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Changes in biochemical blood parameters in cows with catarrhal-purulent mastitis

Kataral-yiringli mastit bilan kasallangan sigirlar qonining biokimyoviy ko'rsatkichlaridagi o'zgarishlar
Изменения биохимических показателей крови у коров, больных катарально-гнойным маститом

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AUTHOR, TITLE AND ABSTRACT METADATA (EN / UZ / RU)**ENGLISH****Rustam Ismoil o'g'li BOBOMURODOV¹**¹ Scientific-Research Institute of Veterinary, Samarkand, Uzbekistan

Abstract. This article investigates changes in certain biochemical blood parameters in cows affected by catarrhal-purulent mastitis. The study was conducted on cows diagnosed with catarrhal-purulent mastitis in various livestock farms in the Samarkand Region. The levels of total protein, glucose, aspartate aminotransferase (AST), and lactate dehydrogenase (LDH) in blood serum were determined at the onset of the disease and on the 5th and 10th days. According to the results, the levels of total protein, AST, and LDH were elevated during the initial stage of the disease, while a decrease in these parameters was observed by the 10th day of the study. No significant changes in glucose levels were detected. The obtained results indicate that biochemical blood parameters in cows with catarrhal-purulent mastitis can be used as additional diagnostic criteria for assessing the course of the disease and the dynamics of inflammatory processes in the body.

Keywords: catarrhal-purulent mastitis; mammary gland inflammation; blood; blood serum; total protein; glucose; AST; LDH; biochemical parameters; inflammation

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Annotatsiya. Maqolada kataral-yiringli mastit bilan kasallangan sigirlar qonining ayrim biokimyoviy ko'rsatkichlarida yuz beradigan o'zgarishlar o'rganilgan. Tadqiqotlar Samarqand viloyatining turli chorvachilik xo'jaliklarida kataral-yiringli mastit bilan kasallangan sigirlarda olib borildi. Qon zardobidagi umumiy oqsil, glyukoza, aspartat aminotransferaza (AST) va laktatdehidrogenaza (LDH) miqdorlari kasallikning boshlanishida, 5- va 10-kunlarida aniqlandi. Tadqiqot natijalariga ko'ra, kasallikning boshlang'ich davrida umumiy oqsil, AST va LDH ko'rsatkichlari yuqori bo'lib, tajribaning 10-kuniga kelib ularning kamayishi kuzatildi. Glyukoza miqdorida esa sezilarli o'zgarishlar aniqlanmadi. Olingan natijalar kataral-yiringli mastitda qonning biokimyoviy ko'rsatkichlari kasallikning kechishi va organizmdagi yallig'lanish jarayonlari dinamikasini baholashda qo'shimcha diagnostik mezon sifatida foydalanish mumkinligini ko'rsatdi.

Kalit so'zlar: kataral-yiringli mastit; sut bezining yallig'lanishi; qon; qon zardobi; umumiy oqsil; glyukoza; AST; LDH; biokimyoviy ko'rsatkichlar; yallig'lanish

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Аннотация. В статье изучены изменения некоторых биохимических показателей крови у коров, больных катарально-гнойным маститом. Исследования проводились на коровах с диагнозом «катарально-гнойный мастит» в различных животноводческих хозяйствах

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HAC / OAK: On the HAC list of national scientific publications (Academy of Sciences of the Republic of Uzbekistan) for 06.00.00 Agricultural Sciences and 16.00.00 Veterinary Sciences. O'zbekiston Respublikasi FA huzuridagi OAK ro'yxatida: 06.00.00 – Qishloq xo'jaligi fanlari; 16.00.00 – Veterinariya fanlari.

Самаркандской области. В сыворотке крови определяли содержание общего белка, глюкозы, аспаратаминотрансферазы (АСТ) и лактатдегидрогеназы (ЛДГ) в начале заболевания, а также на 5-е и 10-е сутки. Согласно результатам исследования, в начальный период заболевания показатели общего белка, АСТ и ЛДГ были повышены, а к 10-м суткам наблюдалось их снижение. При этом существенных изменений содержания глюкозы не выявлено. Полученные результаты свидетельствуют о том, что биохимические показатели крови при катарально-гнойном мастите могут использоваться в качестве дополнительных диагностических критериев для оценки течения заболевания и динамики воспалительных процессов в организме.

Ключевые слова: катарально-гнойный мастит; воспаление молочной железы; кровь; сыворотка крови; общий белок; глюкоза; АСТ; ЛДГ; биохимические показатели; воспаление

1. KIRISH

Introduction

Kirish. Sigirlarda mastit sut bezining yallig'lanishi bilan kechadigan, sut mahsuldorligi va sifatining pasayishi hamdakasallikni davolash uchun sarflanadigan veterinariya xarajatlari natijasida chorvachilik xo'jaliklariga sezilarli iqtisodiy zarar yetkazadigan kasalliklardan biridir. Kasallikning klinik shakllari orasida kataral-yiringli mastit sut bezida kuchli yallig'lanish jarayoni va yiringli eksudat hosil bo'lishi bilan kechishi sababli alohida amaliy ahamiyatga ega. Mastit rivojlanishi davomida sut bezidagi mahalliy yallig'lanish jarayoni organizmning umumiy holatiga ham ta'sir ko'rsatadi. Natijada qonning hujayraviiy va biokimyoviiy tarkibida turli darajadagi o'zgarishlar yuzaga kelishi mumkin. Yallig'lanish jarayonida oqsil almashinuvi, energiya almashinuvi va hujayra membranalarining holati o'zgarishi qon zardobidagi ayrim biokimyoviiy ko'rsatkichlarning o'zgarishi bilan namoyon bo'ladi.

Umumiy oqsil organizmdagi oqsil almashinuvi va immun javob holatini baholashda muhim ko'rsatkichlardan biri hisoblanadi. AST va LDH esa to'qimalarda hujayraviiy shikastlanish va metabolik o'zgarishlar yuz berganda qon zardobida o'zgarishi mumkin. Ayniqsa, LDH ning mastitda sut bezidagi yallig'lanish va hujayra shikastlanishi bilan bog'liq holda ortishi ushbu fermentni qo'shimcha diagnostik ko'rsatkich sifatida o'rganishga imkon beradi. Shu sababli kataral-yiringli mastitda qonning biokimyoviiy ko'rsatkichlarini kasallikning turli bosqichlarida o'rganish kasallikning kechishini baholash va organizmdagi umumiy metabolik o'zgarishlarni aniqlashda muhim ahamiyatga ega.

Mavzuning dolzarbligi: Biz bilamizki sog'in sigirlar orasidagi mastitlar asosiy muammolardan biri hisoblanib; yuqori mahsuldor hayvonlarning xo'jalikda foydalanish muddati 6-8 yoshgacha qisqarishi hamda sigirlar qisir qolishi natijasida muddatdan ilgari yaroqsiz bo'lib yo'q qilinishi, sut mahsuldorligining 15-20 % pasayishi va uning yog'lilik darajasi 0,8-1 % gacha tushib ketishi, sifatining yomonlashishi, yangi tug'ilgan buzoqlarning kasallanishi va o'limining ko'payishi shuningdek ushbu kasallikni tashxislash,

davolash va oldini olish uchun sarflangan xarajatlar natijasida katta iqtisodiy zarar keltirib chiqaradi.

Tadqiqotning maqsadi: Tadqiqotning maqsadi kataral-yiringli mastit bilan kasallangan sigirlarning qon zardobidagi umumiy oqsil, glyukoza, AST va LDH larni miqdor ko'rsatkichlarining o'zgarish darajalarini aniqlash hamda ularning kasallik kechishini baholashdagi ahamiyatini o'rganishdan iborat.

2. MATERIAL VA METODLAR

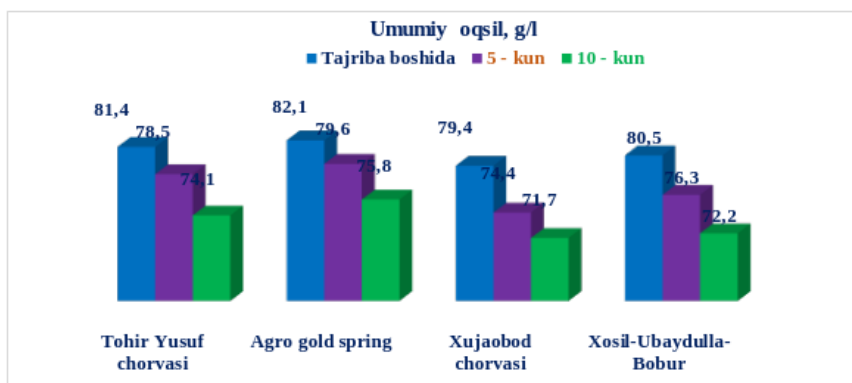
Materials and methods

Material va metodlar: Tadqiqotlar Samarqand viloyatida joylashgan "Tohir Yusuf chorvasi", "Agro gold spring", "Xujaobod chorvasi" hamda "Xosil-Uboydulla-Bobur UAU" chorvachilik xo'jaliklarida kataral-yiringli mastit bilan kasallangan sigirlarda olib borildi. Tadqiqot uchun o'xshash juftliklar tamoyili asosida 15 bosh kataral-yiringli mastit bilan kasallangan sigir ajratib olindi. Hayvonlarda qonning biokimyoviiy ko'rsatkichlari kasallik aniqlangan vaqtda, tajribaning 5-kuni va 10-kunida o'rganildi. Qon namunalari umumiy oqsil, glyukoza, aspartat aminotransferaza (AST) va laktatdehidrogenaza (LDH) miqdori gemanalizator yordamida aniqlandi. Olingan natijalar tegishli me'yoriy ko'rsatkichlar bilan taqqoslanib, kasallik dinamikasida biokimyoviiy ko'rsatkichlarning o'zgarishiga baho berildi.

3. NATIJALAR VA ULARNING TAHLILI

Results and discussion

Tadqiqotlar davomida kataral-yiringli mastit bilan kasallangan sigirlar qonining biokimyoviiy ko'rsatkichlarida kasallikning turli davrlariga bog'liq o'zgarishlar aniqlandi. Birinchi xo'jalikdagi sigirlarda tajriba boshida umumiy oqsil miqdori $81,4 \pm 0,6$ g/l ni tashkil etgan bo'lsa, 5-kunida $78,5 \pm 0,3$ g/l, 10-kunida esa $74,1 \pm 0,2$ g/l gacha kamaydi (1-rasm). "Agro gold spring" xo'jaligida ushbu ko'rsatkich mos ravishda $82,1 \pm 0,1$; $79,6 \pm 0,4$ va $75,8 \pm 0,3$ g/l ni tashkil etdi. "Xujaobod chorvasi" xo'jaligida $79,4 \pm 0,2$ g/l dan $71,7 \pm 0,4$ g/l gacha, "Xosil-Uboydulla-Bobur UAU" xo'jaligida esa $80,5 \pm 0,3$ g/l dan $72,2 \pm 0,2$ g/l gacha pasayganligi aniqlandi. Demak, tajriba boshidan 10-kungacha umumiy oqsil miqdori o'rtacha 9,2% ga kamaygan.

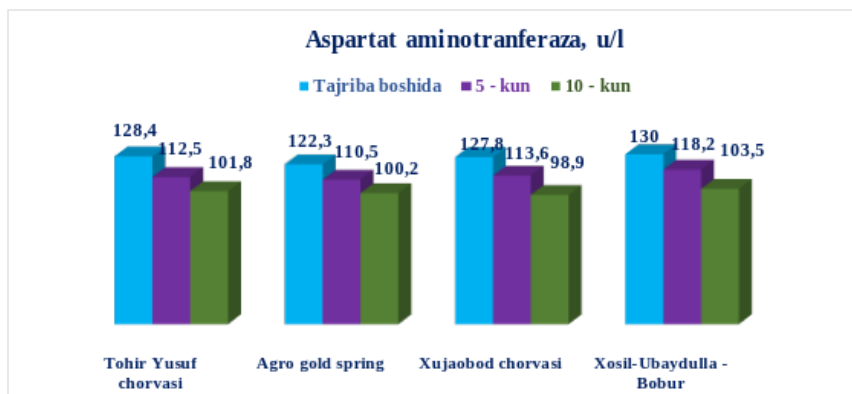


1-rasm. Mastit bilan kasallangan sigirlar qonidagi umumiy oqsil miqdori, g/l / Fig. 1. Total protein content in the blood of cows with mastitis, g/l

Qondagi glyukoza miqdorida esa tadqiqot davomida keskin o'zgarishlar kuzatilmadi. Barcha xo'jaliklar bo'yicha uning o'rtacha miqdori tajriba boshida 2,16 mmol/l, 5-kunida taxminan 2,07 mmol/l, 10-kunida esa 2,17 mmol/l ni tashkil etdi.

Mastit bilan kasallangan sigirlarda AST faolligi ham tajriba davomida sezilarli dinamikaga ega bo'ldi. "Tohir Yusuf chorvasi"

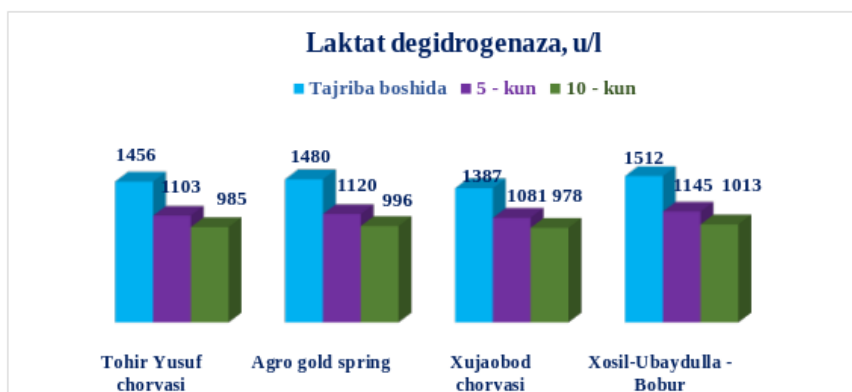
xo'jaligida AST miqdori tajriba boshida $128,4 \pm 0,5$ U/l, 5-kunida $112,5 \pm 0,3$ U/l, 10-kunida $101,8 \pm 0,4$ U/l ni tashkil etdi. "Agro gold spring" xo'jaligida ushbu ko'rsatkichlar mos ravishda $122,3 \pm 0,2$; $110,5 \pm 0,3$ va $100,2 \pm 0,1$ U/l bo'ldi. "Xujaobod chorvasi" xo'jaligida $127,8 \pm 0,4$ U/l dan $98,9 \pm 0,2$ U/l gacha, "Xosil-Uboydulla-Bobur UAU" xo'jaligida esa $130,0 \pm 0,3$ U/l dan $103,5 \pm 0,2$ U/l gacha kamayganligi aniqlandi (2- rasm).



2-rasm. Mastit bilan kasallangan sigirlar qonidagi AST faolligi, U/l / **Fig. 2.** AST activity in the blood of cows with mastitis, U/l

Laktat dehidrogenaza faolligida yaqqol ko'zga tashlanadigan o'zgarishlar kuzatildi. "Tohir Yusuf chorvasi" xo'jaligida tajriba boshida LDH miqdori 1456 ± 3 U/l, 5-kunida 1103 ± 6 U/l, 10-kunida esa 985 ± 2 U/l bo'ldi. "Agro gold spring" xo'jaligida mos ravishda 1480 ± 4 ; 1120 ± 5 va 996 ± 2 U/l, "Xujaobod chorvasi" xo'jaligida

1387 ± 1 ; 1081 ± 4 va 978 ± 2 U/l, "Xosil-Uboydulla-Bobur UAU" xo'jaligida esa 1512 ± 5 ; 1145 ± 3 va 1013 ± 2 U/l kabi ko'rsatkichlar qayd etildi. Yallig'lanish va hujayra shikastlanishi natijasida LDHning qon zardobidagi faolligi ortishi holati kuzatiladi.



3-rasm. Kataral-yiringli mastit bilan kasallangan sigirlar qonidagi LDH faolligi, U/l / **Fig. 3.** LDH activity in the blood of cows with catarrhal-purulent mastitis, U/l

Barcha xo'jaliklar bo'yicha umumlashtirilganda, umumiy oqsil miqdori tajriba boshida o'rtacha 80,8 g/l, 5-kunida 77,2 g/l, 10-kunida esa 73,4 g/l ni tashkil etdi. Qon tarkibidagi oqsillardagi o'zgarishlarni mastitning yallig'lanish jarayoni, oqsil almashinuvining o'zgarishi, organizmning immun javobi va kasallik davridagi metabolik jarayonlar bilan bog'lash mumkin. Bunda oziqlantirish sharoiti va jigar faoliyatining holati ham qon zardobidagi umumiy oqsil miqdoriga ta'sir qiluvchi omillar sifatida hisobga olinishi lozim.

Glyukoza miqdori tajriba davomida nisbatan barqaror saqlanib qoldi. Bu holat kataral-yiringli mastitning ushbu tajriba sharoitida glyukoza almashinuviga kuchli tizimli ta'sir ko'rsatmaganligini ko'rsatadi.

Umumlashtirilgan natijalarga ko'ra, AST faolligi tajriba boshida o'rtacha 127,1 U/l, 5-kunida 113,7 U/l, 10-kunida esa 101,1 U/l ni tashkil etdi, ya'ni, tajriba boshidan 10-kungacha AST faolligi taxminan 20,5% ga kamaygan. AST ko'plab to'qimalarda, jumladan jigar, yurak va skelet mushaklarida uchraydigan ferment hisoblanadi. Shu sababli uning qon zardobidagi o'zgarishini faqat sut bezining shikastlanishi bilan izohlash to'g'ri bo'lmaydi. Biroq

mastitning kuchli yallig'lanish jarayoni va to'qimalarning zararlanishi sharoitida AST faolligining oshishi organizmdagi hujayraviy shikastlanishning qo'shimcha belgisi sifatida baholanishi mumkin. Tajriba davomida AST miqdorining izchil kamayishi esa hayvonlarning klinik holati yaxshilanib, yallig'lanish jarayoni susayganligini ko'rsatuvchi qo'shimcha ko'rsatkich sifatida qaralishi mumkin.

Barcha xo'jaliklar bo'yicha umumlashtirilganda, LDH faolligi tajriba boshida o'rtacha 1458 U/l, 5-kunida 1112 U/l, 10-kunida esa 993 U/l ni tashkil etdi. Demak, tajriba boshidan 10-kungacha LDH faolligi o'rtacha 31,9% ga kamaygan. LDH deyarli barcha to'qimalarda mavjud bo'lgan ferment bo'lib, hujayralarning energiya almashinuvi, xususan laktat va piruvat almashinuvida ishtirok etadi. Shu nuqtayi nazardan, tadqiqotimizda kasallikning boshlang'ich davrida LDH ning yuqori bo'lishi kataral-yiringli mastit fonida to'qimalarda faol yallig'lanish va hujayraviy shikastlanish jarayonlari kechayotganligini ko'rsatadi. 10-kunga kelib ferment faolligining kamayishi esa yallig'lanish jarayonining susayishi bilan mos keladi.

Umuman olganda, olingan natijalar kataral-yiringli mastitning boshlang'ich davrida qon zardobida umumiy oqsil, AST va ayniqsa LDH ko'rsatkichlarida yaqqol o'zgarishlar mavjudligini ko'rsatdi. Kasallikning 10-kuniga kelib ushbu ko'rsatkichlarning kamayib borishi yallig'lanish jarayonining susayishi va hayvonlarning klinik holatining yaxshilanishi bilan mos keldi. Glyukoza miqdorining esa tajriba davomida deyarli o'zgarmaganligi qayd etildi.

4. XULOSA

Conclusion

Xulosa: Tadqiqotlar natijasida sigirlarda kataral-yiringli mastit kechishida qonning ayrim biokimyoviy ko'rsatkichlarida muayyan dinamik o'zgarishlar mavjudligi aniqlandi. Kasallikning boshlang'ich davrida umumiy oqsil miqdori o'rtacha 80,8 g/l, AST faolligi 127,1 U/l, LDH faolligi esa 1458 U/l ni tashkil etgan bo'lsa, 10-kuniga kelib ular mos ravishda 73,4 g/l, 101,1 U/l va 993 U/l gacha kamaydi. Eng katta o'zgarish LDH faolligida kuzatilib, uning miqdori tajriba boshidan 10-kungacha 31,9% ga kamaydi. Glyukoza miqdorida esa sezilarli o'zgarishlar aniqlanmadi. Olingan natijalar umumiy oqsil, AST va LDH ko'rsatkichlarini klinik va boshqa laborator tekshiruvlar bilan birgalikda kataral-yiringli mastitning kechishi hamda davolash jarayonidagi o'zgarishlarni baholashda qo'shimcha biokimyoviy mezonlar sifatida qo'llash mumkinligini ko'rsatadi.

DECLARATIONS

Declarations

Author contributions CRediT

Conceptualization; Methodology; Investigation; Data curation; Writing – original draft; Writing – review & editing. All authors have read and agreed to the published version of the manuscript.

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This research received no external funding.

Ethics approval

Not applicable. This study did not involve humans, animals or other regulated materials.

Informed consent

All authors have read and approved the final version of the manuscript and have given their consent to its submission and publication. The study involved no human participants and no personal data.

Data availability statement

All data supporting the findings of this study are presented in the article and are available from the corresponding author upon reasonable request.

Conflict of interest

The authors declare no conflict of interest.

Generative AI disclosure

Generative AI was used only partially. The authors used Claude (Anthropic, Opus 5) for language editing, formatting of the reference list and preparation of the English and Russian metadata. No text, data, figures or conclusions were generated by AI. The authors reviewed and verified all output and take full responsibility for the content of the publication.

EXTENDED SUMMARY IN ENGLISH

Kengaytirilgan inglizcha xulosa / Расширенный реферат на английском языке

Mandatory for all articles whose full text is not in English. Length 600–1000 words. It must be independently readable: a reader who does not know the language of the full text should understand the problem, the method, the numerical results and the contribution without consulting the main text. Do not copy the 250-word abstract.

Purpose and research problem

Mastitis in cows proceeds as an inflammation of the mammary gland and leads to a fall in milk yield and milk quality; among high-yielding dairy cows it is one of the principal problems of commercial herds. Total protein is one of the key indicators of protein metabolism and of the state of the immune response, while the activities of aspartate aminotransferase and lactate dehydrogenase reflect tissue damage and the intensity of the inflammatory process. Whether these serum indicators change in a regular and interpretable way across the stages of catarrhal-purulent mastitis, and whether they can therefore serve as supplementary diagnostic criteria alongside clinical examination, had not been established for the production conditions of Samarkand region. The aim of the study was to determine the changes in total protein, glucose, AST and LDH in the blood serum of cows with catarrhal-purulent mastitis at the onset of the disease and on the 5th and 10th days.

Materials and methods

The investigations were carried out on cows with catarrhal-purulent mastitis on the farms “Tohir Yusuf chorvasi”, “Agro gold spring”, “Xujaobod chorvasi” and “Xosil-Uboydulla-Bobur” in Samarkand region. Blood serum was examined for total protein, glucose, aspartate aminotransferase (AST) and lactate dehydrogenase (LDH) at the onset of the disease and on the 5th and 10th days of the experiment. The results were recorded separately for each farm and then generalised across all farms; the dynamics of total protein, AST and LDH are presented in Figures 1, 2 and 3 respectively.

Results and discussion

Generalised across all farms, total protein averaged 80.8 g/l at the start of the experiment, 77.2 g/l on the 5th day and a lower value on the 10th, the initial elevation reflecting the acute phase of inflammation and the subsequent decline its attenuation. Glucose remained comparatively stable throughout, showing that under the conditions of this experiment catarrhal-purulent mastitis did not produce a marked disturbance of carbohydrate metabolism. AST activity averaged 127.1 U/l at the start, 113.7 U/l on the 5th day and a further reduced value on the 10th; the individual farms showed the same direction of change, with the highest initial values recorded on “Tohir Yusuf chorvasi”. LDH activity showed the most pronounced dynamics of all the indicators studied, falling from a mean of 1458 U/l at the start to 1112 U/l on the 5th day and lower still on the 10th. Taken together, the data show that in the initial period of catarrhal-purulent mastitis the serum concentration of total protein and the activities of AST and, especially, LDH are elevated, and that they decline as the inflammatory process subsides, whereas glucose does not follow this pattern.

Conclusion and contribution

The study established that certain biochemical blood parameters change in a regular manner over the course of catarrhal-purulent mastitis in cows. Total protein, AST and LDH were elevated in the initial period of the disease and decreased by the 10th day of the experiment, while glucose showed no appreciable change. These indicators can therefore be used as a supplementary diagnostic criterion for assessing the course of the disease and the dynamics of the inflammatory process in the organism, and LDH in particular, with the largest relative change, appears the most sensitive of those examined. The contribution of the work is to provide, for four commercial dairy herds of Samarkand region, a time-resolved biochemical profile of catarrhal-purulent mastitis that complements the haematological picture and can be obtained with the equipment ordinarily available to a farm veterinary service.

ADABIYOTLAR RO'YXATI

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Adabiyotlar matnda birinchi keltirilish tartibida raqamlanadi. Oltitagacha muallif to'liq ko'rsatiladi; DOI mavjud bo'lsa, albatta beriladi.

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Transliterated list — required by Scopus and Web of Science

Mandatory whenever any reference is in a non-Latin script. Transliterate the author names and the original title, then give the English translation of the title in square brackets, followed by the language tag.

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