

TERRINCHO-PDO LAMB MEAT SEEMS TO HAVE HIGHER CONTENTS OF TOTAL LIPID AND CHOLESTEROL THAN TRANSMONTANO-PDO KID MEAT

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Introduction

The Northeast territory of Portugal, named as Trás-os-Montes, produces some of the most traditional and appreciated Portuguese products. Among them are the Terrincho-PDO milk lamb meat, produced by purebred flocks of "Churra da Terra Quente" ewes, and the Transmontano-PDO milk goat kid meat, obtained from purebred flocks of Serrana goats. Churra da Terra Quente ewe's breed and Serrana goat's breed are two important Portuguese autochthonous breeds. Both production systems are certified under the Protected Designation of Origin (PDO), which obliges producers to fulfil the traditional rearing methods based on extensive grazing, and restrict feeding supplementation with local agricultural by-products during the snowfall season. Globally milk lamb and kid meat production is considered a by-product of the small ruminant dairy sector. Light lamb or kid meat is traditionally consumed for Portuguese Christmas lunch. Demand and price for both meats peak over the Christmas period, which has led producers to synchronize most of their flocks' birth just before Christmas. The income of this "Christmas market" represents the most important part of the overall herdsman income and contributes significantly to the socio-economical wellbeing of the rural populations. World Health Organization (WHO), together with other international health organizations, strongly recommends that fat should provide between 15 and 30% of all diet energy and cholesterol intake should not exceed 300 mg per day (Chizzolini *et al.*, 1999). These dietary recommendations are health related concerns since higher fat and cholesterol intake are associated with obesity and hypercholesterolemia, conditions that predispose to several chronic diseases. The quantity of fat in meat and meat products is a general concern for consumers, while dieticians are not only concerned with the quantity but also with the quality of intramuscular fat. Cholesterol content in meat has long been identified as the single most important characteristic of overall meat quality. The aim of this study was the compare the levels of total lipid and cholesterol in Terrincho-PDO lamb meat and Transmontano-PDO kid meat.

Materials and Methods

Meat samples were taken from Terrincho-PDO suckling lambs ($n=15$; 6.3 ± 1.0 kg of carcass weight and 47.3 ± 10.9 days), and Transmontano-PDO suckling goat kids ($n=15$; 4.3 ± 0.6 kg of carcass weight and 50.8 ± 18.0 days) raised with their dams under an extensive production system based on natural pastures, as postulated by the PDO certification system. During the Christmas season in 2005, meat samples from the mid loin (*longissimus lumborum* from the 13th rib to the point of the hip bone) were collected 2-3 days after slaughter ($+1^\circ\text{C}$). Total lipids were extracted from meat (dry matter) by ultrasonication, using methylene-chloride (4:1 v/v) (3 \times) and *n*-hexane (1 \times), as was described by Fritsche *et al.*, (2000). Total lipid contents of the meat samples were calculated in duplicate by weighting the residues obtained after solvent evaporation under a stream of nitrogen. Total cholesterol was extracted from meat, after saponification. Briefly, 0.75 g of homogenised meat sample was placed in a screw teflon-lined cap tube, in duplicate, to which 0.2 g L-ascorbic acid and 5.5 ml saponification solution were added. The saponification solution, freshly prepared each week, contained 11% w/v potassium hydroxide in a mixture of 55% v/v absolute ethanol and 45% v/v distilled water. The sample was then immediately vortexed in order to avoid meat agglomeration. After vortexing, the air was eliminated from the reaction, by displacement with nitrogen gas and the sample was further shaken until the ascorbic acid was completely dissolved. The saponification was carried out in a shaking water bath (200 rpm) at $+80^\circ\text{C}$ for 15 min. Cholesterol was quantified by normal-phase HPLC, using an UV-visible photodiode array as described by Prates *et al.* (2006). The contents of total cholesterol in meat were calculated, in duplicate for each muscle sample (values accepted for CV <6%), based on the external standard technique, from a standard curve of peak area vs. concentration. The data were analysed by the Student's *t*-test with a significance level of 5% INSTAT for Windows (GraphPad Software, San Diego, CA) was used to perform the analysis and data was presented as the mean \pm standard deviation of the mean.

Results and Discussion

Table 1: Total lipid and cholesterol contents (mg/g meat) and specific cholesterol content (mg/g lipids) in mid loin from Terrincho-PDO lamb meat and Transmontano-PDO kid meat.

	Transmontano-PDO kid meat	Terrincho-PDO lamb meat
Contents of total lipids	13.3±2.2 ^a	17.6±1.9 ^b
Contents of total cholesterol	0.67±0.04 ^a	0.73±0.8 ^b
Specific contents of total cholesterol	12.0±1.6 ^c	9.8±1.4 ^d

Means in the same row with different superscripts are significantly different: $P < 0.001$ (between a and b) and $P < 0.05$ (between c and d).

As observed in Table 1, Terrincho-PDO lamb meat has significantly higher contents of total lipids and total cholesterol than Transmontano-PDO goat kid meat ($P < 0.001$). On the other hand, the specific content of total cholesterol was significantly higher in Transmontano-PDO kid meat ($P < 0.05$). The lower lipid and cholesterol contents found in goat kid meat are characteristic of the species (Babiker *et al.*, 1990). Total lipid contents in Transmontano-PDO goat kid meat is in between the values found by Marichal *et al.*, (2003) in mid loin obtain from goat kids of 6 kg (9.6 ± 4.5 mg/g meat) and 10 kg (16.4 ± 11.2 mg/g meat) of live weight. The total lipid contents of Terrincho-PDO lamb meat are lower than the total lipid contents found in an Italian study (31.4 - 40.0 mg/g meat) (Salvatori *et al.*, 2004) and in a Brazilian study (68.5 - 107.9 mg/g meat) (Rowe *et al.*, 1999), both obtained from heavier lambs. The total cholesterol content in Terrincho-PDO lamb mid loin is slightly higher than those found by Rowe *et al.*, (1999), on both drylot and grazing lambs (0.58 and 0.62 mg/g meat respectively) and those found by Salvatori *et al.*, (2004) (0.60-0.63 mg/g meat). The higher total cholesterol contents found in Terrincho-PDO lamb meat in comparison with previous studies may be explained by Arsenos *et al.*, (2000), which has shown that younger lambs have higher total cholesterol contents when compared with older animals. They demonstrated that total cholesterol contents in lambs meat is inversely related with maturity degree at slaughter time. A comparison made with our previous results obtained in beef and veal of Portuguese autochthonous breeds, PDO certified (Quaresma *et al.*, 2004), showed that lamb meat and kid meat are leaner meats but their higher contents of total cholesterol does not mean that they are healthier meats.

Conclusion

The evaluation performed indicated that Transmontano-PDO kid meat has lower contents of total lipid and cholesterol than Terrincho-PDO lamb meat, although both meats are lean and contain relatively high cholesterol contents.

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