

Polymorphism of insulin-like growth factor *IGF-1* in position 211 in national sheep breeds with carpeted wool compared to Polish Merino and European Mouflon (*Ovis aries musimon*)*

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Abstract: *Polymorphism of insulin-like growth factor IGF-1 in position 211 in national sheep breeds with carpeted wool compared to Polish Merino and European Mouflon (Ovis aries musimon).* Research was carried out on 1,684 sheep (1,093 ♀ and 591 ♂) originating from European Mouflon (*Ovis aries musimon*), its hybrids with Polish heat sheep and four sheep breeds that are characterized by a mixed wool compared to Polish Merino. All animals were subjected to gene identification factor insulin-IGF-1, in the assessment of allele C and T. In conclusion it should be noted that in the 7 examined breed groups sheep showed no polymorphism alleles and genotypes of insulin-like factor gene *IGF-1*, limiting its scope to determine the C allele and genotype CC. This result indicates the need for further research in this area in “culture” sheep imported and adapted to Polish conditions and the production environment.

Key words: sheep, *IGF-1*, distribution of alleles and genotypes

INTRODUCTION

Protein IGF-1 is one of the key components of the pathway of growth hormone (Franco et al. 2005). IGF-1 is produced in the liver and is responsible for cell growth and body treatments. It is believed that the effect of growth hormone occurs in the tissue in cooperation with local so-

matomedin e.g. *IGF-1* and stimulates the secretion of hypothalamic somatostatin inhibits secretion of growth hormone (Krzyszowski et al. 1998). Insulin factor gene is exchanged among the conditions that allow the identification of races, as demonstrated in the Mediterranean countries (Pariset et al. 2006). This indicates the possibility of using the factors in the study of animal origin, what has signaled Heindleder et al. (2001). Accordingly, taking into consideration the fact that reported in the cited work conditions influence frequency of insuline-like factor *IGF-1*, decided to examine the distributions of the presence of domestic sheep breeds (PZO, 2013). Compared to the ancestor – European Mouflon (*Ovis aries musimon*) and Polish Merino, and the sheep breeds of mixed wool. In addition, conditioning it can assist in the work of research into the origins of the sheep (Heindleder et al. 2001), which also begins to raise more and more interest.

MATERIAL AND METHODS

The study Polish Merino sheep flock (two herds) of Wielkopolska voivodeship, sheep of mixed wool from

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Małopolska, Łódzkie i Podkarpackie (29 herds), and the European Mouflon (3 herds) i Muflonowrzosówek (2 herds) from Wielkopolskie and Lubuskie. Ewes and rams were aged 2 to 11 years (Table 1). Herds were randomly selected for sampling. From the jugular vein of animals blood was obtained into tubes containing EDTA, for the isolation of genomic DNA for the analysis of molecular genetics. The study was carried out assessment of genes and genotypes frequency of insulin-like gene factor *IGF-1*.

DNA was isolated from blood leucocytes using the conserved EDTA. In order to receive high quality DNA suitable after freezing and thawing of a reusable, blood is pretreated with the resulting

DNA modification by removal of heme compounds lysis of erythrocytes products. DNA is isolated from leukocytes by chromatography on mini-columns of silicate A&A Biotechnology. The fraction thus obtained was used as template DNA for amplification of polymorphic gene allele fragment. Genotyping of allele was performed with KASPar® system. This system (www.kbioscience.co.uk) method is to use a point SNP polymorphism using primers listed in Table 2.

Based on reading the DNA samples were genotyped within the ewes and rams shows distributions of alleles and genotypes frequency separately for each race. Allele and genotype frequencies were compared depending on the breed using SPSS v.21 with Chi² test was

TABLE 1. Summary of experimental material used in the study in 2009–2012

Breed	Sex		Herd sampling
	♀	♂	
European Mouflon	123	73	2010 – 2 ♂; 2011 – 3 ♀, 7 ♂; 2012 – 120 ♀, 64 ♂
Muflonowrzosówka	8	7	2010 – 4 ♀, 4 ♂; 2011 – 4 ♀, 3 ♂
Polish Heat Sheep	334	355	2009 – 114 ♀, 128 ♂; 2010 – 115 ♀, 113 ♂; 2011 – 105 ♀, 114 ♂
Swiniarka Sheep	109	33	2009 – 28 ♀, 16 ♂; 2010 – 81 ♀, 17 ♂
Polish Mountain Sheep – white	141	15	2010
Polish Mountain Sheep – coloured	168	13	2011
Polish Merino	210	95	2010 – 101 ♀, 40 ♂; 2011 – 94 ♀, 48 ♂; 2012 – 15 ♀, 7 ♂
Total within gender	1 093	591	×
Total	1 684		

TABLE 2. The primers and SNP genotyping of the locus of *IGF-1*

Locus	Name	Starters 3' to 5' (forward/reverse)	SNP	Localization
<i>IGF-1</i>	insuline-like factor	CACACACCTTGTGGCACTCC/ /GCTGAGTTGGTTGGATGCTCT	AY737509: 211 C > T ^a	Ekson 3

^aPariset et al. (2006).

assessed range of alleles and genotypes frequency between races, sexes, and the differences between the sexes in terms of individual alleles and genotypes. The results are presented in tables.

RESULTS AND DISCUSSION

Studies have shown that gene at position 211, factor *IGF-1* were found to have only the C allele. Analyses of 1,684 samples collected from the rated sheep did not show the presence of the T allele in any case. In comparison with the results of Pariset et al. (2006), mainly describing sheep found in the region of the Mediterranean, Black and Germany, sheep tested in Poland showed no polymorphism here. Due to the fact that many of the races comes from European Mouflon (Heindleder et al. 2001), it is expected that the distribution of the conditions occurring in sheep breeds reared in Poland (including European Mouflon) was characteristic of this part of the world and different from the observed trends. Perhaps it has to do with another course of life processes of growth and development, which wrote Krzymowski et al. (1998). In this situation, can be a useful series of studies on sheep imported into Polish, polymorphism alleles and genotypes of insulin-like factor gene subject to change due to processes of adaptation – which requires further work in this area.

Generally, it should be noted that the summing up of the 7 examined breed groups sheep showed no polymorphism alleles and genotypes of factor *IGF-1*, limiting its scope to determine is the C allele and genotype CC. This result indicates the need for further research in

this area in “culture” sheep imported and adapted to Polish conditions and the production environment.

REFERENCES

- FRANCO M.M., ANTUNES R.C., SILVA H.D., GOULARDT L.R., 2005. Association of PIT1, GH and GHRH polymorphisms with performance and carcass traits in Landrace pigs. *J. Appl. Genetics* 46 (2): 195–200.
- HEINDLEDER S., JANKE A., WASSMUTH R., 2001: Molecular data on wild sheep genetic resources and domestic sheep evolution. *Arch. Tierz. (Special issue)* 44, 271–279.
- KRZYMOWSKI T. (Ed.), 1998: *Fizjologia zwierząt*. PWRiL, Warszawa: 143–200.
- PARISET L., CAPPUCIO I., AJMONE-MARSAN P., BRUFORD M., DUNNER S., CORTES O., ERHARDT G., PRINZENBERG E-M., GUTSCHER K., JOOST S., PINTO-JUMA G., NIJMAN I.J., LENSTRA J.A., PEREZ T., VALENTINI A., 2006: Characterization of 37 Breed-Specific Single-Nucleotide Polymorphisms in Sheep. *J. Hered.* 97 (5): 531–534.
- PZO, 2013: *Hodowla Owiec i Kóz w Polsce w 2012 roku*. Wyd. PZO, Warszawa.
- SPSS v. 21 for Windows, IBM Inc.

Streszczenie: Polimorfizm genu czynnika insulinopodobnego *IGF-1* w pozycji 211 u krajowych owiec o wełnie mieszanej w porównaniu do merynosa polskiego i muflona europejskiego (*Ovis aries musimon*). Badania przeprowadzono na materiale 1684 owiec (1093 ♀ i 591 ♂) pochodzących od muflona europejskiego (*Ovis aries musimon*), jego mieszańców z wrzosówką oraz czterech ras owiec charakteryzujących się okrywą wełnistą mieszaną porównywanych do merynosa polskiego. Wszystkie zwierzęta poddane były identyfikacji genu czynnika insulinopodobnego *IGF-1*, w zakresie oceny występowania alleli C i T. Podsumowując, należy stwierdzić, iż u badanych 7 grup rasowych owiec nie wykazano

polimorfizmu występowania alleli i genotypów genu czynnika insulinopodobnego *IGF-1*, ograniczając jego zakres do ustalenie jedynie do allelu C i genotypu CC. Wynik ten wskazuje na potrzeby przeprowadzenia dalszych badań z tego zakresu u owiec kulturalnych pochodzących z importu i adaptowanych w polskich warunkach środowiska produkcyjnego.

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