Developing a phenotyping strategy for feed intake and/or methane emissions in dairy cows

Approximate start date: ASAP (end of 2023, start of 2024)

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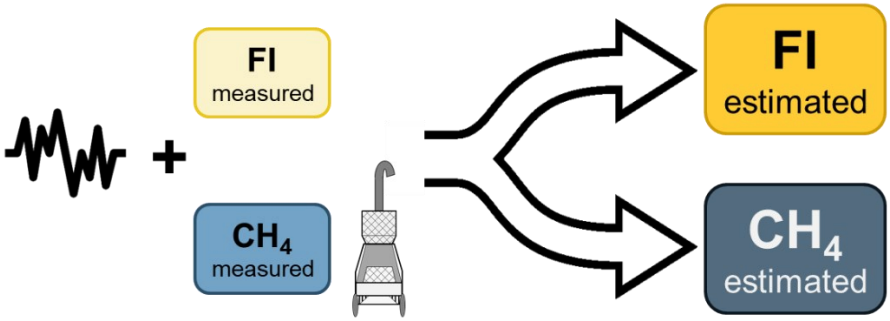
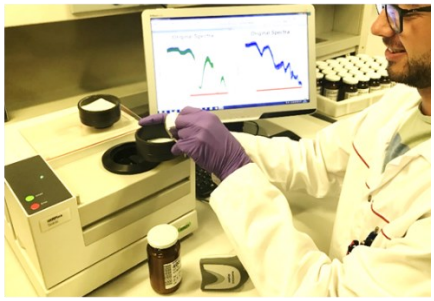
Project description

For breeding purposes, it is important to accurately phenotype traits relevant to dairy cattle. Gold standard methods, such as automated feed-weigh troughs that record individual feed intake (FI) and the GreenFeed system to measure methane emissions (CH_4) with high precision and accuracy, are expensive and limited in availability. This precludes rapid measurement of a large numbers of individuals required for genetic studies. Spectra obtained by mid- or near-infrared (MIR/NIR) spectroscopy are promising proxies that can be easily obtained in large numbers (Grelet *et al.*, 2020; Denninger *et al.*, 2020). In this project, MIR spectra of milk and NIR spectra of milk and faeces from cows will be combined with measurements of feed intake from automated feed-weigh troughs and methane emissions from the GreenFeed head chambers. In collaboration with Agroscope's Feed Chemistry Group, calibration models will be developed that relate the MIR and NIR spectra to the gold standard measurements, using chemometric methods. The aim is to have calibration models with a sufficient degree of accuracy and precision so that only the infrared spectra can be used for phenotyping purposes.

This internship is part of an ongoing genetic study on nitrogen use efficiency and methane emissions in dairy cattle. Participation in the practical work is possible and encouraged.





Prerequisites

This project requires at least a basic knowledge of R and some enthusiasm for using more sophisticated statistical techniques such as PLS or basic machine-learning applications (e.g., the *caret* package in R).

Literature

Denninger, TM, Schwarm, A, Dohme-Meier, F, Münger, A, Bapst, B, Wegmann, S, Grandl, F, Vanlierde, A, Sorg, D, Ortmann, S, Clauss, M & Kreuzer, M, Accuracy of methane emissions predicted from milk mid-infrared spectra and measured by laser methane detectors in Brown Swiss dairy cows. *Journal of Dairy Science* 103: P2024-2039

Grelet, C, Froidmont, E, Foldager, L, Salavati, M, Hostens, M, Ferris, CP, Ingvartsen, LP, Crowe, MA, Sorensen, MT, Fernandez Pierna, JA, Vanlierde, A, Gengler, N, GplusE Consortium & Dehareng, F, Potential of milk mid-infrared spectra to predict nitrogen use efficiency of individual dairy cows in early lactation. *Journal of Dairy Science* 103: P4435-4445

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