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INTRAMUSCULAR FAT, CHOLESTEROL AND 18:2 n-6/18:3 n-3 RATIO IN TOTAL LIPIDS IN TWO FRAME STEERS UNDER DIFFERENT DIETARY REGIMEN[1]

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BACKGROUND

Natural grass systems of beef production are common in Argentina. Our grass-fed beef is lean but keeps a good quality (García & Casal, 1993). Sometimes, during fall or winter it is necessary to supplement the steers with grain. The grain supplementation could increase the amount of intramuscular lipid (Marmer et al. 1984). Consumers are increasingly aware of dietary lipids-health relationships and many of them believe that red meat is unhealthful because its levels of total and saturated fatty acids and cholesterol.

The present investigation was conducted to determine in steers from two frames, small and medium, the effects of four different finishing systems using grass, two different grain supplementation on grassing animals and feedlot on steer intramuscular lipid percentages, cholesterol content and 18:2 n-6/18:3 n-3 fatty acids ratio.

MATERIALS AND METHODS

Angus steers (n=80), forty small frame (S) with an average liveweight of 176 kg and forty medium frame (M) with an average liveweight of 251 kg, were assigned randomly to four experimental treatments T1, T2, T3 and T4 as is shown in Table 1. The steers (T2 and T3) were supplemented every morning according to Table 1. T1, T2 and T3 have had access to a pasture of ryegrass and red and white clover. T4 was in a "feedlot" system receiving, two times in a day, a concentrated of grounded corn and sunflower meal (9:1). The animals were slaughtered according to commercial practices at an average liveweight of 406 kg and 499 kg respectively for the (S) and (M) genotype type. After 24hs chilled samples a slice of approximately 200 g of *Longissimus dorsi* at 12-13th rib (LD) and the entire *Semitendinosus* (ST) and *Tensor fascia latea* (TFL) muscles were taken. Intramuscular fat content (IMF) was determined in aliquot samples (ca 10g) by boiling hexane extraction of the dried samples. Total muscle cholesterol total was determined in one aliquot sample from the cholesterol extract from the Folch et al. (1957) procedure. The sample was saponified, extracted with hexane and the cholesterol quantified with an enzymatic and colorimetric method. Fatty acids composition was determined in ST and LD muscles using GC with a WCOT fused silica 50m x 25 mm coating CP-SIL 8CB capillary column at 190°C. The ratio between the 18:2 n-6/18:3 n-3 areas were calculated from the total lipid chromatograms. Multivariate analysis of variance was performed using a least square model.

Table 1. Experiment design

	Fall-winter	Spring	Summer	Steers n
T1	Pasture	Pasture	Pasture	10 small +10 medium
T2	Pasture + Corn 1%	Pasture	Pasture	10 small +10 medium
T3	Pasture + Corn 1%	Pasture	Pasture + Corn 1%	10 small +10 medium
T4	Feedlot	Feedlot	Feedlot	10 small +10 medium

RESULTS AND DISCUSSION

The IMF% for the different muscles, frames and treatments are presented in Table 2 . IMF % were higher in all T4 muscles ($p<0.05$) respect to T1, T2 and T3. T3 presented higher values than T1 and T2 in some muscles but the differences were not statistically different ($p< .05$). The LD muscle IMF % distribution in the different groups is shown in Fig 1. The CV% in IMF% in all muscles ranged between 31 and 65. The cholesterol levels only were higher in LD muscle in the T4 steers (Table 2). This is agree with others research who found high values in fatty muscles compared to the lean ones. In Fig 2 is shown the distribution of cholesterol content in LD muscle for the different treatments. The diet grain decreases in intramuscular lipids the amounts of 18:3 n-3 and increases the 18:2 n-6/18:3 n-3 ratio (Table 3)

Conclusions

Grass-fed steers can be supplemented with certain levels of grain without altering significantly the percentages of IMF and the cholesterol content compared with the feedlot steer groups. The ratio 18:2 n-6/ 18:3 n-3 increases and the % of 18:3 n-3 fatty acid decreases as the amount of corn grain increases in the diet ($p< .05$).

REFERENCES

GARCIA, P. T. And CASAL, J.J. (1993) . Argentine beef lipids. Fleischwirtschaft 73:755-758.
FOLCH, J., LEES, M. And STANLEY, G. H. S. (1957) A simple method for the isolation and purification of total lipids from animal tissues. J. Biol. Chem. 226:497-509.
MARMER, W. N. , Maxwell, R. J. And WILLIAMS, J. E. (1984). Effects of dietary regimen and tissue site on the bovine fatty acids profiles. J. Ani. Sci 59:109-121.

Table 2. Intramuscular fat (IMF %) and cholesterol (mg/100g) in the three muscles from steers of the two frames, small and medium ,in the four experimental treatments.

Treatment/ Frame	STE IMF %	LD IMF%	TFL IMF %	STE Cholesterol	LD cholesterol	TFL cholesterol
T1 Small	2.2±0.61 a	2.5±0.71 a	3.5±0.89 a	41.4±5.28 a	45.6±5.54 a	45.4±2.94 a
T2 Small	2.3±0.56 a	2.5±0.64 a	3.7±1.37 a	42.4±5.66 a	47.3±5.23 a	46.5±4.96 a
T3 Small	2.2±0.38 a	3.0±1.02 a	4.8±1.86 a	42.3±3.72 a	47.5±5.91 a	48.0±5.57 a
T4 Small	3.1±1.38 b	4.4±1.55 b	ND	40.7±7.14 a	50.4±10.8 a	ND
T1 Medium	2.0±0.82 a	2.0±1.05 a	4.0±2.36 a	37.6±3.11 a	45.4±6.78 a	46.8±3.75 a
T2 Medium	2.8±0.92 ab	2.8±0.81 a	4.7±1.19 a	42.3±4.91 a	44.5±4.87 a	43.5±4.07 a
T3 Medium	2.6±0.51 ab	2.7±0.69 a	4.3±1.47 a	43.1±5.12 a	44.3±3.28 a	47.3±6.81 a
T4 Medium	3.3±0.77 b	5.0±1.42 b	ND	40.7±6.16 a	55.2±4.85 b	ND

a b c Means within the same frame and row with different superscripts differ (p< .05)
ND No determined

Table 3. Percentage of 18:3 n-3 and ratio 18:2 n-6/18:3 n-3 in total lipids from STE and LD muscles in the different treatments.

	T1 STE	T1 LD	T2 STE	T2 LD	T3 STE	T3 LD	T4 STE	T4 LD
18:3 %	1.3 a	1.2 a	1.1 a	1.0 a	0.8 b	0.6 b	0.15 c	0.15 c
18:2/18:3	2.7 a	2.5 a	2.9 a	2.6 a	3.9 b	4.8 b	22.0 c	19.8 c

a b c Means within the same row with different superscripts differ (p< .05)

Fig 1. Distribution of Longissimus muscles intramuscular fat % in the different treatments.

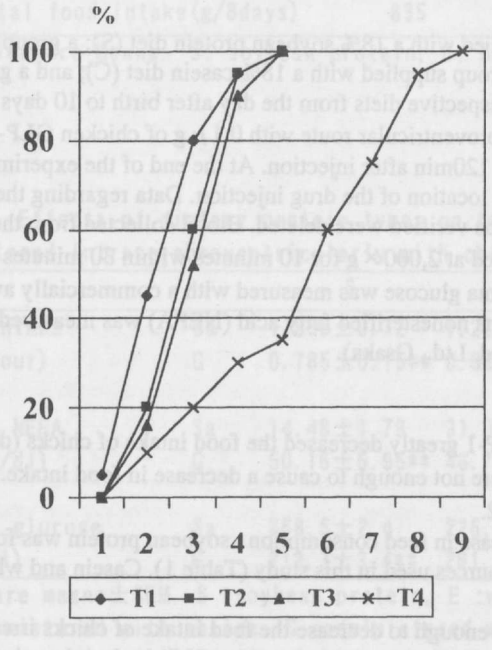

Fig 2. Distribution of Longissimus muscle cholesterol (mg/100g) in the different treatments.