FATTY ACID COMPOSITION OF SUCKLING LAMBS AS AFFECTED BY INCREASING CALCIUM SOAP ON EWE'S DIET

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Introduction

In Mediterranean areas, meat from suckling lambs is traditionally consumed, especially in specific periods (Christmas, Easter); commanding high market prices (Sañudo *et al.*, 2000). In Spain, suckling lambs are usually slaughtered immediately after weaning (10-12 kg live weight) and generally have been exclusively fed with milk. The Spanish market demands light carcasses (under 13 kg) with a characteristic degree of fatness that decides, to great extent, their commercial value. The optimum level of fatness is that which maintains a balance between the minimum amount needed to satisfy consumer tastes and that which guarantees carcass conservation, together with the flavour and aroma of the meat (Castro *et al.*, 2005). It is generally accepted that the fatty acid composition of the adipose depots of suckling animals depends on the composition of the milk they consume (Velasco, 1999; Zygoyiannis *et al.*, 1992) just as the fatty acid composition of this milk depends on the composition of ewe's diet (Goulas *et al.*, 2003). Palm oil, marketed as such and in the form of calcium soaps made from palm oil fatty acids, is one of the principal vegetable fats used in animal feeds (Castro *et al.*, 2005).

Our aim was to investigate the different effects of two ewe's diets (with and without calcium soaps) on the fatty acids of suckling lambs.

Materials and Methods

Sixty 25-30-day-old suckling lambs were studied. Two groups of thirty lambs from three different breeds (assaf, castellana and churra) were slaughtered at 11 kg live weight. One of these groups was fed with a basic diet composed of 18% beetroot pulp, 26% alfalfa, 22% barley, 12% corn, 12% soy, 10% cotton. The other group was fed with an added calcium soap diet composed of 18% beetroot pulp, 26% alfalfa, 18% barley, 12% corn, 12% soy, 10% cotton, 4% calcium soap. Lipids from adipose tissue were extracted using a standard chloroform/methanol procedure (Folch *et al.*, 1957). Fatty acid composition of lipids was methylated (Murrieta *et al.*, 2003) and analysed by gas chromatography (GC 6890 N, Agilent Technologies, USA) using a capillary column of 100 m × 0.25 mm × 0.20 µm (Supelco, Inc., Bellefonte, PA, USA). One microlitre was injected into the chromatograph, equipped with a split/splitless injector and a FID detector. The oven temperature program was 150 ºC increasing at 1ºC/min up to 165ºC then increasing at 0.20ºC/min up to 167ºC and then increasing 1.50ºC up to 225ºC where it was maintained for 15 min. Injector and detector temperatures were 250ºC. The carrier gas was helium at 1 ml/min and split (20:1). Fatty acids were expressed as a proportion by total weight. Data were compared by analysis of variance according to the General Linear Model Procedure of Statgraphics Plus package (Statgraphics Plus for Windows 2.1, Statistical Graphics Corp., 1996).

Results and Discussion

Table 1 displays data on the fatty acid content of adipose tissue (g/100g). In concordance with data found in the bibliography (Castro *et al.*, 2005), the most abundant fatty acids in all depots studied were oleic acid (C18:1 n-9), palmitic acid (C16:0), stearic acid (C18:0), butyric acid (C4:0) and myristic acid (C14:0).

As table 1 shows, breed and ewe's diet had an important influence over fatty acids of suckling lambs. Breed was more influential than diet, but the aim of this study was the latter.

With respect to lambs from ewes with calcium soap diet, the average content of C16:0, C16:0 ramified and C18:0 (saturated fatty acids) was significantly higher than those raised with basic diet ewe's milk. This increasing was caused by palm oil fatty acids that compose calcium soap.

On the other hand, calcium soap diet lambs presented lower monounsaturated and polyunsaturated acid values than basic diet lambs, like oleic acid (C18:1 n-9), linoleic acid (C18:2 n-6) and α-linolenic acid (C18:3 n-3). Other fatty acids that were significantly decreased in calcium soap diet lambs were caprylic acid (C8:0), myristoleic acid (C14:1 n-5), palmitoleic acid (C16:1 n-7), heptadecenic acid (C17:1), elaidic acid (9 *trans* C18:1 n-9) and tricosanoic acid (C23:0). This decrease was caused by the increase of saturated fatty acids in the diet (calcium soap) and the decrease of unsaturated fatty acids (22% to 18% of barley).

Table 1: Effect of diet and breed on fatty acid composition expressed as g/100 g.

	Assaf		Castellana		Churra			
	Basic	Soap	Basic	Soap	Basic	Soap	BREED	FEED
C4:0	9,04	6,10	15,89	20.24	14,00	8,07	**	ns
C6:0	0,07	0,05	0,08	0.05	0,10	0,07	ns	ns
C8:0	0,11	0,09	0,15	0,09	0,10	0,06	ns	**
C10:0	1,74	1,81	1.70	1.86	1,45	1,44	ns	ns
C11:0	0,11	0,13	0.11	0.07	0,09	0,06	**	ns
C12:0	2.34	1,58	2,50	2.89	2.04	2,08	*	ns
C14:0 ramified	0.09	0,09	0,05	0,07	0,07	0,09	*	ns
C14:0	12.93	11.51	11,03	10,94	11.83	12,46	ns	ns
C15:0 ramified	0.55	0,41	0.39	0,38	0.45	0,49	**	ns
C14:1 n-5	0.37	0.38	0.46	0,27	0.45	0.31	ns	**
C15:0	0.85	0,84	0,69	0.65	0,68	0,76	**	ns
C16:0 ramified	0,19	0.20	0,14	0.16	0.16	0,22	*	*
C16:0	23,82	28.21	20.58	22.96	22,29	25,31	**	**
C16:1 n-7	2.21	2,00	2,34	1.23	2.48	1,51	*	**
C17:0	0,79	0,93	0,83	0,63	0.79	0,90	**	ns
C17:1	0,36	0,39	0.40	0,25	0,45	0.37	**	**
C18:0	9.20	12,63	9.67	10.38	8,60	12.32	ns	**
9 *trans* C18:1 n-9	1.82	0,85	1,06	0.72	0,85	1,18	**	**
C18:1 n-9	24.67	24,51	25,64	20.56	26.27	24.53	ns	**
C18:1	1.04	0,75	0,66	0,52	0.79	0,68	**	**
C18:2 n-6	3.45	2,18	1,95	1,63	2.12	2.07	**	**
C18:3 n-3	0,49	0.65	0.57	0,29	0,71	0.46	**	**
C18:2 CLA	0,60	0.35	0.58	0.44	0,45	1.05	*	ns
C23:0	0.26	0,12	0,16	0.01	0.17	0,09	**	**
C22:5 n-3	0.14	0,11	0,10	0.01	0,16	0,08	**	**

* $P<0,1$ **$P<0,05$ ns: not significant

Conclusions

The results obtained in this study indicate that fatty acid composition of adipose depots of suckling lambs were affected by the ewe's diet composition. Supplementation with calcium soap made from palm oil fatty acids increased some saturated fatty acids, like C16:0, and decreased some unsaturated fatty acids, like C18:1 n-9.

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