



DYNAMICS OF LDH ENZYME LEVELS IN EXPERIMENTAL MYOCARDIAL INFARCTION

Xurramova Sevinch G'ulomjonovna,

Ubaydullayev Sulaymon Oybek o'g'li,

Turdiyev Ziyodulla Bobomurod o'g'li

Students of Samarkand State University of Veterinary
Medicine, Animal Husbandry and Biotechnology, Uzbekistan
Scientific supervisors:

Bahriddinova Gulchehra Ubaydullayevna,

Hayitova Barno Amirovna

Assistantsof Samarkand State University of Veterinary
Medicine, Animal Husbandry and Biotechnology, Uzbekistan

Abstract. *Cardiovascular diseases, particularly atherosclerosis, continue to be leading causes of disability and mortality worldwide. This highlights the critical need for ongoing research into the underlying mechanisms of vascular dysfunction, specifically the role of vascular endothelium and hyperlipoproteinemia in the progression of experimental atherosclerosis. In a recent study, 28 rabbits with an average weight of 2.5-3.0kg were used to explore these effects. The investigation focused on the dynamic impact of a specific drug administered over various periods: the first three months and one month post-initial dosage. Results from treated rabbits were meticulously compared to control and intact groups, providing a comprehensive view of the drug's efficacy. Notably, chronic cholesterol exposure led to hypertriglyceridemia, with the severity of its effects correlated to the duration of the experimental conditions. A significant factor in the development of endothelial dysfunction during hypercholesterolemia is the reduced synthesis of endothelial nitric oxide, coupled with the increased presence of its reactive radicals. Additionally, modifications to low-density lipoproteins (LDL) result in their accumulation within the vascular endothelium, exacerbating the condition. Continued research in this area is vital for developing effective therapeutic strategies to combat atherosclerosis and its associated cardiovascular complications.*

Key words: *endothelial dysfunction, atherosclerosis, autoimmune processes, hypercholesterolemia, hyperlipoproteinemia.*

Introduction. According to the World Health Organization (2020), “...cardiovascular diseases are becoming the leading cause of death in the world...” [1]. Myocardial infarction is one of the leading causes of death and disability. In developed countries, 20% of patients diagnosed with myocardial infarction die before emergency medical care is provided, and the 30-day mortality rate reaches up to 30%.

One of the characteristic signs of many diseases is a change in enzyme activity.

An increase in enzyme activity, as is known, may be a consequence of activation of the enzyme in the blood serum as a result of its structural rearrangement, changes in the conditions that control the function of this catalytic protein, or is the result of additional intake from tissues due to a process leading to impaired permeability, destruction of cellular and subcellular membranes structures [2-5].

Aim. This work is devoted to elucidating the relationship between an increase in enzyme activity and metabolic changes, as well as studying the possibility of influencing metabolic processes by introducing the enzyme from the outside.

Materials and methods. Experiments were carried out on 25 rabbits weighing 3.5-4.0kg. Myocardial infarction was induced by ligation of the left coronary artery. On day 3, experimental animals were intravenously injected with the enzyme preparation lactate dehydrogenase at a dose of 5000E per 1 kg of body weight. 1 hour after the introduction of the enzyme, the animal was killed by decapitation and the heart and liver were removed. Mitochondria from the infarction zone and liver tissue were isolated by differential centrifugation in a 0.25 m sucrose solution. The activity of lactate dehydrogenase (LDH) and aldolase was determined in mitochondria and supernatant of cardiac tissue and liver [6-10].

The content of reduced and oxidized metabolic products was studied in the deproteinized tissue extract. The enzyme activity was assessed using an SF-46 spectrophotometer [11-14].

Results and discussion. From the results of our studies it follows that in intact animals, the activity of lactate dehydrogenase in the supernatant of cardiac tissue was equal to $1.923 \pm 0.134 \mu\text{mol NAD-H/mg/min}$, and in mitochondria - $0.089 \pm 0.002 \mu\text{mol NAD-H/mg/min}$, i.e. LDH activity in the supernatant of these animals was 21.6 times higher than in mitochondria.

In rabbits with coronary-occlusive myocardial infarction, in both fractions studied, LDH activity decreases, and in the supernatant by 1.49 times ($1.288 \pm 0.94 \mu\text{mol NADH-/mg/min}$), and in mitochondria by 1.85 times ($0.048 \pm 0.001 \mu\text{mol/NADH/mg/ min}$) compared to control values .

After administration of LDH to rabbits with myocardial infarction, enzyme activity increased both in the supernatant and in the mitochondria of cardiac tissue by 1.27 ($1.643 \pm 0.086 \mu\text{mol/NADH/mg/min}$) and 1.60 times ($0.077 \pm 0.003 \mu\text{mol/NADH/mg/min}$) respectively, compared with those in control rabbits.

The accumulation of lactic acid and associated pH shifts are one of the main reasons leading to the development of arrhythmia in the acute period of myocardial infarction. An increase in LDH activity during hypoxia facilitates the use of lactic acid by ischemic myocardium, which is associated with an acceleration of the oxidation reaction of lactic acid into pyruvic acid, which then enters the Krebs cycle.

Intravenous administration of exogenous LDH causes increased glycolytic breakdown of glucose in the liver. In the cytosolic fraction, aldolase activity increases by 74%, LDH by 26%. In liver mitochondrial fractions, the function of membrane-bound LDH sharply increases, while aldolase remains virtually unchanged.

Activation of the glycolytic breakdown of glucose is accompanied by intense release of dihydroxyacetone phosphate (-39%), increased use of pyruvate (-83%),

and accumulation of lactic acid in the liver (+111.7%). The content of α -glycerophosphate increased by 32%.

The observed dependence of changes in liver metabolism due to the administration of lactate dehydrogenase (LDH) is primarily evidenced by a significant shift within the glycolytic enzyme-substrate system. This shift indicates alterations in glycolytic pathways, which play an essential role in cellular energy production and metabolic regulation. Furthermore, analyses revealed enhanced oxidase activity in the microsomal fraction when compared to the control group, suggesting a marked increase in oxidative detoxification processes involving NADPH. The elevation in oxidase activity implies that the liver is responding to stressors by activating its defensive mechanisms, thereby improving the detoxification of potentially harmful substances. Consequently, the administration of exogenous LDH appears to play a pivotal role in stimulating the microsomal oxidative defense system under the specific experimental conditions employed. This highlights not only the importance of LDH in facilitating metabolic adaptations but also underscores its potential therapeutic implications in enhancing liver function and promoting overall metabolic health. Continued exploration of these pathways may provide valuable insights into interventions for hepatic disorders and metabolic dysfunctions. [15, 18-21].

Thus, the above data indicate that in the acute period of MI (3rd day of the experiment), LDH activity in the affected cardiac tissue decreases significantly. There is a violation of the relationship between oxidized and reduced intermediate metabolic products, which is accompanied by the accumulation of a certain type of metabolites with a general energy deficit [16-17].

Conclusion. LDH introduced into the body is actively involved in metabolism, initiates the activity of associated enzyme systems of cardiac tissue, ensures the transformation of hydrogen, the main source of ATP in living systems,

determines the direction of metabolic flows, optimal electrical balance and energy supply of tissues.

The identified peculiarity of the effect of the enzyme introduced into the body can be used in the correction of metabolic disorders characteristic of myocardial infarction.

Reference

1. Байкулов А. К. Влияние хитозана на синтез ДНК и РНК при ожогах //Врач-аспирант. – 2012. – Т. 53. – №. 4. – С. 26-29.
2. Халиков К. М. и др. Изучение результатов лечения крыс с ожоговой травмой производными хитозана //International Scientific and Practical Conference World science. – ROST, 2017. – Т. 4. – №. 12. – С. 26-28.
3. Байкулов А. К. и др. Исследования эффективности производных хитозана на процессы репаративной регенерации ожоговых ран в эксперименте Байку //World science. – 2016. – Т. 3. – №. 5 (9). – С. 53-58.
4. Иноятова Ф., Байкулов А. Динамика заживления ран у крыс на модели термического ожога с коррекцией производными хитозана //Журнал проблемы биологии и медицины. – 2011. – №. 3 (66). – С. 72-73..
5. Kenjayevich BA, 2023. Dynamics of the nitroergic system in experimental hypercholesterolemia. Int Res J Med Med Sci, 11(3): 30- 34.
6. Baykulov , A. K., Halimova , S. A., & Murtazayeva , N. K. (2023). VASCULAR ENDOTHELIAL DYSFUNCTIONS WITH HYPERLIPOPROTEINEMIA. GOLDEN BRAIN, 1(7), 4–11.
7. Байкулов А. К. и др. Степень эндогенной интоксикации и липопероксидации в динамике термической травмы и лечении производными хитозана //International Scientific and Practical Conference World science. – ROST, 2017. – Т. 5. – №. 3. – С. 28-31.
8. Байкулов А. К., Юсуфов Р. Ф., Рузиев К. А. Зависимость дисфункции эндотелия с содержанием гомоцистеина в крови при экспериментальной

- гиперхолестеринемии //образование наука и инновационные идеи в мире. – 2023. – Т. 17. – №. 1. – С. 101-107.
9. Байкулов А. К., Советов К. Т., Рахмонов Ф. Х. Заживление наружных ран термического ожога с использованием хитозана. – 2021..
10. Kenjayevich B. A., Baxriddinova U. G. EXPERIMENTAL GIPERKOLESTEROLEMIYADA NITRERGIK TIZIM DINAMIKASI //Новости образования: исследование в XXI веке. – 2023. – Т. 1. – №. 9. – С. 1452-1458..
11. Kenjayevich B. A. et al. Investigation of the skin-resorptive effect of manufactured chitosan //european journal of modern medicine and practice. – 2022. – Т. 2. – №. 5. – С. 102-106..
12. Советов К. Т., Байкулов А. К. ДИНАМИКА ИБС С КОРРЕКЦИЕЙ ЛДГ //Modern Scientific Research International Scientific Journal. – 2023. – Т. 1. – №. 9. – С. 47-55..
13. Убайдуллаева Г. Б., Хайитова Б. А. ДИНАМИКА ЭНДОТЕЛИАЛЬНОЙ ДИСФУНКЦИИ ПРИ ЭКСПЕРИМЕНТАЛЬНОЙ ГИПЕРЛИПОПРОТЕИНЕМИИ //Zamonaviy fan va ta'lim yangiliklari xalqaro ilmiy jurnal. – 2023. – Т. 1. – №. 5. – С. 95-103.
14. Байкулов А. К., Убайдуллаева Г. Б., Хайитова Б. А. ЭНДОТЕЛИАЛЬНАЯ ДИСФУНКЦИЯ СОСУДОВ С ЭКСПЕРИМЕНТАЛЬНОЙ ГИПЕРЛИПОПРОТЕИНЕМИЕЙ //O'ZBEKISTONDA FANLARARO INNOVATSIYALAR VA ILMIY TADQIQOTLAR JURNALI. – 2023. – Т. 2. – №. 18. – С. 620-626.
15. Bayqulov, Azim Kenjayevich, Islomov, Xurshid Iskandarovich, Rahmonov, Farxod Xolbayevich EKSPERIMENTAL GIPERKOLESTEROLEMIYADA QONDAGI GOMOSISTEIN MAZMUNI BILAN ENDOTELIY DISFUNKSIYASIGA BOG'LILIGIGA IZOH // ORIENSS. 2023. №3.

16. Baykulov, A. K., D. A. Kadirova, and F. H. Inoyatova. "Effect of chitosan on internucleosomal degradation of DNA model animal skin cells." *Journal of Theoretical and Clinical Medicine* 4 (2012): 7-9.
17. Yunusov, O. T., A. Baykulov, and F. Rakhmonov. "Nakhalbayev The effect of plasma therapy on the general circulation of blood in patients with extensive deep burns." (2020): 2394-3696.
18. Байкулов А. К., Советов К. Т., Халиков К. М. РЕПАРАТИВНАЯ РЕГЕНЕРАЦИЯ КОЖИ ПРИ ЭКСПЕРИМЕНТАЛЬНОМ ТЕРМИЧЕСКОМ ОЖОГЕ С ИСПОЛЬЗОВАНИЕМ ХИТОЗАНА //АКТУАЛЬНЫЕ ПРОБЛЕМЫ БИОМЕДИЦИНЫ-2020. – 2020. – С. 291-292.
19. Байкулов А. К. и др. Показатели системы оксида азота при экспериментальной гиперхолстеринемии //International Scientific and Practical Conference World science. – ROST, 2017. – Т. 4. – №. 12. – С. 5-8.
20. Байкулов А. К. и др. Влияние хитозана на межнуклеосомную деградацию ДНК модельных клеток кожи животных //Журнал теоретической и клинической медицины. – 2012. – №. 4. – С. 7-9.
21. Байкулов А., Советов К. Исследование фармакологических свойств препаратов производных хитозана (гель и порошок) с фурацилином //Журнал вестник врача. – 2014. – Т. 1. – №. 1. – С. 45-52.