LIPID COMPOSITION OF M. LONGISSIMUS DORSI IN FATTENED HYBRID PIGS

TSVETKOVA V.
Institute of Grain and Feed Industry, 2232 Kostinbrod, Bulgaria

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Introduction: The regulation of the biosynthesis, transport and catabolism of the lipids under the influence of different biological factors - food, age, sex, breed and other ones are of importance for meat animals and respectively for the pigs. The composition, the nourishing and energy ensurance has been of great significance for the diets. The effect of the inclusion of barley into the diet as the only one carbohydrate component on the main lipid classes of m. L. dorsi has been studied.

Materials and methods: Hybrid castrated male pigs have been housed individually in pens and have been fattened from 20 to 100 kg live weight. The animals have been devided into control (I) and trial (II) groups, 12 pigs in each group. The cotrol animals have been fed feedstuffs according to Bulgarian State Standard 1642-77 and in the mixture of the trial group have been included barley instead of corn. The diets are isoproteinic and the level of methabolizable energy is 13,3 MJ/kg for group I and 12,0 MJ/kg combined feed for group II. Six pigs have been slaughtered at 20, 50 and 100 kg live weight, I and II groups. The samples have been taken between 10 and 11 dorsal vertebrae from m. Longissimus dorsi.
The total lipids from m. Longissimus dorsi have been extracted according to Bligh and Dyer (1959). The triacylglycerols (TG) and the free fatty acids (FFA) have determined quantitatively and quantitavely (Cunnane et al., 1986) with inner standards tiarachine and arachidic acid, respectively. For gas chromatography analyses have been used a conventional colomn filled with 10% SP 2340 on Chromosorb W.AW 100-120 mesh. The phosphatidylcholine (PC) has been separated by thin layer chromatography according to Touchstone et al. (1980) and fatty acid composition analysed by the method of Lepage and Roy (1988). The level of total phospholipids (Barttlet, 1959) and cholesterol (Sperry and Webb,1950) has been investigated.

Results and discussion: M. Longissimus dorsi in the control and especially in the trial animals is not rich in intramuscular lipids, mainly due to the moderate content of TG. The higher caloricity of the mixture is important for the higher TG concentration in the control animals (Table 1). The results of the study have shown an increase in quantity of this lipid class parallel to growing and live weight of the trial and cotrol pigs. The muscular TG of the control pigs - 100 kg live weight contain a high percent 16:0 and 18:0, normal level of 16:1 and 18:1 and low concentration of 18:2 in comparison with the 20 kg pigs. Similar data for changes with age connected with increase of the quantity of saturated and monounsaturated acids and decrease of polyunsaturated acids in the muscular TG, have been received by Sharma (1987) amd Gandemer (1991). The substitution of corn in the control mixture with barley in the trial mixture does not lead to significant changes in fatty acids ratio of the TG. This is probably due to the lower influence of the diet lipids on the muscles in comparison with that of adipose tissue TG. This relatively saturated composition of the muscular TG has been in conection with the breed specification the more so as lipids from the mixture of the control and trial groups contains significant quantities 18:1 and especially 18:2.
The FFA pools in the muscle decrease in 100 kg control and trial pigs compared to 20 kg pigs. This can be related to the fact that fatty acids are the main source of energy for the muscles while they are at rest. The negligible changes in the concentrations of the total phospholipids parallel to the growing or under the influence of the differences in the feed undoubtedly reveal the relative constancy in connection with their role in the functions of the membranes. During the growth and fattening of the pigs in the fatty acid spectrum of the muscular PC, the level of 18:2 and 20:4 has been increased parallel to the decrease of 18:1. The diet differences does not lead to significant differences in fatty acid composition of the two groups. The attention has been directed to the PC for it is a majoritar individual phospholipid and its changes give orientation for the possoble alimentary influence upon the component fatty acids of the total phospholipids (Gandemer, 1990; Javouhey et al., 1990).

Table 1

LIPID COMPOSITION OF M. LONGISSIMUS DORSI IN FATTENED PIGS

	Live weight, kg				
	20	50		100	
		control	trial	control	trial
Fatty Acid Composition of TG, mol %					
14:0	1.38±0.10	1.05±0.06	0.90±0.14	0.60±0.12^{c,f}	0.52±0.10^{d}
16:0	28.10±0.62	28.06±0.49	28.31±0.69	26.03±0.50^{c,f}	25.64±0.42^{d,j}
16:1	3.83±0.28	4.31±0.19	3.88±0.26	4.09±0.14	4.47±0.27
18:0	13.29±0.35	12.49±0.40	14.19±0.76	11.79±0.29^{c}	12.01±0.49
18:1	48.09±0.49	50.03±0.76	48.63±1.25	53.97±0.78^{c,f}	54.65±0.55^{d,j}
18:2	5.31±0.45	4.06±0.15^{a}	4.09±0.35	3.52±0.16^{c}	2.72±0.19^{d,j}
Fatty Acid Composition of PC, mol %					
14:0	1.07±0.12	0.96±0.13	1.75±0.32	1.48±0.25	0.97±0.08
16:0	37.87±1.29	40.95±1.98	37.83±0.56	36.59±1.36	36.42±0.72
16:1	1.09±0.13	2.33±0.14^{a}	3.72±0.16^{b,e}	1.58±0.49	0.72±0.08^{j}
18:0	11.96±0.99	10.95±1.12	14.14±1.26	9.61±0.25	8.16±0.37^{d,j,k}
18:1	20.57±0.98	19.18±0.50	21.65±0.64^{e}	17.38±0.62^{c}	17.17±0.49^{d,j}
18:2	23.25±2.73	24.32±2.20	19.70±1.60	30.58±0.89^{f}	33.34±1.00^{d,j}
20:4	4.22±0.47	1.31±0.13^{a}	1.23±0.09^{b}	2.72±0.26^{c,f}	3.21±0.26^{j}
Lipid Classes					
Total Lipids,mg/100g	1843±101	2152±130	2660±531	3321±354^{c,f}	3142±311^{d}
TG, mEqn/100g	1021± 79	1489±121^{a}	1973±514	2452±329^{c,f}	2281±258^{d}
FFA, nEqn/100g	509± 74	419± 39	389± 4	330± 19	293± 30^{d}
Phospholipids,mg/100g	618± 19	528± 15^{a}	504± 8^{b}	481± 17^{c}	457± 12^{d,j}
Cholesterol,mg/100g	60± 3	53± 2	52± 1	45± 1^{c,f}	46± 2^{d,j}

a - 20/50 kg control; b - 20/50 kg trial; c - 20/100 kg control; d - 20/100 kg trial; e - 50 kg control/50 kg trial; f - 50 kg control/100 kg control; j - 50 kg trial/100 kg trial; k - 100kg control/100 kg trial; $p \leq 0,05$

The level of the cholesterol, a key regulator for the degree of fluidity of the membrane bilayer is low and does not increase with the growth in the muscular tissue of the control and trial animals. This fact has been established in our study and requires attantion, because this does not correspond to the existing view for the increased the content of cholesterol with the age (Lepine et al., 1990) and has significant importance for the nutritional value of m. Longissimus dorsi. This may be due to breed specifiction, low level of sterols in the mixtures or absence of alimentary components (proteins of animal origin) increasing its endogen synthesis. In the m. L. dorsi a relatively low varying phospholipid/cholesterol ratio has been supported.

Conclusion: The relatively low level of the TG, together with the low content of cholesterol in the m. Longissimus dorsi gives to it some diet properties as a food product, but the low concentration of the 18:2 is not favourable for its nutritional value. Alimentary influence (comparatively low addition of vegetable oil) on the TG content and its fatty acid spectrum may have a desired positive effect, and improves the possibilities for storage.

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