Extraction of Fat from High-Fat Meats

Abstract

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 pressurized fluid 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, the EDGE 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.

Fat extraction can be a challenge because of 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 the 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.

Sample Preparation

The meat samples were individually homogenized in a grinder. A portion of 2 grams of meat samples were mixed with 2 grams of sand and then added to an assembled Q-Cup containing a S1 Q-Disc® stack (C9+G1+C9 sandwich). 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 fat was used. It is recommended that with daily extractions using this protocol, a system wash with water and then a system wash with petroleum ether are done to prevent salt buildup.

EDGE Method for Fat from Meats

Q-Disc: S1 Q-Disc Stack (C9+G1+C9 sandwich)

Cycle 1
Extraction Solvent: Petroleum Ether
Top Add: 10 mL
Bottom Add: 10 mL
Rinse: 0 mL
Temperature: 140 °C
Hold Time: 01:00 (mm:ss)

Cycle 2
Extraction Solvent: Petroleum Ether
Top Add: 10 mL
Bottom Add: 10 mL
Rinse: 0 mL
Temperature: 140 °C
Hold Time: 01:00 (mm:ss)

Wash 1
Wash Solvent: Petroleum Ether
Wash Volume: 15 mL
Temperature: 100 °C
Hold: 00:15 (mm:ss)

Wash 2
Wash Solvent: Petroleum Ether
Wash Volume: 15 mL
Temperature: - - -
Hold: - -:- -

Analysis

After extraction, the pre-weighed extraction vials were transferred to a Q-Dry™ solvent evaporator to remove all the petroleum ether. The pre-weighed extraction vials containing the dry fat sample were weighed, and the difference was determined as the fat amount.

Results

The EDGE yielded accurate 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, 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.

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. 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.

Table 1. Recovery Data for the Extraction of Fat from Hot Dogs, Potted Meat, and Pepperoni

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

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