Abstract

Diagnosis of cows' physiological abnormalities using water spectral patterns of milk

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Introduction

It has been previously reported that water in biological tissues changes from one conformation to another when physiological equilibrium is disrupted. It has also been stated that the spectral difference in water bands around 1440 nm can provide valuable information for disease diagnosis. The objective of this study was to evaluate whether water spectral behavior in milk could be related to the animal health status, which could lead to a better understanding of biomolecular dynamics and structural changes triggered by a cow's physiological abnormalities.

Materials and Methods

Individual raw milk samples were collected from 40 cows during one lactation period (n = 5922 samples). Transflectance NIR spectra were acquired by an XDS Rapid Content Analyzer (Foss NIRSystems, MD, USA). The wavelength region from 1300 nm to 1600 nm, water first overtone, was used in this study. NIR data were pre-processed using multiplicative scatter correction (MSC) to reduce variations caused by the light scattering. To visualise differences in spectra at the water absorbance bands, auto-scaled spectra at 12 water matrix coordinates (bands) were selected and followed through the lactation period. Abnormalities have been introduced as specific spectral patterns.

Results and Discussion

We have found that the spectral differences at water absorbance bands reflects cows' physiological changes, thus their monitoring could provide valuable information for disease diagnosis. Disruption of absorbance balance at water matrix co-ordinates, WAMACS, (when compared to healthy status) may be classified into five groups according to the difference in water absorbance patterns (WAPS) of milk. These patterns were highly related to various abnormalities and proved to be a valuable tool for diagnosis of animal health status.

Conclusion

Differences in absorbance at water matrix co-ordinates (WAMACS) of cow milk spectra lead to a better understanding of biomolecular dynamic changes triggered by a cow's physiological abnormalities.

Reference paper as:
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