Method

A variety of dairy products with a range of fat contents between 1% and 82% were analysed by NMR using an **MQC**-23 fitted with a 26 mm hydrogen probe. Analyses were conducted using the **EasyCal** 'Fat in Foodstuffs' application software package.

Samples were prepared in duplicate by spreading 3–5 g of each sample on glass fibre filter paper and placing either a) on a metal dish or b) directly inside a glass vial. All samples were dried in an oven at 103°C for ~5 hours (drying time dependent on amount of sample). After drying, the open-filter samples were placed inside glass vials. All samples were conditioned at 40°C for one hour, prior to analysis. NMR measurement time was ~32 seconds.

The advantage of this method over extraction techniques is that a large number of samples can be prepared in batches.

Results

Figure 1 shows that a good calibration (Correlation Coefficient = 1.00; Standard Deviation = 0.57) can be obtained using all the samples of dairy produce and an empty tube which represents 0%.

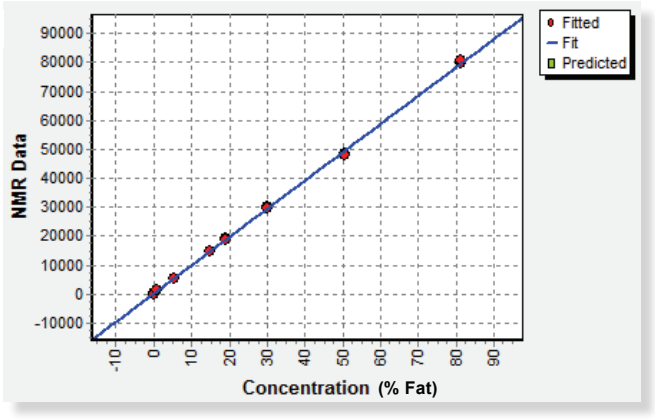

Figure 1

Since the hydrogen density of the fat components will vary with food type (e.g. butter, milk, vegetable oils and modified/blended oils) it is recommended that a calibration is generated from fat derived from the same source material. Such a calibration may be generated by a 100% calibration method or a multi-point calibration covering the range of interest.

Sample	*Stated fat content (%)	Measured fat content (%)	Difference – relative to calibration line derived from all samples (%)
Butter	81.3	81.9	+0.6
Low fat strawberry yoghurt	0.8	1.1	+0.3
Raspberry yoghurt	5.5	5.3	-0.2
Low fat crème fraiche	15.0	14.9	-0.1
Crème fraiche	30.0	30.5	+0.5
Single cream	19.1	19.4	+0.3
Double cream	50.5	49.3	-1.3

*Table 1: Fat content measured by NMR against the value *stated on the packaged produce.*

Figure 2 shows an excellent correlation was achieved using four types of dairy produce and a zero control. By reducing the calibration range (e.g. 0-20%), data from the previous experiment gave a Correlation Coefficient of 1.00 and Standard Deviation of 0.23%.

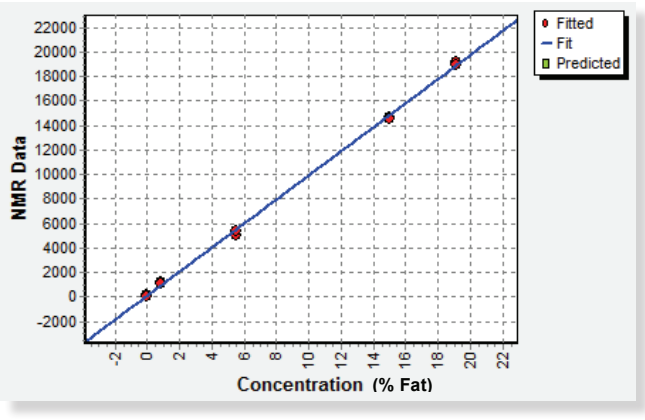

Figure 2

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Conclusions

The **MQC**-23 provides a means of rapidly measuring fat in dairy produce. Sample preparation is simple and conducive to very high sample throughput.

MQC – Enhanced Functionality

The instrument configuration used in this work may also be used to measure Oil in Dried Snack Foods, Fat in Chocolate and other Cocoa Derivatives. The functionality of the instrument may be increased to include the determination of Solid Fat Content (SFC), by the addition of a hydrogen probe (10 mm) and conditioning/tempering hardware as detailed in the AOCS/ISO SFC protocols.


Using Nuclear Magnetic Resonance to Test Fat Content in Foods

Case Study

How one contract laboratory dramatically increased sample throughput

Case Study: Fat in Food


Measurement of Oil Content in Dried Snack Foods

Application Note 2

No 2. Oil in Dried Snack Foods


Determination of Fat and Oil Content in Foodstuffs

Application Note 17

No 17. Fat & Oil in Foodstuffs


Determination of Solid Fat Content in Edible Oils and Fats by the Official Direct Method (AOCS Cd 16b-93)

Application Note 13

No 13. Solid Fat Content (SFC)

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