

EVALUATION OF RAPID FAT DETERMINATION IN MEATS USING AN AUTOMATED MEAT FAT ANALYZER

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A study was conducted to compare the CEM rapid automated fat analyzer with a manual extraction technique, which employed a 2:1 chloroform-methanol solvent mixture. The CEM analyzer consisted of an integrated microwave moisture determination and dichloromethane fat extraction system.

Fat levels determined by the automated method for beef, lamb, chicken and pork were respectively 0.74% (absolute), 0.46%, 0.74% and 0.70% lower than the manual extraction method. For all meats combined, the automated extraction yielded a 0.66% lower value than the manual extraction method ($P < 0.05$). The mean fat content of the samples extracted by the two techniques and the statistical comparison of the methods are shown in the table.

Re-extraction of sample residues from the rapid automated extraction, by the manual extraction method revealed the presence of a small amount of lipid which was enriched in phospholipid relative to the original sample. The failure of the relatively non-polar dichloromethane in the CEM method to extract all the lipid is well known from previous work comparing solvents of different polarity (Sahasrabudhe and Smallbone 1983). For all meat types tested the difference between the two techniques diminished as the total percentage fat in the samples increased. The regression equation for predicting manual fat value when the automated dichloromethane extractable fat value is known was found to be:

$$\% \text{Fat} = 0.93 + (0.97 \times \text{Automated extractable fat}) \quad (r^2 = 0.99)$$

Meat	n	Fat content (g/100g)		Difference between methods		Comparison of results	
		Manual	CEM	Mean Diff.	S.D.(a)	C.V (b)	t(c)
Beef	24	7.49	6.76	0.74	0.28	3.74	12.95
Lamb	13	13.53	13.05	0.46	0.52	3.91	3.19
Chicken	6	12.96	12.22	0.74	0.58	4.61	3.13
Pork	6	11.77	11.07	0.70	0.58	5.08	2.96
Combined	49	10.64	9.99	0.66	0.44	4.26	10.49

(a) Standard deviation

(b) Coefficient of Variation

(c) t-test. All significant ($P < 0.05$)

For low fat meats (<10% fat) the CEM automated method gave a consistently low readings compared with the manual method. This was found to be due to the non-polar dichloromethane quantitatively extracting neutral lipids but not polar lipids. In meats with higher fat levels, the polar lipids make up proportionately less of the total lipid, hence the efficiency of extraction by the CEM automated method approached that of the manual method. The CEM automated method, however, completely extracted the fat of interest to nutritionists (triglycerides). Provided a bias figure was determined for non extracted fat (polar lipids) in low fat meats the CEM apparatus gave accurate fat figures on a wide range of meats of various fat contents.

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