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Standardization of milk mid-infrared spectra from a European dairy network

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Abstract

The goal of this study was to find a procedure to standardize dairy milk mid-infrared spectra from different Fourier transform mid-infrared spectrophotometers (different brands or models) inside a European dairy network to create new farm-management indicators (e.g., fertility, health, feed, environmental impact) based on milk infrared spectra. This step is necessary to create common spectral databases, allowing the building of statistical tools, to be used by all instruments of the network. The method used was piecewise direct standardization (PDS), which matches slave-instrument spectra on master-instrument spectra. To evaluate the possibility of using common equations on different instruments, the PDS method was tested on a set of milk samples measured on each machine, and an equation predicting fat content of milk is applied on all. Regressions were performed between master and slaves fat predictions, before and after PDS. Bias and root mean square error between predictions were decreased after PDS, respectively, from 0.3781 to 0.0000 and from 0.4609 to 0.0156 (g of fat/100 mL of milk). The stability over time of these results was confirmed by an application of the coefficients created by PDS 1 mo later on the slave spectra. These preliminary results showed that the PDS method permits a reduction of the inherent spectral variability between instruments, allowing the merging of Fourier transform mid-infrared milk spectra from different instruments into a common database, the creation of new types of dairy farm management indicators, and the use of these common calibrations for all Fourier transform mid-infrared instruments of the European dairy network.