

# Improving taste and flavor in dairy product through milk analysis of free fatty by Mid-infrared (MIR) spectrometry.

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## Abstract

For several years, the dairy sector deals with a recurring issue: a defect of taste appearing due to degradation of fat, commonly called lipolysis. Lipolysis happens after the milking, through the physical shocks induced by freezing, pumping, transfer and storage of the milk. Physical break of fat globules makes triglycerides accessible to enzymes, and degraded into free fatty acids (FFA). Among them, the volatile short chain FFA lead to organoleptic issues through undesired tastes.

At present, an easy quantification of these individual short chain FFA, responsible of disturbing taste, is very difficult. On the other hand, the analysis of a wide range of FFA is possible by Gas Chromatography coupled with triple quadrupole mass spectrometer (GC-MS/MS). However, the analysis with this equipment is time consuming and expensive and does not allow to provide routine results on a larger scale. In order to bring a new way of preventive and corrective action for dairies and farmers, the main objective of this project is to develop predictive models based on milk mid Infrared spectroscopy (FT-MIR) to quantify FFA.

For this purpose, milk samples from four different countries (Belgium, France, Germany and Austria) were collected and analyzed in MIR spectroscopy as well as in GC-MS/MS. Models linking spectral data and GC-MS/MS data were performed using partial least square regressions and assessed in a 10-folds cross-validation. The PLS model provided moderate RPD for long-chain FFA and relatively low RPD for short-chain FFA. Indeed, most of short chain FFA were under the limit of quantification. The lack of short-chain FFA concentration will be solved with a mechanical induction of lipolysis without interfering with the MIR spectrum.

The current performances indicate that the MIR spectrometry is unable to predict accurately the FFA concentration. However, this is a preliminary study and the accuracy of models would be improved through the addition of samples in the dataset.