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Use of polymorphism of blood groups in selection (breeding) of sheep of the Kazakh meat-wool half-fine breed

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Abstract The article shows the genetic structure, the definition of differentiation by blood groups of sheep of the Kazakh meat-wool half-fine breeds, the peculiarities of blood group profile of different lines of sheep are identified, red blood cell factors associated with productivity, resistance, morphological and biochemical blood composition are determined, the degrees of genetic differences between stud rams and ewes are identified based on the index of genetic similarity and specific features of productivity formation, morphological and biochemical status of the resistance of offspring obtained from parents with different genetic compatibility, as well as morphological blood composition along with the identification of other indicators of autarcesis, that allow more accurately to determine the degree of resistance of the organism against the impact of the adverse environmental factors.

Keywords: selection (breeding), genetic structures, gene pool, biochemical studies, antigens, number of alleles, red blood cells, white blood cells, hemoglobin, resistance, red blood cell factors, wool and meat productivity, immunogenetic testing, morphologic and biochemical status.

Introduction. It is impossible to solve the problems of intensification of animal husbandry, including sheep breeding, without scientific support, based on modern, objective, reliable methods for assessing and predicting the genetic potential of breeding animals [1-3]. The discovery of blood group factors created conditions for obtaining an objective characteristic of the animal genotype, analyzing the genetic structure of various populations, monitoring its dynamics, identifying the contingency of the allelic state of protein-coding genes with 4 quantitative indicators, and also for identifying the best compatibility of breeding pairs. At this, an important role is cast to the information about the relationship of genetic parameters with the morpho-biochemical composition of blood [4]. Such studies and researches are urgent and timely, since they allow to identify significant for selection genetic and biological reserves for increasing the total number of sheep, increasing the productive and breeding qualities of sheep with rational use of feed resources [5].

In this connection, the present research was aimed at studying the blood groups of sheep of this breed to identify genetic markers, biochemical parameters associated with high productivity, resistance, and determine the compatibility of breeding pairs in which offspring with high genetic potential is born [6].

The purpose of the research is to study the gene pool and intra – breed differentiation of Kazakh meat-wool half-fine sheep and to determine the genotypes of high productivity using immunogenetic, morphologic and biochemical methods.

Materials and methods of research. The research was conducted in the conditions of Batay-Shu LLP in the Shu district of Zhambyl region. The Kazakh meat-wool half-fine breed was used in the experiment. The object of research was adult stud rams, breeding (selection) core ewes, as well as young animals (ewe lambs, ram lambs) at the age of 4.5 and 12 months, the number of animals is given in the results of the research for each experiment. Blood samples for immunogenetic, morphologic and biochemical studies were taken from the jugular vein in morning hours before feeding in 7-8 animals from each age-sex group.

The study of resistance, morphological, biochemical parameters of blood were performed at the Department of "Obstetrics, surgery and biotechnology of reproduction of animals" Kazakh National Agrarian University (KazNAU): hematological, including the determination of blood hemoglobin (hemoglobin-cyanide method on electrophotometer), the number of red blood cells and white blood cells on automated Hematology analyzer "Datacele-16", biochemical including the determination of total protein level in peripheral blood using refractometric method, its fractional composition – using colorimetric method; the level of bactericidal and lysozyme activities of blood serum (BABS, LABS) and phagocytic activity in blood (PAB) – on the basis of the guidelines. Immunogenetic testing was performed using monospecific reagents of the Bank of the laboratory for immunogenetics and DNA technology of VNIIOK (All-Russian Scientific Research Institute of Sheep and Goat Breeding) using six blood group systems (A, B, C, D, M, R), including 14 red blood cell factors (AA, AB, BB, Bd, Be, Bg, Bi, Ca, Cb, Da, Ma, Mb, and R), the hemolysis and agglutination reaction development was performed according to the guidelines

Research result. One of the most important problems of selection (breeding) improvement of farm animals, including sheep, is the identification of the most valuable genotypes that best meet the requirements of the process industry in terms of the level of productivity and quality of the resulting products [7-10].

The most important thing in the genetic approach concerning predicting the economic value of an animal is the fact that the identification of markers is possible in the earliest period of the animal's life, what allows almost immediately after its birth to determine its productive potential and its further use. Despite the fact that molecular genetic methods are more and more recognized, the use of immunogenetic indicators has not lost its relevance.

To determine the possible relationship of erythrocyte factors with productivity indicators, the most important parameters in the selection of fine – wool sheep were compared: wool clip and live weight in animals of different genotypes by blood groups [11-14]. Comparative analysis and comparison of the antigenic spectrum of sheep of different lines (wool, thick-wool and meat-wool) with productivity indicators (wool clip, live weight) revealed an ambiguous nature of their relationship, due to both the sex and age characteristics of animals, and their belonging to this or that type [15]. It turned out that a certain range of antigens (Bd, Bg, Cb, Ma, MB, Da, R, O) in the blood of stud rams, ewes, and replacements of wool type was not associated with productivity indicators. Thus, among the rams in whose blood Ab, Be and Bi factors were identified, such rams had a more net wool clip by 0.52, 0.45 and 0.43 kg compared to the stud rams whose genotype did not contain these antigens ($P<0.05$; $P<0.01$).

Even more significant predominance the animals had whose genotype contained all three antigens – Ab, Be, and Bi [16]. The difference in their favor compared to the average for the group was 0.58 kg and it was significant ($P<0.01$) (table 1). At the same time, 9 or 19.5% of 46 animals were carriers of the AbBeBi complex erythrocytic genotype.

Table 1. The productivity of sheep of wool type, taking into account the antigens of blood groups

Anti- genes	Productivity indicators									
	n	Stud rams (n=46)				n	Ewes (n=104)			
		Live weight, kg M±m	td	Clip of net wool, kg M±m	td		Live weight, kg M±m	td	Clip of net wool, kg M±m	td
Aa +	40	92,2±2,07	1.72	5,99±0,08	1.6	72	54,25±0,91	1.71	3,81±0,04	1.06
Aa -	6	100,0±4,58		6,04±0,10	8	32	51,62±1,07		3,74±0,04	
Ab +	11	93,18±3,72	0.72	6,36±0,18	2.1	46	53,34±1,11	0.11	3,96±0,05	4.74
Ab -	35	89,88±2,3		5,84±0,09	4	58	53,51±0,98		3,66±0,04	

Bb +	13	87,38±2,88	3.16	5,67±0,17	1.7	30	54,73±1,25	1.17	3,92±0,03	2.74
Bb -	33	95,12±1,06		6,01±0,10	7	74	52,91±0,88		3,71±0,04	
Bd +	32	91,01±2,19	0.32	6,04±0,10	1.6	56	54,95±0,91	1.99	3,81±0,04	0.63
Bd -	14	89,92±0,33		5,87±0,18	1	48	51,91±1,11		3,77±0,05	
Be +	26	87,03±0,44	2.92	6,23±0,09	1.9	61	53,37±0,98	0.13	3,98±0,03	4.85
Be -	20	95,40±2,22		5,78±0,17	8	43	53,58±0,98		3,67±0,04	
Bi +	22	91,72±2,59	0.65	6,31±0,11	4.3	42	53,09±1,16	0.38	3,75±0,05	0.43
Bi -	24	89,70±1,77		5,97±0,13	6	62	53,67±0,95		3,82±0,13	
Bg +	20	87,55±1,96	1.83	6,01±0,12	1.0	54	53,62±1,07	0.25	3,82±0,06	0.76
Bg -	26	93,07±2,16		5,84±0,11	3	50	53,24±1,00		3,76±0,05	
Ca +	40	90,25±1,68	0.72	6,03±0,09	1.7	98	53,40±0,76	0.19	3,79±0,03	0.48
Ca -	6	93,50±3,31		5,85±0,15	4	6	54,02±0,70		3,73±0,10	
Cb +	36	89,88±2,19	0.76	5,84±0,10	1.5	90	53,48±0,83	0.16	3,79±0,03	0.12
Cb -	10	93,50±4,32		6,16±0,17	2	14	53,14±0,83		3,78±0,08	
Da +	16	92,01±3,14	0.50	6,02±0,14	1.5	90	54,85±1,64	0.76	3,90±0,09	0.14
Da -	30	89,96±2,53		6,00±0,11	2	14	53,22±0,80		3,77±0,36	
Ma +	41	89,75±1,64	0.58	5,99±0,10	0.2	78	53,94±0,82	1.31	3,81±0,03	1.28
Ma -	5	92,21±1,43		6,16±1,77	2	26	51,92±1,53		3,73±0,06	
Mb +	4	101,0±10,59	1.06	6,15±0,27	0.3	24	55,25±1,58	1.37	3,87±0,07	1.64
Mb -	42	99,69±1,30		5,96±0,06	2	80	52,90±0,81		3,76±0,03	
R +	34	90,61±1,74	0.06	6,01±0,09	1.3	82	54,07±0,78	1.69	3,79±0,03	0.17
R -	12	90,83±3,33		6,03±0,13	4	22	51,09±1,75		3,78±0,02	
O +	36	90,30±2,27	0.39	5,84±0,10	1.6	86	54,01±0,80	1.73	3,80±0,03	1.09
O -	10	92,01±0,34		6,18±0,15	5	18	50,77±1,45		3,72±0,07	
On average		90,67±1,94		6,02±0,09			53,42±0,58		3,79±0,03	
Carriers of the desired genotype		100,52±1,50		6,60±0,14			54,95±0,91		3,15±0,18	

Among ewes, carriers of Ab, Bb and Be factors demonstrated a higher wool production. In terms of clip of net wool, they exceeded by 0.30, 0.21 and 0.31 kg ($P<0.05$), respectively, the ewes in whose blood these antigens were not identified. The difference in favor of carriers of Ab Bb Be complex genotype with an average clip of net wool for the group was 0.36 kg ($P<0.05$). Only 16 of 104 of such animals, or 15.4% were identified. It is notable that the carriers of Ab and Be factors had high indicators of wool productivity among young animals, both among ram lambs and ewe lambs. Their predominance over animals in whose genotype these antigens were not detected was 0.52, 0.35 and 0.25, 0.22 kg, respectively, in ram lambs and ewe lambs. The difference in favor of animals that had both antigens present at the same time, if to compare with the average for the herd, was 0.58 and 0.31 kg, respectively ($P<0.01$).

However, it should be noted that only three of these animals were identified among ram lambs and four among ewe lambs, what indicates a low frequency of occurrence of the desired complex erythrocyte genotype among young animals, 12.5% and 10.8%, respectively. Generalization of the results obtained to identify the relationship of antigenic factors with the level of wool productivity pays attention to the fact that among all studied sex and age groups of wool-type animals, animals with Ab and Be antigens present in the genotype had a higher net wool clip. These factors, in our opinion, can be considered as candidates for the markers of high wool productivity for this herd. Comparison of the indicators of live weight of wool-type sheep, taking into account the carrier of blood groups, revealed that among stud rams Bb and Be negative animals weighed by 7.74 and 8.38 kg more, respectively, if to compare with animals with the reverse genotype.

The difference was significant. 7 animals or 15.2% of rams of the complex Bb - Be genotype were identified. Their predominance in comparison with the average value of live weight in the group was 9.8 %. Among the group of ewes, the carriers of the Bd factor had a higher live weight, and such ewes were found with a frequency of 53.8%. The predominance was 3.04 kg and it was significant. No differences are identified in the level of live weight of animals with different genotypes among ram lambs and ewe lambs.

Thus, for wool-type sheep of the Kazakh meat-wool half-fine breed, no single blood group factor that would mark such indicator as live weight is identified. Apparently, long – term selection based on one trait - wool clip, led to the formation of a genetic structure in which a genetic link was formed only for this trait.

It is possible that the selection of animals with high indicators of wool and meat productivity in the future will lead to the occurrence of a complex genotype for both indicators of productivity. A similar comparative analysis of the economic characters of carriers of different genotypes by blood groups among sheep of the thick-wool type allowed to identify the following regularities.

Carriers of Ab, Be, and Da antigens had significantly higher clip of net wool among both stud rams and ewes. Their predominance over the animals in the genotype of which these antigens were not identified was 0.19, 0.26 and 0.44 kg and 0.11, 0.13 and 0.12 kg, respectively. The difference in the level of wool productivity in favor of animals-carriers of all three factors, i.e. the complex genotype – AbBeDa, compared with the average value for the herd was 0.63 kg for stud rams, 0.21 kg for ewes. Such animals among the specified groups were found 8 and 10 or 10.1 and 13.2%, respectively. Among the ram lambs, individuals with Da factor in their genotype had a higher wool productivity, while among the ewe lambs - carriers of Ab, Be, and Bg antigens.

The advantage compared to the animals of the same age in which these blood group factors were not identified was 0.47 and 0.24, 0.25 and 0.26 kg ($P < 0.05$), respectively. 6 individuals, or 20.0%, were identified as carriers of the AbBeBg complex genotype among the ewe lambs. Comparison of live weight of animals with different blood factors allowed to establish that Be negative animals among rams and ewes and 53 Bg positive animals among rams had a significantly higher level of this indicator. The advantage of rams carrying the Be - Bg + genotype was on average 5.2 kg compared to animals with the reverse Be + Bg- genotype and it was significant. For Be - ewes, this difference was 2.9 kg ($P < 0.05$).

Generalization of the results on identification of the relationship between red blood cell factors and productivity indicators of sheep of the Kazakh meat-wool half-fine breed shows that the Ab antigen was associated with a large net wool clip in all groups. Among sheep of wool and thick wool types, the carriers of the Be factor were accompanied by an increase in the level of wool productivity. Attention is drawn to the fact that among the thick-wool sheep, the largest number of Ab Be Bg Da factors associated with net wool clip was revealed compared to other types. This may be due to the fact that animals of this type had the highest indicator of net wool clip and the gene pool of imported breeds was used more intensively when creating and improving the type. All this, apparently, formed its own genotype, in which a greater number of genetic loci, including antigenic factors, are involved in the formation of such a trait as net wool clip.

In whole, for the Kazakh meat and wool half-fine breed, the Ab and Be blood factors can be considered as genetic markers - candidates for high wool productivity. The attention should be paid to their presence in the genotype of sheep of all groups when selecting animals in the breeding groups (table 2).

Table 2. Red blood cell factors - candidates to markers for clip of net wool

Groups	Red blood cell	Age and	Frequency	Net wool clip, kg
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	factors	sex group	. %	carriers	non-carriers	difference
wool	Ab+ Be+	Main rams	19.5	6,60±0,14	6,02±0,09	0.58
		Ewes	15.4	4,15±0,18	4,79±0,03	0.36
		Ram lamb	12.5	5,52±0,21	4,98±0,22	0.54
		Ewe lamb	10.8	3,64±0,17	3,20±0,05	0.44
thick wool	Ab+ Be+ Da+	Main rams	10.1	7,20±0,19	7,57±0,07	0.53
		Ewes	13.2	4,21±0,14	4,00±0,04	0.21
	Da +	Ram lamb	40.0	5,25±0,21	4,97±0,37	0.28
	Ab+ Be+ Bg+	Ewe lamb	20.0	3,70±0,08	3,36±0,05	0.34
meat and wool	Ab+ Mb-	Main rams	8.8	5,94±0,13	5,61±0,09	0.33
		Ewes	11.1	3,85±0,06	3,61±0,05	0.24
		Ram lamb	11.1	4,87±0,08	4,64±0,08	0.23
		Ewe lamb	17.6	3,31±0,08	3,10±0,04	0.21

As for such indicator as live weight, no single antigenic factor or factors that would be associated with this indicator of productivity for sheep of the Kazakh meat-wool half-fine breed as a whole is identified (table 3).

So, for wool and thick-wool groups, the common feature was the fact that the absence of the Be antigen in the sheep genotype was accompanied by a higher live weight. In other cases, different sex and age groups of different sheep groups were characterized by their own erythrocyte factors, the carrier state of which was associated with an increased level of live weight. It can be assumed that the revealed pattern is connected with the fact that for a long time the main indicator for the Kazakh meat-wool half-fine breed was wool clip. More attention is paid to the level of live weight as a selection trait only in recent years. This seems to have effect on the lack of an unambiguous association of one or more antigenic factors of red blood cells with the live weight index of sheep. Nevertheless, we consider it reasonable to pay attention to the carriers of Bb-Be-Bd -, Be - Bg + and Bb + Bg - Cb + genotypes, respectively, when selecting animals in the breeding (selection) groups of wool, thick - wool and meat - wool types.

Table 3. Red blood cell factors - candidates to markers for live weight in sheep of different types

Groups	Red blood cell factors	Age and sex group	Frequency . %	Live weight, kg		
				carriers	non-carriers	difference
wool	Bb - Be -	Main rams	15.2	100,5±1,50	90,6±1,94	9.8
	Bd -	Ewes	53.8	54,9±0,91	53,4±0,58	1.5
thick wool	Be - Bg +	Main rams	22.8	109,4±0,82	104,2±1,50	5.2
		Ewes	26.3	63,2±1,12	61,6±1,00	1.6
	Be - Bg +	Ram lamb	20.0	43,8±0,97	40,8±1,13	3.0
		Ewe lamb	20.0	38,4±0,39	37,8±0,76	3.6
meat and wool	Bb + Cb +	Main rams	10.5	101,2±1,65	97,1±0,54	4.1
		Ewes	14.2	59,8±0,59	57,0±0,48	2.8
	Bb + Bg -	Ram lamb	11.1	44,2±0,58	41,9±0,75	2.3
		Ewe lamb	17.6	39,8±0,03	38,1±0,50	1.7

To accumulate information about the contingency of blood genetic factors with productivity indicators and the most effective use of the marker-associated approach in the breeding (selection) process, it is necessary to carry out further annual certification of animals by immunogenetic indicators and individual accounting of productivity traits.

The mentioned above was the basis for studying cellular immunity (bactericidal and lysozyme activities of blood serum (BABS, LABS)) and humoral immunity (phagocytic activity in blood (PAB)) in offspring obtained from parents with different degrees of allelic heterogeneity, expressed through the index of genetic similarity (table 4).

Table 4. Indicators of autarcesis of young animals

Indicators/ Age, months	0 – 0,30		0,31 – 0,60		0,61 – 1,0	
	4.5	12	4.5	12	4.5	12
wool						
BABS	43,1±0,32	40,6±0,58	48,1±0,44	46,5±0,38	42,4±0,28	40,9±0,33
LABS	36,8±0,18	32,7±0,33	39,6±0,24	38,8±0,17	35,4±0,26	34,8±0,31
PAB	23,7±0,15	25,6±0,21	29,9±0,21	28,8±0,26	26,6±0,33	27,4±0,21
thick wool						
BABS	44,8±0,38	41,9±0,29	49,6±0,42	47,6±0,54	40,4±0,31	42,2±0,28
LABS	35,9±0,21	33,6±0,28	37,7±0,31	36,6±0,21	34,2±0,20	36,6±0,19
PAB	26,8±0,12	24,2±0,19	28,9±0,13	26,1±0,11	23,3±0,17	24,4±0,21
meat and wool						
BABS	45,2±0,21	43,6±0,33	47,8±0,28	46,2±0,29	44,2±0,29	43,0±0,23
LABS	34,4±0,32	32,9±0,17	38,8±0,17	36,2±0,22	31,9±0,18	35,4±0,21
PAB	27,4±0,21	25,8±0,15	29,9±0,22	25,5±0,17	24,4±0,22	25,5±0,17

The analysis of the obtained data indicates the predominance of both cellular and humoral immunity in the offspring of parents with an index of genetic similarity within the range from 0.31 to 0.60, compared with other variants (0 – 0,30; 0,61 – 1,0).

In lambs of the wool group born by parents with an index of 0.31-0.60, the level of BABS, LABS and PAB was significantly higher compared to lambs born by parents with other (0-0, 30; 0.61-1.0) variants: at the age of 4.5 months by 10.4 and 11.6%; 7.1 and 10.5%; by 7.4 and 11.0%, at the age of 12 months - by 12.7 and 12.1%; by 15.7 and 10.3%; by 7.4 and 11.3%, respectively ($P < 0.05$; $P < 0.01$).

Genetic variations of antigenic concentrations of red blood cells are studied for the first time in three groups of (wool, thick-wool, meat-wool) sheep of the Kazakh meat-wool half-fine breed. A significant variability in the frequency of occurrence of individual antigenic factors is observed: the most frequent were Aa, Bd, Ca, Cb, Mai R – factors (0.707 – 0.836), less often – Ab, Bb, Be, Bi, Bg (0.405-0.607), even less often – Mb and Da (0.288-0.349). At the same time, 9 (Aa, Bb, Bd, Be, Bg, Ca, Cb, Ma, and O factors) of 14 factors studied, i.e. 64.2%, had a similar distribution in sheep of both wool and meat-wool productivity orientations.

The revealed nature of genetic relationships is mainly associated with the history of the creation of the breeds and with the region of their development. We were interested in the possibility of using polymorphism of red blood cell factors to assess and predict the productivity of different groups of sheep of the Kazakh meat-wool half-fine breed. It turned out that the presence of Ab, Be and Bi red blood cell factors in the blood of wool-type sheep was accompanied by higher indicators of wool clip. It is interesting to note that in stud rams that are carriers of the complex AbBeBi erythrocyte factor, the wool clip was significantly (by 0.58 kg) higher than the average value for the group ($P < 0.01$).

Such animals in the herd of the main rams were 19.5 %. Among the breeding stock of the same type, the presence of the complex AbBeBi factor was accompanied by a higher (by 0.36 kg) net wool clip ($P<0.05$).

Animals carrying this red blood cell complex in the herd of ewes were 15.4 %. High wool productivity was marked by Ab and Be factors in the replacements of the wool type (ram lambs and ewe lambs). The predominance in this indicator of carriers of marker alleles was, respectively, 0.52; 0.35 and 0.25; 0.22 kg, compared with the animals of the same age that are not their carriers ($P<0.05$).

The interdependence between the blood group factors with live weight in young animals was reflected in the presence of the Be – Bg + genotype, which was expressed in a higher value of the studied indicator by 4.54 kg in ram lambs, by 2.91 kg in ewe lambs, with the frequency of occurrence of such genotypes among replacements of 20.0 %. Red blood cell factors Ab, Be, Da in sheep of the wool-meat type of the Kazakh meat-wool half-fine breed can be candidates to markers of wool productivity, and Be – Bg + – of meat productivity.

The presence of the Ab + Mb – complex in the blood of young animals (ram lambs, ewe lambs) with a frequency of 11.1 and 17.6 % ensured a net wool clip that was higher by 0.34 and 0.16 kg, respectively ($P<0.05$). The contingency of live weight with a specific factor or their complex in different sex and age groups of meat-wool sheep has not been established. Nevertheless, the presence of the Bb + Cb genotype in the blood of rams and ewes was accompanied by a live weight that was higher in stud rams by 10.5 kg, in ewes – by 2.8 kg, with a frequency of occurrence of such animals - 10.5 and 14.2 %, respectively.

A higher live weight, both in ram lambs and in ewe lambs, was observed in such animals with the Bb + Bg genotype - with an advantage by 3.4 and 2.7 kg, with a frequency of occurrence in herds of 11.1 and 17.6 %. Immunogenetic testing of different types of sheep of the Kazakh meat-wool half-fine breed indicates the reasonability to include the animals - carriers of Bb– Be-Bd–; Be-Bg + and Bb+Bg-Cb+ genotypes in the breeding (selection) process. Since initially the selection (breeding) of the Kazakh meat and wool half-fine breed was aimed at increasing of wool production, it can be assumed that this created a situation of accumulation of alleles marking wool productivity, and to a lesser extent – meat productivity.

Higher levels of albumin fractions in the blood serum of young animals, born by the parents with average values of genetic similarity index (0,31-0,60), apparently is the result of a more intensive metabolism, and a higher number of red blood cells, a higher level of hemoglobin in the blood of these lambs contributed to the active synthesis of albumin, quickly involved in the metabolic processes that are reflected in the indicators of productivity, particularly in the value of live weight.

Assessment of the protective potential allowed to reveal a pattern coming down to the fact that in all offsprings, regardless of their belonging to a certain breed group, received from parents with an index of genetic similarity from 0.31 to 0.60, cellular (PAB) and humoral (BABS, LABS) protection factors were significantly higher than in animals of the same age of parents with other variants ($P<0.05$, $P<0.01$).

Selection of breeding pairs with taking into account of their genetic compatibility, calculated on the basis of a comparative assessment of the qualitative characteristics of the blood antigen spectrum, provides the possibility of targeted selection for obtaining highly productive, highly resistant young animals.

Conclusions.

1. Discovered of the relationships between red blood cell factors and productivity indicators of sheep of the Kazakh meat-wool half-fine breed shows that the Ab antigen was associated with a large net wool clip in all groups. Among sheep of wool and thick wool types, the carriers of the Be factor were accompanied by an increase in the level of wool productivity

2. No common genotype associated with the live weight indicator was found. This pattern was typical for all intrabreed types.

3. The offsprings obtained from breeding pairs with an antigenic similarity index within the range of 0.61-0.90, and with the live weight ($h^2 = 0.22 - 0.26$) within the range of 0.31-0.60 had a higher heritability in respect of net wool clip ($h^2 = 0.42 - 0.58$). Morphologic and biochemical profile of blood of lambs depended on the genetic compatibility of parents: in the blood of offspring of parents with an index of genetic similarity within the range of 0,31 – 0,60 had a higher number of red blood cells, higher hemoglobin level, serum protein, its fractions than the animals of the same age obtained as a result of other variants of parent selection.

Practical recommendations for production. To increase the efficiency of the selection and breeding work, improve the breed, productive qualities of sheep of the Kazakh meat-wool half-fine breed, along with traditional zootechnic methods of selection and matching of animals the following shall be carried out:

- wide use in the breeding (selection) process of animals that are carriers of a complex of blood group factors marking a high productivity;
- selection of breeding pairs with taking into account of their genetic compatibility, based on the r_a index ;

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