

Fat extraction of milk powder and infant formula samples

SpeedExtractor E-916:

Fat determination of milk powder and infant formula samples without hydrolysis

1. Introduction

In the dairy industry, the fat determination and extraction is not only a routine procedure in quality assurance and labelling also it is very important for contaminant determination, as e.g. PCBs, dioxins or pesticides. A procedure for fat determination in milk powder and infant formula samples is introduced. The samples are extracted by applying elevated pressure and temperature with the SpeedExtractor E-916. After drying the extract to a constant weight, the fat content is determined gravimetrically. The samples are not hydrolyzed prior to the extraction - hence, the process time is reduced, and chemicals saved. For validation, the fat determination was performed also with a prior hydrolysis step.

2. Experiment

Sample:

Milk powder LVU 08-4a, declared composition: fat 26.24 % (SD 0.39 %), carbohydrates 35.95 %, protein 3.28 %

Skimmed milk powder, declared composition: fat 0.83 %, carbohydrates 53 %, protein 35 %

Infant formula (stage 1, for 0-6 month baby), declared composition: fat 29.50 %, carbohydrates 57.4 %, protein 9.6 %

Equipment:

SpeedExtractor E-916, BUCHI, Extraction cells, 40 mL, BUCHI (051235), Collection bottles 240 mL, BUCHI (052672), Multivapor™ P-6, BUCHI (MP21101S12), Recirculating Chiller F-105, BUCHI (11060002)

Procedure:

The samples are extracted using Pressurized Solvent Extraction with the SpeedExtractor E-916 (Table 1). The received extracts are evaporated in parallel to dryness using the Multivapor™ P-6. The fat content is determined gravimetrically.

Table 1: Extraction parameters for the SpeedExtractor E-916

Parameter	Value
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



Figure 1: SpeedExtractor E-916.

3. Results

Table 2 shows the results of the fat determination of milk powder and infant formula samples. For comparison the fat contents of the samples are determined with and without hydrolysis prior to the extraction with the SpeedExtractor E-916.

Table 2: Fat contents of milk powder and infant formula samples: comparison determination with and without hydrolysis prior to extraction.

Sample	With hydrolysis: Fat [g/100g]	Without hydrolysis: Fat [g/100g]
Milk powder LVU 08-4a	26.53 (0.75 %)	26.21 (0.24 %)
Skimmed milk powder	0.84 (2.26 %)	0.82 (0.95 %)
Baby milk formula	28.14 (0.82 %)	29.21 (0.10 %)

4. Conclusion

The determination of fat using the SpeedExtractor E-916 without hydrolysis resulted in reliable and reproducible results that correspond to the labelled results. Compared to hydrolysis before extraction, the direct fat determination could considerably save process time. In addition, extraction without hydrolysis has inherent advantages, not only for the fat determination but also for the contaminant analysis. Acid hydrolysis could wash out water-soluble compounds and destroy analytes as e.g. pesticides or fatty acids. Finally, the extraction solvents can be recovered with the Multivapor™ P-6. The fat determination in milk powder and infant formula with direct extraction using SpeedExtractor E-916 is an economic, safe, time-saving, easy to work and environmental-friendly method. For further information please refer to Application Note 243/2016.

5. References

Application Note No. 243/2016: Fat extraction of milk powder and infant formula samples