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The energy content of rat carcasses prepared for analysis by different methods

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The effect of oven-drying on the gross energy content of rat carcasses was investigated. No losses of carcass energy could be ascribed to oven-drying per se.

Lofti, Macdonald & Stock (1976) have suggested that oven-drying at temperatures around 100° results in significant losses of energy from animal carcasses and diets. Although they drew this conclusion mainly from analysis of materials which had been partly freeze-dried before oven-drying, they also refer to carcasses which had been oven-dried entirely, and report an energy loss of the order of 10 %.

This statement has obvious implications for experiments which draw their findings from carcass analysis, and we have attempted to confirm it with reference to our standard laboratory procedure of oven-drying followed by homogenization. Our experimental design was intended to minimize the effect of between-animal variation and to afford a direct comparison of drying methods applied to the same material, as well as a comparison of our usual method with one which did not involve any heat treatment of the carcass.

METHODS

Comparison of drying methods

Eleven rat carcasses were used, each being prepared as follows. The rat was killed and the head, tail and viscera removed. The backbone was also removed, and the carcass divided in two longitudinally. One half-carcass was passed three times through an electric mincer, and from the resulting homogenate, two pairs of portions were taken. One pair, portion 'A', were dried to constant weight on tared aluminium dishes in a hot-air forced-draught oven at 95°. The other pair, 'B', were dried to constant weight on tared dishes in a vacuum desiccator over phosphorus pentoxide at room temperature (about 20°). After drying, the samples were ground in a coffee grinder (Moulinex; obtainable at catering supply stores). The second half of the carcass, designated 'C', was prepared by our 'usual method' of drying to constant weight on a tared tray in the oven at 95°, followed by homogenization of the dried carcass in the mincer. Duplicate portions of this were taken for analysis. The times taken to achieve constant weight varied between 3 and 8 d.

By these means we obtained a series of paired comparisons of oven drying with a control method (vacuum–P_2O_5), and of our 'usual method' with both. After drying, duplicate portions were analysed for gross energy using the ballistic bomb calorimeter (Miller & Payne, 1959), for nitrogen by the Kjeldahl method, and for fat by the method of Southgate (1971).

Table 1. *Mean values (standard errors in parentheses) for the composition of eleven rat carcasses after drying by different methods*

	Method		
	Half carcass minced, then:		Half carcass oven dried at 95° and then minced (C)
	Oven dried at 95° (A)	Dried over P_2O_5 (B)	
Total solids (g/g wet wt)	0·371 (0·0095)	0·376 (0·0079)	0·371 (0·010)
Gross energy (kJ/g dry wt)	25·1* (0·29)	24·8* (0·37)	26·2 (0·45)
Nitrogen (mg/g dry wt)	97·5 (4·40)	94·7 (6·96)	97·7 (2·62)
Fat (g/g dry wt)	0·261** (0·0172)	0·256** (0·0258)	0·302 (0·022)
Coefficient of variation for fat (%)	22	33	24

Result of paired Student's t test between method 'C' and the method indicated: * $0{\cdot}05 > P > 0{\cdot}01$, ** $0{\cdot}01 > P > 0{\cdot}001$. No other differences significant.

Table 2. *The fat content of portions of one rat carcass, and of the washings from the mincer and grinder used in their preparation*

		Total fat (g)
Half carcass, minced, oven-dried and ground	A	8·31
Washings from mincer	AW_1	0·167
Washings from grinder	AW_2	0·083
Half carcass, oven-dried and then minced	C	10·98
Washings from mincer	CW	0·207

(AW_1) as percentage of $(A+AW_1+AW_2) = 1{\cdot}95\,\%$.
(AW_1+AW_2) as percentage of $(A+AW_1+AW_2) = 2{\cdot}91\,\%$.
CW as percentage of $(C+CW) = 1{\cdot}84\,\%$.

Loss of fat on mincing

Although our results did not indicate any effect of the drying method per se on carcase energy, we did find a small but significant difference in fat and energy content between portions 'A–B' and 'C'. It was possible that this difference might have been due to a loss of fat when the half carcass (from which 'A' and 'B' were drawn) was minced before drying. We therefore analysed one further carcass in an attempt to find out whether this was so.

One carcass was prepared and divided into two as described above, except that no portions were taken for drying over P_2O_5. The mincer and coffee grinder were both washed thoroughly with hot water, dried, and cooled. After each mincing or grinding, the apparatus was washed with hot water, and these washings were collected, concentrated, and analysed for fat. The carcass homogenates 'A' and 'C' were also analysed for fat.

RESULTS AND DISCUSSION

Table 1 shows the mean values for fat, nitrogen and gross energy in carcass portions dried by the three methods. No significant differences were found between 'A' and 'B', portions of the same half-carcass homogenate dried by the two different methods. We therefore cannot confirm the conclusion of Lofti *et al.* (1976) that oven drying per se results in losses of carcass energy. We did, however, find a difference in the mean values

for gross energy between the two halves of the rat carcass, and as Table 1 shows, this follows on a difference in the mean values for fat. This difference is not highly significant: the fat (and consequently the gross energy) content of the carcasses has a wide range, shown by the coefficients of variation in Table 1.

Our second experiment was intended to find out whether the procedure followed for portions 'A' and 'B' led to a greater loss of fat in mincing and grinding than for 'C', and Table 2 summarizes our findings. This analysis of one carcass indicates that more fat was lost from portion 'A' than from 'C'. Though it does not account for the whole difference between the mean values for fat, it does serve as a reminder that losses of fat (and consequently of energy) from materials being prepared for analysis may occur when grease adheres to mincers, blenders and similar equipment. Such losses must be taken into account when methods are compared, even if they are within acceptable limits for routine laboratory work.

We have no specific explanation of the difference between the portions 'A–B' and 'C', nor for the discrepancy between our findings and those of Lofti *et al.* (1976). Our main concern was to determine whether oven-drying at temperatures below 95° is a procedure which reduces the energy content of animal carcasses, and we are satisfied that this is not the case.

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