



## Symptoms of Chronic Ketosis in Cows and Morphobiochemical Indicators of Blood

B. Tursunaliev<sup>1</sup>, K.N. Norbaev<sup>2</sup>

<sup>1</sup> PhD researcher, Samarkand Institute of Veterinary Medicine

<sup>2</sup> Professor, Samarkand Institute of Veterinary Medicine

**ABSTRACT:** In this article described the ketosis which is subclinical in cows in the last months of pregnancy, the changes in appetite during lactation, anemia of the mucous membranes, decreased skin elasticity and luster of the skin, increased pulse and respiration, clinical signs such as abdominal hypotension, alopecia, and hemoglobin, glucose, total calcium decrease in inorganic phosphorus, carotene, alkaline reserves relative to physiological norms, increase in the amount of ketone bodies, decrease in the number and activity of infusoria in the large abdominal fluid and the course of large abdominal acidosis.

**KEY WORDS:** Acidosis, Acetone, Anemia, Alopecia, Beta-Oxyzoic Acid, Dysproteinemia, Hypocalcemia, Hypocalcemia, Hypoglycemia, High-Yielding Cows, Hypohemoglobinemia, Hypocarotinememia, Ketone Bodiesketocytopenia, Subclinical Ketosis, Secondary Osteodystrophy.

### INTRODUCTION

**Relevance of the topic.** Non-communicable animal diseases are a major obstacle to achieving high productivity in livestock and increasing the profitability of the industry. Among these diseases, subclinical ketosis of cows is of great importance, and the main causes of the disease are hypodynamics, imbalanced diet of cows, poor quality silage, which contains a lot of fatty acids, senna, lack of vitamins, macro- and micronutrients in the diet.

One of the most pressing issues today is the development and introduction into veterinary practice of effective methods for early detection and prevention of subclinical ketosis, including metabolic disorders that occur in productive cows.

Subclinical ketosis of high-yielding cows is causing significant economic damage to farms due to a sharp decline in productivity, infertility, reduced lifespan of high-yielding cows, the birth of low-life and disease-prone hypotrophic calves, increased feed consumption for production [1,3].

Due to the drastic changes in the conditions of storage and feeding of dairy cows, hay and high-quality foods in the diet in the winter are replaced by foods with high acidity, such as silage, haylage, barley causes all kinds of metabolic disorders in cows, such as chronic acidosis and ketosis, secondary osteodystrophy, hypomagnesemia, fatty hepatodystrophy, large abdominal acidosis [1,2,16].

Subclinical ketosis in bovine cows averages 25.8% and is accompanied by hypoglycemia, erythropenia, lymphopenia, hypohemoglobinemia, increased erythrocyte sedimentation rate [5,8].

Secondary anterior gastric dystonia due to subclinical ketosis and secondary osteodystrophy in cows characterized by an increase in acidity in the large abdominal fluid to  $6.30 \pm 0.09$  units, decrease in the total concentration of volatile fatty acids (VOC) by 47.3%, the number of infusoria to an average of  $300 \pm 43$  thousand / ml [12]. Development of hepatic dystrophy, subclinical ketosis and secondary osteodystrophy in fertile cows is a consequence of sugar-protein ratio below 0.7-0.79 and deficiency of vitamins A, D, C and trace elements such as copper, cobalt, zinc, manganese [2,5].

### MAIN PART

In the diet of dairy cows leads to a violation of the sugar-protein ratio, a lack of fiber, the appearance of chronic lactic acidosis in the large intestine and ruminitis. Quantitative and qualitative changes in the microflora in the anterior gastric compartments, a decrease in the number of large and medium-sized infusoria, a decrease in their activity, enhance the hydrolysis of tissue. Excess of concentrated nutrients in the diet provides a decrease in pH - an average of  $6.5 \pm 0.05$  (norm 6.8-7.4) in the large abdominal fluid [6,15].



Chronic ketosis and secondary osteodystrophy occur in an average of 30% of cows, 12% in animals with placental abruption, mastitis, endometritis, 20% in animals with postpartum paralysis and various pathologies of the hooves [13].

In cattle, its environment, the ratio of volatile fatty acids and the activity of microorganisms play an important role in the normal course of digestion of nutrients in the large intestine. When cattle are fed a balanced diet, the ratio of volatile fatty acids in the large intestine is as follows: acetic acid 65%, propionic acid 20%, fatty acid 15% [7,9].

Inequalities in the diet lead to diseases of the gastrointestinal tract in cattle, including acidosis, impaired ratios of volatile fatty acids in the large intestine, a decrease in the number of infusions, as well as decreased motility of the gastrointestinal tract and ketosis [10,14].

**Location, object and methods of research.** Dispensary studies were conducted to study the causes of subclinical ketosis and biochemical parameters of blood in cows belonging to the Holstein-Friesian breed at the cattle farm "Imam ota" in Pastdargom district, Samarkand region.

A reference group of 10 cows was selected from the farm and clinical and hematological examinations were performed once every 30 days during the last two months of calving and the first and second months of lactation through dispensary examinations. Ketone bodies in blood and urine were detected using the KETONE URS-1K indicator test.

Blood samples from cows were biochemically analyzed in the laboratory to determine the amount of hemoglobin (hemoglobin-cyanide method), glucose (color reaction with ortho-toluidine), total protein in serum (refractometric method), alkaline reserve (I.P. Kondraxon method), total calcium (V.P.Vichev, L.V.Karakashov method), inorganic phosphorus (pulse method V.F.Kromyslov and L.A.Kudryavtseva method), carotene (Carr Price method, Yudkin modification), large abdominal fluid medium (using rN-meter), the number of infusoria (Goryaev count type) was determined [4].

**Results obtained and their analysis.** In order to study the clinical signs and symptoms of chronic ketosis in cows, dispensary examinations were conducted in Holstein-Friesian cows belonging to the cattle farm "Imam ota" of Pastdargom district.

In the last 3 years, the average milk yield of cows is 3400 kg, and the yield of calves from 100 cows is 70-75 heads. Analysis of herd syndromics on the farm The microclimate of the building where cows are kept is not at the level of zoohygienic requirements and low productivity, hypovitaminosis from non-communicable diseases, osteodystrophy, subclinical ketosis, secondary osteodystrophy, placental abruption, postpartum paralysis, including endometritis showed that the state of vitamin and mineral metabolism is unsatisfactory.

At the beginning of the study and once a month, the experimental cows underwent clinical examinations, blood samples taken from them, and laboratory tests of large abdominal fluid. In cows, appetite, body temperature, skin and skin lining, pulse and respiration rate per minute, movement of the large abdomen in 2 minutes, condition of mucous membranes, and base movement organs were determined.

In dispensary studies, it was observed that the body temperature of cows was within the physiological norms, and at the beginning of examinations (8 months of gestation) heart rate per minute averaged  $68.2 \pm 4.8$  times, on 9 months of gestation averaged  $76.2 \pm 5.6$  times, on 1 month of lactation averaged  $82.4 \pm 5.3$  times, by the end of the study (2 months of lactation) averaged  $86.2 \pm 5.1$  times (norm 50-80 times per minute), the number of breaths per minute were  $18.6 \pm 0.56$ ,  $22.6 \pm 0.58$ , respectively,  $24.8 \pm 1.1$ ,  $28.5 \pm 0.48$  times (the norm is 12-25 times per minute).

In cows, the number of large abdominal contractions in 2 minutes at the beginning of the study (8 months of gestation) averaged  $3.4 \pm 1.84$  times, while the norm (3-5 times in 2 minutes) at the end of the study (2 months of lactation) identified  $2.2 \pm 1.60$  fold decrease (Table 1).

The constant hypotension of the gastrointestinal tract in farm cows can be explained by the fact that they are kept in one place throughout the year, malnutrition, hypodynamics, one-sided feeding of silage-concentrate type, nutritional and biologically active substances in the diet do not meet the needs of cows. The literature also reports a  $7.4 \pm 0.2$ -fold decrease in the number of 5-minute contractions of the anterior abdominal sections during subclinical ketosis and secondary osteodystrophy in dairy cows [11,12].

At the beginning of the study, that is, in 8-month-old calves, a decrease in skin luster and weak movement of the incisors were observed, while an increase in these symptoms during lactation was characteristic. At the beginning of the study, 40.0% of animals had changes in appetite (lizukha), 60.0% had anemia of the mucous membranes, and by the end of the study (2 months of



lactation), these figures were 50.0 and 90.0%, respectively. Also, in almost all cows, clinical signs such as subclinical ketosis is accompanied by secondary osteodystrophy, which includes whitening of the mucous membranes, changes in appetite, increased heart rate and respiration rate per minute, hypotension of the abdomen, thinning of hair around the eyes and lips, enlarged joints, decreased skin coverage and hoof luster were observed.

**Table 1.** Clinical parameters of cows. (n=10)

Inspection time	Body temperature , °C	Pulse, per 1 minute	Breathe , per 1 minute	Rumination , per 2 minute
8th month of pregnancy	38,5±0,26	68,2±4,8	18,6±0,56	3,4±1,84
9th month	38,9±0,45	76,2±5,6	19,4±1,13	3,2±1,26
1st month of lactation	39,0±0,24	82,4±5,3	24,8±1,1	2,4±1,74
2nd month	39,5±0,26	86,2±5,1	28,5±0,48	2,2±1,60

To study the morphobiochemical changes in the blood in chronic ketosis in cows, 10-year-old Holstein-freeze cows, 4-5-year-old cows were selected as a reference group, and blood samples were taken from them.

The hemoglobin level in the blood of cows averaged 94.4 ± 4.3 g / l at 8 months of gestation, 92.6 ± 3.5 g / l at 9 months, and 86.8 ± 4.5 g / l at 1 month of lactation, averaged 76.8 ± 4.6 g / l in the 2nd month (norm 99–129 g / l). Hypohemoglobinemia was also observed in cows during the last two months of gestation and lactation.

Blood glucose concentrations were noted to be significantly lower than normal at the beginning of dispensary examinations (normal 2.22–2.33 mmol / l) and averaged 2.20 ± 0.32 mmol/l. By the 2nd month of lactation, this figure was further reduced to an average of 1.94 ± 0.42 mmol / l. The decrease in blood glucose levels during the tests can be explained by the fact that the cows' need for sugar during calving and lactation is not met.

The total protein content in the serum of cows was within the physiological norms at the beginning of the study, averaging 72.4 ± 6.2 g / l, and at the end of the study was 84.1 ± 5.1 g / l. Changes in the total amount of protein in the blood serum are explained by dysproteinemia. The amount of alkaline reserve in the blood serum is much lower than normal (norm 46-66 volume% SO<sub>2</sub>), and at the beginning of the study (8 months of gestation) averaged 42.6 ± 2.4% SO<sub>2</sub>, at the end of the study (lactation 2 - month), characterized by a decrease in volume to 34.5 ± 2.3% SO<sub>2</sub> on average. This condition indicates the development of acidosis in cows.

Serum carotene levels were lower than physiological norms, with an average of 0.324 ± 0.46 mg% at the beginning of the study (8 months of gestation) and at the end of the study (2 months of lactation) an average of 0.258 ± 0.42 mg% decrease (norm-0.4-1.0 mg%) was noted.

In subclinical ketosis of dairy cows, macronutrient metabolism was characterized by hypocalcemia and hypophosphoremia, and a decrease in total calcium and inorganic phosphorus levels in the blood during lactation was noted. Serum total calcium averaged 2.22 ± 0.18 mmol / l at the beginning of the study (norm 2.5-3.13 mmol / l), but by the end of the study it had risen to 2.06 ± 0.26 mmol / l. decrease was observed (Table 2). The amounts of inorganic phosphorus averaged 1.44 ± 0.3 and 1.24 ± 0.31 mmol / l (normal 1.45-1.94) (P <0.05), respectively.

The average amount of ketone bodies in the blood of cows was 0.216 ± 0.06 mmol / l at 8 months of gestation, 0.624 ± 0.06 mmol / l at 9 months of gestation, 1.062 ± 0.05 mmol / l at 1 month of lactation, 2 of lactation. - the average was 1,168 ± 0.08 mmol / l per month (norm 0.172-1.032 mmol / l).

The average amount of ketone bodies in the urine was 1.648 ± 0.04 mmol / l, 1.798 ± 0.03 mmol / l, 2.028 ± 0.06 mmol / l, and 2,634 ± 0.05 mmol / l, respectively. In cows, it was found that the incidence of ketonemia and ketonuria in the body increased from a chronic form of ketosis to the lactation period compared to the gestation period.

The amniotic fluid volume (pH) was at the lower limit of physiological norms at the beginning of the study (8 months of gestation) and averaged 6.82 ± 0.06 (pH 6.5-7.5), increasing in acidity during lactation. and decreased by an average of 6.20 ± 0.05 (R <0.001) at the end of the study (at 2 months of lactation).



The number of infusoria in the large abdominal fluid of cows averaged  $548.2 \pm 34.7$  thousand / ml at 8 months of gestation,  $520.2 \pm 38.4$  thousand / ml at 9 months, and an average of  $464.2 \pm 52$  at 1 month of lactation. 6 thousand / ml, and by the 2nd month of lactation, a decrease to an average of  $378.5 \pm 36.4$  thousand / ml ( $R < 0.01$ ) was observed. It was noted that the activity of infusoria also decreases dynamically accordingly.

According to the literature, the average pH of the large abdomen during subclinical ketosis and secondary osteodystrophy in cows decreased to  $6.30 \pm 0.09$  units, and the number of infusoria decreased to 295.0 thousand / ml compared to healthy animals [12].

**Table 2.** Morphobiochemical parameters of the blood of dairy cows (n=10)

Inspection time	Hemoglobin, g / l	Glucose, mmol / l	General protein, g / l	Carotene, mg%	Alkaline reserve, volume % CO2	Ketone bodies mmol./l	
						Sugar	In the urine
8th month of pregnancy	94,4 ±4,3	2,20 ±0,32	72,4 ±6,2	0,324 ±0,46	42,6 ±2,4	0,216 ±0,06	1,648 ±0,04
9th month of pregnancy	92,6 ±3,5	2,12 ±0,22	74,6 ±5,2	0,318 ±0,34	40,5 ±2,8	0,624 ±0,06	1,798 ±0,03
1st month of lactation	86,8 ±4,5	2,06 ±0,14	78,2 ±4,5	0,287 ±0,40	39,8 ±2,5	1,062 ±0,05	2,028 ±0,06
2nd month of lactation	76,8 ±4,6	1,94 ±0,42	84,1 ±5,1	0,258 ±0,42	34,5 ±2,3	1,168 ±0,08	2,634 ±0,05

With the determination of large abdominal fluid parameters in cows, we concluded that chronic ketosis was characterized by an increase in acidity (acidosis) in the large abdominal fluid, a decrease in the number and activity of infusoria.

**CONCLUSIONS**

1. In cows, chronic ketosis in the first two months of lactation is accompanied by secondary osteodystrophy in the form of a complex pathology, whitening of the mucous membranes (anemia), changes in appetite (lizukha), an average heart rate of 18 beats per minute and an average 9.9 beats per minute, hypotension, characterized by clinical signs such as hair loss around the eyes and lips and in some parts of the body (alopecia), decreased skin elasticity and luster, loosening of incisors, enlargement of leg joints.

2. In chronic ketosis, hypogemoglobinemia, hypocarotinememia, hypoglycemia, dysproteinemia, ketonemia, ketonuria and disorders of calcium-phosphorus ratio are observed in cows.

**REFERENCES**

1. Babukhin S.N. Diagnosis, therapy and prevention of subclinical ketosis with pregnancy complications in imported heifers. Abstract thesis.....cand. veterinary sciences: 16.00.01. Saratov 2018. P. 144.
2. Kondrakhin I.P., Levchenko V.I. Diagnosis and therapy of internal diseases of animals. M.: Ed. Aquarium-Print LLC, 2005, pp. 652-664.
3. Kendysh IN, Regulation of carbohydrate metabolism // Veterinary. - Moscow, 2000. No. 1. pp. 41-43.
4. Methods of veterinary clinical laboratory diagnostics: Handbook / ed. prof. I.P. Kondrakhin. M.: Kolos, 2004. pp. 520.
5. Norboev Q.N., Bakirov B.B., Eshbo'riev B.M. Internal non-communicable diseases of animals. Textbook. - Samarkand: 2020. - p. 214-226.
6. Norms and diets for feeding farm animals. Reference manual / A.P. Kalashnikov, V.I. Fisinina, N.I. Kleymenova // Moscow, 2003.- 455 p.



7. Novikova I.A. Correction of the biochemical status in highly productive cows with ketosis in the conditions of an industrial complex: author's abstract .. thesis. cand. biol. Sciences: 03.01.04 / I.A. Novikov; FGBOU VPO KGSMA them. prof. I.I. Ivanova.- Kursk, 2013.-19 p.
8. Tlidzhan M. Influence of pH of cicatricial contents (acidosis, alkalosis) on liver function and lipid metabolism in cows: Abstract of the thesis. diss...cand. vet. Sciences. - M., 1986. - 17p.
9. Trebukhov A.V. Subclinical ketosis of cows: Diagnosis, treatment, prevention: thesis ... candidate of veterinary sciences: 16.00.02, 16.00.01 / A.V. Trebukhov. - Barnaul, 2005. -180 p.
10. Papunidi K.Kh. Recommendations for the diagnosis, treatment and prevention of ketosis in farm animals / K.Kh. Papunidi, V.A. Gorshkov, O.A. Grachev. - M.: FTNU Rosinformagrotekh, 2007. - 95 p.
11. Pasechnik V.A. Etiology, pathogenesis, treatment and prevention of subclinical ketosis in cows: Abstract of the thesis. thesis.....cand. vet. Sciences: 16.00.01/ V.A. Pasechnik. - Vitebsk, 1987. 17p.
12. Khmelkov Ya.T. Etiological structure, pathogenesis and treatment of secondary congestive dystonia of the proventriculus in cows: Abstract of the thesis. diss....cand. vet. Sciences. Belgorod: 2006. pp. 16-17.
13. Eshburiev S.B. Etiopathogenesis and prevention of secondary osteodystrophy in cows. Diss....cand. vet. Sciences. Samarkand: 2011. - P. 46.
14. Gbl J., Grander H.–D. Ergebnisse von leberfuntions prafungen bei labmagen verlagerangen und Ketosen des Rindes//Dtsch. Tilwztl. Wschr. - 1990. - No. 97. pp. 126-130.
15. Baird G.D. Primary ketosis in the high-producing dairy cow: clinical and subclinical disorders, treatments, prevention and outlook U J. Dairy Sci.- 1982.- №65.- P. 1-10.
16. McArt, J.A.A., Nydam, D.V., Oetzel, G.R. 2012. Epidemiology of subclinical ketosis in early lactation of dairy cattle. J. Dairy Sci. 95:5056-5066.

---

*Cite this Article: B. Tursunaliyev, K.N. Norbaev (2022). Symptoms of Chronic Ketosis in Cows and Morphobiochemical Indicators of Blood. International Journal of Current Science Research and Review, 5(3), 853-857*