



A targeted treatment for post-partum infertility in dairy cows

Duration: 2018-2021

Highlights

- One of the major problems in dairy production is related to the fact that cows have lower fertility in the two to three months following parturition, specifically high-yielding cows.
- New scientific data obtained in recent years suggest that the ovaries of dairy cows in the post-partum period are sensitive to the amount of available energy. An abnormal response has been observed at Day 60, particularly for genes that depend on Vitamin A.
- In a second study, 48 cows at Day 60 were categorized according to their metabolic deficit using their blood BHB levels to complete a comprehensive transcriptomic analysis of their dominant follicle. This analysis revealed a functional deficiency in Vitamin A as well as Vitamin D.
- As both vitamins are excreted into the milk and high producers show even greater losses, it is logical to assume that this deficiency is sub-clinical and that the cows' physiological needs may be greater during this period.
- Additionally, not every herd goes out to pasture (fresh grass), a situation that is known to affect fertility.
- The objective of this project is to test the addition of Vitamins A and D between Days 50 and 90 post-partum in conditions that are representative of Quebec dairy farms.
- The hypothesis is that the ovaries will sense a seasonal effect and that a targeted supplement of Vitamins A and D will reproduce the arrival of fresh pasture (Vitamin A) in spring (Vitamin D) and influence fertility.

Objectives

The objective of this project is to test the addition of Vitamins A and D between Days 50 and 90 post-partum in conditions that are representative of Quebec dairy farms.

More specifically, the objectives are to:

- 1) Determine whether the vitamin supplement corrects the ovarian response by analyzing the dominant follicle cells of the treated and untreated cows and according to BHB levels (high or low);
- 2) Determine whether the vitamin supplement improves the fertility levels of cows presenting high BHB levels at the start of the insemination period.

Results and potential benefits

This project proposes categorizing 48 cows on Day 50 based on their energy profile by measuring blood BHB levels at the farm and beginning supplementation for half of the animals (n=24), including 12 cows with a BHB level greater than 0.8. The second half of the animals (n=24) will not be treated in order to validate the therapeutic effect of the vitamins. To measure the response to the treatment, 24 cows (6 per group) will undergo aspiration of the dominant follicle to demonstrate the correction to the gene expression profile through supraphysiological vitamin supplementation. To better understand the therapeutic effect, a fatty acid profile will be completed on the follicular liquors, as well as a Vitamin A (retinol) analysis. Additionally, all animals will be monitored and inseminated to obtain preliminary results on the effectiveness of the treatment on fertility rates before attempting to reproduce the treatment on a commercial scale. The hypothesis is that ovaries sense a seasonal effect and that a targeted supplement of Vitamins A and D will emulate the arrival of fresh pasture (Vitamin A) in spring (Vitamin D) and thereby influence fertility.



Innovative aspects

- Use of genomic tools to understand the ovarian response to post-partum metabolic stress.
- Solution customized to each animal to maximize the effect of the vitamins by treating only those animals that need them at the time.
- Potentially more effective and acceptable than medical heat induction.

Professional trained

One Master's student was recruited in 2019, namely agronomy graduate **Martine Boulet**.

For further information

The research results will be promptly transferable to dairy farmers. An article will be written for the journal *Le producteur de lait québécois*. In addition, a presentation proposal will be submitted to CRAAQ for the Quebec Dairy Cattle Symposium (*Symposium des bovins laitiers*). Other communication activities (articles and presentations) are planned for collaborating users, including Novalait and Lactanet. A presentation will also be given at the Novalait Forum Techno.

Financial contributions

Special call for proposals in dairy production and processing (2016–2021):

- Natural Sciences and Engineering Research Council of Canada (NSERC)
- Quebec consortium for industrial bioprocess research and innovation (CRIBIQ)
- Novalait

Total budget: \$186,311

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