

FAT CONTENT AND FATTY ACID PROFILE OF STEERS REARED IN ITALY: CHANGES ALONG WITH TIME

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Introduction

Bovine meat is one of the most consumed in Italy (Turrini and Lombardi-Boccia, 2002). Data on the composition of the Italian Total Diet reported that bovine meat accounted for 39.4% of the total meat and meat products daily consumption (Lombardi-Boccia *et al.*, 2004). In recent years, much attention has been paid on the nature of fat in meat because it is considered a risk factor in the developing of cardiovascular diseases. Consumer concerns led the meat industry toward efforts aimed at reducing carcass fatness. The present study was undertaken to update and broaden data on the fat content and composition of meat from steers reared in Italy. The objective of this study was therefore to evaluate the total fat content, fatty acids profile and cholesterol content of five meat cuts (fillet, sirloin-steak, eye-round, top-side and knuckle) of steers reared in Italy. Furthermore present data were compared with those coming from previous studies carried out in Italy and changes in fatty acids composition along with time are discussed.

Materials and Methods

Five crossbred steers (Charolais and Limousine) were reared on 5 farms and raised on commercial pellets (UNIFEED). The steers were slaughtered at 21 months of age, and five retail cuts (fillet, sirloin steak, eye-round, top-side and knuckle) from each steer were trimmed away of external fat, packaged in vacuum packs and delivered to the laboratory. In order to obtain representative meat samples for analyses, each meat cut was sliced in pieces of about 20g and subdivided in several equal aliquots: some aliquots were immediately taken for analysis, the others were frozen at -30°C under vacuum and stored for subsequent analyses, each being carried out in triplicate.

Lipid: Intramuscular fat was extracted by means of a modification of the method of Folch, Lees and Stanley (1957) using chloroform/methanol (2/1, v/v). **Fatty acid composition:** Fatty acids were esterified using boron trifluoride in methanol as esterification reagents. The recovered fatty acids methyl ester (FAME) were analysed using a HP 5890 II series gas chromatograph equipped with a flame ionisation detector (FID) and operated with a split ratio of 100:1. Separations were accomplished for saturated fatty acids on a Supelcowax 10 TM (60mx 0.25mm i.d., 0.25µ film thickness) column; detector temperature was 260°C, injector temperature was 240°C and the following temperature program was used: from initial temperature of 120°C to 180°C at 8°/min and to 240°C at 3°/min. Separation of trans fatty acids was carried out using a SP 2560 column (100mx25mm i.d., 0.2µ film thickness), detector and injector temperature was 200°C, the separations were accomplished with an isotherm at 170°C. Identification of the components was based on comparison of retention time with standard and using Standard Reference Material: NIST 1546 (meat homogenate) and BCR 163 (beef-pork fat blend). **Cholesterol:** this was quantified by enzymatic assay (Boehringer Mannheim/R-Biopharm).

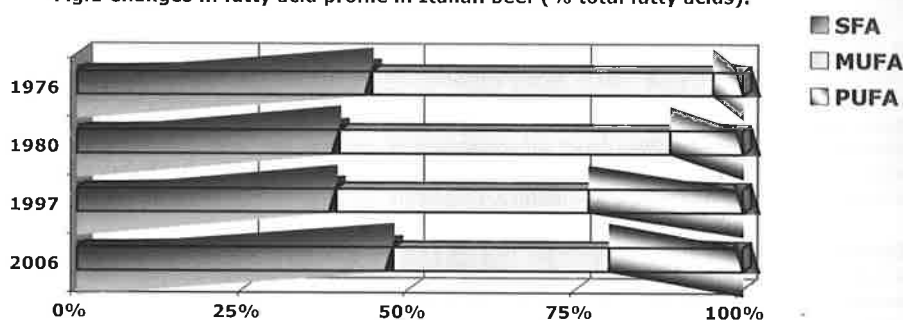
Results and Discussion

The five meat cuts showed a low total fat content, from about 1.1% detected in eye-round and top-side, which displayed about half the amount found in the other cuts, to a maximum of 2.9% detected in sirloin-steak. When the total intramuscular fat content detected in this study was compared with that reported in the Italian Food Composition Table (Carnovale and Marletta, 2000), which describes the composition of Italian meat of about ten years ago, a marked decrease in total fat content along with time was observable: the reduction in intramuscular fat content was up to 56% for fillet, the minimum reduction was found for knuckle (21%), with the mean value of total fat reduction (comprehensive of the five meat cuts analysed in this study) being about 44%. The fatty acid profile of total extractable lipids from the five cuts analysed is given in Table 1. Among the SFA, palmitic and stearic acids were the most represented in all the cuts analysed, sirloin steak showing the highest amounts of both, in contrast, the lowest amounts of palmitic acid were found in top-side and stearic acid in eye-round. Among the MUFA, oleic acid was present in the highest amount and sirloin steak and knuckles were the cuts with the highest concentration of it (84 and 80%, respectively). The most abundant PUFA were linoleic and arachidonic acids. Top-side was the cut with the highest concentration of linoleic acid (19.2%) and the fillet had the highest content of arachidonic acid (about 4.2%).

Table 1: Fatty acid profile (% total fatty acids) of the five raw cuts analysed (f.w.)

Fatty ac.	fillet		sirloin-steak		eye-round		top-side		knuckle	
	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.	mean	s.d.
14:0	1.92	0.27	2.71	0.21	0.97	0.24	1.80	0.42	2.17	0.26
15:0	2.13	1.05	1.80	0.15	0.99	0.34	2.21	0.05	1.91	0.22
16:0	22.41	1.31	25.51	0.58	22.44	0.35	22.13	0.83	21.59	0.49
17:0	2.37	0.40	2.16	0.06	1.94	0.07	1.60	0.18	1.72	0.10
18:0	18.16	1.15	18.42	0.63	16.91	0.41	17.16	0.55	17.32	0.03
21:0	0.86	0.02	0.72	0.04	3.84	0.3	1.34	0.01	1.09	0.04
14:1	0.82	0.19	0.65	0.08	0.99	0.07	1.42	0.12	0.88	0.25
16:1 n7	2.24	0.07	2.44	0.08	2.18	0.54	1.97	0.36	2.68	0.54
17:1 n8	1.79	0.68	0.97	0.18	1.18	0.64	2.39	0.51	1.56	0.19
18:1 n9	24.99	1.70	28.82	0.32	23.89	1.94	21.55	2.21	28.53	1.94
18:1 n7	2.24	0.17	1.43	0.47	2.23	0.59	2.28	0.28	2.06	0.82
18:2 n6	14.53	1.11	10.61	0.84	16.34	1.23	19.21	1.44	13.09	1.04
18:3 n3	0.86	0.16	0.65	0.43	0.81	0.04	0.77	0.01	0.92	0.97
20:4 n6	4.16	0.45	2.51	0.11	3.99	0.48	3.76	0.24	3.87	0.03
20:5 n3	0.51	1.66	0.65	0.05	1.26	1.48	1.24	0.10	0.52	0.05
SFA	47.8		51.3		47.0		46.2		45.8	
MUFA	32.0		34.3		30.5		30.0		35.7	
PUFA	20.1		14.4		22.4		25.0		18.4	

Sirloin steak, the cut with the highest proportion of intramuscular fat, had the highest percentage of SFA (about 51.3%). MUFA were detected in the highest amount in knuckles (35.7%). The two cuts lowest in fat were found to be the cuts richest in PUFA: 25% and 22%, respectively. Compared with data reported in previous studies (Lintas *et al.*, 1977; Carnovale and Marletta, 2000) which describe the composition of Italian meat from 30 years ago (Figure1) a marked decrease in total fat content as well as changes in fatty acid content along with time was observed.

Fig.1 Changes in fatty acid profile in Italian beef (% total fatty acids).**References**

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