CHARACTERISATION OF TOTAL LIPIDS AND TOTAL CHOLESTEROL IN A PORTUGUESE TRADITIONAL VEAL (AROUQUESA-PDO)

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Background

Epidemiological and clinical studies have suggested that fat and cholesterol intakes are directly associated to a greater risk for obesity and hypercholesterolemia, conditions that are considered to predispose to several chronic diseases of the circulatory system. According to Chizzolini *et al.* (1999), meat provides from one third to one half of the daily recommended cholesterol intake (300 mg/day, WHO).

Veal is generally perceived as lower fat contents and by that way recommended for dietary fat reduction (Roseiro *et al.*, 2002). Additionally, meat from autochthonous bovine breeds, produced in traditional handling regimens, has been progressively introduced in the Portuguese diet intake. Arouquesa meat with Protected Denomination of Origin (PDO) is a Portuguese traditional meat obtained from Arouquesa breed cattle, produced within some councils of the districts of Aveiro, Viseu, Porto and Vila Real (centre-north of Portugal).

Objectives

The aim of this work was to characterise the contents of total lipids and total cholesterol in traditional Arouquesa-PDO veal obtained from bovines slaughtered in early Autumn season (the least abundant pasture).

Methods

Meat samples were taken, in early Autumn season, from the ribeye (T1-T3) and loin (L1-L3) portions of *longissimus dorsi* and from the distal region of *semitendinosus* of calves (8-9 months, 120 ± 10 kg), 2-3 days after slaughter (+1°C), and stored at -80°C until analysis.

Total lipids were extracted from meat (dry matter) by ultrasonication, using methylene-chloride (4:1 v/v) (3) and *n*-hexane (1), as was previously described in Fritsche *et al.* (2000). Lipid contents of the test samples were calculated, in duplicate, by weighting the residues obtained after solvents evaporation under a stream of nitrogen.

Total cholesterol was extracted from meat (dry matter), after saponification with saturated methanolic KOH, not using 1 extraction with cyclohexane, as described in Naeemi *et al.* (1995), but using 3 extractions with the same solvent (recoveries higher than 94%). Cholesterol was separated and quantified by normal phase HPLC (column Zorbax Rx-Sil, 4.6 mm ID 250 mm, 5 m particle size, Chrompack, Bridgewater, NJ, USA), using an HPLC system (HP 1100 Series, Hewlett-Packard, Palo Alto, CA, USA) equipped with autosampler and diode array detector adjusted at 206 nm, with a solvent (3% isopropanol in *n*-hexane) flow rate of 1 ml/min and injection volumes of 30 1 (figure 1). Total cholesterol contents in meat was calculated, in duplicate, based on the external standard technique, from a standard curve for peak area *vs.* concentration.

The contents of total lipids and total cholesterol in meat (mean of *r* replicates) were analysed by ANOVA single factor at a significance level of 5% (H_0: $p<0.05$).

Results and discussion

The contents of total lipids in Arouquesa-PDO veal, for different muscles, are presented on table 1 and figure 2. These values are similar to those described for Barrosã veal (Roseiro *et al.*, 2002) but much lower than those reviewed by Chizzolini *et al.* (1999) for beef (6.3% in *longissimus dorsi* and 3.9% in *semitendinosus*). Thus, the data indicate that this meat may be considered lean meat according to Food Advisory Committee (1990) criteria (less than 5% of fat). However, the levels of intramuscular fat are high enough to assure meat sensorial quality. No significant differences (H_0: $p>0.05$) were found among *semitendinosus* and *longissimus dorsi* (T1-T3 and L1-L3 regions) muscles.

Total cholesterol contents in Arouquesa-PDO, reported to g of meat and g of lipids, are depicted on table 1 and figures 3 and 4. These values are similar to those reviewed by Chizzolini *et al.* (1999) for beef. Significant differences (H_0: $p<0.05$) were observed for total cholesterol contents among muscles, having *longissimus dorsi* (T1-T3) and *semitendinosus* higher values than *longissimus dorsi* (L1-L3). These differences in meat cholesterol contents among muscles are probably explained by differences in their fibre type composition (Chizzolini *et al.*, 1999).

Conclusions

Meat from traditional Arouquesa-PDO obtained from calves slaughtered in early Autumn season, with the least abundant pasture, seems to be a tastefully lean meat with cholesterol levels similar to that described in the literature.

References

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Acknowledgements

Sampling assistance (Dr. Carlos Venâncio, ANCRA - Associação Nacional dos Criadores da Raça Arouquesa) and financial support (project CIISA/2002/52.Carne-Bioactivos) are acknowledged.

Table 1. Contents (mean ± standard deviation) of total lipids and total cholesterol in Arouquesa-PDO veal, for different muscles, obtained from bovines slaughtered in early Autumn season.

	Longissimus dorsi, T1-T3 (r=15)	*Longissimus dorsi*, L1-L3 (r=15)	*Semitendinosus*, distal (r=15)
Contents of total lipids (mg / g meat)	23.60 ± 6.576 [a *]	23.61 ± 10.398 [a]	24.55 ± 10.160 [a]
Contents of total cholesterol (mg / g meat)	0.570 ± 0.0378 [a]	0.519 ± 0.0424 [b]	0.585 ± 0.0947 [a]
Specific contents of total cholesterol (mg / g lipids)	26.16 ± 8.244 [a]	27.89 ± 18.498 [a]	28.06 ± 13.076 [a]

* Means with the same superscript, within the same row, are not significantly different (H_0: $p>0.05$).

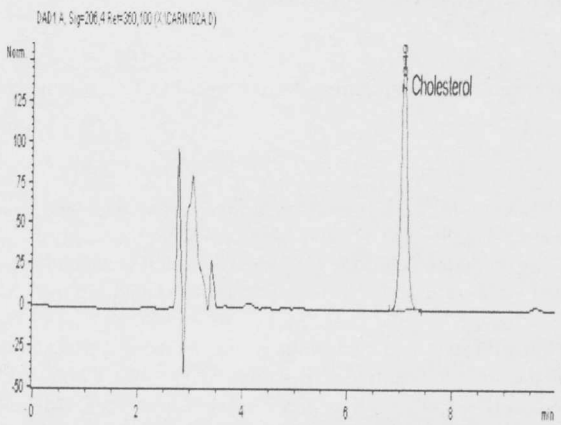

Figure 1. Typical HPLC chromatogram of cholesterol in a meat sample, detected at 206 nm.

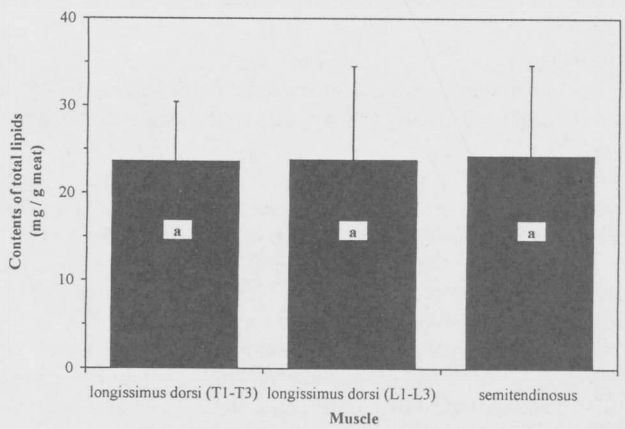

Figure 2. Contents of total lipids in Arouquesa-PDO veal (r=15). Different letters means $p<0.05$ for H_0.

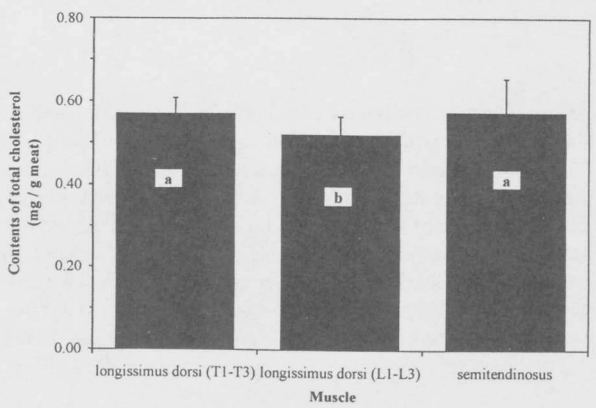

Figure 3. Contents of total cholesterol in Arouquesa-PDO veal (r=15). Different letters means $p<0.05$ for H_0.

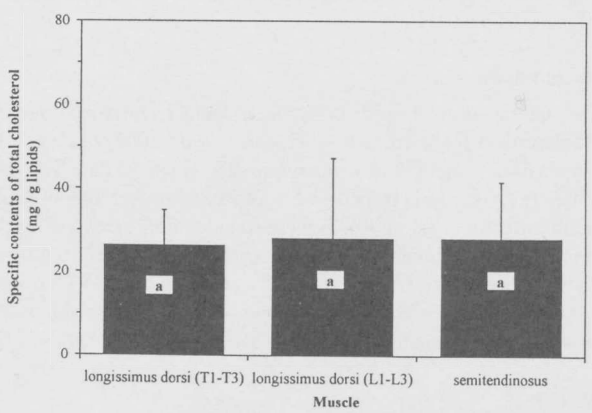

Figure 4. Specific contents of total cholesterol in Arouquesa-PDO veal (r=15). Different letters means $p<0.05$ for H_0.