

## **Predicting ketosis from milk mid infrared (MIR) spectra using multivariate mixed models (work in progress)**

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This study was conducted to verify whether multivariate modeling of milk spectra (direct approach) gives better prediction of  $\beta$ -hydroxybutyrate (BHB) than the common uni-variate (indirect) approach. BHB is an indicator for ketosis. Data-sets were from Polish Federation of Cattle Breeders and Dairy Farmers in Poland. Part of one data-set (small) established a link (regression) between blood BHB and milk spectra. Calibration model developed was unstable, as 10-fold random segment cross-validation suggested different numbers of optimal factors. Spectra from large data-set were reduced to fewer latent variables (PC). Eight principal components explained >99% of the variation in the spectral variables. Estimated variance components and the corresponding variance ratios for the PC were low to medium. In the direct approach, REML estimates of (co)variance components (additive genetic, permanent environment, herd test day and residual variance) for large data-set and BLUP solutions for the PC scores from spectra of small data-set not used in model calibration were computed. Predicted PC scores were back-transformed into spectral scale loading matrix obtained from large data-set and to BHB through regression coefficient. In the indirect approach, the large spectral data-set was converted to single trait (BHB) and variance components estimated by fitting same effects as in the direct approach, but with uni-variate variance structure for the random effects. These BLUP solutions used to calculate predicted BHB. The two sets of predicted BHB values (from direct and indirect approaches) were compared by correlation coefficients with blood BHB for data not used in model calibration. Unexpectedly, correlation between BHB predicted by the indirect approach and blood BHB was higher than correlation predicted from direct approach. That means better prediction of BHB was found when uni-variate variance structure used than when multivariate co-variance structures were used. However, this is not a final conclusion since work is still in progress.

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