Using a dairy cow model to interpret in vivo individual data and to upscale results at herd level through *in silico* experiments

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Models are appropriate tools to help understanding the functioning of biological systems and many of them are used to forecast and simulate scenarios. Precision farming has primarily been developed through the automation of data acquisition but interpretative tools to capitalize on this raw material are lacking. In this context, animal models can be used as translators of individual time series data on animal performance into phenotypic information providing quantification on variability and further useful benchmarks for decision support.

In this study, we propose a fitting procedure on experimental data to synthesize records on individual cows and a demonstration of the use of this model-based interpretation to upscale results at herd level.

We used a modified version of the GARUNS model of dairy cow lifetime performance proposed by Martin and Sauvant in 2010, and data from an experimental trial on extended lactation conducted from 2012 to 2015 at the Danish Cattle Research Centre in Aarhus University (Denmark). Data used concerned insemination and parturition times, diet energy and dry matter content, body weight, body condition score, dry matter intake, milk yield and milk composition. The model was fitted on individual cow data with a step-by-step fitting procedure. Each of the 62 cows was thus characterized by an adjusted version of the model with a specific set of 12 parameters. The variability of these parameter values is then used to design and simulate a herd of individual virtual cows managed with different strategies for extended lactation.

The present communication is intended to describe the fitting procedure of the model, to present the results of the fitting at animal level and the results of the *in silico* experiment at herd level, and to put into perspective the use of this method and more generally of model-based approaches as management tools in the context of precision farming.