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**PATHOANATOMY OF DAIRY COWS WITH KETOSIS**

**Abstract.** The study addressed pathomorphological changes in dairy cows with ketosis. It was determined that deep pathological processes develop in organs and tissues of cows with ketosis in the setting of disorders of carbohydrate, protein and fat metabolism.

**Keywords:** ketosis, metabolism, pathoanatomical changes, granular and fatty degeneration, liver.

**Introduction.** Metabolic diseases including ketosis of dairy cows occupy a special place in the intensive livestock industry. This pathology causes significant economic damage to livestock farms due to a reduction of useful life of the most valuable animals, decrease of their productivity to 30-50%, loss of live weight, forced culling, as well as the increase in the number of infertile cows after the disease and negative effects on offspring [1-5].

At the present time, the problem of ketosis in the Republic of Kazakhstan is extremely urgent, as in recent years there has been a positive tendency in improving the genetic potential of dairy cows. According to different estimates, both clinical and subclinical ketosis affect from 12 to 80% of highly productive adult cows [6-9].

We have conducted comprehensive research at “Bayserke-Agro” LLP. As a result, the clinical and anatomical manifestations of a disease along with biochemical and laboratory data allowed us to refer the disease to acute ketosis.

**The purpose** of the work was to investigate the pathomorphological changes in cows with acute ketosis in “Bayserke-Agro” LLP located in Almaty oblast.

**Methods.** The research was conducted at the “Bayserke agro” LLP, Talgar region, Almaty oblast. 12 forcibly killed black-mottled cows of Holstein-Friesian breed were used as the monitoring object. Samples of muscle tissue and parenchymal organs were collected at autopsy for further histological investigations. Histological sections were stained by Haematoxylin and Eosin according to Van Gieson method and glycogen was determined by the Schiff (PAS) reaction.

**Results.** Clinical and laboratory studies of dairy cows of Bayserke Agro LLP showed the prevalence of ketosis. Hyperreaction to external stimuli was observed in affected animals in the early stages of the disease, there were cases of attacks on people, frightened look, frequent self-licking, ruminative chewing, teeth-grinding, muscle tremor, lowing, excessive salivation and uncoordinated movements. Then, excitement was replaced by depression, which was characterized by weak reaction to environment, and frequently by comatose state. Visible mucous membranes were bile-stained.

Results of laboratory studies have shown increase in the number of ketone bodies, decreased blood glucose level and alkaline reserve.

All compulsorily slaughtered animals had average fatness, except for 3 cows, whose fatness was above average with significant fat deposition in fat depots.

In all cases, skeletal muscles had soft consistency, were light-colored, with abundant fat deposition in the intermuscular tissue (figure 1).



Figure 1 – Cattle



Figure 2 – Fatty deposits under the epicardium

Most pronounced dystrophic and hemodynamic changes were detected in parenchymal organs, especially in the liver, kidneys and heart.

The liver was constantly increased in volume with blunt edges, loose consistency, and yellowish-brown color. There was no lobular pattern on the cut section. The surface of the section is constantly greasy, fatty plaque remains on a knife when cutting the organ. The gall bladder is stretched, bile is thick and sticky.

Kidneys are frequently enlarged, the border between layers is indistinct, the cortical layer is yellowish, vessels in the medulla are overfull with blood (figure 2).



Figure 3 – Sour and fatty degeneration liver

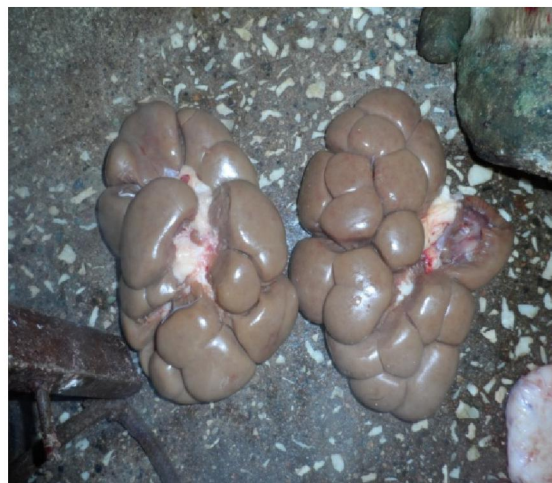


Figure 4 – Fatty degeneration kidneys

Significant fat deposits are observed under the epicardium, at the cardiac base along coronary vessels (figure 3).

However, fat is rather peculiar in terms of its consistency and often is sort of slightly edematous.

The myocardium is flaccid, anemic, with a different degree of myogenic dilatation of ventricles.

On the cut section lymph nodes are juicy, grayish, often slightly enlarged. The spleen is not enlarged.

In forestomachs, especially in the booklet of animals with clinically apparent atony, feed masses are dry and thick. A picture of subacute catarrhus was revealed in the fourth stomach and small intestine.

In adrenal glands the cortical layer is more developed and has grayish-yellow color, the parenchyma of the organ is slightly flaccid.

Microscopic changes. Liver damage on our material was noted in all cases. Diffuse macrovesicular fatty degeneration was noted in hepatocytes combined with carbohydrate and granular degeneration. These changes are most pronounced in the centrolobular area of the organ. Stellate reticuloendothelial cells and Ito cells were also subjected to fatty degeneration. Cell proliferation in the reticuloendothelial and mononuclear-macrophagal systems with formation of clusters or nodules of reticular and lymphoid cells should be noted as a constant sign [Figure 4]. In all cases we noted kidney damage. Degenerative and necrobiotic changes in epithelial cells of straight tubules were typical.

Many epithelial cells of straight tubules were predominantly in the state of protein and microvesicular fatty degeneration. Necrobiotic process is observed in the epithelium of some tubules. There is polymorphocellular infiltration in the interstitial connective tissue. A small quantity of glycogen was observed in the tubular epithelium.

**Dicussion.** There are vascular disorders, atrophic and degenerative changes in the ventricular myocardium: Histochemical studies revealed dramatic reduction and even disappearance of glycogen and microvesicular lipid infiltration of hepatocytes.

**Conclusions.** Thus, these pathomorphological studies suggest occurrence of deep pathological processes in organs and tissues of cows with ketosis in the setting of disorder of carbohydrate, protein and fat metabolism.

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#### САУЫНДЫ СЫРЛАРЫНЫҢ КЕТОЗ КЕЗІНДЕГІ ПАТОЛОГИЯЛЫҚ АНАТОМИЯСЫ

**Аннотация.** “Байсерке” ЖШС сауынды сырларының кетоз кезіндегі патоанатомиялық өзгерістерін зерттедік. Кетозбен ауырған сүтті сырлардың ағзасында көмірсулардың, ақыздың, май алмасудың, зат алмасудың бұзылуымен сипатталып және жасушаларда терең патологиялық процесс пайда болды.

**Түйін сөздер:** кетоз, зат алмасу, патологоанатомиялық өзгерістер, дистрофия, бауыр.

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#### ПАТОЛОГИЧЕСКАЯ АНАТОМИЯ КЕТОЗА МОЛОЧНЫХ КОРОВ

**Аннотация.** Изучены патоморфологические изменения кетоза у дойных коров в ТОО «Байсерке Агро». Установлено, что у коров больных кетозом на почве нарушения углеводного, белкового, жирового обмена веществ в органах и тканях возникают глубокие патологические процессы.

**Ключевые слова:** кетоз, обмен веществ, патологоанатомические изменения, дистрофия, печень.