



Putting back to day 120 the insemination of cows in metabolic stress: an idea to validate for the health and profitability of the herds

Duration: 2016 – 2019

Highlights

- This project brings together complementary genomic and economic expertise applied to dairy cows.
- Université Laval and the University of Wisconsin will partner with Valacta to document an emerging phenomenon: intergenerational epigenetic programming and its technico-economic impact for farmers.
- The metabolic status of mother cows may have an impact on the metabolic programming of the next generation in addition to traditional genes.
- Cows with an energy deficit at the time of insemination may potentially have female offspring that are less efficient at producing milk.
- The project examines this phenomenon under two aspects: 1) by completing a biological demonstration that the embryos carry remnants of this epigenetic programming, allowing us to measure the impacts and 2) by completing an in-depth economic analysis using a management tool that aims to identify the best time for insemination. This tool will be adapted to Quebec and will address this issue of energy deficit.

Objectives

Thanks to economic and epigenomic analysis, the objective is to provide farmers with the tools needed to determine the energy state of lactating cows, as well as the economic and biological benefits and disadvantages of delaying the insemination of cows with a BHB blood level greater than 1.2mM/L.

Results and potential benefits

For the epigenetic portion of the project, it is possible that the embryos will be different between days 60 and 120, particularly for cows with a high BHB level. This distinction will allow us to choose markers associated with the metabolic status. Because the markers identified on the embryos will also be measured on post-natal tissues in order to identify the metabolic programming indicators, these markers will be validated on hundreds of individuals in order to obtain the strength necessary to develop a diagnostic tool. These indicators could be used for a range of purposes, including herd monitoring to choose the heifers to be retained and in conjunction with a tool for Boviteq to modulate the relative value of embryos and animals produced according to the mother's production. These tools are essential to the development of factual management practices, based on measurements taken at birth (biomarkers) and in milk (BHB), and quickly adopted by farmers. Ninety percent of the data for cows has been obtained, and the preliminary analysis of the data confirms numerous differences based on the cow's metabolic status. Thus seven days after fertilization, the cows, which are hungry, have different embryos. Now it's a matter of translating these differences into functionality and seeing if the calves retain the main markers discovered in the embryos.

For the economic portion of the project, a modification in the time of reproduction may have negative economic impacts on the current and future lactation of cows. There is a potential to save money if we are successful in identifying cows using the tool. The tools are in place to process Valacta's data, and the analysis has begun. The tool, which will be developed as part of this project, will then be made available to potential users with the goal of guiding farmers. The results of the project will therefore provide a new rating system that can be integrated in the service offer available to farmers by their centre of expertise (Valacta).



Professionals trained

Catherine Chaput: Master's student at Université Laval. Expertise in the genomic analysis of bovine embryos and the molecular impacts of BHB blood levels at the time of insemination.

Catherine Couture: Master's student at Université Laval in charge of the economic analysis of delaying insemination. Expertise in analyzing economic factors in dairy production.

For further information

We will present our results at the Quebec Dairy Cattle Symposium and the Novalait Techno Forum, and we will produce an article for a journal read by dairy farmers (most likely Le producteur de lait québécois).

Financial contributions

Partnership for innovation in dairy production and dairy processing (EPI 2015-2019):

- Consortium de recherche et innovation en bioprocédés industriels au Québec
- Fonds de recherche du Québec – Nature et technologies
- Novalait

Total budget: \$282,866

Contact persons

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