ANIMAL HUSBANDRY

Boev M.M.

MARKER SELECTION AIMED AT REPRODUCTION GENOTYPES PROVIDES HIGH MILK PRODUCTIVITY IN CATTLE

Boev M.M., Russian Federation, Kursk research institute of agricultural production, candidate of agricultural sciences

Abstract

For the first time analyzed the pleiotropic effects of antigens associated with milk production. For the first time detected the character of complex influence for a number signs of separate blood antigens of cattle.

Keywords: blood group, antigens, **S**immental cattle, genetic markers, pleiotropic effect.

Introduction. Problems of increasing the production of milk, meat and other animal products has been and remains one of the priorities of agriculture. An important place in this work covers the improvement of breeding and productive qualities of Simmental cattle.

Simmental cattle is highly acclimatization capacity, combines milk production with a high body weight and good meat qualities. One of the main methods for improving Simmental cattle is pure breeding. However, the pace of improvement of the animals at the present stage can not fully meet the requirements for selection.

In this regard, there is a problem of finding new methods and techniques in breeding with the Simmental cattle, based on the use of red blood cell antigens as genotype markers for breeding purposes, use them for early and more objective forecasting of

economic and breeding value of animals in the selection of origin and assessment of the quality of the offspring [1].

The purpose of research is to develop a method of increasing the efficiency of the marker selection using antigens associated with milk yield and fat content of milk, taking into account the pleiotropic effects of certain markers [1,2].

In recent years, still a lot of attention paid to the study of genetic polymorphic systems of blood proteins, lymph, semen and use them as a method more objective assessment of the merits of pedigree breeding animals and process management. Particular importance is attached to polymorphism of blood group antigens [3].

The aspiration of researchers to use alleles of the blood groups as markers of productivity have not been successful. Conclusions of the polymorphic interface between systems and quality traits in animals obtained on the materials of specific herd may not be extrapolated to other populations. They can be used in breeding only in animals of a single herd [5,6].

It should be noted that when establishing connection with blood group productive qualities of cattle in most cases researchers [7] only considered allele B system (EAB-locus of blood group), most numerous in the number erythrocyte antigens and antigens from other blood groups were ignored.

We have a breeding value of each of the identified 48 (10 systems of blood groups) erythrocyte antigens was studied. Erythrocyte antigens and their complexes are elements of the genotype, which is due to characteristics of the organism, including those associated with its productive qualities. The studies found an association of 15 erythrocyte antigens with the value of milk production and 22 antigens with fat dairy [8,6,9].

The aim of our further research is to find ways to use genetic markers for directed creation of genotypes that will provide a high milk yield in cattle, which make it possible targeted changes in the structure of the genotype of animals in the desired direction and more precise control of the selection process in the herd and adjust their orientation.

For the first time analyzed the pleiotropic effects of antigens associated with milk production. For the first time detected the character of complex influence for a number signs of separate blood antigens of cattle.

Research object. Research carried out on the breeding factory of Kursk Research Institute of agricultural production. Feeding cattle is organized at the rate of 42-45 centners of fodder units per 1 head. The main object of experimental studies has served

thoroughbred Simmental herd numbering 350 goals. Annual productivity of cows over the past 10 years was 4040 kg of milk with 3.9% fat.

The material of the research were immunological data from 1985 to 2010, compiled on the basis of blood tests in the immunogeneticlaboratory of the institute of animal husbandry Ukrainian Academy of agrarian sciences (Kharkiv)and the All-Russian scientific research institute of animal husbandry (Podolsk).

Materials are grouped in accordance with the tasks and were treatedbiometrically using methods Plohinsky N.A. (1969) and Merkuryeva E.K.(1970), Strygin S.O., DementievaS.I., Alifanova V.V. (2008).

Research results. Studies have revealed differences in milk production in animals of different genotypes (Table 1).

The first group includes animals (35 goals) in the genotype which no markers associated with milk yield, in the second - cows (103 head) in the genotype of which there were only stimulants (markers associated with increased milk yield).The third group consisted of cows (19 heads) containing repressors only in the structure of their genotype, ie markers associated with reduced milk yield. By 4, 5 and 6 groups were classified as animals that had a different ratio of antigen-stimulants and repressors in the structure of their genotype.

The highest milk yield were typical for cows, which were in the genotype antigens stimulators. Their milk production was higher on 422-978kg (R>0,99) milk than cows with other structures genotype blood antigens and 1202 kg (R>0,999) compared with their mothers.The lowest milk yield were detected in cows in the genotype which no stimulators (0-100) or were in the minority (30-70) in relation to the repressors. Milk yield of cows with this structure genotype antigenically amounted to 4129-4083 kg of milk, which is 487-978 kg (R>0,95) lower than that of cows other genotypes.It should also be noted that the presence of the cow in the genotype repressors only exceed their yield of 155kg mothers milk. Cows with a predominance of repressors (70%) had lower milk yields parent on 88kg.

Table 1 - Milk production of the cows, depending on their genotype structure blood antigens

Indicators	The structure of the genotype of cows,% (stimulators - repressors)					
	0-0	100-0	0-100	70-30	50-50	30-70
Groups	1	2	3	4	5	6
number of animals	35	103	19	126	59	52
yieldofmilk, kg	4570 ±160	5061 ±77	4120 ±165	4639 ±66	4635 ±112	4083 ±83
fat, %	3,22 ±0,04	3,88 ±0,02	3,93 ±0,05	3,87 ±0.04	4,02 ±0,02	4,02 ±0,04
Butterfat, kg	179,1	196,4	162,0	179,4	186,0	164,1
correlationdaughter's / mother's	0,168 ±0,181	0,074 ±0,108	0,427 ±0,182**	- 0,116 ±0,093	0,252 ±0,131*	0,210 ±0,131
correlation yield of milk / % fat	- 0,119 ±0,166	- 0,127 ±0,097	- 0,093 ± 0,227	- 0,398 ±0,076***	- 0,274 ±0,120**	- 0,393 ±0,120****
C_V%	21,8	15,7	17,3	16,6	18,7	15,5

at **P>0,95, ***P>0,99, ****P>0,999.

Milk yield of cows of 1,4 and 5 groups ranged from 4570kg to 4639kg, it has occupied an intermediate position. Their milk yield were more at 300-349kg than mothers, but the difference D-M was significant (R>0,99) only in cows with genotype 70-30%.

Therefore, milk production level correlated with specific antigens: increased milk yield - the presence or predominance of genotype stimulators, and reduced - to their absence, or minority.

Reliable degree of maternal genetic effect on the yield of the daughters occurred in cows in the genotype which only repressors (0.427, R>0,95). Cows, in the genotype which only stimulants (100%) correlation between the daughter-mother's milk production is absent (0.074).

The variability of milk yield was the highest in cows, which were absent in the genotype markers milk yield (21.8%) and in cows with an equal ratio in the genotype of stimulants and repressors. The smallest variation in milk production was observed in the cows that were in the structure of its genotype 100% stimulants and in the group of cows with a predominance of repressors (70%).

The correlation coefficient between milk yield and fat content of milk from cows of all genotypes was negative, is close to zero, and invalid.The correlation coefficient was significant at the cows in the genotype which was attended by stimulators and repressors. In the group of cows with equal ratio in the genotype of stimulants and repressors correlation was lower (-0.274) and higher in the groups with the prevalence of stimulators or repressors.

Then we were examined productive qualities of cows and fat content depending on the presence and relations in their genotype antigens that we have associated with high and low milk fat.

Analysis was carried out in cows milk fat progeny bulls that milking improvers, but it was reduced fat milk (Table. 2).

Stable level of feeding and keeping of animals on the farm allowed when evaluating sires to use comparison daughters with their mothers. The evaluation showed that the bulls have increased the yield of daughters 401-1013 kg of milk compared with the mothers.

Table 2 - The milk yield of cows depending on the presence and ratio in their genotype antigens which are associated with milk fat

Groups	Availability of milk fat markers in genotype cows		Number of animals	Milk yield			DifferenceD-M	
	increased	decrea-sed		milk, kg	% Fat	butterfat,kg	at milk, kg	atfat, %
1	0	0	19	4703±138	3,88±0,04	182,7	778	-0,16
2	2,8	0	64	4562±116	4,07±0,03	184,4	401	+0,09
3	0	1,3	37	4862±132	3,81±0,03	185,2	974	-0,23
4	4,7	1,3	143	4511±66	4,11±0,02	184,5	471	+0,16
5	1,1	2,3	24	5008±158	3,83±0,03	191,6	1013	-0,15
6	1,4	1,4	53	4929±113	3,98±0,03	195,4	920	-0,07

Animals were are spaced into groups according to the presence and ratio of the antigens in their blood which are associated with elevated (18 antigens) and lower (4 antigen) fat milk.

So the fat content of the milk increased by 0,09-0,16% only in the presence of antigens associated with high butterfat (group 2), as well as when they are dominated by 3.6 times to antigens that are associated with decreased butterfat (group 4). In the remaining groups there was a reduction of fat content of milk for 0,07-0,23%. This can be explained by the fact that the markers are associated with increased milk fat, non-existent, are equality to or smaller amount in comparison with the antigens associated with a lower milk fat content.

The study of the structure of the genotype of cows with different milk fat content, depending on the presence and relationships in it antigens showed that with an increase in milk fat content from 3.6 to 4.4%, the number of antigens that are associated with fat content increased by 2.2 times.

The structure of the genotype of cows, in which milk fat content is not more than 3.6%, markers associated with high butterfat occupy 48.5%, and the cows whose milk fat content of 4.4% or more - 81.4% ie 1.7 times more.

Similar investigations have been conducted in relation to other qualities of cattle - beef productivity, economic longevity and reproductive capacity. As a result, we were allocated the antigens

associated with the 5 most important economically useful signs of cattle. Received 5 patents [9, 10, 11, 12, 13] . Another patent received a method of producing the heterosis which is based on the pleiotropic effect of detected antigens.

Conclusions and offers. The use of genetic markers as criteria for selection processes, in our opinion, will allow:

- significantly accelerate the evaluation of cattle;
- reliably estimate the potential of the breed, herd and individual animal;
- have more control over selection processes in the herd and adjust their focus.

References:

[1] Boev, M.M. Manifestation of heterosis for milk production in Simmental cattle in the selection of blood group antigens. The Fifth European conference on agricultural. "East West". Vienna, Austria. 2015. P. 54-59.
[2] Boev, M.M. Marker selection aimed at reproduction genotypes provides high milk productivity in simmental cattle. / M.M. Boev, V.V. Volobuev // Herald of Kursk State agricultural academy– Kursk, 2015. - P. 57-60.
[3] Tikhonov, V.N. The use of blood groups in breeding animals. - M.: Kolos, 1967. – 391 p.
[4] Novikov A.A., Romanenko N.I., Semak M.S. Immuno-genetic markers and their use in breeding. Anniversary Collection "Modern aspects of breeding, biotechnology, information in livestock breeding". VNIIplem. M. 1997. P. 265-278.
[5] Boev M.M., Kolyshkina N.S. Improving selection in breeding lines and families by. Kursk. 2001. P. 159-224.
[6] Bakai, A.V. Genetic / A.V. Bakai, I.I. Kochish, G.G. Skripchenko // M. : «Kolos S», 2007. – P. 139-141.
[7] Kol'tsov D.N. Monitoring EAB-locus alleles of blood groups in breeding cattle breed Sychevskaya / D.N. Kol'tsov, V.I. Dmitrieva // Zootehniya. – 2011. - №9. – P. 2-3.
[8] Boev, M.M. Breeding value of erythrocyte antigens. / M.M. Boev // Zootehniya. – 1990. - №7. P. 27-30.
[9] Boev, M.M. A method of of selection of cattle for milk production: invention patent № 2391815 / M.M. Boev, N.S. Kolyshkina, M.M. Boev. – 2010. – 6 p.

[10] Boev, M.M. A method for producing heterosis in breeding cattle: invention patent № 2467569 / M.M. Boev, M.M. Boev, Kukushka E.V. – 2012. – 6 p.
[11] Boev, M.M. A method of screening cattle for reproductive capacity: invention patent № 2372776 / M.M. Boev, M.M. Boev. – 2009. – 6 p.
[12] Boev, M.M. A method for determining the economic longevity in cattle: invention patent № 2316957/ M.M. Boev, Savin A.O. – 2008. – 6 p.
[13] Boev, M.M. A method of of selection of cattle for milk fat: invention patent № 2361398 / M.M. Boev, N.S. Kolyshkina, M.M. Boev. – 2009. – 6 p.