

Capitalizing on mid-infrared spectral data for the improvement of milk composition and cow health

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In milk recording programs, mid-infrared (MIR) spectrometers are routinely used to quantify milk components such as fat and protein contents. In 2014, a Dairy Cluster 2 funded project was initiated to examine the application of MIR technology to improve the nutraceutical value of milk and cow health. Milk MIR spectrometers at CanWest DHI and Valacta milk laboratories were modified to begin to output the MIR spectra of individual milk samples to be transferred and saved into a database at the Canadian Dairy Network (CDN). In addition, multiple milk samples of 433 dairy cows across Canada were analyzed at the University of Guelph for their milk fat globule and casein micelle size, calcium, lactoferrin, and fatty acid contents. The combination of these gold-standard lab analyses and MIR data permitted the development of equations to predict the targeted milk components from the MIR spectra alone. The accuracy of the predicted values varied greatly depending on the component, with some not being suitable for practical use. The most promising results and potential value were realized for the MIR prediction of major fatty acids in milk and those grouped by chain length and saturation. The developed prediction equations could be applied to the millions of saved spectra in the database in order to generate a large number of records unrealizable by gold-standard methodologies. A new service within Canadian DHI is to provide milk BHB concentrations predicted from MIR spectra for herd management and genetic evaluations, with CDN publishing its metabolic disease resistance index, which includes the milk BHB predictions as its major component. We are now realizing the great potential of milk MIR spectra for its additional applications to better milk quality and cow health by simply expanding on a service already in place.

Implications: This project provided broader knowledge of the use of mid-infrared spectroscopy to develop new phenotypic indicators that will aid in the improvement of milk quality and cow health.