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**„MastiMIR“ - A mastitis early warning system based on MIR spectra**

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At farm level the mastitis disease appearance had decreased the milk production, produced veterinary costs, welfare issues, increased culling rate or caused lower milk payment . Because mastitis is associated with a wide range of characteristics that can be measured in milk and with recent advances in estimation of milk components using mid-infrared spectrometry, it is now possible to have the composition of several additional milk components such as fatty acids, lactoferrin, minerals, negative energy balance, non-esterified fatty acids and  $\beta$ -hydroxybutyrate or citrate, etc. The objective of this study was to build a spectrometric tool, such as MastiMIR for the determination in the milk quality of the animal health status, with the aim to evaluate the diagnosis usability and MIR indicators for the improvement of early mastitis prediction at LKV Baden- Württemberg. All data editing, modelling and calculations were done using the R statistical language and environment. The calibration data set contains around 9082 spectral data from around 1000 GMON herds. The validation approach was first cross validation 10 fold and a lot of 8 farms for an external validation. The 8 farms chosen for the external validation were the farms with the highest diagnosis registration and had to cover the important breeds e.g. 3 Holstein farms, 1 Red Holstein farm, 2 Brawn Swiss farms, 2 Simmental farms that are at LKV- Baden-Württemberg registered. To identify animal variables that were positively or negatively associated with mastitis determination, the spectral data set was first pre-processed by Savitzky-Golay first derivative to remove the offset differences between samples for baseline correction, before performing Legendre polynomial modelling. Then the data was submitted to the combination of lasso regression using the “glmnet” R package. For the non-healthy group the spectral data with mastitis diagnosis for a given cow within 7 days before the new mastitis observation and the editing chosen was just test-day that had more than 400,000 somatic cell count (SCC). What come after the mastitis diagnostic was not taken into account for modelling. For the healthy group only spectra which had no diagnosis associated within  $\pm 60$  days were used. For “glmnet” model were considered as fix effects the sampling moment, lactation stage and important LKV- Baden-Württemberg breeds and the Legendre polynomial data based on days in milk for the 212 OptiMIR wavenumbers of spectral data. Our MastiMIR calibration model showed a good accuracy (0.89) and a medium prediction accuracy (0.83) we have to underline that was not find until now any information in the literature of direct use of spectral data to predict the mastitis treat. The model provides four classes of Mastitis warning such as not, moderately, significantly and severely endangered. The moderately endangered class is a signal for the farmer. In that case the farmer would contact the veterinary and a control would be made in order to prevent the mastitis diseases. The MastiMIR model is a complementary tool for the SCC model.

**Keywords:** mastitis, spectrometry, MIR milk spectral data, dairy cow, cow health