

Ultrafast Total Fat Extraction of High-Fat Meats



Summary

The EDGE® automated solvent extraction system is the most advanced system available for extraction of lipids from food samples. It is based on the combination of dispersive solid phase extraction and automated solvent extraction which drastically reduces the amount of time and solvent consumption. The system provides a complete fat extraction in less than 10 minutes, including extraction, filtration, cooling, and system cleaning, much faster than other extraction techniques. The EDGE is an ideal system for high-throughput extraction of all food samples, including high-fat meats. In this application note, EDGE, with its patent pending Q-Cup®, will be shown as a good alternative for the extraction of fat from high-fat meats.

Introduction

The extraction of fat from food is crucial in the food industry for product formulation and because food labels must report both saturated and unsaturated fat content. Furthermore, educated consumers are highly concerned with what is in their food and are particularly concerned with fat content. In an industry with significant quality control and that is increasingly becoming more consumer-driven, time becomes a critical factor. Food manufacturers are burdened with additional testing before product release, making speed of analysis a critical factor.

Total fat extraction can be a challenge due to the potential of fat entrapment in the matrix. Traditional methods, such as Soxhlet, have been found to be effective; however, they take a long time to complete, use lots of solvent, and are destructive to the sample. In the demanding food industry there is a huge need to determine fat content quickly and safely.

Beyond the labeling needs, analyzing for contaminants is increasingly important. When analyzing for food contaminants there is often a need to further process a sample after fat extraction. Most traditional methods destroy the sample during the fat extraction, making further processing impossible. With EDGE, the fat extraction of high-fat content meats is completed in less than 10 minutes. The EDGE process is non-destructive and the extracted sample is ready for further analysis.

Materials and Methods

Reagents

Nathan's Famous® skinless beef franks, Armour® potted meat, and Hormel® original pepperoni were purchased from a local grocery store. Samples were mixed with sand obtained from Sigma Aldrich. Petroleum ether was used as the extraction solvent. The system was washed with petroleum ether and water.

Sample Preparation

The meat samples were individually homogenized in a grinder. 2 g meat samples were mixed with 2 g of sand and then added to an assembled Q-Cup™ containing a C1 Q-Disc®. The Q-Cups containing samples were then dried in an oven at 120 °C for 1 hour tilted to the side to avoid any loss of fat out the bottom of the Q-Cup. The Q-Cups were placed in the EDGE removable rack, each with a pre-weighed collection vial and the rack was positioned on the EDGE. The CEM approved method for total fat was used.

EDGE Method

Q-Disc: C1

Cycle 1
Solvent: petroleum ether
Top Add: 10 mL
Bottom Add: 10 mL
Rinse: 0 mL
Temperature: 140 °C
Hold Time: 1 min

Cycle 2
Solvent: petroleum ether
Top Add: 10 mL
Bottom Add: 10 mL
Rinse: 0 mL
Temperature: 130 °C
Hold Time: 1 min

Wash 1: 10 mL water
Wash 2: 15 mL petroleum ether

Analysis

After extraction, the pre-weighed extraction vials were transferred to an Organomation N-EVAP 111 nitrogen evaporator to remove all the petroleum ether. The pre-weighed extraction vials containing the dry total fat sample were weighed and the difference was determined as the total fat amount.

Results

The EDGE yielded accurate total fat extraction of hot dogs, potted meat, and pepperoni in under 10 minutes. **Table 1** shows the recovery data for the extraction of fat from high-fat content meats. With the EDGE, total fat of these high-fat content meat samples was determined quickly using minimal solvent in a one-step simple process. Furthermore, the extracted fat as well as the fat extracted meats were not destroyed and, if necessary, could both be further processed.

Table 1. Recovery Data for the Extraction of Fat of Hot Dogs and Potted Meat versus Soxhlet

Sample	% Fat	% Recovery
Hot Dogs	17	98
Potted Meat	35	104
Pepperoni	45	99

Conclusion

The extraction process used on the EDGE automated extraction system allowed for a broad range of fatty meats to be extracted extremely efficiently. One CEM approved extraction method, was utilized for all samples, greatly simplifying the sample preparation process. The method was faster and used less solvent than traditional techniques such as Soxhlet. In this study, high-fat content meats were examined, however, this same method would be applicable for all samples containing only unbound fat. The EDGE, with its rapid extraction time, is ideal for high-throughput testing labs that want repeatable results in a fraction of the time of standard techniques. It is also ideal for the lab that requires additional testing on either the matrix or extracted fat as both are well preserved on the EDGE, ready for further processing.

United States (Headquarters)

800-726-3331
704-821-7015
Fax: 704-821-7894
info@cem.com

France

33 (01) 69 35 57 80
Fax: 33 (01) 60 19 64 91
info.fr@cem.com

Germany, Austria, Switzerland

(49) 2842-9644-0
Fax: (49) 2842-9644-11
info@cem.de

Ireland

+353 (0) 1 885 1752
Fax: +353 (0) 1 885 1601
info.ireland@cem.com

Italy

(39) 35-896224
Fax: (39) 35-891661
info.srl@cem.com

Japan

+81-3-5793-8542
Fax: +81-3-5793-8543
info@cemjapan.co.jp

United Kingdom

(44) 1280-822873
Fax: (44) 1280-822873
info.uk@cem.com

www.cem.com

© 2019 CEM Corporation
All rights reserved. This may not be reproduced or published without written permission from CEM.