EXPERIMENTAL RESULTS OF DEVELOPING A COMPREHENSIVE THERAPEUTIC APPROACH FOR KETONURIA IN PREGNANT EWES

K. Hamzayev[1], *Independent Researcher;*
B.Bakirov2, *professor;* **N. B. Ro‘ziqulov[3],** *Associate Professor;*
1Tashkent Branch of Samarkand State University of Veterinary Medicine, Livestock and Biotechnology;
2Samarkand State University of Veterinary Medicine, Livestock and Biotechnology;
3Samarkand Institute of Agroinnovations and Research

Annotation. *This article presents the results of an experimental study aimed at developing a comprehensive treatment protocol for ketonuria in pregnant ewes. The primary objective of the study was to develop an effective therapeutic approach aimed at normalizing clinical and biochemical parameters in ewes affected by ketonuria during pregnancy and to evaluate its therapeutic efficacy. During the experiment, the general clinical condition of the affected ewes, the levels of ketone bodies in urine, as well as selected morphological and biochemical parameters of the blood were examined. The treatment protocol included therapeutic agents aimed at normalizing metabolism, correcting energy deficiency, and supporting liver function.*

Key wods. *pregnant ewes, ketonuria, ketone bodies, metabolism, blood, biochemical parameters, comprehensive treatment protocol, Karakul sheep breeding.*

BO‘G‘OZ SO‘QLARDA KETONURIYANI DAVOLASHNING KOMPLEKS USULINI ISHLAB CHIQISH BO‘YICHA EKSPERIMENTAL NATIJALAR

K. Hamzayev[1]*, mustaqil tadqiqotchi;*
B. Bakirov[2]*, professor;* ***N. B. Ro‘ziqulov[3]****, dotsent;*
[1]Samarqand veterinariya meditsinasi, chorvachilik va biotexnologiyalar universitetining Toshkent filiali;
[2]Samarqand veterinariya meditsinasi, chorvachilik va biotexnologiyalar universiteti;
[3]Samarqand agroinnovatsiyalar va tadqiqotlar instituti

Annotatsiya. *Ushbu maqolada bo‘g‘oz so‘qlarda ketonuriyani davolashning kompleks usulini ishlab chiqishga qaratilgan eksperimental tadqiqot natijalari keltirilgan. Tadqiqotning asosiy maqsadi — bo‘g‘ozlik davrida ketonuriya bilan kasallangan so‘qlarda klinik va biokimyoviy ko‘rsatkichlarni me’yorga keltirishga qaratilgan samarali davolash usulini ishlab chiqish hamda uning terapevtik samaradorligini baholashdan iborat edi. Tajriba davomida kasallangan so‘qlarning umumiy klinik holati, siydikdagi keton tanachalari miqdori, shuningdek, qonning ayrim morfologik va biokimyoviy ko‘rsatkichlari o‘rganildi.*

Davolash usuli moddalar almashinuvini me'yorga keltirish, energiya tanqisligini bartaraf etish va jigar faoliyatini qo'llab-quvvatlashga qaratilgan vositalarni o'z ichiga oldi.

Kalit so'zlar: *bo'g'oz so'qlar, ketonuriya, keton tanachalari, moddalar almashinuvi, qon, biokimyoviy ko'rsatkichlar, kompleks davolash usuli, qorako'lchilik.*

РЕЗУЛЬТАТЫ ЭКСПЕРИМЕНТАЛЬНОЙ РАЗРАБОТКИ КОМПЛЕКСНОГО МЕТОДА ЛЕЧЕНИЯ КЕТОНУРИИ У СУЯГНЫХ ОВЦЕМАТОК

К. Хамзаев[1]*, независимый исследователь;*
Б. Бакиров[2]*, профессор;* ***Н. Б. Рузикулов***[3]*, доцент;*
[1]*Ташкентский филиал Самаркандского государственного университета ветеринарной медицины, животноводства и биотехнологий;*
[2]*Самаркандский государственный университет ветеринарной медицины, животноводства и биотехнологий;*
[3]*Самаркандский институт агроинноваций и исследований*

Аннотация. *В статье представлены результаты экспериментального исследования, направленного на разработку комплексного протокола лечения кетонурии у суягных овцематок. Основной целью работы было создание эффективного терапевтического подхода для нормализации клинических и биохимических показателей у овец с кетонурией в период суягности, а также оценка его терапевтической эффективности. В ходе эксперимента оценивались общее клиническое состояние больных овец, уровень кетоновых тел в моче, а также ряд морфологических и биохимических показателей крови. Протокол лечения включал препараты, направленные на нормализацию обмена веществ, устранение энергетического дефицита и поддержание функции печени.*

Ключевые слова: *суягные овцематки, кетонурия, кетоновые тела, обмен веществ, кровь, биохимические показатели, комплексный протокол лечения, каракулеводство.*

Relevance of the Topic: Currently, Uzbekistan is implementing comprehensive measures aimed at modernizing enterprises in the Karakul sheep breeding sector, upgrading production capacities from technical and technological perspectives, revitalizing and promoting the Uzbek Karakul brand internationally, and increasing the investment attractiveness of the sector.

In this regard, a number of important measures have been adopted by the Government of the Republic of Uzbekistan to provide further state support for the development of the Karakul sheep breeding sector. These include Resolution No. PQ-4420 of the President of the Republic of Uzbekistan dated August 16, 2019, "On Measures for the Comprehensive Development of the Karakul Sheep Breeding Sector"; Resolution No. PQ-4984 dated February 9, 2021, "On Additional Measures for the Further Development of the Karakul Sheep Breeding Sector"; and Presidential Decree No. PF-6059 dated September 2, 2020, "On

Measures for the Further Development of Sericulture and Karakul Sheep Breeding in the Republic of Uzbekistan." These regulatory documents establish important tasks aimed at increasing the number of purebred Karakul sheep and the volume of Karakul products, improving breeding practices on a scientific basis, expanding the deep processing of Karakul products and raw materials and their use for medical purposes, as well as providing social support to workers in the sector.

Ensuring the implementation of these strategic objectives requires particular attention to diseases caused by severe metabolic disorders in livestock, including Karakul ewes. One of the major problems is ketonuria (ketosis), a metabolic disorder that occurs frequently in pregnant ewes and can cause significant economic losses in Karakul sheep farming.

Research Results: The results of clinical examinations conducted during the treatment period demonstrated that, in the latent stage of ketonuria, treatment using the conventional method resulted in the elimination of tachycardia, hypo- and atony of the forestomach compartments, and reduced physical activity by the 20th day of treatment. By the 25th day, these clinical signs were accompanied by the elimination of pica and dyspnea.

In contrast, treatment using the newly developed method resulted in a partial alleviation of clinical signs by the 15th day of treatment and their complete resolution by the 20th day. These findings indicate a more rapid clinical response to the newly developed therapeutic approach in pregnant ewes with ketonuria at the latent stage.

Table 1.

Therapeutic protocol for the treatment of ketonuria in pregnant ewes

T/r	Name of the therapeutic agents used and their routes of administration	Dosage	Stages of the disease					
			Latent		Ketonuria		bosqoq	
			Groups					
			I	II	I	II	I	II
1	Therapeutic agent and route of administration	10 g	+		+		+	
2	Monocalcium phosphate, orally, daily	0,15 g/kg		+		+		+
3	Kaufit Immuno Premium, orally, daily	50 ml	+		+		+	
4	Alcohol–yeast mixture, orally, daily	50 ml		+		+		+
5	Fexoselen germ extract, orally, daily	200 ml	+		+		+	
6	Glucose–saline solution, intravenously, daily	500 ml		+		+		+
7	Sharabrin solution, intraperitoneally, twice in total	50 ml	+		+		+	
8	Trivitamin, intramuscularly, initially and subsequently once every 5 days	3 ml		+		+		+

In the second (ketonuria) stage of the disease, treatment using the conventional method was largely ineffective, and mortality was observed in 33.3% of the animals. Following treatment with the newly developed method, partial recovery was observed by the 25th day of treatment, while complete clinical recovery was achieved by the 30th day.

Table 2

Effects of Therapeutic Treatment of Ketonuria on Blood Parameters in Experimental Ewes

Stages of the Disease	Groups	Examination Time (Days)	Blood Parameters					
			Erythrocytes , mln/mkl	Hemoglobin ., g/l.	Total protein , g/l.	Glucose , Mmol/l	Ketone bodies , g/l.	Alkaline reserve , mg%
Latent	I	1	7,36±0,24	91,3±2,23	56,9±0,28	2,05±0,035	0,021±0,003	384±23,4
		15	7,96±0,39	101,2±5,8	66,4±4,35	2,34±0,23	0,019±0,009	471,5±39,5
	II	1	7,34±0,22	91,0±2,22	56,5±0,21	2,02±0,036	0,032±0,003	38,8±22,6
		15	8,05±0,40	103,3±5,5	69,6±3,8	2,42±0,23	0,011±0,006	482,2±39,8
Ketonuria	I	1	7,28±0,23	90,05±3,1	51,3±1,2	1,83±0,04	0,077±0,002	353±18,0
		15	7,36±0,24	92,0±2,23	56,9±0,25	2,02±0,038	0,032±0,003	39,2±38,2
	II	1	7,25±0,20	90,1±3,5	51,1±1,1	1,82±0,03	0,066±0,03	364±24,2
		15	7,46±0,06	97,4±6,9	66,2±3,5	2,31±0,23	0,05±0,01	442±32,0
Bosqoq	I	1	6,62±0,25	82,0±5,1	50,1±1,1	1,70±0,06	0,120±0,02	320,1±8,6
		15	4,25±0,16	78,6±4,7	46,6±1,5	1,59±0,05	0,275±0,06	300±16,9
	II	1	6,64±0,23	82,4±5,2	50,2±1,2	1,72±0,05	0,118±0,01	328±21,2
		15	4,36±0,18	81,0±4,1	48,2±1,5	1,66±0,03	0,233±0,02	320±25,7

The effects of therapeutic interventions on the blood parameters of diseased animals are presented in Table 2. As shown by the data in the table, in the latent stage of ketonuria, treatment using the conventional method resulted, by the 15th day of treatment, in an increase in the erythrocyte count by 0.6 million/μL, hemoglobin concentration by 9.9 g/L, total protein by 9.5 g/L, glucose by 0.29 mmol/L, and alkaline reserve by 87 mg%, while the concentration of ketone bodies decreased by 0.002 g/L. Following treatment with the newly developed method, pronounced positive changes in blood parameters became evident from the 15th day of treatment. In particular, the erythrocyte count increased by an average of 0.71 million/μL, hemoglobin by 12.3 g/L, total protein by 13.1 g/L, glucose by 0.4 mmol/L, and alkaline reserve by 94.2 mg%, while the concentration of ketone bodies decreased by 0.021 g/L.

In the second (ketonuria) stage of the disease, treatment using the conventional method had no significant effect on the morphological and biochemical parameters of the blood. Following treatment with the newly developed method, by the 15th day, the erythrocyte count increased by an average of 0.21 million/μL, hemoglobin by 7.3 g/L, total protein by 15.1 g/L, glucose by 0.51 mmol/L, and alkaline reserve by 78 mg%, while the concentration of ketone bodies decreased by 0.051 g/L.

Analysis of the scientific literature indicates that metabolism is a complex physiological process involving the intake, breakdown, resynthesis, and assimilation of vital substances, as well as the elimination of end products from the body. Disturbances in these processes lead to deficiencies of plastic and energy substrates required by body tissues, disruption of cellular and extracellular homeostasis, and, consequently, the development of irreversible changes of a dystrophic, degenerative, cirrhotic, and other nature. As a result, the functions of organs and body systems become impaired. Metabolic disorders that remain clinically latent for a certain period may subsequently progress into distinct diseases or groups of diseases with pronounced clinical manifestations.

In the third (advanced) stage of the disease, neither the conventional nor the newly developed treatment method produced a therapeutic effect. By the end of the disease, the erythrocyte count decreased to an average of 4.25 ± 0.16–4.36 ± 0.18 million/μL, hemoglobin to 78.6 ± 4.7–81.0 ± 4.1 g/L, total protein to 46.6 ± 1.5–48.2 ± 1.5 g/L, glucose to 1.59 ± 0.05–1.66 ± 0.03 mmol/L, and alkaline reserve to 300.0 ± 16.9–320 ± 25.7 mg%, whereas the concentration of ketone bodies increased to 0.275 ± 0.06–0.233 ± 0.02 g/L. Recovery was observed mainly within 15–20 days of treatment in the latent stage and by the 30th day in the ketonuria stage, whereas no recovery was recorded in the third (advanced) stage.

Thus, the newly developed etiopathogenetic treatment protocol, based on the administration of Kaufit Immuno Premium premix, Fexoselen germ extract, Sharabrin antitoxic solution, and Multivit minerals in the specified doses and according to the prescribed regimen, demonstrated a certain degree of therapeutic efficacy only during the early stages of ketonuria. It was established that the treatment did not produce the expected therapeutic effect in the

clinically manifest ketonuria and advanced stages of the disease. Therefore, based on the results of the conducted studies, the development of a highly effective group-based preventive protocol for ketonuria in Karakul ewes was considered appropriate.

Conclusions

The conducted studies demonstrated that the course of ketonuria in pregnant Karakul ewes is directly associated with the stage of the disease. During the latent stage, metabolic disturbances were relatively mild, and timely therapeutic intervention made it possible to normalize the morphological and biochemical parameters of the blood.

Compared with the conventional treatment method, the newly developed etiopathogenetic treatment protocol demonstrated greater therapeutic efficacy during the early stages of the disease. By the 15th day of treatment, increases in erythrocyte count, hemoglobin, total protein, glucose, and alkaline reserve, together with a decrease in ketone body concentration, were recorded.

The results indicate that early diagnosis and initiation of treatment at the initial stages of ketonuria are of particular importance in pregnant Karakul ewes. Progression of the disease to an advanced stage substantially reduces the effectiveness of therapeutic interventions.

Based on the results obtained, the development and implementation under farm conditions of a highly effective group-based preventive protocol aimed at detecting metabolic disorders before the clinical manifestation of ketonuria in Karakul ewes is considered appropriate.

References

1. Мирзиёев Ш.М. Ўзбекистон Республикаси Президентининг 2019 йил 16 августдаги «Қоракўлчилик тармоғини комплекс ривожлантириш чора-тадбирлари тўғрисида»ги ПҚ-4420-сонли Қарори.

2. Mirziyoyev Sh.M. O‘zbekiston Respublikasi Prezidentining 2021-yil 9-fevraldagi «Qorako‘lchilik tarmog‘ini yanada rivojlantirish bo‘yicha qo‘shimcha chora-tadbirlar to‘g‘risida»gi PQ-4984-sonli Qarori

3. Бакиров Б. Ҳайвонларда модда алмашинувининг бузилишлари ва жигар дистрофияси. Монография. Самарқанд. 2016 -224б.

4. Bakirov, B., Safarov, M. B., & Ro'ziqulov, N. B. (2023). Klinik diagnostika. *Ichki yuqumsiz kasalliklar. Darslik. “Fan ziyosi” nashriyoti, Toshkent*, *296*.

5. Norboyev, Q., Bakirov, B., & Ro'ziqulov, N. (2024). Ichki yuqumsiz kasalliklar. *Darslik. Samarqand, SamDVMChBU «Nashr matbaa markazi*, *360*.

6. Ruzikulov, N. B. (2021). Main causes and development mechanisms of Karakol sheep Ketonuria. *Asian Journal of Multidimensional Research (AJMR)*, *10*(3), 556-559.

7. Рўзиқулов, Н. Б. (2024). Соғин сигирларда жигар дистрофиясини гуруҳли профилактик даволаш чора-тадбирлари. *Монография. “Фан зиёси” нашриёти, Тошкент*, *128*.

8. Авдеенко В.С., Сенгалиев Е.М., Булатов Р.Н. Биохимические процессы в крови суягных овец при развитии субклинического кетоза. Sciences of europe # 9 (9), 2016 | Veterinary science. 109-113 стр.

9. Киреев И.В., Оробец В.А. Дефицит селена и его фармакологическая коррекция / Труды Кубанского госагроуниверситета: серия Ветеринарные науки, 2009. - №1, ч.1.- С. – 279 – 281.

10. Беляев В.А. Фармако-токсикологические свойства новых препаратов селена и их применение в регионе Северного Кавказа. Автореф. Дис…д-ра вет. наук. – Краснодар. - 2011. - 40 с.

11. Миронова А.А., Чекрышева В.В., Василенко В.Н., Миронова Л.П., Миронова О.А. Диагностический алгоритм при энтеротоксемии овец на фоне кетонурии // Ветеринария Кубани. № 2 / 2024. г. Краснодар, 6-9 стр.

12. Chandan K. K., Savita, R. Sashwati Sen. Tocotrienols: Vitamin E beyond tocopherols Life sciences. – 2006. – V. 78, No 18. – C. 2088 – 2098.

13. Liesegang A., Staub T., Wichert B., Wanner M., Kreuzer M., Liesegang A. Effect of vitamin E supplementation of sheep and goats fed diets supplemented with polyunsaturated fatty acids and low in Se. Journal of Animal Physiology and Animal Nutrition.– 2008.– No 92(3).– P. 292–302.

14. Jacques K.A. Selenium metabolism in animals. The relationship between dietary selenium form and physiological response. th. Science and Technology in SCIENCES OF EUROPE # 9 (9), 2016 | VETERINARY SCIENCE 113 the Feed Industry, Proc. 17 Alltech Annual Symp.- Nottingham University Press. - 2001. - P. 319-348.