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EVALUATION OF GENE POLYMORPHISM THYROGLOBULIN IN DIFFERENT BREEDS OF CATTLE FOR DAIRY AND MEAT CATTLE PERFORMANCE

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Using PCR-RFLP (restriction fragment length polymorphism) molecular genetic analysis of three milk and five Ukrainian meat cattle breeds for thyroglobulin gene was performed.

In the studied populations of animals belonging to five meat cattle breeds, the frequency of allele T in four of them was significantly higher than in populations of dairy breeds. Only in animals breed Hereford low frequency of allele T was observed, which was 0,113 and was lower than in animals Ukrainian red spotted dairy breed (0,12) and no significant difference was observed between the frequency of allele T compared with three dairy breeds. Low frequency of allele T TG gene in populations of cattle belonging to breeds of dairy productivity is directly compared with the frequency of this allele in populations of meat breeds of cattle, it may indicate the influence of selection towards certain animals breeding cattle to change the frequency of allele T .

Cattle, dairy breeds, meat breeds, polymorphism, quantitative traits loci, thyroglobulin.

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Urgency. With the introduction of new and improved methods of molecular genetics in recent decades, the opportunity to assess changes at the DNA level that can affect the productivity of cattle, adding a number of other factors related to the formation characteristics that determine the performance of cattle. Therefore, according to the estimates of gene polymorphism of quantitative traits (QTL), traditional breeding methods can be improved by using information about the presence of changes at the level of genes that can influence the expression of certain agronomic characteristics [5].

One of the most effective approaches to assess the intensity and directivity of lipid metabolism for further selection of animals for its associated features is the use of DNA markers [9]. There is a need for modern methods of assessing susceptibility of animals to the formation of characteristic marmurovosti meat and increased fat in milk [1].

Thyroglobulin (TG) belongs to the genes of quantitative traits that are associated with lipid metabolism. Its protein product - thyroglobulin glycoprotein hormone - is synthesized in the follicular cells of the thyroid gland. It is a precursor of triiodothyronine (T3) and tetrayodtyroninu (T4), participating in the growth of fat cells and their differentiation and homeostasis of body fat. Thyroglobulin gene is located on chromosome 14 and has a size of 1068 bp Precision C → T substitution at position 422 thyroglobulin gene causes the two allelic variants [4,2,6].

In studies of foreign and domestic authors the impact of thyroglobulin polymorphism on meat marbling in meat cattle breeds was investigated [3].

For populations of cattle beef productivity it’s typical to have a rather high frequency of the desired allele T. For instance, to breed Aberdeen Angus T allele frequency was set at 0.240; Simmental-0.400; gray-Ukrainian 0,405 [8]. In studies conducted in Russia, where we studied the effect of thyroglobulin polymorphism on lipid metabolism in animals, cows with genotypes CC, belonging to some Russian breeds tended to increase protein and fat in milk compared with native genotype CT [10]. In another study conducted with Russian breeds, in contrast,

significantly higher values zhyrnomolochnosti was showed in cows that are carriers of the genotype CT than with genotype CC [7]. The results of different studies are controversial and require further research in this direction.

The aim was to evaluate thyroglobulin gene polymorphism in cattle of different dairy and meat breeds.

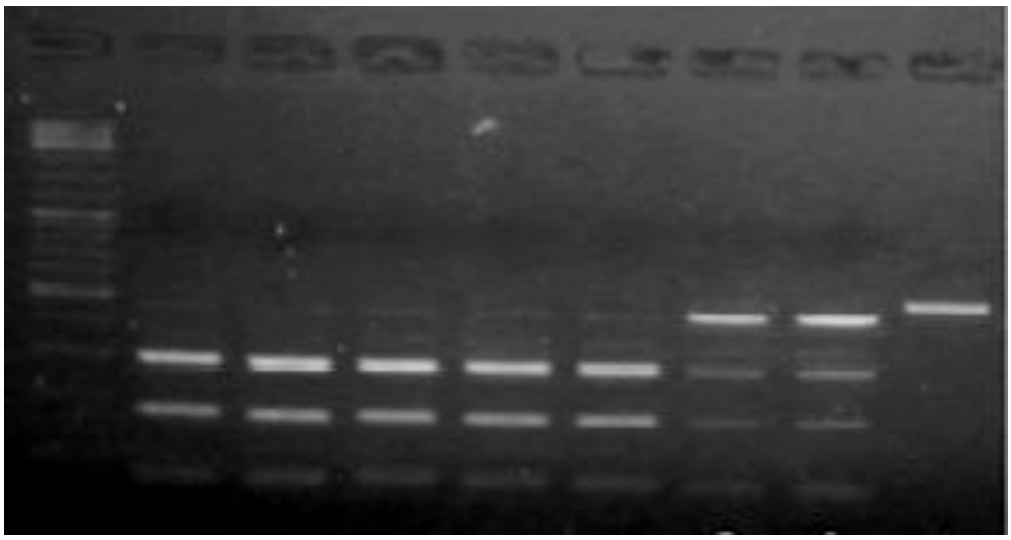
Research Materials and Method. Evaluation of gene polymorphisms TG was performed by PCR-RFLP on DNA isolated from blood of 171 dairy breeds animals and 191 meat breeds animals. Among them there were Ukrainian samples of red and white dairy cattle: DPDG "Khrystynivka" Institute of Animal Breeding and Genetics NAAS of Ukraine (Cherkasy region). (36 animals) Reductions "Holy Dormition Kyiv-Pechersk Lavra" "Voronkivske" (Kyiv region . Boryspil district.) (27 animals) Ltd. "Step-Ukrzalizbud" (30 animals) Ukrainian black and white dairy cattle with JSC "Agro-Region" (Kiev region., Boryspil district.) (40 animals) and Ukrainian red dairy breed of "Partizan" (Crimea, p. Zhuravlevka) (38 animals). Animal meat breeds were selected from different farms: Charolais breed (33 animals), Hereford breed (31 animals). (JSC "Ahrofort", Kyiv region.) Ukrainian meat breed (22 animals), gray Ukrainian rock (84 animals). (DPDG "Markeyevo", Kherson region.) Aberdeen Angus breed (21 animals). (JSC "Holding Ahrykor", Chernihiv region.).

The following primers were used for TG gene amplification:

5 '-GGGGATGACTACGAGTATGACTG-3',

5 '-GTGAAAATCTTGTGGAGGCTGT-3'.

Amplified fragment length - 548 bp[5]. To identify allele variants of C and T TG gene using restriction PsuI. In animals, the genotype CC carriers three restriction sites, fragments of length 295 bp, 178 bp, 75 bp in TT two restriction sites, fragments of length 473 bp, 75 bp and CT- fragments have a length of 473 bp, 295 bp, 178 bp, 75 bp (Figure 1) .



1 2 3 4 5 6 7 8 9

Figure 1. Food restriction gene TG. Tracks: 1 - molecular weight marker DNA Ladder; 2-6 - animals with genotype CC; 7.8 - animals with genotype CT; 9-PCR product, 548 bp

Statistical analysis of data was performed by standard methods [11] using the software MS Excel, STATISTICA 10.

Results. According to the results of the study genetic sequence of dairy breeds was established (Ukrainian red-and-white dairy, Ukrainian black-and-white dairy and Ukrainian red dairy), the frequency of alleles in the gene TG populations studied.

In selected animals from three farms belonging to the Ukrainian red-spotted milk prevailed animals with genotypes CC gene TG. Frequency of allele C-0,880 found only one homozygotes TT. Wright fixation index was negative, indicating an excess of heterozygotes in the studied populations of animals.

Among Ukrainian black and white dairy cattle belonging to the breeding farm ofJSC "Agro-region", C allele frequency was higher and amounted to 0.938; frequency of allele T-0,062. There was no homozygote TT. Actual (H_0) heterozygosity prevailed over the expected heterozygosity (H_E).

In a study of Ukrainian red dairy herd of "Partizan" it was also observed low frequency allele T gene TG at 0.092 and there were no homozygotes TT, C allele

frequency was 0.908. The actual heterozygosity in this group of animals than they expected heterozygosity (Table. 1).

1. The distribution of allelic variants of the gene in TG cows Ukrainian dairy breeds

Species	n	Frequency of genotype	Frequency of allele	H_E	H_0	Wright fixation index (Fis)	$\chi 2$
Ukrainian red-and-white dairy	93	CC-0,740 CT-0,250 TT-1	C-0,880 T-0,120	0,211	0,250	-0,184	0,93
Ukrainian black-and-white dairy	40	CC-0,875 CT-0,125 TT-0	C-0,938 T-0,062	0,116	0,125	-0,075	0,18
Ukrainian red dairy	38	CC-0,816 CT-0,184 TT-0	C-0,908 T-0,062	0,167	0,184	-0,101	0,39

H_0 - expected heterozygosity, H_0 - actual heterozygosity

In the studied populations of animals belonging to five meat cattle breeds, the frequency of allele T in four of them was significantly higher than in populations of dairy breeds. Only animals breed Hereford it was noticed the low frequency of allele T, which was 0.113 (Table. 2).

In animal populations of Ukrainian gray breed, breeds Hereford and Aberdeen-Angus Wright breed fixation index was negative, indicating an excess of heterozygotes in the populations studied.

2. The distribution of allelic variants of the gene in TG cows Ukrainian meat breeds

Species	n	Frequency of genotype	Frequency of allele	H_E	H_0	Wright fixation index (Fis)	$\chi 2$
Ukrainian grey	84	CC-0,309 CT-0,57,1 TT-0,119	C-0,595 T-0,404	0,483	0,571	-0,183	2,91
Ukrainian meat	22	CC-0,409 CT-0,364 TT-0,227	C-0,591 T-0,409	0,483	0,364	0,247	1,34
Charolais	33	CC-0,697 CT-0,300 TT-0,033	C-0,833 T-0,167	0,278	0,273	0,018	0,01
Hereford	31	CC-0,774 CT-0,226 TT-0	C-0,887 T-0,113	0,200	0,226	-0,127	0,50
Aberdeen-angus	22	CC-0,571 CT-0,429 TT-0	C-0,785 T-0,215	0,338	0,428	-0,226	1,56

H_0 - expected heterozygosity, H_0 - actual heterozygosity

There was no significant difference between the frequencies of allele T of thyroglobulin gene in the studied populations of three dairy breeds and breeds Hereford, Charolais breed between populations and Ukrainian red dairy between Aberdeen-Angus and red and white rocks. In all other cases it was observed a significantly higher frequency of allele T in meat breeds, in comparison with dairy breeds (Table 3).

3. The reliability of the difference frequencies of alleles per gene for thyroglobulin between studied herds of dairy and beef breeds calculated by the method of Fisher

Dairy cattle beef breed	Meat cattle beef breed

	Grey Ukrainian	Ukrainian meat	Charolais	Hereford	Aberdeen Angus
Ukrainian red-and-white dairy	P<0,01*	P<0,01*	P<0,05*	P>0,05	P>0,05
Ukrainian black-and-white dairy	P<0,01*	P<0,01*	P<0,05*	P>0,05	P<0,05*
Ukrainian red dairy	P<0,01*	P<0,01*	P>0,05	P>0,05	P<0,05*

* - difference between the frequencies of alleles (P <0,01; P <0,05).

Conclusions.

1. As a result of this work characteristic features of the genetic structure of two allelic variants of the gene TG for cattle breeds of dairy and beef performance was established.

2. Low frequency of allele T TG gene in populations of cattle belonging to breeds of dairy productivity was directly compared with the frequency of this allele in populations of meat breeds of cattle. It may indicate the influence of selection towards certain meat breeds to change the frequency of T allele since it affects the display of meat marbleness and it is desirable for meat breeds.

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