EFFECT OF PLASMA LIPOPROTEIN CONCENTRATION ON ENDOCRINE AND MEAT QUALITY CHARACTERISTICS, FATNESS AND FAT COMPOSITION OF HYBRID ENTIRE BOARS

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Summary. Hybrid entire boars from Lithuanian indigenous wattle x wild boar intercross were used to establish low and high lipoprotein groups of hybrid animals in which low-density and high-density lipoprotein concentrations differed statistically significantly. The average age of the hybrids with a significantly lower level of plasma lipoproteins was higher and the testosterone concentration was lower compared to the animals with higher concentrations. The backfat thickness and loin area of the boars with a lower concentration of high-density lipoproteins (HDL) and total lipoproteins was higher than of the boars with higher concentrations of these lipoproteins. There were no significant differences in the *longissimus dorsi* muscle fatty acid composition between the boars with low and high concentration of low-density lipoproteins (LDL). However, the increase of plasma HDL was monitored to relate to possible decrease of C17:0 and C17:1, and increase of C16:1 in *longissimus dorsi* muscle, and decrease of C18:3n-3 in subcutaneous tissue. The hybrids with lower plasma total lipoproteins had lower content of C17:0 and C18:3n-3 and tended to have lower content of C20:0, C17:1 but have higher content of C16:1 and C20:1 in the *longissimus dorsi* muscle, and also lower content of C17:0 and C18:3n-3 and higher content of C16:1 and C20:1 in the subcutaneous tissue.
Key words: wild boar, hybrids, LDL, HDL, fatty acids, testosterone.

LIPOPROTEINŲ KIEKIO KRAUJO PLAZMOJE ĮTAKA HIBRIDINIŲ KUILIUKŲ ENDOKRININĖMS SAVYBĖMS, RIEBUMUI, MĖSOS KOKYBEI IR RIEBALŲ SUDĖČIAI

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Santrauka. Hibridinių Lietuvos vietinių kiaulių su šernais nekastruotų kuiliukų grupės tyrimams buvo sudarytos pagal patikimai besiskiriantį mažesnį ir didesnį mažo molekulinio tankio, didelio molekulinio tankio ir bendrą lipoproteinų kiekį jų kraujo plazmoje. Hibridai, kurių plazmoje buvo mažiau lipoproteinų, skerdimo svorį pasiekė būdami vyresnio amžiaus, bet jų testosterono koncentracija buvo mažesnė negu kuiliukų, kurių plazmoje buvo daugiau lipoproteinų. Kuiliukų, kurių kraujyje buvo mažesnis didelio molekulinio tankio ir bendras lipoproteinų kiekis, lašinių storis ir ilgiausiojo nugaros raumens skerspjūvio plotas buvo didesni, negu kuiliukų su didesniu šių lipoproteinų kiekiu. Kuiliukų su mažesniu ir didesniu mažo molekulinio tankio lipoproteinų kiekiu riebalų rūgščių sudėtis ilgiausiajame nugaros raumenyje nesiskyrė, tačiau didelio molekulinio tankio lipoproteinų kiekio padidėjimas sietinas su C17:0 ir C17:1 riebalų rūgščių mažėjimu bei C16:1 riebalų rūgšties padidėjimu raumenyje ir C18:3n-3 sumažėjimu riebaliniame audinyje. Hibridai su mažesniu bendru lipoproteinų kiekiu turėjo mažiau C17:0 ir C18:3n-3, bet daugiau C16:1 bei C20:1 riebalų rūgščių ilgiausiajame nugaros raumenyje ir poodiniame riebaliniame audinyje. Be to, nustatyta tendencija, kad individai su mažesniu bendru lipoproteinų kiekiu taip pat gali turėti mažiau C20:0, C17:1 riebalų rūgščių.
Raktažodžiai: šernas, hibridai, mažo ir didelio molekulinio tankio lipoproteinai, riebalų rūgštys, testosteronas.

Introduction. Hypercholesterolemia is a major risk factor for cardiovascular diseases (Hornstra et al., 1998; Stewart et al.; 2001; Le Moyec et al., 2005; Karen and Granger, 2005). One method used to control the concentrations of plasma lipids is to limit the amount of dietary fat and to control the specific fatty acids consumed. Animal products contribute significantly to the saturated fat and cholesterol content of the human diet. The most widely produced and consumed meat is pork. 70% of the pork's fat forms a subcutaneous tissue which can be removed before consumption. Unlike other animals, the pork's fat is not high in the meat (Wood et al., 1999; Bragagnolo and Rodriguez-Amaya, 2002). The cholesterol content of pork reported in the literature varies (Harris et al., 1993, 2003; Tsuji et al., 2008). The discrepancy can be attributed to natural variation brought about by factors such as age and genotype of the animals, their diet and rearing systems. Stewart et al. (2001) have reported that the diet containing modified pork with a high content of polyunsaturated fatty acids lowers LDL cholesterol in women. In recent years, research has focused attention not only on studying changes of cholesterol concentrations in the serum and muscle tissue of pigs through dietary supplementation but also on the influence of genetics and age on serum cholesterol levels and cholesterol accretion in pork and fatty acid composition using pigs selected for high and low serum cholesterol or pigs of different age (Bragagnolo and Rodriguez-Amaya, 2002). Breed differences were not apparent for concentrations of lipoproteins in domestic pigs (Pond et al., 1986). However, introgres-

sion of wild boar into domestic pigs could show higher variations for either trait. On the other hand, castration of male piglets is a controversial issue within Europe, mainly from the perspective of animal welfare (EFSA, 2004; Andersson et al., 2005; Fredriksen et al., 2006). The surgical castration of wild boar is unknown and even not under consideration, therefore, the castration of their hybrids is questionable too. The present study was designed to estimate the influence of serum low-density and high-density lipoprotein level on fatness, fatty acid composition in the muscle and subcutaneous tissue of entire male hybrids from Lithuanian indigenous pigs and wild boar.

Materials and Methods. The study included the material from fourteen hybrid entire boars from Lithuanian indigenous wattle x wild boar intercross. The animals were used and cared for in accordance with the principles of the law for animal care, keeping and usage of the Republic of Lithuania No8-500 (1997). The hybrids were born and reared indoors from birth to slaughter consuming twice a day the same standard concentrate feed. The composition and nutrient value of the concentrate feed are indicated in Table 1. The animals were slaughtered when they reached approximately 90 kg live weight. Blood samples were taken from the vein *cava cranialis* at slaughter and collected in 10 ml tubes containing heparin. After collection of blood, samples were refrigerated at 4ºC for approximately 6 h and then centrifuged for 5 min at 2000 rpm. Plasma samples were stored at -20^0 C until they were assayed for testosterone and lipoproteins concentrations. Values of high-density lipoproteins (HDL) and low-density lipoproteins (LDL) in plasma were measured enzymatically by the Cholesterin CHOD-PAP-Method (Boehringer Mannnheim, Germany). Testosterone (17β-hydroxyandrostenone) concentration was measured by electrochemiluminescence immunoassay using Elecsys 1010 analyzer and reagents (Roche Diagnostics GmbH, Manheim, Germany). Elecsys testosterone is based on a competitive test principle using monoclonal antibody specifically based against testosterone. The test has been calibrated using ID-GC/MS (Isotope Dilution Gas Chromatography Mass Spectrometry). Samples before measuring were diluted 1:10 using 0.9% sodium chloride solution.

Table 1. **Composition and nutrient value of concentrate feed**

Ingredients	Amount of ingredient
Crude protein (%/kg feed)	14.5
Crude fiber (%/kg feed)	6.39
Ether extract (%/kg feed)	2.82
Metabolisable energy (MJ/kg)	12.2
Lysine (%/kg feed)	0.78
Calcium (%/kg feed)	0.78
Phosphorus (%/kg feed)	0.27
Sodium chloride (%/kg feed)	0.39

Table 2. **Main characteristics of entire boars by interpretation of plasma lipoprotein scores**

Variables	Mean	SD	Median	Mean	SD	Median
	Low density lipoprotein score interpretation					
	Low (0.61-0.75)			High (0.80-0.99)		
Age (days)	271.1	40.0	261.0	232.6	34.0	210
Testosterone (nmol/l)	69.1[a]	80.5	30.9	162.2[b]	84.2	176.9
LDL (mmol/l)	0.71[c]	0.05	0.72	0.88[d]	0.08	0.84
HDL (mmol/l)	0.59	0.12	0.56	0.74	0.20	0.68
High density lipoprotein score interpretation						
	Low (0.44-0.61)			High (0.67-0.98)		
Age (days)	270.7	23.41	258.0	233.0	47.4	210.0
Testosterone (nmol/l)	85.0	106.7	27.5	146.4	71.0	123.1
LDL (mmol/l)	0.72[a]	0.07	0.72	0.86[b]	0.11	0.84
HDL (mmol/l)	0.53[c]	0.06	0.52	0.84[d]	0.13	0.81
	Total lipoprotein (LDL and HDL) score interpretation					
	Low (1.13-1.41)			High (1.51-1.97)		
Age (days)	276.4	26.95	259.5	219.2	32.9	206.5
Testosterone (nmol/l)	87.4	99.1	29.2	153.3	75.1	150.0
LDL (mmol/l)	0.72[c]	0.06	0.72	0.89[d]	0.09	0.89
HDL (mmol/l)	0.55[c]	0.08	0.54	0.82[d]	0.13	0.85
Total lipoprotein (mmol/l)	1.27[c]	0.09	1.27	1.71[d]	0.18	1.68

Different letters within the rows indicate significant difference for Mann-Whitney test: [a-b] $P<0.05$; [c-d] $P<0.01$

Table 3. **Fatness of carcasses from boars with different plasma lipoprotein concentration**

Variables	Mean	SD	Median	Mean	SD	Median
	Low density lipoprotein score interpretation					
	Low (0.61-0.75 mmol/l)			High (0.80-0.99 mmol/l)		
Backfat thickness at 10 rib (mm)	23.6	2.99	23.0	24.3	7.34	24.0
Loin area (cm^2)	33.3	2.83	32.7	29.8	3.34	30.5
	High density lipoprotein score interpretation					
	Low (0.44-0.61 mmol/l)			High (0.67-0.98 mmol/l)		
Backfat thickness at 10 rib (mm)	27.0	5.26	26.0	20.6	3.01	19.0
Loin area (cm^2)	32.0	2.47	32.4	30.2	3.49	30.5
	Total lipoprotein score interpretation					
	Low (1.13-1.41 mmol/l)			High (1.51-1.97 mmol/l)		
Backfat thickness at 10 rib (mm)	25.7	5.63	23.5	20.3	3.01	19.0
Loin area (cm^2)	32.3	2.43	32.5	29.6	3.29	29.9

Samples of *M. longissimus dorsi* and backfat were removed from the loin of the left side of carcasses at the 1-2 lumbar vertebra over 24 h period in a chiller. The samples of *M.longissimus dorsi* were analysed in duplicate for meat dry matter and fat content by standard methods (AOAC, 1990). Cooking losses were estimated by weighing before and after cooking. Water holding capacity of LD was determined by the method of Grau and Hamm (1953). Extraction of lipids for fatty acid analysis was performed with chloroform/methanol (2:1 v/v) as described by Folch et al. (1957). Fatty acid methyl esters (FAME) were prepared using the procedure of Christopherson and Glass (1969). The FAMEs were analysed using a gas liquid chromatograph (GC – 2010 SHIMADZU) fitted with flame ionization detector. The separation of methyl esters of fatty acids was effected on a ALLTECH capillary column AT Silar, 30 m x 0.32 mm x 0.25μm, by temperature programming from 100°C to 240°C. The rate of flow of carrier gas (nitrogen) through column was 0.33 ml/min. The column was operated at 100°C for 4 min, then the temperature was increased to 240°C at 3°C/min and held for 10 min. The temperature of the injector and detector were held, respectively, at 225° and 250°C. Peaks were identified by comparison with the retention times of the standard fatty acids methyl esters FAME MIX (SUPELCO, USA). The relative proportion of each fatty acid was expressed as the relative percentage of the sum of the total fatty acids.

The data were subjected to the descriptive and non-parametric analysis. Mann-Whitney test was used to ascertain the existence of significant differences between the traits where they occurred. Significance was determined at $P<0.05$, but differences of $0.05 \leq P<0.10$ would be considered as trends. All analyses were performed in MINITAB 15

Results. The means, standard deviations and medians for all variables in the tables were calculated within established low LDL, HDL and high LDL, HDL concentration groups. The average age of the entire male hybrids with significantly lower level of plasma lipoproteins was higher than that of the animals with higher levels (Table 2). Backwards, the testosterone concentration of the males with lower levels of lipoproteins was lower than that of the males with higher plasma lipoprotein levels. However, only the difference of testosterone concentrations between entire males with different low-density lipoprotein scores was statistically significant ($P<0.05$). Backfat thickness of the hybrid males with a lower level of high-density lipoproteins ($P=0.055$) and total lipoproteins ($P=0.051$) was higher than that of the hybrids with a higher level of these lipoproteins (Table 3). The animals with a lower level of plasma lipoproteins were also characterized by insignificantly higher loin area. The average intramuscular fat content for the boars with high lipoprotein scores was insignificantly higher as well as were higher water holding capacity and lower cooking losses but only the difference between the animals with low and high total plasma lipoprotein scores was statistically significant ($P<0.05$; Table 4). There were no significant differences in *longissimus dorsi* muscle fatty acid composition between the boars with a low and high concentration of LDL (Table 5). Only C18:3n-3 in the subcutaneous tissue tended to decrease ($P=0.085$) with increasing plasma LDL concentration (Table 6). However, the increase of plasma HDL was monitored to relate to the possible decrease of C17:0 ($P<0.05$) and C17:1 ($P=0.073$), and the increase of C16:1($P<0.05$) in the *longissimus dorsi* muscle (Table 7). C17:0 ($P=0.073$) also tended to decrease in the subcutaneous tissue (Table 8). Beside this tendency in the subcutaneous tissue, there were less saturated fatty acids ($P<0.05$), including C18:0 ($P<0.05$). Although the entire boars with a higher plasma HDL had insignificantly higher total amount of polyunsaturated fatty acids in the *longissimus dorsi* muscle and particularly in the subcutaneous tissue and higher PUFA/SFA ratio in the subcutaneous tissue, there was decrease of C18:3n-3 ($P<0.01$) in the subcutaneous tissue. The differences in the concentration of HDL also seem to reflect the influence of total concentration of LDL and HDL on fatty acid composition. The hybrids with lower plasma total lipoproteins had lower content of C17:0 ($P<0.05$) and C18:3n-3 ($P<0.01$) and tended to have a lower content of C20:0 ($P=0.091$),

C17:1 (P=0.060) but a higher content of monounsaturated fatty acids such as C16:1 (P<0.01) and C20:1 (P<0.01) in the *longissimus dorsi* muscle (Table 9), and also a lower content of C17:0 (P<0.05) and C18:3n-3 (P<0.01) and a higher content of C16:1 and C20:1 (P<0.01) in the subcutaneous tissue (Table 10).

Table 4. **Meat chemical composition, water holding capacity and cooking losses from boars with different plasma lipoprotein concentrations**

Variables	Mean	SD	Median	Mean	SD	Median
	Low density lipoprotein score interpretation					
	Low (0.61-0.75 mmol/l)			High (0.80-0.99 mmol/l)		
Dry matter (%)	24.58	0.38	24.45	24.36	0.82	24.30
Fat in dry matter (%)	3.80	1.19	3.58	4.13	1.53	3.79
Cooking loss	41.90	3.00	43.70	35.00	7.71	35.99
Water holding capacity	59.32	1.59	58.64	62.92	3.54	63.18
	High density lipoprotein score interpretation					
	Low (0.44-0.61 mmol/l)			High (0.67-0.98 mmol/l)		
Dry matter (%)	24.32	0.58	24.38	24.60	0.66	24.61
Fat in matter (%)	3.67	1.24	3.13	4.26	1.44	3.79
Cooking loss	40.41	6.02	43.70	36.49	7.14	38.18
Water holding capacity	60.62	3.34	60.03	61.63	3.30	62.37
	Total lipoprotein (LDL+HDL) score interpretation					
	Low (1.13-1.41 mmol/l)			High (1.51-1.97 mmol/l)		
Dry matter (%)	24.36	0.55	24.41	24.60	0.73	24.55
Fat in dry matter (%)	3.66	1.15	3.35	4.38	1.55	4.15
Cooking loss	40.91[a]	5.76	43.79	35.16[b]	6.82	37.09
Water holding capacity	60.29	3.23	59.34	60.82	2.76	60.75

Different letters within the rows indicate significant difference for Mann-Whitney test: [a-b] P<0.05

Table 5. **Fatty acid composition** (%) **in longissimus dorsi muscle according to low density lipoprotein concentration in plasma**

Variables	Low density lipoprotein score interpretation					
	Low (0.61-0.75)			High (0.80-0.99)		
	Mean	SD	Median	Mean	SD	Median
C14:0	0.97	0.13	0.93	1.05	0.21	1.02
C16:0	24.49	1.04	24.81	24.82	1.11	24.61
C17:0	0.25	0.07	0.25	0.27	0,12	0.21
C18:0	11.52	0.85	11.64	13.00	2.74	12.66
C20:0	0.14	0.06	0.16	0.23	0.27	0.14
SFA	37.37	1.93	37.65	37.46	1.90	36.77
C16:1	2.80	0.43	2.71	2.92	0.41	2.95
C17:1	0.32	0.13	0.29	0.22	0.03	0.21
C18:1	44.70	1.53	44.8	43.83	3.3	43.67
C20:1	0.47	0.03	0.47	0.50	0.13	0.49
MUFA	48.22	1.81	48.39	47.55	3.39	47.32
C18:2 (n-6)	11.73	2.51	11.21	12.03	2.89	12.91
C18:3 (n-3)	0.36	0.05	0.35	0.36	0.06	0.34
C20:4 (n-6)	1.61	0.60	1.57	1.79	0.83	2.09
C22:5 (n-3)	0.26	0.18	0.21	0.38	0.27	0.36
C22:6 (n-3)	0.16	0.15	0.24	0.09	0.25	0.00
PUFA	14.16	3.24	13.75	14.6	3.72	16.08
PUFA/SFA	0.38	0.11	0.36	0.39	0.10	0.44

Table 6. **Fatty acid composition** (%) **in subcutaneous tissue according to low density lipoprotein concentration in plasma**

Variables	Low density lipoprotein score interpretation					
	Low (0.61-0.75)			High (0.80-0.99)		
	Mean	SD	Median	Mean	SD	Median
C14:0	0.99	0.13	0.98	1.05	0.16	1.10
C16:0	24.1	1.94	24.30	24.35	1.25	24.23
C17:0	0.38	0.10	0.41	0.35	0.19	0.27
C18:0	15.05	1.31	15.09	14.50	2.25	13.83
C20:0	0.18	0.02	0.18	0.14	0.07	0.16
SFA	40.70	3.14	41.18	40.40	3.06	39.90
C16:1	1.57	0.18	1.47	1.76	0.44	1.61
C17:1	0.32	0.09	0.35	0.3	0.14	0.24
C18:1	39.28	1.51	39.12	40.25	1.59	39.79
C20:1	0.63	0.11	0.64	0.69	0.15	0.65
MUFA	41.80	1.49	41.8	43.01	1.55	42.56
C18:2 (n-6)	15.87	2.56	15.11	15.12	3.02	16.19
C18:3 (n-3)	0.81	0.16	0.74	0.66	0.12	0.65
C20:4 (n-6)	0.17	0.02	0.17	0.17	0.1	0.19
PUFA	17.51	2.75	16.65	16.6	3.26	17.7
PUFA/SFA	0.44	0.10	0.38	0.42	0.11	0.46

Table 7. **Fatty acid composition** (%) **in *longissimus dorsi* muscle according to high density lipoprotein concentration in plasma**

Variables	High density lipoprotein score interpretation					
	Low (0.44-0.61 mmol/l)			High (0.67-0.98 mmol/l)		
	Mean	SD	Median	Mean	SD	Median
C14:0	0.97	0.07	0.94	1.06	0.24	0.92
C16:0	24.83	0.92	24.81	24.49	1.22	24.61
C17:0	0.31[a]	0.11	0.31	0.21[b]	0.05	0.21
C18:0	11.47	0.93	11.64	11.12	0.96	10.66
C20:0	0.24	0.28	0.16	0.14	0.02	0.14
SFA	37.37	1.93	37.65	39.53	3.67	38.44
C16:1	2.62[a]	0.02	2.57	3.11[b]	0.44	2.96
C17:1	0.32	0.13	0.29	0.22	0.34	0.21
C18:1	44.38	3.15	44.80	44.15	1.94	43.67
C20:1	0.48	0.12	0.47	0.50	0.06	0.49
MUFA	48.22	1.81	48.39	47.55	3.39	47.32
C18:2 (n-6)	11.75	2.68	11.21	12.01	2.74	12.91
C18:3 (n-3)	0.38	0.05	0.38	0.34	0.05	0.33
C20:4 (n-6)	1.65	0.65	1.57	1.76	0.80	2.09
C22:5 (n-3)	0.21	0.17	0.21	0.43	0.24	0.49
C22:6 (n-3)	0.11	0.14	0.00	0.14	0.26	0.00
PUFA	14.43	3.39	13.96	14.98	3.75	16.74
PUFA/SFA	0.39	0.11	0.37	0.38	0.10	0.44

Different letters within the rows indicate significant difference for Mann-Whitney test: [a-b] $P<0.05$

Discussion. In the present study the estimated increase of testosterone level in hybrid Lithuanian indigenous wattle x wild boar entire males with a higher plasma lipoproteins level was in agreement with the data of Wise et al. (1993) who have reported that domestic pigs from the selected high cholesterol line had higher testosterone concentrations than from the control and low lines. Also higher fatness of the hybrids used in this study was in agreement with the findings of Pond et al. (1992); Young et al. (1993) and Harris et al. (2003) who have reported that the low cholesterol line of pigs tended to have more body fat and in contrast with Tsujii et al. (2008) who have reported that dietary lowered plasma cholesterol in pigs slightly decreased backfat thickness. These authors find a lower lipid content in the meat from pigs with lowered plasma cholesterol but no differences in other meat chemical composition and quality traits. In this study lower plasma lipoprotein concentration reflected insig-

nificant influence on the lower lipid content in the muscle and water holding capacity, and higher cooking loss but no differences in other meat chemical composition and quality traits. Tsujii et al. (2008) also have reported that a supplemented diet that lowers plasma cholesterol of pigs, increased linoleic acid (C18:2n-6), arachidonic acid (C20:4n-6) and total PUFA in the *longissimu*s muscle. In the present study no significant differences were observed in these fatty acids.

Table 8. **Fatty acid composition** (%) **in subcutaneous tissue according to high density lipoprotein concentration in plasma**

Variables	High density lipoprotein score interpretation					
	Low (0.44-0.61 mmol/l)			High (0.67-0.98 mmol/l)		
	Mean	SD	Median	Mean	SD	Median
C14:0	1.05	0.12	1.07	1.00	0.16	0.93
C16:0	24.82	1.34	24.99	23.63	1.65	23.88
C17:0	0.44	0.17	0.42	0.30	0.09	0.27
C18:0	15.67[a]	1.48	15.38	13.88[b]	1.70	13.57
C20:0	0.15	0.07	0.16	0.17	0.03	0.16
SFA	42.12[a]	2.54	42.63	38.98[b]	2.66	38.71
C16:1	1.55	0.14	1.52	1.79	0.44	1.85
C17:1	0.35	0.14	0.36	0.27	0.08	0.24
C18:1	39.14	1.27	39.43	40.40	1.67	40.67
C20:1	0.63	0.11	0.68	0.69	0.15	0.64
MUFA	41.67	1.29	41.88	43.14	1.59	43/3
C18:2 (n-6)	14.71	2.71	13.68	16.28	2.68	16.38
C18:3 (n-3)	0.74[c]	0.13	0.73	0.72[d]	0.19	0.70
C20:4 (n-6)	0.15	0.07	0.17	0.19	0.06	0.19
PUFA	16.22	2.88	15.21	17.89	2.96	17.98
PUFA/SFA	0.39	0.09	0.37	0.46	0.10	0.47

Different letters within the rows indicate significant difference for Mann-Whitney test: [a-b] P<0.05; [c-d] P<0.01

Table 9. **Fatty acid composition** (%) **in *longissimus dorsi* muscle according to total lipoprotein** (LDL+HDL) **concentration in plasma**

Variables	Lipoprotein score interpretation					
	Low (1.13-1.41 mmol/l)			High (1.51-1.97 mmol/l)		
	Mean	SD	Median	Mean	SD	Median
C14:0	0.95	0.07	0.93	1.09	0.24	1.03
C16:0	24.58	1.09	24.7	24.75	1.08	24.62
C17:0	0.31[a]	0.10	0.30	0.20[b]	0.05	0.20
C18:0	11.33	0.94	11.38	11.25	0.98	10.71
C20:0	0.23	0.26	0.16	0.13	0.01	0.13
SFA	37.40	1.71	37.83	37.43	2.17	36.71
C16:1	2.60[c]	0.15	2.55	3.21[d]	0.39	3.15
C17:1	0.31	0.13	0.28	0.21	0.04	0.21
C18:1	44.07	3.05	44.73	44.53	1.80	44.42
C20:1	0.47[c]	0.11	0.46	0.51[d]	0.05	0.49
MUFA	47.45	3.13	48.16	48.47	1.91	48.39
C18:2 (n-6)	12.31	2.95	11.86	11.29	2.2	12.1
C18:3 (n-3)	0.38[a]	0.05	0.40	0.33[b]	0.02	0.32
C20:3 (n-6	0.31	0.06	0.31	0.33	0.04	0.34
C20:4 (n-6)	1.76	0.69	1.61	1.62	0.54	2.00
C22:5 (n-3)	0.25	0.19	0.23	0.42	0.3	0.44
C22:6 (n-3)	0.14	0.15	0.12	0.11	0.27	000
PUFA	15	3.64	14.6	13.7	3.11	14.98
PUFA/SFA	0.40	0.11	0.39	0.37	0.10	0.42

Different letters within the rows indicate significant difference for Mann-Whitney test: [a-b] P<0.05; [c-d] P<0.01

Although in this study the pigs with lower lipoprotein concentration tended to have more body fat and grew slower but they had higher concentrations of linolenic acid (C18:3), which belongs to the n-3 polyunsaturated fatty acid family and is believed to be beneficial for consumer health (Hornstra et al., 1998; Tapiero et al., 2002; Williams and Burdge, 2006). Evidence was established that ingestion of long-chain n-3 fatty acids, abundant in fish oils, have profound effects on many human disorders and diseases (Siddiqui et al., 2004; Ruxton et al., 2004). However, during the past 15 years or so, public health concerns regarding fish consumption have tended to focus on the risks associated with the contaminants such as methylmercury (MeHg) and PCBs in fish (Stern, 2007), therefore any increase of minor amounts of essential fatty acids in other food is also highly important.

Table 10. **Fatty acid composition** (%) **in subcutaneous tissue according to lipoprotein concentration in plasma**

Variables	Lipoprotein score interpretation					
	Low (1.13-1.41 mmol/l)			High (1.51-1.97 mmol/l)		
	Mean	SD	Median	Mean	SD	Median
C14:0	1.02	0.14	1.02	1.03	0.16	1.01
C16:0	24.31	1.90	24.64	24.10	1.16	24.05
C17:0	0.43	0.16	0.41	0.29	0.09	0.25
C18:0	15.37	1.60	15.23	13.97	1.84	13.70
C20:0	0.15	0.07	0.17	0.17	0.03	0.16
SFA	41.29	3.33	41.91	39.56	2.36	39.30
C16:1	1.54	0.13	1.49	1.84	0.46	1.86
C17:1	0.35	0.13	0.35	0.25	0.08	0.23
C18:1	39.41	1.40	39.52	40.24	1.78	39.88
C20:1	0.63[c]	0.10	0.64	0.70[d]	0.16	0.64
MUFA	41.93	1.40	41.96	43.04	1.72	42.60
C18:2 (n-6)	15.22	2.89	14.40	15.86	2.68	16.29
C18:3 (n-3)	0.78[c]	0.17	0.73	0.67[d]	0.13	0.67
C20:4 (n-6	0.61	0.10	0.62	0.69	0.10	0.68
C20:4 (n-6)	0.16	0.07	0.17	0.19	0.07	0.18
PUFA	16.44	2.74	15.93	17.87	3.25	18.33
PUFA/SFA	0.41	0.11	0.38	0.44	0.10	0.47

Different letters within the rows indicate significant difference for Mann-Whitney test: [a-b] $P<0.05$; [c-d] $P<0.01$

Conclusion. Based on the results from this study, the hybrids from Lithuanian indigenous wattle x wild boar intercross with a lower plasma lipoprotein concentration grew slower and had higher carcass fatness, however pork obtained from these animals had a higher content of linolenic (C18:3n-3) fatty acid.

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