INTRAMUSCULAR vs. DISSECTED BODY FAT IN GRASS FED STEERS.

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Summary

The intramuscular fat percentages (MF%) were determined in Biceps brachii (BB), Semitendinosus (ST), Longissimus dorsi (LD) and Psoas major (PM) muscles from 340 grass fed steers of different breed types, at slaughter weight, relating the MF% to total dissected carcass fats (TDF). The average MF% were 2.7-+0.98; 1.7-+0.66; 2.9-+1.4 and 4.1-+1.58 for BB, S, LD and PM respectively. The 69% of the ST muscles have less than 2% of MF and the 81% of LD muscles less than 4% of MF in LD and PM muscles grow at faster rates ($p<0.5$), relatively to TDF than in S or BB muscles.

Introduction

The intramuscular (marbling) fat influences the eating quality of beef and also is a very important aspect of its consumption as a result of the relation between dietary lipids and the onset of cardiovascular diseases (LRCP, 1984).

The relationship between marbling and beef meat quality has also commercial importance and needs to be considered in any beef meat production system. Several studies have found a lower intramuscular fat content in meat from grass fed steers compared with meat from grain fed animals (Marmer et al., 1984; Westerling & Hedrick, 1979). This fact could be favorable for grass beef meat production systems if the meat quality is adequate.

The relationship between intramuscular fat content and total body fat in the bovine is not well know. This lack of information is due to difficulties in the determination of the amounts of intramuscular fat. A further understanding of lipid deposition patterns in the bovine is needed, so that improve food products can be developed.

The purpose of this paper was to determine the intramuscular fat percentages of four muscles from 340 grass fed steers of different breed types at slaughter weights, relating the intramuscular fat content to dissected body fats.

Materials and Methods

Three hundred and forty A. Angus and crosses of A.A. with Charolais, Holando, Nellore, Criollo and Limousine steers, placed on full feed on a mixed pasture of rye grass and white clover, were considered. Since the animals were managed and fed in the same way, no differences due to diet were expected. At the end of the trial the steers were slaughtered at the Castelar abattoir of INTA, after 24 h with water only. The left side of each carcass was chilled at 1 C until the total dissection was performed. The total weight of dissected fat (TDF) in the half carcass was calculated as the sum of the weights of the different fat depots.

Carcass sampling:

Biceps brachii (BB) and Semitendinosus (ST): The total muscles minced and aliquot samples-+ 200 g kept from each at - 20 C until the analyses were performed.

Longissimus dorsi (LD) and Psoas major (PM) slices of -+ 150 g from the middle of the muscles were minced and kept at -20 C until the analysis were performed.

Two aliquot samples of 10 g each from the minced muscles were extracted to determine the total amount of chemical fat according to the Official Method of the British Standards Institution, 1958.

The data were processed statistically by the NWASTATPAK Program, Northwest Analytical, Inc Portland Oregon USA. The allometric equation proposed by Huxley (1932) was used in the form $\ln y = \ln a + b \ln x$ to estimate the growth coefficient (b) of the part (y) relative to

the whole (x). In the present study the part (x) was TDF and MF weights or % TDF and part (y) subcutaneous fat (SCF), intermuscular fat (IMF), kidney fat (KF) and intramuscular fat (MF). Heterogeneity of standard errors of the various growth coefficients was taken into account by use of the Behrens-Fisher test in comparisons of growth rates (Berenson et al. 1983).

Results and Discussion

Means, standard deviation, coefficients of variation (%) and minimum and maximum values for slaugther weight, age, left side weight, left side fat weight and per cent of carcass fat for the total steer population (n=340) are shown in Table 1. The left side fat weight ranged from 7.2 to 54.1 kg and because of this wide range it was possible to examine the allometric growth rates of the individual fat depots and the MF in the four muscles in relation to the growth of TDF and its percentage. Means, standard deviation, coefficients of variation (%) and minimum and maximum values for % of intramuscular fat in the Mm Biceps brachii, Semitendinosus, Longissimus dorsi and Psoas maior are presented in Table 2. The distribution of the four muscles according to the % MF are shown in Fig. 1 69% of M. Semitendinosus had less than 2% of MF and 81% of M. Longissimus dorsi less than 4% of MF. Average values for % MF according to % TDF are shown in Table 3. These values are lower than the values given recently by The National Research Council (1988) for several USA beef cuts and grades. Marmer et al (1984) has also demonstrated that tissues from grass fed steers are leaner than tissues from grain fed steers. Crouse et al (1984) found that carcasses from grass fed heifers possessed lower ($p<0.05$) marbling scores than carcasses from grain fed heifers at 0.96 cm 12 th rib fat thickeness. Smith et al (1977), Westerling & Hedrick (1979) found similar effects of the dietary regimen in the amounts of marbling.

The sample correlation coefficients between MF % in the four muscles studied and TDF % are shown in Table 4. The values were similar to those detected previously for authors (Garcia et al., 1986). Prediction of MF % considering only TDF % is not accurate enough at least in grass pasture systems. Considerable economic significance is attached not only to the total amount of carcass fat, but also to the relative amounts of fat deposited in particular carcass depots.

The growth coefficients (b) for MF content in the four muscles relative to TDF are given in Table 5. This results indicated differences in relative growth among depots. The fat in LD and PM muscles grew at faster rates ($p< 0.05$) then in ST and BB muscles.

Conclusions

There are significant differences in relative growth of intramuscular fat among the studied muscles. The intramuscular fat growth faster in Longissimus dorsi and Psoas muscles than in Biceps brachii or Semitendinosus muscles.

Prediction of intramuscular fat considering only total dissected fat weight is accurate enough in grazing steers.

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able 1. Some characteristics of the steer population (n=340). Mean (x), standard deviation SD), coefficient of variation (CV %) and minimum and maximum values (Min-Max).

	x	SD	CV%	Min-max
laughter weight (kg)	441	44	9.9	350-360
ge (days)	771	118	15.4	479-1073
eft side weight (kg)	127	15	12.0	95-180
eft side fat weight (kg)	23.3	8.0	33.0	7.2-54.1
er cent carcass fat	18.6	5.4	28.9	5.8-34.3

able 2. Percentages of muscular fat (MF%) of Mm Biceps brachii (BB), Semitendinosus (ST), ongissimus dorsi (LD) and Psoas major (PM). Mean (x), standard deviation (SD), Coefficient f variation (CV%) and minimum and maximum values (min-max).

uscle	x	SD	CV %	Min-max
BB	2.7	0.98	36	1.03-5.75
ST	1.7	0.66	38	0.46-3.93
LD	2.8	1.40	48	1.06-6.91
PM	4.1	1.58	38	1.21-7.98

able 3. Average values of MF% according to the TDF% in the four muscles.

TDF%	n	Biceps brachii		Semitendinosus		Longissimus		Psoas major	
		x	SD	x	SD	x	SD	x	SD
10	19	1.6 b	0.47	0.9 a	0.30	1.2 a,b	1.00	2.3 c	0.92
10-15	70	2.3 c	0.71	1.2 a	0.39	1.9 b	1.06	3.1 d	1.31
15-20	116	1.6 b	0.76	1.7 a	0.49	2.5 b	1.10	4.0 c	1.20
20-25	100	3.3 c	0.95	1.9 a	0.54	3.0 b	1.18	4.7 d	1.43
25-30	35	3.9 b	0.92	2.6 a	0.78	4.4 b	1.14	5.7 c	1.49

ntramuscular fat (MF). Total dissected fat (TDF).
a,b,c,d, Values in rows with different letters differ ($p < 0.05$).

Table 4. Simple correlation coefficients between TDF% and MF% in the four muscles studied

	MF%BB	MF%ST	MF%LD	MF%PM
TDF%	0.64*	0.65	0.62*	0.61*

* $p < 0.05$.

Table 5. Growth coefficients (b) for MF(g) in BB, ST, LD and PM muscles relative to TDF, IM, K and TDF%.

	Biceps bracchii		Semitendinosus		Longissimus		Psoas major	
	b	SE	b	SE	b	SE	b	SE
TDF (KG)	.548 a,c	.055	.483 a	.044	.976 b	.146	.700 b,c	.063
SB (KG)	.312 a	.036	.374 a,b	.032	.553 b,c	.105	.428 c	.044
IM (KG)	.538 a	.062	.696 a,c	.059	1.204 b,c	.180	.859 b	.075
K (KG)	.304 a	.040	.367 a,c	.034	.534 b	.087	.397 a,c	.044
% TDF	.524 a	.055	.608 a,c	.057	1.086 b	.206	.734 b,c	.076

a,b,c Values in rows with different letters differ ($p < 0.05$).

Fig. 1 Distribution of MF% in the Mm BB, ST, LD and PM (n = 340).