



A milk sample to predict a dairy cow's welfare status?

Duration: 2017 – 2020

Highlights

- As of yet, no research carried out around the world has managed to develop a biomarker that would allow one to easily detect, from a simple milk sample, the health and welfare status of a dairy cow.
- The rationale of the current research project is that:
 - Research on animal welfare has led to the development of reliable behavioral indicators, ranging from clinical signs to measures of activity.
 - Blood metabolites such as NEFA and BHBA are sensitive indicators of specific health disorders, but currently no indicator has allowed one to quantify the general welfare status of animals. Moreover, the collecting and analysis of such blood indicators is often costly and technically demanding, on top of being stressful for the animals.
- Recently, milk BHBA was found to be positively correlated with circulating BHBA (research by Denis-Robichaud et al. 2014. JDS 97:3314), indicating that milk sample analysis could be used to measure biomarkers of dairy cow health.
- The objective of this project is to develop precise indicators of dairy cow health and welfare that could be measured routinely in milk samples from individual cows or from herds.
- In the context of this project, physiological indicators will be analyzed along with the behavioral data collected during the experiments led by the chair on the sustainable life of dairy cattle.

Objectives

Developing precise biomarkers that can be recorded routinely (for example, through samples collected for milk recording) and used to detect herds and cows with a lower health and welfare level.

Results and potential benefits

This project integrates within the first theme (Cow comfort and herd management) of the Research Chair on the Sustainable life of dairy cattle program, **by adding physiological data to the measures taken, among which most others are behavioral.**

4 experiments have been conducted on the Macdonald Campus Farm of McGill University, over a period of 36 months. These experiments aimed to evaluate the impact of stall configuration on the comfort and movement opportunities of tie-stall dairy cows. 4 aspects were evaluated:

1. position of the tie-rail;
2. chain length;
3. stall width;
4. stall length-manger wall height combination (currently running).

For more information, read the abstracts and posters produced by Jessica St John & Véronique Boyer, two of our students)

Behavioural measures were collected to evaluate the cows' ease of movement and activity. Thanks to various technologies, we can automatically collect certain data, which aids in the detection of welfare issues in tie-stall barns:

- The number and quality of lying and rising bouts, total lying time, number of steps, use of available space, etc.



Results and potential benefits, continue...

Milk samples and blood samples were collected 3x/week during the first two weeks of each experiment, and 1x/week for the following 4-8 weeks. Physiological measures were selected according to the following four secondary objectives:

1. **Identify and evaluate the link between various indicators of health and welfare**
 - Plasma, milk and behavior indicators
2. **Establish indicators allowing to effectively discriminate between cows with low and high levels of welfare**
 - Welfare level = comfort level (ranging from low to high) provided to the cow in her tie-stall
3. **Define and refine the use of these indicators (alone or in combination) on the basis of cow and environmental indicators, including:**
 - Improved comfort level, stage of lactation, number of parities
4. **Evaluate the potential to detect changes in the welfare status of cows or herds using the same type of spectroscopy as what is currently used for milk recording**
 - FTIR spectroscopy

The collection and analysis of physiological data, in combination with behavioral data, is ongoing.

Professionals trained

Behavioral Measures Component: - 4 thesis-based Master students

Sarah McPherson

Erika Edwards (in collaboration with University of Tennessee, USA)

Véronique Boyer

Jessica St John

The work of these students is carried out as a part of the Chair on the Sustainable Life of Dairy Cattle. The results will be shared with the following two students:

Physiological Measures Component: - 2 students

Audrey St-Yves, M.Sc. student

Mazen Bahadi, Ph.D. student

1 Bachelor of Science Student (with distinction):

Shannon Manley

For further information

- An article featuring the project can be found in the June 2017 edition of the magazine *Le producteur de lait québécois*
- Website of the project manager: <https://www.mcgill.ca/animal/staff/elsa-vasseur>
- Blog: <http://cowlifemcgill.blogspot.ca/>
- Twitter account: @CowLifeMcGill

Financial contributions

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- Consortium de recherche et d'innovation en bioprocédés industriels du Québec (CRIBIQ)
- Fonds de recherche Québec – Nature et technologies (FRQNT)
- Natural Sciences and Engineering Research Council of Canada (NSERC)
- Novalait

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