

STUDY OF BIOCHEMICAL PROPERTIES OF BLOOD OF CALVES WITH A DIAGNOSIS OF KERATOCONJUNCTIVITIS

S.N. TSEPKOVSKAYA¹, A.V. ZAGUMENNOV¹, V.A. ERMOLAEV²,
Yu.V. ZEMLYANOVA¹

¹Penza State Agrarian University, 30 Botanicheskaya Street, 440014, Penza, Russia

²Ulyanovsk State Agrarian University Ulyanovsk, 1 New Venets Boulevard, 432017,
Ulyanovsk, Russia

Corresponding author email: obetik@mail.ru

Abstract

Eye diseases of young cattle are one of the reasons hindering the development of animal husbandry. Keratoconjunctivitis is a disease of the eye characterized by inflammation of the conjunctiva in the initial stage and subsequent transition process to the cornea. The disease is manifested in different forms and severity of inflammation. Keratoconjunctivitis causes serious economic losses due to high incidence and prevalence, both in our country and abroad. Losses from keratoconjunctivitis consist of slowing down the growth and development of young animals, loss of productivity, loss of live weight. On average, 25-30% of sick animals remain blind, the same amount of sight loss is 50%. In calves 5-6 months of age with obvious signs of keratoconjunctivitis contained in the conditions of the private livestock breeding complex, serious changes in ALT and AST activity were revealed during biochemical studies of blood plasma. Moreover, AST indicators during treatment exceeded the reference values characteristic of a given species and age of animals. Indicators of Albumin and Total protein fluctuated slightly, which indicates the activation of humoral and cellular immunity.

Key words: keratoconjunctivitis, blood, plasma, calves.

INTRODUCTION

Not a single doctor who stands guard over human health would begin treatment procedures, except in emergency cases, without a thorough analysis of the biochemical blood parameters results of his patient. Among veterinarians, there is also a kind of “tribute to fashion”, when some of them regularly, although unsystematically, conduct blood sampling for biochemical studies. However, for the most part, all these studies, as well as their results, are not used in medical practice by veterinary specialists.

The results of biochemical studies could be of great service not only to veterinarians, but also to zootechnical specialists in terms of the formation of balanced diets for animals.

However, this method of work, when the results of biochemical blood tests reveal all the errors in feeding animals, does not always suit livestock personnel who are responsible for the quality of the same feeds. Any irrational approach of the application of this universal research method could point out two following ideas; the first is illiteracy and unwillingness to fulfill one's

professional duty (for veterinary specialists); and the second, blood biochemical parameters are reliable facts that even specialists responsible for feeding animals cannot refute. The more veterinarians analyze biochemical parameters, the more detailed picture of an animal's health status they would receive.

It would not be new to say that a change in the physiological parameters of a large number of biochemical indicators reflects a certain list of pathological changes in the animal organism or the reasons that caused them.

Timely and competent use of these results would allow not only to preserve the health of animals, but also to receive high-quality products from them.

Livestock breeding is a complex and very costly branch of agricultural production, as it is associated with the need for daily care and attention to breeding animals, which, unlike their wild relatives, are fully supported by humans. In order to get maximum production from a small herd or large livestock complex, you need to constantly provide animals with high-quality feed and properly feed them (Pugh, 1986).

They should have unimpeded access to water and be housed in compliance with ethological principles in premises that meet the zoohygienic standards for their maintenance. It is important to establish daily care and medical care for them. The degree of exploitation of animals technological conditions should correspond to the biological capabilities of the body, should not weaken health and reduce the time of their production use. Failure to comply with at least one of these conditions reduces the profitability of livestock farming (Abinanti et al., 1961).

Reasonable results have been gained in certain biochemical indicators of blood plasma (total protein, albumin, ALT, AST and LDH) in the calves with keratoconjunctivitis and within the monitoring of dynamics of these indicators after the medical treatment with the use of the drug "Ligfol" in combination with various drugs.

The aim of this work is the identification and analysis of some biochemical blood indices of calves in the presence of clinical manifestations of keratoconjunctivitis, monitoring of the dynamics of biochemical parameters of blood plasma in the treatment of various preparations with local action and of the drug "Ligfol".

MATERIALS AND METHODS

As for any infectious disease, the keratoconjunctivitis is also characterized by general emergence tendencies and spreads out with a certain coverage of the susceptible population, severity and duration of the course, outcome, etc.

Therefore, the study of all these epizootological problems is of great importance in the development of diagnostic methods, treatment and prevention. To find out the zonal features of the manifestation, we studied the epizootological features of this infectious disease in one of the agricultural enterprises of the Ulyanovsk region. According to our observations, in recent years the prevalence of keratoconjunctivitis infections has been increasing. First of all, calves are affected, especially from two days of age to a year. In

adult animals, the disease is diagnosed less frequently and the inflammatory process in them proceeds more benignly. For several years, at "Megafarm – Oktyabrskay" in the Cherdaklinsky District of the Ulyanovsk Region (Russia), we were able to follow the development of enzootic of infectious keratoconjunctivitis in cattle. On this farm, in calves of the Holstein-Friesian breed, the disease progressed very quickly. A disease with eye damage of varying severity was recorded back in 2017.

The study was conducted in October 2018 on the basis of "Megafarm - Oktyabrskay" Cherdaklinsky district of the Ulyanovsk region. For this purpose there were formed 4 groups of calves. The total number of livestock in every group included 8 heads. All animals included in the group were diagnosed with clinical signs keratoconjunctivitis. Age of calves ranged from 5 to 6 months. All animals had a similar Constitution, were kept in the same microclimatic conditions, the diet was similar. For the study there were selected 4 treatment regimens, which we used for the appropriate groups. The main components of the regimen were: Daily eye treatment solution "Dioxidine" 0.5% and intramuscular injection of the drug "Ligfol" in a dose of 5 ml per head. The treatment was carried out for 14 days (Table 1). Blood samples for biochemical analysis were made at 1, 3, 7, 10 and 14 days of treatment. Blood was taken from jugular vein in vacutainer tubes with activator clot formation (SiO₂). Blood was taken in the morning, before feeding. The blood after collection was centrifuged to obtain plasma. Research plasma was produced in a clinical laboratory of the Department of surgery, obstetrics, pharmacology and therapy of the "Ulyanovsk state agricultural University". The researchers examined the biochemical indexes of blood plasma using the biochemical analyzer "Erba Mannheim XL-100». There was also determined a number of parameters: GPT, AST, LDH, Albumin and total protein. The data obtained were subjected to statistical processing in a computer program, "Statistika 12".

Table 1. Group treatment regimens

Group number	The total number of livestock in every group	Solution Dioksidini 0.5% + Ligfol 5 ml I/m + "additional drug"	Status
1	8	Tetracycline ointment 10 000 units	Background/control
2	8	Chloramphenicol 0,25%, 2-3 drops	Experience
3	8	Ciprofloxacin 0,3%, 2-3 drops	Experience
4	8	Gentamicin sulfate 3%, 2-3 drops	Experience

RESULTS AND DISCUSSIONS

Having examined the blood plasma, it was found that in calves the indicators of albumin in the course of treatment tended to decrease to the average 32.83 g/L. The average content of albumin in plasma at the time of the first study day (38.55 g/l) did not exceed norms for a given species (30-40 g/l).

The average value of the indicator "total protein" in the beginning of the study was 81.75 g/l, slightly higher than normal (60-80 g/l) for this species. After the treatment there was seen a tendency in decreasing of the indicator "total protein" value on day 14 was 70.18 g/l.

It was revealed a significant decrease of activity alanine aminotransferase (ALT), the average of which in beginning research made 100.91 u/l; normal 50 u/L. At the end of the treatment the average ALT activity fell to 31.15 u/l.

In the case of aspartate-aminotransferaza (AST), on day 14 of the treatment, it showed improved activity in comparison with the first day of the study. On the first day, the average AST in all groups was 36.26 u/l at norm for a given species 80 u/L. After the treatment, the increase in the average AST to 95.00 was observed (Figure 1).

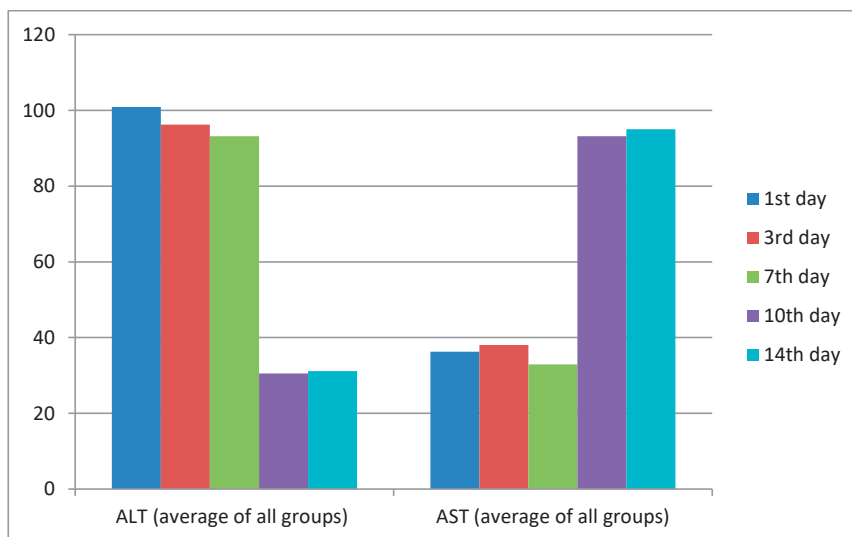


Figure 1. The ratio of the average ALT and AST activity during the treatment

The average activity of lactate dehydrogenase (LDH) at all stages of the study remained normal (1500 u/l). The average at the beginning of the

study was 1451.46 u/l and at the end of the treatment he average indicator decreased to 1406.87 u/l (Table 2).

Table 2. Biochemical indicators of the blood plasma of calves during the treatment on 1,3,7,10 and 14 days

Group number	Day	Albumin g/l	Total protein g/l	ALT u/l	AST u/l	LDH u/l
Group 1	1	42.01±1.00	85.15±2.69	89,73±12,30	44.80±7.69	1,494.50±83.29
	3	32.05±1.70 ***	73.16±1.87 **	98.80±12.99	42.11±6.51	1,496.62±79.18
	7	32.76±1.52 ***	68.15±3.16 **	100.01±10.48	36.11±3.76	1,503.87±67.92
	10	31.12±0.97 ***	64.88±2.38 ***	33.82±1.84 ***	89.30±4.33 ***	1,473.75±57.09
	14	34.44±1.15 ***	65.08±2.77 ***	30.25±1.20 ***	97.47±9.40 ***	1,445.37±50.13
Group 2	1	35.70±1.30	76.48±2.52	113.82±18.51	35.00±3.90	1,437.50±64.63
	3	31.97±0.97 *	79.88±0.85	105.01±12.19	30.33±3.35	1,436.12±62.52
	7	32.46±1.18	74.21±2.34	97.15±9.37	33.13±1.20	1,432.62±58.09
	10	32.89±1.27	69.64±2.89	24.97±2.77 ***	87.38±4.01 ***	1,441.37±52.19
	14	32.40±0.97	65.64±3.98 *	32.70±2.06 ***	115.40±14.33 ***	1,428.75±69.32
Group 3	1	37.16±1.41	79.00±3.70	103.63±11.15	35.57±2.99	1,454.37±53.72
	3	35.89±0.84	81,63±1.85	107.12±5.97	38.05±1.75	1,243.98±180.22
	7	33.49±1.46	70.19±2.62	91.35±8.59	31.61±2.62	1,385.12±46.10
	10	36.51±0.67	62.32±3.76 **	31.82±2.03 ***	102.11±9.76 ***	1,416.75±50.11
	14	30.30±0.63 ***	77.37±1.07	34.03±1.48 ***	92.16±4.06 ***	1,407.62±48.34
Group 4	1	39.97±0.60	86.36±1.88	96.46±7.72	46.30±14.63	1,419.50±58.38
	3	37.59±1.19	81.14±2.18 ***	74.22±9.65	41.81±6.75	1,397.50±60.30
	7	31.46±1.36 ***	67.71±2.80 ***	84.12±5.32	30.88±3.14	1,385.12±46.10
	10	29.74±2.11 ***	48.18±6.47 ***	31.51±1.21 ***	96.88±8.82 *	1,372.37±46.62
	14	32.83±1.14 ***	72.66±1.99 ***	29.86±1.10 ***	83.17±5.96 *	1,345.75±40.55

Note: difference of values in comparison with the 1st day of the study: *** - $p < 0.001$, ** $p < 0.01$, * - $p < 0.05$

CONCLUSIONS

In calves aged 5-6 months with obvious signs of keratoconjunctivitis contained in the conditions of a livestock breeding complex "Megafarm - Oktyabrskay" in the course of biochemical studies of blood plasma revealed major changes in the activity of ALT and AST. The incidences of AST during treatment exceeded the reference values, characteristic of the species and age of

animals. Indicators of Albumin and Total protein fluctuated slightly.

Most reliable abnormalities in comparison with the first day of treatment were detected in group nr.1 and group nr.4.

The indicators of activity of LDH throughout the treatment remained within the normal range.

A significant difference of biochemical indicators of the blood plasma, depending on the schema of treatment has not been established.

Eye diseases of young cattle are one of the reasons hindering the development of animal husbandry. Keratoconjunctivitis is a disease of the eye characterized by inflammation of the conjunctiva in the initial stage and subsequent transition process to the cornea.

Keratoconjunctivitis causes serious economic losses due to high occurrence frequency and prevalence, both in our country and abroad. Losses from keratoconjunctivitis consist of slowing down the growth and development of young animals, loss of productivity, loss of live weight. The study of biochemical parameters allows to identify the factors predisposing to the disease and identifying the causes of it under consideration.

ACKNOWLEDGEMENTS

This research work was carried out with the support of Penza State Agrarian University and Ulyanovsk State Agrarian University.

REFERENCES

- Abinanti, F.R., Plummer, G.J. (1961). The isolation of infectious bovine rhinotracheitis virus from cattle affected with conjunctivitis observations on the experimental infection. *Am. J. Vet. Res.*, 22(8), 13-17.
- Pugh, G.W. (1986). Infectious bovine keratoconjunctivitis: evidence for genetic modulation of resistance in pure-bred Hereford cattle. *Am. J. Vet. Res.*, 47(4), 885.
- Smith, J.A., George, L.W. (1995). Treatment of acute ocular *Moraxella bovis* infectious in calves with a parenterally administered long-active Oxytetracycline formulation. *Am. J. Vet. Res.*, 46(4), 804.