

Dry Period Disease Indicators INRA 2015

Reference: COST-STSM-ECOST-STSM-FA1308-120115-051404

Summary Statement

As per re-negotiation of the project dates in mid-December, the above DairyCare COST funded STSM was completed successfully at INRA in Paris, during the months of February – April 2015. During this time a comprehensive and detailed data set was developed which allowed extensive preliminary analysis to be conducted. A draft of a scientific paper was produced; this will be submitted for publication in a reputable journal following further re-drafting.

Background

Scientific

This project was undertaken in light of the increasing interest in precision farming techniques specifically, in automated methods of disease detection. The project sought to address some of the issues surrounding the use of such detection aids by identifying potential dry-period indicators of production disease (metabolic disorders, metritis and retained placenta) that occur in the transition period. The physiologically overwhelming nature of the transition period, means that this stage of lactation is one of the most important and interesting areas to study.

This project was a natural progression from the work that was conducted in the early stages of my PhD, which identified significant differences in body weight change in the dry period for cows who developed different diseases post calving. Previous analysis was conducted on a small population of cows (n=26), whereas the COST funded project was conducted on a considerably larger dataset of cow-lactations (n=542).

Practical

INRA was considered to be the prime location in which to conduct this project due to the expertise which exists in the Modélisation systémique appliquée aux ruminants (MoSAR) unit. Supervision was by Dr Nicolas Friggens, director of the unit. This was extremely beneficial as he has been involved in my research from the commencement of my research career.

Objective Fulfilment

Data extraction and cleaning took a considerable length of time. Although this process was more time consuming than originally anticipated it allowed me to gain invaluable skills in coding and programming in MySQL. As a result of the time invested in this stage, the data set is now very robust and I am confident in its structure and content. This process means that I am now confident in extracting and managing large datasets – a skill which will be applied throughout my research career irrespective of the field. The following is an outline of the specific objectives of the study and the practical steps that I have undertaken to address them.

Objective 1

- To identify and quantify the effect of production disease on body energy change (BEC) in the dry period by monitoring such in diseased and healthy animals

Practical steps undertaken

Weekly live weight (LW) and body condition score (BCS) were collated for each week of the dry period for individual cows

Cows were classified into disease groups based on disease incidence in the first 30 days post calving. An importance factor was given to each disease which allowed a cumulative disease code to be assigned to each animal. In addition to the production diseases mentioned in the Work Plan a further disease group was created for cows that had an elevated somatic cell count in this first 30 DIM period.

Objective 2

- To develop a data handling system to filter, extract and combine body condition score and live weight data collected on farm

Practical steps undertaken

Null and erroneous values were removed from live weight and condition score data

Coding in SAS was developed which allowed the automated calculation of weekly body energy content (MJ) from weekly live weight and condition score data

Objective 3

- To identify features of body energy data (total change, slope of change etc.) which are significantly different in diseased and health animals.

Practical steps undertaken

Features extracted from the data included;

- BCS at drying (kg)
- LW at drying
- BCS at calving
- LW at calving (kg)
- BCS calving – BCS drying (total and per day of the dry period)
- LW – LW drying (total and per day of the dry period)
- BEC calving – BEC drying (total and per day of the dry period)
- Slope of change in BCS (across the whole dry period and in 2 separate phases of close up and far off)
- Slope of change in LW (across the whole dry period and in 2 separate phases of close up and far off)
- Slope of change in BEC (across the whole dry period and in 2 separate phases of close up and far off)
- Fitted end point of regression line (intercept extracted from regression analysis) for; BCS, LW & BEC

Objective 4

- To construct a statistical model which is able to calculate risk of production disease based on body energy data collected in the dry period

Practical steps undertaken

Differences in the features extracted between the disease groups were determined using a generalised linear model, which was constructed sequentially using proc glm in the statistical program SAS (v9.3). Explanatory variables used in the model include genetic line, feeding group, genetic x feeding interaction, parity, dry period length, year and health status. Further explanatory variables were considered but were found to be either insignificant or highly correlated to others which were already included.

Differences determined will be reported in the results section of the draft paper. At this stage, the results suggest that it is possible to distinguish between cows that go on to develop different production diseases based on change in body energy related traits in the dry period.

Exceptions

Due to the considerable volume of data, time spent constructing the data set and analysis of the traits listed in objective 3 it was decided that the predictive aspect of the work (calculating the risk of production disease) should form the next stage of analysis. This second phase will form a follow-up scientific paper to be submitted to a journal on completion.

Highlights

- Extensive one-on-one tuition in SQL and SAS from Dr Nic Friggens
- Networking with PhD students in similar subject area – knowledge sharing Draft of paper suitable for submission to reputable journal
- Evidence of potential value of on-farm data which can be further developed
- Framework for second paper
- Knowledge of theory behind natural cycles of lipid change in mammals and specifically, dairy cows gained

Summary Statement

The project is considered to have been successful by all participants. The greatest advantage has been considerable tuition in programming in SQL and data cleaning and analysis techniques using SAS. These skills are invaluable and will play a key role in my future research career. Scientifically, the results show that simple on farm data can be used to distinguish between cows that develop different diseases. This is a key finding which allows progression to the predictive aspect of this work. Following further re-drafting with co-authors, the work from this project will be submitted for publication a full original research paper.

Acknowledgements

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