LIPIDS AND CHOLESTEROL IN PORK MUSCLES

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BACKGROUND

Meats do not have a healthy image compared with others foods like fruits or vegetables. Lipids and cholesterol present in all meats are the principal responsible for this concept. Researches from the meat industry are trying to decrease the meat fat and cholesterol content and also to modified the fatty acid composition toward a healthier lipid profile. Less saturated fatty acids, more monounsaturated and a lower omega 6/omega 3 ratio are actually the main objectives. In the monogastric animal the diet seems to be the easier way to manipulate the animal body lipid composition (Anh et al., 1996) but other aspects as sex and muscle anatomical location can be also important (Garcia et al., 1986). Differences in intramuscular fat percentages, total cholesterol and fatty acid composition could be more important than dietary effects.

OBJECTIVES

The purpose of this study was to investigate the effects of sex and muscle in the intramuscular fat percentages, total cholesterol and fatty acid composition in a commercial pork population.

MATERIAL AND METHODS

Four muscles from 24 pigs (12 barrows (B) and 12 gilts (G)), selected from a commercial pork population, with an average live-weight of 98±6 kg and similar feeding regimen were used. *Semimebranosus* (SM), *Semitendinosus* (ST), *Psoas major* (PM) and *Longissimus* (LD) free of external fat were minced and aliquot samples were used for total intramuscular fat (IMF %) by extraction with boiling hexane of the dry muscle. Cholesterol and lipids were extracted using Folch et al. (1957) method. Aliquot samples from the chloroform extract were used for triglyceride isolation by TLC and total cholesterol by Roschlan et al. (1975) method. The methyl esteres were analyzed by capillary GLC with a WCOT 50m fused silica CP-Sil 88.The data were analyzed using a General Lineal Procedure (SAS, 1987).

RESULTS AND DISCUSSION

The IMF % and the cholesterol content are presented in Table 1. There were significant differences in the amounts of IMF % among muscles but no significant sex effects. IMF % were in general ST>SM.>PS>LD in gilts and ST>SM.>LD>PS in barrows. Cholesterol content was affected by sex and muscle. In general, muscle cholesterol content in gilts or barrows decreased in the following order PS>ST>SM>LD. In Fig 3 are shown the relationships among IMF%, total muscle cholesterol amd mg cholesterol/g IMF in all muscles from barrows. These results are similar to the obtain in previous studies (García et al., 1986)

The fatty acid composition from the trygliceride fraction is given in Table 2. Differences for all fatty acids, except 14:0, were detected showing the effect of sex and muscle in the fatty acid composition.The largest differences for 16:0 were (22.4% vs 25.9%) between SM B and PS G; for 16:1 (2.3% to 4.5%) between ST B and LD G; for 18:0 (10.2% to 13.7%) between SM G and 13.4 PS G: for 18:1 (43.3% to 50.4%) between PS G and LD G and for 18:2 (5.7% to 9.6%) between LD G and PS B respectively. The SFA % were between 34.1% in SM B to 40.7% in PS G. The ratio PUFA/SFA from 0.15 in LD B to 0.26 in ST G.

In Fig 1 and 2 are shown the % of 18:0, 18:1 and 18:2 in total intramuscular lipids for all muscles in gilts and barrows

The differences are similar that the detected in the triglyceride fraction (Table 2). SM and ST muscles show similar profiles but LD and PS were different. PS muscle has the largest percentages of 18:2 and the lowest for 18:1.

CONCLUSION

Important differences in total intramuscular fat percentages, cholesterol content and fatty acid composition were detected in different pork muscles. Muscle anatomical location effects were more important than sex. The results from this study indicate that the consumer worried about health could choose the muscles with the more adequate fatty acid composition or the less cholesterol content.

REFERENCES

Anh, D.U., Lutz, S. and Sim, J.S. (1996). Effects of dietary alfa-linolenico acid on the fatty acid composition, storage stability and sensory characteristics of pork loin. Meat Sci 43:291-299

Folch, J. Lees, M. and Sloane, G. H. S. (1957). A simple method for the isolation and purification of total lipids from animal tissues. J. Biol. Chem. 226:497-509

Garcia, P. T., Casal, J. J., Olsen, C.& G. Berra (1986). A comparison of distribution and composition of intramuscular fat in Duroc Jersey and Hampshire pigs at 100 kg live-weight. Meat Sci 16:283-295

Roschlan P., Bernard E. and Gruber W. (1975) Congress on Clin. Chem. Toronto. Abstr. No1 , \

Table 1. Intramuscular fat % and total cholesterol (mg/100g) in gilts (G) and barrows (B) different muscles. Mean±SD

	SM G	SM B	ST G	ST B	PS G	PS B	LD G	LD B
IMF %	3.7±2.0a	5.0±1.9ab	6.9±2.0b	5.9±1.9b	3.0±0.7a	3.2±1.2a	2.6±1.3a	3.8±2.0a
Cholesterol	44±4a	52±4b	53±6b	54±4b	55±7b	58±7b	42±8a	49±7a

abc Means within a row with different letters are significantly different ($p<0.05$)

Table 2. Fatty acid composition (%) of intramuscular triglycerides according to sex and muscle. Mean±SD
G gilts B barrows

Fatty acid %	SM G	SM B	ST G	ST B	PS G	PS B	LD G	LD B
14:0	1.3 ±0.1a	1.4±0.2a	1.3±0.13a	1.2±0.1a	1.4±0.2a	1.4±0.2a	1.3±0.1a	1.4±0.2a
16:0	22.9±1.3a	22.4±1.6a	22.6±1.2a	23.3±1.4ab	25.9±1.3b	24.6±1.7ab	23.9±1.1ab	24.4±1.4b
16:1	4.2±0.4d	3.7±0.3bc	3.6±0.5bc	2.3±0.4a	3.5±0.5bc	3.4±0.5b	4.5±0.4d	3.9±0.6c
18:0	10.2±1.2a	10.3±1.3a	11.0±ab	11.9±1.2b	13.4±1.7c	12.7±0.9b	10.8±1.4ab	11.5±0.8ab
18:1	48.5±2.6bc	49.3±3.4bc	48.2±2.2bc	46.7±2.3ac	43.3±3.5a	43.5±4.0a	50.4±2.0b	48.8±3.4bc
18:2	7.8±1.3b	8.8±1.7b	9.1±1.8bc	8.9±1.5b	8.3±1.3b	9.6±1.7c	5.7±1.6a	5.9±1.6a
SFA	34.4±2.3a	34.1±2.0a	34.9±2.6a	36.5±2.3ab	40.7±2.3c	38.7±2.5bc	35.9±2.5ab	37.6±1.6b
PUFA/SFA	0.226	0.258	0.260	0.243	0.203	0.248	0.158	0.156

abc Means within a row with different letters are significantly different ($p<0.05$)

Fig 1. Percentages of 18:0, 18:1 and 18:2 in gilts
Total lipids from all muscles

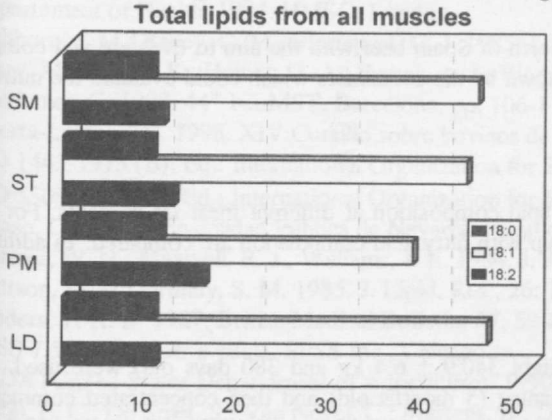
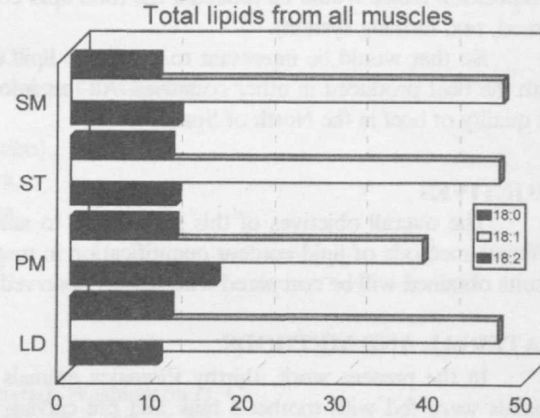


Fig 2. Percentages of 18:0, 18:1 and 18:2 in barrows
Total lipids from all muscles



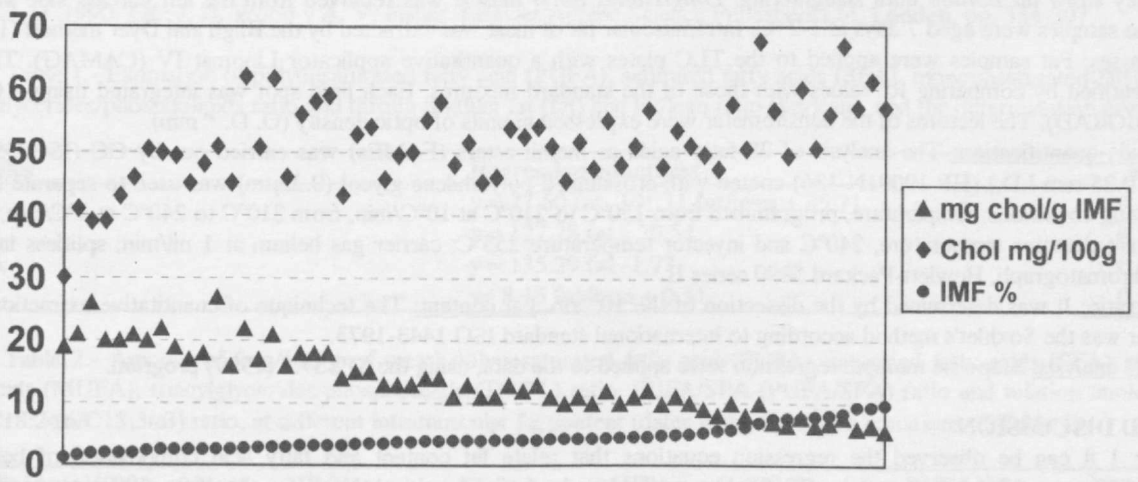


Fig 3. IMF%, total cholesterol (mg/100 g muscle) and mg cholesterol/g IMF). Barrows (all muscles).