Predicting milk fatty acids and energy balance of dairy cows in Australia using milk mid-infrared spectroscopy

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Abstract

Mid-infrared spectroscopy (MIR) is traditionally used for analysing milk fat, protein, and lactose concentrations in dairy production but there is growing interest in using it to predict difficult, or expensive to measure, phenotypes on a large scale. The resulting prediction equations can be applied to MIR from commercial herd-testing to facilitate management and feeding decisions, or for genomic selection purposes. We investigated the ability of MIR of milk samples to predict milk fatty acids (FAs) and energy balance (EB) of dairy cows in Australia. Data of 240 Holstein lactating cows that were part of two 32-d experiments, were used. These experiments were primarily designed to measure intake and methane emissions. Milk fatty acids were obtained twice during the experimental period. Prediction models were developed using partial least squares regression with a 10-fold cross validation. Measures of prediction accuracy included the coefficient of determination ($R^2_{cv}$) and root mean square error (RMSE$_{cv}$). Milk FAs with a chain-length $\leq 16$ were accurately predicted ($0.89 \leq R^2_{cv} \leq 0.95$) while prediction accuracy for FAs with a chain-length $\geq 17$ was slightly lower ($0.72 \leq R^2_{cv} \leq 0.82$). The accuracy of the model prediction was moderate for EB with the value of $R^2_{cv}$ of 0.48. In conclusion, the ability of MIR to predict milk FAs was high, while EB was
moderately predicted. Additional data are needed to improve the accuracy and the robustness of the prediction models.