Fat extraction of milk powder and infant formula samples

SpeedExtractor E-916:
Fat determination of milk powder and infant formula samples without hydrolysis

The determination of fat in food is a routine procedure used in quality assurance and for labelling. Furthermore, the extracted fat is often used for contaminant analysis, e.g. dioxins.
Below, a procedure for fat determination in milk powder and infant formula is presented. Samples are not hydrolyzed prior to the extraction with SpeedExtractor E-916 – hence, the process time is reduced and chemicals saved.
For comparison, fat determination was performed with a prior hydrolysis step.

1. Introduction

Fat determination is one of the key analysis performed in the food industry. The samples are dried and mixed with diatomaceous earth. Afterwards, the fat is extracted with a suitable organic solvent using SpeedExtractor E-916. After the extract has been dried to a constant weight, the total fat content is determined gravimetrically.

2. Experimental

Equipment: SpeedExtractor E-916, Multivapor P-6

Samples: Milk powder LVU 08-4a with labelled fat content of 26.24 g/100 g. Skimmed milk powder with labelled fat content of 0.83 g/100 g. Baby milk formula with labelled fat content of 29.50 g/100 g

Determination: 7 g of diatomaceous earth (DE) was added to a weighing boat. The samples were weighed onto the DE. Then, another spatula of DE is put on top of the sample before deionized water is dropwise and evenly added to the sample/DE mixture. The content of the weighing boat was transferred into a mortar, then the mixture was ground to a fine powder and filled in a prepared extraction cell. The extraction was performed using the E-916 (Figure 1) by applying the parameters specified in Table 1. After extraction the solvent is evaporated from the fat using the Multivapor P-6.

Figure 1: SpeedExtractor E-916.

The samples were extracted in triplicate. All extracts were dried to a constant weight in a drying oven at 102°C before the total fat content was calculated.

Table 1: Extraction parameters using the SpeedExtractor E-916.

Temperature	100 °C
Pressure	100 bar
Solvent	Hexane 80 % Ethanol 20 %
Cells	40 mL
Collection bottles	240 mL
Cycles	4
Heat-up	1/1/1/1 min
Hold	10/10/10/10 min
Discharge	2/2/2/3 min
Flush with solvent	1 min
Flush with gas	3 min
Total time	80 min
Solvent consumption per sample	< 130 mL

3. Results and Discussion

The determined fat contents obtained with the SpeedExtactor E-916 are shown in Table 2. The fat contents of the samples determined without prior hydrolysis, are comparable to the values obtained with a hydrolysis step before the extraction. Furthermore, the results correspond well to the declared values and show low relative standard deviations (<1 %), which are lower than the rsd obtained with hydrolysis.

Table 2: Determined fat content in milk powder and infant formula samples, n=3. Labelled fat content: 26.24 g /100 g, 0.83 g /100 g and 29.50 g /100 g (rsd in brackets, n=3).

Sample	Direct extraction	With Hydrolysis
Milk powder LVU 08-4a	26.21(0.24%)	26.53(0.75%)
Skimmed milk powder	0.82(0.95%)	0.84(2.26%)
Baby milk formula	29.21(0.10%)	28.14(0.82%)

4. Conclusion

The determination of total fat content in milk powder and infant formula samples using the SpeedExtractor E-916 provides reliable and reproducible results. Applying high temperatures and pressures, the fat which is strongly bound to the matrix is released quantitatively.
Extraction using the SpeedExtractor E-916 is applicable to analyze the total fat content in milk powder and infant formulas of low and higher fat levels.
Because no acid hydrolysis is applied, the fat can be used for subsequent analysis e.g. for contaminants or fatty acid composition.

5. References

[1] BUCHI Application Note no. 007/2009: Fat determination in food and feed products using SpeedExtractor E-916 after acid hydrolysis.