CHOLESTEROL AND FAT CONTENTS OF BARROSÃ MEAT AS INFLUENCED BY SEX AND MUSCLE SITE

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Background

Consumers are more conscious of the nutrition value of foods as this is related to health. Among their concerns, the cholesterol and fat contents of the diet have become important issues, since they have been directly associated to a greater risk of cardiovascular troubles. Veal meat is generally perceived as lower fat content and by so, recommended for dietary fat reduction.
Meat from autochthonous local cattle breeds has been progressively introduced in the national diet intake, in view of its intrinsic quality and also because the feeding regime still in use on animal production to exclude the impact of practices associated with intensive handling regimes.

Objectives

Attending to this consumption tendency, the present study was undertaken to evaluate fat and cholesterol contents of Barrosã veal and to determine the effects of muscle location and sex on both parameters.

Material and methods

Longissimus dorsi (Ld), *Supraspinatus* (Ss) and *Biceps femoris* (Bf) muscles of Barrosã calves of both sexes and about 7 months old were used after 24 h chilling. After the excisement of visible fat, samples were kept frozen at –18°C until be analysed.
Total lipids were extracted by the procedure of Folch *et al* (1957) and then separated into neutral (NL) and polar (PL) fractions through a waters Sep-Pak silica cartridge (Millipore, Waters Chromatography Division, Milford, MA). The NL and PL fractions were eluted with 20 ml of chloroform and 30 ml of methanol, respectively, as described by Juaneda and Rocquelin (1985).
For the cholesterol determination, lipid extracts were dissolved in 25 ml of hexane and a aliquot of 1 ml was saponified at 80°C for 15 min. with 15 ml of 15% potassium hydroxide solution in 90% ethanol added of propyl gallate (0.5 % in saponification misture). When cooled, 5 ml of distilled water were added and the unsaponifiable material extracted with 5x25 ml hexane. Combine hexane extracts were then washed 2 times with 10 ml distilled water. Following the evaporation of hexane, the residue was redissolved in 15 ml of hexane HPLC grade and filtrated through a membrane Acrodisc 25 mm GHP, GF 0.45 µm (Gelman Sciences, Inc.). Cholesterol determination was performed by HPLC with a Spectra-Physics Model Spectra 100 equipped with variable wavelength UV detector set at 206 nm and a Spherisorb S 5W silica, 5µm, 4.0x125 mm cartridge (Waters PSS 845549). The phase mobile was hexane/isopropanol (97:3) at a flow rate of 1.0 ml min^{-1} (Figure 1). The concentration of cholesterol in the meat was calculated from standard curve for peak height vs concentration. Results were based on averages of three injections of each sample.

Results and discussion

The intramuscular fat contents (IMF) of the studied muscles are depicted on Table 1. Taking into consideration the production feeding system and the age at slaughter (about 7 months) the IMF of Barrosã veal is quite expressive, clearly higher than many results in the literature (Garcia *et al*., 1996; Seewald *et al*, 1987), specially for Ld, muscle where values ranged from 1.46 % to 6.30%.
Significant differences ($p<0.05$) were observed between muscles, the Ld having the higher mean value (2.97%), followed by Ss (2.39%) and Bf (1.67%). Such concentration of intramuscular lipids seems to depend on the genetic background of the breed (Alves, 2001) and contributes to its incomparable eating quality.
Neutral lipids showed muscle concentration trends similar to the total lipids. However, the polar fraction completely diverged in this concern, the Ss presenting the higher content, with the Bf in an intermediate position. Those variations are evidenced by the low and high correlation coefficients found out between total lipids and polar and neutral lipids, respectively (Table 2). In relation to the polar lipids distribution in muscles, it confirms the results presented by O'Keefe *et al* (1968), namely that the contribution of the phospholipids to the total lipid content decrease as the amount of total fat in muscle increase.
No significant differences were found in the cholesterol content (mg/g muscle) among muscles. These results are in agreement with the findings of Tu *et al*, 1967, Eichhorn *et al*, 1986 and Bohac & Rhee, 1988.
The sex of animal did not affect significantly the quality parameters under study. However, expectably, females showed slightly higher total lipid mean values in Ld and Bf, but lower concentrations in Ss. By the contrary, males presented higher mean cholesterol levels than females, specially when reported to the IMF (mg/g fat) (Figure 2 and 3). This is in disagreement with data reported by Hood & Allen (1971) who found in heifer samples from Ld higher ($p<0.01$) percentage of cholesterol than in bulls and steers.

Conclusions

Irrespective of the sex of the animal, Barrosã veal IMF depends on muscle site in the carcass, probably reflecting the different intrinsic metabolic/contractile condition. Within each studied muscle, the variation detected on this meat quality trait is quite expressive and could be associated to differences on local production systems, namely on feeding availability or the walking needs of animals. Since IMF highly influences eating quality of meat, mean values obtained in Ld and Ss muscles of Barrosã calves gives to them a special status on this concern, among rustic breeds around the world.
In relation to the mean cholesterol contents of Barrosã veal, they do not generally diverge from published data, based on similar experimental conditions.

References

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Table 1. Means and standard deviation of cholesterol and fat contents in different muscles of Barrosã veal.

	Longissimus dorsi	*Biceps femoris*	*Supra spinatus*	F value
n	27	23	25	
Cholesterol (mg/g muscle)	0.53±0.07	0.56±0.09	0.58±0.07	2.63
Total lipids (%)	2.97±1.08 [a]	1.67±0.48 [c]	2.39±0.73 [b]	15.75***
Neutral lipids (%)	2.54±1,14[a]	1,00±0,46 [c]	1.63±0,66 [b]	22.24***
Polar lipids (%)	0.63±0,07 [c]	0.69±0,06 [b]	0.74±0,12 [a]	10.45***

In the same row, means with identical letters are not significantly different (test LSD, $P<0.05$).

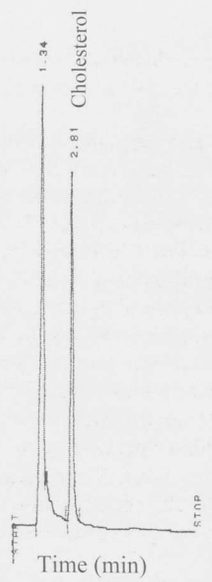

Figure 1. HPLC chromatogram of cholesterol in Barrosã veal

Table2. Simple correlation coefficients between lipid fractions in Barrosã muscle.

		Total lipids
Ld	Neutral lipids	0.959***
	Polar lipids	0.065
Bf	Neutral lipids	0.963***
	Polar lipids	0.161
Ss	Neutral lipids	0.952***
	Polar lipids	0.190

*** $p<0.001$

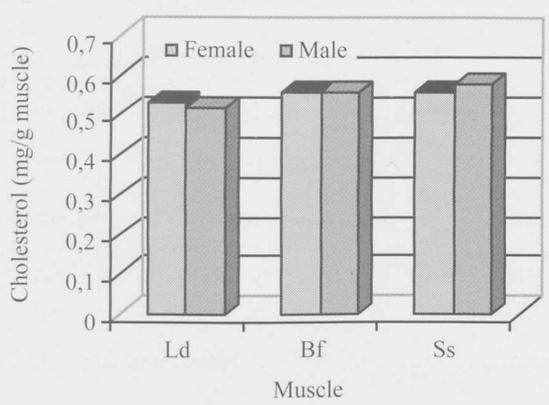

Figure 2. Cholesterol mean value (mg/g muscle) in the different muscles for both sex condition.

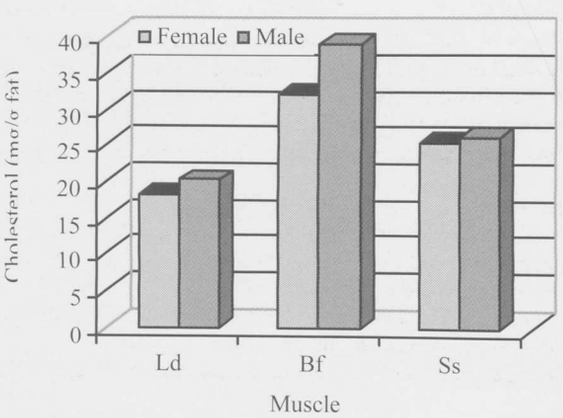

Figure 3. Cholesterol mean value (mg/g fat) in the different muscles for both sex condition.