

The effect of the probiotic 'Maxilac' on the growth dynamics, hematological and biochemical indicators of Karakul lambs

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Abstract. This article expounds on the research undertaken and the results obtained in order to study the effect of probiotic 'Maxilac' on the growth dynamics, hematological and biochemical parameters of newborn Karakul lambs. The conducted studies revealed differences in live weight gain, hematological and biochemical parameters of Karakul lambs of control group 1 and experimental group 2, to which the probiotic 'Maxilac' was applied. The rumen microflora of experimental Karakul lambs, which were administered probiotic 'Maxilac', was also studied. Conclusions were drawn regarding the effective effect of probiotic 'Maxilac' on live weight gain, hematological and biochemical parameters of Karakul lambs. The results of this study demonstrate the significant role of probiotics in veterinary practice and karakul breeding.

1 Introduction

Livestock breeding is one of the leading branches of agriculture in our republic and plays an important role in providing the population with food products. The pivotal decisions concerning the advancement of the livestock industry within our country, complemented by the implementation of state-sponsored initiatives, have culminated in a notable surge in the number of livestock, accompanied by a discernible enhancement in their breeding attributes and productivity.

This, in turn, has engendered a steadfastness in the prices of livestock commodities within the consumer market, thereby ensuring food security. The findings of this study underscore the paramount significance of probiotics in both veterinary practice and the realm of karakul breeding. In animal breeding the issues of increasing animal productivity, increasing their resistance, reducing the impact of various food preservatives, production of high-quality meat products harmless to human health are topical.

Many bioactive substances are used in the meat industry for this purpose. They belong to the group of substances that stimulate growth and have an anabolic effect on the body. These include protein-vitamin and mineral supplements, organ and tissue hydrolysates, food antibiotics, anabolic agents, botanicals and probiotics.

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However, according to some data, they are rarely used in livestock farms of our republic due to low economic efficiency, harmfulness and uneven distribution of their action, which are insufficiently studied [4].

In our country, one of the main areas of animal husbandry is cattle breeding. Karakul breeding is a source of livelihood and income for people living in desert and semi-desert regions.

The fact that the number of Karakul sheep in our republic is increasing from year to year is of great importance for our people.

Today, the development of karakul breeding has reached a new level, which means that the demand for products made from karakul lambs in the markets is growing rapidly.

In order to increase the safety of Karakul lambs, the use of probiotic preparations in the diet of lambs, along with milk, showed high efficiency.

The founder of the doctrine of probiotics is I.I. Mechnikov, who in 1903 proposed the practical use of antagonistic microbial cultures in the fight against pathogenic bacteria. The term 'probiotic' was originally used to refer to substances produced by protozoan animals that stimulate the growth of other microorganisms. Later, probiotics came to refer to feed additives that have a beneficial effect on the animal's organism by influencing the intestinal microflora. Recently, the role of probiotics has been defined as organisms and substances that promote gut microbial balance [11].

The term 'probiotic' was first proposed and used by A. Purap and R. Parker to refer to microorganisms with antagonistic activity against pathogenic microflora and their fermentation products.

The term 'probiotic', of course, was not chosen by chance; it is the antipode (opposite) of the word 'antibiotic'. Antibiotics kill pathogenic microorganisms and stop the growth and development of normal microflora, and the very word 'antibiotic' means 'against life'.

The literal translation of the word 'probiotic' means 'for life'.

Probiotics have attracted the attention of researchers because they do not harm microorganisms even when taken in doses higher than the recommended rate [1-2].

According to many researchers, symbiont microflora due to its enzymatic activity has the ability to synthesize many biologically active substances, organic acids, lipids, vitamins (especially B group), tetrapyrrole structural compounds. Most of them, getting into the blood, play an important role in maintaining the vital activity of the host organism, participate in energy and vitamin metabolism.

In this case, organic acids increase peristalsis and intestinal secretion. This aids digestion and increases calcium and iron absorption. Bacterial polyphosphates are actively involved in the transport of carbohydrates into cells, thus fulfilling the function of hexokinase [6, 13].

Microorganisms used for the preparation of probiotic preparations must meet the following basic requirements: they must be normal representatives of the intestinal tract, grow and develop well in it, synthesize substances that inhibit pathogenic bacteria present in the intestine, and retain their metabolic activity in the finished product.

Based on these requirements, the finished formulation of the drug must keep the cells alive for a long time, maintaining their viability even in the lowest parts of the intestine. As a result, the probiont microorganisms must be able to withstand the measures taken during preparation, be stable in the low pH environment of the stomach and gallbladder. Gram-positive bacteria are usually given more attention as probiotic microorganisms. Because they are more resistant to the digestive enzymes' lysozyme, freezing and drying.

In addition, these microbes must have a much stronger adhesion to the intestinal epithelium of the animal than pathogenic or opportunistic bacteria. This prevents pathogenic and opportunistic bacteria from invading the intestinal mucosa [1-2, 6].

Substances included in probiotics increase the concentration of organic acids and bacteriocins important for digestion, have an important nutritional value for enterocytes in time, create unfavorable conditions for reproduction and survival of pathogenic microorganisms, participate in the synthesis of vitamins in the process of digestion

In the process of growth of Karakul lambs metabolism occurs at different levels. A decrease in protein content in the blood of Karakul lambs from 2 months of age has been noted in the studies of many scientists. In order that lambs weaned from their mothers do not lag behind in growth and development, they are placed on pastures with preserved ephemeral grasses and additionally fed 100-150 g of mixed fodder daily [2, 8].

The balance of the dynamic state of proteins in the blood depends primarily on the characteristics of the concentration of individual protein fractions, nutrition and metabolism.

As a result of the use of muscle protein for the needs of the body, their atrophy occurs, accumulation of intermediate products in the body - ketogenic amino acids, as well as fatty, protein, amyloid dystrophy in parenchymatous and other organs, which causes the loss of vital functions of the body. In addition, the organism of lambs separated from their mothers is somewhat weakened and the immune system's response to exposure to conditioned pathogens is reduced. As a result, the animals lag behind in growth and development [13].

Live weight of Karakul lambs is closely related to their viability. Female lambs with a live birth weight of 3 kg had a higher survival rate. These animals arrived at the age of 1.5 years with normal development, high live weight and good tolerance to unfavorable winter feeding and housing conditions [4].

Lambs weighing less than 3 kg at birth have low viability. Most of them died during the nursing period and those that survived had poor growth and development. They suffered greatly from the summer heat and unfavorable winter weather, especially in the second half of winter, when grasses in pastures became less nutritious, the weather worsened and rain began to fall.

At the age of one and a half years, they showed signs of underdevelopment. They gain weight from supplementary nutrition and at the same time are not exhausted. To prevent the reproduction of small, infantile animals within the breed, it is advisable to leave for breeding only well-developed, strong lambs with a live birth weight of at least 3 kg, and smaller lambs are sent to slaughter to obtain karakul hide [6].

The purpose of our research is to study the effect of probiotic 'Maxilac' on the dynamics of live weight growth, hematological and biochemical parameters of Karakul lambs.

2 Materials and methods

The research was conducted on Karakul lambs kept in Karakul farms located in the desert-steppe zone of Mubarak district of Kashkadarya region. For this purpose, 20 Karakul lambs were selected from the lambs of the second calving on the principle of 'similar pairs'.

Laboratory studies were conducted in the research laboratory of the Department of Physiology, Biochemistry and Pathological Physiology of Animals at our university.

During the experiment, the live weight of Karakul lambs was determined on electronic scales, as well as blood parameters using BIOBASE BK6190 hematological analyzer.

3 Results and Discussion

We have conducted a number of studies on the effect of probiotic ‘Maxilac’ on the dynamics of live weight growth, hematological and biochemical parameters of Karakul lambs.

Initially we determined the dynamics of live weight growth of experimental Karakul lambs at birth, at the age of 1, 2, 3 and 4 months.

Analysis of the obtained results showed that there was a difference in the growth rate of live weight of Karakul lambs of control group 1 and experimental group 2, which was used probiotic ‘Maxilac’ (Table 1).

It was found that the live weight of Karakul lambs of control group 1 was 3.92 kg at birth, 7.92 kg at 1 month, 16.5 kg at 2 months, 20.3 kg at 3 months and 22.1 kg at 4 months.

It was found that the live weight of Karakul lambs of the 2nd experimental group, to which the probiotic ‘Maxilac’ was applied, at birth was 2.85 kg, and in 1 month increased to 9.7 kg, in 2 months - to 19.2 kg, in 3 months - to 21.4 kg, in 4 months - to 24.9 kg (Table 1).

Table 1. Dynamics of live weight gain of lambs.

Body weight determination times	Control	Experimental
	Group I live weight, kg	Group II live weight, kg
At birth	3.92±0.14	2.85±0.83
1 month old	7.92±0.25	9.7±0.56
2 months old	16.5±0.46	19.2±0.07
3 months old	20.3±0.33	21.4±0.09
4 months old	22.1±0.67	24.9±0.08

The fact that the live weight of 1,2,3,4-month-old Karakul lambs of experimental group 2 was higher than that of 1,2,3,4-month-old Karakul lambs of control group 1, indicates the effective effect of probiotic ‘Maxilac’ on live weight gain.

In order to study the importance of blood in the body of animals and the effect of probiotic ‘Maxilac’ on morphological and biochemical indices of blood composition, we continued experiments on 2- and 4-month-old Karakul lambs (Tables 2-4).

For this purpose, Karakul lambs of control group 2 at the age of 2 and 4 months were given probiotic ‘Maxilac’ mixed with water (1 g probiotic per 100 liters of water).

Table 2. Effect of probiotic ‘Maxilac’ on hematological parameters of Karakul lambs.

Blood indicators	Unit of measurement	2-month-old		4-month-old	
		I-group	II- group	I- group	II- group
Erythrocytes	million	8.49±5.7	9.74±7.8	8.20±4.5	10.48±9.5
Leucocytes	thousand	7.46±1.2	7.21±0.24	7.81±0.65	7.24±0.86
Haemoglobin	g/l	9.69±2.75	11.4±3.02	10.72±2.36	11.82±2.4

As can be seen from Table 2, when analyzing hematological parameters according to the results of our research:

- In the blood composition of two-month-old Karakul lambs in the 2nd experimental group compared to the 1st control group, the number of erythrocytes was 1.25 million, the amount of hemoglobin was 2.71 g/l more, and the number of leukocytes was less by 0.25 thousand.
- The number of erythrocytes in the 2nd experimental group was 2.28 million, the amount of hemoglobin was 1.10 g/l more, and the number of leukocytes was 0.57 thousand less than in the 1st control group.

In order to study the effect of probiotic 'Maxilac' on biochemical parameters of Karakul lambs, the results of studies conducted before and after the application of this preparation were analyzed.

In the study of biochemical parameters of blood of Karakul lambs before the application of probiotic Maxilac the following was established (Table 3):

- In the control group: content of total protein 45.6 g/l, glucose 3.04 mmol/l, urea 4.79 mmol/l, total bilirubin 1.32 mmol/l, magnesium 0.59 mmol/l, cholesterol 6.06 mmol/l, chloride up to 95.6 mmol/l, calcium 1.44 mmol/l and phosphorus 3.71 mmol/l;
- In the experimental group: the amount of total protein increased to 51.6 g/l, glucose to 4.12 mmol/l, urea to 5.77 mmol/l, total bilirubin to 1.56 mmol/l, magnesium to 0.52 mmol/l, cholesterol to 4.14 mmol/l, chloride to 82 mmol/l, calcium to 1.22 mmol/l, phosphorus to 3.49 mmol/l.

Table 3. Biochemical parameters of blood of Karakul lambs before mixture application (p≥0.05).

No.	Serum index	Unit of measure	Control	Experience
			I- group	II- group
1	Total protein	g/l	45.6±3.35	51.6±40.4
2	Glucose	mmol/l	3.04±0.40	4.12±0.64
3	Urea	mmol/l	4.79±0.29	5.77±0.68
4	Total bilirubin	mmol/l	1.32±0.39	1.56±0.36
5	Magnesium	mmol/l	0.59±0.16	0.52±0.1
6	Cholesterol	mmol/l	6.06±0.46	4.14±0.7
7	Chlorides	mmol/l	95.6±4.36	82±1.05
8	Calcium	mmol/l	1.44±0.63	1.22±0.2
9	Phosphorus	mmol/l	3.71±0.28	3.49±0.2

The following changes were found in biochemical parameters of blood of Karakul lambs after application of Maxilac probiotic (Table 4):

Table 4. Biochemical parameters of blood of Karakul lambs after application of the mixture (p≥0.05).

No.	Serum index	Unit of measure	At the age of 2 months	
			I- group	II- group
1	Total protein	g/l	44.8±3.95	40.0±10.1
2	Glucose	mmol/l	2.71±0.44	3.77±0.22
3	Urea	mmol/l	5.1±0.27	6.9±0.6
4	Total bilirubin	mmol/l	0.12±0.04	1.6±0.3
5	Magnesium	mmol/l	0.36±0.02	0.44±0.10
6	Cholesterol	mmol/l	3.89±0.82	5.97±0.44
7	Chlorides	mmol/l	106.6±5.44	97.0±5.3
8	Calcium	mmol/l	2.29±0.68	3.68±0.50
9	Phosphorus	mmol/l	4.65±0.50	3.78±0.27

As can be seen in Table 4, when analyzing the biochemical parameters according to the results of our research:

In the blood of 2-month-old Karakul lambs receiving probiotic Maxilac:

- In the control group: total protein 44.8 g/l, glucose 2.71 mmol/l, urea 5.1 mmol/l, total bilirubin 0.12 mmol/l, magnesium 0.36 mmol/l, cholesterol 3.89 mmol/l, chlorides 106.6 mmol/l, calcium 2.29 mmol/l, phosphorus 4.65 mmol/l.
- A decrease in total protein in the experimental group to 40.0 g/l, chlorides to 97.0 mmol/l, phosphorus to 3.78 mmol/l, glucose to 3.77 mmol/l, urea to 6.9 mmol/l, total

bilirubin to 1.6 mmol/l, magnesium to 0.44 mmol/l, cholesterol to 5.97 mmol/l, calcium to 3.68 mmol/l was observed.

Table 5. Biochemical parameters of blood of Karakul lambs after application of the mixture (p≥0.05).

No.	Serum index	Unit of measure	At the age of 4 months	
			I- group	II- group
1	Total protein	g/l	56.2±4.73	43±3.4
2	Glucose	mmol/l	3.3±0.777	3.4±0.5
3	Urea	mmol/l	5.3±0.6	6.81±0.5
4	Total bilirubin	mmol/l	0.2±0.5	1.13±0.5
5	Magnesium	mmol/l	0.52±0.11	0.37±0.05
6	Cholesterol	mmol/l	3.32±0.51	6.26±0.47
7	Chlorides	mmol/l	130±10.7	90.0±3.3
8	Calcium	mmol/l	2.92±0.24	2.48±0.21
9	Phosphorus	mmol/l	3.5±0.2	2.78±0.24

Table 5, In the blood of 4-month-old Karakul lambs treated with probiotic Maxilac:

- In the control group the content of total protein - 56.2 g/l, glucose - 3.3 mmol/l, urea - 5.3 mmol/l, total bilirubin - 0.2 mmol/l, magnesium - 0.52 mmol/l, cholesterol - 3.32 mmol/l, chloride - 130 mmol/l, calcium - 2.92 mmol/l, phosphorus - 3.5 mmol/l.
- Total protein in the experimental group decreased to 43 g/l, magnesium to 0.37 mmol/l, chlorides to 90.0 mmol/l, calcium to 2.48 mmol/l, phosphorus to 2.78 mmol/l, glucose to 3.4 mmol/l, urea to 6.81 mmol/l, total bilirubin to 1.13g. There was an increase in cholesterol up to 6.26 mmol/l.

These indicators show the positive effectiveness of probiotic ‘Maxilac’.

Continuing our experiments, we also studied the rumen microflora of experimental Karakul lambs given probiotics.

For this purpose, 4-month-old Karakul lambs were taken liquid from the large intestine through a probe and determined the amount of microflora in it with the help of a microscope in a water bath at a temperature of +450 degrees Celsius.

The results of the experiment showed that the percentage of microflora and beneficial bacteria in the rumen of Karakul lambs increased.

Table 6 below summarizes the results of microflora status in 1 g of food.

Table 6. The state of microflora in the rumen of Karakul lambs in the experimental group.

No.	Microflora	Amount
1	Infusoria	1 million
2	Bacteria	10 billion
3	Streptococcus	1 billion
4	Ruminococcus	1,5 billion
5	Succinogens	1,2 billion
6	Cellulose destroyers	1,5 billion

It was found that in the large rumen of Karakul lambs receiving the probiotic ‘Maxilac’, the number of infusoria was 1 million, streptococci - 1 billion, ruminococci - 1.5 billion, succinogens - 1.2 billion, cellulolytic degraders - 1.5 billion.

These indicators testify to the positive effectiveness of the probiotic ‘Maxilac’.

4 Conclusion

Based on the results of our study, we come to the following conclusions:

- The difference in live weight growth of Karakul lambs of control group 1 and experimental group 2 (with application of probiotic 'Maxilac') was revealed.
- It was found that the live weight gain of Karakul lambs at the age of one, two, three and four months in the experimental group 2 was higher than in the control group 1.
- In the blood composition of two- and four-month-old Karakul lambs, the content of total protein, erythrocytes and hemoglobin was higher in the 2nd experimental group (with the use of probiotic 'Maxilac'), and the number of leukocytes was lower in the 1st control group.
- As a result of application of probiotic 'Maxilac' it was found that the average biochemical indices of blood of lambs stabilized: glucose, urea, total bilirubin, cholesterol, calcium and chlorides.
- It was found that the percentage of microflora and beneficial bacteria in the large intestine of Karakul lambs receiving the probiotic 'Maxilac' increased.
- The results of our research indicate that probiotic 'Maxilac' has an effective effect on growth, hematological and biochemical indicators of live weight of Karakul lambs.

Therefore, the use of probiotics is of great importance in veterinary practice and animal husbandry, including in karakul breeding.

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