EFFECT OF WEANING ON FAT QUALITY IN SPANISH MERINO LIGHT LAMBS

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Introduction

Generally, the Mediterranean consumer looks for lamb meat with a reduced amount of fat (Castro *et al.*, 2005). For this reason, the Spanish Merino breed is oriented toward light lamb production, based on extensive production systems.

Fat depot amount and composition influence lamb carcass and meat quality (Pérez *et al.*, 2002). Intramuscular (IM), intermuscular (IN) and Subcutaneous (SC) fat depots have an important effect on meat quality due to their influence on firmness or softness (Wood *et al.*, 2004).

Conjugated linoleic fatty acid (CLA) is a collective term indicating a group of octadecenoic acids that are geometric and positional isomers of linoleic acid (C18:2) (Pariza *et al.*, 2001; Schmid *et al.*, 2006). Several health effects (anticarcinogenic, antiatherosclerosis, hypocholesterolemic, modulation of inmune system and reduction of body fat) have been reported for CLA in animals (Pariza and Hargraves, 1985; Lee *et al.*, 1994; Park *et al.*, 1999; Miller *et al.*, 2001).

Most authors agree about there are several factors that influence fat characteristics and CLA levels (breed, slaughter weight, fatness degree,...) and of these feeding is one of the most important factors (Vatansever *et al.*, 2000; Arsenos *et al.* 2006).

The main objective of this study was to characterise fat quality of Spanish Merino light lambs bred following a traditional Southern Spain production system (no weaning and concentrate availability from 45 days after birth) and following a standard system (weaning at 45 days and fattening with concentrate).

Materials and Methods

Sixteen pure-bred Spanish Merino lambs were selected. Eight lambs were assigned to **Treatment 1** (weaning at 45 days and fattening with concentrate) and eight to **Treatment 2** (not weaning and concentrate availability from 45 days after birth). Lambs were slaughtered at 21.90±0.24kg live weight. Samples of SC and IN fat were collected in the slaughterhouse within the first hour *post mortem*, vacuum packed and frozen. *Longissimus dorsi* samples were collected 24h post slaughter from the left side of the carcass and aged for 72 hours at 4ºC prior to vacuum packing and freezing them. Total fatty acids were extracted, methylated and analysed by an adaptation of the method described by Elmore *et al.* (1999). Separation and quantification of the FAMEs (fatty acid methyl esters) was carried out using a gas chromatograph (GC, Varian Star 3400CX, Varian Associates, Inc., California, USA) equipped with a flame ionisation detector (FID) and fitted with a BPX-70 capillary column (120m, 0.25mm i.d., 0.2µm film thickness, SGE, Australia). Tricosanoic acid methyl ester (C23:0 ME) was used as an internal standard. Fatty acid profiles were expressed as a percentage with respect to overall fatty acids identified and grouped as follows: Saturated fatty acids (SFA), Monounsaturated fatty acids (MUFA), Polyunsaturated fatty acids (PUFA), w3 and w6 fatty acids and CLA, PUFA/SFA and w3/w6 ratios and desaturase activity Δ^9C16 and Δ^9C18 indexes were also calculted (Malau-Aduli *et al.*, 1998). Statistical analyses were performed using SPSS 12.0 for Windows.

Results and Discussion

The effect of weaning on fatty acid profiles of Spanish Merino light lambs SC, IN and IM fat deposits is presented in Table 1. The fatty acid profile of IM fat, as reported by Castro *et al.* (2005), has been shown to have higher amounts of PUFA than SC and IN fat depots ($p<0.001$). Furthermore, MUFA and SFA levels were higher for IM fat ($p<0.001$). CLA levels were not affected by the depot ($p>0.05$), showing similar levels in the three kinds of fat studied.

No difference between treatments ($p>0.05$) was observed for SFA or MUFA levels. However, PUFA/SFA, w3/w6 ratios and PUFA levels were higher for IN and SC fat from Treatment 2 lambs. Furthermore, MUFA and SFA levels were lower for IM fat lambs for all fat types. Therefore, longer suckling periods may improve healthy fatty acid profiles. This may be due to the presence of CLA in ewes milk and their grass-based production system.Δ^9C18 enzyme activity was higher in weaned lambs (Treatment 1), which would result in a greater capacity to desaturate C18:0 fatty acid, due to a higher ruminal activity. Δ^9C16 enzyme activity was higher in weaned lambs (Treatment 1) in IN fat only.

Table 1: The effect of weaning on the fatty acid groups in Spanish Merino light lambs Subcutaneous, Intra and Intermuscular fat depots.

Depot	*Intramuscular fat*			*Intermuscular fat*			*Subcutaneous fat*		
Treatment	1	2	SD[A]	1	2	SD[A]	1	2	SD[A]
SFA	43.29±1.26	43.68±0.78	ns	47.47±1.17	47.36±1.03	ns	46.7±1.288	45.8±1.157	ns
MUFA	43.62±1.20	41.75±0.57	ns	46.66±1.10	45.11±1.21	ns	47.1±1.210	46.6±1.141	ns
PUFA	13.0±1.25	14.5±0.91	ns	5.85±0.21	7.52±0.34	***	6.13±0.18	7.46±0.35	**
P/S[B]	0.30±0.03	0.33±0.02	ns	0.12±0.00	0.15±0.00	**	0.13±0.00	0.16±0.00	*
w3/w6	0.29±0.02	0.33±0.01	ns	0.07±0.00	0.10±0.01	*	0.09±0.00	0.12±0.00	*
CLA	0.89±0.07	1.74±0.19	***	0.87±0.06	1.97±0.25	***	1.02±0.08	2.04±0.18	***
Δ^9C16[C]	0.08±0.00	0.08±0.00	ns	0.08±0.00	0.07±0.00	*	0.10±0.00	0.10±0.00	ns
Δ^9C18[D]	0.75±0.00	0.73±0.00	*	0.74±0.00	0.69±0.00	***	0.79±0.01	0.77±0.01	*

[A]SD: Significant differences. ns = p>0.05; * = p<0.05; **= p<0.01; *** = p<0.001
[B]P/S: PUFA/SFA ratio
[C]Δ^9C16 = 100*[(C16:1)/(C16:0+C16:1)]; [D]Δ^9C18 = 100*[(C18:1)/(C18:0+C18:1)]

Conclusions

IM fat had higher levels of PUFA, however, no fat deposition effect was observed for CLA levels between IM, SC and IN fat depots.

Fat from those lambs that stayed with their mothers until slaughter had a healthier fatty acid composition in comparison to fat from those lambs weaned 45 days after birth.

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