

Title:**Analysis of Butter and Margarine by High-Resolution ^1H NMR****Authors & affiliations:***Jan Schripsema*

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Introduction

Butter and margarine are fat in water emulsions. The separation of butter or margarine in a polar (soluble in water) and apolar fraction (soluble in chloroform) and subsequent analysis of these fractions by ^1H NMR permits a comprehensive analysis of its constituents.

Methods

120-130 mg of butter or margarine was dissolved in 0.80 ml of deuterated water, containing an exact quantity of the internal standard and 0.80 ml of deuterated chloroform. An aliquot of each of the layers was transferred to an NMR tube for analysis. Experiments were performed on a JEOL Eclipse+ 400 spectrometer.

Results and Discussion

A ^1H NMR spectrum was obtained for both the polar and apolar fraction. In the polar fraction the preservatives benzoic and sorbic acid, the organic acids citric, lactic, butyric, acetic and formic acid and furthermore the carbohydrate lactose were quantified. In the apolar fraction the CLA (Conjugated Linoleic Acid) rumenic acid, diglycerides, and linoleic acid were quantified. Rumenic acid is a characteristic component of ruminant fats and was found in all butter samples. The levels varied between 0.50 and 1.08 %.

In an investigation of different brands of butter, fourteen samples of Brazilian butter and one sample from Norway were investigated. Also two brands of margarine were investigated for comparison. A large variation in especially polar constituents was found between the butter samples, revealing the presence of preservatives in five brands of butter from Brazil, remarkable because these additives are legally not allowed. Furthermore the levels of organic acids and lactose permitted conclusions about the production process and quality, e.g. the presence of higher levels of free butyric acid indicate lipolysis leading to a lower quality and low levels of lactose indicate that after churning the residual milkfluids have been removed by an additional washing step in the production process.