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HISTOLOGICAL PROFILE OF THE *LONGISSIMUS DORSI* MUSCLE IN POLISH LARGE WHITE AND POLISH LANDRACE PIGS AND ITS EFFECT ON LOIN PARAMETERS AND INTRAMUSCULAR FAT CONTENT*

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Abstract

The objective of this study was to analyse differences in individual fibre types in the histological profile of the *longissimus dorsi* muscle and their effect on pork carcass lean content and level of intramuscular fat (IMF) content, which determines palatability of meat and meat products. Analysis showed that the amount of type IIB fibres had a statistically significant ($P<0.05$) effect on the IMF content of the *longissimus dorsi* muscle. Animals with more than 70% of type IIB fibres in this muscle were also characterized by larger loin eye area ($P<0.01$) and loin eye height ($P<0.05$). Analogous relationships were noted when the analysed group of animals was divided according to the diameter of type IIA fibres. IMF was negatively correlated to the percentage of type IIB fibres ($r_P=-0.162$). Relationships with the other two fibre types were positive (IIA – $r_P= 0.097$; I – $r_P= 0.187$). It was found that increased percentage of type IIB fibres resulted in a slightly greater loin weight ($r_P= 0.176$), higher loin eye height ($r_P= 0.136$), larger loin eye area ($r_P= 0.265$) and higher carcass lean content ($r_P= 0.204$). Likewise, the increase in the number of type IIA and type I fibres decreased these parameters.

Key words: pigs, histological profile, intramuscular fat

The skeletal muscles of humans and vertebrates are formed from different types of muscle fibres. These fibres can be classified according to their biochemical, functional and metabolic properties, among others. One of the classifications refers to myosin ATPase studies and distinguishes three major types of fibres: I, IIA and IIB. Phenotypic diversity of these fibres is determined by the presence of various myosin

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heavy chain isoforms, which determines myosin ATPase activity and contractility (Majerczak et al., 2001).

The observed profile of individual fibres in skeletal muscles, and thus the expression of different myosin isoforms is stable and genetically determined (Simoneau and Bouchard, 1995). Nevertheless, under certain conditions, e.g. the effect of hormonal factors, physical effort or electrical stimuli it may respond at the mRNA level, leading to degradation of existing proteins and formation of new microfilaments. However, these changes occur in a longer time period and largely depend on the duration of the stimulus (Majerczak et al., 2001; Spangenburg and Booth, 2003). This is why muscle fibre profile can be assumed to be stable when animals are kept under constant environmental conditions and are not exposed to stress and physical effort. Given such an assumption, considerable species, breed but also individual variation is observed in the amount and diameter of individual fibre types. Fibre types and their proportions in muscle determine muscle motility and its predisposition to physical effort. On the other hand, they may indirectly affect other physicochemical properties of muscle tissue. From the consumer's perspective, the proportions of individual fibre types may be manifested as sensory differences in meat and reinforce some consumer habits.

Meat quality is not easy to define and depends on many factors. One of the characteristics used to determine this parameter are sensory traits, including the associated intramuscular fat (IMF) content. Long-term selection for increased leanness has negatively affected the taste quality of pork and its products, which is closely related to IMF content. It is of note that this fat carries taste and has a beneficial effect on meat tenderness, palatability and juiciness (Enser, 2004), while reducing losses during heat treatment (cooking, grilling). Intramuscular fat is a mixture of triglycerides and phospholipids, which form 0.5–7% and 0.5% of the *longissimus dorsi* muscle, respectively. A small amount of triglycerides is stored as droplets in type I fibres, and the remaining part is located in intramuscular adipocytes, which are largely grouped along the perimysium or are interlaced between muscle fibres (Lefaucheur, 2010).

The question now arises as to how the muscle fibre profile may affect basic traits of economic and consumer importance in farm animals. Therefore, the objective of this study was to analyse differences in individual types of muscle fibres in the histological profile of the *longissimus dorsi* muscle and their effect on pork carcass lean content, as well as to analyse the level of IMF content, which determines palatability of meat and meat products.

Material and methods

Experimental procedure

The experiment used purebred Polish Landrace (PL) and Polish Large White (PLW) gilts tested at the Pig Performance Testing Station in Pawłowice, Poland. A total of 176 gilts (92 PL and 84 PLW) were investigated. Animals were maintained and fed according to the Testing Station method. The actual test began when animals reached 30 kg body weight and ended at a final weight of 100 kg. Feed intake was recorded throughout the test. One day before slaughter, animals were withheld from feed. Body weight was measured on the day of slaughter.

Carcass measurements

Animals were sent to slaughter at a live weight of approximately 100 kg. After at least 2 h of rest in the abattoir they were stunned with low-voltage electricity. Carcass weight, including head and leaf fat was measured. Half-carcasses were measured after 24-h chilling at 4°C. Next, they were dissected into cuts, of which loin as a whole cut and loin without backfat and skin were studied. Dissected components of the half-carcass were weighed to the nearest 5 g. The contour of the *longissimus* muscle section was traced using plastic film or wax paper on loin at the intersection of the last thoracic vertebra and the first lumbar vertebra, on the cephalic plane. Height and width of the *longissimus dorsi* muscle was measured on this contour and loin eye area was planimetered. The cuts obtained (loin and ham) were dissected into tissues to estimate carcass meat percentage, based on a regression equation calculated according to the testing station method (Różycki and Tyra, 2010).

Meat quality measurements

The indicators of meat quality studied were lightness of loin (L*) and IMF content in loin. The measurement was taken in loin muscle at the midline over the last rib. The lightness of loin (L*) was measured on loin 24 h postmortem using a Minolta CR 310. In addition, IMF content was analysed by Soxhlet method. The sample for analysis was taken from the middle part of *longissimus* muscle cross-section behind the last rib. The IMF content of meat was determined as raw fat using Soxhlet extraction with fat solvents (Soxtherm SOX 406, Gerhardt).

Histochemical analyses

Samples for histochemical analysis, measuring 1 cm^3 in area (excised parallel to muscle fibre orientation) were taken within 45 min. of slaughter from the *longissimus dorsi* muscle at the 5th lumbar vertebra and frozen at –196°C in liquid nitrogen. Muscle samples were cut on a cryostat (Slee MEV, Germany) at –20°C into sections (10 μm thick) and subjected to NADH dehydrogenase (diaphorase) reaction (Dubovitz et al., 1973). The slides were examined under a Nikon Eclipse 50i light microscope for percentage of different muscle fibre types (I, IIA, IIB) and diameters using MultiScanBase ver. 18.03 image analysis software. Each histological slide was analysed for at least 300 fibres of each type.

The main factor was division into groups according to percentage and diameter of different muscle fibre types. Preliminary statistical analysis showed that the breed factor had no effect on the percentage of different types of fibres and their diameter. This meant that the two breeds (PLW and PL) studied can be analysed together. The animals were divided into two groups according to percentage of different fibre types: group I – with up to 70% of type IIB fibres, and group II – with over 70% of type IIB fibres. The second division was based on differences in the diameter of type

I (group I – mean fibre diameter up to 50 µm, group II – above 50 µm) and type IIA fibres (group I – mean fibre diameter up to 55 µm, group II – above 55 µm).

Statistical analyses

Statistical analysis was performed using the GLM procedure of SAS (1989) software. The statistical model accounted for the fixed effect of breed and group according to percentage of different fibre types and diameters. The breed by group interaction was included when significant. Weight at slaughter was fitted in the model as a covariate for slaughter traits and IMF level.

$$Y_{ijk} = \mu + d_i + g_j + (dg)_{ij} + \alpha(x_{ijk}) + e_{ijk}$$

where:

y_{ijk} = the ijkth observation,
μ = general mean,
d_i = effect of ith breed (i = 1, 2),
g_j = effect of jth group (j = 1, 2, 3),
$(dg)_{ij}$ = effect of interaction between ith breed and jth group,
$\alpha(x_{ijk})$ = covariance on right half-carcass weight (for slaughter traits and IMF),
e_{ijk} = residual random term with variance.

Differences between the means for individual groups were tested for significance at the 5% and 1% level by Duncan's multiple range test.

Results

Statistical analysis was performed to determine the percentages and diameters of different types of muscle fibres responsible for different IMF levels in the *longisimus dorsi* muscle and to determine the level of loin slaughter traits (loin weight, height, width and eye area) and carcass lean content. The analysed factors were percentage of different types of fibres and their diameter. IMF level was characterized by the highest (almost 40%) variation of all loin and carcass parameters (Table 1). High variation was also observed for proportion of type I and IIA fibres (about 20%) and for the diameter of all fibre types (over 10%). This probably had an effect on analogous differences in loin eye height and area, which were characterized by the greatest variation of all loin parameters analysed.

The analysis showed that the amount of type IIB fibres had a significant ($P<0.05$) effect on IMF content in the *longissimus dorsi* muscle (Table 2). The difference between the analysed groups was 0.46%, i.e. formed 1δ of observed variation for this trait in the analysed group of animals. The animals with over 70% of type IIB fibres in the *longissimus* muscle were also characterized by greater loin eye area ($P<0.01$) and height ($P<0.05$). The division made according to this group of muscle fibres (IIB) had no effect on the other parameters of loin and carcass.

Table 1. Basic statistics for the analysed traits of PLW and PL pigs

Traits	x	δ	min	max	V
Fibre type percentage:					
IIB	73.6	4.57	63.0	83.3	6.21
IIA	10.6	2.44	4.60	16.2	23.1
I	15.8	3.10	8.35	25.8	19.6
Fibre diameter (µm):					
IIB	81.5	8.61	58.1	102	10.5
IIA	58.8	8.60	7.20	72.3	14.6
I	56.4	7.10	39.0	73.6	12.5
IMF (%)	1.72	0.47	0.39	2.75	38.7
Water holding capacity (%)	31.6	6.97	21.8	61.2	22.1
Colour of *longissimus dorsi* muscle (L*)	55.2	3.47	50.2	64.5	6.28
Weight of loin (kg)	8.23	0.42	7.22	9.32	5.12
Weight of loin without backfat and skin*(kg)	6.61	0.47	5.21	7.44	7.21
Loin eye width (cm)	10.71	0.62	9.50	12.4	5.85
Loin eye height (cm)	7.16	0.69	5.50	8.90	9.63
Loin eye area (cm^2)	58.6	7.58	39.4	79.1	12.9
Carcass lean content (%)	60.9	3.38	50.3	69.0	5.56
Weight of meat from primal cuts (kg)	24.4	1.56	20.3	29.2	6.39

Table 2. Analysis of selected slaughter and meat quality traits depending on percentage of type IIB fibres

Traits	Percentage of type IIB fibres			
	up to 70%		above 70%	
	x	δ	x	δ
Number of animals (o)	45		131	
Fibre type percentage – IIB	67.2**	2.00	75.5*	3.17
IMF (%)	2.07**	0.28	1.61**	0.46
Water holding capacity (%)	31.2	5.74	31.7	7.35
Colour of *longissimus dorsi* muscle (L*)	55.1	3.49	55.3	3.49
Weight of loin (kg)	8.16	0.52	8.25	0.39
Weight of loin without backfat and skin (kg)	6.64	0.43	6.60	0.49
Loin eye width (cm)	10.7	0.61	10.7	0.63
Loin eye height (cm)	6.89*	0.58	7.24*	0.70
Loin eye area (cm^2)	54.7**	5.74	59.7**	7.72
Carcass lean content (%)	61.2	2.38	60.9	3.65
Weight of meat from primal cuts (kg)	24.3	8.98	24.4	1.70

** P<0.01. * P<0.05.

Analogous relationships were observed for the division of the analysed group of animals according to the diameter of type IIA fibres (Table 3). Animals in which the diameter of these fibres was below 55 µm had a significantly higher level of IMF (P<0.01) compared to animals with fibre diameter exceeding 55 µm. They were also characterized by significantly lower loin eye height and area, and lower carcass lean content (P<0.05). For the analogous division of type I fibres, the observed relationships were not so significant (Table 4). Animals with diameter of type I fibres exceeding 50 µm had lighter colour of the *longissimus dorsi* muscle (P<0.05), greater loin eye area and higher carcass lean content (P<0.05). No differences were observed in the IMF content of this muscle.

Table 3. Analysis of selected slaughter and meat quality traits depending on diameter of type IIA fibres

Traits	Diameter of type IIA fibres			
	up to 55 µm		above 55 µm	
	x	δ	x	δ
Number of animals (n)	24		151	
Fibre diameter – IIA (µm)	51.9**	2.69	62.1**	4.21
IMF (%)	2.01*	0.43	1.70*	0.45
Water holding capacity (%)	31.8	5.47	31.2	7.43
Colour of *longissimus dorsi* muscle (L*)	55.4	4.20	55.7	3.61
Weight of loin (kg)	8.22	0.51	8.25	0.43
Weight of loin without backfat and skin (kg)	6.62	0.48	6.66	0.44
Loin eye width (cm)	10.7	0.55	10.8	0.76
Loin eye height (cm)	7.05*	0.70	7.23*	0.77
Loin eye area (cm^2)	56.6*	6.65	60.6	8.82
Carcass lean content (%)	60.6*	3.55	61.7*	3.65
Weight of meat from primal cuts (kg)	24.2	1.26	24.7	1.81

** P<0.01. * P<0.05.

Table 4. Analysis of selected slaughter and meat quality traits depending on diameter of type I fibres

Traits	Diameter of type I fibres			
	up to 50 µm		above 50 µm	
	x	δ	x	δ
Number of animals (n)	50		126	
Fibre diameter – I (µm)	48.2**	1.77	58.1**	6.42
IMF (%)	1.88	0.29	1.68	0.48
Water holding capacity (%)	30.8	4.51	32.1	7.21
Colour of *longissimus dorsi* muscle (L*)	52.0*	1.39	55.6*	3.55
Weight of loin (kg)	8.39	0.52	8.22	0.43
Weight of loin without backfat and skin (kg)	6.70	0.76	6.62	0.46
Loin eye width (cm)	10.5	0.37	10.7	0.71
Loin eye height (cm)	6.90	0.92	7.20	0.76
Loin eye area (cm^2)	56.7*	7.02	58.6*	8.22
Carcass lean content (%)	60.0*	5.55	61.2*	3.46
Weight of meat from primal cuts (kg)	24.3	2.31	24.5	1.60

** P<0.01. * P<0.05.

Analysis was also made for the correlations between loin parameters and percentage and diameter of different muscle fibre types (Table 5). The results obtained show that these parameters were influenced more by the frequency of individual fibre types than by the diameter of these fibres. As regards the parameter of most interest to us, namely IMF, a negative relationship was obtained with percentage of type IIB fibres (r_P= –0.162). Analogous relationships with the other two types of fibres were positive (IIA – r_P= 0.097; I – r_P= 0.187). The increased percentage of type IIB fibres will result in a slightly higher weight of loin (r_P= 0.176), higher loin eye height (r_P= 0.136), greater loin eye area (r_P= 0.265) and higher lean meat content (r_P= 0.204). Likewise, the increase in the number of type IIA and type I fibres will reduce these parameters. Meanwhile, the increase in the diameter of all types of muscle fibres will result in a decrease in IMF and an increase in loin eye height, loin eye area and loin weight, while contributing to higher carcass lean content.

Table 5. Correlations between selected slaughter and meat quality traits, and amount and diameter of different muscle fibre types in *longissimus dorsi* muscle

Traits	Fibre type percentage			Fibre diameter (µm)		
	IIB	IIA	I	IIB	IIA	I
IMF (%)	–0.162	0.097	0.187	–0.156	–0.158	–0.148
Water holding capacity (%)	0.002	0.026	0.023	–0.165	–0.042	–0.102
Colour of *longissimus dorsi* muscle (L*)	0.112	–0.021	–0.129	0.178	0.152	0.084
Weight of loin (kg)	0.061	–0.009	–0.095	0.071	0.061	0.071
Weight of loin without backfat and skin (kg)	0.176	–0.024	–0.099	0.154	0.103	0.096
Loin eye width (cm)	0.042	–0.006	–0.005	0.155	0.098	0.092
Loin eye height (cm)	0.136	–0.023	–0.035	0.081	0.061	0.071
Loin eye area (cm^2)	0.265	–0.033	–0.078	0.211	0.092	0.123
Carcass lean content (%)	0.204	–0.042	–0.019	0.173	0.064	0.076

Discussion

Most researchers involved in the study of meat quality report that good quality meat should contain from 2% to 3% of intramuscular fat (Ellis, 2006; Wood et al., 2008). At less than 2%, the most common breeds of pigs raised in Poland, namely PLW and PL, fail to measure up to this standard. The IMF level of 1.72%, obtained in our study, concurs with the results reported for these breeds by Tyra and Żak (2010), who monitored over 4600 pigs from the national breeding population in the period 2006–2010. The values of the other parameters presented in this study are also comparable. The consistent decrease in the level of IMF in pork meat, which has been observed for more than ten years, motivates a search for methods to curb this unfavourable trend (Orzechowska et al., 2008; Tyra and Żak, 2010). The observed variation in the level of IMF in the *longissimus dorsi* muscle and in the percentage and diameter of individual muscle fibre types, as well as the findings presented in the introduction may suggest that IMF level can be largely determined by these two factors. The size of a muscle, and thus carcass lean content depend on the number of prenatally formed muscle fibres, and next on their size that increases postnatally as a result of hypetrophy (Rehfeldt et al., 2000). In the *longissimus dorsi* muscle of pigs, type IIB fibres are most numerous, as evidenced by the results of our own study (over 73% of this fibre type) and the findings of other researchers (Lefaucher, 2010), who report that the proportion of type IIB fibres in the *longissimus dorsi* muscle (about 80%) is highest compared to other fibre types. It follows from the data reported by these authors that the considerable variation observed results from the breed factor. Considerable within-breed variation is found in the percentage of individual fibre types, as evidenced by our results, especially those concerning type IIA (23%) and type I fibres (19%). From a biochemical point of view, these two fibre types are oxidative-glycolytic and oxidative (Picard et al., 2002), for which intramuscular fat (stored not only between muscle fibre bundles but also within them as clusters of lipid droplets surrounding single muscle fibres) serves as an energy reservoir used in the contraction process; this mainly concerns type I fibres (Leseigneur-Meynie and Gandemer, 1991), and was also discussed by Wojtysiak and Kaczor (2011). The observations of Essén-Gustavsson et al. (1994) showed that type I and IIA fibres contain much more intracellular fat than type IIB fibres. For this reason, the percentage of these two fibre types may to a large extent determine the level of intramuscular fat in the analysed muscle. This is confirmed by our findings. Animals with over 70% of type IIB fibres in the *longissimus dorsi* muscle (i.e. with only 30% of type IIA and I fibres) had a significantly lower level of IMF (1.61%) compared to animals in which this frequency exceeded 30% (2.07%). The second group (>70%) also had a significantly higher loin eye height and greater loin eye area, which is due to the greater diameter of type IIB fibres (81 μm) compared to the other two types (IIA – 58.8 μm, I – 56.4 μm). Meanwhile, no differences were observed between the analysed groups in carcass muscle content, which was generally regarded as the main reason for decreased IMF levels. Our results in this respect are confirmed by the analagous lack of differences in the level of external fat and carcass lean content depending on IMF level in the *longissimus dorsi* muscle, which was reported by Czarniecka-Skubina et al. (2007). Also Lonergan et al. (2001), who analysed differences between two groups of Duroc pigs (control group and group selected for lean growth efficiency) found no significant changes in marbling level of *longissimus* muscle cross-section. The lack of a relationship between carcass lean percentage and IMF level is also supported by low genetic (r_G= –0.28) and phenotypic correlations (r_P= –0.24) between these traits (van Wijk et al., 2005). Also Tyra and Żak (2012) ruled out the possibility of classifying animals in terms of IMF based on the level of their muscling.

In cattle an increase in the proportion of type I fibres has a positive effect on IMF content, contributing to greater palatability and juiciness of meat. In pigs, however, these relationships are not so conclusive. Some researchers admit that the level of IMF increases in muscles with predominance of type I and IIA fibres because of triglycerides, which are more abundant in these fibres (Costa et al., 2006). On the other hand, these lipids form a small percentage of triglycerides in intramuscular fat located in the spaces between fibres (Lefaucheur, 2006). It should be noted, however, that the histochemical profile of muscles does not affect the quality of raw material (meat) obtained only in the context of increased IMF level. This effect is also manifested in postmortem changes in muscles. The level of oxygen necessary for aerobic metabolism decreases in animals after exsanguination. For this reason, the glycolysis metabolic pathway results in the accumulation of lactate, leading to a decrease in muscle pH. This is particularly dangerous in animals exposed to stress prior to slaughter, because after slaughter, when the temperature of muscles is high, the muscles become rapidly acidic, leading to denaturation of proteins and a decrease in the quality of the raw material obtained. Therefore, in this respect, the increase in the proportion of type IIB fibres will negatively affect meat quality parameters. The histological profile of muscles also influences their colour. Meat colour (L*) is negatively correlated to the amount of type I fibres (Henckel et al., 1997), and an analogous relationship was observed in our study (r_p= –0.129). Meat colour is a very important marketing attribute and darker meat is more willingly bought by consumers, which is a good consumer habit because such meat is characterized by better sensory parameters.

However, better results can be achieved by using genetic markers that determine this trait. The search for genetic markers of IMF level does not give satisfactory results (Tyra and Ropka-Molik, 2011; Tyra et al., 2011; Gerbens et al., 1999; Li et al., 2010). On the other hand, indirect marker-assisted selection for increased percentage of type I and II fibres (Nii et al., 2005; van den Maagdenberg et al., 2008) could improve the quality of pork obtained, in particular the IMF level, because our results show that decreasing the proportion of type IIB fibres by 10% allows obtaining a difference of 0.46% in the IMF level in relation to the group of animals with a greater proportion of type IIB fibres, which constitutes about 1δ. This effect is very significant and in the case of some productive traits it is determined by several major genes. Finding genetic markers that determine much of this variation would result in IMF level being elevated across the entire breeding population. This is also evidenced by the correlations obtained between these traits in both this and other studies (Larzul et al., 1997). Despite the low correlations observed between these traits, reducing the proportion of type IIB fibres by 6% may result in a considerable (about 0.81%) increase in IMF level to almost 2.5%. As is evident from the study of Devol et al. (1988), an increase in the IMF content of meat to 2.5–3% has a considerable effect on improving its palatability, tenderness and juiciness.

The amount of meat produced per animal slaughtered is determined by the amount and size of muscle fibres, which also has an effect on the quality of pork obtained. During the first weeks of life in piglets, muscle fibres undergo maturation by increasing their volume and differentiating into different types. The diameter of muscle fibres increases by 100% up to 25 days after birth, but this increase diminishes considerably between 100 and 125 days postnatally (Karlsson et al., 1999). Fibres grow as animals get older but this growth is much more rapid in animals with a smaller number of fibres compared to those with a greater number of muscle fibres (Fiedler et al., 1999). On the other hand, our results show considerable variation in the diameter of different fibre types, notably type IIA (14.6%) and type I (12.5%), in experimental animals of the same age and body weight. From a mathematical standpoint, the observed increase in the diameter of muscle fibres should translate into decreased IMF levels. This is confirmed by our results obtained for type IIA fibres, for which higher IMF level (2.01%) was observed in the group of animals with average fibre diameter of less than 55 µm compared to animals with average fibre diameter exceeding 55 µm (1.7%). The greater diameter of these fibres translated into higher loin eye height and area. No differences in IMF levels were observed during analogous analysis of type I fibres. The only statistical relationship was the lighter colour of meat and greater loin eye area, which resulted from the greater diameter of these fibres. Therefore, selection for the size (but not the amount) of fibres will accelerate progress in carcass lean content. In turn, this direction of breeding will decrease the quality of the raw material obtained, as evidenced by the correlations obtained by Rehfeldt et al. (2000) between these groups of traits. Also the correlations obtained between muscle fibre diameter and IMF content, meat colour, loin eye area and carcass lean content support this view in the case of our study and those of other authors (Larzul et al., 1997; Bulotiene and Jukna, 2008; Orzechowska et al., 2008). According to Lengerken et al. (1997), pigs with a greater number of muscle fibres are characterized by a smaller diameter of these fibres, higher pH_{45} and lower drip loss compared to animals with a smaller total number of muscle fibres of high diameter. Thus, the results reported by many authors suggest that muscles consisting of a greater number of small and medium diameter fibres are characterized by better quality while having no direct influence on total muscle weight (Zochowska et al., 2005; Ryu and Kim, 2006).

The objective of the present study was to determine relationships between the histological structure of *longissimus dorsi* muscle in PLW and PL pigs, parameters of loin, and IMF content of loin. The results obtained, especially those regarding percentage of different fibre types, allow a conclusion that selection for decreased proportion of type IIB fibres in the *longissimus dorsi* muscle (or increased proportion of type IIA, and especially type I fibres in the histological profile) may improve sensory properties of the meat obtained because of the increase in IMF level. A side effect of this selection will be a decrease in loin eye area, but this will generally have no effect on the weight of loin or the lean content of carcasses obtained. Meanwhile, the increased diameter of different fibre types will contribute to increased parameters of loin (loin eye height and area) and overall carcass lean content, but may have an adverse effect of lowering meat quality (IMF level and colour). However, not all of the variation in IMF level is determined by the histological profile of the muscle, as shown by high variations observed in different groups of animals divided according to percentage of type IIB fibres. Even this partial determination may bring positive results. Therefore, it would be advisable to increase the percentage of type IIA fibres, especially type I fibres, which could translate into better quality of the raw material obtained, including IMF level.

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