Apparatus for Direct Collection of Volatiles from Meat

An apparatus is described for direct distillation of meat under vacuum. It consists of a cold trap which is mounted in an inverted position and fits directly into the standard joint of the sample flask. When the efficiency of distillation was tested with the aid of a hydrocarbon mixture, recoveries ranging from 86 to 95% were obtained.

The analysis of trace volatile compounds in foods is important in flavor research and in studying certain decomposition reactions. Recently, we described techniques for isolation and measurement of volatiles in lipid systems (Nawar *et al.*, 1969). A cold-finger high-vacuum distillation apparatus similar to that designed by deBruyn and Schogt (1961) was used for analysis of the *n*-alkane and *n*-alkene series from C_9 to C_{22}. The proximity of the cold finger to the surface of the sample allowed for excellent recoveries of these compounds. This method, however, is not applicable to the recovery of volatiles from meats or other aqueous food systems due to severe accumulation of ice on the cold finger and resultant poor efficiency of distillation.

The apparatus shown in Figure 1 was designed to overcome this problem. It consists of a cold trap (T) which fits directly into the standard joint (⅋ 34/45) of a 150 ml flat-bottom sample flask (S). Trap (T) is similar to a conventional round-bottom cold trap except that it is equipped with a liquid nitrogen jacket (L) and is mounted in an inverted position. The use of a safety guard during vacuum distillation is suggested.

Samples of meat (10 g) are ground and spread in a thin layer over the bottom of the sample flask. The apparatus is assembled with arm (A) connected to high vacuum, the sample is frozen, and the system is evacuated. Liquid nitrogen is then placed in the reservoir, the sample is thawed, and the distillation carried out at 10^{-3} torr for 1 hr, during which the sample is maintained at the desired temperature. At the end of the distillation, the cold trap is disconnected, and its position reversed with the liquid nitrogen carefully poured into a separate container. The condensed volatiles are then taken into 5 ml of diethyl ether for gas chromatographic injection. Qualitative and quantitative analysis can be made as described previously for the volatiles from lipid systems. The mixing of 1 ml of ethyl ether with the ground sample before distillation was found to improve recovery of the volatiles by approximately 15%.

The apparatus described here is simple and combines the advantages of both the short-path cold-finger system (deBruyn and Schogt, 1961) and the conventional cold trap. Efficiency of distillation was evaluated with the aid of a test hydrocarbon mixture which was incorporated in 10 g of fresh ground meat. The mixture contained 0.6 mg of each of 6-dodecyne, *n*-tetradecane, and *n*-heptadecene, and the sample flask was maintained at 80° C during the distillation period. Recoveries of 86, 92, and 95%, respectively, were obtained when glc peaks of the volatiles collected were compared to those obtained by injecting a standard solution of these compounds in ether.

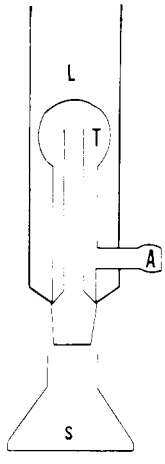

Figure 1. Apparatus for direct distillation of meat samples

The apparatus has been successfully used in this laboratory to study the hydrocarbons produced in meats by irradiation.

LITERATURE CITED

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John J. Balboni[1]
Wassef W. Nawar

Department of Food Science
and Technology
University of Massachusetts
Amherst, Mass. 01002

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[1] Present address: General Foods Corp., Tarrytown, N.Y.