

# METABOLIC PARAMETRES IN PREGNANT SHEEP WITH SUBCLINICAL KETOSIS

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**Abstract** - The experimental group of pregnant sheep with symptoms of ketonuria consisted of animals with the content of ketone bodies in urine more than 0.5 mmol/l. It was found that when the level of ketone bodies is raised above physiological limits by 2.3 times and their fractions — AcAc by 5.9 times indicates a metabolic disorder in pregnant sheep that is characteristic of ketonuria. The ratio of ketone bodies fractions  $\beta$ -hydroxybutyric acid (BH) to acetone with acetoacetic acid (AcAc) is lower than 1.9: 1, and it should be considered as a nonspecific marker of fatty liver dystrophy regardless of the level of CKB in the blood. In the future, the material obtained in this study should be considered when studying the problem of ketonuria and ketosis of pregnant sheep as the concept of development of dysfunction «LPO-AOD» system for this metabolic disease.

**Index Terms** - pregnant sheep, blood, «LPO-AOD» system, ketonuria, metabolic processes.

## INTRODUCTION

The mechanism of development of ketonuria of pregnant sheep, in the context of metabolic disorders, is considered in scientific publications as a factor of destabilization of the homeostasis of pregnant sheep and is currently in the stage of accumulation of factual material. The result of the noted changes in the organism of pregnant sheep is the manifestation of the syndrome of fetoplacental insufficiency, which is the main mechanism of impaired fetal development during the intrauterine period. So in works, it is noted that extragenital diseases, such as ketonuria of pregnant sheep against the background of E and C vitamin deficiency, can provoke fetoplacental insufficiency, which negatively affects fetal development and promotes the birth of a hypotrophic offspring.

At present, has established the involvement of vitamin E in reducing the level of lipid peroxidation and the binding of free radicals, which optimizes the immunobiological reactions in the organism.

Currently, many issues of the functioning of the system «lipid peroxidation — antioxidant protection» according to V. S. Avdeenko, S. A. Migaenko [1] and V. S. Avdeenko, A. V. Molchanov, R.

N. Bulatov [2] concerning the state of metabolic processes in the organism of pregnant sheep in the presence of subclinical ketosis have not yet been studied.

The mechanism of development of subclinical ketosis in pregnant sheep in the context of metabolic disorders is considered in scientific publications as a factor in the destabilization of homeostasis in pregnant animals and, at the present time, according to the analysis of the studies conducted by V. S. Avdeenko [3] and I. V. Kireev [4], is in the stage of accumulation of factual material. At present [5,6,7], selenium is involved in reducing the level of lipid peroxidation and binding of free radicals, which optimizes the immunobiological reactions in the organism.

In the works of E. W. Edens [8] and K. A. Jacques [9] showed that selenium metabolism, absorbed in the animal's tissue, is fixed by protein globulins. At the same time, according to J. Kohrle, [10] and J. A. Johannigman [11], with the low content of selenium in the ration of small cattle, the work of the proventriculus is disrupted, as a result, the metabolism in the rumen is disrupted with the formation of insoluble forms of the microelement, that are excreted with excrements, which

leads to a significant accumulation of free radicals and disruption of the «LPO-AOD» system.

**Purpose of the study.** Determination of the change in the status of the system «lipid peroxidation — antioxidant protection» in pregnant sheep against the background of ketonuria.

**Materials and methods.** The work was carried out in the period 2006–2016. The experimental group of pregnant sheep was made up of animals with symptoms of ketonuria. For hematological studies, blood was taken before morning feeding. Biochemical blood tests were performed on a CIBA-CORING 288 BLOOD GAS SYSCHEM analyzer (manufactured in the USA). In addition, the content of malondialdehyde (MDA), vitamins C and E were determined in the blood of sick animals. Statistical analysis of data was carried out using standard programs like Microsoft Excel 2000 SPSS 10.0.5 for Windows.

**Results.** The results of a biochemical blood test in pregnant sheep, positively reacting to ketone bodies in the urine, are presented in the data of Table 1.

**Table 1. Biochemical studies of blood of pregnant sheep, positively reacting to ketone bodies in the urine**

**Note:** hereafter \*  $p < 0.05$ , \*\*  $p < 0.01$

Analysis of the obtained materials indicates that an increase in the level of ketone bodies above physiological limits by 2.3 times and their fractions — AcAc (acetoacetic acid with acetone, mmol /l) and BH (β-hydroxybutyric acid, mmol /l), respectively 5.9 times and 1.5 times, reduction of buffer bases to  $18.41 \pm 1.53$  mmol /l, glucose concentration to  $2.25 \pm 0.16$  mmol /l, and the ratio coefficient BH/AcAc to  $1.53 \pm 0.28$ .

Therefore, the ratio of the fractions of ketonic bodies of β-hydroxybutyric acid (BH) to acetone with acetoacetic acid (AcAc) is lower than 1.9:1, should be considered as a nonspecific marker of fatty liver dystrophy regardless of the level of CKB in the blood.

From the materials presented in Table 2 it follows that in pregnant sheep with extragenital pathology of pregnancy, an increase in the content of lipid peroxidation intermediate product MDA by 43.0% ( $p < 0.05$ ) was noted at the initial stage of ketonuria

development ( $p < 0.05$ ) and activation of the system antioxidant protection, as a compensatory reaction to the damaging effect of peroxidation products.

Activity of the content of stable metabolites of nitric oxide increased by 38.0%, vitamin C by 24.1%. At the same time, the content of vitamin E, not synthesized in the organism, decreased by 13.1 % (from  $18.1 \pm 1.02$  to  $12.5 \pm 1.73$  mmol /l), which is associated with a significant consumption of it at neutralization of toxic products of lipid peroxidation.

**Table 2. Some parameters of the state of the " LPO-AOD " system in sheep during physiological and pathological pregnancies**

Parameters	Subclinical	Clinically
Malondialdehyde,	$1.41 \pm 0.01^*$	$1.04 \pm 0.01$
Gap, mm 0-8N/Limin	$13.6 \pm 0.34^*$	$16.8 \pm 0.12$
Catalase, mm	$33.3 \pm$	$25.2 \pm 0.13$
Vitamin E, mkmol/l	$6.2 \pm 0.09^{**}$	$13.4 \pm 0.20$
Vitamin C, mmol/l	$11.5 \pm 0.43^*$	$17.2 \pm 0.42$
N0*, mkmol/l	$58.1 \pm$	$82.6 \pm 1.88$

Researched	Actual	Reference
Glucose, mmol/l	$2.25 \pm 0.16$	2.22-3.33
Total protein, g/l	$82.0 \pm 6.1$	72-86
Alkaline reserve,	$18.41 \pm 1.53$	19-27
Common ketone	$2.38 \pm$	0.18-1.03
Acetoacetic acid with	$0.94 \pm$	0.03-0.24
-hydroxybutyric acid	$1.44 \pm 0.16^*$	0.48-0.79
The BH/AcAc ratio	$1.53 \pm 0.28$	-

## CONCLUSION

The information obtained in this work reveals the mechanism of development of ketonuria in pregnant sheep. Among the studied parameters, the lowest sensitivity, 13.1%, is characterized by the content of vitamin E. The concentration of stable metabolites of nitric oxide and vitamin C in the blood of pregnant sheep with ketonuria is significantly higher by 1.75 times and by 1.24 times in comparison with the

parameters of clinically healthy animals. In the future, the material obtained in this work should be taken into account when studying the problem of ketonuria in pregnant sheep and its relationship with fetoplacental insufficiency in domestic animals

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