorities	Selecting and monitoring projects	Transferring research results

SHAREHOLDING AND ORGANIZATIONAL STRUCTURE



BOARD OF DIRECTORS 2020 2021

Novalait is governed by six experienced administrators who represent the three groups of Novalait shareholders.

President
Michel Couture
Agropur Dairy Cooperative

Vice-president
Yvan Bastien
Les Producteurs de lait du Québec

Secretary-Tresaurer
Charles Langlois
Conseil des industriels laitiers du Québec

Administrator
Simon Robert
Agropur Dairy Cooperative

Administrator
Chantale Fleury
Les Producteurs de lait du Québec

Administrator
Jean-Marc Bertrand
Danone

WORD FROM PRESIDENT

Dear Shareholders,

It is with immense pride that I present this 2020–2021 annual report on behalf of the board of directors and the Novalait team.

Novalait has maintained its powerful financial leveraging to support investment in research. In response to the evolving requirements of different funding agencies, Novalait has documented its role in the development and completion of its research projects, the transfer of research results and value creation. Novalait also developed new funding partnerships with different organizations based on the strength of converging research interests.

We also took considerable action to address issues related to solids-not-fat (SNF) and permeate surpluses. Numerous research projects are currently underway and in development to create new opportunities to add value to processing co-product surpluses and to support companies in choosing the best valorization strategy. Novalait has also relied on its network of experts and applied its experience in project coordination in particular to carry out a technical-economic study on novel approaches in the dairy sector to build companies' capacity to valorize SNFs and permeates.

As my term as President comes to a close, I would like to emphasize the extent to which Quebec's dairy sector has set itself apart by creating Novalait. Our research investment company for dairy farmers and processors executes and delivers results. It has also become an ideal forum in the industry to address issues and develop innovative solutions for the benefit of all.

Michel Couture
President of Novalait

REPORT FROM THE EXECUTIVE DIRECTOR

Dear Shareholders,

Novalait's mission is to feed innovation in your companies. To do so, it must innovate in its practices. Always on the lookout for innovative solutions to meet the priorities of its shareholders, this year Novalait set up a process to accept letters of intent on a rolling basis. This formal step initiates the evaluation process to determine the relevance of promising research ideas and the project co-development process. Thirteen proposals were evaluated in 2020–2021 and Novalait's funding offers surpassed $600,000. Thank you to our researchers for answering the call!

This year, the interactions between our expert committees and research teams to develop and monitor projects multiplied through the use of video conferences. Novalait's capacity to deliver depends on the support of experts delegated by our shareholders. Thank you for consistently sharing your ideas and opinions!

Novalait also innovated in 2021 with a virtual edition of the Forum Techno. The event itself was integrated into International Cheese Technology Week, in partnership with IDF Canada, Université Laval and the Quebec Cheese Expertise Center (CEFQ). The record participation and strong online consultation of post-forum presentations confirms the value of the virtual formula for the transfer of research results. Thank you to our transfer coordinator, Valérie Bélanger, for rising to the challenge and making the first Virtual Forum Techno a success. Novalait, together with CEFQ and Lactanet,

also launched an exploration of other opportunities to communicate research results more effectively to the same target audiences.

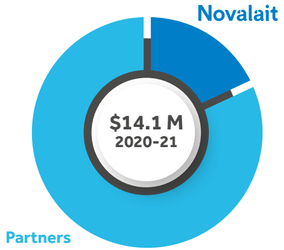
Thank you to our shareholders and our inspiring partners who make all of Novalait's achievements possible.

Élise Gosselin
General Director

2020-21 IN NUMBERS

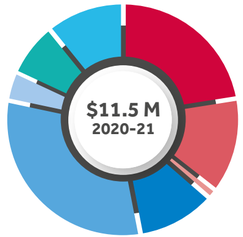
NOVALAIT MAINTAINS A REMARKABLE LEVERAGE EFFECT

Novalait and its partners have committed a total of $14.1 million to ongoing research in 2020-2021, including $3.5 million for new projects.



SHARE OF GOVERNMENT FUNDS AND PRIVATE PARTNERSHIPS

Projects selected by Novalait are successful in provincial and federal funding programs. Novalait also partners with agri-food and industry suppliers to share costs and accelerate the accessibility of research tools and services to its shareholders.



- NSERC
- AAFC
- CCL
- CRIBIQ
- MAPAQ
- MEI
- Dairy industry
- Other private funds

DIVERSIFIED MEANS OF INVESTMENT

Novalait invests its funds according to different formulas to solve a targeted problem (Team projects), to validate R&D results on the farm or in the plant (Pilot projects); to mobilize scientific and financial resources on large-scale issues (Initiatives) and to create or renew researchers' positions (Chairs).

- **31%** Team projects
- **3%** Pilot projects
- **27%** Initiatives
- **39%** Chairs

COMMITTEES' ACTIVITIES

Numerous meetings for the development and follow-up of projects.

8
Boards of Directors

3
Selection committees for 13 proposals evaluated

More than **20**
meetings of Steering committees for projects and chairs

Novalait is involved

The Novalait team is involved in several organizations as a member of a committee or a board of directors:

- Strategic planning of the dairy sector
- Quebec consortium for industrial bioprocess research and innovation (CRIBIQ)
- Quebec cheese expertise center (CEFQ)
- National dairy research council (DFC)
- Cheese Symposium organizing committee (IDF-Canada)
- Dairy cattle committee (CRAAQ)

COMMUNICATION

Website

Activity on Novalait.ca is increasing and contributes to Novalait's influence.

Years	Visitors	Pages viewed
2020-2021	9,848	20,854
2019-2020	6,698	15,875
2018-2019	6,103	13,755
2017-2018	4,095	16,052

Forum Techno

More than **480**
registrations including participants in the International Symposium on Sciences and Cheese Technology

More than **200**
viewings of content in the the following month of the Forum

Several video clips and content of the Forum are available on novalait.ca

Lait'Xpress

6
newsletters to know everything about Novalait's activities

More than **400**
subscribers

Subscribe today!

RESEARCH

CURRENT RESEARCH PROJECTS

Novalait and CRIBIQ have been working together for a number of years now to fund research projects that meet the priorities of Quebec's dairy farmers and processors. The researchers answered the call. Here are the new research initiatives that have grown out of this partnership.

Natural antimicrobial compounds to combat bacteria in silage

Sporulated thermoduric bacteria, including clostridia, cause a lot of headaches when it comes to silage. These bacteria from the Clostridium genus contaminate fodder during fermentation and alter its nutritional value. In addition, Clostridium spores can be found in milk. Clostridium spores are highly heat-resistant and can survive all stages of dairy processing. Quebec processors estimate the losses associated with Clostridium to be nearly $10 million per year. Ismail Fliss's team at Université Laval is proposing using bacteriocins – lactic acid bacteria with known antimicrobial properties – to combat contamination by sporulated thermoduric bacteria.

The use of these natural antimicrobials in the dairy production and processing sector would limit the use of chemical additives and reduce losses caused by deficient silage and non-compliant dairy products.

Reproduction: *In vitro* fertilization or artificial insemination?

More and more bulls and cows of high genetic value are now produced through *in vitro* fertilization (IVF). Surprisingly, until now there has been no phenotypic monitoring (observable set of traits) of animals produced through this reproductive method, nor has there been any structured analysis of the effects of IVF. However, different stakeholders including Lactanet record fertility data, certain health data, and productivity data. For farmers and genetics companies, it is important to be able to identify the presence or absence of a phenotypic effect of IVF in order to see as many genetic gains as possible. It should also be considered that the phenotype that could result from IVF is sensitive to the environment and could potentially be modulated through specific control conditions (such as feed). Université Laval researcher Marc-André Sirard is researching the phenotypic effects of IVF to give farmers using *in vitro* fertilization a competitive advantage.

Collecting microorganisms from atypical products

Raw milk is known to be an excellent growth medium for microorganisms. Although strict hygiene conditions are imposed in milk production and processing, milk may contain pathogens or altering microorganisms. In dairy processing plants, these microorganisms may lead to non-compliant or atypical products. The resulting economic losses are estimated to be over $1 million per incident in the province of Quebec, in addition to creating unnecessary waste. These microorganisms (bacteria, yeasts, and moulds) are all the more problematic because they are difficult to eliminate. In addition, the accessibility of these strains remains very limited as they are most often eliminated to avoid any additional risk of contamination.

The team of researchers led by Julie Jean at Université Laval aims to create an inventory and characterize these industrial strains of microorganisms from atypical products. The compilation of data on the microorganisms will allow for a better assessment and more precise identification of the problem strains. A better understanding of these undesirable microorganisms is essential in order to develop effective control strategies.

New Research Chair in Dairy Production Biosafety

Leukosis, salmonellosis, paratuberculous, mastitis, digital dermatitis, Neosporo... these infectious diseases that are well known to farmers ravage herds and, therefore, the profitability and sustainability of dairy farms. Some emerging diseases, such as *Salmonella* Dublin and *Mycoplasma* spp., as well as bovine viral diarrhea, can also have devastating effects. They all pose a constant threat to animal health, production safety, and the ability to export Quebec genetics.

Unlike other types of animal production, where facilities can be depopulated, decontaminated, and repopulated, dairy farms operate in a continuous production system which makes developing biosafety standards challenging.

The new NSERC-MAPAQ-NOVALAIT-DFC Industrial Research Chair on Biosafety in Dairy Production, based at Université de Montréal, proposes enhancing scientific expertise in biosafety. It will be co-directed by researchers Simon Dufour and Juan Carlos Arango Sabogal.

The research program will cover three themes:

1. Identify key practices and develop more robust biosafety programs to control the prevalence of infections within a herd and prevent the introduction or spread of diseases between herds (external biosafety or bio-exclusion).
2. Validate rapid, robust, and effective diagnostic strategies to support rigorous biosafety programs, with a focus on diagnostic tests that can be performed without requiring a high level of technical expertise.
3. Develop disease monitoring and control programs to assist dairy farmers, governments and veterinary physicians in their daily work to control and, in certain situations, eradicate different infectious diseases.

The benefits are promising: they can help reduce the risk of introducing emerging diseases and reduce the prevalence of diseases like paratuberculous, leukosis, contagious mastitis, bovine viral diarrhea, and digital dermatitis.

Valorizing milk co-products

Increasing the recovery of solids-not-fat (SNF) in milk and processing co-products is one of the objectives in the dairy sector's strategic plan and has been a research priority since Novalait's creation. In 2019, it is estimated that the Canadian dairy system generated an excess of 75,000 tonnes of SNF (in the form of milk powder), in addition to 265,000 tonnes of milk solids in the form of whey, whey ultrafiltration (UF) permeate, and buttermilk. The recovery of these milk solids, 35% of which result from the processing of milk in Quebec, is still a major issue for the Canadian dairy industry and poses technological, economic, and environmental challenges.

Researcher Alain Doyen at Université Laval has proposed a prospective study on pathways to valorizing skim milk, whey, and whey permeates. The research team will deliver a tool enabling dairy processing companies to identify the most appropriate recovery routes adapted to their unique situation (such as the type of co-product and volumes, transport distances, and their ability to pre-concentrate co-products). This project will

1. map the volumes of SNF and permeates in Quebec;
2. create a general register of valorization pathways;
3. model and simulate valorization processes using Simulait software;
4. develop a tool for dairy companies to support their decision-making on SNF and permeate valorization.

Novalait welcomes project ideas on an ongoing basis

Novalait is always looking for new projects to meet the research priorities of Quebec dairy farmers and processors and is now accepting research proposals on a rolling basis.

The research projects supported by Novalait are virtually always the result of a process of co-creation or feedback between research teams and our industry committees. The submission of a letter of intent is the first formal step in initiating this process.

This helps diversify the research offer, expand the network of researchers, and develop the portfolio of projects under Novalait's development.

CURRENT RESEARCH PROJECTS 2020–2021

Current research projects aim to find answers to the research priorities established by Quebec dairy farmers and processors. Want to know what Novalait is working on? The current projects are grouped below according to the different research themes.

Innovative practices on the farm

Performance and behaviour of dairy heifers according to their milk diet
Édith Charbonneau, Université Laval

Vitamins post-calving: a way to increase cow fertility?
Marc-André Sirard, Université Laval

Educational Leadership Chair in Sustainable Agricultural Building Design
Sébastien Fournel, Université Laval

Lactic acid bacteriocins: a natural approach to controlling sporulated thermoduric bacteria in silage
Ismail Fliss, Université Laval

Dairy production and feed efficiency

Improving cows' protein diet through new models tested in Quebec
Doris Pellerin, Université Laval

Optimizing the efficiency of proteins in rations
Cristiano Cortes, Agrinova

Animal welfare, reproduction and health

NSERC-Novalait-Dairy Farmers of Canada-Valacta Industrial Research Chair in Sustainable Life of Dairy Cattle
Elsa Vasseur, McGill University

Using the fatty acid profile of milk to detect and prevent ruminal acidosis in cows
Stéphanie Claveau, Agrinova

Validation of a genomic tool to improve health and fertility traits in dairy cows
Claude Robert, Université Laval

Deciphering the molecular mechanisms of infertility in dairy cows with subclinical acidosis
Raj Duggavathi, McGill University

Comparison of cows produced through *in vitro* fertilization versus artificial insemination based on fertility, health and productivity criteria
Marc-André Sirard, Université Laval

NSERC-MAPAQ-NOVALAIT-DFC Industrial Research Chair on Dairy Production Biosafety
Simon Dufour et Juan Carlos Arango Sabogal, Université de Montréal

Technology and process eco-efficiency

Increasing eco-efficiency by concentrating dairy fluids
Yves Pouliot, Université Laval

Educational Leadership Chair in Cheese Technology
Julien Chamberland, Université Laval

Characterizing the structure of stirred yogurt through digital technology and the mapping of critical processing points
Sylvie Turgeon, Université Laval

Valorization of co-products

New approaches to transforming carbohydrate-rich co-products into high-value products
Salwa Karboune, McGill University

An eco-efficient approach to valorizing buttermilk
Guillaume Brisson, Université Laval

Prospective study on the valorization of solids-not-fat in milk and processing co-products
Alain Doyen, Université Laval

For more information on each of the projects: novalait.ca.

Alternatives for the preservation of dairy products

Identifying bioprotective cultures that extend the shelf life of dairy products
Marie Filteau, Université Laval

Developing natural antimicrobial-based antifungal ingredients to preserve grated cheese
Monique Lacroix, INRS, Institut Armand Frappier

Developing an intelligent platform to identify natural and multifunctional ingredients
Salwa Karboune, McGill University

Developing active packaging solutions to extend the shelf life of food products
Richard Silverwood, Polytechnique Montréal

Milk quality

How do milk's natural microflora and composition contribute to cheese quality?
Steve Labrie, Université Laval

Presence and impact of microbial biofilms on milk quality, from the farm to dairy plants
Denis Roy, Université Laval

Establishment of an inventory of microorganisms associated with non-compliant and atypical dairy products
Julie Jean, Université Laval

Consumer expectations

Naturalness of food products: Gaining a better understanding of consumer perceptions and behaviours
Joanne Labrecque, HEC Montréal

RESULTS

Projects completed during the 2020–2021 fiscal year delivered innovative results for dairy farms and plants. Longer-term research initiatives continued their activities and made promising advances. Two pilot projects currently underway are also presented.

FASTER DETECTION OF ACIDOSIS

Sub-acute ruminal acidosis is a metabolic disorder that develops when the rumen pH is less than 5.8 for a minimum of five hours per day. In these conditions, the growth of bacteria responsible for digesting fibre decreases, which reduces feed efficiency. This project was designed to use fatty acids in milk to detect ruminal acidosis. Researchers from Agrinova and Université Laval first measured rumen pH in real-time using boluses ingested by more than 100 cows from 12 different farms. The pH data was collected over the course of 50 days and analyzed using artificial intelligence tools. In addition, the fatty acids profile of the milk under study was analyzed using chromatography and infrared spectroscopy.

Boluse example.

The relationship between the rumen pH data and the fatty acids profile of the milk is currently under analysis. The preliminary results are promising for predicting acidosis based on fatty acids profiles. The researchers are continuing work to achieve greater accuracy in the prediction model. Acidosis is a difficult disease to detect and has a major economic impact, and this project will provide a more affordable and accessible acidosis detection tool for Quebec dairy farmers.

Over 700,000 pH figures and 3,000 milk samples were analyzed.

MILK ANALYSIS THAT PREDICTS COW WELL-BEING AND HEALTH

Assessing a cow's level of well-being requires extensive data collection. Could a simple milk sample be used to determine a cow's level of well-being? This project aimed to develop an easily identifiable bioindicator in a milk sample to assess the health and well-being of cows. The team of researchers led by Elsa Vasseur at McGill University correlated physiological indicators in milk and blood measured using infrared spectroscopy with behavioural measurements collected to assess the cows' activity and ability to move in the stall. The analysis identified multiple links between modifications to housing and the different bioindicators. The results showed that it is possible to use regularly collected milk samples to identify cows with high or low levels of well-being. More work is needed to refine the method and pinpoint the impacts of specific modifications to stalls on cow well-being. This method is unique is that it allows for remote, non-invasive, and low-cost tracking through milk recording samples.

LEADERSHIP IN TEACHING

The two Educational Leadership Chairs at Université Laval are at work to advance the innovative training of future professionals in the dairy sector. Novalait has invested in these initiatives to consolidate the critical masses of researchers in strategic areas for the dairy sector. The following are progress reports from the leaders of these chairs.

Building for the future

Directed by professor Sébastien Fournel, the Educational Leadership Chair in Sustainable Agricultural Building Design aims to support dairy farmers in making informed decisions about building construction. Four courses were created or updated and cover topics including analyzing the environmental needs of animals and the interior design of livestock buildings. Students are also trained on the thermal efficiency of buildings. Sébastien Fournel has also developed a collaborative research program with a network of researchers and supervises seven graduate students.

Technology at the service of cheesemakers

The holder of the Educational Leadership Chair in Cheese Technology, professor Julien Chamberland, has established a new graduate training course called "Advanced Cheese Technology." The first cohort will begin in the winter of 2022. The course is geared toward students wishing to deepen their knowledge of cheese technology in order to accelerate their integration into companies. The training covers the different stages of the cheesemaking process, from milk conditioning to cheese packaging. The winter of 2022 will also mark the beginning of the graduate microprogram in cheese technology, which aims in particular to provide continuous training to meet the needs of dairy plant managers. The chair takes original approaches to hybrid learning (in-person and online) and offers a range of educational activities and real-life case studies. Professor Chamberland is also involved in a number of research initiatives on efficiency in cheese manufacturing processes aimed at increasing the competitiveness of the Quebec cheese sector.

INDUSTRIAL RESEARCH CHAIR ON SUSTAINABLE LIFE OF DAIRY CATTLE

Optimizing cow comfort in tie-stalls to increase well-being: such was the mission of the chair on the sustainable life of dairy cattle supervised by researcher Elsa Vasseur at McGill University. Its success is rooted in the fruitful exchanges between the research team and dairy processors, who have benefited from its pioneering work and significant findings. The research team has made multiple discoveries about the longevity of cows, their profitability, and the relationship between well-being, longevity, and farm profitability. Here is a quick glance at the advances made by the chair within the past year.

Research Team.

A good start could be the key to longevity

Longevity is a key aspect of sustainability in the dairy industry. The longer productive cows remain in the herd, the more profitable the herd is. The research team evaluated the impact of early-life indicators on the longevity of Holstein heifers in Quebec herds. The results showed that small birth size, calving complications, and gemellary gestation increased the risk of early culling during a cow's productive life. These findings provide new perspectives on anticipating the selection of candidates for replacement.

Elsa Vasseur
Sustainable Life of Dairy Cattle Chairholder, McGill University

"Working with farmers at every stage of the research process has been very rewarding for me as a researcher over the six years of the chair. There has been a lot of feedback from all partners which has generated even more relevant results. This also leads to faster application on the ground."

Determining herd well-being

Animal well-being is also integral to sustainability in the dairy industry. A study was conducted to determine the overall well-being of Quebec dairy herds using data from the ProAction program collected on nearly 2,700 farms between 2016 and 2019. Five distinct herd well-being profiles were established. The profile with the highest overall well-being also had the highest longevity, profitability, and productivity.

Gabriel Dallago presented his results at the annual conference of the American Dairy Sciences Association as part of his PhD at the chair. He won 2nd place in the audience favourite competition. See the video here

Getting cows moving

What does it mean, in practice, to provide cows with access to exercise areas? A series of experiments conducted in tie-stalls has shown that when an outdoor or indoor exercise area is provided, regardless of its size, cows will walk more, but not that much more – they don't work out! Access to an exercise area improved cows' ability to walk and farmers' ability to handle them. The project also demonstrated that outdoor access can be provided in any season, without affecting the animals' thermal comfort. The next initiatives will aim to quantify the frequency and adequate duration of access to exercise areas in order to maximize benefits for cows while proposing practices to more easily manage exercise periods.

Chair summary:

1 new professor-researcher position at McGill University

Training of highly qualified personnel:

11 master's degree students

3 PhDs

8 post-doctoral fellows

6 meetings of the scientific committee

More than **25** scientific articles

More than **90** presentations

10 popular science articles and video capsules

MILK QUALITY AT THE HEART OF RESEARCH

Two Novalait-supported research projects, as part of Agriculture and Agri-Food Canada's (AAFC) dairy research cluster and in collaboration with dairy farmers in Canada, have generated promising early results.

Did you say biofilms?

The team of researchers led by Denis Roy at Université Laval and Évelyne Guèvremont at AAFC aims to characterize the structure and composition of biofilms formed on the farm and in plants, and their potentially harmful or even beneficial impacts. To date, over 50 farms and two plants have been sampled. On the farm, the initial findings have revealed complex biofilms composed of a wide variety of bacteria, yeasts, and moulds. They are present in all places where milk flows. Some strains of lactic acid bacteria may persist in the milk line throughout the year and have demonstrated antimicrobial potential. In the plant, biofilms in raw milk tanks and pipes are dominated by proteobacteria, which are mostly disposed of after pasteurization. Researchers use powerful metagenomics tools to identify the species present and their activity. In a unique vein, the team uses a bioreactor to simulate biofilm formation in the lab to better understand their development. In the future, new sanitizing protocols will be developed and assessed.

Thank you to the participating farms and plants
Sampling at farms and cheese plants is currently underway for both projects in the dairy research cluster. Thank you to our dairy farmers and cheesemakers for opening your doors to researchers. Your contribution is essential to knowledge advancement.

DAIRY RESEARCH CLUSTER 3 GRAPPE RECHERCHE LAITIÈRE 3

Natural microbiota of cheeses under study

Variations in the composition of the natural microbiota of milk and cheese are a constant challenge for cheesemakers. One of the objectives of the projects developed by the team led by Steve Labrie at Université Laval, as well as Claude Champagne, Michel Britten and Marie-Claude Gentes at AAFC, is to measure the impact of milk concentration, mineralization of cheeses, and natural antimicrobial systems on proteolysis and microbiota development during maturation. In their analysis of summer and fall cheese-making milk, the researchers observed seasonal variations in milk composition. Researchers are completing an in-depth study of "summer decalcification" of casein micelles. In cheddar, natural antimicrobial systems appear to be little affected by milk thermization. Lactoferrin, lysozyme and lactoperoxidase concentrate up to three times in fresh cheeses. The evolution of these antimicrobial systems will be tracked in the next year as the cheeses mature.

PILOT PROJECTS UNDERWAY

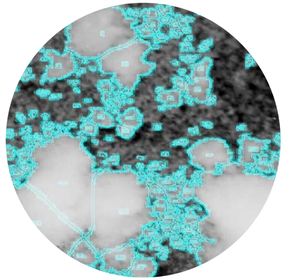
Some results from Novalait-supported research require a subsequent developmental stage for their use on the farm or in plants. Pilot projects aim to validate, in commercial conditions, compelling research results which have been identified by the members of the steering committees during project follow-ups. Here are the advances made by the two pilot projects underway.

Improving cow health and fertility traits

The team led by researcher Claude Robert has developed a new genomic analysis tool that generates a genetic diversity score for cows' health and fertility traits. With equal genetic value, the objective is to identify the bull that will generate a genetically more diversified progeny for these traits. This pilot project validates the genomic analysis tool on a large amount of data. Through a partnership with Lactanet, genotypic data and breeding values for more than 150,000 cows were introduced into the project database. These data are correlated with those of multiple bulls and the first validations are convincing. The more the cows are heterozygous for the sections of the genome found, the better are the values associated with health and fertility traits. This positive relationship also applies for somatic cells and animal longevity. Work continues in parallel with validation analyses to improve the tool's graphical interface.

Characterizing the structure of stirred yogurt using digital technology

Researcher Sylvie Turgeon at Université Laval is aiming to validate a fast and easy method for characterizing the structure of stirred yogurt by analyzing images obtained with a digital camera. Links that have been found between composition, shearing strength, and the final characteristics of stirred yogurt in previous research serve as the basis of this pilot project. The method is to spread a thin layer of yogurt over a spacer on a slide over a digital camera. The analysis of the images obtained by specialized software assesses the structure, size, and number of microgels. Eight commercial yogurts were tested. The team is currently validating the relationships between the physical properties of the yogurts (viscosity, texture, syneresis) and the size of microgels through image analysis. This method will provide a new tool that is fast, economical and easy to use in plants to support product development and quality control. The tool will be accompanied by a mapping of the critical manufacturing points for stirred yogurt.



Demonstration of image analysis in a video capsule

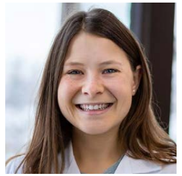
IMPACTS AND BENEFITS

DEDICATED PROFESSIONALS RESPOND TO THE CHALLENGES FACED BY DAIRY PRODUCTION AND PROCESSING COMPANIES

Novalait fuels innovation in companies in the dairy sector through the training it provides within the framework of its projects. By investing in research, Novalait supports the development of knowledge and expertise in the field.

Fuelling up on healthy foods

Hélène Pilote-Fortin completed her master's degree as part of the Metabiolac Industrial Research Chair in Metabolic Activity and the Functionality of Bioprotective Lactic Cultures. She studied the antifungal activity of reuterin produced by *Lactobacillus reuteri* and analyzed its potential application as a natural preservation agent in fermented milk. Through her work with industry suppliers during her studies, she decided to continue along the same trajectory. She is now in tune with the expectations and challenges of food processors as a project manager for the Quebec City-based research cluster Créneau d'excellence Aliments Santé de la Capitale-Nationale. The aim of the research cluster is to develop and market new, healthy, value-added and innovative food products to meet the needs of tomorrow's consumers.



Hélène Pilote-Fortin
Project manager,
Aliments Santé
créneau d'excellence

"During my master's, I developed my critical thinking, organizational, and leadership skills. I had the great privilege of being one of the students supported by Novalait. In addition to being an exceptional financial partner and supporting innovation in the dairy field, Novalait helps create an invaluable professional network for students. I had the opportunity to complete my master's degree at Université Laval in an industrial research chair in partnership with researchers at the Agriculture and Agri-Food Canada research centre in Saint-Hyacinthe. The experience helped me find my place in the world of work. I now work as a project manager at the Créneau d'excellence Aliments Santé. We provide support to food processors in Quebec seeking to leverage science and innovation to support their growth."

Innovating in fine cheeses

Thomas Messier received a grant from the Canadian Dairy Commission, a program managed by Novalait in Quebec, to complete his studies at Université Laval. Mr. Messier worked to identify texturing strains in yogurts. The originality of his project lies in the speed with which the strains were identified thanks to the genomic tools used. The goal of using these strains, which originate from lactic acid bacteria, is to replace the texturing agents currently used in a Clean Label approach. Mr. Messier now holds a position that allows him to combine his interests in research and product innovation.

Thomas Messier
Innovation and
Product Development
Specialist–Fine
cheeses, Agropur
Dairy Cooperative

"During my master's degree, I faced numerous technical and theoretical challenges. From the start, I was able to hone my expertise in the dairy sector and acquire knowledge of new concepts in genomics, which is a fast-growing field. The experience taught me a rigorous way of working that I needed in order to carry out my research project. In my work, the many follow-ups with my research partner helped me develop my analytical and communication skills. In my current job in innovation and development, I now see how my transition to a master's degree was critical to my career and in the development of my professional skills."

CONSOLIDATING STRATEGIC EXPERTISE FOR THE DAIRY SECTOR

The creation and renewal of research positions in Quebec is a priority for Novalait to provide the dairy sector with a continuous succession of scientific experts.

New expert in biosafety in the dairy sector

With support from NSERC, MAPAQ, Dairy farmers of Canada and Novalait, the Chair in Biosafety in Dairy Production was established at the Faculty of Veterinary Medicine at Université de Montréal. It is co-directed by researchers Simon Dufour and Juan Carlos Arango Sabogal. Mr. Arango Sabogal obtained his position as a researcher within the framework of the Chair. The research activities focus on three main areas: 1) understanding the epidemiology of infectious diseases in dairy cattle, 2) evaluating diagnostic tests and screening strategies, and 3) developing prevention and control programs and surveillance tools. The impacts and benefits are promising: they can help reduce the risk of the introduction of emerging diseases and reduce the prevalence of diseases like paratuberculous disease, leukosis, contagious mastitis, bovine viral diarrhea, and digital dermatitis.

Juan Carlos Arango Sabogal
Co-Director of the Research
Chair in Dairy Production
Biosafety, Faculty of
Veterinary Medicine,
Université de Montréal

"We will be undertaking projects that align with the priorities of dairy farmers. The research will provide an ideal opportunity to train highly qualified personnel in biosafety, epidemiology and animal health. By targeting the prevention and control of high-priority infectious diseases for the dairy industry, our research activities will help limit the economic losses caused by the introduction or presence of these diseases on farms in Quebec and Canada. Ultimately, Canadian consumers will benefit from increased access to high-quality dairy products produced by animals not only raised in exceptional conditions that promote their welfare, but also with a minimal use of antimicrobials. I count myself lucky to be able to combine my research interests, my passions for research and epidemiology, and my teaching profession in the Chair in Dairy Production Biosafety."

New recruit for dairy production at Université Laval

As a student that is actively involved in a Novalait-supported project and a Canadian Dairy Commission grant recipient, Véronique Ouellet quickly distinguished herself through her knack for understanding the dairy sector's issues. Université Laval recruited her in 2020 as an assistant professor in the Department of Animal Sciences. The new researcher wants to focus her activities on the interactions between the environment and animals in a context of climate change to increase not only the resilience of cows but that of the entire dairy sector.

Véronique Ouellet
Assistant Professor,
Department of
Animal Sciences,
Université Laval

"Both at the master's and PhD levels, I have always wanted to participate in research projects that provide concrete solutions to the problems observed on Quebec's dairy farms. For example, I had the chance to do a master's degree in calving detection and a PhD on issues faced by in the dairy farming sector due to climate change. Throughout my graduate studies, I gained perseverance, resilience, communication abilities, and a range of skills needed to conduct research. My participation in different projects along the way has guided my current research program on the interactions between the environment and animals in order to make our dairy herds more resilient in the face of a changing climate."

2021 FORUM TECHNO: DAIRY RESEARCH GETS CENTRE OF ATTENTION

Novalait held the first entirely virtual edition of its Forum Techno on June 8 and 10, 2021, in conjunction with the International Dairy Federation Symposium in Cheese Science and Technology. The collaboration provided excellent exposure for Novalait with 480 registrations for the week of events, including more than 200 participants at the Forum Techno. Participants had access to the latest research results of projects supported by Novalait and its partners in a virtual yet interactive format. Participants exchanged live with researchers and discussions thanks to the smart-couch feature.

Wide-ranging sessions

Novalait's research aims to bring concrete solutions to dairy farms and plants of all sizes that produce a wide range of products. Topics including new pathways to improve cow genetics, the use of more digestible alfalfa, the diagnosis of ruminal acidosis, and cow longevity were covered during the half-day program on dairy production. In the processing sessions, researchers presented a synthesis of multiple years of research on milk's natural microflora and bacteriophages. The themes of naturalness, natural antimicrobials and the valorization of dairy processing co-products rounded out the program. Participants were able to replay the sessions, available on the digital platform for one month following the event.

Young professionals in the spotlight

Novalait dedicates more than 25% of its research budget to graduate student salaries. Over the past 25 years, more than 300 professionals have been trained through our applied research programs. Many still work in the dairy sector. The Forum Techno facilitated exchanges with students as part of the virtual sessions and the "My thesis in 180 seconds" presentations.

Screenshot of an interactive question and answer session at the 2021 Forum Techno. Even the future generation was in attendance!

A number of Forum Techno sessions are now available in video format at novalait.ca. As well as fact sheets summarizing our current projects. Share them widely with your colleagues!

Congratulations to the recipients of the IDF-CANADA Excellence Awards

In one of the competitions, 21 students presented their research project in the form of a short video. They were evaluated, in particular, on their oral and written communication skills. Thank you to our evaluators for the student evaluations, as well as IDF-CANADA, who kindly donated the student awards. The awards recognize excellence among professionals trained through Novalait's research projects. Congratulations to the recipients!

PRODUCTION

$350 **Annie Fréchette**
The important role of *Klebsiella pneumoniae* in clinical mastitis of dairy cows raised on recycled manure bedding.

$150 **Jean-Philippe Laroche**
Protein nutrition: Can we do more with less?

PROCESSING

$350 **Nissa Niboucha**
Production of dairy biofilms on stainless steel surfaces in a bioreactor and development of an efficient collection method.

$150 **Serine Touhami**
Buttermilk under high pressure.

Awards to the best presenters

Participants also had the chance to vote for their favourite presentations given by students who took up the challenge of presenting their research project in 180 seconds. The recipients included:

PRODUCTION

Félix Huot
Characterization of ruminal pH measured continuously on 12 commercial farms

PROCESSING

Rachel Deshaies-Langlois
Lactoferrin, lactoperoxidase or lysozyme content in milk and cheeses

Novalait would like to thank all of our participants, speakers, students and sponsors for helping make the 2021 Forum Techno a success.

Ce que les participants en ont pensé

"The Novalait Forum rose to the challenge and modernized its format to offer a virtual experience for its 2021 edition. In keeping with past editions, the sessions were enriching and varied. It is always a great opportunity to meet and learn about the projects funded."

Débora Santschi, PhD, Agriculture, Director of Innovation and Development, Lactanet

"The Novalait Forum gives us an opportunity to take a break, to take stock of where we are, but also to take stock of the future, which is difficult to envision at times."

Luc Savoie, Project Manager - Technical Services and R&D, Saputo

"The Novalait Forum is a must-attend event to learn the results of research projects funded by dairy farmers and which respond to their concerns. The sessions always cover a range of topics and provide an opportunity to learn more about processing."

Chantal Fleury, Director of Economic Research, Producteurs de lait du Québec

"This was my first time participating in a forum like this, and it was an excellent experience. Coming from the cheesemaking field, I really enjoyed the presentation on flora and stretched-curd cheeses. I hope to have a chance to repeat the experience. Communication with the speakers was also easy and fast."

Richard Dubois, Chief of Operational Efficiency, Agrilait Co-Op

Novalait
Research Catalyst

275 rue du Parvis, suite 508
Québec (Québec) G1K 6G7

novalait.ca