

## **Use of milk infrared spectra as animal health and welfare indicators**

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Some aspects of health (metabolic) and feeding problems of cow can be seen in milk. For example, milk composition and in particular, milk fat content and fatty acid profiles may significantly change with feeding and health state of cows. Milk samples are routinely analysed by Fourier transform infrared (FTIR) spectrometry and milk fat content, fatty acid composition and other milk components may be quantified from spectral information. These quantified milk components are taken as observed composition of the milk sample. Based on the common circumstances of a cow on a given test-day (parity, stage of lactation, herd\*test day, additive genetic and permanent environmental value of cow), a mixed model including these effects may be fitted to predict values for fat percentage. Thus, the deviation between the observed and predicted values for the specific milk sample may be computed. If the deviation is large, it may indicate some health or welfare problems.

The infrared reading of the milk sample is very multivariate (1060 spectral variables for every milk sample). Many of these are highly correlated, so some 5 to 20 independent sources of information (factors or principal components) may explain most variation in the dataset. For prediction of fat percentage one linear combination of the spectral variables of a milk sample is needed. Similarly, for a health or welfare aspect of the cow one linear combination of spectral variables may suffice. However, the mixed modelling of the common circumstances of a cow on a given test day may benefit from the multivariate info of the spectra. Therefore, the predicted values may be more accurate and a diagnosis based on the deviation of spectral observation from its prediction becomes more reliable. A PhD in multivariate modelling is starting now on fatty acid composition of milk based on FTIR spectra to give feeding and breeding advice. With available extra information on health or welfare aspects for cows, this might be included in the PhD.

Key words:- milk infrared spectra, multivariate analysis, health indicators

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