EFFECTS OF POLYUNSATURATED FAT IN DIETS FOR PIGS AND WILD BOARS ON CHEMICAL AND FATTY ACID COMPOSITION OF MEAT

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Background

Besides beneficial effects towards cardiovascular diseases, ω3 fatty acids are essential for monogastric species and must be incorporated in the diet since α-linoleic acid (C 18:3ω3) elongation and desaturation products (C 22:5ω3 and C 22:6ω3) are required for brain and retinal development and function (Van Oekel *et al.*, 1996). Dietary recommendations for humans favouring the consumption of less saturated fat have led to an increased interest in meats containing more unsaturated fatty acids (Bryhni *et al.*, 2002) and to take in count the right balance between lipidic fractions (Simopoulos, 2002). Since the amount and composition of dietary fatty acids influence the quality of fat tissue in pigs (St-John et al., 1987), we tried to verify the effects of polyunsaturated fat in diets for pigs and wild boars on chemical and fatty acid composition of meat. The effect of dietary fatty acids on some performance parameters of wild boars has been investigated by Marsico *et al.* (1999; 2000) and Vicenti *et al.* (1997).

Objectives

In order to increase polyunsaturated fatty acids (PUFA) content in pigs and wild boars meat, this experiment was led to test the effects of two feeds (containing animal fat and PUFA) on meat quality by assessing the chemical composition of meat and the incorporation of fatty acids in peri-intramuscular fat of meat.

Methods

Eight wild boars (*Sus scrofa ferus*) and six pigs were subdivided into two groups each and fed "*ad libitum*" on two diets. One group of pigs and one of wild boars were fed on a diet (AF) containing 1.5% of animal fat; the other two groups on a diet (ω3) containing 1.5% of fish oil (rich in PUFA). Chemical composition and fat content of diets are shown in Tables 1 and 2. After slaughter, a sample of meat was removed from *Longissimus dorsi* muscle to determine the chemical composition of meat (ASPA, 1980) and the acidic composition of fat, by measuring the contents of saturated fatty acids (SFA), unsaturated fatty acids (UFA), mono unsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA). Fatty acid composition was analysed as extracted/methylated using a gas chromatography system (Chromopack CP9000) with a capillary 60 m silica-glass column and cyanopropyle film at 100%. The data were analyzed for variance and the significance between the means was evaluated using Student's "t" test (SAS, 1996).

Results and Discussion

Table 3 shows the chemical composition of meat. Diet didn't significantly affect chemical composition of pigs and wild boars meat, while, considering the genotype, meat from wild boars was more proteic and less fat ($P<0.01$) than that from domestic pigs. Ash and undetermined contents of meat were higher ($P<0.05$) in domestic pigs. The interaction effect between diet and genotype evidenced that wild boars fed on ω3 diet produced significantly more proteic meat, differing from that from pigs fed on the same diet ($P<0.01$) and on diet containing animal fat ($P<0.05$). The lipidic content of pigs fed on ω3 diet was higher ($P<0.05$) compared to wild boars fed on ω3 and AF diets. Ash percentage was higher ($P<0.05$) in wild boars than in domestic animals fed on ω3 and AF diets. The undetermined reached a significantly higher percentage ($P<0.01$) in wild boars fed on both diets than in pigs fed on AF diet. Acidic composition of peri-intramuscular fat of domestic pigs and wild bors fed on ω3 and AF diets is shown in Table 4. Some traits of fat from both genotype seemed to be modifiable by the diet, according to Bryhni *et al.* (2002) and Muriel *et al.* (2002) for free-ranging reared pigs. In fact, the subjects fed on ω3 diet showed higher contents ($P<0.01$) of PUFA, PUFA ω3 and PUFA ω6 than those fed on AF diet. The genotype effects on acidic profile of fat evidenced significant differences ($P<0.01$) between UFA, PUFA, PUFA ω3 and PUFA ω6 contents, which were more abundant in wild boars meat. Atherogenic index and trhombogenic index were significantly better ($P<0.01$) and closer to the optimal ones (Ulbricht and Southgate, 1991) in wild boars meat. Considering the interaction diet-genotype, fat from the two groups of domestic pigs was more saturated ($P<0.01$) than that from wild boars fed on the two diets. Levels of PUFA found in wild boars fed on both diets were higher ($P<0.01$) than in pigs. Very interesting was the increase of PUFA ($P<0.05$) obtained in meat of wild boars fed on ω3 diet compared to that of wild boars fed on the other diet. In the same way, the contents of PUFA ω6 and ω6 were mainly influenced by the genotype since their contents were significantly higher ($P<0.01$) in wild boars fat than in pigs. Despite the diet, the analysis of the UFA/SFA and SFA/PUFA ratios and of the atherogenic and trhombogenic indexes showed the significant and better ($P<0.01$) results obtained from meat fat of wild boars compared to domestic pigs.

Conclusion

In this investigation the genotype significantly influenced meat chemical composition, leading to more protein and less fat in wild boars compared to domestic pigs. The type of diet didn't cause any effect on chemical composition. Diet partially influenced acidic composition of fat, since ω3 diet increased PUFA and reduced SFA deposition, emphasizing the characteristics of the wild genotype and positively affecting those of domestic animals. Moreover, healthiness indicators, already positive in wild boars, were improved with ω3 diet.

It could thus be concluded that the increase of ω3 fatty acids in wild boars and domestic pigs meat by feeding improved their value for human nutrition. This seems to be a good approach to improve quality image of pork and emphasize dietetic traits of wild boar meat, in order to promote their consumption and guarantee consumers' health.

Table 1 - Chemical composition of diets (% on dry matter)

	Dry matter	Protein	Fat	Ash	Crude fiber	N-free extract
AF	10.07	16.14	6.24	6.47	6.75	54.33
ω3	11.06	15.98	5.54	6.22	6.26	54.94

Table 2 - Fatty acids of diets (%)

	SFA	UFA	PUFA	ω3	ω6	ω6/ω3
AF	39.8	60.2	33.3	3.2	29.7	9.28
ω3	30.1	69.9	50.31	12.5	35.5	2.89

Table 3 - Chemical composition of meat (%)

	Diet		Genotype		Diet x Genotype				SED
					AF		ω3		
	AF	ω3	Wild boar	Pig	Wild boar	Pig	Wild boar	Pig	
Samples n.	7	7	8	6	4	3	4	3	DF=10
Moisture	68.35	67.73	68.92	67.14	68.70	68.02	69.16	66.41	1.884
Protein	22.35	22.27	22.83 A	21.79 B	22.69 ab	22.00 bc	22.96 Aa	21.45 Bc	0.468
Fat	6.97	7.55	5.46 B	9.07 A	5.69 b	8.24	5.22 b	9.89 a	1.972
Ash	1.18	1.15	1.24 a	1.10 b	1.28 a	1.09 b	1.21	1.10 b	0.092
Undetermined	1.15	1.30	1.55 a	0.90 b	1.64 a	0.65 b	1.45 a	1.15	0.450

A, B, C: P<0.01; a, b, c: P<0.05

Table 4 - Fatty acids of meat fat (%)

	Diet		Genotype		Diet x Genotype				SED
					AF		ω3		
	AF	ω3	Wild boar	Pig	Wild boar	Pig	Wild boar	Pig	
Samples n.	7	7	8	6	4	3	4	3	DF=10
SFA	36.29	35.24	27.07 B	44.47 A	28.81 B	43.77 A	25.33 B	45.17 A	4.209
UFA	63.71	64.75	72.93 A	55.53 B	71.19 A	56.23 B	74.67 A	54.83 B	4.209
MUFA	49.31	46.05	48.60	46.76	49.51	49.10	47.69	44.42	4.491
PUFA	14.40 B	18.70 A	24.33 A	8.78 B	21.68 Ab	7.13 B	26.98 Aa	10.42 B	2.450
ω6	11.30 B	15.17 A	19.84 A	6.63 B	17.60 Bb	5.00 C	22.08 ABa	8.27 C	2.149
ω3	2.43 B	3.29 A	4.04 A	1.68 B	3.55 Aa	1.30 B	4.53 A	2.05 Bb	0.636
ω6/ω3	4.76	4.45	5.02	4.20	5.05	4.48	4.98	3.92	1.446
UFA/SFA	1.93	2.09	2.76 A	1.26 B	2.57 A	1.30 B	2.95 A	1.23 B	0.394
SFA/PUFA	3.93	2.94	1.13 B	5.73 A	1.33 B	6.54 A	0.94 B	4.93 A	1.549
Atherogenic index *	0.50	0.47	0.34 B	0.63 A	0.38 B	0.62 A	0.30 B	0.63 A	0.093
Thrombog. index *	0.97	0.92	0.55 B	1.34 A	0.62 B	1.33 A	0.48 B	1.36 A	0.171

A, B, C: P<0.01; a, b, c: P<0.05
* according to Ulbricht and Southgate, 1991

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