# Raman Spectroscopy as a Tool for Fat Composition Study: Application to Animal and Milk Fat

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In recent years, there has been an increased attention towards the composition of fats. In many food products and even some processing operations, it is important to be able to control and obtain better knowledge on lipid composition of the desired product. This implies the use of reliable techniques in order to ensure the quality of products.

The feasibility of using rapid and non-destructive methods, to study fat composition has been investigated. Cases on milk and animal fats were selected for this work. Fourier Transform Raman (FT-Raman) spectroscopy has been chosen for its advantage to give detailed structural information. Data were treated using chemometrical methods as Principal Component Analysis PCA and Partial Least Square PLS regression.

Two datasets were analyzed for this study. The first one was composed of 29 various types of animal fats in which different sample types (poultry, pig, bovine, lamb, and fish oils) were obtained from various sources, local and industrial retailers and producers, in order to cover the variation which may occur within each sample type. In the second a subset of 75 milk samples, selected from a databank (n=1033) from six cow feeding experiments on the basis of high, mid, and low concentration ranges of various odd and branched chain saturated fatty acids and different isolated and conjugated *trans* unsaturated isomers, were analyzed by FT-Raman spectroscopy at both room and frozen temperature.

Results obtained by the application of chemometrical methods on animal fat spectra show the benefit to study fats in their solid and liquid form for the characterization of unsaturated groups of fats. In the case of milk fat, it should be stressed the interest to use Raman spectra collected at different temperatures for the prediction of narrow concentrations of saturated odd- and branched-chain fatty acids in milk fat.

**Key words**: animal fat, milk fat, quantification, discrimination, composition, PLS, PCA