

LIPIDS IN LEAN BEEF

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INTRODUCTION

Health professionals are recommending diets low in saturated fat, cholesterol and energy to reduce the risk of chronic atherosclerosis. Studies have been conducted which show that beef intramuscular lipids composition is influenced by dietary regimen (Westerling & Hedrick, 1979). Generally the results showed that grass-fed beef is leaner than the grain-fed (Marmer et al., 1984). Fatty acid composition of intramuscular lipids is also related to beef palatability (Dryden & Marchello, 1970).

The objectives of the present study were to determine the lipid composition of intramuscular fat of 8 muscles from 10 grass-fed steers and to study the relationships between the fatty acid composition and the amounts of intramuscular fat.

Materials and methods

Eight muscles from 10 Aberdeen Angus grass-fed steers, slaughtered at a commercial weight and classified as the low body fat level (F1) according to Argentine Official Regulations, were dissected. The muscles studied were Semitendinosus (ST), Semimembranosus (SM), Cutaneus (C), Triceps brachii (TB), Latissimus dorsi (LAD), Longissimus dorsi (LD), Pectoralis profundus (PP), and Psoas major (PM). Aliquot samples were used to determine the total intramuscular fat (Official Method of the British Standards Institution, 1958) and the fatty acid composition of triglycerides, phospholipids and total lipids isolated with the method of Folch et al. (1957), separated by TLC and the methyl esters analyzed by GLC.

The data were processed statistically using the SAS 6.04 1987 "SAS User's Guide: Statistics, SAS Institute, Inc. Cary, NC.

Results and Discussion

The intramuscular fat content from the 8 muscles studied is shown in Table 1. The fatty acid composition from the 8 muscles studied is shown in Table 2.

The average fatty acid compositions for the phospholipids, triglycerides and total lipids are shown in Fig 1. The correlation coefficients between intramuscular fat content and fatty acid composition in the three lipid classes is shown in Table 3. The higher correlations were found in the total lipids where 16:0, 18:0 and 18:1 were positively associated with the IMF% while polyunsaturated fatty acids were negatively correlated. The importance of the relative contribution of the two lipid classes is the most important factor in the determination of the fatty acid composition of the intramuscular lipids. For each muscle the negative correlation between the % IMF and the sum of PUFA in total lipids is shown in Table 4.

Conclusions

The intramuscular fat content of lean beef produced in Argentina under pasture conditions is very low. The percentages of intramuscular fat were negatively related to the content of PUFA. Lean beef lipids should not be considered a source of saturated fat.

References

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Table 2
Total Fatty Acid Composition from 8 Muscles
(Means and Average of STD)

Muscle	14:0	15:0	16:0	16:1	18:0	18:1	18:2	18:3	20:3	20:4
ST	2,9	1,7	22	5,7	11,2	39,9	3,8	2	0,9	1,9
SM	2,7	1,5	22,8	4,7	12,6	40,5	3,6	2	0,7	1,7
C	2,5	1,5	22,3	7,3	9,4	42,5	3,4	2	1,2	2,2
TB	3,2	1,2	22,2	5	13,3	40,3	3,6	1,8	0,6	1,5
LAT	2,7	1,6	22,8	5,3	12,7	40	3,6	1,7	1,1	2,1
LD	2,8	1,2	24,3	4,7	14,8	39,6	3,3	1,8	1	1,9
P	2,3	1,3	20,9	5,7	12,8	43,1	3,7	2,1	0,8	1,7
PM	3	1,2	23,5	3,6	16,6	39	3,5	1,8	0,9	1,4
AVG STD	0,81	0,73	2,15	1,62	2,51	4,78	1,91	0,61	0,91	0,98

Table 1
Intramuscular Fat Percentages in Different Muscles

Muscle	ST	SM	C	TB	LAD	LD	P	PM
Mean	1,5	1,6	1,2	2	1,7	1,6	2	1,3
STD	0,58	0,71	0,67	0,72	0,48	0,66	0,98	0,59

Table 3

Correlation coefficients between Intramuscular Fat (%) and Percentages of Fatty Acids in Phospholipids, Triglycerides and Total Lipids

Fatty Acid	PL	TG	TL
14:0		0,33**	0,01
15:0		0,06	-0,27**
16:0	-0,14	0,15	0,34**
16:1	0,14	-0,04	0,06
17:0	0,11	0,01	-0,16
17:1	0,09	0,02	0,03
18:0	0,07	0,02	0,20*
18:1	0,26**	-0,15	0,52**
18:2	-0,24**	-0,38**	-0,62**
18:3	-0,40**		-0,56**
20:3	0,01		-0,49**
20:4	0,01		-0,60**

N= 80, * Significant (P<0.05), ** Significant (P<0.01)

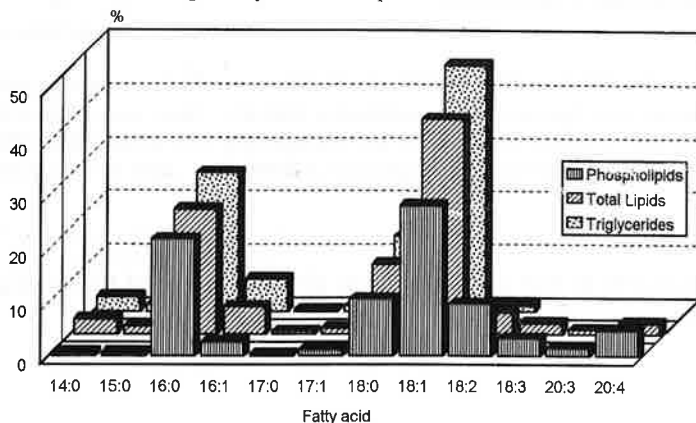
Table 4

Correlation Coefficients between Percentage of IMF and PUFA Fatty Acids in the Individual Muscles

ST	SM	C	TB	LAD	LD	PP	PM
-0,81	-0,84	-0,72	-0,86	-0,72	-0,8	-0,75	-0,67
**	**	**	**	**	**	**	*

** Significant (P<0.05) ** Significant (P<0.01)

Average Fatty Acid Composition from the 10 Muscles⁽¹⁾



(1) Average % of Intramuscular Fat: 1.6 ± 0.78

Figure 1