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Short communication

Relation of porcine myogenin gene PCR/RFLP *Msp*I and reproduction traits of the Czech Large White sows

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Abstract

Reproduction traits are highly important for pigs producers because of effect on economic efficiency. Hence, breeders as well as geneticists try to find the way to improve the reproduction traits. Because the protein coded by the myogenin gene (*MYOG*) is necessary for regulation of skeletal muscles development during embryogenesis, many authors have studied its influence on the meat traits of pigs. The aim of our study was to determine the effect of myogenin gene on the sows' reproduction traits. There were included 529 litters of 107 Czech Large White sows. Effects on the age of the first conception, service period, insemination index, average birth weight of piglets, average weights of litter at the age of 21 days, total number of born piglets, number of piglets born alive and number of weaned piglets were studied. For studying the influence of myogenin gene on chosen traits we used the mixed linear model procedure REML and in one case general linear model. Significant effects of myogenin gene on the age of first conception, the insemination index and on the litter size were proved.

Keywords: Porcine myogenin gene; *MYOG*; Reproduction traits; Czech Large White; Pig

1. Introduction

Efficiency of production of livestock is highly influenced by reproductive success, especially in litterbearing species. The gene of myogenin (*MYOG*) is a member of a family of transcription factors that are specific to skeletal muscle (Wright et al., 1989). In the pig, primary muscle fibre formation takes place in the period around day 35, and secondary muscle fibre formation is taking place in the period at approximately day 65 of gestation (Wigmore and Tickland, 1983). The myogenin and the *MYF3* gene induce the terminal transformation of myoblasts into myofibers (Te Pas and Visscher, 1994). Because of that, the myogenin gene is considered as a candidate gene for meat traits. The significant effect of the myogenin gene on birth weight, growth rate and lean weight has been detected by Te Pas et al. (1999). By contrast, they did not find any differences for backfat thickness. An impact of the *MYOG* gene on reproductive traits was noticed only by Horák et al. (2004). They watched the influence of this gene in Přeštice Black-Pied sows which have been declared as the genetic resource in the Czech Republic. The aim of our study was to determine the impact of the myogenin gene

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Table 1
Used model and type of factors: F — fixed effect, R — random effect, L — linear regression

	Litters	Model	MYOG	HYMB	OL	TNB	NBA	BOAR	sire	SOWS	AFC	WL
AFC	1st–7th	GLM	F	F	–	–	–	–	–	–	–	–
SP	1st–7th	MLM	F	F	–	–	–	–	–	R	–	–
II	1st–7th	MLM	F	F	F	–	–	–	R	R	L	–
AWP	1st–7th	MLM	F	F	–		F	R	–	R	L	–
AWL	1st, 2nd, 1st–7th	MLM	F	F	F	F	–	R	–	R	–	–
TNB	1st	MLM	F	F	–	–	–	R	–	–	F	–
	1st–5th	MLM	F	F	F	–	–	R	–	R	–	–
NBA	1st	MLM	F	F	–	–	–	R	–	–	F	–
	1st–5th	MLM	F	F	F	–	–	R	–	R	–	–
NW	1st	MLM	F	F	–	–	F	R	–	–	F	L
	1st–5th	MLM	F	F	F	–	F	R	–	R	–	L

AFC — age of the first conception; SP — service period; II — insemination index; AWP — average birth weight of piglets; AWL — average weights of litter at the age of 21 days; TNB — total number of born piglets; NBA — number of piglets born alive; NW — number of weaned piglets; MYOG — genotypes in the porcine myogenin gene; HYMB — herd * year * months of sows birth; OL — of order litter; BOAR — effect of the boar; SIRE — effect of the sire of sows; SOWS — effect of sows; AFC — age of the first conception; WL — weight of litter at 21 days; GLM — general linear model; MLM — mixed linear model.

on the reproduction traits of purebred Large White sows. The Czech Large White breed is used as maternal line in breeding schemes in the Czech Republic.

2. Material and methods

2.1. Animals

The populations of tested sows were collected from three purebreds' herd of the Czech Large White pigs in this experiment. A total of 529 litters' records from 107 sows were included in the litter size analyses. The sows were bred in three independent herds: herd 1, 2 and 3 where the number of animals was 12, 29 and 66, respectively.

2.2. Detection of genotypes

To detect the genotype in the gene of myogenin, the PCR-RFLP method was used. To amplify DNA, primers designed by Te Pas et al. (1996) were used. Allele *A* possesses an *Msp*I restriction site (EMBL accessed number X89209) so the PCR product was cut into fragments of length 219 bp and 134 bp while allele *B* did not included restriction site so the PCR product was not cleaved.

2.3. Analyzed traits

The following traits were analyzed in the 1st–7th litters: service period (SP), the insemination index (II) and the average weights of piglets after parturition (kg, AWP). AWP were probed at the latest 24 h after parturition in every analyzed litter independently. The relations between age of first conception (AFC) of sows and genotype in *MYOG* gene were studied too. The average weights of litter at the age of 21 days (kg, AWL) in the 1st, the 2nd and the 1st–7th litters were analyzed separately. Data for AWL were collected from 35 sows. The effect of the *MYOG* gene on the total number of born piglets (TNB), the number of piglets born alive (NBA) and the number of weaned piglets (NW) was studied in the 1st and the 1st–5th litters.

2.4. Statistical analysis

Statistical analyses were performed by the general linear model (GLM) and the mixed linear model (MLM) procedure REML, both by the SAS for Windows 9.1.3 (SAS Institute Inc., 2004). The following factors were included: genotypes in the myogenin gene (*MYOG*), interaction of herd, year and months of birth of sows (HYMB), order litter (OL), number of piglets born alive

Table 2
Number of tested animals (*n*) and relative frequencies of genotypes and alleles in the myogenin gene

		Relative frequencies of genotypes			Relative frequencies of alleles	
	n	*AA*	*AB*	*BB*	*A*	*B*
Herd 1	12	0.50	0.25	0.25	0.63	0.37
Herd 2	29	0.34	0.59	0.07	0.64	0.36
Herd 3	66	0.41	0.27	0.32	0.55	0.45
Σ		0.40	0.36	0.24	0.58	0.42