

INTRAMUSCULAR FATTY ACID COMPOSITION OF EARLY AND LATE LAMBS IN SICILY

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Introduction

In recent years meat quality has been seen as a main target in animal production. In particular, consumers demand for healthier food has encouraged research focussing on the manipulation of meat fatty acid (FA) composition in order to improve benefits to human health. It has been demonstrated that lowering the *n-6* fatty acids content and increasing the *n-3* fatty acids contents in the human diet reduces the incidence of cardiovascular diseases (Enser *et al.*, 1998). Several studies focussed on the meat content of the *cis-9, trans-11* isomer of linoleic acid (conjugated linoleic acid or CLA), as it has been shown that this fatty acid exerts favourable effects against carcinogenesis in mammals (McGuire and McGuire, 1999). It is known that animal species, breed, sex, age and feeding system are all factors influencing meat fatty acid composition. Conversely to other European countries, in Sicily two types of lamb are produced from the same breed: early lambs, fed exclusively maternal milk, and late lambs, allowed to graze and also receiving concentrate supplements. The intramuscular fatty acid profile of these two types of meat were compared. This research was developed in the framework of a three-year collaboration between "Ente di Sviluppo Agricolo Regione Siciliana" (ESA) and the University of Catania.

Materials and Methods

Forty-two male Comisana lambs were used in this trial. Twenty-two lambs were fed exclusively maternal milk and were slaughtered at 40 days of age (early lambs). The remaining 20 lambs were allowed to graze on natural pasture and received also a daily ration of concentrate and hay until slaughter at 8 months of age (late lambs). After slaughtering, carcasses were stored at 4°C and 24hrs post-mortem the muscle *longissimus dorsi* (LD) was excised from the carcasses. Meat intramuscular fatty acids (FA) were extracted according to Folch *et al.* (1957), as modified by French *et al.* (2000) from 5g of ground meat removed at the level of the 13th thoracic rib. Fatty acid methyl esters were separated by gas chromatography. Meat FA were identified according to retention time with reference to fatty acid standards. Meat FA are expressed as g/100 g of total fatty acid methyl esters. Data were analysed by ANOVA general linear model (GLM) including "lamb type" (early or late lamb) in the model.

Results and Discussion

Medium chain saturated fatty acids (C12:0, C14:0 and C15:0) were present at higher amount ($P < 0.0005$) in the intramuscular fat of early lambs (Table 1). A similar pattern was found for palmitoleic acid (C16:1 *9-cis*; $P < 0.05$). The percentages of these fatty acids in early lamb meat were higher compared to data reported by Valvo *et al.* (2005) on meat fatty acid composition of lambs fed exclusively maternal milk and with their dams fed green grass or concentrate. Oleic acid did not differ between the two groups of animals and was the predominant FA in lambs intramuscular fat, confirming results reported by Sañudo *et al.* (2000). *Trans*-vaccenic acid (C18:1 *11-trans*) and linolenic acid (C18:3 *n-3*) were present at higher amount ($P < 0.005$) in the meat of late lambs compared to early lambs. Late lambs had free access to pasture and according to Santos-Silva *et al.* (2002) a green herbage diet enhances the inclusion of these two fatty acids into lamb fat. The content of CLA in meat was not affected by lamb type. Very long chain FA, total *n-6* and *n-3* FA were not different among the two groups of animals. Only C22:6 *n-3* (DHA) was found at significantly higher percentage in early lamb meat.

Conclusions

This study has shown that some differences occur in meat fatty acid composition between early and late lambs in Sicily. In particular, early lamb meat contains higher percentages of medium chain saturated fatty acids and lower *trans*-vaccenic acid and linolenic acid. These differences were probably caused by the different rearing conditions and age at slaughter of the two groups of animals. Conjugated linoleic acid, total *n-6* and *n-3* FA contents did not vary among the two types of lamb. The *n-6* / *n-3* ratio was similar in the meat of the two groups of lambs and its low value was favourable for consumers' health.

Table 1: Effect of lamb typology on meat intramuscular fatty acid composition (g/100g FA methyl esters).

No of lambs	Early lamb	Late lamb	SEM	P - value
	n = 22	n = 20		
C12:0	0.82	0.23	0.062	<0.0005
C14:0	5.42	2.20	0.309	<0.0005
C14:1	0.26	0.16	0.014	<0.0005
C15:0	0.48	0.38	0.015	<0.0005
C15:1	0.11	0.33	0.025	<0.0005
C16:0	20.93	19.60	0.373	0.075
C16:1 9-cis	1.42	1.06	0.071	0.010
C17:0	0.74	0.97	0.025	<0.0005
C17:1	0.31	0.66	0.062	0.004
C18:0	9.38	13.61	0.391	<0.0005
C18:1 11-trans	1.08	2.29	0.139	<0.0005
C18:1 9-cis	27.67	26.46	0.478	0.211
C18:1 11-cis	1.70	2.11	0.080	0.008
C18:2 12-trans	0.56	0.65	0.037	0.242
C18:2 n-6 (linoleic)	12.87	13.17	0.394	0.712
C18:3 n-6 (γ-linolenic)	0.14	0.15	0.007	0.934
C18:3 n-3 (α-linolenic)	1.47	2.46	0.178	0.004
C18:2 9-cis,11-trans (CLA)	0.65	0.52	0.049	0.953
C18:2 10-trans,12-cis	0.03	0.04	0.005	0.383
C20:2 n-6	0.10	0.13	0.023	0.516
C20:3 n-3	0.12	0.13	0.011	0.770
C20:4 n-6	7.93	7.63	0.230	0.901
C20:5 n-3	1.67	1.67	0.118	0.989
C22:5 n-3	2.10	2.16	0.090	0.750
C22:6 n-3	1.43	0.74	0.071	<0.0005
n-3	6.79	7.16	0.365	0.625
n-6	21.09	21.21	0.660	0.928
n-6 / n-3	3.20	3.77	0.239	0.236

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