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INFLUENCE OF GENETIC FACTORS ON THE SPERM PRODUCTION OF BULLS PRODUCING MEAT BREEDS IN THE CONDITIONS OF THE NORTHERN REGION OF KAZAKHSTAN

ANNOTATION

The article presents the results of studies of the influence of genetic factors on the fertilizing ability and quality indicators of sperm production forbeef sires of different breeds.

The main purpose of the work: to determine the influence of the breed and the country of origin on the quantitative and qualitative indicators of sperm production of beef sires with different genotypes and the relationship of the studied breeding traits.

Research work was carried out in the Akmola region. The object of the study are sires of the Kazakh whiteheaded, Aberdeen-Angus and Hereford breeds. The practical part of the work was carried out on the basis of AI Center named "Asyl-Tulik" JSC on a healthy livestock in compliance with all veterinary and sanitary requirements. To study the fertilizing ability of bull sperm, the indicators of 18 bulls were obtained: for the Kazakh white-headed breed - 6 bulls, Aberdeen Angus - 6 bulls, Hereford - 6 bulls. 5610 cows and heifers were inseminated: according to the Kazakh white-headed breed - 2190, Aberdeen Angus - 2160, Hereford - 1260.

According to the results of the study, it was found that the fertilizing ability of sires of the Kazakh white-headed breed ranges from 47-60%; Aberdeen - Angus - within 30-59%; Hereford breed - in the range of 45-60% and 38% of genetic factors affect the sperm production of sires. Of these, 22.0% by genotype, 14.0% by breed and 1.5% by country of origin.

Key words: *beef sires, sperm productivity, quantitative and qualitative indicators, fertility, genetic factors, genotype.*

Introduction. To date, the country has expanded the use of highly productive animal breeds, improving the system of feeding and keeping animals, beef production technology and forms of organization, where the meat balance occupies a leading place[1].

However, due to the successful development of the industry and the increase in its profitability in a given region, it depends on the timely implementation of measures for the reproduction of the herd, as well as correctly analyzed scientifically based breeds and genotypes of animals[2].

Manufactured products can be achieved not only by improving the existing gene pool and increasing the number of livestock, but also by increasing the productivity of livestock [2].

An important place in the field of breeding work is occupied by the issues of effective evaluation and selection of farm animals for productive and pedigree qualities. Sires are of great importance in improving the pedigree and productive qualities of animals [1,3].

To date, in this regard, in all developed countries, one of the main requirements for breeding work is the high quality of sperm from bulls - producers. Sperm quality is influenced by many factors and conditions. One of the main factors is the breed of bulls[4,16].

The reproductive function of bulls is always determined by their genotype. While there is speculation about this efficacy, there is little research on genetic potential.

Therefore, the reproductive ability of sires often depends on the interaction of the genotype with the environment. Changes in the volume of ejaculate during the year occur as a result of the reaction of the animal organism to changes in seasonal environmental environmental factors.

Among the genetic factors that affect the quality of sperm, the following can be distinguished: sire genotype, breed, paternity trace, origin, etc.

It is known that in the livestock industry the level of intensification consists of many factors. However, the main role in this process is played by the genetic potential, and if it is not high enough, other factors will not have an influence [4,5,6,7,20].

According to the studies of many scientists who refer that the individual feature of breeding sires is transmitted to their offspring by 30% by genetic factors, and by 70% by paratypic factors. Nevertheless, today the study of ways and means of predicting the influence of genetic factors on the meat productivity of the offspring of beef sires is becoming an urgent problem. That is, in breeding work with beef cattle, it can be carried out using forecasting of the index assessment of livestock productivity to improve breeding qualities and increase the production of high-quality beef [8,9,10].

Genetic factors are characterized by belonging to a particular breed, sire, pedigree, mother, herd of cattle.

Studies by many scientists show that genetic factors largely depend on the sire, even more so the connection of the breed.

In this context, some authors state that the fertility of sperm obtained from beef bulls is determined by genetic factors, i.e., it is 14.24% of the genotype of the sire bull, 11.21% of its breed and 1.6% of its origin. Bulls-producers of domestic and foreign breeds are somewhat different – 64.29% and 60.26%, respectively [10,11,19].

According to some scientists, the sexual activity of bulls to a certain extent depends on their genotype, which is determined by a number of random reasons, the main of which are the activity of bulls. The volume of sperm, its mobility and concentration are largely determined by the genotype. According to scientists, the share of genetic variability reaches 60% [12,13,15].

In most studies, the heritability coefficient for sperm activity is 0.052; by ejaculate volume – 0.970; by sperm concentration – 0.200; by the amount of sperm in the ejaculate – 0.672; 0.176.

Differences in the genetic structure of cattle are evidently depending on their origin. Therefore, it is necessary to know the influence of this factor on the reproductive ability of animals.

In this regard, the creation of market relations in agricultural production on the basis of modern conditions for the development of animal husbandry and on the basis of artificial insemination of animals, the identification and effective use of sires of the highest class, taking into account their genetic influence and the relationship of breeding traits depending on the genotype, breed, origin of animal sperm producers is a pressing issue today.

The purpose of the research work: to determine the influence of the breed and country of origin on the quantitative and qualitative indicators of sperm production of beef sires with different genotypes and the relationship of the studied breeding traits.

Materials and methods. Research work was carried out in the Akmola region. The object of the study is bulls-producers belonging to the Kazakh white-headed, Aberdeen-Angus and Hereford breeds. The work on the practical part was carried out on the basis of JSC Asyl-TulikRepublican Center for Breeding in Livestock on healthy livestock in compliance with all veterinary and sanitary

requirements. Productive qualities of livestock were determined under the same conditions of feeding and keeping.

The following were taken as research materials: own experiments - laboratory studies to assess the quality of sperm of sires, documentation on production and on breed affiliation.

The analysis included data on the production and use of semen from 9 sires by country of origin and 3 breeds - Kazakh Whitehead, Aberdeen Angus and Hereford.

For research, we conducted immunogenetic testing of the semen of clinically healthy animals, in accordance with the instructions for use of bulls manufacturers.

Feeding and caring for the animals were the same for everyone, with no differences in the seasons of the year. The norms and diets of animals are compiled in accordance with the recommendations of JSC " Asyl тulik ", taking into account age, live weight and modes of application.

The determination of the genetic influence on the productivity of sires with different genotypes is carried out according to the seasons of the year: in winter (December, January, February), spring (March, April, May), summer (June, July, August), autumn (September, October, November).

Sperm was obtained in the center for obtaining sperm from sires under standard conditions in compliance with all zootechnical and veterinary requirements. The mode of application is medium (twice a week, with a double cage of animals).

The resulting sperm was examined according to physiological parameters based on generally accepted methods:

- color, smell, texture - organoleptic analysis;
- semen volume - through a metered test tube;
- activity of spermatozoa on a 10-point scale, at a temperature of 35-38°C, through a microscope, magnified 180-200 times;
- the concentration of sperm in 1 ml was determined by the photoelectrocolorimetric method (F. I. Ostappso, G. S. Gaivoronsky), using the FEK-M photocolorimeter.
- resistance-resistance of sperm to 1% NaCl solution we determined by the Korotkov method;
- the intensity of the rest of the sperm - was determined on a 1% solution of methylene blue at a discoloration rate of 0.1;
- the concentration of hydrogen ions (pH) - by the electrometric method on the device electropotentiometer pH-340, determined by the electrometric method.

All semen was frozen in liquid nitrogen for long-term storage in a sperm bank.

We frozen the resulting sperm in straws, diluting it with a synthetic diluent (in terms of the number of spermatozoa at least 15 million per dose). The control of sperm resistance to deep freezing was carried out before dosage packaging after a month of storage.

One-way analysis of variance was defined by the following equation:

$$H^2_x = C_x / C_\sum \quad (1)$$

WhereC_x–factors taken into account;

$C_\sum$ - sum of all factors.

The coefficient of phenotypic correlation of the reproductive ability of productive bulls was determined by the equation:

$$r = C_x + C_y + C_d / 2 \vee C_x \text{ x } C_y \quad (2);$$

where C_x- factors to consider

C_y- second selection characteristic taken into account

C_d- third selection characteristic taken into account

We determined the level of bull semen insemination in accordance with the approved method of statistical processing of bulls in regional farms on herds of beef cattle.

We have identified the influence of genetic factors on sperm production by factor analysis of variance.

The main quantitative materials obtained in the course of the study are processed by variational statistics by the method of N.A. Plokhinsky and by Student using the SPSS for Windows application program.

Research results. One important indicator of the reproductive function of bulls is the fertilizing ability of sperm [12]. Currently, there are no methods for assessing the fertility of bulls by sperm quality, so they are determined by the results of the first insemination. However, high quality sperm allows not only to increase the number of inseminated queens, but also to increase their efficiency. It has been scientifically proven that up to 15-18% of non-viable or very weak calves are born in bulls with reduced sperm fertility (less than 70%) [12,15].

The fertilizing ability of the sperm of stud bulls is an important indicator that determines the reproductive ability of stud bulls. The basis for comparing bulls in terms of fertility is the insemination of more females by each bull in the required measure, with more cows inseminated, the average fertility indicator shows the actual value.

This indicator directly depends on the conditions of feeding, the maintenance of queens and the genetic compatibility of fathers and breeding stock, the qualifications of a specialist engaged in artificial insemination of animals. The fertilizing ability of the sperm of the bulls of producers is assessed by repeated insemination. If during repeated insemination the number of cows exceeds 50%, then bulls are excluded from use [13,18].

Analysis of compliant indicators of productive ability: the quantity and quality of sperm, its fertilizing ability, safety, decrease, cases of stillbirth of young animals, the number of artificial abortions can give a reliable and complete assessment of the reproductive ability of sires [14,16].

The fertilizing ability of sperm directly depends on the age of puberty, feeding, the absence of infectious diseases, the hormonal background of the sire from which the sperm is obtained. If we take farms and farms, then in this case it is necessary to take into account the economic conditions, the level of zootechnical and veterinary work. Bulls-producers that have the same category in terms of sperm quality and are allowed for breeding use must necessarily be divided according to the fertilizing ability of sperm [15,17].

To study the fertilizing ability of bull sperm, indicators of 18 bulls were obtained: for the Kazakh white-headed breed - 6 bulls, Aberdeen Angus – 6 bulls, Hereford – 6 bulls. 5610 cows and heifers were inseminated: according to the Kazakh white-headed breed – 2190, Aberdeen Angus – 2160, Hereford - 1260. The genotype of breeding bulls also affects the quality of sperm and the number of ejaculates.

To this end, Asyl Tulik JSC managed to identify differences in breeds in terms of sperm production at all stages of the use of sires. (tab.1).

Table 1 – Indicators of sperm production of sires of various genotypes

Indicators	Breed		
	Kazakh white-headed	Aberdeen-Angus	Hereford
	The country of origin		
	Kazakhstan	Canada	Germany
Number ofsires	11	7	10
Amountofejaculate, pcs	430,1±52,7	223,4±30,3	369,1±51,5
Ejaculatevolume, ml	3,38±0,15	4,01±0,25	3,86±0,26
Spermconcentration, billion/ml	0,78±0,03	0,70±0,04	0,78±0,05
Average amount of sperm to use, doses	24 497	12 200	32 348
Percentageofmarriage, %	49	60	42

According to the results of the study, it was found that the average volume of ejaculate in bulls of the Aberdeen Angus breed of Canadian origin is 3.97 ml, which is 0.08 ml (2%) more than in bulls of the Hereford breed and 0.61 ml (16%) more than the Kazakh white-headed breed.

The amount of frozen semen depends on the concentration and amount of ejaculate, and this indicator corresponds to a given value for the concentration of sperm in the ejaculate.

According to the table, the sperm production of sires of the Kazakh white-headed breed was in high demand, which is explained, first of all, by the priority of the livestock of this breed in the Republic of Kazakhstan.

The highest percentage at the 1st insemination among beef breeds falls on the Kazakh white-headed breed. In addition, it was found that the individual abilities of bulls have a significant impact on the fertilizing ability.

According to the table, the fertility of bulls of Kazakh white-headed breed ranged from 47 to 60%; in Aberdeen-Angus - from 30 to 59%; in the Hereford breed - from 45 to 60%.

Genetic factors influencing the formation of products obtained from animal breeds can be predicted in advance by a one-sided dispersion method.

Among the genetic factors that affect the quality of sperm, the following can be distinguished: sire genotype, breed, paternal trace, origin, etc.

The method of dispersion analysis can determine the influence on the formation of the considered products (feature), factors.

In this regard, the results of a one-way analysis of variance were identified to assess the degree of influence of the breed and origin of sires with different genotypes on sperm quality; ejaculate volume, amount of ejaculate and sperm concentration, unsuitability of sperm (Table 2).

Table 2 – Results of the analysis of variance between the degree of reliability of the influence of breed and origin on the index of sperm production

Factors	Indicators	Fisher Criterion		Accuracy
		Per table	fact	
Breed	ejaculatevolume	1	162,032	<0,001
	Amountofejaculate	1	142,356	<0,001
	semenconcentration	1	52,789	<0,001
Country oforigin	ejaculatevolume	3,32	483,106	<0,001
	Amountofejaculate	3,32	378,455	<0,001
	semenconcentration	3,32	122,130	<0,001

The table shows that there are significant differences between the breed and countries of origin of sires with different genotypes in terms of sperm productivity ($p < 0.001$).

The results of the fertility of beef bulls are presented in Table 3.

Table 3 – Fertilizing ability of bulls producing meat breeds

Factor	Genotype	Ejaculate volume. ml	Concentration, billion/ml	Dams inseminated	fertilizedfrom 1 insemination	
					n	%
Breed	Kazakh White-headed	3,28±0,14	0,77±0,03	219	137	62,5
	Aberdeen-Angus	4,04±0,34	0,97±0,23	3172	1403	44,2
	Hereford	4,06±0,28	0,79±0,05	841	463	55,1
Country of Origin	Kazakhstan	4,06±0,28	0,79±0,05	841	463	55,1
	Canada	3,96±0,45	0,76±0,02	837	423	50,5
	Germany	3,46±0,07	0,85±0,02	282	149	52,8

The low rate of fertility for Aberdeen-Angus bulls is based on its breed characteristics and adaptive properties. If we summarize these data, then for breeds in the Republic of Kazakhstan it reaches – 75–80%, for other breeds – 85–90%.

In terms of breeds, the highest rate among meat breeds belongs to the Kazakh whiteheaded breed. In addition, it was found that the individual qualities of bulls have a significant impact on fertility.

According to the list of sires presented in the table, the bulls with names Champion, Voron, Barnaul were distinguished from the Kazakh whiteheaded breed, the indicators of the volume and concentration of ejaculate were 3.67 ml and 0.80 ml/ml; 3.09 and 0.73; 3.30 and 1.01% make up 60%. Of the Aberdeen Angus bulls, the best insemination rate belongs to the Oris bulls – 59%, and the Yong Dale Zepter 115z – 56%.

Among the Hereford bulls, the Vasco bull is in the lead. With the 1st insemination of 300 heads of cows with the sperm of the Vasco bull, the insemination rate reached 60%. This bull showed excellent results in all parameters of sperm production at all stages of its use on the farm, which, in turn, is an important factor affecting fertility.

Based on the study, bulls that have received the best and stable sperm production at all stages of use on the farm are characterized by high fertility.

It can be seen that between the beef bulls, the breed differences in fertilizing ability are not so noticeable. Based on the above data, it can be seen that the fertility of sperm is influenced by the individual characteristics of the bulls and the conditions of the farms that raise females.

Based on the data obtained, it can be seen that heredity directly depends on the fertilizing ability of sperm. Thus, bulls of the Kazakh white-headed breed are superior to the Aberdeen-Angus breed by 7.5% in the percentage of insemination at the 1st insemination.

There are no significant significant interbreed differences between the Hereford and Kazakh white-headed breeds and between the Hereford and Aberdeen-Angus breeds.

The harmonious development of many traits of livestock breeds goes through the variability of the conditions of environmental factors. And the development of traits in the body of animals taken into account in production depends on each other and is characterized by a correlation coefficient.

The sperm production of sires can be influenced by various factors: paratypic and genetic. Including the influence of genetic factors depends on the genotype, breed and country of origin. That is, when determining the reliability of the influence of the studied indicators of various factors on phenotypic variability, it is necessary to assess the strength of the influence of genetic factors. The classic method for determining the strength of a genetic effect is the intraclass correlation coefficient.
In this regard, we determined the strength of the influence of the genotype, breed and country of origin on the quantitative and qualitative indicators of the sperm production of bulls of various genotypes obtained in the study using the correlation coefficient of the class (Table 4).

Table 4 – The strength of the influence of the genotype, breed and country of origin on the quantitative and qualitative indicators of the semen of bulls

Spermproductionindicators	Genetic Factors		
	Sire Genotype	Breed	Country of Origin
spermactivity	0,218	0,103	0,011
ejaculatevolume	0,267	0,124	0,020
semenconcentration	0,233	0,217	0,010
Amountofejaculate	0,245	0,143	0,021
Fertility	0,132	0,102	0,015
Averageofall	**0,22**	**0,14**	**0,02**

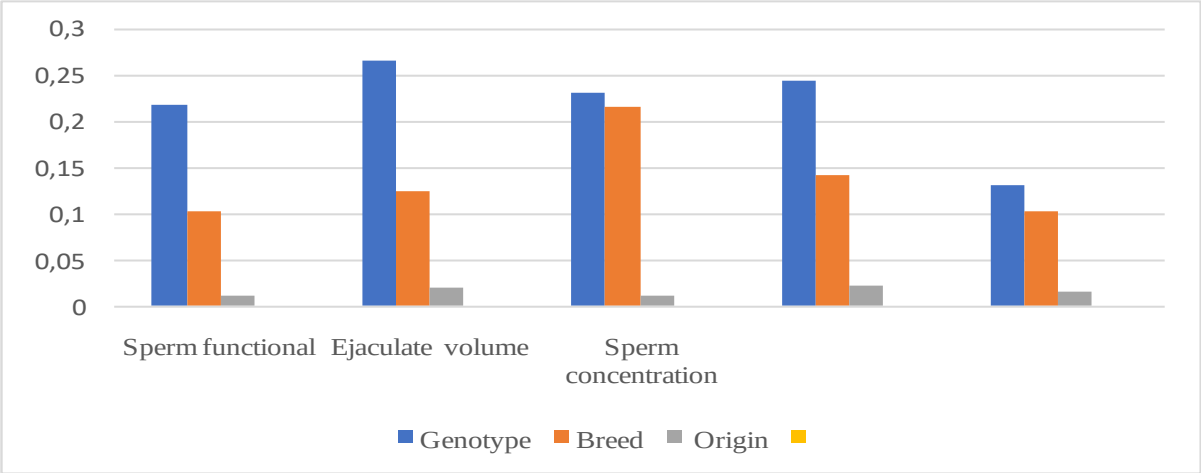

Figure 1 – The power of influence on the quantitative and qualitative indicators of the sperm of sires of the genotype, breed and country of origin

As a result of studies (Table 4), it was found that sperm activity is genetically transmitted 33.20%, which indicates the effect of 21.80% on the genotype, 10.30% on the breed and 1.1% on the country of origin, ejaculate volume, quantity ejaculate in it and the concentration of sperm, respectively, 41.1%, 40.9% and 46.0% for hereditary factors. Such an important indicator; the effectiveness of the use of bulls as a fertilizing ability is determined depending on genetic factors 24.90%: 13.20% of the genotype, 10.2% of its breed and 1.5% of the origin.

In this regard, the results of the study showed that 38% of genetic factors affect the sperm production of bulls. Of these, 22.0% by genotype, 14.0% by breed and 1.5% by country of origin. To determine the influence of genetic factors, such as the genotype, breed and country of origin of the bull, on the reproductive ability, we carried out a one-sided analysis of variance (Table 5).

A one-sided analysis of dispersion showed fairly significant differences between the breed and the origin, fertilizing ability of the sperm of sires of different genotypes.

Table 5 – The results of a univariate analysis of the variability of the influence of the genotype, breed and origin of the sire bull on the fertilizing ability

Factors	Fisher Criterion		Accuracy
	As per table	In fact	
Breed	2,32	4,032	<0,001
Country oforigin	2,37	2,756	<0,05
Sire	1,00	1,730	<0,001

According to the Fisher criterion given in the table, it can be seen that the degree of authenticity of the breed and the sire prevails over the country of origin (P0,001). That is, we can say that the influence of the genotype and breed of sires on the fertilizing ability is higher.

Conclusion. The results of the study showed that the fertility of bulls in the Kazakh white-headed breed was 47–60%; in Aberdeen - Angus – 30–59%; in the Hereford breed, 45–60%.

It was found that the activity of sperm is transmitted genetically 33.20%, of which 21.80% depends on the genotype, 10.30% on the breed and 1.1% on the country of origin, the volume of ejaculate, the amount of ejaculate in it and the concentration of sperm, respectively 41.1%, 40.9% and 46.0% depended on hereditary factors. An important indicator is the fertilizing ability as the efficiency of using bulls 24.90%, determined depending on genetic factors: 13.20% of the genotype, 10.2% of its breed and 1.5% of origin.

In this regard, the results of the study showed that 38% of genetic factors affect the sperm production of bulls. Of these, 22.0% by genotype, 14.0% by breed and 1.5% by country of origin. At

the same time, it can be said that the influence of the genotype and breed of bulls on reproductive ability is higher.

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РЕЗЮМЕ

В статье представлены результаты исследований влияния генетических факторов на оплодотворяющую способность и показатели качества спермопродукции быков-производителей мясных пород.

Основная цель работы: определение влияния породы и страны происхождения на количественные и качественные показатели спермапродукции быков-производителей мясных пород с различным генотипом и взаимосвязь исследуемых селекционных признаков.

Научно-исследовательские работы проводились в Акмолинской области. Объектом исследования являются быки-производители казахской белоголовой, абердин-ангусской и герефордской породы. Практическая часть работы осуществлялась на базе АО "Асыл түлік" на здоровом поголовье с соблюдением всех ветеринарно-санитарных требований. Для исследования оплодотворяющей способности спермы быков получены показатели 18 быков: по казахской белоголовой породе-6 быков, абердин-ангус-6 быков, герефорд - 6 быков. Осеменено 5610 коров и телок: по казахской белоголовой породе-2190, абердин-ангус-2160, герефорд - 1260.

По результатам исследования установлено, что оплодотворяющая способность быков казахской белоголовой породы колеблется в пределах 47-60%; абердин - ангусов – в пределах 30-59%; герефордской породы - в пределах 45-60% и на показатели спермопродукции быков-производителей влияет 38% генетических факторов. Из них 22,0% по генотипу, 14,0% по породе и 1,5% по стране происхождения.

ТҮЙІН

Бұл мақалада етті бағыттағы тұқымдық бұқалардың ұрықтандыру қабілетіне және ұрық өнімінің сапалық көрсеткіштеріне генетикалық факторлардың әсерін зерттеу нәтижелері көрсетілген.

Жұмыстың негізгі мақсаты – әртүрлі генотипті етті бағыттағы тұқымдық өндіруші бұқалардың шәует өнімділігінің сандық және сапалық көрсеткіштеріне мал тұқымы мен шыққан елінің әсерін және зерттелетін селекциялық белгілердің байланысын анықтау.

Ғылыми-зерттеу жұмыстары Ақмола облысында жүргізілді. Зерттеу нысаны ретінде қазақтың ақбасы, абердин-ангус және герефорд тұқымдарының асыл тұқымды бұқалары алынды. Жұмыстың тәжірибелік бөлігі «Асыл Түлік» АҚ базасында барлық ветеринариялық-санитариялық талаптарды сақтай отырып, сау мал басы бойынша жүргізілді. Бұқа шәуетінің ұрықтандыру қабілетін зерттеу үшін 18 бас бұқаның көрсеткіштері алынды: қазақтың ақбас тұқымы үшін – 6 бұқа, абердин ангус – 6 бұқа, герефорд – 6 бұқа. 5610 сиыр мен құнажын ұрықтандырылды: қазақтың ақбас тұқымы бойынша – 2190, абердин-ангус – 2160, герефорд – 1260.

Зерттеу нәтижелері бойынша қазақтың ақбас тұқымының бұқаларының ұрықтандыру қабілеті 47–60% аралығында; Абердин-ангус бұқаларында – 30–59% арасында; Герефорд тұқымында – 45–60% және 38% диапазоны аралығында аталықтардың сперматозоидтарының түзілуіне генетикалық факторлар әсер еткен. Оның 22,0%-ы генотипі бойынша, 14,0%-ы тұқымдылығы бойынша және 1,5%-ы шыққан елінетиесілі болды.

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THE QUALITY OF BIOLOGICAL MATERIAL IN EMBRYO TRANSPLANTATION

ANNATATION

This article presents the results of embryo transplantation in Pobeda LLP, one of the largest farms in the Pavlodar region. New economic conditions dictate the need for identification of selection works to the improvement of breeding and productive qualities of animals. This in turn requires improving the efficiency of artificial insemination method and wider use of embryo transplantation. The main objective of the embryo transplantation method is obtaining maximum number of valuable genotypes of animals from highly productive mothers and fathers, evaluated by the quality of offspring.

In this regard, there is an urgent need to rethink the definition of old and new, original approaches to research in the chosen field of knowledge with the creation and use of fundamentally new methods. However, modernization prospect and practical application of biotechnological method of embryo transplantation for the purpose of overcoming problems in dairy cattle breeding and further development of the industry is impossible without establishment of modern theoretical concepts, systematization, analysis and generalization of the accumulated in the last twenty years, experimental data and manufacturing experience.

Therefore, the embryo transplantation method has been used at the farm "Pobeda" to solve these problems and our goal was to develop and improve the technology to produce not less than 6 embryos per retrieval per donor, to study their qualitative characteristics and to achieve a high engraftment of embryos during transplantation and that experience is summarized here.

Key words: *Biotechnology, transplantation, donor, recipient, ovulation, synchronization, morula, blastocyst.*

Introduction. An effective way to increase productivity in dairy and beef cattle breeding is the use of biotechnological methods of accelerated reproduction of the most valuable parental genotypes [1,2,3].

Notable progress has been shown over the past 20 years in implementation of the assisted reproductive technologies in cows in advance with the study of stages of embryo development, qualitative characteristics of embryos with the purpose of determining suitability for transplantation. Modern biotechnological methods of cattle reproduction include artificial insemination of cows, deep freezing of semen, the technology of embryo transplantation. The main advantages of the latter are, firstly, the possibility of regulation of multiple pregnancies and increasing the intensity of selection replacements; secondly, there is a possibility of quick reproduction of highly productive animals, including donor herd of cows, which directly have characteristics of high productivity [4].

A cow can reproduce up to 6–8 calves during its life and with the use of transplantation technology, tens or hundreds of descendants with highly economically valuable traits. The use of this method makes it possible to obtain 50–60 embryos suitable for transplantation from one donor cow per year, or 25–30 newborn calves [5].

Currently the work of livestock breeders is very difficult and demanding as it needs using new technologies in order to improve productivity. Thus, biotechnology in the process of cattle reproduction and breeding is of particular importance, since this type of animals belongs to the singleton species of mammals, while cow ovaries contain hundreds of thousands of immature eggs - oocytes, representing a huge genetic reserve [6,7].

In Kazakhstan the work on embryo transplantation based on global experience began in the last years. Embryo transplantation is regarded not as a substitute but as a complement to the method of artificial insemination. Using this method differently can significantly increase the genetic value of farm animals, successfully overcome some forms of infertility, provide favorable conditions for the implementation of special breeding programs [8,9,10].

Expansion of embryo transplantation technology has allowed to conduct some series of studies to improve and control the processes of separation and freezing, zygote transplantation and determine the time and place of their application. These achievements are very valuable in the study of genetic parameters and functions of farm animals reproduction [11].

The main stages of embryo transplantation using the in vivo technique is superovulation, egg fertilization, zygote formation, and then its fragmentation and blastomerization. Knowledge of the oocyte morphology makes it possible to control the development of the donor cow embryos, starting from the process of obtaining embryos by washing, and thus allows the assessment of the embryo and determining its further development [12,13,14].

In this regard, the introduction of embryo transplantation technology for the development of cattle breeding is justified. Practical application of this method in the dairy and beef cattle provides intensive breeding of animals with a high genetic value, accelerates obtaining of valuable breeding bulls, whose mothers are outstanding ancestors, enhances the effectiveness of breeding, recovery of herds from several diseases [15,16,17].

Pavlodar region is the region with the developing cattle breeding, where administration in cooperation with academic institutions developed and implemented a program of state support and working on the study of adaptive and productive qualities of cattle imported breeds of foreign selection. In these favorable conditions for the development of animal husbandry in the region implementing embryo transplantation technology based on imported breeds of cattle with the aim of obtaining valuable genotypes is justified and forward-looking [18,19,20].

Research material and methodology. The study was carried out from 2020 to 2021 in the Pobeda LLP of the Pavlodar region (Republic of Kazakhstan). 10 heads of record-breaking cows of the Simmental breed were selected as donors. The donor cows were selected according to zootechnical data analysis. These were healthy animals with no gynecological diseases, weighing 550–650 kg, giving 6000–8000 kg of milk perlactation, and having from 2 to 5 lactations. To induce superovulation in cows, a folliclestimulating hormone was used (Pluset, Laboratorios Calier, S.A., Spain). Hormone injection was performed intramuscularly twice in decreasing doses for 4 days (10 mL in total). The order of administration of the hormone was as follows: On the first two days, 1.5 mL in the morning and evening, and on the third and fourth day, 1 mL. In conclusion, 4 mL of prostaglandin (Magestrophan, Mosagrogen JSC, Russia) was injected in the morning and evening for the rapid manifestation of cow heat. The superovulation pattern of donor cows is shown below.

Table 1 – Donor Superovulation Pattern

The time of the sexual cycle	Pluset hormone (KDAG)	
	It's morning 06:00	o'clock in the evening 18:00
0 day	Arrival of donors	
11 day	1,5 mL	1,5 mL
12 day	1,5 mL	1,5 mL
13 day	1,0 mL	1,0 mL
14 day	1,0 mL +2,0 mL prostaglandin (Magestrophan)	1,0 mL +2,0 mL prostaglandin (Magestrophan)
Day 16 or cycle day 0 (due date)	Artificial insemination (with 2 amounts of semen)	Artificial insemination (with 2 amounts of semen))
7 days of the cycle	embryo abortion	

At the end of hormonal treatment, the manifestation of heat was detected in each cow under study, according to external signs and behavioral changes. Artificial insemination was carried out twice (in the morning and the evening, two doses each) with the sperm of a bull assigned to each

donor cow. On the 7 th day after artificial insemination, the embryos were washed out of the uterine horns with Dulbecco solution, which was collected into a container after treatment, controlling the volume of fluid.

After the embryos were deposited on the bottom of the bottle, the upper part of the solution was drained using the siphoning effect. The remaining solution at the bottom of the bottle with a volume of up to 5 cm3 was gently shaken and poured into Petri dishes. Embryo detection was performed using a Nikon SMZ-745 microscope, with a magnification of ×50–100 or more. The quality of the embryos was assessed according to morphological parameters by stereomicroscopic examination.

Using of embryo transplantation method we have tried to solve another problem – obtaining valuable adaptive genotypes of donor animals of imported breeds, transplants from highly productive mothers and fathers. The local cows that carry embryos are recipients. Many imported breeds poorly adapt and do not realize their genetic potential when being brought into new conditions.

Research results discussions. Morphological assessment of embryos is one of the main methods of integrated assessment. Its aim is embryo selection suitable for conservation and transplantation, culling degenerated embryos and identification of anomalies in their development. Decisive importance in assessing the quality of transplanted frozen - thawed embryos is their viability, checked by culturing in vitro or transplantation to recipients.

Table 2 – Quantity and quality of embryos received from Simmental breed

Nickname, cow's number	Quantity of received embryos		Embryo quality			
	Total		Suitable		Unsuitable	
	n	%	n	%	n	%
23123	4	100	4	100	-	-
70775	23	100	16	69,5	7	30,5
16533	15	100	10	66,6	5	33,4
91773	10	100	6	75,0	4	25,0
97621	8	100	6	75,0	2	25,0
06935	7	100	4	57,1	3	42,8
84162	4	100	3	75,0	1	25,0
85085	4	100	3	75,0	1	25,0
80223	0	0	-	-	-	-
02136	0	0	-	-	-	-
Total	75	100	52	69,3	23	30,7

According to our research out of 10 donors only 8 cows reacted. The results of embryos quality evaluation showed that 75 embryos were flushed from those donor cows out of 10 donor cows, the embryos from 2 cows were not received, 52 embryos turned out to be suitable for transplanting which is 69.3 %. The number of flushed embryos varies from 0 to 23, the results obtained indicate that the total number of produced embryos also depends on the individual characteristics of the donor.

Figure 1 – Determination of embryo quality assessment

The efficiency of transplantation is largely determined by the method of extraction of the embryos. Fertilized eggs from superovulated donor cows can be extracted in three ways: after the slaughter of donor cows; surgical; non-surgical. The easiest and most reliable method of extraction of the embryos is slaughter of donor cows. This method was practiced only in the early stages of development of the method of transplantation. At the present time it is not used because of the loss of genetically valuable donor cow.

The important point, ensuring the efficiency of extraction of embryos, is the definition of the stage of their development and location in the genital tract of the donor cow.

At the farm "Pobeda" we extracted the embryos using a non-surgical way as the part of our research work. The main advantage of non-surgical method of extraction of the embryos is the ease of manipulations.

It does not require special operating room. Washing-out was repeated 5–8 times. The main part of the embryos was extracted in the first three or four wash-outs. It took approximately 50 minutes to wash-out both horns of the uterus, including the establishment of catheters. During this time, more than 50 % of the embryos were extracted at the stage of morula or blastocyst.

After extracting and assessing the viability we transferred embryos in a nutrient medium with the temperature of 37 degrees. Most of the nutrient mediums where the embryos were cultivated and stored, included solutions of salts, amino acids with bicarbonate ion as a buffering agent providing a pH in the range of 7.2 and 7.6. Our studies showed that the duration of cultivation without loss of biological qualities of embryos is possible up to 95 hours.

The indicators of morphological assessment are very important, because the visible diversity is an indicator of internal physiological and biological inferiority of embryos.

Special attention is paid to the fluctuation of the volume of embryos, their shape, integrity, state of the transparent membrane and protoplasm.

The biologically usable are considered to be the embryo which has a spherical shape, homogeneous cytoplasm, undamaged transparent membrane, equally sized blastomeres with tight intercellular contact and must comply with the level of crushing, the age from the moment of fertilization until its extraction.

The normal morula has the shape of a sphere. Doubling the number of blastomeres in morula occurs every 24 hours. The degree of fragmentation of embryos in the early period may be due to the lengthiness of ovulation. Some morula have individual cells that can bulge, they may have small bubbles on their surface.

Along with the assessment of the quality of embryos, the stage of embryo development was studied, as embryo's settling down depends on its development.

Table data on stages of development show that 52 embryos were transplanted, 5.8 % of which was at the early stage of morula, 57.7 % at the stage of compact morula, 28.8 % at the early stage of blastocyst and 7.7 % at the stage of blastocyst.

Table 3 – Stage of embryo development of cows of Simmental breed

Number of the donor-cow	Total number of embryos		Stages of embryo development									
			Early morula		Compact morula		Early blastocyst		Blastocyst		Expanded blastocyst	
	n	%	n	%	n	%	n	%	n	%	n	%
23123	4	100	-	-	2	50	2	50	-	-	-	-
70775	16	100	-	-	10	62,5	3	18,7	3	18,7	-	-
16533	10	100	2	20	5	50	3	30	-	-	-	-
91773	6	100	-	-	4	67	2	33	-	-	-	-
97621	6	100	1	20	3	50	2	30	-	-	-	-
06935	4	100	-	-	2	50	2	50	-	-	-	-
84162	3	100	-	-	1	33,3	1	33,3	1	33,3		
85085	3	100	-	-	3	100	-	-	-	-	-	-
Total	52	100	3	5,8	30	57,7	15	28,8	4	7,6	-	-

The data on the assessment and development of embryos corresponds to the requirements of transplantation which will provide a high percentage of embryo survival and receiving of transplant calves.

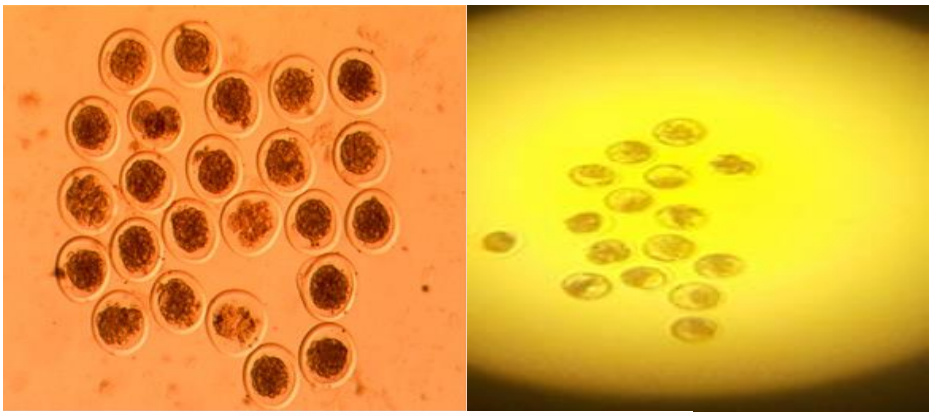

Figure 1 – Viable embryos for transfer

As it has been noted above, the embryos were transplanted to healthy heifers of local black - motley breed with a live weight of 380 to 420 kg above the average fatness in order to obtain the adaptive animal. The main indicator of recipient selection was the absence of gynecological disorders, and productive, breeding and breed qualities was not so important. However, recipients with poor body condition, low fertility after the first insemination, may have problems with settling down the embryos.

On average, 5–6 recipients were collected for each donor. Most experts believe that physiologically developed heifers with good breeding conditions are more suitable as recipients.

The basic condition of good implantation of embryos is synchronous manifestation of sexual hunting of donors and recipients. The time difference in the manifestation of sexual hunting should not exceed 24 hours, the optimal results are obtained when the difference is not more than 12 hours.The modern level of techniques of transplantation recommend to transplant embryos immediately after their extraction from the horns of the uterus of the donor and evaluation.

Animal genetic resources are valuable and strategically important capital of any country, since they are connected with the problem of providing the population with food, industry with raw materials.

According to Boettcher P., Gandini G. to preserve the gene pool of farm animals is necessary to carry out activities at two levels: the population and cell biotechnology.

At the population level relic farms should be established in different regions for the conservation of endangered species and populations of animals in genetic pool preserving farms; obtaining from them a sufficient number of gametes and embryos and their further cryopreservation; accelerated reproduction of valuable species by transplanting embryos; genetic expertise of existing in the country and imported into the country breeding animals to protect genetic resources of Kazakhstani livestock from drift of undesirable genes. The need for these activities is due to the possibility of harmful genes importation, fraught with the most unpredictable and undesirable consequences.

According to M. Ayatkhanuly, T. Bekseitov one of the key points for rapid multiplication of valuable genotypes of animals is the development of fundamental and applied bases of biotechnological techniques such as embryo transplantation, aimed primarily at maximizing the use of reproductive abilities of donor cows. For a more complete use of this huge genetic potential as an indispensable tool serves a biotechnological method - embryo transplantation in combination with hormonal induction of superovulation.

Zh. Almantay notes that embryo transplantation plays an important role in dairy and beef cattle of the country, and its importance will continue to grow, as it allows a better use of biological reserve of females to improve livestock production.

T. K. Bekseitov, R. B. Abeldinov note that Kazakhstan has taken timely measures to solve fundamental problems of conservation and accelerated reproduction of valuable and rare genotypes.

Conclusions. The results of studies on the stages of embryo development, assessing the embryo quality meet the physiological parameters, the results will increase the percentage of embryos engraftment and obtain a large amount of valuable transplant-calves.

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ТҮЙІН

Бұл мақалада Павлодар облысындағы ірі шаруашылықтардың бірі «Победа» ЖШС-да эмбрион трансплантациялау жұмыстарының нәтижелері көрсетілген. Жаңа экономикалық жағдайлар жануарлардың асыл тұқымдық және өнімділік қасиеттерін жақсарту үшін селекциялық жұмыстарды анықтау қажеттілігін туындатады. Бұл өз кезегінде қолдан ұрықтандыру әдісінің тиімділігін арттыруды және эмбриондарды трансплантациялауды кеңінен қолдануды талап етеді. Эмбриондарды трансплантациялау әдісінің негізгі мақсаты – ұрпақтарының сапасымен бағаланатын, өнімділігі жоғары аналықтар мен аталық малдардың құнды генотиптерінің максималды санын алу.

Осыған байланысты таңдалған білім саласындағы зерттеулерге ескі және жаңа, өзіндік көзқарастардың анықтамасын түбегейлі жаңа әдістерді құру және қолдану арқылы қайта қараудың шұғыл қажеттілігі туындайды. Алайда, сүтті мал шаруашылығындағы проблемаларды еңсеру және саланы одан әрі дамыту мақсатында эмбриондарды трансплантациялаудың биотехнологиялық әдісін соңғы жиырма жылда, тәжірибелік деректер мен өндірістік тәжірибелерді модернизациялау перспективасы мен практикалық қолданылуы қазіргі теориялық тұжырымдамаларды, жүйелеуді, талдауды және жинақталғанды жалпыламай мүмкін емес.

Сондықтан осы мәселелерді шешу үшін «Победа» жауапкершілігі шектеулі серіктестігінде эмбриондарды трансплантациялау әдісін қолдану арқылы бір донордан орташа 6 эмбрион алуға болатындығын, алынған эмбриондардың сандық және сапалық көрсеткіштерін бағалап, талдау жұмыстары жүргізілді.

РЕЗЮМЕ

В данной статье представлены результаты работы по трансплантации эмбрионов в ТОО «Победа», одном из крупнейших хозяйств Павлодарской области. Новые экономические условия диктуют необходимость выявления селекционных работ по улучшению племенных и продуктивных качеств животных. Это, в свою очередь, требует повышения эффективности метода искусственного осеменения и более широкого использования трансплантации эмбрионов. Основной задачей метода трансплантации эмбрионов является получение максимального количества ценных генотипов животных от высокопродуктивных матерей и отцов, оцениваемых по качеству потомства.

В связи с этим возникает острая необходимость переосмысления определения старого и нового, оригинальных подходов к исследованиям в выбранной области знаний с созданием и использованием принципиально новых методов. Однако перспектива модернизации и практическое применение биотехнологического метода трансплантации эмбрионов с целью преодоления проблем в молочном скотоводстве и дальнейшего развития отрасли невозможны без создания современных теоретических концепций, систематизации, анализа и обобщения накопленных за последние двадцать лет экспериментальных данных и производственного опыта.

Поэтому для решения этих задач в хозяйстве «Победа» был использован метод трансплантации эмбрионов, целью которого было разработать и усовершенствовать технологию получения не менее 6 эмбрионов за одно извлечение на одного донора, изучить их качественные характеристики и добиться высокой приживляемости эмбрионов при трансплантации, и этот опыт обобщен в данной работе.

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FEATURES OF GENETIC POTENTIAL AND DEFINITION QUANTITATIVE CONTENT OF IMMUNOGLOBULINS IN LAMBS AND SHEEP MEAT-FAT KAZAKH FAT-TAILED ROUGH-HAIRED BREED

ANNOTATION

This article presents research on the dietary benefits, protein, and immunoglobulin spectrum of blood serum in newborn lambs using agar gel electrophoresis, immunoelectrophoresis, and radial immunodiffusion.

The results indicate the crucial importance of colostrum feeding as the primary source of immunoglobulins and colostral immunity in newborn lambs. The study also examines the heritability and repeatability of these traits, along with the influence of paternal and maternal factors on the type of birth in young animals. The protein content in the blood serum of twin-born animals was lower by 2-3%, regardless of age, compared to single-born lambs. The hemoglobin content in the blood of single-born lambs was higher than that of twins by 2.3% at 4 months and by 3.6% at 7 months. Additionally, the phagocytic and bactericidal activity of the blood serum in single-born lambs was higher than in twin-born lambs.

For future work, to increase the meat productivity of kazakh fat-tailed sheep and enhance the profitability of meat production in the Almaty region, it is recommended to select animals of twin birth type.

Key words: *protein composition of blood, hemoglobin, reproductive ability, sheep, heritability coefficient, repeatability*

Introduction Experience in the development of the sheep industry on a global scale shows that increasing efficiency and competitiveness requires fully utilizing the potential for sheep meat productivity. To ensure meat specialization in the sheep industry, it is necessary to use breeds characterized by high meat quality and early maturity. These requirements are fully met by fat-tailed sheep breeds oriented towards meat production. Sheep breeding is one of the main branches of animal husbandry in the southeast of Kazakhstan. To increase meat roductivity, some breeders use interbreeding methods, while the improvement of productive qualities can also be achieved through purebred breeding to preserve valuable hereditary traits and breed integrity [1, 2].

At the current stage of animal husbandry development, preserving livestock populations and increasing their productivity is particularly relevant. Therefore, it is necessary to identify and study biologically active substances that enhance the viability and productivity of animals. These substances include immunoglobulins, which are animal-derived proteins with protective properties. Chemically,

immunoglobulins are complex proteins—glycoproteins containing carbohydrates. Five classes of immunoglobulins have been identified in human blood serum (G, M, A, D, and E), and three classes (G, M, and A) in the blood serum of farm animals. Immunoglobulins protect the body from viruses and bacteria, neutralize foreign antigens, and create optimal conditions for biochemical processes that increase animal productivity. To date, significant progress has been made in studying the immunoglobulins of farm animals [3,4].

Meanwhile, methods for the isolation and identification of immunoglobulins, especially IgM and IgA, and their quantification require further development. The protein composition of the blood serum of sheep and cattle is insufficiently studied under normal conditions and in various diseases. The protein and immunoglobulin spectrum of blood serum in newborn animals and their dynamics in postnatal ontogenesis are of particular scientific and practical interest.

The relevance of studying blood serum proteins is due to their constant exchange with proteins of organs and tissues, which affects the intensity of metabolic processes and the productivity of animals. Modern biochemical studies contribute to establishing the immunological status of animals and can be used in breeding work to improve existing breeds and create new breeds and breed groups [5].

In this regard, studying the spectrum of immunoglobulins in the ontogenesis of young farm animals is particularly relevant, especially in the early hours of ontogenesis. This period is crucial for the formation of the immune system, which underpins the body's defenses and productivity. Over the past decade, the livestock industry has suffered significant damage due to socio-economic shocks, leading to a decrease in both livestock numbers and productivity [6].

Researchers explain the prevalence of meat-fat fat-tailed sheep breeds in many countries by their unpretentiousness to feed and high potential for adaptation and acclimatization, which allows them to survive in a wide variety of conditions, including arid zones, semi-deserts, and cold mountain areas. Additionally, these sheep are highly responsive to the improvement of natural feeding conditions and feeding, i.e., they have high rates of feed efficiency [7,8,9]. Sheep meat comes from a wide variety of farming systems, from extensive to intensive indoors, with slaughter of animals of different ages. In Europe, slaughter can be carried out from the age of 4 weeks in dairy lambs to adulthood. [10]. Crossbreeding is a common practice among commercial sheep producers in order to improve animal productivity[11]. One of the main conditions for increasing the production of lamb meat is the improvement of selection and breeding work, along with the widespread use of industrial crossing in sheep breeding.

In the practice of global sheep breeding, an important place is given to crossing local native breeds of sheep with commercial breeds of different productivity directions, using the world's gene pools. Such methods make it possible to increase the volume of sheep production and improve its quality in a short period. The resulting crossbreeds exhibit early maturity and are not inferior in productivity to the original breeds. [12]. Studies have been conducted in the semi-arid region of Brazil to assess the productivity and characteristics of sheep carcasses of local breeds and their crosses; however, these studies use exotic breeds that produce precocious lambs with heavier carcasses, but not adapted to climatic conditions and an extensive production system, which jeopardizes the sustainability of the sheep production system[13].

It should be noted that the market economy has made its own adjustments to the breed composition and breed zoning of sheep in the republics. After the transition to market relations, sheep breeders began to focus on breeding sheep in the meat-fat fat-tailed direction of productivity. Currently, the share of such sheep in the total livestock population exceeds 70%. This trend, driven by high consumer demand for organic lamb and mutton, as well as the economic benefits of raising these sheep for agricultural production, is expected to continue increasing in the near and long term.

Of particular interest for research is the staging and periodization of the embryonic and postembryonic periods of animal development, which opens up the possibility of directed influence on the formation of desirable productive qualities [14, 15].

One of the most highly productive breeds of sheep is the kazakh fat-tailed meat-fat breed. This breed is characterized by high precocity, excellent constitution and unpretentiousness to the level of feeding and keeping conditions.

In this regard, the present research work is devoted to the study of biological and productive features of Kazakh fat-tailed sheep obtained from single and twin litters. It is relevant and holds certain scientific and practical interest

The aim of the research was to provide scientific and practical substantiation for the study of the general patterns of development of lambs of the kazakh fat-tailed breed during ontogenesis. This includes analyzing the protein and immunoglobulin composition of the blood serum of newborn lambs before taking colostrum. Additionally, the study aims to develop effective methods for increasing the meat productivity of Kazakh fat-tailed sheep. This is examined in the comparative aspect of lamb production from sheep born in single and twin litters, within the environmental conditions of the south and south-east of Kazakhstan.

Materials and methods of research. The experimental part of the study was conducted on populations of Kazakh fat-tailed sheep in Raiymbek district, Almaty region. The facility is recognized as a leading breeding establishment specializing in the meat-fat fat-tailed breed of sheep. The husbandry practices employed at the facilityadhere to the traditional methods characteristic of this region. Biochemical parameters. Morphological and biochemical parameters of blood were studied in accordance with the guidelines for physiological and biochemical studies of the blood of farm animals and poultry. Blood samples for biochemical and hematological studies were taken from the jugular vein of sheep aged 4 and 7 months. The assessment of hematological parameters utilized an automatic Abacus junior vet analyzer (Diatron, Austria), which counts blood cells by the Culter method, or by the conductometric method based on the fact that cells pass through a small aperture. The hemoglobin content was determined by photometric method. Biochemical parameters of sheep blood plasma were studied on an automatic analyzer Labio 200 (Mindray Medical International Limited, China). The protein and immunoglobulin composition of the blood serum of newborn lambs was studied by electrophoresis, immunoelectrophoresis, and radial immunodiffusion. Blood collection from newborn lambs was performed within 10-30 minutes after birth before taking colostrum. Agar gel electrophoresis utilized a borate-acetate buffer with a pH of 8.6, in an electrophoretic chamber made of plexiglass, buffer composition: 43.55 g of sodium acetate, 52.58 g of boric acid and 76.28 g of borax were dissolved in 10 liters of distilled water. The pH of the buffer is 8.6. Immunoelectrophoretic analysis of blood serum was also performed in borate-acetate buffer using antisera against sheep proteins. The immunoglobulin composition of blood serum was studied in borateacetate buffer by radial immunodiffusion using monospecific immune sera to sheep immunoglobulins.

Results and their discussion. One of the urgent problems of modern agricultural science and practice continues to be the search for objective, reliable, highly effective methods for assessing the genetic potential of breeding animals. Identification of the best genotypes and their widespread use in practical breeding will significantly speed up the breeding process and increase its efficiency [16, 17].

The search for such animals within lines, herds, and breeds cannot be limited to the use of phenotypic characteristics alone; it can be highly effective when a comprehensive assessment of both phenotype and genotype is undertaken. Extensive material from domestic and foreign science and practice indicates that the use of blood group information in breeding work allows not only to assess the genetic relationships between breeds, which has great theoretical significance, but also to determine the most effective paths for further development of livestock in general, and sheep breeding in particular.

This becomes especially relevant at present, when significant attention is paid to the restoration of the sheep breeding industry and its efficient development. The overwhelming majority of researchers have concluded that immunogenetic analysis based on the identification of blood groups, combining relative simplicity of execution on a sufficiently large headcount, with quite high performance, remains the most convenient and reliable method to solve a number of practical breeding tasks.

The genetic potential of zoned breeds must fully correspond to the intensification of the industry in its economic expression. Based on this, work was initiated to create meat-fat fat-tailed sheep in the mountainous regions of the Almaty region, which are capable of best recouping the costs of production.

The main indicator revealing the picture of metabolism in the body of animals is blood. Thanks to a well-developed network of blood vessels and capillaries, it comes into contact with the cells of all tissues and organs, thereby providing them with the possibility of nutrition and respiration. Any

impact on the body's tissues affects the composition and properties of blood. Based on the above, we studied the morpho-biochemical parameters of sheep's blood depending on the type of birth [18, 19].

The studied clinical and physiological parameters were within the physiological norm. The body temperature of lambs and rams ranged from 38.5 to 38.8 °C at birth and from 39.1 to 39.7°C at weaning. An increase in the body temperature of animals during shearing is associated with stress and adaptation to high summer air temperatures.

The results of the study of the dynamics of the live weight of rams of the Kazakh fat-tailed breed, control weighing of animals, show that at birth, single lambs were larger than their peers from twin litters.

During the first month of life, sheep from single litters increased their live weight by an average of 7.32 kg, and from twin litters by 5.36 kg. During the suckling period, before reaching the age of 4 months, twin sheep averaged a weight of 25.5 kg, which is 6.15 kg (19.4%) less than single sheep ($P>0.999$). At the age of 7 months, this difference was 9.25 kg or 22.8% ($P>0.999$) in favor of animals from single litters.

Immunoglobulins, the main protective proteins of human and animal bodies, are crucial to humoral immunity. Five classes of immunoglobulins–G, M, A, D, and E—have been found and identified in humans, determining the immune status and resistance of an individual. In farm animals—cattle, sheep, and goats—three classes of immunoglobulins, G, M, and A, have been identified, with immunoglobulin G consisting of two subclasses: G1 and G2.

All classes of immunoglobulins are important for the body's immune defense, but biologically, Class G immunoglobulins are the most significant. They are found in the highest amounts in the blood, colostrum, and milk of animals, contain antibodies to various antigens, and are the main indicator of the body's immune defense.

Previously, we studied the formation of the G1 and G2 immunoglobulin system in single and twin lambs of the Kazakh fat-tailed sheep breed. However, the analysis of theoretical and applied studies on the immune system highlighted the need to investigate the formation of the M and A immunoglobulin system further. This research will allow a deeper understanding of the immune system's development in farm animals, particularly sheep. IgM, a high-molecular-weight protein in blood serum with a molecular weight of about 1 million and a sedimentation constant of 19S, contains approximately 10% carbohydrates. IgM is an antibody of the primary immune response, synthesized first after antigenic stimulation. After a few days, the synthesis of IgM transitions to IgG, and later to IgA. An essential property of IgM is its presence on the surface of B-lymphocytes as their primary receptors.

Immunoglobulin A is one of the least studied protective proteins in humans and animals, due to its low content in normal animal blood serum, challenges in identification and isolation in its pure form, and similarities with immunoglobulins G and other non-immunoglobulin proteins. Such characteristics can be used to solve the problematic situation associated with a shortage of animal protein for human consumption, especially in conditions of climatic changes [20]. In farm animals, it is present in small amounts, while in human blood, it is relatively more abundant. Immunoglobulins A primarily protect the mucous membranes of the gastrointestinal, respiratory, and genitourinary systems, and in the blood, they act as carriers of various antibodies. IgM and IgA are identified only by immunoelectrophoresis, double diffusion reactions, and cross-reactions with human anti-IgM and IgA, and are quantified only by monospecific antisera.

For the first time, genetic variations in the antigenic concentrations of red blood cells in different types of Kazakh fat-tailed sheep were studied. A significant variability in the frequency of occurrence of individual antigenic factors was observed: the most common were Aa, Bd, Ca, Cb, Mai, and R factors (0.707-0.836), less frequently Ab, Bb, Be, Bi, Bg (0.405-0.607), and even less frequently Mb and Da (0.288-0.349).

Concurrently, 9 out of the 14 factors studied—Aa, Bb, Bd, Be, Bg, Ca, Cb, Ma, and O factors, accounting for 64.2%—had a similar distribution in both wool and meat-wool sheep. Significant differences in the frequency of occurrence were found only for five blood groups—Ab, Bi, Mb, Da, and O (**$P < 0.01$**). This information laid the groundwork for assessing the genetic intra-breed and inter-breed relationships of the meat-fat Kazakh fat-tailed rough-haired sheep breed.

Thus, immunogenetic analysis methods enable the determination of the probable value of selection, prediction of the effectiveness of breeding work, planning further selection to consolidate the hereditary resistance of animals, and monitoring and maintaining heterozygosity at a level that ensures sufficient variability and plasticity of breeding herds.

One of the most pressing issues in the breeding improvement of farm animals, including sheep, is identifying the most valuable genotypes that align with the processing industry's requirements for productivity and product quality, which ultimately caters to the consumer market.

For decades, breeding has relied on the assessment of animal phenotypic traits. However, with the advent of modern genetic analysis methods, assessments based on the genetic marking of loci associated with productivity levels and traits have become increasingly prevalent in animal husbandry.

The key advantage of the genetic approach to predicting an animal's economic value is that marker identification is possible at the earliest stages of the animal's life. This allows for the determination of its productive potential almost immediately after birth and informs its subsequent utilization. Despite the growing recognition of molecular genetic methods, the relevance of immunogenetic indicators remains undiminished.

In the intensive rearing of young sheep of the meat-fat Kazakh sheep rough-wool breed for meat, the greatest impact comes from the rearing approach and the completeness of the diet, which enhances product quality and reduces feed costs per unit of production. To boost the production of high-quality lamb and mutton, it is essential to utilize the genetic potential of the meat-fat Kazakh fat-tailed rough-wool breed more effectively and market the meat of young animals aged 4 months.

Feed concentrates play a pivotal role in this context, as they can regulate the level of degradable protein in the diet. Consequently, based on the degradable protein level of feed included in the winter diet of rams, we have developed and tested recipes for mixed feed concentrates, tailored to the hay-silage-concentrate type of feeding (table 1).

Table 1 – Recipes for mixed feed concentrates for rams (% by weight)

Component	Recipe	
	№ 1	№ 2
Wheat bran	25,0	25,0
Corn turf	44,0	56,5
Soy meal	25.0	12.5
Molasses (solution)	5.0	5.0
Premix	1.0	1.0
Total	100	100
1 kg of mixed feed contains:		
Feed units	1.15	1.14
Exchange energy m J	11.0	11.5
Dry matter, g	862.5	835.0
Crude protein, g	198.9	154.3
incl. degradable, g	116.6	84.8
Non-decomposable, g	82.3	69.5
Digestible protein, g	160.7	118.2
Crude fat, g	37.9	38.7
Crude fiber, g	56.5	52.5
BEV, g	535.7	430
Including starch, g	281.5	335
Sugar	112.7	110.8
Calcium, g	3.55	3.27
Phosphorus, g	6.34	6.16
Magnesium, g	2.55	2.29
Sulfur, g	2.16	2.99
Iron, mg	243	254
Copper, mg	8.49	6.76
Manganese, mg	41.44	37.3
Cobalt, mg	od	0.09
Iodine, mg	0.63	0,58

As can be seen from the data in Table 1, the main composition and nutritional value of mixed feeds of both recipes were almost the same, the difference was in the ratio of individual components that contribute to the creation of different levels of degradable protein in the diet; recipe No. 1 - contained 58.6%, and No. 2 –54.9% of degradable protein.

The main feeds of the south-east of Kazakhstan contain different amounts of protein fractions decomposable and non-decomposable in the rumen.

Proteins of clover and alfalfa grass (83.6-84.6%), grass of foothill and mountain pastures (70.0-71.7%), alfalfa hay and haulage (76.6-81.3%), corn silage (78.6%), oat and barley grains (84.0-85.3%) are most intensively decomposed in the rumen. Pasture proteins, alfalfa hay flour, and soy grains are broken down in the range of 60-65%, while hay, straw, and corn grains, soybean meal, and corn on the cob are broken down in the range of 31.8-55.3%. Reducing the level of protein breakdown in the diet of the control group from 75.5% to 64.0 and 58.2% in the experimental groups, by adding feed concentrate, significantly increased all productivity indicators.

Thus, the analysis of the dynamics of indicators that characterize weight growth allows us to conclude that certain differences are caused by the genotype of animals, gender, and physiological state.

At the same time, the advantage in all cases was on the side of rams, young ewes were characterized by minimal indicators. At the same time, the data obtained indicate a fairly high level of productivity of young animals of all genotypes.

Introduction of research results into practice will ensure the fullness of the diet and thereby significantly increase the productivity of animals, improve the quality of their products and reduce

feed costs per unit of production. To increase the production of high-quality lamb and mutton, it is necessary to more effectively use the genetic potential of meat-fat Kazakh fat-tailed rough-haired sheep and sell young animals aged 4 months for meat.

In order to study the features of the formation of the M and A immunoglobulin system, the blood serum of 3 Kazakh fat-tailed lambs was studied 20-30 minutes after birth before taking colostrum, 24-36 hours after taking colostrum, on the 10th day and at the age of one month and 3 months. The protein composition of the blood serum of ewes and their lambs was studied by electrophoresis in agar and polyacrylamide gels. Agar gel electrophoresis was performed in a borate-acetate buffer, pH 8.6, in an electrophoretic chamber made of plexiglass. Buffer composition: 43.55 g of sodium acetate, 52.58 g of boric acid, and 76.28 g of borax were dissolved in 10 liters of distilled water. The pH of such a solution is 8.6. Immunoelectrophoresis was performed in 1% agar using borate-acetate buffer, pH 8.6. A gel plate was placed in a wet chamber for 48 hours to form a precipitation line. After the reaction was completed, the immunoelectrophoregram was washed of ballast proteins in an isotonic sodium chloride solution for a week, then dried and stained with amido-black 10 B.

Identification of immunoglobulin M in sheep blood sera was performed by immunoelectrophoresis, double diffusion reactions, and cross-reactions using human anti-Ig M and human Ig M.

Identification of immunoglobulin A in sheep blood sera was also performed by cross-reaction immunoelectrophoresis using human anti-IgA and human Iga. Quantitative determination of immunoglobulins M and A was performed by radial immunodiffusion in agar gel using monospecific immune sera to them. The results obtained for determining the quantitative content of immunoglobulins M and A in lambs of the Kazakh fat-tailed breed in early postnatal ontogenesis are shown in table 2.

Table 2 – Content of immunoglobulins M and A in the blood serum of lambs, mg / ml

Age of lambs	n	Immunoglobulins	
		M	A
1	2	3	4
Sheep lambs			
0.5 h before taking colostrum	3	0.13±0.01	-
24 hours after taking colostrum	3	3.12±0.21	1,78±0,29
10 day	3	2.98±0.42	0,58±0,04

1	2	3	4
1 month	3	1.24±0.09	0,26±0,1
3 month	3	2.17±0.18	0,35±0,02
Lambs of twins			
0.5 h	3	0,21±0,01	-
-24 hours	3	4,20±0,22	1,93±0,17
10 day	3	2.48±0.37	0,49±0,08
1 month	3	2.17±0.26	0,43±0,07
3 month	3	2.22±0.25	0,39±0,05

As indicated in table 1, immunoglobulin M in the blood serum of newborn lambs of both breeds is present in trace amounts before colostrum intake and reaches 3.12 ± 0.21 and 4.21 ± 0.22 g% respectively, 24 hours after birth. Immunoglobulin A in lambs appears in noticeable amounts only after 24 hours of postnatal life (1.78 ± 0.29 and 1.93 ± 0.17 mg/ml respectively), and its level rapidly decreases as the lambs grow, being 0.35 ± 0.43 mg/ml.

According to the materials and methods of the research, we conducted a study on the morpho-biochemical parameters of sheep blood depending on the type of birth.

The data on the hematological parameters of sheep presented in table 2 indicate that all of them are within the physiological norm.

In almost all hematological parameters, the superiority of sheep of the same birth type is observed, however, there are no significant differences in the content of shaped blood elements.

Table 3– Hematological parameters of lambs depending on the type of birth

Indicator	Type of birth	
	alone	twins
Hemoglobin, g / l	92.6±1.3	90.1±1.2
Red blood cells, $\times 10^{12}$/l	7.4±0.1	7.7±0.3
White blood cells, $\times 10^{9}$ /l	9.8±1.3	9.4±1.2
Platelets, $\times 10^{9}$ /l	268.4±9.1	260.1±6.9
Phagocytic activity, %	56.4±0.15	53.6±0.12
Bactericidal activity, %	56.8±0.21	54.4±0.14
Lysozyme activity, %	57.9±0.15	57.8±0.11

The hemoglobin concentration in 4-month-old lambs from single births was 92.6 g/L. In contrast, lambs from twin births exhibited a 2.3% reduction, and those born in twin litters showed a 3.6% decrease compared to their single-birth counterparts. The erythrocyte count remained consistent across all ages and birth types, with variations falling within statistical error margins. Leukocyte numbers in 4-month-old rams were stable, ranging from 9.5 $\times 10^{9}$ to 9.7 $\times 10^{9}$cells, irrespective of birth type.

Biochemical analysis of lamb blood serum revealed that protein levels in twins were 2-3% lower than in single-birth lambs, regardless of age. A notable increase in total bilirubin by 8.2%, direct bilirubin by 44.0%, and urea by 29.6% in 4-month-old twin lambs indicates significant protein metabolism. The urea levels, conforming to physiological norms, suggest efficient renal function.

At 4 months, glucose levels—a primary carbohydrate metabolism marker—were marginally above the physiological norm in both groups but normalized with age.

In summary, morphological blood analysis at 4 months suggests that twin-born lambs may exhibit reduced phagocytic, bactericidal, and lysozyme activities, potentially indicative of lower immunity. Protein concentrations in the serum of twin lambs were consistently 2-3% lower than in single-birth lambs, while hemoglobin levels in single-birth lambs exceeded those of their twin counterparts by 2.3% at 4 months and 3.6% subsequently.

This revision ensures the text adheres to scientific standards and clarity, suitable for referencing in Animal Husbandry literature.

Conclusion. To enhance the breeding efficiency and improve the pedigree and productive traits of the meat-fat Kazakh fat-tailed rough-haired sheep breed, it is imperative to integrate traditional zootechnical selection methods with the extensive use of animals that possess a complex of blood-group factors indicative of high productivity. Furthermore, the selection of breeding pairs should consider their genetic compatibility, utilizing an index-based approach.

This revision ensures that the conclusion is presented in a scientific manner, suitable for inclusion in Animal Husbandry literature.

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ТҮЙІН

Бұл мақалада агар геліндегі электрофорез, иммуноэлектрофорез және радиалды иммунодиффузия әдістерімен жаңа туған қозылардың қан сарысуындағы ақуыз және иммуноглобулин спектрінің диетасының толықтығын мақсатты түрде зерттеудің ғылыми-зерттеу жұмыстары ұсынылған.

Нәтижелер иммуноглобулиндердің негізгі көзі ретінде уыз сүтін азықтандырудың ерекше маңыздылығын көрсетеді-және жаңа туған қозылардағы колостральды иммунитет және осы белгінің тұқым қуалау және қайталану коэффициенттері және әкелер мен аналардың жас туу түріне әсер ету үлесі. Егіз жануарлардың қан сарысуындағы ақуыздың мөлшері жасына қарамастан 2-3% – ға төмен болды, бұл туудың бір типті жас жануарларындағы ақуызбен салыстырғанда; жалқы туылған еркек қозылардың қанындағы гемоглобин мөлшері егіз қоқыстардағы қатарластарына қарағанда 4 айда 2,3% - ға, 7 айда 3,6% - ға жоғары болды; жалқы туылған еркек қозылардың қан сарысуындағы фагоцитарлық және бактерицидтік белсенділік егіздерге қарағанда жоғары болды.

Жұмысты одан әрі жүргізу үшін, қазақтың құйрықты етті-майлы бағыттағы қойлардың ет өнімділігін арттыру және Алматы облысының жағдайында қой шаруашылықтарында жас төлді сою кезінде алынған ет өнімдерін өндірудің рентабельділік деңгейін арттыру мақсатында егіз туу үлгісіндегі жануарларды іріктеуді жүргізуді ұсынамыз.

РЕЗЮМЕ

В данной статье представлены научно-исследовательские работы целенаправленного изучения полноценности рациона, белкового и иммуноглобулинового спектра сыворотки крови новорожденных ягнят методами электрофореза в агаровом геле, иммуноэлектрофорезом и радиальной иммунодиффузией.

Полученные результаты указывают на особую важность кормления молозивом, как главного источника иммуноглобулинов - и колострального иммунитета у новорожденных ягнят и коэффициентов наследования и повторяемости этого признака и доля влияния отцов и матерей на тип рождения молодняка. Содержание белка в сыворотке крови у двойневых животных было ниже на 2 – 3% не зависимо от возраста, по сравнению с содержанием белка у молодняка одинцового типа рождения; содержание гемоглобина в крови баранчиков-одинцов было выше, чем у сверстников из двойневых пометов на 2,3% в 4 месяца, на 3,6% в 7 месяцев; фагоцитарная и бактерицидная активность сыворотки крови баранчиков из одинцовых пометов была выше аналогичного показателя, чем у двоен.

Для дальнейшего ведения работы, с целью увеличения мясной продуктивности овец казахской курдючной породы и повышения уровня рентабельности производства мясной продукции, полученной при убое молодняка овец, в условиях Алматинской области в овцеводческих хозяйствах, рекомендуем вести отбор животных двойневого типа рождения.

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MORPHOLOGICAL AND BIOCHEMICAL BLOOD PARAMETERS OF THE STUDIED ANIMAL GROUPS

ANNOTATION

The hematological parameters of animals to a certain extent characterize their breeding and productive qualities.

The article presents the results of a study of morphological and biochemical parameters of the blood of sheep of the Akzhaik meat and wool breed on fattening at the ages of 4 and 8 months. The first group is represented by sheep of the BALI-1395 line, which has a large live weight, the second group is represented by sheep of the BAK-4087 line, selected for longhair, the third group is represented by sheep of the related group No. 7082. As a control group, the experiment involved sheep of non-linear origin, that is, which did not belong to these two tested lines.

The morphological and biochemical composition of the blood of sheep at the ages of 4 and 8 months shows that all blood parameters (morphological and biochemical) were within physiological norms. The sheep of the first group were superior to other groups in terms of the number of red blood cells, hemoglobin, total protein, calcium and phosphorus. The rams of other factory lines also had an advantage in these indicators over the rams of the control group. This can explain the higher productivity of young animals in these lines compared to the young of the nonlinear group.

***Key words**: akzhaikskaya, hematology, erythrocytes, leukocytes, hemoglobin, calcium, phosphorus*

Introduction. The study of morphological and biochemical blood parameters allows us to assess the intensity of physiological processes occurring in the body. Blood is a direct participant in metabolism [1,2, 3, 4].

Blood is the only liquid tissue of the body that performs a variety of functions. Including trophic (nutrient), transport (transfer of nutrients), respiratory (oxygen delivery and removal of carbon dioxide), protective and others. At the same time, the biochemical and morphological composition of blood changes depending on the age and sex of the animal, feeding and housing conditions, physiological state, time of year and other factors. The blood picture quite fully reflects the nature of metabolism in the body and allows one to judge the state of health of animals [5].

Different breeds of animals differ in a number of important blood parameters, and these differences are often hereditary. The authors write that the offspring obtained from different selection options differ at the morphological level in the manifestation of meat and wool productivity, i.e. the

obtained indicators of meat productivity are not random, but are based on the morphological composition of the blood and the predisposition of animals to metabolism [6,7,8].

Innovative methods for studying interior indicators can play the role of genetic markers, which will make it possible to predict the productive qualities of animals at an earlier age [9,10,11,12,13,14].

The main indicators by which the properties of blood are studied are its total quantity, the number of erythrocytes and leukocytes, the content of hemoglobin, protein and its fractions, reserve alkalinity, the content of sugar, lactic acid, enzymes and others. A number of authors have devoted their research to studying the composition of the blood of animals in connection with productivity, sex, age, genetic and breed characteristics, fertility, environmental factors and feeding and housing conditions [15,16,17,18].

It was found that sheep whose blood contained more red blood cells and hemoglobin had the greatest reproductive ability [17,18,19,20,21].

In order to better understand the constitutional characteristics and physiological state, on which the productivity and breeding qualities of animals largely depend, some hematological parameters of experimental groups of young Akzhaik meat and wool sheep were studied.

Materials and research methods. To study hematological parameters, four groups of rams of the Akzhaik meat and wool breed were formed for fattening. The first group is represented by rams of the BALI-1395 line, which has a large live weight, the second group - by rams of the long-haired line BAK-4087, the third group - by rams of the related group No. 7082. As a control group, the experiment included rams of non-linear origin, that is, those that did not belong to these two tested lines.

Blood was collected from the jugular vein before feeding in the morning.

Results and its discussion. The morphological and biochemical composition of blood is normally quite constant and in the animal body it performs a variety of functions (respiratory, nutritional, excretory, regulatory, protective), creating the most favorable conditions for the life of individual tissues. Therefore, blood, like a mirror, reflects all the processes that occur in the body of animals. In this regard, the study of hematological parameters provides invaluable information about all processes occurring in the body.

We studied the hematological parameters of 10 lambs from each group in fattening at the age of 4 and 8 months.

Table 1 – Morphological blood parameters of rams at the age of 4 months

Index	Group			
	BALI -1395	BAK -4087	kin group №7082	nonlinear
Red blood cells, million/mm^3	10,62±0,30	9,68±0,23	9,05±0,27	8,09±0,21
Leukocytes, thousand/mm^3	7,86±0,54	7,74±0,27	7,65±0,24	7,36±0,31
Hemoglobin, g/l	10,96±0,14	10,01±0,22	9,86±0,19	8,96±0,13
Hematocrit, %	37,88±1,13	36,77±1,16	37,06±0,98	36,62±0,96
Quantity hemoglobin in 1 red blood cell, pg	10,28±0,31	10,21±0,22	10,14±0,24	10,10±0,36
Volume of 1 red blood cell, mcm^3	36,17±0,10	36,86±0,16	37,12±0,44	36,44±0,44
Medium Cellular concentration hemoglobin in erythrocytes, g%	28,86±0,42	27,03±0,29	24,76±0,62	24,88±0,81

A study of the morphological parameters of sheep blood showed that when compared between lines, there are some differences (Table 1). The largest number of erythrocytes was contained in the blood of rams of the BALI-1395 line - 10.62 million/mm3, which is more than in the group of non-linear rams by 2.53 million/mm3 or 31.3%, with P>0.999. The rams of the second group of animals of

the control group (P>0.999) are significantly higher (by 19.61%) in terms of the content of erythrocytes in the blood, as well as the third group of rams, which are 11.1% higher than the rams of the control group. There were no significant differences between the groups in the content of leukocytes, and the content of leukocytes in all groups was within the physiological norm. The highest concentration of hemoglobin was observed in the blood of rams of the first group - 10.96%, which is more by 2.0 g% or 22.3%, with P>0.999. Also, the rams of the second and third groups (P>0.99) outperformed the control group by a significant amount (P>0.999).

There were no significant differences between the groups in terms of the volume of formed elements (cells) of the blood, that is, in hematocrit.

Significant differences were established when comparing the first group with the control group of rams in terms of the average cellular concentration of hemoglobin in erythrocytes. In the blood of animals of the massive line, the concentration of hemoglobin in erythrocytes was higher by 3.98 g% or 16.0%, P>0.999. According to this indicator, the rams of the second group were superior to the control group. In this case, the difference was 2.15 g% or 8.6%, with P>0.95. The superiority of the third group was insignificant. There were no significant differences between the groups in other studied indicators.

In addition to the morphological composition of the blood, the biochemical composition of the blood was also studied (Table 2).

Table 2 – Biochemical composition of blood serum of rams at the age of 4 months

Index	Group			
	BALI -1395	BAK -4087	kin group №7082	Nonlinear
Total protein, g/l	88,1±0,15	76,7±0,21	74,4±0,10	72,3±0,13
Phosphorus, mg%	4,58±0,08	4,47±0,07	4,41±0,06	4,22±0,03
Calcium, mg%	12,17±0,22	11,36±0,31	11,27±0,36	10,60±0,26
Carotene, mg/l	0,373±0,01	0,361±0,01	0,328±0,02	0,308±0,01
Alkaline reserve, cm^3	56,62±0,46	55,78±0,42	55,56±0,38	55,46±0,44

The amount of total protein in the blood serum indicates the level of protein metabolism in the body. The higher the protein content, the higher the protein metabolism and productivity of animals. In terms of the concentration of total protein in the blood serum, rams of the first group are superior to all groups. At the same time, their superiority over the rams of the control group reached 15.8 g/l or 21.8%, with a significant difference of P>0.999, over animals of the third group - 13.7 g/l or 18.4%, with P>0.999 , over animals of the second group – 11.4 g/l or 14.8%, P>0.999.

Animals of the second group are superior in total protein content to rams of the control group by 4.4 g/l or 6.1%, but this difference is not significant. The superiority of the third group over the control group was 2.1 g/l or 2.9%, the difference is also significant.

Our studies have shown that in the blood serum of experimental animals there is sufficient protein to fulfill all the physiological needs of the body. After all, blood, in addition to participating in metabolism, also performs other functions, such as: helping to maintain isotonic plasma pressure; preventing the transition of an aqueous blood solution into the surrounding tissue fluid, which means maintaining the body's water balance; ensuring optimal blood viscosity; transfer of biologically active substances - hormones, enzymes, vitamins, pigments, metabolites, microelements; participation in the regulation of acid-base balance; ensuring blood clotting; protection of the body [22].

It is known that during metabolic processes in the body a large amount of acidic and alkaline products are formed. But the amount of acidic products formed is always greater than alkaline ones. Therefore, there is a danger of the pH shifting towards the acidic side. At the same time, the total charge of alkaline ions is greater than that of acidic ones and their ratio is called the acid-base balance of the blood. As a result, the blood reaction is always slightly alkaline and the pH is 7.35. This indicator is one of the most "hard" constants in the animal body. At the same time, blood is a very mobile system; it constantly receives substances that can disrupt the pH of the blood. But despite this, the blood pH level remains constant. How is this possible? There are various mechanisms to regulate

the acid-base balance. These are complex neurohumoral (physiological) and chemical mechanisms (alkaline and acidic blood reserves, carbonate and phosphorus buffer systems, etc.).

The alkaline reserve of the blood is the sum of all alkaline substances in the blood, mainly potassium and sodium bicarbonates. The greater the body's alkaline reserve, the better protected it is from acidic foods. For sheep, the norm is 56 cm3 of carbon dioxide in 100 ml of blood plasma.

In our studies, the alkaline reserve of the blood of rams in different groups ranges from 55.46 to 56.62 cm3. Moreover, the highest value was in the group of rams of the BALI-1395 line, and the lowest in the group of non-linear animals. In other groups these values were intermediate. No significant differences have been established between different genotypes. The increased level of reserve alkalinity of the first group can be explained by the fact that they are more highly productive and their metabolic rate is at a higher level.

Studying the content of calcium and phosphorus in blood serum allows one to judge the state of mineral metabolism in the animal's body. The mineral components of the body are in a molecularly dispersed or ionically dispersed state, as well as in the form of complexes with colloids, often with proteins. In clinically healthy animals, a constant level of ash elements - calcium, potassium, sodium, phosphorus and others - is strictly maintained in the blood serum. Even if salt solutions of mineral substances are added to the blood, their content in the blood is quickly restored.

Diagnosing the level of calcium in the blood serum is very important, since calcium salts contribute to the compaction of cell and tissue membranes; with its deficiency, osteomalacia occurs, the permeability of blood vessels increases, and the excitability of the central and peripheral nervous systems increases. Typically, calcium in the blood is found in the form of an ionized part, constituting 45-55% of the total calcium content, and a non-ionizing part, which is in a combined state with blood plasma proteins.

In the blood serum of rams of the experimental groups, the calcium content met the requirements of the physiological norm. The largest amount of calcium was contained in the blood of rams of the first group, which indicates a higher level of mineral metabolism in them. In these animals, the calcium content was 1.57 mg% higher than in the rams of the control group (by 14.8%), with P>0.999. Animals of the second group outperformed the control group rams by 7.2%, and the third group - by 6.3%. But in these comparison cases the difference is unreliable.

One of the main indicators of the level of mineral metabolism in the body is the phosphorus content in the blood serum. In the body, more precisely in the blood serum, phosphorus is found in the form of organic and inorganic compounds. In this case, we study the content of inorganic phosphorus.

A low level of phosphorus in the body can lead to rickets in young animals, and osteomalacia in adult animals. At the same time, excess phosphorus occurs with fever, uremia, oxygen starvation, and dysfunction of the parathyroid glands. The phosphorus content in the blood serum of the experimental rams was at the level of 4.22-4.58 mg%, which corresponds to the physiological norm. The largest amount of phosphorus was in the blood serum of rams of the first group - 4.58 mg%, which is more than in the blood serum of rams of the control group by 0.36 mg% or 8.5%, with P>0.999. Also, the rams of the second group are superior to the rams of the control group by a significant amount (0.25 mg% or 5.9%) (P>0.99). The superiority of the third group over the control group was 0.19 mg% or 4.5%, with P>0.95.

The carotene content in feed, and subsequently in the blood serum of animals, plays an extremely important role. Vitamin A is formed from carotene in the small intestine of animals, which plays an important role as a catalyst for many processes in the body. Vitamin A is also called the growth vitamin. A deficiency of this substance leads to growth retardation, decreased reproductive functions and the onset of a disease - decreased vision ("night blindness"). Excess carotene is deposited in adipose tissue. The normal content of carotene in sheep blood serum is 0.300-0.520 mg/l.

The carotene content in the blood serum of experimental rams of all groups was within physiological norms. The highest content of carotene was in the blood of rams of the BALI-1395 line - 0.373 mg/l, which is 0.065 mg/l more than in the blood of non-linear rams. This is 21.1%, with P>0.999. The blood of rams of the long-haired line contained 0.361 mg/l of carotene, which is more than in the blood of rams of the fourth group by 0.053 mg/l or 17.2%, with P>0.99. The greatest advantage of carotene content in the blood serum of thick-haired rams over the control group was observed by 0.020 mg/l or 6.5%, but this difference is not significant.

Thus, summarizing the results of studying the biochemical parameters of blood serum, we can conclude that all indicators were within the physiological norms for sheep in all groups. Linear rams are superior in the content of total protein, calcium, phosphorus, and carotene to the content of these substances in the blood serum of control rams.

In the process of protein metabolism in the body, not only the total amount of protein plays an important role, but also individual protein fractions. Determining the content of individual protein fractions is of great importance, since their content reflects not only the clinical health of the animal, but also its productivity [23].

Albumins and globulins are the main protein fractions that take part in the metabolism of animals. They are in constant exchange with protein molecules of the body's tissues, accordingly they influence various functions of the body and, therefore, have a certain information content [24].

A particularly important function in protecting the body is given to gamma globulins, which also enhance metabolic processes, take part in enzymatic-hormonal reactions of the body and have immune properties. In this regard, studying the content of individual fractions is of great importance.

Analysis of blood serum samples from rams of various genealogical groups showed that there are intergroup differences in the content of individual protein fractions in the blood serum (Table 3). The highest amount of albumin was in the blood serum of rams of the first group - 48.6 g/l. This is 9.6 g/l or 24.6% more, at P>0.999, than in non-linear animals. The rams of the second group contained 3.0 g/l more albumin in the blood serum than the rams of the control group (7.7%, P>0.99).

Animals of the dense-haired line outperformed rams of the control group by 1.3 g/l or 3.3%, P>0.95. The rams of the first group contained the highest amount of globulins compared to other rams - 39.5 g/l, but in relative terms their globulin content was the lowest - 44.8%.

Table 3 – Content of protein fractions in the blood serum of rams

Index	Group			
	BALI -1395	BAK -4087	kin group №7082	nonlinear
Total protein, g/l	88,1±0,15	76,7±0,21	74,4±0,10	72,3±0,13
Albumins:				
g/l	48,6±0,41	42,0±0,38	40,3±0,44	39,0±0,37
%	55,2±0,46	54,8±0,32	54,3±0,42	54,0±0,38
Globulins:				
g/l	39,5±0,41	34,7±0,37	34,1±0,43	33,3±0,37
%	44,8±0,46	45,2±0,33	45,7±0,42	46,0±0,38
including:				
Alpha globulins, g/l	12,2±0,80	12,6±0,43	11,8±0,32	10,8±0,35
Beta globulins, g/l	9,3±0,86	8,7±0,31	8,5±0,36	8,0±0,39
Gamma globulins, g/l	18,0±1,16	13,4±0,88	13,8±0,41	14,5±0,42

In terms of the total amount of globulins, they exceeded their peers in the control group by 13.8 g/l or 18.6%, P>0.999. In the blood of rams of the second group, the content of globulins was higher than in the blood of rams of the control group by 1.4 g/l or 4.2%, with P>0.95. The superiority of rams of the third group over control animals in this indicator was unreliable. There are differences between groups in globulin fractions. For alpha globulins, the highest content was in the blood serum of rams of the second group - 12.6 g/l. This is 1.8 g/l or 16.7% more than in the blood of control group rams, P>0.99. In second place were the rams of the first group - 12.2 g/l, which is 1.4 g/l more than the control group (12.9%), but this difference is not significant. There were no significant differences between the groups in beta globulins. There is a tendency for linear lambs to be superior in this indicator to their peers from the control group.

In terms of the content of gamma globulins in the blood, the rams of the first group differed favorably. They were significantly superior to all groups: rams of the second group - by 4.6 g/l; third group – by 4.2 g/l; control group – by 3.5 g/l. This makes it possible to assume that their body has

good resistance. In second place in terms of the content of gamma globulins in the blood serum were rams from the control group. Their advantage over other groups was unreliable.

A study of the blood of rams at the age of 8 months showed that in the blood of rams of different lines some changes occurred both in the morphology of the blood and in the biochemical composition (Table 4).

The number of erythrocytes and leukocytes was within the physiological norm in all groups. The largest number of erythrocytes, as well as leukocytes, was in the blood of rams of the first group. The number of erythrocytes in them was 0.77 million/mm3 higher than in the control group of animals, P>0.999. There were also more red blood cells in the blood of other groups of linear animals than in the control group. There were no significant differences between the groups in the content of leukocytes; there was a tendency for the number of leukocytes in linear rams to be superior to the number of leukocytes in control animals.

Table 4 – Morphological blood parameters of rams at the age of 8 months

Index	Group			
	BALI -1395	BAK -4087	kin group №7082	nonlinear
Red blood cells, million/mm^3	9,64±0,38	9,32±0,41	9,03±0,32	8,87±0,44
Leukocytes, thousand/mm^3	7,67±0,22	7,61±0,18	7,54±0,24	7,42±0,19
Hemoglobin, g%	12,7±0,17	12,6±0,22	11,6±0,19	11,0±0,24
Hematocrit, %	36,7±1,13	36,4±1,17	36,1±1,20	35,8±1,11
Amount of hemoglobin in 1 red blood cell, pg	13,4±0,31	13,1±0,33	12,8±0,28	12,7±0,37
Volume of 1 red blood cell, mcm^3	36,8±0,10	36,4±0,09	36,2±0,11	36,4±0,13
Midcellular hemoglobin concentration in erythrocytes, g%	29,1±0,40	28,3±0,38	28,1±0,42	27,8±0,41

The hemoglobin content was also the highest in the blood of animals of the first group - 12.7 g%, with a color index of 1.27. In terms of hemoglobin content, the rams of the first group exceeded the rams of the control group by 1.7 g% or 15.4%, with P>0.999. And the rams of the second group were superior to the rams of the control group in this indicator by 1.6 g% or 14.5%, P>0.999. This means that these animals had higher redox processes, therefore, they had higher productivity. The study of biochemical parameters of the blood of rams at this age gave the following indicators (Table 5).

Table 5 – Biochemical blood parameters of rams at the age of 8 months

Index	Group			
	BALI -1395	BAK -4087	kin group №7082	nonlinear
Total protein, g/l	83,3±0,23	75,2±0,18	73,8±0,12	71,3±0,21
Phosphorus, mg%	5,12±0,07	4,82±0,06	4,91±0,09	4,81±0,08
Calcium, mg%	11,85±0,23	11,62±0,32	11,43±0,36	11,22±0,28
Carotene, mg/l	0,356±0,01	0,357±0,02	0,344±0,01	0,338±0,02
Alkaline reserve, cm^3	55,16±0,52	54,87±0,48	54,42±0,41	54,16±0,50

In terms of total protein content, the BALI-1395 line is superior to all other groups. The difference in this indicator of the first line with the group of non-linear animals was 12 g/l or 16.8%, with P>0.999, with the second line the difference was 8.1 g/l or 10.8%, with P>0.999, with the third line – 9.5 g/l or 12.9%, P>0.999. It should be noted that the total protein in the blood of rams decreased by 1.4-5.4% compared to the protein content at the age of 4 months. This indicates a decrease in the level of protein metabolism with age of animals. Also, the level of calcium in the blood

of older rams decreased slightly compared to the level of calcium in the blood of 4-month-old rams, and the concentration of phosphorus increased slightly. Apparently, this is a consequence of the feeding habits of animals during this period. The carotene content was at a sufficient level in the blood of all rams. Reserve alkalinity in the blood was slightly lower than in the blood of 4-month-old rams. In general, the alkaline reserve in all groups was within physiological norms.

The content of individual protein fractions was also studied in the blood samples of rams (Table 6). Interesting changes occurred in the content of individual protein fractions. In all groups, the amount of albumin in the blood decreased with age and the amount of globulin fraction increased accordingly.

Table 6 – Content of protein fractions in the blood serum of rams at the age of 8 months

Index	Group			
	BALI -1395	BAK -4087	kin group №7082	nonlinear
Total protein, g/l	83,3±0,23	75,2±0,18	73,8±0,12	71,3±0,21
Albumins:				
g/l	39,4±0,33	35,9±0,41	35,9±0,37	33,4±0,28
%	47,3±0,44	47,8±0,41	48,6±0,39	46,9±0,42
Globulins:				
g/l	43,9±0,36	39,3±0,31	37,9±0,33	37,9±0,35
%	52,7±0,44	52,2±0,41	51,4±0,39	53,1±0,42
including:				
Alpha globulins, g/l	14,6±0,80	13,3±0,49	12,6±0,41	12,1±0,41
Beta globulins, g/l	11,5±0,71	10,2±0,33	9,1±0,39	8,7±0,37
Gamma globulins, g/l	17,8±0,98	15,8±1,11	16,2±0,91	17,1±0,56

In terms of the amount of albumin and globulin, the leadership was in the rams of the first group, but in terms of relative content they were inferior to the animals of the second and third groups. And in terms of globulin content in relative value, rams of the fourth group (53.1%) were in first place.

In the globulin portion of the protein, there was an increase in all fractions, without major differences between groups.

Conclusion. Thus, by studying the morphological and biochemical composition of the blood of rams at the age of 4 and 8 months, we can conclude that all blood parameters (morphological and biochemical) were within physiological norms. The rams of the first group were superior to other groups in the number of red blood cells, hemoglobin, total protein, calcium and phosphorus. Lambs from other factory lines also had superiority in these indicators over rams from the control group. This can explain the higher productivity of young animals of different lines compared to young animals of the non-linear group.

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ТҮЙІН

Жануарлардың гематологиялық көрсеткіштері белгілі бір дәрежеде болады, олардың асыл тұқымды және өнімділік қасиеттерін сипаттайды.

Мақалада 4 және 8 айлық жастағы бордақылаудағы ақжайық етті – жүнді қойлардың қанының морфологиялық және биохимиялық көрсеткіштерін зерттеу нәтижелері келтірілген. Бірінші топқа үлкен салмақты БАЛИ-1395 желісінің еркек қозылары, екінші топқа ұзын жүнді БАК - 4087 желісінің еркек қозылары, үшінші топқа №7082 туыстық тобының еркек қозылары кіреді. Бақылау тобы ретінде экспериментке аталық ізге жатпайтын еркек қозылары қатысты, яғни олар осы екі сыналатын желіге жатпайды.

4 және 8 айлық малдардың қанының морфологиялық және биохимиялық құрамы барлық қан көрсеткіштерінің (морфологиялық және биохимиялық) физиологиялық нормалар шегінде болғанын көрсетеді. Бірінші топтағы еркек қозылардың эритроциттер, гемоглобин, жалпы ақуыз, кальций және фосфор саны бойынша басқа топтардан асып түсті. Басқа зауыттық желілердегі еркек қозылары да осы көрсеткіштер бойынша бақылау тобындағы еркек қозылардан басым болды. Бұл аталық ізге жатпайтың топтағы жас жануармен салыстырғанда осы аталық желілердегі еркек қозылардың жоғары өнімділігін түсіндіруге болады.

РЕЗЮМЕ

Гематологические показатели животных в определённой мере характеризуют их племенные и продуктивные качества.

В статье представлены результаты исследования морфологических и биохимических показателей крови баранчиков акжаикской мясо – шерстной породы на откорме в возрасте 4 и 8 месяцев. Первая группа представлена баранчиками линии БАЛИ-1395, имеющей большую живую массу, вторая группа - баранчиками длинношерстной линии БАК-4087, третья группа – баранчиками родственной группы №7082. В качестве контрольной группы в эксперименте участвовали баранчики нелинейного происхождения, то есть которые не принадлежали к этим двум апробируемым линиям.

Морфологический и биохимический состав крови баранчиков в возрасте 4 и 8 месяцев показывает, что все показатели крови (морфологические и биохимические) были в пределах физиологических норм. Баранчики первой группы превосходили другие группы по количеству эритроцитов, гемоглобина, общего белка, кальция и фосфора. Баранчики других заводских линий также имели превосходство по этим показателям над баранчиками контрольной группы. Этим можно объяснить более высокую продуктивность молодняка в этих линиях по сравнению с молодняком нелинейной группы.

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ON THE USE OF ADAPTOGENS OF ANIMAL ORIGIN IN THE FEEDING OF BREEDING BULLS IN KAZAKHSTAN

ANNOTATION

Cattle breeding in Kazakhstan is a key and promising sector within livestock breeding and the agro-industrial complex, as it is the primary source of beef, milk, and their products. These meet the population's needs according to physiological and medical standards per capita (82 kg, including at least 45 kg of beef and 405 kg of milk and its products).

According to the Ministry of Agriculture of the Republic of Kazakhstan, as of January 1, 2024, there are more than 8.6 million head of cattle in the country. This includes 56.1% dairy cattle, 13.2% beef cattle, and 30.7% combined cattle. It should be noted that more than 94% of cattle are on private plots (62.52%) and peasant and farm holdings (31.5%).

In this regard, of particular relevance is the solution to the problem of accelerated reproduction of highly productive animals, the creation of breeding and commercial herds with the best genetic productivity potential using modern modified methods of reproduction biotechnology, including methods of cryopreservation of sperm doses and artificial insemination of cows and breeding cattle breeds. To obtain high-quality sperm products from stud bulls, adaptogens of plant and animal origin are widely used globally.

Based on the results of a study on the sperm productivity of Kazakh white-headed, Auliekol, and Simmental bulls located at JSC "RCZH 'Asyltulik'," the sole Republican center for livestock breeding, it was established that, per head, the sperm yield of Kazakh white-headed bulls was on average 31.4% lower than that of Simmental bulls.

In this regard an adaptogen of animal origin - drone brood homogenate - began to be used as a stimulant that improves the physiological state increases the body's immunity and sperm productivity of bulls.

Based on the results of an analysis of sperm production in bulls by season, it was found that the effective periods for pumping, collecting and freezing sperm doses are spring and autumn. The yield of sperm doses obtained from bulls in spring and autumn is 2.57 and 2.67 times higher than in the summer period.

Keywords: *bulls producers, sperm production, cryopreservation, drone homogenate, dietary supplement.*

Introduction. Cattle breeding in Kazakhstan is the main and promising industry in the agro-industrial complex, which meets the needs of the domestic and foreign markets. It is the main source that provides the needs of the population with meat, milk and their products, according to medical and physiological standards per capita (405 kg of milk and 45 kg of beef each).[1]

Unfortunately, currently the domestic market for these and other types of products is provided by imports from other countries. According to the Ministry of Agriculture of the Republic of Kazakhstan, there are currently more than 8.6 million cattle in the country. In particular, the number of dairy cattle is 56.1%, meat cattle – 13.2% and combined cattle -30.7%.

It should be noted that 94% of the total number of cattle is in private subsidiary farms (62.52%) and peasant and farm farms (31.5%).However, there is no data on the breeding stock of cattle, showing the quality of the breed composition, taking into account the direction of productivity of cattle.

Improving the qualitative composition and genetic structure of bred populations and livestock breeds depends on many factors, one of which is the cultivation of bulls with high breeding qualities and obtaining high-quality sperm from them in greater quantities, ensuring an improvement in the genetic potential of domestic breeds and Kazakhstani populations created from among imported animals of meat or dairy production of cattle breeds of foreign breeding.

The reproduction of domestic animals is under human control and is carried out using technologies specially developed to facilitate the implementation of planned works. Modern reproductive technologies dictate the strategic directions of breeding work, which determine the choice of animals based on genetic characteristics responsible for product quality. Artificial insemination was given crucial importance in this matter, providing additional opportunities to improve genetic selection. Modern methods of biotechnology open up opportunities for almost all branches of agriculture. Research in the field of breeding, breeding and reproduction of cattle and small cattle is particularly important for the development of science and increasing the pace of production. The rate of breeding, thanks to the introduction of artificial insemination and cryopreservation of sperm into production, has been increased 2-3 times.

The increase in productivity of meat, dairy and combined cattle, along with the creation of comfortable conditions for keeping and feeding, is also influenced by the genetic potential of animals, which is transmitted from their parents.

Breeding indicators of livestock depend on purposeful breeding and breeding work, where producer bulls of high value in terms of genetic and reproductive qualities are used.

As a result of properly organized breeding work in the country, the share of highly productive animals in agricultural formations began to increase, which is confirmed by the research results of many domestic scientists [2,3,4]. A number of scientists note that the increase in livestock is due to the use of breeding bulls with high hereditary inclinations, while others argue that the use of bulls with the best quality sperm products also contributes to the production of offspring with high genetic indicators. [2,3,4,5]

Also, some breeders believe that the effectiveness of the method of artificial insemination of cows is influenced by the quantitative and qualitative indicators of sperm of breeding bulls producing dairy and meat productivity, and the sexual activity of breeding bulls is influenced by the conditions of their maintenance, where comfortable conditions are created and their hormonal status, which should be at the upper level, which directly affects their sexual activity.

The main goal at the points and stations where breeding bulls are kept is to obtain the maximum amount of high-quality sperm products and prolong the life (service) of their use.[1,3]. Currently, quite a lot of publications are devoted to the definition of factors that improve the reproductive function of producing drugs and there are three groups according to the mechanism of action on them: hormonal stimulation; the use of vitamins and adaptogens, immune stimulants, etc.; physical through UHF massage and electrical stimulation of the reproductive system.

V.I. Velikzhanin and L.A. Andreeva (1997) believe that the sexual activity of breeding bulls is determined by the manifestation of sexual reflexes and their speed of activity. [3,4,5,6] Many scientists claim that the use of adaptogens of plant and animal origin helps to increase the body's resistance, increase the reproductive ability and productive indicators of agricultural and domestic animals.[7,8,9,10,11,12,13,14]

It is known that any biologically active feed additive to the basic diet of breeding bulls has a positive effect on the level of their resistance, well-being, activity and improvement of animal life.

In this regard, we set a goal to study the effect of drone homogenate when using it as a biologically active feed additive in the feeding diets of bulls producing meat and dairy-meat productivity.

It is known that beekeeping is one of the most profitable industries in the agro-industrial complex. In the process of breeding honey bees, beekeepers receive many useful products from them: honey, propolis, royal jelly, drone milk, bee venom, wax. All of the above beekeeping products are used in pharmaceuticals, medicine, food industry, etc., and the bee itself is used in crop production as a pollinator and in ecology to create and preserve the best ecological environment of our planet.

It is known that until today, many studies have been conducted on the use of drone homogenate, in various forms of preparation, on mice, birds, sheep and pigs.

Drone milk is the most valuable unique, biological, active bee products. On the basis of drone

homogenate, medicinal, nutritional supplements, cosmetic creams, etc. are produced in many countries with developed beekeeping (China, Japan, Romania, Kenya, etc.) [15, 16, 17]. It should be noted that drone homogenate has a powerful healing, rejuvenating, biostimulating effect and promotes the restoration of biochemical, massometric characteristics of the testes, prostate gland, impaired sexual function, and is also a stimulant of the central mechanisms of regulation, the formation of androgens[18,19, 20].

Steroid hormones (androgens) amino acids, enzymes, trace elements, vit. Group B, vit. A, D defines the anabolic effect. The presence of carbohydrates, amino acids (glycine, methionine, glutamic acid) hormones in the complex characterizes the actoprotective effect, improvement of brain activity.

Drone brood contains a high amount of vitamins A and D. The stabilizing, activating ingredients of drone brood are:sucrose, glucose, lactose, bran and soy depending on the technology: extraction, lyophilization, thermal drying, adsorption, stabilization by mixing.

R.M. Khabibulin (2023) established the effective effect of adaptogens, including when using drone homogenate, the live weight of bulls by the age of one month exceeds peers of other groups where safflower leucea and pantocrine were used by 5.71%. The biological value of beef obtained from these bulls was higher by 0.18-0.36 units [3,4].

Due to the inclusion of adaptogens of plant origin in the Red Book (maral root, golden root), scientists began to look for other adaptogens, including those of animal origin, that effectively affect the animal body.

Currently, the best, effective adaptogens are the BA of bee products - drone homogenate and royal jelly.

Materials and methods of research . The object of the research was the sperm production of bulls-producers of meat and combined breeds of cattle, contained intended for pumping and collecting semen in the conditions of JSC RCPJ Asyltulik.

From among the bulls-producers of the Simmental, Kazakh white-headed breed, experimental groups according to the principle of a group of analogues, bull feeding was carried out according to the feeding standards of Kalashnikov A.P. (2003). Quantitative and qualitative indicators of freshly obtained sperm production of breeding bulls were determined in accordance with regulatory documentation and GOST 26030-2015. The physiological parameters of the body of breeding bulls were studied according to generally accepted methods. Pumping and collection of sperm was carried out twice a week in the conditions of JSC "RCPJ "Assyl Tulik" according to zootechnical and veterinary requirements by double-loading. Previously, during the preparatory period, 1,480 ejaculates were examined during the accounting period (300 days).

Sperm from breeding bulls was obtained at the center, according to the approved technology for obtaining sperm from breeding bulls under standard conditions in compliance with all zootechnical and veterinary requirements. The mode of application is average (twice a week, with two sets of animals).

The study of sperm quality was carried out during the receipt of freshly obtained sperm by visual assessment of color and consistency. Sperm quality was determined by the number of translational sperm and the lifetime of the sperm after its activation. For cryopreservation, sperm with 80% mobility in the field of view under a microscope or with a score of no more than 8 points was used.

The resulting sperm was examined according to physiological parameters based on generally accepted methods:

- color, smell, consistency -organoleptic analysis;
- sperm volume - through a 15 ml metered-dose pyrex tube;
- sperm activity on a 10-point scale, at a temperature of 35-38 ° C, through a microscope magnified 180-200 times;
- mobility - with the help of a microcircular microscope with a camera and software, a CEROS analyzer of a computer technology system.
- the concentration of sperm in 1 ml was determined by the photoelectrocolorimetric method (F. I. Ostappso, G. S. Gaivoronsky), using FEC-M, an Accucell 783 photometer.

All sperm was frozen in liquid nitrogen for long-term storage in a sperm bank. The resulting sperm was frozen in polypropylene bags, diluted with OptiXcell synthetic diluent, manufactured by

the French company IMVTechnologies (in terms of the number of spermatozoa at least 15 million per dose).

The control of sperm resistance to deep freezing was carried out before metered packaging after a month of storage. The pre-frozen spermadoses were thawed at a temperature of 35 ± 1 °C. The essence of the method is to visually determine with the help of a microscope in a crushed drop of sperm the quantitative ratio of spermatozoa with rectilinear translational motion to their total number. The number of spermatozoa with rectilinear translational motion, expressed in %, was determined on the CEROS sperm analyzer of the CASA computer technology.Statistical processing was performed on a PC using the Excel program.

Research results and their discussions. To conduct research, after evaluating the quality of freshly obtained sperm, animal groups were formed, which included bulls producing meat and dairy breeds. The data on sperm production in breeding bulls for 2023 in JSC "RCPJ "Assyl tulik" were studied and analyzed. At the same time, the seed was pumped out using a doublet cage pumping 2 times a week (Table 1).

Table 1 – Sperm production of breeding bulls of experimental groups

S/N	Name	Breed	Number of Ejaculates	Volume of Ejaculate (ml)	Concentration (billion/ml)	Number of Doses
1	Paris Zeus Morits	Simmental Simmental Simmental	113±10.2 124±8.5 132±7.8	5.0±0.8 3.5±1.5 4.5±0.6	1.3±0.3 1.5±0.3 1.4±0.4	11130 13384 13634
2	Akbas Shygys Asyl	Kaz. white-headed Kaz. white-headed Kaz. white-headed	112±1,3 132±3,3 118±1,0	3,0±1,5 3,5±0,4 3,0±0,4	1,3±0,3 1,2±0,4 0,4±0,1	7627 6308 0
3	Altai Karasu Kolos	Kaz. white-headed Auliekol Kaz. white-headed	95±0,1 124±0,8 54±0,1	4,0±0,3 4,5±0,7 4±1,7	1,2±0,3 1,3±0,4 1,3±0,5	3366 11757 2791
4	Ring Alpan Aran	Kaz. white-headed Kaz. white-headed Kaz. white-headed	131±1,2 130±11,5 134±8,4	5,0±0,8 5,0±0,6 4,0±0,7	1,4±0,4 1,5±0,3 1,1±0,3	10990 17069 12913

The largest dose was received from a bull named "Alpan" of the Kazakh white-headed breed, KH "Aisulu" WKO 17069 doses. Next were the bulls of the Simmental breed 13384, 13634 doses and 11130 doses, then the bulls "Aran" 12913 doses of the "Aisulu" farm, the bull producer of the Karasu Auliekol breed – 11787 doses and the "Ring" from the Sabit farm – 10990 doses of the Kazakh white-headed breed.

More than one dose of "Asyl" (khAisulu) was not received, and doses from bulls-producers "Altai" and "Kolos" - KBGP from Pavlodar and North Kazakhstan region, respectively, were in the range of 2791 and 3366 doses, bulls "Akbas" and "Shygys" occupied the middle in the dose accounting (7627 and 6308d).

Therefore, due to such a disparity in the volume of sperm output and uneven volumes of sperm output from bulls of elite - record classes, it was necessary to find opportunities to increase the activity of bulls and improve the quality indicators and ejaculate volume output.

According to literature data, the use of bee products, including drone milk, improves the physiological state and immunity of animals, activates the morphological process, accelerates the growth and development of bulls, sheep, increases milk productivity and milk quality.[7,8,9]

In this regard, in order to improve reproductive ability, sperm yield, quality of fresh and frozen sperm, increase the prepotency of bulls and fertility of spermadoses, it was decided to study the effect of drone homogenate on the above-mentioned indicators of breeding bulls-producers of dairy, meat and meat production in the conditions of JSC "RCPJ "Assyl Tulik" within the framework of a grant project.

At the same time, the ejaculates were taken into account separately for the accounting period by cages, that is, the first separately and the second separately (Table.3 The volume of the seed of breeding bulls in ml.), the average volume for the first cage was 2.95 ml, for the second–2.84 ml. The volume of ejaculates for the Kazakh white-headed breed in the first cage ranged from 2.95 to 4.11 ml, and in the second - from 2.84 to 4.96 ml; in Simmental breeding bulls in both cages, the average was the same -2.98 ml, and in auliekolsky -3.95 and 4.01 ml. The average concentration of semen in Kazakh white-headed bulls in the first cage ranged from 0.36-0.49 billion /ml, in the second - from 0.39 to 1.11 billion/ml. For the Simmental bulls, these indicators were 0.47-0.74 and 0.88-1.11, respectively.

The activity of fresh sperm in Kazakh white-headed bulls ranged from 3.6 to 5.12 in the first and 3.91-7.39 in the second cage. From this it can be seen that the total output of the volume of ejaculate activity, the concentration of freshly obtained sperm were the best in the second cage of sperm production in all experimental bulls of Asyltulik JSC. According to the activity of the frozen seed, there were no special differences between the first and second cages.

During the accounting period, 11,0036 spermodoses were obtained from all experimental breeding bulls, including 55.11% from Kazakh white-headed bulls, 34.8% from Simmental and 10.10% from Auliekol breed. Thus, the total output in terms of the number of sperm doses per head was higher in bulls of the Simmental breed and amounted to 12776 doses, low indicators were in bulls of the Kazakh white-headed breed - 7579 sperm doses.

In this regard, it became necessary to increase the yield of ejaculate, spermadosis with a good concentration, high activity with its preservation even after freezing and thawing, the use of biologically active additives as a stimulant to increase the yield of sperm production in breeding bulls by adding to their feeding diets.

Currently, in order to set up an experiment to study the effect of drone larva homogenates, bulls producing meat and combined breeds have been selected, taking into account their origin and age, and experimental groups have been formed

The testing of drone homogenate as an adaptogen of animal origin will be carried out in equal doses. At the same time, the basic diet remains unchanged, according to the approved feeding ration of breeding bulls.

Table 2 – Sperm production of breeding bulls of experimental groups by season.

Indicators	Seasons											
	Winter			Spring			Summer			Autumn		
	Per head	Sim	KWH	Per head	Sim	KWH	Per head	Sim	KWH	Per head	Sim	KWH
Number of Ejaculates	22,05	88,0	22,1	36,3	42,0	34,4	17,75	81,3	16,5	17,6	45,7	42,3
Volume of Ejaculate (ml)	3,28	3,03	3,36	3,61	3,67	3,59	3,72	3,66	3,73	3,54	3,15	3,67
Concentration (billion/ml)	0,68	0,90	0,61	0,73	0,9	0,67	0,625	0,64	0,62	0,65	0,79	0,60
Number of Frozen Doses per Head	1788	2699	1447	3090	5084	2425	1439	1074	1595	3283	3818	3573
Total Frozen Doses, thou	19,6	8,1	11,6	37,1	15,3	21,9	14,4	3,2	11,2	38,5	11,5	26,6

Note: Sim is a Simmental breed, KWH is a Kazakh white-headed breed.

It can be seen from the table that the bulls of producers in terms of sperm production turned out to have low indicators in the summer period compared to other periods by 26.8%, up to 26.7% were lower for frozen spermadoses.

In this regard, we consider the most favorable periods for pumping and harvesting sperm in fresh and frozen form to be the spring and autumn periods of the year. In terms of concentration, the sperm production of Kazakh white-headed bulls is inferior to Simmental bulls. We believe that the use of drone larva homogenate in the future will stimulate the release of ejaculates and sperm activity in breeding bulls. The increase in the indicators of sperm productivity of the Kazakh white-headed breed of the western direction of productivity, in turn, contributes to improving the realization of genetic potential and, in general, increasing the breeding stock of livestock with high indicators, increasing the competitiveness of cattle breeding in Kazakhstan.

It should be noted that the main and determining factor in the reproduction of dairy and beef cattle is the effective use of sperm from high-class breeding bulls for artificial insemination of cows.

In recent years, biologically active feed additives of plant and animal origin have become widely used.

For example, scientists Ezhova I.V., Kasumova A.M., Livinkov A.S., Belyakov C (2018) studied and established the stimulating effects of drone larvae on the growth of broiler chickens, and Lutsuk S.N., Nikitin V.Ya., Belugin N.V., Logvinov A.N., Dyachenko Yu.V., Pisarenko N.A. (2015) determined the effective effect of a lyophilized feed additive from larvae and pupae of drones on the sexual activity of sheep. [22, 23, 24]

An interesting fact has been established that Efanova N.V., Mikhailova D.S. corrected the endocrine and metabolic status of dogs using drone homogenate. According to the experience of Krupin O.V., Khabibulina I.M., Mironova I.V., Khabibulina R.M., when using plant adaptogens (levzeyasafloroid – maral and golden roots), pantocrine and drone homogenate in feeding cows, the best effect was in the group where homogenate was used, which amounted to 13.4% of pantocrine - 8.88% and from levzey - 5.61% compared to the control. [7,8,21].

We studied and determined the amount of sperm received from each bull, the volume and concentration of sperm aimed at dilution with the determination of the degrees of dilution and the number of rejected sperm and cryopreserved spermadoses. The study of sperm production by seasons made it possible to determine the advantages of each bull in the context of breeds in experimental breeding bulls.

It should be noted that the concentration of semen of Kazakh white-headed bulls ranged from 0.36 to 0.49 billion/ml for the first and from 0.39 to 1.11 billion/ml in the second cage, and the activity of fresh sperm in Kazakh white-headed bulls ranged from 3.6 to 5.12 and from 3.91 to 7.39, respectively, in the first and second cages.

Thus, the total amount, volume of ejaculate output, and concentration of freshly obtained sperm were the best obtained from the second cage from all bulls-producers of JSC RCPJ Asyltulik.

According to the seasons, the sperm concentration of the winter collection was 8%, the spring and autumn collections exceeded the summer ones by 4% and 16.8%. When calculating per bull, spermadosis was frozen in winter - 1789, in spring-3090 and in autumn - 3203, which was 24.3%, 114.7% and 122.5% higher, respectively, than the summer figure. In general, 109,586 spermadoses were frozen during the accounting period, of which 17.95% were frozen in winter, 33.84% in spring, 13.13% in summer, and 35.07% in autumn. It should be noted that 68.9% of the total volume was frozen during the spring and autumn period.

Conclusion. It has been established that the sperm production of breeding bulls is influenced by the seasons of the year. The best periods for pumping and freezing sperm are the spring and autumn periods of the year, during these periods about 70% of the total amount can be collected and frozen. The best yields of the amount and volume of ejaculate and the concentration of sperm are obtained with the second cage of breeding bulls, the superiority is about 30%.

It is necessary to use breeding bulls with high yields of high-quality sperm products to improve the genetic potential of bred cattle breeds. It is known that high rates of sperm production depend on the created comfortable conditions of maintenance, feeding and breed characteristics of the genetic potential of bulls-producers of bred cattle breeds intended for pumping, collecting and freezing high-quality sperm and storage before sale to business entities.

The use of adaptogens as a stimulant contributes to an increase in sperm production and quality indicators of sperm of breeding bulls in Kazakhstan.

It was also found that the lowest sperm counts in all parameters were found in bulls producing semen in the summer than in other periods of the year, where the average amount of ejaculate per bull was 26.8% less in summer than in winter, 2.57 times from spring and 2.67 times from autumn harvest.

It should be noted that the total number of frozen sperm doses in the summer and the number of frozen doses in the winter period was 88.5% less than in the spring and 95.3% less than in the autumn period.

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ТҮЙІН

Мақалада Қазақстанда ірі қара мал бұқаларына биологиялық белсенді заттарды-адаптагендерді, олардың жемшөбіне қосып бергендегі әсерлерін анықтауға бағытталған зерттеулер нәтижелері берілген. Қазақстанда

АӨК ішінде мал шаруашылығы салалары негізгі әрі болашағы зор сала, себебі, ол сиыр етімен, сүтімен және олардан жасалған өнімдермен елді медициналық, физиологиялық мөлшерлермен (әр жанға шаққанда: 45 кг сиыр еті; 405 кг сүт) толық қамтамасыз етудің көзі болып табылады.

Қазіргі таңда, Қазақстанда 8,6 млн. бас ірі қара малы бар, оның ішінде 56,1% сүт, 19,2-ет және 30,7 аралас,яғни сүтті- етті сиыр малы тұқымына жатады. Тағы бір күрделі мәселе , ол ірі қара малдың 94% жеке үй шаруашылығы (62,52) мен жеке кәсіпкерлер қолында (31,5%) екендігі. Осыған байланысты, өсіріліп отырған ірі қара мал тұқымдарының жоғары өнімділіктерін жедел көбейтіп, генетикалық әлеуеттері өте жоғары асыл тұқымдық және тауарлық табындардықұрып, сандарын арттыруға, заманауи жетілдірілген биотехникалық, шәуіттерді криоконсервациалау, сиырды қолдан ұрықтандыру әдістерін кеңінен пайдалану қажет.

Дүние жүзінде бұқалардан жоғарғы сапалы шәуіт өнімділігін алу үшін,өсімдік және жәндік тектестерден жасалған адаптогендерді кеңінен қолдану өріс алып келеді.

Мал шаруашылығындағы асылдандыру жұмысы бойынша республикалық орталық болып табылатын "Асыл түлік РМШАО "АҚ-да орналасқан қазақ ақбас, әулиекөл, симментал ірі қара мал тұқымдарын өндіруші бұқалардың шәует өнімділігін зерттеу нәтижелері бойынша бір басына есептегенде қазақ ақбас тұқымды бұқалардың шәует өнімінің шығымдылығы 31,4% - ға болғандығы анықталды алынған доза симментал бұқалардан аз.

Осыған байланысты физиологиялық жағдайды жақсартатын, ағзаның иммунитетін және тұқымдық бұқалардың шәуітқнімділігін арттыратын стимулятор ретінде жануарлардан алынатын адаптоген -дрон тұқымының гомогенаты қолданыла бастады. Жыл мезгілдеріне сәйкес бұқалардағы шәуіт өнімділігі бойынша талдау нәтижелері бойынша шәуітті жинау және қатыру үшін тиімді кезеңдер көктем мен күз болып табылады. Көктемде және күзде бұқалардан алынған шәуіт өнімділігі жазға қарағанда 2,57 және 2,67 есе көп.

РЕЗЮМЕ

Скотоводство Казахстана является основной и перспективной отраслью в животноводстве и в системе агропромышленного комплекса, так как оно является основным источником производства говядины, молока и их продукции, обеспечивающим потребности населения по физиологической и медицинским нормам на душу населения (82 кг в т.ч. не менее 45 кг говядины и 405 кг молоко и его продукции).

По данным Министерства сельского хозяйства Республики Казахстан на 01.01.2024 насчитывается в стране более 8,6 млн голов крупного рогатого скота. В том числе, численность молочного скота составляет 56,1% мясного– 13,2% и комбинированного –30,7%. Следует отметить, более 94 % крупного рогатого скота находится в личных подсобных хозяйствах (62,52%) и крестьянских и фермерских хозяйствах (31,5 %).

В этой связи, особую актуальность имеет решение проблемы ускоренного размножения высокопродуктивных животных, созданием племенных и товарных стад с лучшими генетическими потенциалами продуктивности с применением современных модифицированных методов биотехнологии воспроизводства, включая методов криоконсервации спермадоз и искусственного осеменения коров, разводимых пород крупного рогатого скота. Для получения высококачественной спермопродукции от быков-производителей в мире стали широко использовать адаптогенов растительного и животного происхождения.

По результатам исследования спермопродуктивности быков-производителей казахской белоголовой, аулиекольской и симментальской пород крупного рогатого скота, находящихся в АО «РЦПЖ «Асылтүлік»», который является Республиканским центром по племенному делу в животноводстве, установлено, что при расчете на одну голову выход спермопродукции у быков производителей казахской белоголовой породы в среднем было на 31,4 % меньше полученной дозы, чем от симментальских быков.

В этой связи в качестве стимулятора, улучающего физиологическое состояние, повышающего иммунитета организма и спермопродуктивности быков-производителей, начали использовать адаптоген животного происхождения – гомогенат трутневого расплода.

По результатам анализа по выходу спермопродуктивности у быков по сезонам года установлено,что эффективными периодами для откачки, сбора и замораживания спермадоз являются весна и осень. Выход спермадоз, получаемых от быков весной и осенью в 2,57 и 2,67 раза больше, чем летний период.

CONTENT

ANIMAL HUSBANDRY

Rules for authors on the design of an article for publication

Scientific and practical journal «Ğylym jäne bilim» is a periodical of the West Kazakhstan Agrarian and Technical University named after Zhangir Khan K. The journal is published kuarterly and articles are published in Kazakh, Russian and English languages. The journal publishes scientific works on actual problems of fundamental and applied researches in the field of agricultural, veterinary, biological, technical, economic and socio-humanitarian sciences.

Subscription to the collection can be arranged through the catalogues of newspapers and magazines «Kazpost» JSC (index 76316).

Scientific, technical and industrial articles planned for publication in our journal undergo the procedure of unilateral blind review and approval by the editorial board. With a positive conclusion, the material is placed in the «portfolio» of the editorial board in the kueue for publication. The speed of publication depends on the relevance of the material and fullness of the «portfolio» of the editorial office on the given topic. In addition, due to the fact that according to the order of the Chairman of KKSON MES RK dated 12.06.2013 № 949 one of the conditions for inclusion of the journal in the list of editions recommended by the Committee for publication of the main results of scientific activity is the availability of publications in foreign languages, the right of extraordinary publication will be enjoyed by articles in English.

Articles for publication should be submitted through the online article submission and review system.

When preparing articles for the journal we recommend to follow the following rules:

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