

Assay of the Fat Content of Commercial Meat Products

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Introduction

Recent publicity by consumer-protection agencies, has focused attention on the unexpectedly high fat content of many commercially-ground meat products e.g. frankfurters and hamburger meats. Meat processors often disguise fatty bulk to look like red meat, with blood and coloring agents. This practice not only deceives the consumer, but also exposes him to the possible health hazard of incorporating too many cholesterol-generating fats into his diet.

In the following experiment, the fatty components of hamburgers, bologna salami and frankfurters will be measured by weighing a sample of the meat product, extracting the fats with a suitable solvent, and finally weighing the defatted, dried meat residue.

Extraction is the process of washing a mixture of two substances with a solvent, where one substance dissolves readily and the other does not. When the solvent is removed, the insoluble substance remains. Extraction is thus a purification or separation process. In this case with acetone as the solvent, the meat protein is the insoluble substance and the fat is soluble the soluble substance extracted from the meat by the acetone.

Procedure

Obtain a Wiley extractor unit (see Figure next page) from the stockroom and a sample of bologna, salami hamburger or frankfurter meat from your instructor. Note the brand name and the price per pound of your meat sample.

Weigh a fresh paper extraction thimble in an aluminum dish, in the analytical balance. Record this weight on your report sheet. Weigh and record the aluminum dish alone.

Shred a thumb-size piece of meat by means of a knife or spatula, and introduce the pieces into the extraction thimble. Reweigh thimble + contents in the aluminum dish. Fill the extraction thimble to within ¼" of the top.

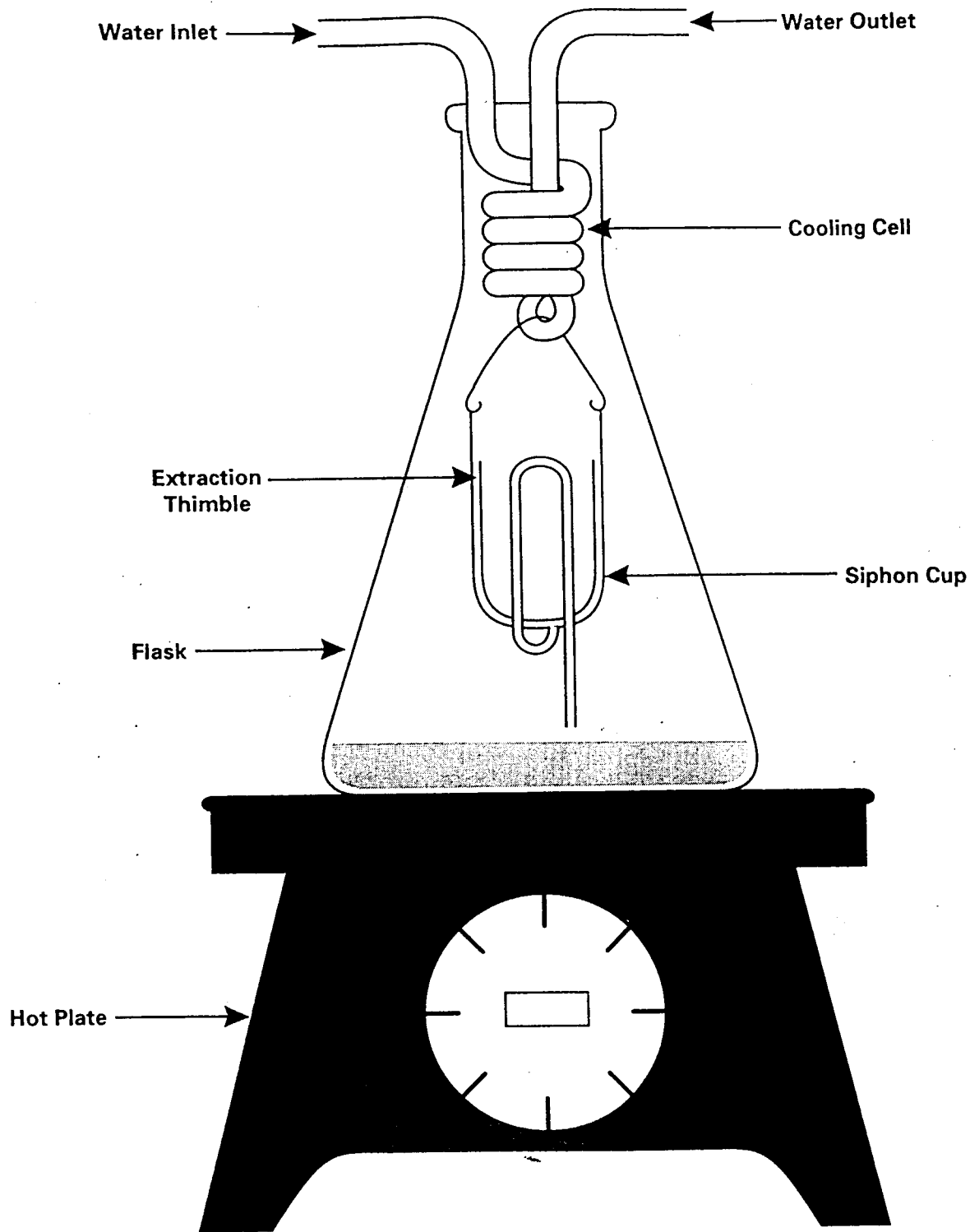
Now pour 50 ml of acetone into the ehrlenmeyer flask (which forms part of the Wiley extractor). Put the filled thimble into the glass siphon-cup and hang it, by means of the attached wire, from the cooling coil of the extractor (see diagram on the next page) over the flask with the cooling unit with siphon-cup so that the projecting siphon-tube hangs above the surface of the acetone. Attach one of the connecting rubber hoses to a cold-water tap, and have the other empty into the drain trough. (It is advisable to extend the exit hose with a piece of glass tubing). Now, stand the assembled extractor on a hot plate, topped with a wire mesh, and set the dial for MEDIUM before heating. Be careful that none of the rubber hoses touch the hot plate, and that there are no open flames in the vicinity of the apparatus.

Let the contents of the extractor percolate for at least 15 minutes after the first drop of the condensed acetone drips from the cooling coil (A thirty-minute extraction period is recommended).

Turn off the hot plate and remove the apparatus to the desktop. When the flask is comfortably cool to the touch, turn off the circulating water, detach the siphon cup, and remove the extraction thimble by means of a tweezers. Transfer the thimble and contents to the previously-used aluminum dish.

Place the dish + contents into a drying oven at 60°C and allow to dry for 20 minutes. After this time, check to see if any moisture is visible on the inside or outside of the dish. If dry, remove to the open air and carefully smell it. Should a pronounced odor of acetone persist, continue the drying for a longer period. Then, allow the dish to cool, and reweigh it with its contents on the analytical balance.

WHILEY EXTRACTOR UNIT



Report Sheet for Assay of Fat in Meat

Name _____ Lab Section _____ Date _____

Data

Brand and type of meat _____

Cost (in cents) per pound: _____ cents

Weight of fresh meat (+ thimble + aluminum dish): _____ g

Weight of thimble + aluminum dish: _____ g

Weight of defatted meat (+ thimble + aluminum dish): _____ g

Calculations

Weight of fresh meat _____ g

Weight of defatted meat: _____ g

Weight of extracted fat: _____ g

% fat in meat sample = weight of extracted fat/weight of fresh meat X 100 = _____%

% fat-free meat sample = 100 – % fat in meat sample = _____%

Cost (in dollars) per pound of fat-free meat = Cost(in cents per lb)/% fat free meat
= \$ _____

Comparison of brands and types of meat

Brand Name	percent fat	\$cost/pound of fat-free meat
1. _____	_____	_____
2. _____	_____	_____
3. _____	_____	_____
4. _____	_____	_____
5. _____	_____	_____

Questions

1. This experiment separates meat into an acetone-soluble part and an acetone-insoluble part. The calculations are based on the principal components of meat being fat (acetone soluble) and protein (acetone insoluble or fat-free meat in report sheet). More realistically, the principal components of meat are fat, protein, and water. Water is acetone soluble. Based on this information, the calculations correctly calculate what quantity, % fat or % fat-free meat? Is the incorrectly calculated quantity over or under estimated?

2. This experiment separates the fat from the protein by dissolving the fat in acetone. What advantage does using the Wiley extractor have over simply pouring acetone over the meat again and again?

3. Why was hot plate necessary to boil the acetone? Why not use a Bunsen burner?

4. What affect would each of the following changes in procedure have had on the calculated percentage of fat found for your meat product?
 - a) The acetone-washed meat in the thimble was not completely dried before weighing.

 - b) The amount of acetone in the flask was increased from 50ml to 75ml, at the start of the extraction process.

 - c) The fresh meat was thoroughly dried, before starting the experiment.