The effect of age on the levels of lipogenic enzymes in subcutaneous fat and muscle of pigs

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Introduction Understanding the mechanisms that regulate the formation of subcutaneous and intramuscular fat (IF) Is important in improving meat quality. Formation of IF is a process, which occurs in the later stages of development, perhaps due to age-related changes in expression of lipogenic enzymes. Acetyl CoA carboxylase (ACC) and fatty acid synthase (FAS) are the key enzymes in the process of *de novo* synthesis of fatty acids. Delta-9-desaturase (d-9-d) is another key lipogenic enzyme, which catalyses conversion of saturated fatty acids (synthesised *de novo* as well as dietary) to monounsaturated. The objective of the present research was to investigate the levels of ACC, FAS and d-9-d in the subcutaneous fat and muscles of pigs of different ages.

Materials and methods Thirty Meishan x Large White male pigs were used in the study. Half of the animals had been castrated at birth under veterinary supervision. The animals were fed a standard pelleted feed and slaughtered at the age of 114, 144 and 174 days (five boar and five castrated pigs per each age group). The diet contained 14 MJ/kg Digestible Energy, 170g/kg crude protein and 1.1g/kg lysine. Samples of subcutaneous fat and the *longissimus* muscle were frozen in solid CO_2 and subsequently stored at –80 ^{o}C. Cytosolic and microsomal fractions were isolated by differential centrifugation. The levels of ACC and FAS in cytosol and the level of d-9-d in microsomes were measured by Western blotting using polyclonal sheep antibodies against rabbit mammary gland ACC and FAC or rabbit polyclonal antibody against porcine d-9-d. Significance of differences was assessed using Sudent's *t*-test.

Results The levels of ACC, FAS and d-9-d in subcutaneous fat were low in 114d animals, increased at 144d and significantly declined in 174d pigs (Table 1). In muscles d-9-d level was decreased between 114-144 days and then significantly increased in 174d animals. Thus, the pattern of age-related changes of d-9-d in muscles showed the opposite trend to the pattern in subcutaneous fat. The levels of ACC and FAS in muscle were approximately the same in all age groups. Castration led to an increase in the d-9-d level in both tissues (Fig 1 and 2).

Conclusions The results suggest that the mechanisms regulating expression of the lipogenic enzymes in subcutaneous fat and muscles are different. Sex hormones might be one of the factors regulating d-9-d expression.

Table 1 Relative amount of lipogenic enzymes (arbitrary units) in subcutaneous fat and *longissimus* muscle of pigs of different age

	Age (days)		
	114	144	174
	Subcutaneous fat		
ACC	0.74 ± 0.17*	2.06 ± 0.21	0.71 ± 0.16***
FAS	0.88 ± 0.14*	1.67 ± 0.16	1.08 ± 0.13*
D-9-d	18.7 ± 5.7*	54.6 ± 13.5	14.8 ± 7.9*
	Longissimus muscle		
ACC	0.77 ± 0.03	0.67 ± 0.01	0.58 ± 0.02
FAS	0.10 ± 0.05	0.09 ± 0.04	0.06 ± 0.01
D-9-d	10.3 ± 0.74*	6.7 ± 1.2	13.0±2.6*

The data are presented as the mean ± SEM.
* P<0.05 , ***P=0.001 (when compared with 144d)

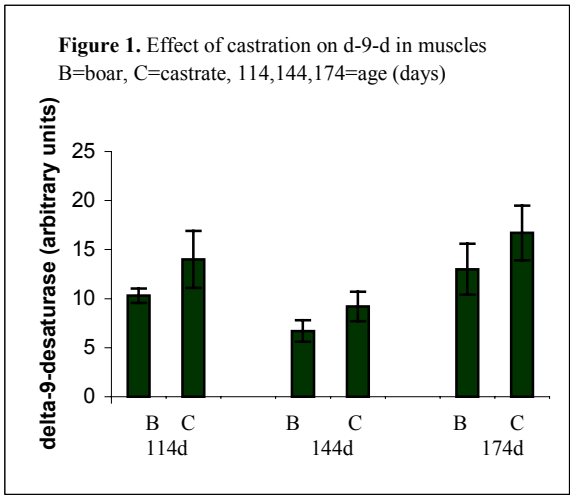


Figure 1. Effect of castration on d-9-d in muscles B=boar, C=castrate, 114,144,174=age (days)

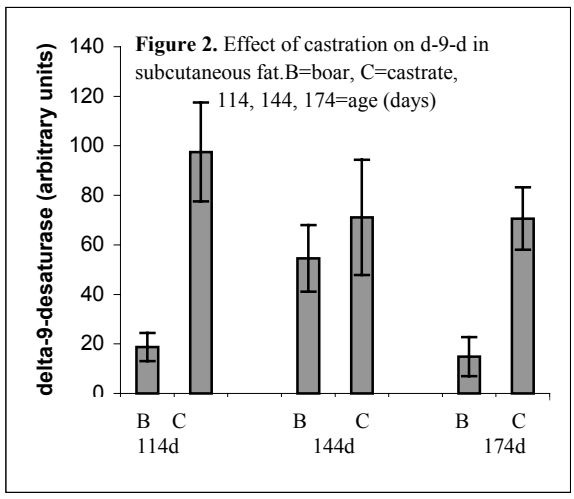


Figure 2. Effect of castration on d-9-d in subcutaneous fat.B=boar, C=castrate, 114, 144, 174=age (days)

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