



SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Proceedings of the
International Conference

Date:
December 8

Beijing, China 2020

上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

International Conference
“Scientific research of the SCO
countries: synergy and integration”

Part 1: Participants' reports in English

2020年12月8日。中国北京
December 8, 2020. Beijing, PRC



Proceedings of the International Conference
**“Scientific research of the SCO countries: synergy
and integration”**. Part 1 - Reports in English

(December 8, 2020. Beijing, PRC)

ISBN 978-5-905695-78-5

这些会议文集结合了会议的材料 – 研究论文和科学工作者的论文报告。它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。

作者对所引用的出版物，事实，数字，引用，统计数据，专有名称和其他信息的准确性负责

These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examines technical and sociological issues of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

Authors are responsible for the accuracy of cited publications, facts, figures, quotations, statistics, proper names and other information.



ISBN 978-5-905695-78-5

©Scientific publishing house Infinity, 2020

©Group of authors, 2020

CONTENTS

ECONOMICS

中国在国内外的冶金行业投资

Chinese investments within the country and abroad on the example of metallurgy sector

Frolova Anna Andreevna, Khasanova Diana Emilevna.....11

道德营销中的定价机制

Pricing Mechanism in Socio-Ethical Marketing

Krikovtsev Alexander Alekseevitch.....19

JURISPRUDENCE

关于行政法原则

On the principles of administrative law

Kononov Pavel Ivanovich.....24

POLITICAL SCIENCES

鱼眼永远不会成珍珠（关于中国共产党与赫鲁晓夫的修正主义的斗争）

Fisheye will never pass for a pearl (About the struggle of the Chinese Communist party with Khrushchev's revisionism)

Galko Victor Ivanovich.....32

ART HISTORY

路德维希·范·贝多芬的钢琴教学法

Piano pedagogy by Ludwig van Beethoven

Kireyeva Natalia Yuryevna.....36

被命名为俄罗斯古典音乐明星节

Named Russian festival of classical music stars

Dryaev Maxim Ruslanovich, Kurenevskii Aleksey Sergeevich,

Redko Anatoly Maksimovich.....45

MEDICAL SCIENCES

孕妇生活质量对肠节律的依赖性

Dependence of the Quality of Life on the Bowel Rhythm in Pregnant Women

Dolgov Gennadii Victorovich, Shemerovskii Konstantin Alexandrovich.....56

双眼平衡和适应障碍作为近视发展标准

Disorders of binocular balance and accommodation as myopia progression criteria

Fomina Elena Viktorovna, Pochinok Elena Mikhailovna,

Bedash Kalinka Ivanova, Ponomareva Maria Nikolaevna.....61

成人烧伤疾病毒血症期间收缩压的昼夜节律

Circadian rhythm of systolic blood pressure during toxemia of burn disease in adults

Muhitdinova Hura Nuritdinovna.....66

临时义肢修复后丙烯酸和双丙烯酸材料的抗弯强度的测定

Determination of the flexural strength of acrylic and bisacrylic materials for provisional prostheses after their repair

Petrikas Oleg Arnoldovich, Trapeznikov Dmitry Valerievich.....75

骨关节炎合并冠状动脉粥样硬化患者血清中金属蛋白酶3和13的浓度研究

Study of serum concentrations of matrix metalloproteinases 3 and 13 in patients with osteoarthritis in combination with coronary atherosclerosis

Portyannikova Olesya Olegovna, Romanova Elena Nikolaevna,

Tsvinger Svetlana Matveevna.....81

医疗机构预防HCAI的某些方面

Some aspects of HCAI prevention in medical organizations

Smetanin Victor Nikolaevich.....90

臭氧疗法在糖尿病足综合征的综合治疗中

Ozone therapy in the comprehensive treatment of diabetic foot syndrome

Teuvov Aslan Alekseevich, Baziev Arthur Mukharbievich,

Pshukova Elena Mukhadinovna, Teuvov Islam Aslanovich.....94

作者在临床牙科中对下颌的解剖学和地形标志知识的应用的变体

The author's variant of application in clinical dentistry of knowledge of anatomy and topographic landmarks of the lower jaw

Volkov Sergei Ivanovich, Lebedev Sergey Nikolaevich,

Lebedeva Julia Vladislavovna.....104

PHARMACEUTICAL SCIENCES

含环己烷和环己thri theneene药效团片段的N3-（噻吩基）-6-甲基尿嘧啶新衍生物的合成和生物活性的筛选

Synthesis and screening of biological activity of new derivatives of N3- (thietanyl) -6-methyluracil containing cyclohexane and cyclohexanthriene pharmacophore fragments

Meshcheryakova Svetlana Alekseevna, Melnikov Alexander Sergeevich, Zaykina Anastasia Viktorovna.....108

BIOLOGICAL SCIENCES

具有获得性抗生素抗性的细菌对水的污染

Water contamination by bacteria with acquired antibiotic resistance

Lykov Igor Nikolaevich, Volodkin Vladislav Sergeevich.....113

VETERINARY SCIENCE

局部麻醉狗前肢器官的方法

Method of locoregional anesthesia for organ-preserving operations on the forelimbs in dogs

Voronova Maria Olegovna, Kornushenkov Evgenii Alexandrovich, Vatnikov Yurii Anatolevich.....119

AGRICULTURAL SCIENCES

不同年龄母牛的产奶量

Milk productivity of cows of different ages

Fedoseeva Natalya Anatolyevna, Peryshkina Ekaterina Sergeevna, Migacheva Olga Sergeevna.....123

干燥粪便第一阶段的设备

Device for the first stage of drying manure

Gusev Valentin Alexandrovich, Syssoeva Inna Grigorievna, Zazykina Liubov Alexandrovna.....129

在赫里福德公牛的饲养中使用饲料添加剂

Use of feed additives in the rearing of Hereford bulls

Pristupa Vasily Nikolayevich, Torosyan Diana Sergeevna, Babkin Oleg Aleksandrovich.....134

红葡萄品种干果渣提取物的研究

Research of extracts from dry pomace of red grape varieties

Shchetinina Anna Sergeevna, Yakuba Yuriy Fedorovich, Sabelnikova Tamara Alekseevna.....142

产犊季节对奶牛产奶量的影响

Influence of calving season on milk production of cows

Voronov Mikhail Viktorovich, Fedoseeva Natalya Anatolyevna,

Pimkina Tatiana Nikolaevna.....147

GEOLOGICAL AND MINERALOGICAL SCIENCES

乌拉尔前陆盆地南翼的地质构造和油气前景

Geological structure and oil and gas prospects of the southern flank of the Urals
Foreland Basin

Abilkhasimov Khairly Babashevich.....152

TECHNICAL SCIENCES

模拟工件直径减小的过程

Simulating the process of workpiece diameter reduction

Proskuriakov Nikolai Evgenievich, Zverev Ivan Vaycheslavovich,

Lisovskay Ekaterina Vladimirovna.....168

用于控制机器人复合体的不变系统的构建

Construction of invariant systems for controlling robot complexes

Ternovaja Galina Nikolaevna, Parsheva Elizaveta Alexandrovna.....175

Foreword

We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 65 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).

This conference was a result of the serious interest of the world academic community, the state authorities of China and the Chinese Communist Party to preserve and strengthen international cooperation in the field of science. We also thank our Russian partner Infinity Publishing House for assistance in organizing the conference, preparing and publishing the conference proceedings in Chinese Part and English Part.

I hope that the collection of this conference will be useful to a wide range of readers. It will help to consider issues, that would interest the public, under a new point of view. It will also allow to find contacts among scientists of common interests.

Fan Fukuan,

Chairman of the organizing committee of the conference

"Scientific research of the SCO countries: synergy and integration"

Full Professor, Doctor of Economic Sciences

前言

我们感谢所有参加本次会议的“上海合作组织国家的科学研究：协同作用和整合”，感谢您的演讲和报告。代表所有上海合作组织成员国的广泛参与者都谈到此次活动的必要性和重要性。参与者的报告涵盖了广泛的主题性科学问题，我们的联合互动将有助于不同国家的科学家进一步发展理论和应用的现代科学研究。会议结果是来自7个国家（中国，俄罗斯，乌兹别克斯坦，哈萨克斯坦，阿塞拜疆，塔吉克斯坦，吉尔吉斯斯坦）的65位作者的参与。

这次会议的召开，是学术界，中国国家权力机关和中国共产党对维护和加强科学领域国际合作的高度重视的结果。我们还要感谢我们的俄罗斯合作伙伴无限出版社协助组织会议，准备和发布中英文会议文集。

我希望会议的收集对广大读者有用，将有助于在新的观点下为读者提供有趣的问题，并且还将允许在共同利益的科学家中寻找联系。

范福宽，
教授，经济科学博士，中国科学院院士，会议组委会主席“上合组织国家科学研究：协同与融合”

DOI 10.34660/INF.2020.20.12.002

中国在国内外的冶金行业投资
**CHINESE INVESTMENTS WITHIN THE COUNTRY AND ABROAD
ON THE EXAMPLE OF METALLURGY SECTOR**

Frolova Anna Andreevna

Specialist

Limited liability company “Intellectual consulting center of Financial University under the Government of the Russian Federation”

Khasanova Diana Emilevna

Specialist

Limited liability company “Intellectual consulting center of Financial University under the Government of the Russian Federation”

Scientific advisor — V.V. Smirnov

Candidate of Economic Sciences, Associate Professor

抽象。 该研究的目的是确定冶金行业对中国的金融投资政策。 本文从政府规制的角度确定并解释了黑色金属产业发展的财务状况。 主要重点是外国直接投资和海外投资。 信息是从最新资源中获得的，这使得研究在当前条件下更加相关。

关键词： 投资， 中国， 冶金， 融资， 外资， 负面清单。

Abstract. *Purpose of the research is to determine financial investment’s policy of China, looking in more details a metallurgy sector. In the article the financial conditions of development of ferrous industry were determined and explained from point of view of governmental regulation. The main focus is on the foreign direct investments and investing abroad. Information was obtained from the newest resources, that makes the research more relevant in current conditions.*

Keywords: *investments, China, metallurgy, financing, foreign capital, negative list.*

Introduction

The relevance of the research subject is based on the phenomenal achievements of the People’s Republic of China (PRC) over the past 40 years since 1978, when the economic transformation began. China turned into the second world power after USA. It reached leading positions in terms of different aspects, from foreign trade, gold and foreign exchange reserves, to production volumes of more

than 30 main types of modern industrial, scientific, and technical products. But how much the state rely on investments? Those that from China to foreign countries, within the state, and that come abroad into national economy – all play significant roles in this theatre of economic operations. The PRC is very attentive to the R&D, spheres of technologies, IT, machinery, and more other industries, such as metallurgy. Nowadays metallurgy power of China progressively increases through investing into foreign enterprises, into domestic ones and using FDI. So how did this happen?

Investments within the world

In terms of private capital, Chinese investors prefer to finance different foreign companies. It turns out a profitable deal for both parties. On the one hand, China's partners receive additional money that can be used to develop the country; on the other hand, China does not lose, because thanks to all this injection of money, it receives everything they want - resources, territory and, of course, influence. Now the areas of information technology and high-tech development are a priority. After the global pandemic, these are areas that have become even more profitable in the world and China is the leader in the volume of Internet trade and the development of IT spaces. Historically, China has issued many loans to needy countries in order to establish its superiority in the future. And at the moment, it is gradually moving towards this goal.

Therefore, China is not afraid to invest in countries that can be considered unreliable, such as Macedonia, Serbia and Montenegro, as well as in many countries in Africa. To prove their loyalty to this European region, the Chinese invested more than a billion dollars in the construction of a local port. Convinced that such projects would be profitable, the Chinese were more actively engaged in investments in all countries of Southeast Europe. Now in 2020, Chinese companies are even more looking for opportunities to buy the latest technology in Europe, hoping that the European market will be in a vulnerable position due to the pandemic economic crisis, as well as their unstable relations with the United States. However, European governments fear China's technological expansion and make it clear that they are ready to protect the most valuable sectors of the economy. Especially after the pandemic, when many countries and companies are weakened, the EU leadership assumes and tries to prevent the purchase of all current assets by China. But as mentioned earlier, China is buying up less powerful countries to assert its power in Europe.

The intensive economic development of the country required an increasing amount of energy, which with much certainty, set a goal to find sufficient energy resources that can be supplied to the country smoothly to maintain stable economic growth. To solve this, a new foreign economic strategy has been established and has found Africa as the best option for self-realization. More than 2,000 Chinese companies are investing in Africa. Most of the investments are in energy, min-

ing, construction, and production, oil. China's national oil and gas corporation, for example, has invested up to \$6 billion in Sudan's oil sector.¹ The private company Huawei has become the main provider of telecommunications services in a number of African countries.

Europe and North America (excluding Mexico) have become major destinations for Chinese foreign direct investment FDI, receiving 52.1 percent (\$544.5 billion) of China's total global FDI outflows from 2005 to 2017.² Xi Jinping also pledged \$250 billion to invest in South America over the next ten years. China's investments into the US may see further declines as trade tensions rise between the two biggest economies in the world. Likewise, the energy sector in the US and Canada attracts a considerable amount of investment from China. However, China's investment in the United States sharply decreased amid a tightening trade confrontation between the countries. A new round of trade war between the United States and China began, when Donald Trump introduced a national emergency due to alleged threats from Huawei to the country's information technology.

China as a recipient of foreign capital

In the early 2000s, China overtook the United States as the world's largest recipient of foreign capital. According to the World Bank, the largest inflow of foreign investment was recorded in China in 2013, when \$ 290.9 billion of foreign capital was invested in the country.³ Due to this fact, technological level of the development of the economy increased and demanded high-qualified workers, that caused increases in cost of labor and growth of social benefits. That's why, costs of work and produced goods grew. Many experts consider that such high and sudden growth rate lead to "overheating" of the Chinese economy. One of the signs of overheating is an inflation growth, that takes place to be in economy of the state. Thanks to the supporting program of economy provided by government, citizens of the country began to spend more that increased demand inside the country. As well as, the economic bubble was formed not only in the market of real estate, where it is the most obvious, but in the whole domestic market of PRC. This situation can be explained using the fact, that the total debt of the state increased by two and a half times than the sizes of national economy and became more than \$28 trillion.⁴ The results achieved by China are just incredible, but formal risks of business cycles and debt bubbles cannot be written-off. That is why, national government started primitive policy and enacted different laws and restrictions.

¹E. N. Safronova. China and the countries of Africa, Latin America, and the Middle East in 2018 // Problems of the Far East. 2019. №5

²A. S. Davydov. Ideology and pragmatism in establishing and strengthening Chinese-American ties // Problems of the Far East. 2019. №2

³Official electronic website of The World Bank. URL <http://www.worldbank.org/>

⁴Official electronic website of International Monetary Fund. URL <https://www.imf.org>

Limitations on foreign investments

China actualized itself as a one of the players in the world market not so long time ago, especially if we compare it with other countries. It always has been closed to “the world abroad”. As a new state, the PRC was very accurate in the process of development own economy with activity of others foreign participants. That is why in 1979 Chinese government sign the Law "On mutual joint ventures with Chinese and foreign capital", in 1986 – the Law "On enterprises with foreign capital", and in 1988 – the Law "On contractual joint ventures with Chinese and foreign capital". These laws are commonly referred to as the "three foreign investment laws", which do not correspond to the current government policy related to openness. Because of this the new law “On foreign investments” came into force in January 2020. It requires a creation of the same conditions on the market for Chinese and foreign investments. Market should be created within the principles of stability, transparency, fair competition, and predictability.

The "Negative List" is an exhaustive list of restrictions on foreign investment determined by the State Council and the Cabinet of Ministers of China. According to the new law, the state must use it to ensure a unified national regime at the pre-investment stage. Foreign investors came to an equal status with Chinese investors at the initial stages of establishing legal property. This Negative List consists of two parts: FTZ negative list and the national negative list. During the long period, they were significantly reduced within the content. The last adjustments were made on June 2020. By far, all restrictions on the share ratio of foreign capital in the financial sector have been eliminated in accordance with the established opening timetable, which makes 2020 known as the first year of the full opening of China’s financial sector.⁵ The new lists also signal a new level of opening-up – they will boost foreign investor confidence in China as well as accelerate structural upgrades to the existing supply chains in the country.

Metallurgy by itself

Back in the late 70’s China started development of its own metallurgy. Deng Xiaoping create a basement of future progress by planning and starting the construction of Baosteel, established in Shanghai. The initial cost of its building, \$6 billion, was enormous. This amount was 36 times higher than China's foreign exchange reserves at those times.⁶ Nowadays, China surpassed the United States in steel production in 1993, Japan in 1996, and in 2017 produced three times as

⁵China’s 2020 New Negative Lists Signal Further Opening-Up. URL: <https://www.chinabriefing.com/news/chinas-2020-new-negative-lists-signals-further-opening-up/?hilite=%27negative%27%2C%27list%27>

⁶Maslov A. A. Review of China's metallurgical industry in the XX and XXI centuries: stages of formation and development // Bulletin of the peoples ' friendship University of Russia. Series: Economics. 2019. №3 – P 551-562.

much steel as the United States, Russia, and Japan combined. But the PRC is not only famous by its production of steel and processing of metals, but also developing of the whole metallurgy industry by investing in this sphere. Between 2015 and 2016, Chinese investors spent a record \$8.7 billion on 22 deals to acquire mines and combines in the outside world. Companies from the Asia-Pacific region accounted for 70% of all cross-border transactions made during this time.⁷ Now China is a big player in the world of steel production.

Companies investments abroad

In 2015 Chinese enterprises were ready to actively participate in regional investment in infrastructure facilities, as well as they were ready to switch to new development models by expanding the range of industries by entering foreign markets and moving excess production capacity. In 2020 now already can be seen the results of Chinese enterprises actions.

China Baowu Steel Group Corporation Limited is a Chinese steel company, the largest in China and the second largest in the world was formed on December 1, 2016 as a result of the merger of Baosteel Group Corporation and Wuhan Iron & Steel (Group) Corporation. Nowadays this leader continuously work with and invest in the Russian market of metallurgy and natural resources. Indeed, Baowu Group, which has significant financial assets, expand its activities through the «Kamchatka territory’ development Corporation» and cooperation with «Kolmar», which is a leading company of the South Yakut in mining the coal. In September 2020 Baowu group made a takeover, taking control of the country's oldest steel producer, Chongqing Iron & Steel. This is the second takeover for Baowu this year. In August, the group acquired Taiyuan Iron & Steel Group (TISCO), the second largest stainless-steel producer in China.⁸

Another one of the biggest metallurgy companies in China is **Jingye Group**. In 2019, the Group’s sales revenue reached 127.4 billion yuan. Jingye Group is a large global steel rebar production base, a national high-strength steel bar production demonstration enterprise, and a national high-tech enterprise. The “Jingye” trademark is a well-known trademark in China, honored as the “2017 Most Influential Responsible Brand of Beijing-Tianjin-Hebei Region” and rated as one of “China’s 500 Most Valuable Brands” from 2017 to 2019. In March of 2020, this corporation group has purchased a bankrupt British Steel company. The actual subject of the transaction was the company's assets in the UK and the Netherlands. In the coming years, Jingye Group plans to invest about 1.2 billion pounds (\$1.58

⁷Suslov D. V., Sokovnin V. B. China's Direct investment in the ASEAN countries: assessment of volumes and structure // Proceedings of the far Eastern Federal University. Economics and management. 2017.

⁸Baowu: thematic news of metallurgy. URL: <https://www.metalinfo.ru/ru/news/s9625.html>

billion) in British Steel's UK assets.⁹ These funds will be invested in the modernization of one of the Scunthorpe blast furnaces and a rolling mill, the construction of an electric furnace, a new power plant with an installed capacity of 250 MW, as well as a rebar production line. The Chinese company says it is still interested in acquiring the French Hayange plant. According to the British TV channel Sky News, not so long ago the company made an offer to the Indian group Tata Steel to acquire its British division. The British division of Tata Steel includes the largest port Talbot steel plant in the UK. And the second-largest steel company in the country, the Scunthorpe combine, is under the control of Jingye. So, combining would lead to the fact that a large portion of the steelmaking capacity in the UK would have been under Chinese control.

Zijin Mining Group is China's largest copper and gold producer, a sizable multinational mining group principally engaged in the prospecting, exploration and mining of gold, copper, and other mineral resources. With asset scale, operating income, accumulated profit, and tax exceeding RMB 100 billion, the Company is one of the sizable mining companies generating the best efficacy, controlling the highest metal resources reserve volume, performing most competitively in Chinese mining industry. In the November of 2019, signed an agreement to purchase the assets of the American company Freeport McMoran in Serbia. The transaction volume is up to \$390 million. In the December of the same year, it signed an acquisition agreement for almost \$1 billion. of Canadian company Continental Gold, whose main asset is the Buritica gold mine being completed in Colombia. In June of 2020, Zijin acquired for \$ 3.88 billion yuan (\$548 million) controlling stake (50.1%) in the private company Tibet Julong Copper, which has licenses for two copper mines in the Tibet Autonomous region of China. Tibet Julong's most attractive asset is the Qulong mine, which the company has a license for until 2037. It annually produces up to 30 million tons of copper ore, which also contains molybdenum and silver. After this, Zijin became the main bidder for the acquisition of the Canadian gold mining company Guyana Goldfields, which operates in Guyana, offering \$238 million for it.¹⁰ The main interest there is an asset of Guyana Goldfields, that is the Aurora mine. The Chinese Group has made a number of international acquisitions in recent years. In particular, it consolidated the entire copper industry in Serbia, and thanks to last year's acquisition of the Canadian company Nevsun Resources, it gained control of the Bisha copper and zinc mine in Eritrea.

Government support

Metallurgical complex of China is an active basically because of private enterprises. They by themselves are busy of self-financing and expanding powers, research, and development of such big business sphere. But despite this fact Chi-

⁹China's Jingye Group bought British Steel. URL: <https://www.metallinfo.ru/ru/news/114613>

¹⁰Zijin: thematic news of metallurgy. URL: <https://www.metallinfo.ru/ru/news/s281.html>

nese government pay a lot of attention to metallurgy and have a big influence on steel industry. For 2016, about half of Chinese steel enterprises in China became a state-owned. In order to upgrade equipment at enterprises, increase exports, increase output from higher value-added, stimulating the implementation of projects abroad for more investment, the Chinese government started to pay more government subsidies and provide loans from state-owned banks. China's steel mills receive free land, cheap energy, government capital, and low-interest loans. In 2018, Beijing reported that in 2016, steel producers received a subsidy totaling \$4.4 billion from the Central government and \$933,000 from local authorities.¹¹ Such huge subsidies and low expenses make a steel to be one of the cheapest even in the world market, that arise questions. Economic organizations started to inspect Chinese steel industry and implement anti-dumping measures, being afraid of Chinese malice.

One of the financing features in China is SOEs. Since 2012, China has reorganized 41 central State-owned enterprises. This was made to improve the efficiency of State capital. The country will continue to spin off a number of SOE subsidiaries that lose money, as well as non-primary businesses. This is in order to improve the companies' efficiency. Sixty-four central SOEs saw their debt-to-asset ratio drop from the beginning of last year. In such industry as metallurgy this ratio fell by more than 1 percentage point. The improved efficiency of the SOEs is considered to benefit the whole corporate sector as they provide broad opportunities for the investment and growth of businesses. Three types of support enable SOEs to maintain production at a loss for a long time: government subsidies; support from a superior group of enterprises (through direct subsidy, interest-free loans or provision of loan guarantees); and loans from a state-owned bank.¹² These conditions have made SOEs much less sensitive to profit changes and other market signals.

However, the rising role of private steel enterprises in the industry cannot be denied. SOEs not only started to be privatized, but also the scale of newly built, privately owned and run enterprises started to increase over time. It is hard to say, what is actually favorable or adverse to development of metallurgy industry in such case. Both private companies and state-owned enterprises have peculiarities. The thing is, that the main aim and point here is to harmonize their coexistence, observe norms and to not go beyond the limitations. China as a country is able to achieve such ideal state of things because it already has shown what China is capable for.

¹¹China has decided to provide additional support to the private sector. REGNUM news agency. 2018. URL: <https://regnum.ru/news/economy/2521371.html>

¹²More integration seen for centrally administered SOEs. URL: http://www.china.org.cn/business/2020-01/16/content_75618644.htm

Limitations on investments

Before already mentioned expanding the openness of Chinese market for foreign investments, it has pretty many restrictions, especially in the field of metallurgy. Foreign investors were not allowed to own a controlling stake in China's steel corporations. In order to obtain permission to invest in the steel segment of the state, foreign investors were required to have technologies, intellectual property patents, as well as to have steel production capacity in the minimum allowable volume – 1,000,000 tons of special or stainless steel per year, or 10,000,000 tons of carbon steel per year.

Such difficulties in investing processes have led to the fact that only a few foreign corporations now own assets in China, despite the fact, that already for many years the Chinese market has been considered very attractive and prospective for investment activities, especially in the field of metallurgy. For example, the Korean company Posco has shares in factories focused on the production of stainless steel. Nippon Steel has created a plant similar to that of Baosteel, and ArcelorMittal owns 10% of Hunan Valin Steel, with its share accounting for another 33% of the shares of the automobile sheet plant.

After the implementation of new documents connecting with foreign investments foreign companies were allowed to form subsidiaries on the territory of free economic zones that were completely controlled by them. The list of industries is quite wide and includes the metallurgical industry. At the moment, China has 4 FEZs – in the provinces of Fujian and Guangdong, as well as the cities of Tianjin and Shanghai. As a result, processing industry now is one of the most completely open economic spheres for foreign investments in China.

Conclusion

Investments is a significant part of economy of each country. It is very important to be able for the state harmoniously and with skill distribute different types of cash flows, those that come from abroad, that arise within the state because of government support or from compatriots, that goes abroad in order to widespread own powers beyond the boards. China was very influenced by FDIs at the beginning, that lead to economic instability. But after actions, developing economic openness, it became much better. The metallurgy sector is a representative field that shows the results of such actions. Chinese positions in the metallurgy arises day by day thanks to purchasing of fields, mines, companies, their shares; investing to own domestic enterprises, providing

道德营销中的定价机制
PRICING MECHANISM IN SOCIO-ETHICAL MARKETING

Krikovtsev Alexander Alekseevitch

*Candidate of Economic Sciences, Associate Professor
Donetsk National University of Economics and Trade
named after Michael Tugan-Baranovsky*

抽象。 本文介绍了作者进行的关于在市场空间中的参与者之间建立业务交互和市场中的定价问题的科学和实践研究的结果。 提出了一种诊断消费市场价格行销成分的算法。

关键词：社会伦理营销，机制，定价，业务互动，整合。

Abstract. *The article presents the results of a scientific and practical study of the problems of forming business interactions between participants in the market space and pricing in it, carried out by the author. An algorithm for diagnosing the marketing component of prices in the consumer market is proposed.*

Keywords: *Socio-ethical marketing, mechanism, pricing, business interactions, integration.*

The situation in the consumer market is characterized by a fairly high degree of dynamism and transformation. At the same time, the competition between the participants in the socio-economic market system intensifies, on the one hand, and the motivation for their partnership and integration increases, on the other. These processes indicate that it is necessary to appropriately adapt marketing strategies and tactics and its tools in order to develop effective solutions that allow market participants to enter into business interactions and support them. The concept of building up single transactions in order to obtain the highest possible short-term value in the form of profit is being replaced by the concept of integrated business interactions of all market partners in order to obtain prolonged persistent meta-value. This concept is most pronounced when making decisions in the marketing mix, one of the basic components of which is pricing.

Analysis of the existing market situation allowed us to say that. That in its active and dynamic transformation, two polar tendencies can be traced:

- to the integration of all business interactions in the socio-economic space;
- to the personification of business interactions within the framework of the

functioning of the market system.

On the basis of this thesis, it is proposed to use the concept of "marketing integrated business system" (MIBS) [3], the schematic diagram of which is shown in Fig. 1.

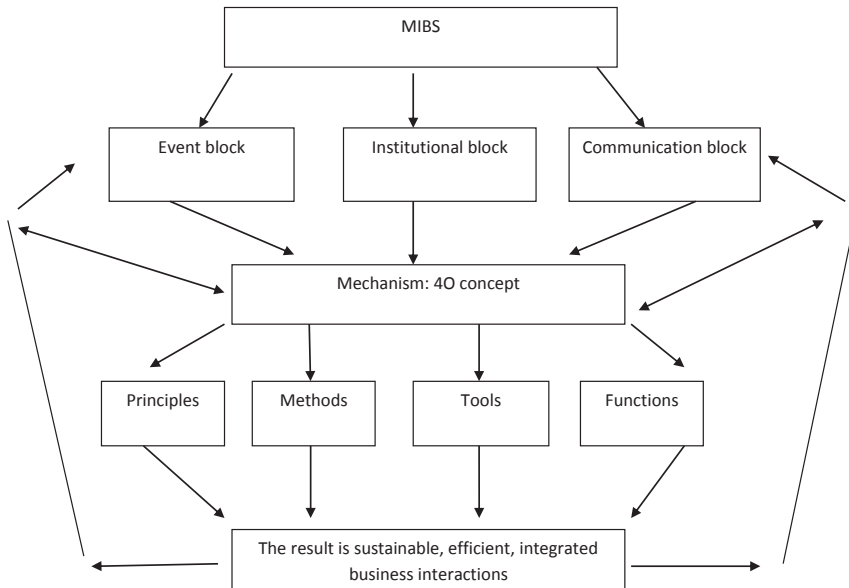


Figure 1 - Conceptual diagram of the functioning of the marketing integrated business system.

To solve pricing problems, it is proposed to use the concept of additivity in the framework of the 4O concept for each cycle of the triad shown in Fig. 1 of the basic blocks. The pricing mechanism is proposed to be interpreted as interactions between the subject and the object, based on the consistency of actions within the framework of the relevant principles, methods, functions using the marketing tools of the behavior of market participants. In this case, competition is considered as a parity/disparity of MIBS participants regarding the implementation of public and personal interests. [1,2]

The price component in socio-ethical marketing takes the following form: $IMCP = \sum_{i=1}^n PEC + PMT + PEM$, where

IMCP- integrated marketing component of the price;

PEC- economic (rational) component of the price;

PMT- motivational component of the price;

PEM- emotional (affective) component of the price.

IMCP is formed and implemented in accordance with and on the basis of the 4O concept (table 1.)

Table 1. *Methodological aspects of price formation in terms of the 4O concept*

Concept indicators	PEC	PMT	PEM
1. Responsibility	Taking into account the principles of ISO, GRI	Motivators within the framework of quality-price positioning methods	Correspondence of information signals to the actual state of interactions
2. Openness	Transparency of pricing methods	Consideration of the level of personification of contacts of MIBS participants	Lack of cognitive dissonance
3. Reasonableness	The choice of a pricing method based on the type of market, characteristics of the target audience, the place of the subject in this market	Studying the motivators of the target audience behavior and the level of their integration into MIBS	Application of Integrated Incentives under MIBS
4. Objectivity	Analysis of the economic parameters of MIBS including profitability and rentability	Motivation based on complete information, including using the possibilities of digitalization	Formation and maintenance of perceived value and meta-value of business interactions

The author does not claim this to be an exhaustive interpretation of the indicators of the 4O concept, which can be supplemented and transformed taking into account the types of markets and characteristics of the target audience. In this case, the following options can be proposed, complementary to the methodological framework, and presented in tables 2 and 3.

Table 2. *Assessment of the degree of significance of indicators by MIBS levels (3-point scale)*

Indicators	Global level			National level			Local level		
	high	medium	low	high	medium	low	high	medium	low
PEC	5-4	3-2	1-0	5-4	3-2	1-0	5-4	3-2	1-0
PMT	5-4	3-2	1-0	5-4	3-2	1-0	5-4	3-2	1-0
PEM	5-4	3-2	1-0	5-4	3-2	1-0	5-4	3-2	1-0

Table 3. Assessment of the degree of satisfaction with the price by segments of MIBS subjects (3-point scale)

Indicators	Premium			Ordinary			Base		
	high	medium	low	high	medium	low	high	medium	low
PEC	5-4	3-2	1-0	5-4	3-2	1-0	5-4	3-2	1-0
PMT	5-4	3-2	1-0	5-4	3-2	1-0	5-4	3-2	1-0
PEM	5-4	3-2	1-0	5-4	3-2	1-0	5-4	3-2	1-0

To achieve the relevance of the empirically obtained calculated data, it is advisable to take into account the specific weight of each of the above indicators.

The results of the analysis and integration of the obtained data serve as an objective methodological platform for developing a marketing pricing mechanism and maintaining integrated business interactions (fig. 2)

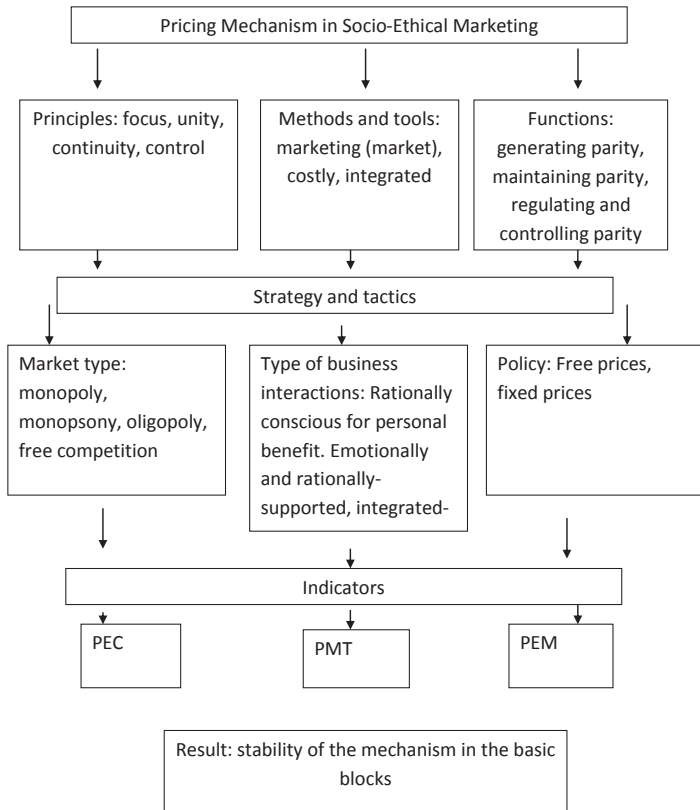


Figure 2 - Pricing mechanism in socio-ethical marketing

As an explanation of the presented graphical interpretation of the pricing methodology, it should be noted that we intentionally used an additive and not a multiplicative approach. This is due to the peculiarities of the functioning of the main blocks of MIBS in the field of the socio-ethical concept. So, if you use a multiplier, then the absence or low degree of development of any indicator unambiguously leads to zeroing of the integrated result. In our case, additivity as the value of the integrated effect is equal to the sum of the values of each of the components. Consequently, low values, or even the absence of one element, does not exclude the possibility of the functioning of the entire system, if, of course, we exclude a disparity of a fundamental nature.

In conclusion, let me give you the view of F. Kotler, set out in the work "Marketing Management", which reflects conceptual approaches to the problems of business interactions, although without taking into account the socio-ethical aspects. Kotler talks about a change in marketing thinking, as attempts to maximize the profit obtained as a result of each individual transaction are becoming a thing of the past, and evolutionary development receives profit as a result of partnerships. [4]

References

1. *Marketing in the food market: a holistic approach. Monograph / E.M. Azaryan, A.A. Krikovtsev.-Donetsk National University of Economics and Trade named after Michael Tugan-Baranovsky; Donetsk: DonNUET, 2015.-170P.*
2. *Azaryan E.M. Place and role of social and ethical marketing in the system of integrated business interactions / E.M. Azaryan, A.A. Krikovtsev // Strategic management of enterprise development in the post-industrial economy: monograph / under gen. ed. T.S. Maximova.- Luhansk: publishing house of LNU n.a. V. Dahl, 2018.-P68-78.*
3. *Azaryan E.M. Methodological foundations of the formation and functioning of the socio-economic mechanism of business interactions in the consumer market / E.M. Azaryan, A.A. Krikovtsev // Innovative development of the economy.-2018.-№5(47).-P8-15.*
4. *Kotler F. Marketing management/Transl.from eng. ed. L.A. Volkova, Yu.N. Kapturevsky.-SPb: Piter, 2001.-348P.*

关于行政法原则
ON THE PRINCIPLES OF ADMINISTRATIVE LAW

Kononov Pavel Ivanovich

*Doctor of Juridical Sciences, Full Professor,
Vyatka State University
Kirov, Russia*

抽象。 本文考察了现代行政法原则的实质和分类。 作者特别关注对公共行政执法活动的法律规制原则的分析： 确保公共和私人利益的平衡； 在职权范围内开展行政和公共活动； 合法合理的行政裁量权； 施加的公共职责是否适当（比例）以及所应用的行政和法律措施。

关键字： 行政法， 原则， 公共行政， 公共行政机构。

Abstract. *The article examines the essence and classification of the principles of modern administrative law. The author pays special attention to the analysis of the principles of legal regulation of the law enforcement activity of the public administration: ensuring the balance of public and private interests; implementation of administrative and public activities within the competence and authority; legitimate and reasonable administrative discretion; adequacy (proportionality) of the imposed public duties and applied administrative and legal measures.*

Keywords: *administrative law, principles, public administration, public administrative bodies.*

The question of the principles of administrative law seems to be very complicated, since, firstly, the essence and system of such principles in relation to modern state and legal reality in the Russian administrative and legal science have not been sufficiently fully identified and studied, and secondly, these principles are not found a generalized and systematic consolidation in the current administrative legislation of Russia. Meanwhile, the development and normative consolidation of the principles of administrative and legal regulation of social relations have not only purely theoretical, but also applied, law enforcement significance. This is due to the fact that the principles of administrative law determine the basic, most general rules for the implementation by public administration bodies (hereinafter referred to as administrative-public bodies) of external law enforcement activity

(hereinafter referred to as administrative-public activity) and administrative-public interaction, on the basis of which the entire mechanism of administrative and legal regulation and which are subject to unconditional observance, execution and application by all subjects of the relevant legal relationship.

Let us consider further what ideas about the principles of administrative law were formed in the domestic administrative and legal science.

First of all, let us turn to the general theoretical understanding of the principles of law in general.

In the general theory of law, the principles of law are traditionally considered as the initial regulatory and guiding principles (imperative requirements), cross-cutting ideas that determine the general direction of legal regulation of social relations.¹ The literature also highlights the functions of the principles of law, which include: the formation of legal infrastructure, the establishment of the limits of legal regulation, determination of the meaning and content of ambiguities in law, elimination of inconsistencies and contradictions in law, elimination of defects in legislation, limitation of free discretion, elimination of gaps in law, assessment of the behavior of participants in legal relations.²

In Soviet administrative-legal science, as a rule, not the principles of administrative law were distinguished and studied, but the principles of public administration, which were divided into groups: 1) organizational and political (political and legal) (party leadership, democratic centralism, participation of workers in management, equality of nationalities, legality, planning); 2) organizational principles of building a management apparatus (sectoral, functional, production-territorial, collegiality and one-man management).³ Some authors identified the principles of administrative law as a branch of Soviet law. In particular, V.A. Yusupov considered the principles of Soviet administrative law as the main principles (sets of ideas) that characterize its content, consolidate the laws of development and determine the mechanism of administrative-legal regulation of managerial relations, and at the same time subdivided them into the following groups: 1) general principles of the branch of administrative law (priority of party acts, accounting for acts of public and amateur organizations of workers, accounting for the systemic nature of law, accounting for the competence of the body adopting the administrative act, accounting for constitutional rights, freedoms and legitimate interests of citizens, the effectiveness of administrative law); 2) the principles of the institutions of administrative law, concretizing general principles in relation to a certain

¹See, ex.: *Alekseev S.S.* Coll. Op. in 10 v. V. 3.M.: Statute, 2010. P. 100; General theory of state and law: Academic course in 3 volumes / ex. ed. M.N. Marchenko. V. 2. M.: Zertsalo-M, 2002. P. 75.

²See: *Kashanina T.V.* The structure of law: monograph. M.: Prospect, 2016. P. 249-255.

³See, ex.: *Soviet administrative law.* Public administration and administrative law. M.: Jurid. lit, 1978. P. 40-59.

area of public relations.⁴

In the Russian science of administrative law of the post-Soviet period, taking into account the changed constitutional and legal realities, new approaches to understanding and systematizing administrative and legal principles have appeared. In particular, D. Galligan, V.V. Polyansky, Yu.N. Starilov believe that the principles of administrative law are "fundamental ideas, regulations expressing the objective laws of the organization and formation of state power in general (as well as executive power in particular), determining scientifically grounded directions for the implementation of the competence, tasks and functions of state administrative bodies (powers civil servants) acting in the system of state power for the implementation of management functions (including control and supervisory powers)." These authors distinguish the following groups of principles of administrative law: constitutional (legality, priority of human and civil rights and freedoms, unity of the system of state power, division of state power into three branches, ensuring the rights of citizens to participate in public administration, equality, humanism); organizational and functional principles (controllability and accountability of state bodies and civil servants, the unity of the basic requirements for public administration, professionalism and competence of civil servants, transparency in the implementation of public administration, responsibility of state bodies and civil servants for adopted administrative acts (decisions), mandatory taking into account the scientific foundations of public administration).⁵ Yu.M. Kozlov, identified such principles of administrative law as legality, separation of powers, federalism, publicity, responsibility for violation of the requirements of administrative law.⁶ Yu.A. Dmitriev, I.A. Polyansky and E.V. Trofimov proposed the following system of principles of Russian administrative law: 1) general principles (legality, federalism, priority of the individual, responsibility, transparency); 2) functional and managerial principles (control, separation of powers, professionalism and competence, hierarchy of the management system, specialization of public administration).⁷ A similar, in fact, approach is followed by L.L. Popov and Yu.I. Migachev, who refer to the principles of administrative law as the priority of the individual and his interests in the life of society and the state, separation of powers, federalism, legality, transparency, responsibility.⁸ In some works of administrative scholars, in addition to the traditionally distinguished principles of legality,

⁴See: *Yusupov V.A. Theory of administrative law. M.: Jurid. lit., 1985. P. 33-45.*

⁵See: *Galligan D., Polyansky V.V., Starilov Yu.N. Administrative law: history of development and basic modern concepts. M.: Yurist, 2002. P. 194-216.*

⁶See: *Kozlov Yu.M. Administrative law: textbook. M.: Yurist, 2005. P. 72-77.*

⁷See: *Dmitriev Yu.A., Polyansky I.A., Trofimov E.V. Administrative law: textbook. M.: Eksmo, 2009. P. 39-45.*

⁸See: *Dmitriev Yu.A., Polyansky I.A., Trofimov E.V. Administrative law: textbook. M.: Eksmo, 2009. P. 39-45.*

separation of powers, priority of human rights and freedoms, openness (openness), such principles of public administration activities inherent in the Western European administrative-legal tradition as legal justice and equality, legal certainty, are indicated. proportionality (proportionality) of administrative actions, maintaining confidence in public authorities, prohibition of arbitrariness and abuse of authority, impartiality.⁹

At the same time, in the modern administrative-legal literature, there remains a tendency to highlight not the principles of administrative law, but the principles of the implementation of executive power, associated not so much with the legal regulation of the activities of executive bodies, but with the internal organization of the functioning of their system (principles of distribution and normative establishment of functions and powers, centralization and decentralization, organization of sectoral, intersectoral and territorial administration, linearity and functionality of the organization of public administration, collegiality and one-man management).¹⁰

In modern Western European literature on administrative law, a system of principles of administrative law and administrative activity is considered, which, in particular, include the principles of legality, equality, impartiality, transparency, balance of public and private interests, efficiency, openness and responsibility of public administration.¹¹ In the common European theory of administrative law, the principles of the so-called "good administration" are singled out, which include: legality, observance of procedure, participation, relevance, efficiency, legal certainty, proportionality (adequacy). At the same time, special attention is paid to the principle of proportionality, the essence of which boils down to the fact that when making decisions, administrative bodies are obliged to ensure a balance of various conflicting interests, correspondence between the goals of administrative activity and the means used in its implementation.¹²

We will offer our approaches to understanding the essence and classification of the principles of modern administrative law.

First of all, it should be noted that the principles of administrative law as a branch of law should be distinguished from the principles of organization and

⁹See, ex.: Galligan D., Polyansky V.V., Starilov Yu.N. *Ind. Op. P.* 168-192. Mitskevich L.A. *Essays on the theory of administrative law: modern content: monograph. M.: Prospect, 2015. P.* 79-86; Volkov A.M. *Administrative law of Russia: textbook. M.: Prospect, 2016. P.* 34-36.

¹⁰See, ex.: *General administrative law: textbook. In 2 parts / ed. Yu.N. Starilov. Part 2. Voronezh: Publishing House of VSU, 2016. P.* 55-59; Bratanovsky S.N., Konjakulyan K.M., Bratanovskaya M.S. *Administrative law of Russia: textbook. M.: RIOR: INFRA-M, 2019. P.* 24-28.

¹¹See, ex.: Delpino L.-Del Giudice F. *Compendio di diritto amministrativo. Napoli: Simone, 2020. P.* 196-201; Moròn Miguel Sánchez *Derecho administrativo. Parte General. Madrid: Tecnos, 2019. P.* 126-131.

¹²See, ex.: Craig Paul *Administrative Law. Eighth Edition. London: Sweet & Maxwell, 2016. P.* 17, 649-652.

functioning of public administration. The first ones establish the fundamental foundations of regulation by the law of administrative-public activity and administrative-public interaction, that is, they determine the directions, nature, methods, measures, the limits of the impact of the norms of law on the corresponding regulated relations, the basic rules of behavior of the subjects of these relations. The latter, however, determine not the foundations of the impact of the law on administrative-public activity, but the foundations of the organizational and managerial structure of the system of administrative-public bodies and the organization of their functioning, they, in fact, are not the principles of law, but the principles of management. Taking into account this remark, we will further consider precisely the principles of regulation by the law of administrative-public activity and administrative-public interaction.

So, the principles of administrative law, from our point of view, should be understood as the fundamental, basic rules (norms) of legal regulation of public relations arising in the process of organizing and carrying out administrative-public activities and administrative-public interaction, on the basis of which the norms should be formed and implemented administrative law.

In other words, the principles of administrative law are, in fact, the basic legal norms that set the most general parameters of legal regulation of administrative-public activities and administrative-public interaction, which underlie the entire system of this branch of law.

The principles of administrative law are formally and legally formulated and enshrined in constitutional and legal and administrative legal norms.

In our opinion, all the principles of administrative law, depending on the level of socialization and systematization of regulated administrative legal relations, can be divided into the following groups:

1) universal general principles of administrative and legal regulation, which determine the basic rules for the organization and implementation of administrative-public activities and administrative-public interaction;

2) the principles of administrative and legal regulation, which determine the basic rules for the construction and organization of the functioning of the system of administrative and public bodies;

3) the principles of administrative and legal regulation, which determine the basic rules for the implementation of administrative and public activities, including the relationship between administrative and public bodies and other entities arising in the course of these activities;

4) the principles of administrative and legal regulation, which determine the basic rules of administrative-public interaction between individuals and (or) organizations without direct participation in this interaction of administrative-public bodies.

Of particular importance are the principles of legal regulation of external administrative-public activities carried out in relation to individuals and organizations and affecting their rights.

From our point of view, the following global universal principles of legal regulation of the implementation of administrative and public activities can be distinguished, which are to be applied in all spheres of functioning of public administration.

1. The principle of ensuring the balance of public and private interests in the implementation of administrative and public activities. The essence of this principle lies in the fact that administrative decisions taken in the course of administrative-public activities and administrative actions performed should simultaneously be aimed both at maintaining and protecting public (national, public) interests, and at satisfying the private interests of individuals or organizations, in respect of which the specified activity is carried out. In other words, the public administrative body must act in such a way as to, on the one hand, preserve and not violate the public interest, but, on the other hand, to ensure the implementation of the subjective right of a specific individual or legal entity, aimed at satisfying private property or non-property interests. The need to apply the principle under consideration in practice arises, in particular, in cases of providing individuals or organizations with land plots from state or municipal property, granting permits for the construction of real estate, permits for placing advertising structures within the boundaries of settlements, that is, it exists in all cases where public and private interests may intersect.

2. The principle of carrying out administrative-public activities within the competence and powers determined by the norms of administrative or administrative-procedural law.

This principle follows from the general principle of the legality of administrative-public activity and boils down to the fact that any administrative-public body, as well as an official acting on its behalf, has the right to make administrative decisions and perform administrative actions only on issues related to their respective administrative and legal norms. conduct (competence) and within the limits of the rights granted to them by such norms. The practical application of the principle under consideration concerns absolutely all administrative-public bodies and should take place in all cases of administrative law enforcement.

3. The principle of lawful and reasonable administrative discretion.

The essence of this principle lies in the fact that if an administrative-public body or its official has the right to make administrative decisions or perform administrative actions at its own discretion, provided by administrative-legal (substantive or procedural) norms, the following rules are subject to observance:

1) making an administrative decision or performing an administrative action at

its own discretion only in cases and on issues that are determined by the relevant norms of administrative or administrative procedural law;

2) the choice of one of the options for administrative decisions or administrative actions only from among those provided for by the relevant administrative and legal norms (substantive or procedural), or in case of uncertainty of such options, based on an assessment of the circumstances of the resolved legal-factual situation;

3) factual and legal justification for choosing one of the options for an administrative decision or administrative action.

4. The principle of conformity (adequacy, proportionality) of public obligations imposed on a person by an administrative act, administrative and legal measures applied to him/her to the nature of the legal-factual situation being resolved, the goals and results of its resolution and taking into account the possible consequences of their implementation, the content of which can be determined as follows:

1) the duty imposed on the person must be aimed at achieving the relevant public goals and a publicly significant result, based on the essence of the administrative case being resolved, its execution must be objectively possible and must not entail a violation of the balance of public and private interests, as well as infringement (deprivation, restriction) not provided for by law of the rights of this person or other persons;

2) an administrative-legal measure applied to a person, entailing the termination, temporary restriction of the right of the specified person or the establishment of conditions for its implementation must correspond (be proportionate) to the nature, specific circumstances and possible consequences of the violation of the law or other normative legal act committed by this person or the nature, degree of danger and the possible consequences of a potential or real threat to the security of an individual, society or state.

The listed principles, from our point of view, create a necessary, universal legal basis for the implementation of administrative and public activities of any kind and in all spheres of the functioning of the state and society.

References

1. *Alekseev S.S. Collected works in 10 volumes. V. 3. M.: Statute, 2010.*
2. *Bratanovsky S.N., Konjakulyan K.M., Bratanovskaya M.S. Administrative law of Russia: textbook. M.: RIOR: INFRA-M, 2019.*
3. *Volkov A.M. Administrative law of Russia: textbook. M.: Prospect, 2016.*
4. *Dmitriev Yu.A., Polyansky I.A., Trofimov E.V. Administrative law: textbook. M.: Eksmo, 2009.*

5. Galligan D., Polyansky V.V., Starilov Yu.N. *Administrative law: history of development and basic modern concepts*. M.: Yurist, 2002.
6. Kashanina T.V. *The structure of law: monograph*. M.: Prospect, 2016.
7. Kozlov Yu.M. *Administrative law: textbook*. M.: Yurist, 2005.
8. Mitskevich L.A. *Essays on the theory of administrative law: modern content: monograph*. M.: Prospect, 2015.
9. *General theory of state and law: Academic course in 3 volumes / ex. ed. M.N. Marchenko. V. 2*. M.: Zertsalo-M, 2002.
10. *General administrative law: textbook. In 2 parts / ed. Yu.N. Starilov. Part 2*. Voronezh: Publishing House of VSU, 2016.
11. Popov L.L., Migachev Yu.I. *Administrative law of the Russian Federation: textbook / ex. ed. L.L. Popov*. M.: RG-Press, 2020.
12. *Soviet administrative law. Public administration and administrative law*. M.: Jurid. lit, 1978.
13. Yusupov V.A. *Theory of administrative law*. M.: Jurid. lit., 1985.
14. Delpino L.-Del Giudice F. *Compendio di diritto amministrativo*. Napoli: Simone, 2020.
15. *Craig Paul Administrative Law. Eighth Edition*. London: Sweet & Maxwell, 2016.
16. *Moròn Miguel Sánchez Derecho administrativo. Parte General*. Madrid: Tecnos, 2019.

鱼眼永远不会成珍珠 (关于中国共产党与赫鲁晓夫的修正主义的斗争)
**FISHEYE WILL NEVER PASS FOR A PEARL (ABOUT THE
STRUGGLE OF THE CHINESE COMMUNIST PARTY WITH
KHRUSHCHEV'S REVISIONISM)**

Galko Victor Ivanovich

*Candidate of Economic Sciences, Rector,
University of Work Correspondents*

抽象。 文章揭示了中国共产党捍卫马克思列宁主义关于无产阶级专政和共产党反对赫鲁晓夫修正主义的无产阶级性的基本规定的斗争内容。 充分证明了无产阶级专政的必要性，直到完全消除阶级差异为止。 随后几年的事件：苏联资本主义的恢复，中国社会主义建设的成功延续表明了中国共产党的正确性。

关键词：共产主义，无产阶级专政，“全体人民的状态”，共产党，修正主义。

Abstract. *The article reveals the content of the struggle of the Communist Party of China in defense of the basic provisions of Marxism-Leninism about the dictatorship of the proletariat and the proletarian character of the communist party against Khrushchev's revisionism. The necessity of the dictatorship of the proletariat until the complete elimination of class differences is substantiated. The events of the following years: the restoration of capitalism in the USSR, the successful continuation of the construction of socialism in the PRC showed the correctness of the Chinese communists.*

Keywords: *Communism, the dictatorship of the proletariat, the "state of the whole people", the communist party, revisionism.*

The counter-revolutionary coup carried out in the USSR in October 1961 ultimately led to the restoration of capitalism in our country. But the world communist movement was not defeated. The Chinese communists took up the red banner. The Chinese Communist Party resolutely came out in defense of Marxism-Leninism against the revision of its fundamental principles by the Khrushchevites.

The content of the struggle of the Communist Party of China for Leninism, the chronology of events, as well as related documents and materials of the CC of the CPC and the printed edition of the CC of the CPC, the "Zhenmin zhibao"

are presented in the collection "Polemics on the General Line of the International Communist Movement" [1].

The struggle of the Chinese communists has received a definite coverage in contemporary Marxist-Leninist literature. In particular, the materials of the scientific-practical conference "I. V. Stalin - the head of the state of the dictatorship of the proletariat" contained an article by Mao Zedong "On the question of Stalin"[2].

Let us consider the main points of disagreement and the content of the struggle between the Chinese Communist Party and the top of the CPSU.

The proposition of the dictatorship of the proletariat – is the main thing in Leninism. Therefore, it is no coincidence that the Khrushchevites struck a blow, first of all, at the dictatorship of the proletariat. In the Program of the CPSU, adopted at the XXII Congress, the dictatorship of the proletariat was thrown out, replaced by a kind of "state of the whole people."

The Marxist idea that any state has a class character, and that there is no state of the whole people, is well known. Lenin stated bluntly: "Either the dictatorship (ie, iron power) of the landlords and capitalists, or the dictatorship of the working class. There is no middle way. Barchata, intellectuals, gentlemen who studied poorly from bad books in vain dream of the middle. There is no middle ground anywhere in the world and cannot be. Either the dictatorship of the bourgeoisie (covered up with pompous Socialist-Revolutionary and Menshevik phrases about democracy, constituent members, freedoms, etc.), or the dictatorship of the proletariat. Whoever has not learned this from the history of the entire XIX century is a hopeless idiot" [3, 158].

An attempt to portray the state as a nationwide one is in fact a cover for smuggling in a different class character of the state. The CPC assessment is unequivocal: "By abolishing the dictatorship of the proletariat under these conditions, the Khrushchev revisionist clique betrayed the cause of socialism and communism." "Speaking bluntly, the so-called "nationwide democracy", which Khrushchev trumpets with might and main, as well as the "nationwide state", is just the purest deception. Gathering old stuff from the bourgeoisie and the old revisionists, Khrushchev darned it, repaired it and pasted his stamp only in order to deceive the Soviet people and revolutionary peoples of the whole world in order to hide his dark deeds - betrayal of the dictatorship of the proletariat and anti-socialist activities" [1].

The CPC concluded that as a result of the counterrevolutionary coup the essence of the socialist state was changed - the dictatorship of the proletariat was replaced by the state of the dictatorship of the bourgeoisie: "Having changed the character of the Soviet state as a dictatorship of the proletariat, Khrushchev is turning it into an instrument for the implementation of the dictatorship of a small-numbered bourgeois privileged strata above the soviet workers, peasants and intelligentsia" [1].

The CPC links the need for the dictatorship of the proletariat to the complete elimination of classes and class distinctions, which is in line with Lenin's position. The socialist countries "are still very far from the destruction of all classes and class distinctions, from the communist society, where the principle" from each according to his ability, to each according to his needs "is implemented. Therefore, all socialist countries must resolutely defend the dictatorship of the proletariat" [1].

It is known that the most active representatives of the class are united in the party. The Communist Party is the vanguard of the working class. Any attempts to replace the class approach with a supra-class one, to present the Communist Party as a national one means betrayal of the cause of the working class and a transition to the position of the opposite class - the bourgeoisie.

The Chinese communists immediately saw such a substitution in the actions of the Khrushchevites: "The facts clearly show that, putting forward the so-called theory of the" popular party, "the Khrushchev revisionist clique is pursuing its true goal - to radically change the proletarian character of the Communist Party of the Soviet Union, to achieve the degeneration of the Marxist- from Lenin's party to the revisionist one" [1].

The counter-revolutionary coup was carried out at once, but it was being prepared gradually and for a long time. The CPC quite rightly notes that "the 20th Congress of the CPSU was the first step from which the leadership of the CPSU began its movement along the path of revisionism." And further, "the XXII Congress of the CPSU became a milestone, which marked the fact that the leadership of the CPSU has already, step by step, turned into a complete system the revisionist line begun by the XX Congress of the CPSU" [1].

The Chinese communists' appraisal of the CPSU Program is unequivocal: it "is a rough revision of the doctrine of the proletarian revolution and the dictatorship of the proletariat, of the proletarian party - this core of Marxism-Leninism, it announced that the dictatorship of the proletariat was no longer necessary in the USSR and that the character of the CPSU has changed, and put forward an absurd theory about the "state of the whole people" and "the party of the whole people" [1].

Despite the abundance of communist phrases, the CPSU Program has nothing to do with the development of communism: "The CPSU Program, put forward by the Khrushchev revisionist clique at the XXII Congress of the CPSU, is a program of pseudo-communism, there is a revisionist program directed against the proletarian revolution, to abolish the dictatorship of the proletariat and the proletarian party" [1].

The counter-revolutionary coup marked the beginning of the transition from communism to capitalism in the USSR. The Chinese comrades note: "The Khrush-

chev revisionist clique liquidates the dictatorship of the proletariat under the guise of a "state of the whole people", changes the proletarian character of the CPSU under the guise of a "popular party" and clears the way for the restoration of capitalism under the guise of "expanded construction of communism"[1].

The traitors and revisionists in the CPSU, having deceived the working class and working people, led the country into capitalism. The Khrushchevites did not succeed in deceiving the Chinese communists: "Under the guise of "building communism", Khrushchev set out to conceal his true, revisionist appearance. But this fraud is not difficult to expose. The fisheye will never pass for a pearl, never will revisionism pass for communism." The Chinese communists warned: "Khrushchev's revisionism set up the world's first socialist state, for the creation of which the great Soviet people shed their blood, in front of an unprecedentedly serious danger - the restoration of capitalism" [1].

The party leadership of the CPSU in every possible way concealed the position of the Communist Party of China from the Soviet communists and imposed its own revisionist position. The working class, the Soviet communists did not manage to uncover in time the revisionism and betrayal in the CPSU, soaked in communist phraseology. The appeal of the Chinese communists that "under such circumstances the Soviet people are faced with the question not of how to build communism, but of how to resist and fight against Khrushchev's implementation of the restoration of capitalism," turned out, as life has shown, true and topical [1].

Time has shown that the Chinese Communists are right. Socialism in the USSR was destroyed; today there is capitalism in Russia, and the Russian working class is once again faced with the task of overthrowing the yoke of capital. On the contrary, the largest country in the socialist camp, the People's Republic of China, continues to successfully build socialism.

References

1. *Controversy about the general line of the international communist movement. Beijing: Foreign Language Literature Publishing House, 1965. — 615 P. // http://library.maoism.ru/Great_Polemic/*

2. *J.V. Stalin – the head of the state of the dictatorship of the proletariat. Materials of the scientific-practical conference dedicated to the 135th anniversary of the birth of I.V. Stalin / ed. dr. phil. sci, professor, head of the Leningrad branch of the Fund of the Working Academy of A. S. Kazennov. SPb. Publishing house of Polytech. un-ty, 2015. – 123 P.*

3. *Lenin V. I. Compl. coll. of op. V. 39. M. 1963.*

路德维希·范·贝多芬的钢琴教学法
PIANO PEDAGOGY BY LUDWIG VAN BEETHOVEN

Kireyeva Natalia Yuryevna

Candidate of Art History, Associate Professor

Saratov state Conservatory named after L. V. Sobinov

抽象。路德维希·范·贝多芬是一位伟大的作曲家。他的交响乐，乐器和声乐作品仍由不同国家的音乐家演奏。特别著名的是钢琴奏鸣曲，其中许多都包含在钢琴家的“金色曲目”中。这位作曲家的作品是他钢琴作品的延续。

现代科学空间中有许多作品探讨了贝多芬作品的不同方面。经常不进行钢琴和教学等活动。这项工作旨在填补这一空白。

关键字：路德维希·范·贝多芬，钢琴，贝多芬钢琴家，贝多芬老师，钢琴教学法。

Abstract. *Ludwig van Beethoven was a great composer. His symphonic, instrumental and vocal compositions are still performed by musicians from different countries. Especially famous are the piano sonatas, many of which are included in the «golden repertoire» of pianists. The composer's work is a continuation of his piano opuses.*

There are many works in the modern scientific space, that explore different facets of L. Beethoven's compositions. Activities such as piano and teaching are often left out. This work is intended to fill this gap.

Keywords: *Ludwig van Beethoven, piano, Beethoven-pianist, Beethoven-teacher, piano pedagogy.*

Introduction. December 2020 marks the 250th anniversary of the birth of the greatest representative of the Viennese school of the XVIII–XIX centuries, Ludwig van Beethoven. Despite the fact that a fairly large historical period separates us from the time of Beethoven's life, the significance and relevance of his legacy remains to this day. This applies both to compositional works and to the piano traditions laid down by Beethoven. The composer's creativity is a natural continuation and at the same time preservation of his unsurpassed instrumental skill. Ludwig van Beethoven was able to pass on some of his experience as a composer and pianist to his students, including Karl Czerny (1791–1857). This fact is quite

important for revealing the continuity of the traditions of piano performance in the Saratov Conservatory. This is primarily due to the name of the recently departed great pianist, People's artist of Russia, Professor Lev Isaevich Shugom (1946–2017). At one time, Lev Shugom studied as an assistant-trainee at the Moscow Gnessin state music Institute in the class of Professor A. L. Yoheles, who was once a student of K. N. Igumnov. In 1982, Shugom graduated from the FPC at the Moscow state Tchaikovsky Conservatory in the class of Professor L. N. Vlasenko. He was a student of J. V. Flier, and Flier studied under Igumnov. Igumnov also graduated from the Conservatory in the class of Professor A. I. Ziloti. Alexander Ilyich, on the advice of Nikolai Rubinstein, went to Weimar to improve his skills by Franz Liszt – who had studied under K. Czerny, the immediate successor of L. V. Beethoven.

In December 1770, in the small German town of Bonn, the boy Ludwig was born to the family of the court tenorist Johann and the daughter of the court cook Mary Magdalene. He was baptized on December 17 of the same year. During the first years of Ludwig's life, the family was calm, gracious, and peaceful. Mary Magdalene was a kind, charming woman, had a gentle disposition, but at the same time she was not devoid of endurance and willpower. Father was more frivolous and weak in character, but he had a relatively decent job, a stable income, and generally not a bad, although modest, position in society. Grandfather-Ludwig Sr., morally and financially supported his son. But after the death of Johann's father and due to other circumstances, the family's well-being began to deteriorate. Mary Magdalene became ill with tuberculosis. Little Ludwig was increasingly left to his own devices. All the strength of a sick mother went to the younger children, the father almost did not deal with children.

Of course, this state of Affairs could not but puzzle and upset the boy. Sometimes he would lie for hours on the windowsill, deep in thought, and gaze out over the river. This contributed to the formation of a character trait accompanied by concentration and isolation. But little Louis was not a self-absorbed melancholy, he still grew up a healthy, strong boy, who did not shy away from children's pranks. As stressed by A. A. Allswang, «later, as a schoolboy, Ludwig often spends his free time playing. A lively temperament is reflected in his hot inclination or undisguised antipathy to certain people, in a passionate attitude to the events of the surrounding life, in a sense of humor, and the ability to laugh a lot and cheerfully» [2, p. 15].

Concentration and sensitivity are balanced by the personality of Beethoven and this immediately had an impact on their preferences in the knowledge from the

earliest years. He was «initially inclined to have an interest in art, endowed with intellectual complexity, as well as to appreciate any serious scientific knowledge, be it music theory, history, philosophy, philology, or even astronomy, which he was also interested in» [4, p. 61]. Beethoven considered science and art to be one of the highest achievements of society, and more than once spoke about the importance of introducing each person to them.

At the same time, according to historians and Beethoven himself, his «official» education was not very thorough. Ludwig attended school only until the age of ten, and then for family reasons could not study at all. But the boy didn't stop there. In order to fill in the gaps in knowledge, Beethoven looked for any ways to get them: he read a lot himself, and also sought to study with more experienced and developed comrades. Moreover, this gave its results – Beethoven could express himself in foreign languages, translated foreign philosophical treatises. This is how the ability to think independently developed in independent searches.

The same applied to music classes, which were conducted without any system. However, unique creativity was noticed by the father from an early age. The father invited teachers for his son, who taught him to play various instruments: harpsichord, oboe, flute, organ, viola and violin. His father wanted to make a child Prodigy out of his son. He was not a tyrant, but «jealously watched the progress of his son's education, interfered in teaching and almost forced the boy to study music for several hours a day» [2, p. 17]. The main focus was on developing the technique by playing exercises for many hours. But there were also «lyrical» lessons, when Johann himself sat his son on his knees in front of the piano and taught him to accompany singing. Ludwig quickly mastered musical notation and easily played from the sheet, but his free spirit required free music making, and he especially liked to improvise, despite the instructions of his father, who sought to streamline his son's musical thinking, urging him first to learn how to play exactly what is written. So, the beginning of the composer's activity was laid in 1782. The highest refraction of pianism in the composer's work of L. V. Beethoven will be his piano sonatas, in which the piano will resemble an organ and even a symphony orchestra.

One of the most significant influences on the creative development of the young man had classes with the composer and organist Christian Gottlob Neefe. Beethoven played the organ well, and from 1784 began to receive a salary for performing as an assistant to the Neefe, thus continuing his sixty-year family tradition of court musicians of the electors of Cologne in the city of Bonn. Despite the fact that there are different opinions about Beethoven's attitude to the organ, but Karl Czerny testified that Beethoven treated the piano like an organ, refracting the features of its sound on the piano. And all this despite the fact that L. Beethoven's hands were not very large, they barely covered the decima, and the limit of their

capabilities were octave passages. H. G. Neefe highly appreciated the piano and composing abilities of his student. In 1783, Beethoven's teacher Neefe described his pupil as «a boy of... most promising talent. He plays the clavier very skillfully and with power, reads at sight very well...» [quoted in: 7, p. 76].

Beethoven was not only a brilliant and prolific composer, but also a first-class performer and improviser. It is worth noting that L. Beethoven played not only his own compositions. K. Czerny, for example, recalled that Beethoven excelled at playing the piano scores of operas Glyuk's. Absolutely unsurpassed was his «outstanding piano talent and stunning ability to improvise», which «made a strong impression even on Mozart, if you believe the legendary story of Seyfried» [quoted in: 4, p. 133].

There is still some evidence of Beethoven's playing and improvisation. At one of the meetings in the salon, which were widely popular in those days, the famous pianist Joseph Gelinek, hearing Beethoven's playing, said: «I have never heard such a game! He fantasized about the theme I had set in a way I had never heard even from Mozart. Then he played his compositions, which were most wonderful and magnificent, and extracted from the piano such difficulties and effects as we would never have dreamed of» [quoted in: 4, p. 177]. As we can see, Gelinek notes not only the technical and improvisational capabilities of the pianist, but also the quality and variety of the means of expression used, unfamiliar to Beethoven's contemporaries until now.

When Beethoven was particularly inspired, he played with enthusiasm and great technical dexterity, although not all from a position of pianistic perfection and precision of detail. This is generally characteristic of playing composers, who have always treated musical sound as not something crystallized, but as a living matter from which the musical universe is molded. He often displayed an excess of vitality; excelled at playing legato and captured the attention of listeners with the depth of his expressive playing, especially at slow tempos. With the Creator's penchant for living mostly in the present, he performed some of his most inspiring extraordinary improvisations. Beethoven's contemporaries noted that the pianist very rarely resorted to purely virtuosic decorations and techniques. The expressiveness of the performance was achieved through rhythmic accents, which brought musical speech closer to a live oratorical performance.

One might assume that Beethoven's improvisations were thought out in advance or even memorized, but the «duel» with the then brilliant virtuoso pianist Daniel Steibelt proves the opposite. In 1800, for example, Beethoven's op. 11 trio and Steibelt's quintet were performed at a social event. A few days later, the musicians met again. At the next party, frivolous and short-sighted Steibelt performed a brilliant variation that he had learned beforehand, based on the theme of the Beethoven trio performed the previous day. Beethoven's admirers and Beethoven

himself were puzzled. Without hesitation, Beethoven took the first cello part of the Steibelt quintet that came to his attention, placed it upside down on the piano stand, and played the first bars, taking them as the theme. And «being both offended and hurt, he improvised so that Steibelt left the hall before the end, so that he would never meet him again – and even made it a prerequisite that Beethoven was not invited to perform with him» [quoted in: 4, p. 179].

Most of the rave reviews of contemporaries described Beethoven's spontaneous improvisations, one of which was also a half-hour development of the fugue in one of the lessons with his student F. Ries: «Once, when we were talking about Fugue themes at the end of the lesson, I was sitting at the piano, and he was next to me. I played the theme of the first fugue from Graun's "Death of Jesus"; He began to play along with his left hand. Then I attached the right one, and without any interruptions I developed the topic for about half an hour. I still don't understand how he could have stayed in such an uncomfortable position for so long. Inspiration made him insensitive to external impressions» [quoted in: 4, p. 182].

With incredible ease, Beethoven could also transpose works on the spot. One day in 1812, the Viennese musician FR. Starke offered to play one of Beethoven's french horn sonatas together. Finding that the available piano was half a tone lower, Beethoven immediately moved his part a half-tone higher – to *Fis-dur*. Eye-witnesses admired: «in a wondrously beautiful way: the passages rolled along so clear and fine that one couldn't believe at all that he was transposing. Beethoven also had praise for Starke because he had never heard the sonata performed with shading; he found the *pp* especially fine» [7, p. 77].

Beethoven singled out the pianist and composer John Kramer among all his contemporaries. The style of his playing was quite close to Beethoven's, although he was more successful in the works of W. A. Mozart, whom he played especially soulfully. Kramer had a brilliant technique and phenomenally smoothly performed the most difficult passages, skillfully mastered the skill of «singing on the piano». Both musicians had respect for each other and had a special influence on each other. In 1804, J. Kramer published the «School of piano playing», which Beethoven later strongly recommended to his nephew Karl and the young Gerhard Breuning.

Thus, L. Beethoven could improvise in completely different styles and forms. These could be simple and catchy fantasies and variations on a particular theme, polyphonic developments in a strict or free style, or even a sonata form with all its corresponding sections. Beethoven impressed not only with his large technique, powerful and bright sound, filigree shades and contrasts, but also with an incredibly powerful intellectual component.

Of course, the question of communicating with such brilliant individuals who have a huge life and professional experience, who can create in borderline states of being-non-being, remains open, and hardly has a clear answer and is beyond the

understanding and feeling of an ordinary listener. «His spirit, – in the words of a contemporary, – tore all restraining fetters, threw off the yoke of slavery, and, triumphant, flew into the bright ethereal space. His playing was noisy, like a wildly foaming volcano; his soul now drooped, weakened, and uttered quiet complaints of pain, then rose again, triumphant over the passing earthly sufferings, and found soothing comfort in the chaste breast of sacred nature» [quoted in: 2, p. 92]. This emotional description of the experience of Beethoven's playing is almost a reflection of the properties of the very nature of his personality: «The personality of the brilliant pianist had a hypnotic effect on society, especially on women. Short, ugly, and quick-tempered, Beethoven could be a charming conversationalist and a good friend. An ardent desire for friendship, an exceptional sincerity and genuine kindness balanced in the eyes of others many of the shortcomings of his violent, passionate character. With deep respect for love, for family life, always cherishing the idea of a real, only woman, he was sometimes tempted by random meetings, sharply condemning himself for them» [2, p. 86-87].

Despite some instability in everyday life, behavior and uneven creative activity, in general, Ludwig van Beethoven was a very organized person, demanding both to himself and to others. Beethoven clearly distributed his day. He got up at dawn and worked until lunch. The rest of the time, he thought and organized his ideas. He did it in the fresh air. In any weather, Beethoven would walk in the afternoon. When walking, he walked mostly at a brisk pace. In the evening, the master gave concerts, met with friends, and visited the theater. Beethoven spent his summers in Baden, or in a secluded village where he worked hard.

Ludwig van Beethoven was a brilliant pianist and an excellent improviser. But he dreamed of becoming a great composer, which he later succeeded in doing. But at the same time, Beethoven had several students: F. Ries, K. Czerny, I. Moscheles, D. Ertman.

Ries, Czerny, and Moscheles accepted and admired Beethoven's principles of musical performance, but they were far removed in nature heroic sound of their teacher. The closest thing to Beethoven's pianism was the German pianist Dorothea Ertmann. She was particularly successful in performing Sonata 14 – op. 27 No. 2 *cis-moll*. One of the most wonderful sonatas is dedicated to her – opus 101, No. 28. Here's what Reichart writes about this amazing pianist: «The tall, stately figure and beautiful, animated face caused me to look at the noble woman with intense expectation, but still I was shocked as never before by her performance of the Beethoven Sonata. I have never seen such power combined with the most profound tenderness, even in the greatest virtuosos. On each fingertip is a singing soul, and in both equally perfect, equally confident hands there is such power, such mastery of an instrument that sings, speaks, and plays, reproducing all the great and beautiful things that art possesses. The great artist breathed her soul full

of feeling into the instrument and forced it to such effects that it was probably not able to give under other hands» [2, p. 109-110]. And despite the fact that Dorothea Ertman could not become a famous pianist, because she occupied a position corresponding to the rules of society, and her artistic activity was limited, she went down in history as the best performer of works among Beethoven's contemporaries.

However, Beethoven also highly valued his other students – F. Ries and K. Czerny. At the end of 1801, Ferdinand Ries, the son of violinist and Kapellmeister Franz Ries, a close friend of the Beethoven family, came to Beethoven from his native Bonn. Ludwig van Beethoven was sincerely grateful for his participation in a difficult period of their life. At the age of seventeen, Ferdinand was extremely gifted: he played the piano, violin, and cello very well, and could compose quite well. Ferdinand was taught by Beethoven very honestly and patiently. F. Ries had a great respect for his teacher and sincerely regretted that he had not written a book that would explain his methods of piano playing, which he had always hoped to write. Ries recalled that despite his nature, Beethoven was a surprisingly patient teacher. He asked me to repeat the missing passage ten or more times, or even the entire work. He was tolerant of errors in the performed musical text, but was very intolerant of the lack of content, emotional dryness, and the absence or weakly expressed dynamic drama [7, p. 81]. The master taught the musical order and especially attracted the attention of the young musician to the sensual and meaningful side of the performance of the work. Ferdinand Rees later moved to London, where he gained a well-deserved reputation. He toured Kiev, Moscow, and St. Petersburg in 1812.

Almost at the same time as Ries, an extremely capable boy appeared in Beethoven's class – Karl Czerny, who grew up among professional musicians from an early age. In a letter of recommendation given by Beethoven in 1805 to Karl Czerny, the composer states in it that «for his fourteen-year – old age, he achieved absolutely exceptional, exceeding expectations in playing the piano, and that both in this respect and taking into account his amazing memory, he is worthy of all possible support» [1, p. 36]. And indeed, the young Karl played by heart all the published works of Beethoven: «Prince Likhnovsky forced Czerny to play the works of his favorite composer twice a week, and only called the opus numbers, and Czerny immediately began to play the required Beethoven piece» [2, p. 107]. Czerny was active in concert until 1815. Beethoven entrusted him with the performance of his Third and Fifth piano concertos.

Beethoven was in demand in Vienna as a teacher, but he did not see this type of activity as permanent and especially as a possible source of income. Most of the time, he didn't even charge the students. Following Salieri, Beethoven considered it his professional duty to help his younger colleagues. Beethoven's attitude

towards his students was akin to that of a medieval master and apprentice: the teacher accompanied them in life in a fatherly way, delved into all their problems, took them for walks and fed them with dinners, etc. But the students also responded to him in return, and were always ready to help their teacher at the first request: to negotiate with publishers, read proofs, copy parts, perform in a concert, etc. Beethoven did not seek to take money from noble and rich students and preferred to present classes as a kind of friendly communication. One example was the following case, when in 1802 Countess Susanna Guicciardi (mother of Juliet) decided to send Beethoven some shirts as a thank you for her work, for which she received a very demanding response: «The talent of your daughter, Your friendliness and kindness attract me in Your home – why it is necessary to look for others, why? ... Is this friendship? Friendship requires no reward other than that which is contained in it» [quoted in: 4, p. 176].

Priority for Beethoven, according to N. Kashkadamov, was the education of the talented musician. He paid great attention to understanding the content and feeling the spirit of the performed works. Beethoven immediately became interested and eager to work with such students who had the ability to comprehend the meaning of the master's instructions and translate them into performed works [6, p. 353]. But this was not a one-sided manipulation of emotionality, and the master primarily aimed students at developing technical equipment.

For example, he recommended that the young Czerny practice gammas in order to rationally build the apparatus by distributing the fingering, hand position, and thumb application. A methodological guide in the course of classes also served as a treatise by F. E. Bach «Experience of the true art of keyboard playing», which the teacher himself studied as a child. Modern researcher A. A. Genkin draws attention to the fact that «the mentor also drew the student's attention to the differences between the sharp sound of the harpsichord and the melodious sound of the piano, which requires a different style of playing, namely legato» [3, p. 45]. Also, the lessons were constantly focused on the volume of sound, the relief of phrasing, and the various use of the pedal. «The unusual use of the pedal in Beethoven is due to the peculiarity of the sound of instruments of his time, which allow combining the entire theme on a single bass with changing harmony», – writes E. I. Maksimov [5, p. 21]. It was a true school of pianism. Ludwig van Beethoven died on March 26, 1827.

References

1. Eisenstadt, S. A., *Teacher of music. The life and work of Karl Czerny, Moscow: Composer, 2010, 215 p.*

2. Alshvang A. A. *Ludwig van Beethoven: an essay on life and creativity*. 5th ed. Moscow: Music, 1977. 447 p.
3. Genkin A. A. *the Origins of the aesthetic ideal of K. Cherni // International scientific and practical conference «World of science»*. 2018. Vol. 5. No. 2 (30). Pp. 43-49.
4. Kirillina L. V. *Beethoven. Life and creativity: in 2 volumes. Vol. 1*. M.: Scientific and publishing center «Moscow Conservatory», 2009. 537 p.
5. Maksimov E. I. *Beethoven's Piano work in the context of music criticism and performance trends of the late 18TH-first third of the 20th century / Evgeny Maksimov. Abstract. Diss ... Cand. of art criticism: 17.00.02. Moscow, 22 p.*
6. Kashkadamov N. *The art vikonannya music on clave-strings instrumento (clavan, harpsichord, fortepiano). XIV-XVIII art.: navch. posib. 2-hewed., ViPr. I dopov. Kiev: Osvita Ukrainy, 2009. 416 p.*
7. Newman William S. *Beethoven on Beethoven: playing his piano music in his own way*. New York: W. W. Norton company. 336 p.

DOI 10.34660/INF.2020.45.27.007

被命名为俄罗斯古典音乐明星节
NAMED RUSSIAN FESTIVAL OF CLASSICAL MUSIC STARS

Redko Anatoly Maksimovich

Candidate of Pedagogic Sciences, Associate Professor

Perm State Institute of Culture

Perm, Russia

抽象。 这篇文章是关于彼尔姆州（Perm Oblast）的第十届Matsuev节-2020。 尽管卡玛地区流行病形势严峻，但精通国际水平的部队已降落在彼尔姆，尽管符合所有反流行病的要求：口罩，听众的象棋座位，大量免费座位，没有纸质程序，小册子，没有自助餐。

关键字：节日，竞赛，项目，获奖者-2020年。

Abstract. *The article is about the tenth Matsuev festival-2020 in the Perm Oblast. A masterful troop of international level landed in Perm, despite the difficult epidemiological situation in the Kama region, although in compliance with all anti-epidemic requirements: masks, chess seating for listeners, a lot of free seats, there were no paper programs, booklets, and no buffets.*

Keywords: *festival, competition, project, laureates-2020.*

The jubilee annual (10th in a row) event¹ opened with a solo concert by the outstanding contemporary pianist D.L.Matsuev² (see: photo 1).

Greeting the Perm audience, the pianist wished the Krai Philharmonic Society and the Permians in this difficult time that music would sound on the stage, and there would be listeners in the hall, and that everyone would be healthy. "Real music heals. This is a vaccine that is needed anytime, anywhere in the world, and even more so now. And at our concerts you can only get infected with real art!"

The musical calendar of the project contains two important names and two important dates: 180 years since the birth of P.I. Tchaikovsky and the 250th an-

¹General partner of Denis Matsuev's creative projects. Supported by the Ministry of Culture of the Russian Federation. Within the framework of the program of the Ministry of Culture of the Russian Federation "All-Russian philharmonic seasons".

²The name is inextricably linked with the traditions of the legendary Russian piano school, the innovation of creative concepts and the depth of artistic interpretations. "A virtuoso in the tradition of E. G. Gilels, S. T. Richter, V. S. Horowitz" - according to one of the most authoritative US newspapers "Los Angeles Times".

niversary of the birth of L. van Beethoven³.

"Of course, we could miss these anniversaries of two geniuses," said Denis Matsuev. - The first was dedicated to the concert "Tchaikovsky - Gala" - performances of the winners of the International Competition named after P.I. Tchaikovsky of different years: it is me, myself / D. Matsuev / (1998), H. Gerzmava (Grand Prix, 1994), S. Dogadin (2019). As for the German composer, this is an absolute genius. And I (D. Matsuev) already have a sufficient number of his sonatas in my repertoire. But Sonata № 31 ("Appassionata)" and Sonata № 32 in Perm in my performance were performed for the first time. I have never played all three sonatas of genius in a row. This is a real Beethoven manuscript. And each of them is a revelation."



Photo 1. Melomaniacs are happy to meet the musician again at the most prestigious concert venues in the world as a chamber performer, with recitals, with orchestras conducted by the best conductors of our time. BZPF.

There were performed compositions that not only delight in their depth and beauty, but also pose the most difficult creative tasks for the performers.

A composition of tremendous tragic power. The characteristic⁴, given by the Hamburg publisher A. Krantz, turned out to be very successful and became almost the official title of the work. The composer himself, answering the question of

³The composer is a recognized genius who combines divine inspiration and transcendental skill, gentle lyricism, colossal will, deepest thought, crushing power of feeling in his music.

⁴Appassionato, which means passionately.

what his music is about, advised to read "The Tempest" by W. Shakespeare. When you listen to the finale, the words of R. Rolland involuntarily come to mind: "... like the rows of advancing waves that break on the rock, until they crush and sink it" / the above refers to Sonata № 23, f-moll/.

A romantic sonata, small in size, it strikes with the fullness of feelings expressed in each of its laconic and contrasting sections. The transition from serenity to mental suffering is reflected in the figurative structure of the work / the above refers to Sonata № 31, As-dur/.

The pinnacle of his creation in genre, the sonata is reduced to two parts, in it there is a place for both the heroic principle and contemplative variations. The tense, impetuous drama of the first movement is resolved by the highest calmness and serenity in its finale / the above refers to sonata № 32, c-moll/ (see: photo 2).



Photo 2. The magnificent program of the solo concert of the pianist in combination with the rare talent of the performer did not leave indifferent numerous admirers of his sparkling talent! BZPF.

The traditional page is close attention to the young "sparks", as Denis Leonidovich himself calls them, - the young talents of the city of Perm; Perm region. The award ceremony (see: photo 3) of the scholars of the Interregional competition "New Names", which were determined in the spring at the regional competi-

tive⁵ selection⁶ remotely in connection with the current sanitary and epidemiological situation, took place: namely, by video recordings (for young musicians), by photo slides of paintings (for young artists).



Photo 3. The floor was given to A. Petrosyan, Vice-President of the I. Voronova Charitable Foundation "New Names" (Moscow). Traditional ritual: lighting the bowl, associated with new sparks of the OZPF.

Six young musicians and an artist (scholarship holders 2020): artist Maya Uzerina (teacher: E.N. Galkin, CAS №1 Tchaikovsky); cellists Vera Vyatchanina (1st year PMC), Vasilisa Pavlenko (teacher: ZrkRF MV Vdovina, CMS № 3 "Dominanta"); guitarist Yaroslav Romashev (teacher: AA Kruch, additional education department of the PMK); accordion player Ivan Dozmorov (teacher: N.V. Yunkind, CMS № 4 "Kvarta"); violinist Sofya Tyuleneva (teacher: E.V. Stratulat; CMS № 10 "Dynamics"); flutist Olesya Yamanaeva (teacher: E. B. Smyslova, CAS № 9) / see: photo 4).

⁵The competitive selection of scholarship holders is part of a long-term project to identify and support young talents in the field of culture and art "New Names of Russia" (2018 - 2021), implemented using a grant from the President of the Russian Federation for the development of civil society provided by the Presidential Grants Foundation. Chairman of the jury of the first stage: SAM of the Russian Federation N.N. Gorkaya. (CMS № 3 "Dominant", Perm).

⁶The works were evaluated by A. Petrosyan, vice-president of the "New Names" charitable foundation named after I. Voronova, associate professors of the Moscow State Conservatory named after P.I. Tchaikovsky D. Kopylov, A. Sokolova, professor of the Gnessin Russian Academy of Music V. Kruglov, Honored Artist of Russia S. Oleinikov.



Photo 4. Winners after the awarding ceremony. OZPF.

The best concert numbers captured by a photo lens (see: photos 5, 6,).



Photo 5. Participants of the concert program are performing. OZPF.



Photo 6. Participants of the concert program are performing. OZPF.

The Russian National Orchestra (artistic director: M. Pletnev), by the way, is the RNO - the best symphony collective in the country - celebrating its 30th anniversary, with which the orchestra congratulated the festival's demiurge Denis Leonidovich Matsuev. And its chief conductor Mikhail Pletnev is also a laureate of the V.I. International P.I. Tchaikovsky 1978. And the fact that the outstanding orchestra celebrated its anniversary with a concert in Perm, according to Matsuev, a sign of special reverence for the Perm stage and the festival, with conductor D. Botinis⁷, presented a concert program with the participation of brilliant soloists, musicians of the European level: Eva Gevorgyan⁸ (piano), Alexander Ramm⁹ (cello), Denis Matsuev (piano).

⁷Conductor D. Botinis at the age of 19 won and became the owner of all the special prizes of the Pedrotti International Competition for Symphony Conductors (Italy, 2006). Since 2015, he has been the chief conductor of the ASO of the V.I. Safonov.

⁸A talented pianist, composer, laureate of the International Grand Piano Competition (project by D.L. Matsuev). Possessing bright virtuoso data, phenomenal artistry, precise feeling. In 2019 she was recognized as the winner of the ICMA International Prize in the Discovery of the Year nomination. In 2020 she received the Grand Prix and a special prize for the best performance of a work by F. Chopin at the International Online Music Competition in Chicago (USA).

⁹The game combines virtuosity, deep penetration into the composer's intention, emotionality and artistic individuality.

He supported the initiative of the soloists and the RNO by performing rarely sounding Variations on a Theme by P. I Tchaikovsky A. Arensky. On the stage of the Krai Philharmonic, the musicians of the RNO obeyed the conductors of the festival's debutants: the aforementioned Dimitrios Botinis and Valentin Uryupin, the only Russian laureate of the VIII Sir G. Solti International Conducting Competition (Frankfurt, 2017).

Eva Gevorgyan performed Concerto № 3 C-dur for piano and orchestra by S. Prokofiev (see: photo 7). A bright, full of virtuoso brilliance, the concert was the crown number of many of Prokofiev's performances as a pianist.



Photo 7. The best work of the composer is the result of his many years of research in the field of piano music, the most perfect of the five concertos he composed. BZPF.

Pyotr Ilyich's music sounded two nights in a row. Variations on a Rococo theme for cello and orchestra were performed by A. Ramm (cello), laureate of the International Cello Competition Paulo Cello Competition in Helsinki / see: photo 8 /. This work has been included in the compulsory program of the third round of the International Competition named after P.I. Tchaikovsky. "When I play variations on the Rococo theme, I remember the competition and the feeling of total happiness," Alexander admits. - I perform it quite often, but every time with pleasure. And, of course, I try to immerse myself in this music deeper each time."



Photo 8. The best violinists in the world consider it an honor to perform this work, and the attitude of the general public to the concert cannot be called anything other than enthusiastic. BZPF.

Sergey Dogadin¹⁰ filigree played a concert for violin and orchestra D-dur - a reference work of the composer, mandatory for performance at the third round of the International Competition named after P.I. Tchaikovsky. His virtuoso mastery of the instrument made an indelible impression on the audience, for which the musician thanked the Permians by scattering for an encore an incredible, superhuman playing on the theme of the opera La Molinara ("The Beautiful Miller Woman") by N. Paganini (see: photo 9).

¹⁰The performer is a charismatic musician of his generation. His performance leaves a lasting impression every time. The musician plays the violin by the Italian master D. Montagnana (Venice, 1721).



Photo 9. S.Dogadin in musical ecstasy showed his mastery and magnificent sound of a collection violin of a Venetian master. BZPF.

Concerto № 2 for piano and orchestra G-dur of the P.I. Tchaikovsky is another tribute to music lovers from Maestro Matsuev himself. Effective, glorifying life in all its rampancy, this rarely performed one provided grateful opportunities to demonstrate the performer's virtuoso skill and the capabilities of the grand piano.

The world famous Prima Donna H. Gerzmava found time in her busy schedule to perform in Perm. She arrived in our city for just a few hours. For the Permians, she performed Leonora's aria from the opera "Troubadour" by D. Verdi. The enchanting music of this aria evokes compassion and tenderness for a brave woman who decides to sacrifice herself for love. And also the RNP "Grass-ant", a touching romance "Bouquet of flowers from Nice" by D. Bouda.

A representative of the world elite of the Russian piano school, he also performed the solo part in F. Chopin's Concerto № 2 for piano and orchestra in f-moll.

"I call this instrumental concert pandemic: we can say that the pandemic helped me in this regard, because earlier I had never dared to take this concert on stage, but, oddly enough, these months that we held at home, there was an opportunity to learn new material. Of course, I did a lot during this time, but after leaving the quarantine and into concert life, F. Chopin's Concerto № 2 - a work of indescribable beauty - has firmly entered my repertoire. And, of course, I could not but include it in the program of our anniversary festival in Perm," said the Maestro.

This is the facet of his talent that we so want to hear, which we all value so much, this is the finest musician, he reveals himself as a person of absolute taste, because Chopin is a litmus test, this is the option when it is easy to go into the salon, go into a kind of vagueness Denis did it in a unique way, keeping his style and shape, although he later joked that for the first time I was playing with an empty hall. But this joke seems hilarious, quite hilarious compared to 25%. We do not comment on this and cannot condemn, not praise, this is a given. Thank you for 25. It's important for musicians, we can't live without an audience. Create, embody only with the public. This is with feedback, energy waves and therefore it is so difficult to play in the Internet space, felt the lack of a live audience. Without an audience, no masterpieces can be created (see photo 10).



*Photo 10. D. Matsuev performs instrumental concerts by P.I. Tchaikovsky;
F. Chopin.*

Summing up the results of the anniversary project, Denis Matsuev emphasized that 10 years of the festival have certainly strengthened its cooperation with the Perm Philharmonic: “But I would not call this cooperation, but I would call great friendship with a wonderful team and its director G. Yu. Kokoulina – the eternal

engine of culture in Perm Krai. And the team that she brought together is always a feeling of being together, always a team and a kind family that does their amazing job flawlessly. I know very well what it means to hold a festival - it's not easy. The success of the festival is not only those faces that we see on stage, but also invisible heroes, whom I also congratulate on our anniversary festival. And thanks to the governor of Perm Krai D. Makhonin, who attended the third day of the festival, that he does not close the concert life. Believe me, you Perm people are envied almost all over the world, because concerts are held in few places, and it is a great happiness that you and we have such a festival. And the Permian audience is the illustrative example that I am talking about almost all over the world. We have known each other for over 22 years, I can see perfectly how the number of spectators has increased in number - the halls are overcrowded, always sold out. And our most important achievement, which I really will not tire of repeating, is the birth of a new audience, a new generation of listeners who are accustomed to going to concerts of academic music. And, of course, the Perm Philharmonic is an accomplice in this process, developing this audience, making the right programs. The unique poster of the Philharmonic is really a brand, an indicator of a certain level. The most famous hall in the world is not ashamed to have such a poster! The level set by the Krai Philharmonic Society over the years, I am sure, will be maintained further, knowing how reverently the Philharmonic Society treats the audience and the artists."

A short video was edited from the entire broadcast from the concerts, which was shown before the start of each evening concert, and at the end of the grand festival it was shown with the addition of the current 2020 event. Another video film before the commemoration of the current young winners - "our new sparks" - as D. Matsuev himself affectionately calls them.

References

1. *Perm Krai Philharmonic. Solo concert by Denis Matsuev [Electronic resource].* – Access: <https://filarmonia.online/afisha/solnyjkoncertdenisamacueva10.html>
2. *Perm Krai Philharmonic. Gala concert "New names" [Electronic resource].* – Access: <https://filarmonia.online/afisha/gala-koncertnovyeimena20.html>
3. *Perm Krai Philharmonic. "The X Festival of Denis Matsuev has triumphantly ended in the Perm Philharmonic Society" [Electronic resource].* – Access: <https://filarmonia.online/filarmonija/novosti/vpermskojfilarmonii triumfalnozavershilsjaXfestivaldenisamacueva.html>

孕妇生活质量对肠节律的依赖性
**DEPENDENCE OF THE QUALITY OF LIFE ON THE BOWEL
RHYTHM IN PREGNANT WOMEN**

Dolgov Gennadii Victorovich

Doctor of Medical Sciences

North-Western state medical University named after I. I. Mechnikov

Shemerovskii Konstantin Alexandrovich

Doctor of Medical Sciences, Full Professor

Saint Petersburg Medico-social Institute

恢复。对两组孕妇的生活质量进行了比较研究：排便功能的昼夜节律正常（Euenteria）和此功能的节律缓慢不规律（Bradyenteria）。每天有至少7次大便次数，每天有肠律动的女性被诊断为患有Euenteria。当肠蠕动的频率为每周1-6次时，就被诊断为蠕动。生活质量水平由修改后的简短形式SF-36确定，其中考虑了7个主要参数：从体育锻炼到心理健康。研究发现，妊娠中期三个月中有26%的女性有规律的排尿节律，而被诊断为不规律的排尿节律的频率几乎高出3倍（接受调查的妇女中有74%）。Euenteria主要与肠内节律的生理最佳早晨阶段有关。Braintree与早晨没有排便有关。患有Euenteria和早晨大便的孕妇的生活质量比具有Bradyenteria且没有早晨排便习惯的妇女的生活质量高11-29%。妊娠中期妇女的生活质量水平在很大程度上取决于昼夜排便的排便节奏是否正常，以及是否存在早晨排便习惯。

关键字：昼夜节律，排便习惯，Euenteria，Bradyenteria，怀孕，生活质量。

Resume. *A comparative study of Quality of Life was conducted on two groups of pregnant women: with regular circadian rhythm of bowel evacuation function (Euenteria) and with irregular slow rhythm of this function (Bradyenteria). Euenteria was diagnosed in women with a daily intestinal rhythm with a stool frequency of at least 7 times a week. Bradyenteria was diagnosed when the frequency of bowel movements was 1-6 times a week. The Quality of Life level was determined by the modified short form SF-36, which takes into account 7 main parameters: from physical activity to mental health. It was found that regular bowel rhythm occurred in 26% of women in the third trimester of pregnancy, and irregular bowel rhythm was diagnosed almost 3 times more often (74% of women surveyed). Euenteria was associated predominantly with the presence of*

a physiologically optimal morning phase of the enteral rhythm. Braintree was associated with the absence of morning defecation. The Quality of Life of pregnant women with Euenteria and morning stool was 11-29% higher than that of women with Bradyenteria and with the absence of morning bowel habit. The level of quality of life in women in the third trimester of pregnancy greatly depends on the regularity or irregularity of circadian evacuation rhythm of bowel function, and the presence or absence of morning bowel habits.

Keywords: *circadian rhythm, bowel habits, Euenteria, Bradyenteria, pregnancy, Quality of Life.*

Introduction

One of the most common syndromes that complicate the course of pregnancy is Bradyenteria syndrome (constipation), which is manifested by slowing down the circadian rhythm of the intestinal evacuation function [1-4]. According to Chinese researchers, the incidence of defecation rhythm disorders in the form of chronic constipation in pregnant women is significantly higher than in the general population. Among the risk factors for constipation, in addition to the state of pregnancy itself, were noted: a tendency to obesity, physical inactivity, psychological stress, and previous abortions. According to endocrinologists, the incidence of constipation and heartburn in pregnant women reaches 38% and 45%, respectively. According to Turkish studies, the severe stages of constipation in pregnant women can be alleviated by special water procedures, which can help improve the quality of life of these women. According to Czech surgeons, constipation in pregnant women can be complicated by acute surgical pathology, which is sometimes accompanied by appendectomy. However, the dependence of the quality of life on the regularity of bowel rhythm remains poorly studied.

The aim of the study

was to compare the quality of life in two groups of pregnant women: those with a regular (daily) rhythm of bowel evacuation function and women with a slow bowel rhythm (with bradyenteria or constipation).

Materials and methods

Rapid diagnostics of the regularity of the Bowel Habits rhythm using the "Chronoenterography" method [5-6] was used, which allowed detecting the frequency and acrophase of the Bowel Habits rhythm. According to the frequency of enteral rhythm, 4 states were distinguished: 1-regular Bowel Habit rhythm with a stool frequency of at least 7 times a week (Euenteria), 2 – mild Bradyenteria – with a stool frequency of 5-6 times/week, 3 – moderate Bradyenteria – with a stool frequency of 3-4 times/week, 4 – severe Bradyenteria – with a stool frequency of 1-2 times/week. Acrophase of Bowel Habits rhythm was allocated to 2 conditions: 1 – physiologically optimal (morning) acrophase of circadian Bowel Habits

rhythm (from waking up to 12:00) and 2 – pessimal phase of Bowel Habits rhythm (from 12:00 to bedtime). 42 women of the third trimester of pregnancy aged 19-38 years were examined. The level of Quality of Life was determined using a modified SF-36 questionnaire, which allows assessing the physical, social and mental components of Quality of Life. We compared the Quality of Life of women with physiological Euenteria (7 days a week with the everyday stool) with that of women with moderate Bradyenteria (3-4 days a week with stool). The significance of differences was assessed at a 95% confidence level ($p < 0.05$).

Results

Regular Bowel Habits rhythm was found in 26% of the women examined, but the three stages of Bradyenteria (mild, moderate and severe) - in 74% of pregnant women. It was found that the optimal morning acrophase of the Bowel Habits rhythm prevailed (it was found in 78% of cases) in women with Euenteria. Women with Bradyenteria have predominately the pessimal acrophase of the Bowel Habits rhythm (72% cases). The level of quality of life in women with regular Bowel Habits rhythm (with Euenteria, with daily stools) ranged from 78% to 91% of the optimal, while the levels of General health (86%) and Mental health (91%) dominated. The level of quality of life in women with moderate bradyenteria (with a stool frequency of 3-4 times a week) ranged from 49% to 80% of the optimal level, with the lowest levels for Pain symptoms - 49% and Social activity - 50% (Table).

Table

Comparison of Quality of Life in pregnant women with regular (Euenteria) and irregular (Bradyenteria) rhythm of Bowel Habits.

Quality of Life in pregnant women with regular rhythm (Euenteria) 7 bowel movement/week	Quality of Life in pregnant women with irregular rhythm (Bradyenteria) 3-4 bowel movement/week	The predominance of Quality of Life in women with Euenteria in comparison with women, suffering from Bradyenteria
Physical functioning = 78%	Physical functioning = 52%	26%
The lack of Body Pain = 77%	The lack of Body Pain = 49%	28%
General Health = 86%	General Health = 62%	24%
Viability = 85%	Viability = 70%	15%
Social functioning = 79%	Social functioning = 50%	29%
Emotional functioning = 87%	Emotional functioning = 70%	17%
Mental Health = 91%	Mental Health = 80%	11%
83% +- 7	62% +- 9 ($p < 0,05$)	21% +- 6

Conclusions

1) Disturbance of circadian rhythm of Bowel Habits in women in the third trimester of pregnancy in the form of Bradyenteria met almost 3 times more often than the regular daily Bowel Habit rhythm in the form of Euenteria.

2) Regular (daily) Bowel Habits rhythm was associated predominantly (78%) with the optimal (morning) acrophase of this rhythm.

3) Irregular (not every day) Bowel Habits rhythm was associated predominantly (72%) with the absence of the optimal (morning) acrophase of this rhythm.

4) The Quality of Life of pregnant women in the third trimester was significantly (on 21%) higher in those with Euenteria, compared with pregnant women suffering from Bradyenteria.

Due to the fact that the phenomenon of Bradyenteria detected by us using the "Chronoenterography" method [6-7] is quite common and is the risk factor for constipation, obesity, and colorectal cancer [7-10], the diagnosis of Bradyenteria syndrome in pregnant women is extremely important. The data obtained in this study indicate that the mechanism for converting Bradyenteria to Euenteria is the restoration of the morning acrophase (physiologically optimal phase) of the circadian biorhythm of the Bowel Habits. Prevention of pregnancy complications in women with irregular Bowel Habits should be aimed at restoring physiologically normal Euenteria (a regular rhythm of daily defecation with a frequency of at least 7 times a week) by training the Bowel Habit in the morning hours this can significantly improve the Quality of Life of pregnant women.

References

1. Shi W, Xu X, Zhang Y, Guo S, Wang J, Wang J *Epidemiology and Risk Factors of Functional Constipation in Pregnant Women. PLoS One.* 2015 Jul 24;10(7):e0133521. doi: 10.1371/journal.pone.0133521.
2. Vazquez JC. *Constipation, haemorrhoids and heartburn in pregnancy. BMJ Clin Evid.* 2010 Aug 3; 2010:1411.
3. Alan S, Gozuyesil E, Surucu SG. *The Effect of Bidet Use on Severity of Constipation and Quality of Life Among Pregnant Women. Yonago Acta Med.* 2020 Aug 20; 63(3):205-213. doi: 10.33160/yam.
4. Rosendorf J, Liška V, Pálek R, Třeška V. *Acute abdomen in pregnancy: a retrospective study of pregnant patients hospitalised for abdominal pain. Rozhl Chir.* 2020 Winter; 99(3):131-135. doi: 10.33699/PIS.2020.99.3.131-135.

5. Shemerovskii, K. A. *Chronoenterography: monitoring of circadian rhythm of the intestinal evacuatory function. Bulletin of Experimental Biology and Medicine* (2002) 133: 506. <https://doi.org/10.1023/A:1019834409733>

6. Shemerovskii, K. A. *Circadian rhythm of rectal reactivity in individuals with regular and irregular bowel evacuation function. Bulletin of Experimental Biology and Medicine* (2002) 134: 565. <https://doi.org/10.1023/A:1022965212971>.

7. Dolgov G.V., Dolgova M.G., Shemerovskii K.A. *Risk Factors of bowel bradyarrhythmia in pregnant women with edema. Doctor-pharmacist-patient: collection of materials of the Assembly. – Saint-Petersburg, 2003. - P. 23-24.*

8. Shemerovskii K.A, Ovsianikov V.I, Mitreikin V.F. *Screening of irregular bowel movement frequency. Gut, 20th UEGW, Abstract Issue, October 2012, Vol 61, Supplement 3, 2012. Amsterdam, The Netherlands, 2012, A305-306, P0957.*

9. Shemerovskii Constantine. *Screening of irregular bowel movement frequency as functional risk factor of Colorectal Cancer. Falk Symposium 182. Carcinogenesis, Prevention and Treatment of Colorectal Cancer – State-of-the-Art 2012, February 10-11, 2012, P 61, Munich, Germany.*

10. Shemerovskii K.A, Ovsianikov V. I, Mitreikin V.F. *Irregular Bowel Habit Increases Risk of Obesity. United European Gastroenterology Journal, 2015, 3 (5S), A504, P1223.*

DOI 10.34660/INF.2020.26.65.009

双眼平衡和适应障碍作为近视发展标准
**DISORDERS OF BINOCULAR BALANCE AND ACCOMMODATION
AS MYOPIA PROGRESSION CRITERIA**

Fomina Elena Viktorovna

Candidate of Medical Sciences, Associate Professor

Pochinok Elena Mikhailovna

Candidate of Medical Sciences, Associate Professor

Bedash Kalinka Ivanova

Candidate of Medical Sciences, Associate Professor

Ponomareva Maria Nikolaevna

Doctor of Medical Sciences, Full Professor

Tyumen State Medical University, Tyumen, Russia

抽象。以156名7至18岁的近视眼学龄儿童（312眼）为例，我们研究了相对适应储备（RAR）在诊断和治疗过程中的动态以及根据临床屈光度引起的双眼平衡紊乱。12-14岁患者的RAR指数显著下降，并且随着屈光度的增加而显著下降。记录了对视力矫正的眼睛的肌肉平衡有积极作用：外分泌的频率及其程度降低。确定了“近视发展的风险组”。

关键字：进行性近视，适应，杂散，学龄。

Abstract. *Using the example of 156 schoolchildren (312 eyes) aged 7 to 18 years with a diagnosis of myopia, we studied the dynamics of the relative accommodation reserve (RAR) in the diagnostic and treatment process, and the disturbance of binocular balance depending on clinical refraction. There was a significant decrease in the RAR index in patients aged 12-14 years and a significant decrease with an increase in refraction. A positive effect on the muscular balance of the eyes of optical correction was recorded: the frequency of exophoria and its degree decrease. The "risk group for the progression of myopia" was determined.*

Keywords: *progressing myopia, accommodation, heterophory, school age.*

Relevance. The prevalence of myopia (near-sightedness) in developed countries is 25.0-40.0% in the population and is a significant medical and social problem of modern society [1]. In Russia, the number of children suffering from myopia is increasing annually by 5.0%, mainly due to pupils of the elementary and

secondary grades of schools [2]. During visually strenuous work in a growing organism, accommodation, which is in constant tension, suffers first of all, which often leads to impairment of binocular vision with the subsequent development of latent strabismus. Most people have some degree of heterophoria [4,5]. In near vision, this is clinically manifested in the form of asthenopic complaints [7]. The main causes of heterophoria are uncorrected ametropia, violations of the relationship between accommodation and convergence [5, 8]. As a risk factor for the development of myopia, a number of authors consider heterophoria more than $4 \Delta D$, as well as an increase in the AK/A ratio, that is, a violation of the relationship between convergence and accommodation. [6]. It is also well known that the weakness of accommodation, manifested by a decrease in the accommodation response near in combination with prolonged visual work at short distances with a low tilt of the head, are prognostically significant factors for assessing the likelihood of myopia development. Timely diagnosis of heterophoria and its compensation by training fusion reserves [9] allows in some cases to prevent the development of strabismus, which requires many years of step-by-step treatment, including surgical correction [10]. Accommodation disorders primarily precede the onset and accompany the development of myopia [3]. Among the indicators of the function of the ciliary muscle, the most important is the positive part or the margin of relative accommodation (RAR), because a decrease in this value is a criterion for the threatening progression of myopia. Patients with accommodation pathology are at risk of developing myopia [1]. Knowledge of this indicator is necessary when carrying out activities related to the prevention of the onset and progression of myopia in children.

Purpose: to identify the frequency of binocular balance disorders (latent strabismus) and to determine the margin of relative accommodation in children with myopia for carrying out, during the treatment period, a comparative analysis of the indicator in dynamics.

Materials and methods. For the study, 156 pediatric patients (312 eyes) with myopic refraction were selected by a selective method. A standard study of the organ of vision and an additional study of relative accommodation (a method for studying the adaptation of the eyes to visual loads at a close distance - 33 cm) were carried out - the RAR index was determined in negative diopters [1], before and after treatment, as well as in dynamics with repeated examinations and courses of treatment at least twice a year. The comparison was carried out with the age norm RAR in school-age children from -4.0 diopters to -5.0 diopters [2]. Near heterophoria was assessed by the following methods: Cover-test, Graefe test for near without optical correction and with correction. The patients were divided into age groups. The first group - 36 children, the average age was calculated as 9 ± 2.5 years, the second - 63 children (13 ± 1.7 years), the third - 57 children ($16.5 \pm$

1.4 years). The observation period was three years. During statistical processing of the data, the arithmetic mean (M) and the error of the mean (m) were calculated, the statistical significance of the differences between the groups was determined by the Student's t-test, the differences were considered statistically significant at $p < 0.05$. Research results. Gender differences were revealed, the predominance of the female sex - 55.7% in comparison with the male - 44.3%. The prevalence of patients with mild myopia in 97 children (in 62.2% of cases), 51 (32.7%) moderate and 8 (5.1%) high was determined. In all age groups in girls, the initial (before treatment) mean RAR was determined significantly ($p < 0.001$) less by 0.51 diopters than in boys: -1.63 diopters and -2.14 diopters, respectively. With an increase in refraction in the range of a weak degree from 0.25 to 3.0 diopters, the RAR index in patients of both sexes gradually significantly decreased ($p < 0.001$). With myopia up to 1.0 diopters, it averaged 3.55 diopters, with myopia more than 3.0 diopters - 0.98 diopters and over 6.0 diopters - 0.74 diopters. The dynamics of changes in the RAR indicator by study group is presented in table 1.

Change in RAR by groups in dynamics.

Table 1

Terms of observation	The positive part (stock) of relative accommodation		
	Group 1 (n=72)	Group 2 (n=126)	Group 3 (n=114)
Before treatment	-2,45 ± 1,31	-1,93 ± 1,62	-2,17 ± 1,42
After the first course of treatment	-5,07 ± 1,23	-3,99 ± 1,36	-4,44 ± 1,49
After six months	-5,02 ± 1,01	-3,46 ± 1,12	-4,11 ± 1,73
In one year	-3,37 ± 1,09	-2,76 ± 1,17	-3,02 ± 0,97
After the second course of treatment	-5,09 ± 1,19	-3,94 ± 1,48	-4,52 ± 1,48
In two years	-2,97 ± 0,88	-2,59 ± 0,91	-3,97 ± 1,08
After the third course of treatment	-5,04 ± 1,28	-3,61 ± 1,56	-5,05 ± 1,82
In three years	-4,12 ± 0,74	-2,86 ± 0,81	-4,53 ± 1,33

On the basis of the presented data, a significant decrease in RAR was revealed in the 2nd group for all periods of the diagnostic and treatment process in comparison with other observation groups. During the first diagnostic study before treatment, a decrease in the RAR index from the age norm was detected in all groups, but in the 2nd group of children this indicator was lower. In all groups, there is an increase in the indicator after the course of treatment (up to the age norm and above), but over the years in the 1st group the difference was insignificant, in the second there was a decrease in the indicator with each course of treatment, and in the 3rd group the indicator continued to increase. The duration of the result of an increase in RAR after treatment was recorded. So, in the 1st group, a high positive

result persisted only in the first six months. In the second group, a decrease was noted immediately and not only 6 months after treatment, but also within three years of observation. In the third group, the decrease in the indicator occurred gradually over all the years of observation, and the results of treatment improved, there was a positive trend. This made it possible to achieve stabilization of the state in the process of patient management and to obtain the highest results in terms of RAR. After the last examination, it was revealed that during the annual treatment in the first age group, the preservation of the supply of accommodation within the normal range was achieved in 23 children (63.8%), in the third group - in 45 (80.7%). In group 2, the indicator was below normal (less than 4.0 diopters). To correctly identify the frequency of binocular balance disorders, a statistically comparable control group of 50 people with emmetropic refraction was formed. In this group, orthophoria was found in 22 children (44.0%), heterophoria prevailed in 28 (56.0%), of which exophoria in 24 children (41.7%) and esophoria in 4 (14.3%). According to the results of the Cover test, in all other groups, orthophoria was detected in 58 schoolchildren (37.2%), heterophoria prevailed in 98 (62.8%), of which exophoria - in 95 (60.9%) and esophoria - in 3 (1.9%). Graefe test for nearness without optical correction: orthophoria was detected in 13.6% of cases, deviation up to $3\Delta D$ (prism diopters) - 52.2%, from 3 to 6 ΔD - 25.2%, more than $6\Delta D$ - 9%. With optical correction: orthophoria was detected in 19.7% of cases, deviation up to $3\Delta D$ - 55.0%, from 3 to $6\Delta D$ - 22.5%, more than $6\Delta D$ - 2.8%. The influence of optical correction on the magnitude of exophoria was considered. Without optical correction: orthophoria - 8.8%, exophoria up to $3\Delta D$ - 28.8%, esophoria up to $3\Delta D$ - 20.3%, exophoria from 3 to 6 ΔD - 26.6%, esophoria from 3 to $6\Delta D$ - 2.2 %, exophoria more than $6\Delta D$ - 13.3%. With optical correction: orthophoria - 24.3%, exophoria up to $3\Delta D$ - 33.3%, esophoria up to $3\Delta D$ - 20.3%, exophoria from 3 to $6\Delta D$ - 14.8%, esophoria from 3 to $6\Delta D$ - 5.5%, exophoria more than $6\Delta D$ - 1.8%.

Conclusion. A significant decrease in RAR, the primary of the main prognostic signs of myopia progression in group 2 during all periods of the treatment and diagnostic process (in comparison with other observation groups), allows us to regard children of this age as "progressing in myopia" and indicates the need to increase the frequency of their treatment up to 2-4 courses per year. A decrease in the RAR index (below -2.25 diopters) in the 1st group allows predicting the progression of myopia at an older age, which makes it possible to assign a particular patient to the "risk of myopia progression" group and take timely measures to prevent it. The frequency of heterophoria was 62.8%. Optical correction has a positive effect on the muscular balance of the eyes: the frequency of exophoria and its degree are reduced. Methods for determining the RAR indicator and the study of heterophoria are available for performing in ophthalmological offices and do

not entail additional costs. They can be recommended for mandatory examination of children at the receptions of patients of the dispensary group with a diagnosis of "Myopia", which will allow adequate optical correction, prescribe treatment and, at the initial stage, reveal its progression.

References

1. Avetisov E.S. *Myopia. M.: Medicine, 1999. 288P.*
2. Korotkikh S.A., Stepanova E.A., Shelomentsev N.A. *Prevention and treatment of accommodation spasm in children. Clinical ophthalmology. 2005; 6(1): 21-22.*
3. Pospelov V.I., Khrebtova L.A. *On the classification of heterophoria in children. Ophthalmological journal. 1986; 1:32-34.*
4. Rosenblum Yu.Z. *Optometry. SPb: Hippocrates, 1996. 248 P.*
5. Sergievsky L. I. *Conjugate strabismus and heterophoria. M.: Medgiz, 1951. 244 P.*
6. Tarutta E.P., Proskurina O.V., Tarasova N.A., Ibatulin R.A., Kovychev A.S. *Predictors of myopia as a starting point for implementing active measures to prevent its development. Russian Ophthalmological Journal. 2018; 11 (3): 107-12.*
7. Fomina E.V., Konovalova O.S. *Comparative characteristics of the state of accommodation in schoolchildren with myopia. Medical science and education of the Urals.2010;11: 130-131.*
8. Fomina E.V., Pochinok E.M., Ponomareva M.N. *Analysis of the medical efficiency of an individual approach in the complex treatment of patients diagnosed with strabismus. Medical science and education of the Urals. 2017;18: 23-26.*
9. Khaziakhmetova E.R., Pochinok E.M. *Analysis of the effectiveness of hardware (functional) treatment of patients with refractive errors in the university multidisciplinary clinic of Tyumen State Medical University. University medicine of the Urals. 2017; 3: 71-72.*
10. Shevich I.A., Rosenblum Yu.Z. *Induced heterophoria in presbyopic age. Bulletin of Optometry. 2004;5: 29-33.*

成人烧伤疾病毒血症期间收缩压的昼夜节律
**CIRCADIAN RHYTHM OF SYSTOLIC BLOOD PRESSURE DURING
TOXEMIA OF BURN DISEASE IN ADULTS**

Muhitdinova Hura Nuritdinovna

Doctor of Medical Sciences, Full Professor

Tashkent Institute for Post-Graduate Medical Education

抽象。在 27.3 ± 5.6 岁的受创伤患者中，昼夜节律SBP的中位数增加，烧伤皮肤损伤面积为 $59.4 \pm 13.5\%$ ，3B级为 $21.3 \pm 13.3\%$ ，IF- 119.4 ± 38.4 单位为4-12天增加4-9%，19.21.22天增加12%。在第2组烧伤表面积为 $54.3 \pm 16.5\%$ ，3B- $11.9 \pm 8.9\%$ ，IF- 92.5 ± 20.8 单位的患者中，昼夜节律SBP的中位值与1天的指标无差异。第3组的烧伤表面总面积相对较小的患者为 $40.8 \pm 5.8\%$ 3 b $21.7 \pm 6.7\%$ ，IF- 86.7 ± 12.8 单位，在第12天的昼夜节律SBP的中值显著降低。16、17、18、23、25在10-15毫米汞柱下。第3组（年龄为 71.3 ± 7.0 岁）的SBP昼夜变化发生在每周周节律中，SBP昼夜节律幅度出现最大偏差。

关键词：昼夜节律性血压，毒血症时期，成人烧伤

Abstract. *In traumatized patients aged 27.3 ± 5.6 years, an increase in the mesor of the circadian rhythm SBP was revealed with an area of burn skin injury of $59.4 \pm 13.5\%$, grade 3B $21.3 \pm 13.3\%$, IF - 119.4 ± 38.4 units for 4-12 days by 4-9% and at 19.21.22 days by 12%. In group 2 patients with a burn surface area of $54.3 \pm 16.5\%$, grade 3B - $11.9 \pm 8.9\%$, IF - 92.5 ± 20.8 units, the level of the mesor of the circadian rhythm SBP did not differ from the indicator in 1 day. Patients of group 3 with a comparatively smaller total area of the burn surface of $40.8 \pm 5.8\%$, grade 3 b $21.7 \pm 6.7\%$, IF - 86.7 ± 12.8 units showed a significant decrease in the mesor of the circadian rhythm SBP on days 12, 16, 17, 18, 23, 25 at 10-15 mm Hg. Diurnal changes in the SBP mesor occurred in a peri-weekly rhythm with maximum deviations in the amplitude of SBP diurnal rhythms in group 3 (at the age of 71.3 ± 7.0 years).*

Keywords: *circadian rhythm of systolic blood pressure, period of toxemia, adult burn disease*

Relevance. Blood pressure readings can change throughout life. Sometimes this is due to the adaptation of the body to new external conditions for it, the pressure can decrease or increase within 10 points. However, in most cases, research-

ers believe that changes in blood pressure are influenced by age. The circadian, bicircadian, weekly, seasonal, and other rhythms of physiological functions are of prime importance. Age-related changes in the adaptive and regulatory mechanisms of the body take place in three stages: maximum stress to maintain the range of adaptive capabilities; decrease in reliability: the adaptive capabilities of the organism decrease while maintaining the level of basic metabolism and functions; decreased basal metabolism and body functions and a sharp limitation of the range of adaptability [1,2].

The period of toxemia in severe burns occurs within a few hours or within the first day after receiving a burn. Along with the pain factor during this period, the phenomena of intoxication of the body come to the fore. The duration of toxemia depends on the severity of the lesion and the general condition of the body. With severe burns, it lasts 10-15 days and can imperceptibly turn into septicotoxemia. Usually, the beginning of the period of toxemia coincides with the onset of fever in the patient, and the end with clinically pronounced suppuration of the burn wound [3,4].

Due to the lack of information on the differentiated assessment of the severity of the condition, the characteristics of the stress reaction of systolic blood pressure (SBP), the respiratory system and other homeostasis systems, the determination of the prognosis depending on the characteristics of the organism at different age periods, we considered it necessary to study monitoring data, the relationship with systemic inflammatory reactions, especially inherent in age groups, including old age in order to increase the effectiveness of treatment, optimize the prognosis.

Purpose of the work. To study the circadian rhythm of systolic blood pressure during toxemia of burn disease in adults.

Material and research methods. The results of monitoring the systolic blood pressure indicator, infusion therapy of 25 patients admitted to the department of combustiology of the republican scientific center of emergency medicine due to burn injury were studied. After recovery from shock, anti-inflammatory, antibacterial, infusion therapy, correction of protein and water-electrolyte balance disorders, early surgical, delayed necrectomy, additional parenteral nutrition, syndromic, symptomatic therapy were performed. The systemic inflammatory response was studied by monitoring hourly SBP registration in patients with severe thermal burns in three age groups - group 1, 12 patients aged 20-40 years, group 2 - 7 patients aged 41-60 years, group 3, 6 patients - 61-78 years old. The division into groups was dictated by the well-known characteristics inherent in each age group, described in detail in the references.

Table 1

Patient characteristics (25)

	Age, years	Height, cm	Weight, kg	Total burn area,%	Burn of 3B grade	IF, units	Day in the ICU
Group 1	27,3 ±5,6	174,9 ±5,7	73,0 ±22,2	59,4 ±13,5	21,3 ±13,3	119,4 ±38,4	22,4 ±14,6
Group 2	50,7 ±7,1	165,8 ±6,3	73,8 ±14,3	54,3 ±16,5	11,9 ±8,9	92,5 ±20,8	13,3 ±2,4
Group 3	71,3 ±7,0	165,3 ±8,4	73,3 ±8,9	40,8 ±5,8	21,7 ±6,7	86,7 ±12,8	18,8 ±9,5

As can be seen from Table 1, the age groups were significantly different and averaged 27.3 ± 5.6 years in group 1, 50.7 ± 7.1 years in the second, and 71.3 ± 7.0 years in the third. The total area and area of deep skin burn lesions did not differ significantly between the groups. The highest IF index was revealed in group 1, which determined the longest duration of intensive therapy in ICU conditions in the youngest group. Thus, the most pronounced burns in area and depth were found in patients of group 1.

Results and discussion.

Systolic blood pressure (SBP) has its own age norm: 20-30 years: 120-126; by the age of 50, a person's blood pressure reaches 130; after 60, the readings of the tonometer 135 are considered normal; in the 70th year of life, the parameters increase to 140 mm Hg [1,2]. On the first day, there were no significant deviations from the norm and age-related differences in the mesor of the circadian rhythm SBP (Table 2).

Table 2.

Dynamics of the mesor of the circadian rhythm of systolic blood pressure by age

days	Group 1	Group 2	Group 3
1	117,2±2,3	123,7±3,0	122,1±2,7
2	114,8±1,8	123,1±1,4 ^{'''}	125,2±1,4 ^{'''}
3	124,3±7,6	122,3±1,1	127,3±3,2
4	122,7±0,8*	124,0±1,6	127,2±2,1 ^{'''}
5	122,9±1,4	127,2±1,7	122,8±2,9
6	126,0±2,2*	126,3±2,7	119,6±2,1 ^{'''}
7	128,1±1,8*	123,7±1,9	124,9±3,1
8	126,3±1,9*	122,1±1,3	120,5±3,3 ^{'''}
9	125,6±1,6*	120,7±1,6	121,8±3,2
10	123,8±1,2*	118,5±2,2	122,4±4,7
11	123,7±1,8*	121,4±4,2	121,6±5,3

12	124,0±1,3*	121,7±1,7	110,6±6,4* ^{'''}
13	125,2±1,6*		119,1±4,6
14	126,8±1,0*		117,4±3,4 ^{'''}
15	125,2±1,8*		114,0±5,7 ^{'''}
16	123,9±2,2*		109,5±2,3* ^{'''}
17	126,3±1,7*		113,0±3,8* ^{'''}
18	129,9±2,4*		113,9±3,3* ^{'''}
19	130,0±1,1*		117,6±3,5 ^{'''}
20	126,8±1,8*		120,7±4,5
21	129,9±2,4*		118,0±3,5 ^{'''}
22	128,4±2,0*		120,2±3,4 ^{'''}
23	125,9±2,8*		112,5±5,4* ^{'''}
24	126,8±3,0*		123,1±7,9
25	127,5±1,8*		109,8±6,5* ^{'''}
26	121,4±2,4		115,6±6,4
27	124,8±1,7*		122,6±8,0
28	123,6±1,4*		119,6±2,2
29	122,4±2,1*		117,4±6,4
30	122,7±2,0*		124,3±7,2

*- the dynamics is reliable relative to the indicator in 1 day.

^{'''}- significant difference between SBP and the first group

In dynamics during the period of toxemia in group 1, an increase in the SBP mesor on day 4 by 4%, 8% -6 day, 9% -7 day, 6% -on day 8, 7% -9 day, 4% -10, 11, 12 days. The most pronounced arterial hypertension was noted on days 19, 21, 22, when the SBP mesor was 12% higher than the initial value. In the following days, the propensity to increase SBP became somewhat less, but the mesor of the circadian rhythm SBP was significantly higher than the indicator on the first day of the burn injury. Despite the intensive analgesic, anti-inflammatory therapy, correction of other deviations of homeostasis in the injured patients of the 1st group, a reliably significant hyperdynamic type of blood circulation remained with the area of skin burn injury $59.4 \pm 13.5\%$, grade 3B $21.3 \pm 13.3\%$, IF - 119.4 ± 38.4 units. In group 2 patients with a burn surface area of $54.3 \pm 16.5\%$, grade 3B - $11.9 \pm 8.9\%$, IF - 92.5 ± 20.8 units, the level of the mesor of the circadian rhythm SBP did not differ from the indicator in 1 day. Only on the 2nd day was there a reliably significant difference from the indicator of the same name in the patient of group 1 by 8% ($p < 0.05$) (fig. 1). Thus, a relatively smaller area of the lesion of the skin surface of burn grasses and a lower IF value caused a relatively less pronounced stress response of hemodynamics, which was expressed in a relatively more stable indicator of the mesor of the circadian rhythm SBP in patients of group 2. Thus,

the area of deep skin damage of grade 3B and the IF value determine the severity of the stress reaction of hemodynamics during toxemia. In patients of group 3 with a comparatively smaller total area of the burn surface by 19% ($40.8 \pm 5.8\%$), grade 3 b $21.7 \pm 6.7\%$, IF - 86.7 ± 12.8 units, a significant a decrease in the mesor of the circadian rhythm SBP on days 12, 16, 17, 18, 23, 25 by 10-15 mm Hg ($p < 0.05$, respectively), which we regarded as a high risk of developing cardiac insufficiency due to an energy deficit state characteristic for this age group with a decrease in the adaptive capabilities of hemodynamic restructuring in the stress response of the body during the period of burn disease toxemia in old age (fig. 1).

Dynamics of the mesor of the circadian rhythm of systolic blood pressure depending on age



Fig. 1

It is noteworthy that in all age groups, diurnal changes in the SBP mesor occurred in a peri-weekly rhythm with maximum deviations in the amplitude of SBP diurnal rhythms in group 3 on days 12, 15, 24, 27 (fig. 2). Thus, the instability of hemodynamics turned out to be typical for patients of group 3 at a later date during the period of toxemia, which, apparently, was due to the depletion of energy resources typical for this age group of patients.

Dynamics of the amplitude of the circadian rhythm of systolic blood pressure

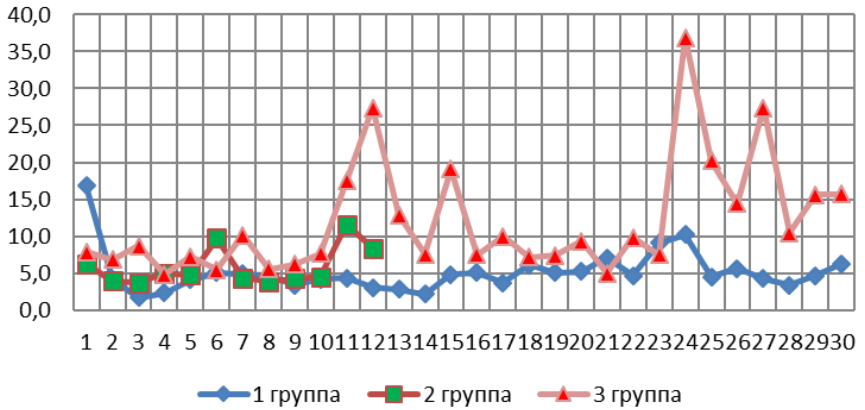


Fig. 2

Duration and severity of acrophase shifts in the circadian rhythm of systolic blood pressure during toxemia, depending on age

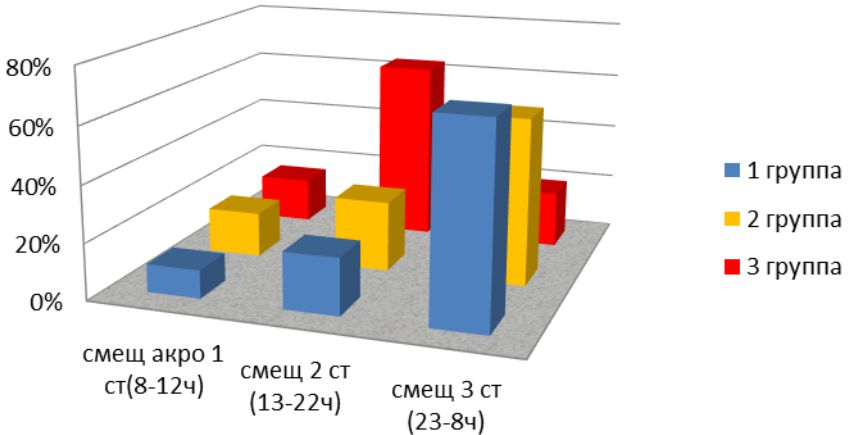


Fig. 3

As shown in fig. 3, there was a difference in the duration and severity of acrophase shifts in the circadian rhythm of systolic blood pressure during toxemia, depending on age. So, the most pronounced duration of the shift in the peak of the acrophase of the circadian rhythm SBP at night (70% of the duration of intensive

therapy) was found in patients of group 1, in group 2 the indicator was 59%. At the same time, in patients of group 3, the duration of a moderate shift of the SBP acrophase peak of 64% prevailed within the light period of the day. The most significant stress response of hemodynamics was also expressed in the shift of the acrophase peak to the night hours in patients of group 1.

Correlation between the amplitude and swing of the maximum SBP drops

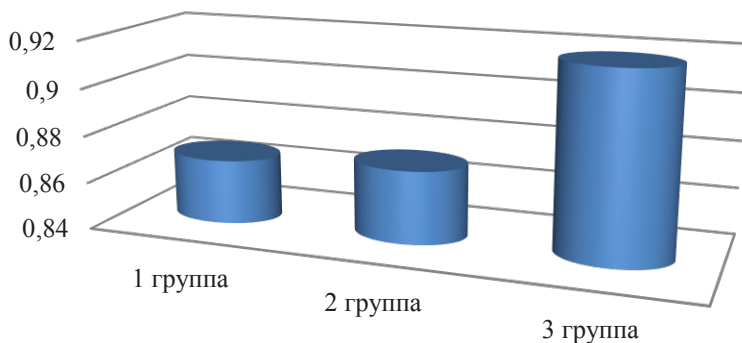


Fig. 4

The most pronounced dependence of the oscillation amplitude on the daily changes in the mesor of the circadian rhythm SBP was characteristic for group 3 (0.918), although a direct relationship was observed in both groups 1 (0.8673) and 2 groups (0.8708) (fig. 4).

Correlation between the mesors of the circadian rhythm of body temperature and systolic blood pressure by age

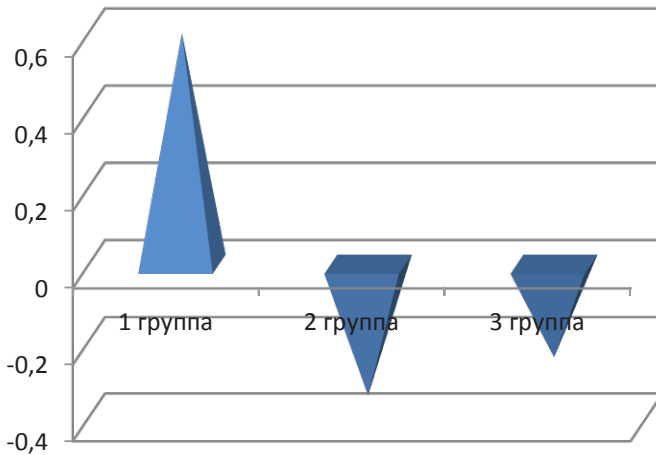


Fig. 5

Figure 5 shows the correlation between the mesors of the circadian rhythm of body temperature and systolic blood pressure by age, a direct moderate correlation was found in group 1, 0.5988, in groups 2 and 3, it turned out to be negative, amounting to -0.3427 and -0.2426.

Conclusion. In traumatized patients of group 1, an increase in the mesor of the circadian rhythm SBP was revealed with an area of burn injury of the skin of $59.4 \pm 13.5\%$, grade 3B $21.3 \pm 13.3\%$, IF - 119.4 ± 38.4 units by 4 - 12 day by 4 - 9% and by 19.21.22 days by 12%. In group 2 patients with a burn surface area of $54.3 \pm 16.5\%$, grade 3B - $11.9 \pm 8.9\%$, IF - 92.5 ± 20.8 units, the level of the mesor of the circadian rhythm SBP did not differ from the indicator in 1 day. Patients of group 3 with a comparatively smaller total area of the burn surface of $40.8 \pm 5.8\%$, grade 3 b $21.7 \pm 6.7\%$, IF - 86.7 ± 12.8 units showed a significant decrease in the mesor of the circadian rhythm SBP on days 12, 16, 17, 18, 23, 25 at 10-15 mm Hg. Diurnal changes in SBP mesor occurred in a peri-weekly rhythm with maximum deviations in the amplitude of SBP diurnal rhythms in group 3.

References

1. <https://yandex.uz/images/search?text=%>

2. https://yandex.uz/images/search?pos=2&img_url=https%3A%2F%2Fpresent5.com%2Fpresentation%2F11215828_154946288%2Fimage-21.
3. <https://www.operabelno.ru/klinika-ozhogovoj-bolezni-chetyre-perioda-i-osobennosti-lecheniya-ozhogovoj-bolezni/>
4. <https://volynka.ru/Articles/Text/1419>

DOI 10.34660/INF.2020.54.88.011

临时义肢修复后丙烯酸和双丙烯酸材料的抗弯强度的测定
**DETERMINATION OF THE FLEXURAL STRENGTH OF ACRYLIC
AND BISACRYLIC MATERIALS FOR PROVISIONAL PROSTHESES
AFTER THEIR REPAIR**

Petrikas Oleg Arnoldovich*Doctor of Medical Sciences, Full Professor**Tver State Medical University***Trapeznikov Dmitry Valerievich***Assistant**Tver State Medical University*

抽象。就牙列的生物学，美学和生物力学而言，临时结构的使用是重要的一点。新的双丙烯酸材料已帮助消除了与传统丙烯酸材料相关的一些问题。但是，双丙烯酸酯的缺点是在应力增加的区域可能断裂。这项研究的目的。修理后检查丙烯酸酯和双丙烯酸酯制成的样品梁的抗弯强度。材料与方法。在通用测试机上，根据材料检查了7组样品-自硬化丙烯酸塑料Re-fine Bright（日本山八牙科MFG.，日本）或自硬化双丙烯酸复合塑料Protemp 4（3M ESPE），以及修复损坏样品的方法。记录断裂力，计算比弯曲强度的平均值（MPa-兆帕斯卡）和平均误差。检查结果的正态分布。使用非参数Kruskal-Wallis检验确定组之间的统计差异。结果。与实心梁（组）相比，在所有胶合双丙烯酸酯样品（第2组，第4组）中，强度均显着下降 $p < 0.05$ ，或有这种趋势（第3、5组）-（ $0.05 < p < 0.2$ ）。1）。当合并部分丙烯酸酯破裂的梁时，胶合样品的强度几乎达到了初始值，统计学差异不明显 $p > 0.05$ 。

关键字：丙烯酸酯，双丙烯酸酯，胶合样品梁，抗弯强度。

Abstract. *The use of provisional constructions is an important point in terms of biology, aesthetics, and biomechanics of the dentition. The new bisacrylic materials have helped eliminate some of the problems associated with traditional acrylic materials. However, the disadvantage of bisacrylates is the possibility of breakage in areas of increased stress. PURPOSE OF THE STUDY. Examination of the flexural strength of sample beams made of acrylate and bis-acrylate after repair. MATERIAL AND METHODS. On a universal testing machine, 7 groups of samples were examined depending on the material - self-hardening acrylic plastic Re-fine Bright (Yamahachi Dental MFG., CO., Japan), or self-hardening*

bisacrylic composite plastic Protemp 4 (3M ESPE), as well as the method of repairing broken samples. The fracture force was recorded, the average values of the specific flexural strength (MPa - megapascals) and the average error were calculated. The normal distribution of the results was checked. Statistical differences between groups were determined using the nonparametric Kruskal-Wallis test. RESULTS. A significant decrease in strength was observed in all glued samples for bisacrylate (groups 2, 4) - $p < 0.05$, or a tendency to this (groups 3, 5) - ($0.05 < p < 0.2$) compared to a solid beam (group 1). When combining parts of broken acrylate beams, the strength of the glued samples practically reached the initial one with insignificant statistical differences - $p > 0.05$.

Keywords: *acrylates, bisacrylates, glued sample beams, bending strength.*

Introduction

Provisional (temporary, intermediate) constructions have now become an integral part of any orthopedic treatment, including splinting, the use of bridges, and implants [3]. The modern understanding of the need for temporary structures is not limited to only partial restoration of the patient's teeth function at the stage of prosthetics, but allows additional information to be obtained for an accurate understanding of the functional and aesthetic characteristics of the planned prostheses [4].

Despite the introduction of new materials (bisacrylic composite plastics, composites) for provisional bridges, which have such advantages as improved mechanical properties, low polymerization temperature with low shrinkage, good polishability, color stability, and odorlessness [2], dentists often face the problem of breakage temporary structures, especially in conditions with increased functional load on the abutment teeth. These are included defects of medium and large length or mobile teeth, when it is necessary to preserve provisional bridges for a long time [1].

The purpose of this study is to investigate, by mechanical testing, the flexural strength after the repair of bisacrylic composite plastic and PMMA beams used for the manufacture of provisional bridges.

Material and methods

The laboratory study consisted of the determination of the fracture forces of the sample beams by the 3-point bending method (GOST R51202-98 clause 6.1; ISO 10477-92). The algorithm for this mechanical test was as follows. Using a special mold, consisting of two aluminum and two glass elements, experimental specimens-beams with dimensions of $2.0 \pm 0.1 \times 2.0 \pm 0.1 \times 25 \pm 2$ mm were made from the self-hardening bisacrylic composite plastic Protemp 4 (3M ESPE), as well as self-curing acrylic resin Re-fine Bright (Yamahachi Dental MFG., CO., Japan). The beams were subjected to fracture by bending on a universal testing

machine FPZ 10/1 (Fritz-Heskert, Germany) providing a traverse speed of 0.75 ± 0.25 mm/sec. (fig. 1). The distance between the centers of the supports was 20 ± 0.1 mm. The load was applied at the same distance from the centers of the supports. Then the two broken pieces of each beam were glued together in different ways.

The essence of further tests consisted in the repeated destruction of the glued beams by bending until the appearance of visible damage. At the same time, on the dial of the testing machine, the maximum load in newtons (n), which the sample withstood, was recorded, and then converted into megapascals (MPa). The research was carried out on the basis of the mechanical testing laboratory of the Department of Strength of Materials and Theory of Elasticity of Tver State Polytechnic University.

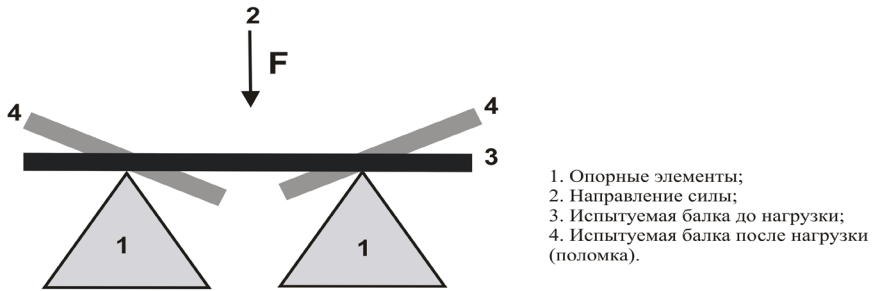


Figure 1. Three-point bending test setup

The arithmetic mean values of the specific strength (M) and the mean error (m), standard deviation were calculated. Analysis of variance, Leuven and Brown-Forsyth tests were used to determine the normal distribution of results. Most measurements showed either a mismatch with the normal distribution or a similar trend. Therefore, to compare the groups, a nonparametric method was applied using the Kruskal-Wallis test.

For the mechanical experiment, a total of 49 sample beams were made, among which 7 groups were distinguished, 7 samples in each.

Groups studied:

- 1) Protemp 4 - solid beam before breakage (control 1);
- 2) Protemp 4, repair with Protemp 4;
- 3) Protemp 4, repair with Filtek flow. + adhesive (Single – bond, 3M);
- 4) Protemp 4, repair with Filtek flow. + adhesive + GlasSpan (fiberglass reinforcement tape, GlasSpan);
- 5) Protemp 4, repair with Re-fine Bright + monomer;

- 6) Re-fine Bright - solid bar before breakage (control 2);
- 7) Re-fine Bright, repair with Re-fine Bright + monomer.

Results and discussion. The specific strength data (MPa) of beams made of Prot Kemp 4 bisacrylic composite plastic and Re-fine Bright acrylic plastic are presented in Table 1.

Table 1. Results of specific strength of beams made of bisacrylic composite plastic Prot Kemp 4 and acrylic plastic Re-fine Bright

№ of group	Group parameters of the studied samples	Average value (MPa) of specific strength (F), average error (m): F = M ± m.
1.	Prot Kemp 4 (control 1)	F = 0,72±0,03 MPa
2.	Prot Kemp 4, repair with Prot Kemp 4	F = 0,16±0,05 MPa
3.	Prot Kemp 4, repaired with Filtek flow. + adhesive (Single –bond)	F = 0,33±0,03 MPa
4.	Prot Kemp 4, repaired with Filtek flow. + adhesive + GlasSpan	F = 0,24±0,001 MPa
5.	Prot Kemp 4, repair with Re-fine Bright + monomer	F = 0,33±0,01 MPa
6.	Re-fine Bright (control 2)	F = 0,41±0,03 MPa
7.	Re-fine Bright, fix with Re-fine Bright + monomer	F = 0,40±0,02 MPa

The first five studied groups belonged to bisacrylic plastic Prot Kemp 4, where the reference point for comparison (control 1) was the specific strength of solid beams before their breakage - 0.72 ± 0.03 MPa (group 1). The repair options achieved the highest strength after gluing parts of Prot Kemp 4 beams using the Filtek flow fluid composite with Single bond adhesive - 0.33 ± 0.03 MPa (group 3), and also, using Re-fine Bright acrylate with its own monomer - 0.33 ± 0.01 MPa (group 5). Nevertheless, the obtained strength results were significantly inferior to a solid beam with a stable statistical trend - $p = 0.097$.

The last two groups studied Re-fine Bright acrylic plastic. A one-piece beam made of this plastic (group 6) played the role of control 2. Assessing the possibilities of repairing acrylate, it was found that when parts of broken Re-fine Bright beams were combined using the same plastic with its own monomer, the strength of the glued beams practically reached the initial one - 0.40 ± 0.02 MPa - with insignificant statistical differences - $t_{6,7} = 0.47$ $p > 0.05$.

Comparative diagrams presented in Figures 2 and 3 make it possible to visually evaluate the results of repairing beams made of two types of materials - self-hardening bisacrylic composite plastic and self-hardening acrylic plastic, which are most often used for the manufacture of temporary prostheses.

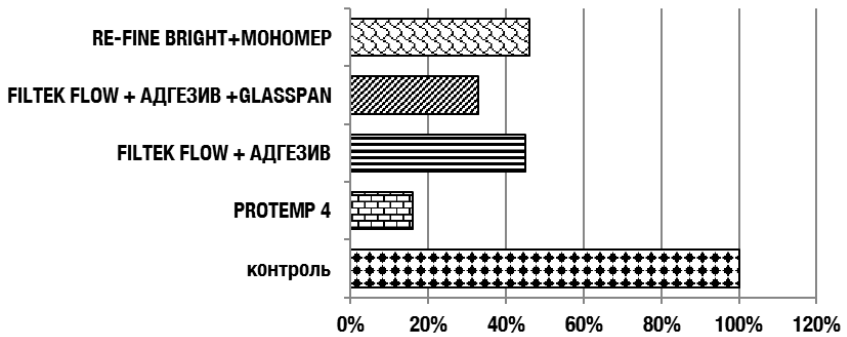


Figure 2. Visual assessment of the strength of the beams after repair from the self-hardening bisacrylic composite plastic Protemp 4 compared to the solid beam (control - 100% strength)

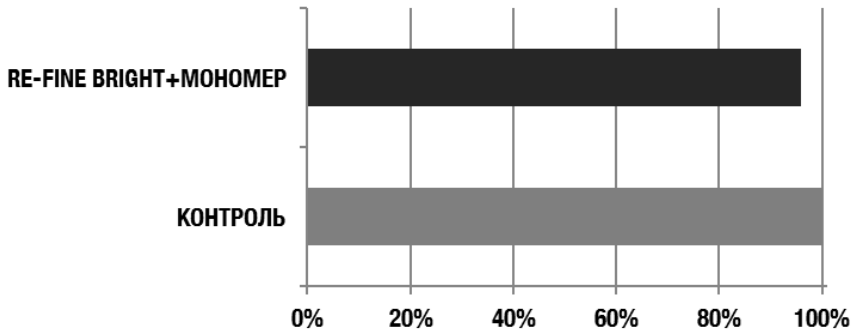


Figure 3. Visual assessment of the strength of the beams after being repaired with self-curing Re-fine Bright acrylic resin compared to a solid beam (control - 100% strength)

The results obtained in the repair of bars made of bisacrylic composite plastic Protemp 4 indicate the impossibility of achieving the initial strength of the samples before breakage (in dental practice, these are bridges, combined crowns). In the event of a breakdown of such prostheses, it seems appropriate to re-manufacture them.

With regard to temporary prostheses made of acrylic plastic, in the event of a breakdown, repairing them is quite possible and advisable in accordance with the clinical situation.

The results of the studies conducted led to the following **conclusions**: 1. Comparison of the flexural strength of beams made of bisacrylic composite plastic Protemp 4 revealed a significant weakening after any kind of repair.

2. Best results have been achieved when using Protemp 4 to repair bisacrylic composite beams with a flowable light-curing composite (Filtek flow with adhesive) or with Re-fine Bright acrylic resin with monomer.

3. When repairing Re-fine Bright acrylic plastic beams with the same monomer resin, the strength is almost restored to original.

References

1. Belousov N.N. *determination of the effectiveness of teeth splinting in severe forms of inflammatory periodontal diseases. Periodontics.- 2009.- №3.- P.41-44.*
2. Terry D., Geller V. *Aesthetic and restorative dentistry. Moscow, St. Petersburg, Kiev, Vilnius, Almaty: Alphabet,2013, 703 P.*
3. Gegauff AG, Hollaway JA. *Interim fixed restorations. In Rosenstiel SF, Land MF, Fujimoto J, Contemporary fixed prosthodontics. 4th ed, St. Louis, MO: Mosby, 2006, 466-504.*
4. Christensen GJ. *Making provisional restorations easy, predictable and economical. J Am Dent Assoc, 2004, 135(5), 625-627.*

DOI 10.34660/INF.2020.34.78.012

骨关节炎合并冠状动脉粥样硬化患者血清中金属蛋白酶3和13的浓度研究
**STUDY OF SERUM CONCENTRATIONS OF MATRIX
METALLOPROTEINASES 3 AND 13 IN PATIENTS WITH
OSTEOARTHRITIS IN COMBINATION WITH CORONARY
ATHEROSCLEROSIS**

Portyannikova Olesya Olegovna

Assistant

Romanova Elena Nikolaevna

Doctor of Medical Sciences, Associate Professor, Head of Department

Tsvinger Svetlana Matveevna

Candidate of Medical Sciences, Associate Professor

Chita State Academy of Medicine

Chita, Russia

抽象

这项研究的目的。检查原发性骨关节炎（OA）合并冠状动脉粥样硬化患者的血清基质金属蛋白酶（MMP）-3和-13的浓度。

材料和方法。该研究提出了对92名被诊断患有原发性OA的患者进行检查的结果。根据是否存在冠状动脉粥样硬化，将患者分为两组。所有患者均进行了血清基质金属蛋白酶-3和-13的血清水平测试。

结果。血清MMP浓度的研究表明，与OA相比，与MMP-13相比，OA组的冠状动脉粥样硬化患者相对于MMP-13分别增加了2.7倍（ $p < 0.05$ ）和1.7倍（ $p < 0.05$ ）合并无冠状动脉粥样硬化的OA患者。该组中MMP-3的最大浓度为188000 pg / ml，MMP-13-520.4 pg / ml。

结论。因此，OA患者的较高血清MMP-3和MMP-13浓度以及已证实的冠状动脉粥样硬化表明这些疾病相互加剧。了解OA和动脉粥样硬化中炎症过程的一般机制，可以更准确地确定合并症患者的治疗效果。

关键词：骨关节炎，冠状动脉粥样硬化，基质金属蛋白酶，血清浓度。

Abstract

Purpose of the study. *Examine the serum concentrations of matrix metalloproteinases (MMP) -3 and -13 in patients with primary osteoarthritis (OA) in combination with coronary atherosclerosis.*

Materials and methods. *The study presents the results of an examinations of 92 patients diagnosed with primary OA. The patients were divided into two groups*

depending on the presence or absence of coronary atherosclerosis. All patients were tested for serum levels of matrix metalloproteinases -3 and -13.

Results. *The study of serum MMP concentrations revealed their increase in the group of patients with coronary atherosclerosis against the background of OA for MMP-3 by 2.7 times ($p < 0.05$) and 1.7 times, respectively, for MMP-13 ($p < 0.05$) compared with OA patients without coronary atherosclerosis. The maximum concentration of MMP-3 in this group was 188000 pg/ml and MMP-13 - 520.4 pg/ml.*

Conclusion. *Thus, the higher serum concentrations of MMP-3 and MMP-13 in patients with OA and verified coronary atherosclerosis indicate a mutually aggravating course of these diseases. Knowledge of the general mechanisms of the inflammatory process in OA and atherosclerosis may allow more accurate determination of the direction of the therapeutic effect in comorbid patients.*

Keywords: *osteoarthritis, coronary atherosclerosis, matrix metalloproteinases, serum concentration.*

Osteoarthritis is the most common joint disease affecting more than 10% of the world's population [1-3]. According to current concepts, OA is characterized by cellular stress and degradation of the extracellular matrix, arising from macro- or microdamages, which activate abnormal adaptive repair responses, including the pro-inflammatory pathways of the immune system. A number of studies have demonstrated a high comorbidity of OA and cardiovascular diseases. One of the ways of interaction is a cascade of nonspecific inflammation, which includes an endopeptidase component. The nonspecific subclinical inflammatory process in OA, which occurs with the participation of proinflammatory cytokines and MMPs, has common pathophysiological mechanisms with atherosclerosis. According to several researchers, potential pathophysiological links between OA and vascular diseases include: nonspecific inflammation; the formation of the final products of accelerated glycosylation of proteins - AGE products; MMP activity. [4-7]

Purpose of the study: examine serum concentrations of matrix metalloproteinases (MMP) -3 and -13 in patients with primary osteoarthritis (OA) in combination with coronary atherosclerosis.

Materials and methods: Clinical observations were carried out on the basis of SHCI "Regional Clinical Hospital", SHCI "Clinical Medical Center" PP №1, Chita, in the period from November 2017 to October 2019. Laboratory studies were carried out in the laboratory of experimental and clinical biochemistry and immunology, Research Institute of Molecular Medicine FSBEI HI "Chita State Academy of Medicine". The study presents the results of examination of 92 patients diagnosed with primary OA.

Study inclusion criteria: 1. Primary polyosteoarthritis with involvement of

three or more groups of joints. The diagnosis was verified on the basis of the ACR classification criteria, taking into account the Kelgren-Lawrence radiological criteria. 2. The age of the subjects was from 35 to 55 years. 3. Body mass index (BMI) less than 30 kg/m². 4. Normal blood pressure (BP) or not higher than grade 3, controlled by the intake of antihypertensive drugs (ACE inhibitors, angiotensin receptor blockers, diuretics).

Exclusion criteria: 1. Patient refusal to participate in the study. 2. Secondary osteoarthritis. 3. Systemic connective tissue diseases. 4. Oncological diseases (any localization). 5. Diseases of the blood (acute and chronic). 6. Endocrine diseases. 7. Pregnancy and lactation. 8. Women with menopause (including surgery).

The patients were divided into two groups. The first group (n = 44) consisted of patients with primary OA in combination with coronary atherosclerosis, confirmed by coronary angiography (the study was carried out on the ALLURAX-perFD20 Philips 2012 apparatus). The second group (n = 48) included patients with primary OA and the absence of atherosclerotic changes in the vessels according to the USDG of the brachiocephalic arteries, ultrasound of the vessels of the lower extremities? Coronary angiographic research.

Blood sampling was carried out according to the standard method, in a calm state of the patient, at the same time in the interval between 7:30 and 9:30 using preservative vacutainers. The concentration of MMP-3 and MMP-13 was determined using a plate sorbed with antibodies specific for these types of MMP. To wash the samples, we used an Atlantis 4 washer made in Great Britain; further research was carried out on an Expert 96 ELISA reader made in Great Britain.

Ethical review. The individuals included in the study gave their consent to the manipulation. The study was carried out in accordance with the principles of the Declaration of Helsinki. The FSBEI HI "Chita State Academy of Medicine" Ethics Committee approved Study Protocol №86, dated November 1, 2017.

Statistical analysis methods. Statistical processing of the data obtained was performed using the Statistica 10.0 package (StatSoft, USA). With a normal distribution of the trait, the mean value and standard deviation ($M \pm SD$) were calculated. Comparison of two independent groups was carried out using the Mann-Whitney U-test. Differences between the studied parameters were considered statistically significant at $p < 0.05$.

Results

Patients in the study groups were comparable in age and sex. Our study included patients aged 35 to 55 years, and did not include women in menopause [8,9,10].

In the examined patients, polyosteoarthritis prevailed with a predominant lesion of the knee (42%), hip (17%) and small joints of the hand (13%), radiographically 2-3 stages in 92% of patients. The average duration of OA in groups 1 and 2 did not differ and amounted to 6 [4; 8] and 8.5 [5; 9] years, respectively ($p > 0.05$).

When analyzing the number of affected joints, it was found that in groups of patients with subclinical atherosclerosis and without clinical and instrumental signs of such, the average value of the indicator is 1.5 times higher than among patients of group I ($p < 0.05$). At the same time, there is a significant prevalence of more severe X-ray stages of joint damage in patients with verified atherosclerotic coronary artery disease compared with group II of the studied patients ($p = 0.0019$). The percentage of smokers was comparable in the groups of OA patients with and without coronary atherosclerosis. In the group of patients with coronary atherosclerosis, arterial hypertension (AH) occurred in 86.4% of cases, in the group without atherosclerosis in 68.7% of cases ($p > 0.05$). It should be noted that in all patients with AH, the increase in blood pressure in the anamnesis did not exceed grade 2, and the target blood pressure values were achieved when prescribing antihypertensive drugs: ACE inhibitors (56%), angiotensin receptor blockers (48%) and diuretics (38%). The need for NSAIDs due to arthralgias did not differ in the study groups. Clinical and demographic characteristics of patients are presented in table 1.

Table 1
Clinical and demographic characteristics of patients in groups at the time of inclusion

Characteristics	I group (n=44)		II group (n=48)	p
Age, years	48,79±5,01		46,28±6,28	0,16
Females, n/%	7/16,9		16/33,3	0,092
Males, n/%	37/83,1		32/66,7	0,092
BMI, kg/m ² (M±SD)	25,48±1,35		24,89±2,49	0,622
Smoking n/%	24/54,5		22/45,8	0,53
AH n/%	38/86,4		33/68,75	0,08
The number of affected joints, Me [25th; 75th per-le]	4 [3;6]		6 [5;9]	0,017
Duration of the disease, years, Me [25th; 75th per-le]	6 [4;8]		8,5 [5;9]	0,17
X-ray stage, Me [25th; 75th per-le]	I	0	6/12,5	0,04
	II	26/59	36/75	0,16
	III	18/41	6/12,5	0,0019
OA debut age, Me [25th; 75th per-le]	34 [30;42]		36 [31;48]	0,061
Chondroprotective therapy, n/%	8/18,18		25/52,1	0,0015
NSAID therapy, n /%	25/56,8		30/62,5	0,58

Note. Statistically significant differences at $p < 0.05$. Data are presented as mean and standard deviation $M \pm SD$, as well as median with calculation of 25th and 75th percentile. NSAIDs - non-steroidal anti-inflammatory drugs, BMI - body mass index, AH - arterial hypertension.

Group I patients were sent to the hospital with the following diagnoses: myocardial infarction with Q wave in 45.4% (20 people) of cases, acute coronary syndrome with ST segment elevation - 20.4% (9 people), progressive angina pectoris - 34.2% (15 people). After clarifying the diagnosis (troponin test, dynamic ECG, echocardiography, coronary angiography), the final diagnosis was as follows: MI with Q wave - 84% (37 people), MI without Q wave - 9.2% (4 people), progressive angina pectoris - 6.8% (3 people).

According to the results of coronary angiographic examination, as well as additional calculations using the SYNTAX scale, 18.2% (8 people) of patients scored ≥ 33 points and were recommended to undergo coronary artery bypass grafting, the rest underwent PCI with stenting.

The study of serum MMP concentrations revealed their increase in the group of patients with coronary atherosclerosis against the background of OA for MMP-3 by 2.7 times ($p < 0.05$) and 1.7 times, respectively, for MMP-13 ($p < 0.05$) compared with OA patients without coronary atherosclerosis (table 2). The maximum concentration of MMP-3 in this group was 188000 pg/ml and MMP-13 - 520.4 pg/ml.

Table 2
Serum concentration of MMP-3 and -13 in patients with primary OA

Serum concentration	I group (n=44)	II group (n=48)	p
MMP-3, pg/ml	85900 [49900;114700]	31290 [3542,5;91650]	0,045
MMP-13, pg/ml	182,10 [101,15;300,9]	108,28 [48,49;169,2]	0,03

Note. Statistically significant differences at $p < 0.05$. Data are presented as median with 25 and 75 percentile calculations.

Discussion

According to the results of scientific studies, coronary atherosclerosis and osteoarthritis have common mechanisms for the development of subclinical inflammation and a mutually aggravating effect on the course of these diseases in the complex. It has been established that the presence of two or more swollen joints is a predictor of cardiovascular mortality, regardless of other risk factors [12].

Vascular changes that occur when patients have atherosclerosis are considered one of the mechanisms of mutual aggravation. A number of researchers, in particular P. Conaghan et al., Suggest that OA and its subsequent progression may be a consequence of atheromatous vascular disease of the subchondral bone [13]. In addition, the nonspecific subclinical inflammatory process in OA, which occurs with the participation of proinflammatory cytokines and MMPs, has com-

mon pathophysiological mechanisms with atherosclerosis, including due to the development of endothelial dysfunction. Common points will be: the end products of accelerated glycosylation of proteins - AGE-products (AGE - advanced glycosylation end products); activity of matrix metalloproteinases; cartilage oligomeric matrix protein [14-18].

To date, the presence of MMP in active atherosclerotic plaques has been reliably established [19]. Examination of human coronary atherosclerosis samples demonstrate the joint localization of MMP-9 and MMP-3 at the edges of atherosclerotic plaques [20]. Localization of MMP indicates weak areas in the plaque, where ruptures occur most often [21]. In addition, the predominance of MMP activity over TIMP promotes vascular remodeling and increased atherogenesis [21].

A number of studies have shown an increase in the level of MMP expression in atherosclerotic lesions and their special contribution to the weakening of the vascular wall and degradation of the extracellular matrix. Studies show that there is a tendency to increase the levels of transcription of MMP-1, MMP-3, MMP-7, MMP-9, MMP-12 in atherosclerotic plaques [4,5,6]. In addition, MMP-3 activates other MMPs, including MMP-1, -7, -8, -9, and -13 [22-24], which also play an important role in atherogenesis [25,26]. Found MMPs are often associated with inflammatory cells such as macrophages or T-lymphocytes [18]. Macrophages in the composition of the plaque, due to the influence of pathological factors (arterial hypertension, etc.), can release a number of endopeptidases, including the MMP-3 and MMP-13 studied by us [27,28]. These components of inflammation are capable of destroying collagen fibers, leading to defects in the lining of atherosclerotic plaques, increasing the concentration of MMP in the blood serum. Endopeptidases within the affected joints are released by chondrocytes, maintaining a cascade of nonspecific low-intensity inflammation and certain levels of MMP in the synovial fluid [29,30]. At the same time, a lower level of MMP is noted in the bloodstream. This fact explains the higher serum concentrations of MMP-3 and MMP-13 in patients with OA in combination with coronary atherosclerosis, compared with the OA group without atherosclerotic vascular changes.

Conclusion

Thus, the higher serum concentrations of MMP-3 and MMP-13 in patients with OA and verified coronary atherosclerosis indicate a mutually aggravating course of these diseases. Knowledge of the general mechanisms of the inflammatory process in OA and atherosclerosis may allow more accurate determination of the direction of the therapeutic effect in comorbid patients.

References

1. Cunningham L.S., Kelsey J.L. *Epidemiology of musculoskeletal impairments and associated disability. Am J Public Health.* 1984;74(6):574-9. doi: doi.org/10.2105/ajph.74.6.574
2. Branco JC, Rodrigues AM, Gouveia N, et al. *Prevalence of rheumatic and musculo-skeletal diseases and their impact on health-related quality of life, physical function and mental health in Portugal: results from EpiReumaPt – a national health survey. RMD Open.* 2016;19;2(1):e000166. doi: 10.1136/rmdopen-2015-000166.
3. Grotle M, Hagen KB, Natvig B, et al. *Prevalence and burden of osteoarthritis: results from a population survey in Norway. J Rheumatol.* 2008;35(4):677-84. Epub 2008 Feb 15.
4. Bijlsma J. W., Berenbaum F., Lafeyber F. P. *Osteoarthritis: an update with relevance for clinical practice // Lancet.* 2011; 377: 2115–2126. doi.org/10.1016/s0140-6736(11)60243-2
5. Алексеева Л.И. *Современные возможности выбора терапии при остеоартрозе. Эффективная фармакотерапия. Ревматология, травматология и ортопедия.* 2014. 2(26). 32-3 [Alekseeva L.I. *Modern abilities of choosing therapy in patients with osteoarthritis. Effektivnaya farmakoterapiya. Revmatologiya, travmatologiya i ortopediya* 2014. 2(26). 32-3 (In Russ)]
6. Насонов Е.Л. *Российские клинические рекомендации. Ревматология.* Москва: ГЭОТАР-Медиа; 2017. С. 42-50. [Nasonov EL, *Russian clinical guidelines. Rheumatology. Moscow: GEOTAR-Media; 2017. P. 42-50. (In Russ)*]
7. Mitchell PG, Magna HA, Reeves LM, et al. *Cloning, expression, and type II collagenolytic activity of matrix metalloproteinase-13 from human osteoarthritic cartilage. J Clin Invest* 1996; 97:761–768.
8. *Рекомендации ЕОК по ведению пациентов с острым инфарктом миокарда с подъемом сегмента ST 2017 Российский кардиологический журнал* 2018; 23 (5): 103–158 2017 [ESC guidelines for the management of acute myocardial infarction in patients presenting with ST-segment elevation *Russ J Cardiol* 2018; 23 (5): 103–158 (In Russ)] doi.org/10.15829/1560-4071-2018-5-103-158
9. Rebecca C. PhD; Johnson, B. Delia PhD; et al. *Menopausal symptoms and cardiovascular disease mortality in the Women's Ischemia Syndrome Evaluation (WISE)Thurston, MD Menopause: 2017; 24(2):126–132* doi: 10.1097/GME.0000000000000731
10. Сметник, В.П., Сметник, А.А. *Женские половые гормоны и сердечно-сосудистая система. Meditsinskii sovet.* 2011; (3-4):40-45. [Smetnik, V.P., Smetnik, A.A. *Women's sexual hormones and cardiovascular system* 2011; (3-4):40-45. (In Russ)]

11. Efstathiou M., Settas L. *The effect of non-steroidal anti-inflammatory drugs on matrix metalloproteinases levels in patients with osteoarthritis Mediterr J Rheumatol* 2017;28(3):133-41 doi: 10.31138/mjr.28.3.133

12. Lane NE, Buckwalter JA. *Exercise: a cause of osteoarthritis? Rheum Dis Clin North Am* 19:617–633, 1993.

13. Conaghan P. G., Vanharanta H., Dieppe P. A. *Is progressive osteoarthritis an atheromatous vascular disease? Ann.Rheum. Dis.* 2005. Vol. 64. P. 1539–1541.

14. Felson D. T., McLaughlin S., Goggins J. et al. *Bone marrow edema and its relation to progression of knee osteoarthritis Ann. Int. Med.* 2003; 139: 330–336.

15. Pickvance E.A., Oegema T.R.Jr., Thompson R.C. *Immunolocalization of selected cytokines and proteases in canine articular cartilage after transarticular loading. J Orthop Res* 1993;113:313–23.

16. Buckwalter J.A. *Osteoarthritis and articular cartilage use, disuse, and abuse: experimental studies. J Rheumatol Suppl* 43:13–15, 1995.

17. Sah R.L., Doong J.Y., Grodzinsky J., et al. *Effects of compression on the loss of newly synthesized proteoglycans and proteins from cartilage explants. Arch Biochem Biophys* 286:20–29, 1991.

18. Guilak F., Ratcliffe A., Lane N., et al. *Mechanical and biochemical changes in the superficial zone of articular cartilage in canine experimental osteoarthritis. J Orthop Res* 1994;12:474–484.

19. Guilak F., Fermor B., Keefe F.J., et al. *The role of biomechanics and inflammation in cartilage injury and repair. Clin Orthop Relat Res* 2004;17-26.

20. Olson S.A., Marsh J.L. *Posttraumatic osteoarthritis. Clin Orthop Relat* 2004 Res 2,.

21. Matyas JR, Atley L, Ionescu M, et al. *Analysis of cartilage biomarkers in the early phases of canine experimental osteoarthritis. Arthritis Rheum* 2004; 50:543–552.

22. Lawrence R. C., Everett D. F., Hochberg M. C. *Arthritis In: Corroni-Huntley J.C., Huntley R.R., Feldman J.J. Health Status and Well-being of the elderly. Oxford University press. New York, 1990;136–151.*

23. Галушко Е. А., Большакова Т. В., Виноградова И. Б. и др. Структура ревматических заболеваний среди взрослого населения России по данным эпидемиологического исследования (предварительные результаты) Научно-практ. ревматология. 2009; № 1: 11–17. [Galushko E. A., Bol'shakova T. V., Vinogradova I. B. *The structure of rheumatic diseases among adults Nauchno-prakt. revmatologiya.* 2009; № 1: 11–17. (In Russ)]

24. Raisz L.G. *Prostaglandins and bone: physiology and pathophysiology. Osteoarthritis Cartilage* 1999;79:83–94.

25. Lauffer S., Gay S., Brune K. *Inflammation and Rheumatic Diseases: The molecular basis of novel therapies. Georg Thieme Verlag.* 2003;139.

26. Grushko G., Schneiderman R., Maroudas A. *Some biochemical and biophysical parameters for the study of the pathogenesis of osteoarthritis: a comparison between the processes of aging and degeneration in human hip cartilage.* *Connec Tissue Res* 1989;19:149–76.

27. Hu, W., Wei, R., Wang, L., Lu, J., Liu, H., & Zhang, W. (2018). *Correlations of MMP-1, MMP-3, and MMP-12 with the degree of atherosclerosis, plaque stability and cardiovascular and cerebrovascular events.* *Experimental and Therapeutic Medicine*, 15, 1994-1998. <https://doi.org/10.3892/etm.2017.5623>

28. Vacek T, Rehman S, Neamtu D, Yu S, Givimani S, Tyagi S *Matrix metalloproteinases in atherosclerosis: role of nitric oxide, hydrogen sulfide, homocysteine, and polymorphisms* *Vasc Health Risk Manag* 2015 27;11:173-83. <https://doi.org/10.2147/VHRM.S68415>

29. Fawzy RM, Abdel Hamid YA, Albehesy MM, Aboelmaged RF. *Serum and synovial matrix metalloproteinase-3 as markers of disease activity in early rheumatoid arthritis.* *Egypt Rheumatol Rehabil [serial online]* 2016 [cited 2019 Jun 6];43:178-83. DOI: 10.4103/1110-161X.192257

30. Kobayashi A, Naito S, Enomoto H, Shiomoi T, Kimura T, Obata K, Inoue K, Okada Y. *Serum levels of matrix metalloproteinase 3 (stromelysin 1) for monitoring synovitis in rheumatoid arthritis.* *Arch Pathol Lab Med.* 2007 Apr;131(4):563-70.

医疗机构预防HCAI的某些方面
SOME ASPECTS OF HCAI PREVENTION IN MEDICAL ORGANIZATIONS

Smetanin Victor Nikolaevich

*Candidate of Medical Sciences, Associate Professor
Ryazan State Medical University*

抽象。 医疗保健相关感染（HCAI）被认为是现代医疗保健中最严重的问题之一。 我们分析了统计数据以及医疗机构中HCAI病例登记的质量，确定了医疗机构中感染控制的问题以及消除方法。

关键字：HCAI，注册，统计，损害，感染控制，违反反流行病制度的处罚。

***Abstract.** Healthcare-associated infection (HCAI) are considered as one of the most acute problems of modern healthcare. We analyzed the statistical data, as well as the quality of registration of cases of HCAI in medical organizations, identified the problems of infection control in medical organizations and ways to eliminate them.*

***Keywords:** HCAI, registration, statistics, damage, infection control, penalties for violations of the anti-epidemic regime.*

Hospital-acquired infections (HAI) are any clinically expressed diseases of microbial origin that affect the patient as a result of his hospitalization or visit to a medical institution for treatment, as well as hospital staff due to their activities, regardless of whether symptoms of this disease appear or do not appear during time spent by these persons in the hospital. This definition was proposed by the WHO Regional Office for Europe in 1979. [4]

An infection is considered nosocomial if it first appears 48 hours or more after being in the hospital, provided that there are no clinical manifestations of these infections at the time of admission and the possibility of an incubation period is excluded. [5].

In the modern conditions of the development of healthcare and humanity, the prevention of healthcare-associated infection (HCAI) is one of the global problems of the world. Today, the activities of a significant number of scientists, numerous healthcare practitioners and most large companies that present their prod-

ucts and services on the world market are subordinated to the solution of these serious issues.

At present, it is difficult to overestimate the social and economic damage that HCAI inflicts annually on the global community. Thus, according to official statistics, in the United States more than 2 million patients suffer from HCAI annually, 88 0 00 patients die, the annual economic damage is 4-10 billion dollars; in the UK, taking into account the registered HCAI, inpatient treatment of patients increases by 3.6 million days, the annual economic loss is about 1 billion pounds [1-3].

The urgency of the HCAI problem is determined by their widespread occurrence in medical institutions of various profiles and the significant damage caused by these diseases to the health of the population. [6]

The problem associated with the lack of registration of real cases of HCAI in medical and preventive organizations (MPO) and, as a consequence, the provision of inaccurate statistics is of great importance. It is important to understand that the availability of statistics reflecting the real situation in the country will contribute to improving the methods of solving the existing problem. According to statistics, HCAI affects 5-10% of patients in hospitals, and ranks tenth among the causes of mortality in the population. In Russia, according to official statistics, approximately 30 thousand cases of infections associated with the provision of medical care are registered annually (~ 0.8 per 1,000 patients), but experts believe that their true number is at least 2-2.5 million people. Depending on the action of various factors, the incidence of HAI fluctuates. [7]

Patients with HCAI stay in the hospital 2-3 times longer than similar patients without signs of infection. On average, their discharge is delayed by ten days, the cost of treatment increases by 3–4 times, and the risk of death is 5–7 times. [7]

Registration of nosocomial infections is carried out in all treatment and prevention organizations in accordance with the current procedure for statistical accounting. For each detected case of nosocomial infection, an urgent notification is promptly sent to the territorial center of the FBHC "Hygiene and Epidemiology". [7]

In matters of HCAI prevention in hospitals, middle and junior medical personnel are assigned the main, dominant role of the organizer, the responsible executor, and also the controller. Daily, careful and strict fulfillment of the requirements of the sanitary-hygienic and anti-epidemic regime in the course of the performance of their professional duties is the basis of the list of measures for the prevention of HCAI. [8]

The number of nosocomial infections (infections associated with the provision of medical care, HCAI) in Russia reaches 25-30 thousand cases per year, but this statistic is significantly underestimated, experts say. However, today we can talk

about a clear underestimation of cases of nosocomial infection. The real figure is actually much higher - 2-2.5 million cases. Despite the fact that the number of nosocomial infections in the country as a whole has decreased by 20% over the past ten years, the error in HCAI statistics in Rospotrebnadzor was noted earlier. In particular, the department revealed facts of concealment of data on nosocomial morbidity and other violations in medical organizations, including cases of late isolation of patients, untimely start of anti-epidemic measures, violation of the rules for maintaining functional premises, as well as non-compliance with antiseptic requirements when working with sterile material. [10]

The way to solve the existing problem at present is to improve the quality of medical care by improving the infection control system inside the hospital, as well as by making changes to the regulatory legal acts regarding the control of the anti-epidemic regime.

First, the number of general cleanings should be at least doubled. At the moment, according to SanPiN 2.1.3.2630-10 "Sanitary and Epidemiological Requirements for Organizations Carrying out Medical Activities", general cleaning of the ward premises should be carried out at least 1 time per month. General cleaning of the operating room, dressing rooms, delivery rooms, treatment rooms, manipulation rooms, sterilization rooms and other aseptic rooms is carried out once a week. [11] We propose to increase the number of general cleaning up to 1 time per week in ward rooms, up to twice a week in operating rooms and maternity rooms.

Secondly, the number of control checks in medical institutions should be increased by strengthening the epidemiological and microbiological control of the activities of the medical and preventive institution.

Thirdly, the proper control over the observance of sanitary rules and hygienic standards will be at the highest level if the degree of punishment for non-compliance is increased. According to Article 6.3. "Violation of the legislation in the field of ensuring the sanitary and epidemiological well-being of the population" of the Code of the Russian Federation on Administrative Violations, violation of the legislation in the field of ensuring the sanitary and epidemiological well-being of the population, expressed in violation of the current sanitary rules and hygienic standards, failure to comply with sanitary and hygienic and anti-epidemic measures, entails a warning or the imposition of an administrative fine on citizens in the amount of one hundred to five hundred rubles; for officials - from five hundred to one thousand rubles; for persons engaged in entrepreneurial activities without forming a legal entity - from five hundred to one thousand rubles or administrative suspension of activities for up to ninety days; for legal entities - from ten thousand to twenty thousand rubles or administrative suspension of activities for up to ninety days.

References

1. Livshits M.L. et al. *Hospital infections: problems and solutions* / M.L. Livshits, E.B. Brusina // *Journal of Microbiology, Epidemiology and Immunobiology*. 1992. № 1. P. 22.
2. Pokrovsky V.I. *Nosocomial infections: new horizons of prevention* / V.I. Pokrovsky, V.G. Akimkin, N.I. Briko, E.B. Brusina, L.P. Zueva, O. V. Kovalishen, V.L. Stasenko, A.V. Tutelyan, I.V. Feldblum, V.V. Shkarin // *Epidemiology and infectious diseases*. 2011. № 1. P. 4–7.
3. Pokrovsky V.I. et al. *Fundamentals of modern classification of infections associated with the provision of medical care* / V.I. Pokrovsky, N.I. Briko, E.B. Brusina, A.S. Blagonravova, L.P. Zueva, O. V. Kovalishen, V.L. Stasenko, A.V. Tutelyan, I.V. Feldlyum, V.V. Shkarin // *Epidemiology and infectious diseases. Topical issues*. 2011. № 3. P. 4–10.
4. SIR, HAI concept. The causes of HAI. Preventive measures // [Electronic resource]//URL: <https://helpiks.org/7-42625.html>//
5. Hospital-acquired infections // [Electronic resource] // URL:http://www.wikiznanie.ru/wp/index.php/Внутрибольничные_инфекции
6. Relevance of hospital-acquired infections. Prevalence of hospital-acquired infections. // [Electronic resource]// URL: <https://studfiles.net/preview/5016900/>
7. Epidemiological analysis of the incidence of nosocomial infections // [Electronic resource] // URL: http://управлениездоровоохранением.рф/publ/medicinskaja_statistika/ehpidemiologicheskij_analiz_zabolevaemosti_vnutribolnichnyimi_infekcijami/28-1-0-17/
8. HAI statistics. // [Electronic resource]// URL: <http://znakka4estva.ru/dokumenty/medicina-zdorove/statistika-po-vbi/>
9. Epidemiologist: the official statistics on nosocomial infections are under-reported. // [Electronic resource] //URL: https://vademec.ru/news/2015/11/23/epidemiolog_ofitsialnaya_statistika_po_vnutribolnichnym_infektsiyam_zanizhena/
10. SanPiN 2.1.3.2630-10 "Sanitary and epidemiological requirements for organizations carrying out medical activities" // [Electronic resource]//URL: http://www.consultant.ru/document/cons_doc_LAW_104071/
11. Code of the Russian Federation on administrative offenses dated 30.12.2001 № 195-FZ(as amended on 28.11.2018), article 6.3" // [Electronic resource]//URL:http://www.consultant.ru/document/cons_doc_LAW_34661/c967e-b7a901005316559be99424c3a824dc426b0/

臭氧疗法在糖尿病足综合征的综合治疗中
**OZONE THERAPY IN THE COMPREHENSIVE TREATMENT OF
DIABETIC FOOT SYNDROME**

Teuov Aslan Alekseevich

Candidate of Medical Sciences, Associate Professor

Baziev Arthur Mukharbievich

Candidate of Medical Sciences, Associate Professor

Pshukova Elena Mukhadinovna

Candidate of Medical Sciences, Associate Professor

Teuov Islam Aslanovich

Student

Kabardino-Balkarian State University named after H.M. Berbekov

抽象。下肢化脓性坏死病变的发展常常使糖尿病（DM）复杂化，不仅导致肢体截肢导致早期残疾，而且缩短了寿命。糖尿病足综合征（DFS）是糖尿病足的一种病理状态，其发生在周围神经，血管，皮肤，软组织，骨骼和关节受损的背景下，并伴有破坏性和化脓性坏死过程。在20-80%的糖尿病患者中以各种形式观察到DFS，并且使下肢坏疽的风险增加20倍。与没有糖尿病的人相比，对这些患者进行下肢截肢的频率要高15-20倍。该研究的目的是评估臭氧溶液在糖尿病足综合征综合治疗中的有效性。研究方法：将所有患者分为2组。主要的临床试验组包括17例DM患者，这些患者在2020年1月至2020年11月期间入院，并发展了DFS（根据F. Wagner的分类为3-5级严重程度）。在入院前即开始治疗前和术后第1-3-5-7-10天进行了临床，血液学，细菌学和细胞学研究。作为对照组，研究对象来自2019年同期入院的20例患者的病历。对照组接受传统治疗。在主要人群中，传统治疗辅以局部和一般臭氧治疗会议。分析了37例发展为DFS的糖尿病患者的治疗结果；评估了化脓性手术中这种病理学臭氧疗法的发展成果和前景。在主要组中，观察到了从炎症-退化过程到再生过程的快速过渡以及微生物菌群的快速完全消除。在第3-5天，主要患者的红细胞沉降率（ESR）参数和白细胞总数恢复正常，刺和分段白细胞的含量减少，淋巴细胞和单核细胞的数量增加，与对照组相比的卧床天数。我们的研究表明，用静脉内和局部含臭氧药物补充急性化脓性外科疾病患者的综合治疗具有明显的治疗和经济效果。

关键词：臭氧疗法糖尿病足综合征；化脓手术。

Abstract. *Diabetes mellitus (DM) is often complicated by the development of purulent-necrotic lesions of the lower limbs, leading not only to early disability due to limb amputation, but also shortening the life span. The Diabetic Foot Syndrome (DFS) is a pathological state of feet in diabetes mellitus, which occurs against the background of impaired peripheral nerves, vessels, skin, soft tissues, bones and joints and is accompanied by destructive and purulent necrotic processes. DFS is observed in various forms in 20-80% of patients with diabetes and increases the risk of gangrene of the lower extremities by 20 times. And amputation of the lower limbs is performed to these patients by 15-20 times more often than in people without diabetes. The objective of the study was to evaluate the effectiveness of applying ozonated solutions in the comprehensive treatment of diabetic foot syndrome. Methods of research: all patients are divided into 2 groups. The main clinical trial group included 17 patients with DM, who were admitted in the period from January to November 2020 and had DFS developed (3-5 severity class according to F. Wagner's classification). Clinical, hematological, bacteriological, cytological studies were performed at admission before the beginning of treatment and on the 1-3-5-7-10th postoperative day. Data from medical records of 20 patients admitted in the same period of 2019 were the subjects of the study as a control group. The control group received traditional treatment. In the main group, traditional treatment was supplemented with sessions of topical and general ozone therapy. The treatment results of 37 patients with diabetes having DFS developed were analyzed; the outcomes and prospects for the development of ozone therapy of this pathology in purulent surgery were evaluated. In the main group a rapid transition from inflammatory-degenerative processes to regenerative ones and fast complete elimination of microbial flora were observed. On the 3rd-5th day, the patients of the main group showed normalization of Erythrocyte Sedimentation Rate (ESR) parameters and total leukocyte count, decrease in the content of stab and segmented leucocytes, increase in the number of lymphocytes and monocytes, a decrease in the number of bed-days as compared to the control group. Our studies have demonstrated that supplementing the comprehensive treatment of patients having acute purulent surgical diseases with intravenous and topical ozone-containing medications exerted a pronounced therapeutic and economic effect.*

Keywords: *Ozone therapy; Diabetic Foot Syndrome; purulent surgery.*

Introduction

Diabetes mellitus (DM) is often complicated by the development of purulent necrotic lesions of the lower extremities, leading not only to early disability due to limb amputation, but also shortening the life span^{1,2}.

Diabetic Foot Syndrome (DFS) is a pathological state of feet in diabetes mellitus, which occurs against the background of impairment to the peripheral nerves,

vessels, skin, soft tissues, bones and joints and is accompanied by destructive and purulent necrotic processes. DFS is observed in various forms in 20-80% of DM patients and increases the risk of gangrene of the lower extremities by 20 times. Amputation of the lower limbs is performed to these patients by 15-20 times more often than in people without diabetes. In most cases, amputations are made because of ischemia and a deep infection or a combination of both^{3,4}. DFS is more frequent in case of inadequate treatment of diabetes. It occurs in two clinical forms: neuropathic and neuroischemic⁵.

With the neuropathic DFS the peripheral nervous system is affected with a violation of sensitivity. The main blood flow does not suffer.

With a neuroischemic form, neuropathy is less pronounced, but decompensated, critical ischemia always dominates. It is caused by polylocal occlusions and stenoses mainly of distal arteries. With the development of irreversible ischemia, moist gangrene or uncontrolled dry necrosis is observed.

The oxidative stress is the most important link in the pathogenesis of diabetes; this stress is induced by tissue damage and cell death leading to increased production of free radicals and inhibition of antioxidant protection⁴.

The objective of the research is to evaluate the effectiveness of applying ozonized solutions in the complex treatment of Diabetic Foot Syndrome.

The tasks of the research are as follows:

1. To study the effect of ozonized solutions on the course of the nearest post-operative period in patients with Diabetic Foot Syndrome;
2. To determine the effect of ozonized solutions on the endotoxemia indices and the level of microbial bodies in smears-prints;
3. To identify the economic effect of including ozonized solutions in the treatment of patients with DFS.

Materials and methods

Medical supervision involved 37 patients with diabetes, who had DFS developed (of the 3rd-5th DFS severity class according to F. Wagner's classification⁶). All patients are divided into 2 groups. The first, control group (n = 20) were patients who received traditional treatment. In the second, main group (n = 17) traditional treatment was supplemented with sessions of local and general ozone therapy.

The patients of both groups matched by sex, age, primary and concomitant diseases and developed complications.

The main group of the clinical trial included patients who were admitted in the period from January to November 2020. Clinical, hematological, bacteriological, cytological studies were performed at admission before the beginning of treatment and on the 1-3-5-7-10th postoperative day. Data from medical records of 20 patients admitted in the same period of 2019 were the subjects of the study as a control group.

The comprehensive treatment was carried out by several specialists (a surgeon, an endocrinologist, and an intensivist) and included conservative therapy and surgical correction.

Conservative therapy began with correction and/or compensation of diabetes mellitus with obligatory transfer to insulin therapy, antibacterial and symptomatic therapy, measures to reduce the critical ischemia manifestations.

The surgical treatment was based on the principle of tissue conservation and maximum preservation of the length of the foot. Wide lancing of purulent necrotic foci, removal of necrotic and purulence-impregnated tissues and adequate drainage were carried out. However, single surgical intervention did not always allow achieving radical surgical treatment, repeated surgical treatment with neurectomy was required.

The total number of surgical interventions, taking into account the severity of DFS, is shown in table 1.

Table 1: Volume of surgical treatment of DFS

DFS severity class according to F. Wagner	Extent of operations								Total
	Phlegmon lancing		Astragalar amputation		Foot amputation (resection)		Lower extremity amputation		
	Main group	Control group	Main group	Control group	Main group	Control group	Main group	Control group	
III severity class	19	15					1	2	37
IV severity class			4	5	2			1	12
V severity class							6	5	11
Total	19	15	4	5	2		7	8	60

In the main group, the traditional treatment complex was supplemented by sessions of local and general ozone therapy.

For the general ozone therapy, 200 ml of ozone-saturated 0.9% sodium chloride solution was injected intravenously daily with ozone concentration being 800-1000 mcg/L. The duration of the treatment course depended on the general condition of the patients, the wound process progress, the dynamics of the biochemical, clinical and immunological parameters of the body.

In the postoperative period local ozone therapy included daily dressings of wounds and the introduction of ozonized saline with concentrations of 3.3-4 mg/L in drains.

The timing of the regenerative processes in a purulent wound and the number of microbial bodies in smears-imprints were evaluated as the main outcome of the study.

The endotoxycosis rates and the number of bed-days were evaluated as additional outcomes of the study in the main group as compared to the control one.

The intoxication severity was judged by the parameters of the average molecular weights (AMW) and the leukocytal intoxication index (LII) according to Kalf-Kalif.

Cytological examination of the material was carried out by applying a defatted sterile slide to the wound surface cleaned from the exudate. Wound imprints were fixed with 96% ethyl alcohol and stained by Romanovsky-Giemsa procedure. To obtain a more authentic view of the wound process dynamics, the cellular composition was expressed as a percentage, the quantitative characteristics of the basic cellular elements were reduced to a common cytogram taking into account microflora, leukocytes (lymphocytes, monocytes, macrophages, and neutrophils).

When carrying out hematological studies, the following parameters of peripheral blood were studied: the dynamics of the total leukocyte count, leukogram, ESR.

The statistical analysis was performed using the StatGraphics 5.0 program.

Results

Age and sex composition of patients is given in table 2.

Table 2: Age and sex characterization of patients

Age	Main group (n=17)		Control group (n=20)		Total
	males	females	males	females	
21-30	1	-	-	-	1
31-40	-	1	-	-	1
41-50	1	-	1	-	2
51-60	1	-	2	2	5
61-70	3	5	4	2	14
> 70	-	5	3	6	14
Total	6	11	10	10	37

Diabetes mellitus, type II, severe form, decompensation stage was diagnosed in 80% of patients.

According to the form of purulent-necrotic lesion of the limb, our patients were distributed as follows:

- foot phlegmon and abscess (the 3rd severity class according to Wagner) – 23;
- gangrene of one or more toes (the 4th severity class) – 7;
- disseminated foot gangrene, with pronounced intoxication, requiring amputation of the lower limb in an emergency order (the 5th severity class) – 8.

Of these, one patient has both feet simultaneously affected.

After a traditional surgical intervention (opening and drainage of abscesses, amputations of toes, feet or limbs^{7,8}) and local visual examination of wounds of soft tissues of patients was performed daily during dressings. Before the treatment, purulent discharge, pronounced fibrinous plaque on the wound bottom, edema and hyperemia of the surrounding tissues were noted. In the process of ozone treatment, medicinal manipulations in the wound region did not cause any painful sensations in patients by 3rd-5th day. When analyzing the treatment results, it was found that under the influence of ozone therapy, there was significant reduction in pain, more intensive decrease in swelling and hyperemia of the tissues, early clearance of wounds compared with the control group.

On the first day after the operation the analysis of hematological parameters revealed that the patients of the study groups had high ESR, a leukogram showed high neutrophil count with a shift to the left, and the total lymphocyte count was decreased. On the 3rd-5th day, the patients of the main group showed normalization of ESR parameters and total leukocyte count, decrease in the content of stab and segmented leucocytes, increase in the number of lymphocytes and monocytes, a decrease in the number of bed-days as compared to the control group.

According to our data, *St.aureus* (55.8%), *St.epidermidis* (28.4%), and *Ps.aeruginosa* (12.2%) were causative agents of the purulent process, and the associations of microorganisms (*St.aureus* + *St.epidermidis*) were inoculated in 42.8%. In the main group, against the background of the ozone application, the growth of pathogens was absent in the wounds already on the 5th day.

In the cytograms before the treatment, the cellular elements of the smears were presented predominantly (90%) by neutrophilic leukocytes, mostly with manifested degeneration and rare cases of macrophages (1.4%); fibroblasts were not detected. Morphologically, necrotic detritus was noted.

The dynamics of cytological and bacteriological changes is presented in table 3.

Table 3: Characterization of cytological and bacteriological changes in the wound

Cellular composition of smears	Main group (n=17)				Control group (n=15)			
	1 day	3 days	5 days	7 days	1 day	3 days	5days	7days
Neutrophils	90%	58%	36%	20%	91%	70%	62%	55%
Macrophages	1.4%	5%	18%	32%	1.2%	1.2%	10%	25%
Fibroblasts	-	3%	15%	30%	-	-	5%	15%
Microorganisms	10 ⁷	10 ⁷	-	-	10 ⁷	10 ⁷	10 ⁶	10 ⁵

As table 3 demonstrates, there was a rapid transition from inflammatory-degenerative processes to regenerative one and fast, complete elimination of microbial flora in the main group, while in the control group the cytograms dynamics and the infestation of wounds by microorganisms testified to the sluggish flow of regeneration processes.

The dynamics of endotoxigenesis indices (AMW, LII) in both groups is shown in figures 1 and 2, which illustrate that faster detoxification occurred under the influence of general and local application of ozone.

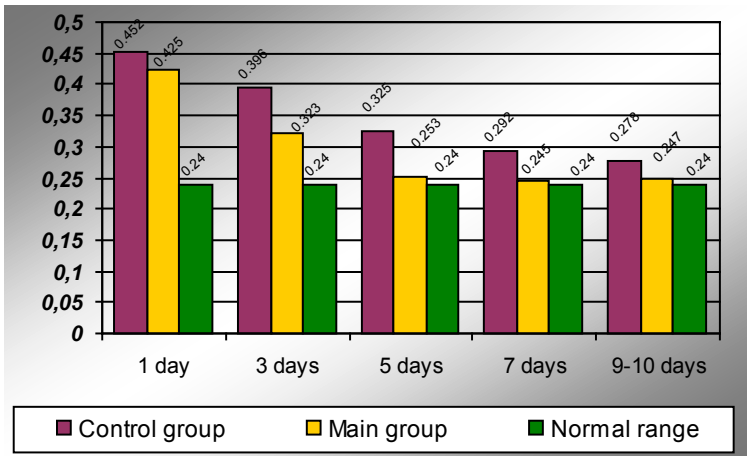


Fig. 1: Dynamics of the AMW level

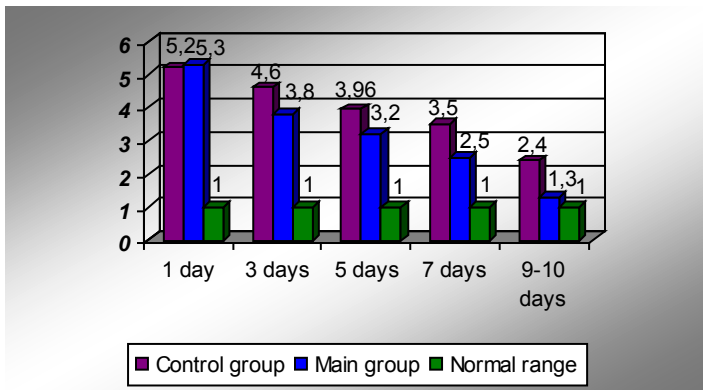


Fig. 2: Dynamics of the LII level

Figure 3 shows the ratio of bed-days in patients of both groups, which indicates that the application of ozone therapy enabled to reduce the number of bed-days by an average of 7 days for the main group of patients.

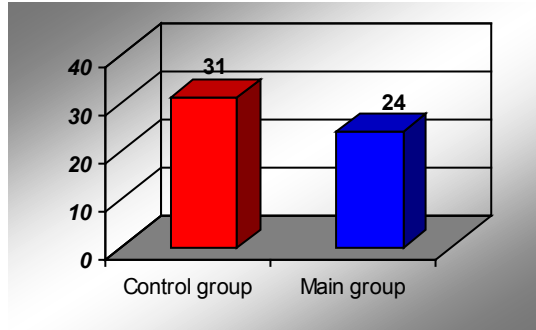


Fig. 3: Ratio of bed-days in patients of study groups

One patient died, whose postoperative period was complicated by the development of pulmonary artery thromboembolia.

Discussion

The clinical picture improved earlier in the main group of patients under the influence of ozone therapy. Restoration of endotoxemia results and cessation of the wound microflora growth occurred on the 5th day, whereas in the control group the recovery period took 10 days or more.

As is known, medical ozone increases the permeability of cellular membranes for glucose, which is achieved by stimulating the pentose phosphate shunt and aerobic glycolysis which are suppressed in diabetes, and this helps reduce hyperglycemia by better glucose entering the tissue. Glucose is oxidized to the final products, and as a result, the basic function of carbohydrates – the energy function – is restored. The energy hunger of tissues is removed. Catabolic processes are oppressed, LPO is normalized^{4,9,10}.

Another important circumstance is that, under the action of ozone, glucose metabolism in erythrocytes is more active, hemoglobin releases oxygen to tissues better, oxygen supply is increased, and hypoxia is eliminated, which plays almost a key role in the treatment process. Ozone therapy contributes to prevention of the development and progression of processes associated with low entry of glucose into the cell, such as neuropathies, arthropathies, angiopathies^{9,10}.

It is necessary to take into account the immune-modulating effect of ozone, especially for the insulin-dependent form of diabetes, which is characterized by the liability to chronic infections and pustular lesions against the background of suppressed immunity.

The therapy is based on the intravenous administration of ozonized normal saline (ONS) in a volume of 200 ml with ozone concentration at the output of 1000 mg/L, which are conducted every other day in the amount of 10-14 procedures. Infusions can be replaced with rectal ozone introductions according to the same schedule as the ONS, in an amount of 500 ml with the ozone dose of 1000 mcg.

Additional ozone therapy procedures are prescribed depending on the type of diabetes mellitus and the available complications. With the signs of secondary immunodeficiency, minor autohemotherapy (MiAHT) with ozone is performed in 6-8 sessions 2-3 times a week; with diabetes mellitus of the second type, ozone reflexotherapy is additionally used according to the common formula¹⁰.

In this paper, the authors investigated the persistent characteristics of strains isolated in the patients' wound culture. The purulent process was caused by *St.aureus* (55.8%), *St.epidermidis* (28.4%), and *Ps.aeruginosa* (12.2%), and associations of microorganisms (*St.aureus* + *St.epidermidis*) were revealed in 42.8% of wound culture. The main group showed a rapid transition from inflammatory-degenerative processes to regenerative ones and fast, complete elimination of microbial flora. On the 3rd-5th day, normalization of ESR parameters and total leukocyte count, decrease in the content of stab and segmented leucocytes, increase in the number of lymphocytes and monocytes were observed in the main group in comparison with the control group, which coincides with the literature data¹¹⁻¹⁶.

Factors that could significantly affect the findings of the study were not identified. In the course of the treatment, minor autohemotherapy was used to prevent postinjection complications and reflexology in the absence of special equipment.

Conclusion

Thus, our studies have shown that supplementing the comprehensive treatment of patients having acute purulent surgical diseases in the main group with intravenous and topical application of ozone-containing medications resulted in:

1. earlier improvement in the general condition of patients,
2. decrease in endotoxiosis indices, acceleration of regenerative processes in the purulent wounds, decrease in the number of microbial bodies in smears-prints,
3. reduction of bed-days.

It should be noted that ozone therapy methods have a pronounced curative effect in DFS, they are easy to use, available to any surgical hospital and are economically viable.

References

1. Malyar, N.M., Freisinger, E., Meyborg, M., Lüders, F. & Lawall, H. *Amputations and mortality in in-hospital treated patients with peripheral artery disease and diabetic foot syndrome. Journal of Diabetes and its Complications, 2016; 30(6): 1117-1122.*

2. Pscherer, S., Dippel, F-W., Lauterbach, S. & Kostev, K. *Amputation rate and risk factors in type 2 patients with diabetic foot syndrome under real-life conditions in Germany. Primary Care Diabetes*, 2012; 6(3): 241-246.
3. Obolenskiy, V.N., Leval, P.S., Ermolova, D.A. & Protsko, V.G. *Diabetic foot syndrome: Our approach to the treatment of the patients. Wound Medicine*, 2014; 4: 30-36.
4. Bocci, V., Zanardi, I., Huijberts, M.S.P. & Travagli, V. *Diabetes and chronic oxidative stress. A perspective based on the possible usefulness of ozone therapy. Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 2011; 5(1): 45-49.
5. Mitish, V. A., Eroshkin, I. A., Galstyan, G. R., Doronina, L., Paskhalova, Y., Eroshenko, A. *Purulent-necrotic lesions of neuroischemic form of diabetic foot syndrome. New possibilities of complex surgical treatment. Endocrine surgery*, 2008; 2(1): 15-19.
6. Obolenskiy, V.N., Protsko, V.G. & Komelyagina, E.Y. *Classification of diabetic foot, revisited. Wound Medicine*, 2017; 18: 1-7.
7. Sohrabi, S., & Russell, D. *Diabetic foot and foot debridement technique. Surgery (Oxford)*, 2017; 35(9): 500-504.
8. Miller, R.J. *Neuropathic Minimally Invasive Surgeries (NEMESIS): Percutaneous Diabetic Foot Surgery and Reconstruction. Foot and Ankle Clinics*, 2016; 21(3): 595-627.
9. Kulikov, G. A., Turova, E. A. and Kiseleva, O. M. *The Effectiveness of different methods of ozone therapy in vascular complications of diabetes mellitus. Problems of balneology, physiotherapy and exercise therapy*, 2002; 5: 17-20.
10. Maslennikov, O. V. and Kontorshchikova, K. N. *Practical ozone therapy. Allowance. Vector-Tis, Nizhny Novgorod (2003)*.
11. Noor, S., Khan, R.U. & Ahmad, J. *Understanding Diabetic Foot Infection and its Management. Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 2017; 11(2): 149-156.
12. Charles P.G.P., Uçkay, I., Kressmann, B., Emonet, S. & Lipsky, B.A. *The role of anaerobes in diabetic foot infections. Anaerobe*, 2015; 34: 8-13.
13. Uçkay I., Aragón-Sánchez, J., Lew, D. & Lipsky, B.A. *Diabetic foot infections: what have we learned in the last 30 years? International Journal of Infectious Diseases*, 2015; 40: 81-91.
14. Peters, E.J.G. & Lipsky, B.A. *Diagnosis and Management of Infection in the Diabetic Foot. Medical Clinics of North America*, 2013; 97(5): 911-946.
15. Karmaker, M., Sanyal, S.K., Sultana, M. & Hossain M.A. *Association of bacteria in diabetic and non-diabetic foot infection. An investigation in patients from Bangladesh. Journal of Infection and Public Health*, 2016; 9(3): 267-277.
16. LaSalvia, M.T., Clark, A.T. & Karchmer, A.W. *Diabetic Foot Infection. Hospital Medicine Clinics*, 2012; 1(2): 185-198.

作者在临床牙科中对下颌的解剖学和地形标志知识的应用的变体
**THE AUTHOR'S VARIANT OF APPLICATION IN CLINICAL
DENTISTRY OF KNOWLEDGE OF ANATOMY AND TOPOGRAPHIC
LANDMARKS OF THE LOWER JAW**

Volkov Sergei Ivanovich

Doctor Medical Sciences, Head of Department

Lebedev Sergey Nikolaevich

Candidate of Medical Sciences, Associate Professor

Lebedeva Julia Vladislavovna

Candidate of Medical Sciences, Associate Professor

Tver State Medical University

本文显示了在创建安全有效的下颌麻醉方法中实际应用地形和解剖数据的可能性。翼状space肉间隙的地形和解剖学检查是通过宏观和微观制备方法对从不同性别和年龄的人的固定尸体中取出的18种解剖制剂进行的。确定上颌三角形的解剖标志，以改善下颌麻醉的方法，从而显着降低损害内侧翼状肌，舌神经，下牙槽神经血管束的风险，并提高麻醉的效率和安全性。下颌。对20名志愿者进行的临床研究结果表明，下颌麻醉的方法是通用的，与其他局部麻醉方法一起用于牙科领域。

关键词：翼状media肉内侧肌，舌下神经和下牙槽神经，下颌支，下颌麻醉。

The paper shows the possibility of practical implementation of topographic and anatomical data in the creation of a safe and effective method of mandibular anesthesia. Topographic and anatomical examination of the pterygo-jaw space was carried out on 18 anatomical preparations taken from the fixed corpses of people of different sex and age by macro- and micropreparation methods. The anatomical landmarks of the intermaxillary triangle were determined to improve the method of mandibular anesthesia, which significantly reduce the risk of damage to the medial pterygoid muscle, lingual nerve, lower alveolar neurovascular bundle, and increase the efficiency and safety of anesthesia for the teeth of the lower jaw. The results of a clinical study, which was performed on 20 volunteers, showed that the method of mandibular anesthesia is universal and is used in dentistry along with other methods of local anesthesia.

Keywords: *medial pterygoid muscle, lingual and lower alveolar nerves, ramus of the lower jaw, mandibular anesthesia.*

Mandibular anesthesia is one of the most common procedures in dental practice. There are many facts when various complications were observed during anesthesia at the mandibular foramen, and anesthesia of the entire mandible was not achieved [1,2,3]. This was the reason for a detailed study by the authors of the topography of the mandibular foramen, the inferior alveolar, lingual and buccal nerves and variants of the relationship of these nerves before the entry of the inferior alveolar nerve into the mandibular canal.

Anatomical and topographic study of 18 preparations of the lower jaw of corpses of adults showed that the mandibular opening was located on the inner surface of the lower jaw branch, closer to its posterior edge, and was removed from it by 12-14 mm, from the anterior edge - by 18-20 mm. from the lunate notch - by 23-25 mm and from the angle of the lower jaw - by 27-29 mm. In women (n = 7), the mandibular foramen was located lower than in men (n = 11), and was removed from the lunate notch by 21-23 mm and from the angle of the lower jaw by 24-26 mm. The mandibular foramen is covered from above and from the front by a bony protrusion – "tongue". According to our data, the bony tongue was not always clearly defined; it was absent on 8 preparations of the lower jaw.

The inferior alveolar nerve had a diameter of 2.5 - 4.0 mm, a length of 13 to 40 mm, and went to the mandibular foramen, located inward and anterior to the inferior lunar artery. Before entering the canal, it was located in the inter-ptyergoid cellular space together with the lingual nerve. They were separated by a thin plate of the inter-ptyergoid fascia. The lingual nerve, having a diameter of 2.0-3.0 mm, departed from the mandibular nerve at the same level as the inferior alveolar nerve, located inward and anterior to it at an angle of 5 to 30 degrees. The distance between these nerves at the mandibular foramen was 3-5 mm. The buccal nerve, with a diameter of 1.5-2.0 mm, passed between the heads of the lateral pterygoid muscle, descended, pierced the fascia of the temporal muscle at its anterior edge and went along the inner surface of its tendon to the retromolar region. There it divided into branches branching in the area of the 8th tooth. The main trunk of the buccal nerve penetrated into the thickness of the cheek and branched out. The distance from the buccal to the inferior alveolar nerve is from 15 to 23 mm, from the buccal to the lingual nerve is from 12 to 21 mm.

Analysis of the data of the topographic and anatomical study of the ptyergo-jaw space made it possible to establish [4] that on the inner surface of the mandibular ramus there is a site (triangle) free from the branches of the trigeminal nerve, through which safe access to the lower alveolar nerve can be provided when performing mandibular anesthesia. The boundaries of this mandibular triangle in

front were the anterior edge of the branch of the lower jaw and the tendon of the temporal muscle, the lingual nerve was located behind and medially, and the lower edge of the lateral pterygoid muscle and above the buccal nerve were located above. The dimensions of this triangle were as follows: from the lateral side - 18 mm, from the medial side - 20 mm, from above - 15 mm. With the mouth wide open, this triangle was projected onto the oral mucosa behind the mandibular molars.

On the basis of the performed topographic and anatomical study of the retromolar space on the oral mucosa, an "intermaxillary triangle" was identified, which coincided and projected onto the mandibular triangle, highlighted on the inner surface of the mandibular ramus. The apex of the intermaxillary triangle was facing the retromolar fossa, the base was located at the level of the alveolar process of the upper jaw. The medial border of the intermaxillary triangle was the pterygo-jaw fold, and the lateral border was the groove of the oral mucosa formed when the oral cavity was opened by the anterior edge of the mandibular branch.

An experimental study made it possible to topographically and anatomically substantiate a new way of performing mandibular anesthesia [5]. For mandibular anesthesia, the "intermaxillary triangle" was used as a reference point for the needle injection site. A needle is injected with a syringe into the oral mucosa at the intersection of the bisectors of the angles formed by the lateral groove and the pterygo-jaw fold and the bisector of the angle formed by the pterygo-jaw fold and the alveolar process of the upper jaw (directly in the center of the previously mentioned triangle). The bevel of the needle was directed towards the ramus of the lower jaw to facilitate its advancement. The introduction of the needle within this triangle and its advance 15 mm deep was safe, since the needle was located between the inner surface of the lower jaw and the lateral surface of the medial pterygoid muscle together with the lingual nerve. The syringe was positioned in the corner of the mouth at the level of the canine on the opposite side of the lower jaw. Anesthetic depot was created in the amount of 1.7 ml. This author's technique of mandibular anesthesia prevented damage to the internal pterygoid muscle, lingual, lower alveolar nerves and blood vessels, and the anesthetic was located near the neurovascular formations.

Clinical evaluation of the use of the developed universal method of mandibular anesthesia in the clinic [6] showed the absence of complications, which indicates the safety of using the method of mandibular anesthesia, which significantly reduces the risk of damage to the medial pterygoid muscle, lingual nerve, and lower alveolar neurovascular bundle. The place where the needle is inserted in the intermaxillary triangle, to ensure the conduct of mandibular anesthesia, can be used in dentistry along with other anatomical landmarks.

References

1. *Safe anesthesia in dentistry* / S.A. Rabinovich, E.V. Zoryan, L.A. Zavodilenko, Yu. L. Vasiliev. – Moscow: GEOTAR-Media, 2018. – 154 P.: fig. - Ref.: P. 150-154. - ISBN 978-5-9704-4478-8.
2. *Clinical case of complications during local anesthesia in dentistry* / Volkov S.I., Lebedev S.N., Khodnenko O.V. // *Upper Volga Medical Journal*. – 2017. – 16 (№2). – P. 51-52.
3. *Difficulties and complications of anesthesia in dentistry* / ed. Robert K. Bozak, Stuart Liebich, S. A. Rabinovich; transl. from English A. S. Dobrodeev. – Moscow: GEOTAR-Media, 2019. – 426 P. : fig., tab. – Ref. at the end of chapters, App.: P. 401-426. - ISBN 978-5-9704-5108-3.
4. *Topographic, anatomical and clinical rationale for mandibular anesthesia* / Volkov S.I., Lebedev S.N., Lebedeva Yu.V. // *Morphology*. - 2018. V. 153. № 3. P. 61.
5. *Method of carrying out mandibular anesthesia* / Volkov S.I., Lebedev S.N., Lebedeva Yu.V. // Patent for invention № 2672930C1. Application № 2017141093 dated 27.11.2017. Published 21.11.2018. Bulletin INVENTIONS USEFUL MODELS - № 33.
6. *The method of carrying out mandibular anesthesia based on topographic and anatomical landmarks* / Volkov S.I., Lebedev S.N., Lebedeva Yu.V. // *Dentistry*. - 2019. V.98, № 3. P. 94-96.

含环己烷和环己thritheene药效团片段的N³-(噻吩基)-6-甲基尿嘧啶新衍生
物的合成和生物活性的筛选

**SYNTHESIS AND SCREENING OF BIOLOGICAL ACTIVITY OF
NEW DERIVATIVES OF N³-(THIETANYL)-6-METHYLURACIL
CONTAINING CYCLOHEXANE AND CYCLOHEXANTHRIENE
PHARMACOPHORE FRAGMENTS**

Meshcheryakova Svetlana Alekseevna

Doctor of Pharmacy, Head of the Department of General Chemistry

Melnikov Alexander Sergeevich

Assistant

Zaykina Anastasia Viktorovna

Student

Bashkir State Medical University

抽象。 根据对世界研究的分析，嘧啶衍生物具有相当高的价值，并具有广泛的生物学活性。

为了筛选新的嘧啶衍生物的生物活性，我们获得了一系列6-甲基-3-(thietan-3-yl)嘧啶-2, 4 (1H, 3H)-二酮与芳族酸酯的衍生物。 一氯乙酸，并使用获得的数据的相关分析，使用在线资源PASS和GUSAR首次初步预测了可能的合成生物活性和毒性类型。

根据获得的结果，制定了目标，并揭示了最可能的生物活性类型的实践研究前景。

关键词：甲基尿嘧啶，硫杂环丁烷，一氯乙酸，生物活性，芳香族酯。

Abstract. *Based on the analysis of world studies, pyrimidine derivatives have a fairly high value and a wide range of manifestations of biological activity.*

In order to screen the biological activity of new pyrimidine derivatives, we've obtained a series of derivatives of 6-methyl-3-(thietan-3-yl) pyrimidine-2,4 (1H, 3H)-dione with aromatic esters of monochloroacetic acid, and also carried out a preliminary forecast possible types of biological activity and toxicity for the first time synthesized thietane-containing substanses using the online resources PASS and GUSAR, using the correlation analysis of the data obtained.

Based on the results obtained, the objectives are formulated and the prospects for practical research of the most probable types of biological activity are revealed.

Key words: methyluracil, thietane, monochloroacetic acid, biological activity, aromatic esters.

Relevance: Substances based on 6-methyluracil containing a thietane fragment exhibit various types of biological activity. The activity of such substances is largely correlated with the spatial structure of the substituents introduced by the parent compound [1; 3; 4]. In turn, in connection with innovations in science, the search for new derivatives of the aforementioned substances is an urgent objective of pharmaceutical, medical, and bioorganic chemistry [2].

Purpose: The purpose of our research was to synthesize new methyluracil derivatives containing thietane and cyclohexantriene fragments and preliminary screening of biological activity taking into account changes in the structure of the pharmacophore.

Materials and methods: The starting substance is 6-methyl-3- (thietan-3-yl) pyrimidine-2,4 (1H, 3H) -dione, obtained with constant stirring (temperature 43-45 °C) a mixture of 6-methyluracil with 2-chloromethyltiran, taken in a ratio of 1: 1.5, in potassium hydroxide, for 2 hours.

The starting aromatic esters of monochloroacetic acid were obtained by stirring chloroacetyl chloride with the corresponding phenols and cyclohexanols in a ratio of 1: 1.5 at a temperature of 50-60 ° C, in an acetonitrile medium with calcined potassium carbonate, for 5 hours.

All starting substances, after receiving, were thoroughly purified and dried.

New derivatives containing cyclohexane and cyclohexanthriene fragments were obtained by refluxing 6-methyl-3- (thietan-3-yl) pyrimidin-2,4 (1H, 3H) -dione with the corresponding esters (ratio 1: 1.5) at a temperature 70-80° C, with calcined potassium carbonate, for 6 h (*pic. 1*).

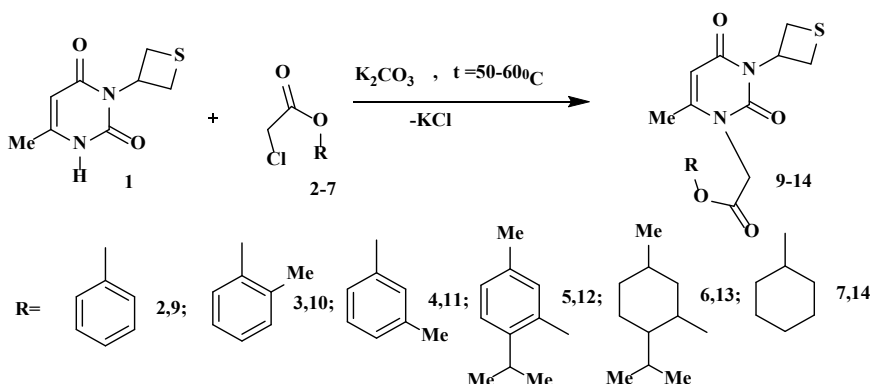
The individuality of the synthesized substances was confirmed by thin layer chromatography (TLC) and determination of the melting point. The melting point was measured in a capillary on a ПТМ-М device (Russia), TLC on Sorbfil plates (ZAO Sorbpolymer, Krasnodar) using ethyl acetate as a mobile phase, development in iodine vapor and in UV light on an УФС-254 (Russia). The structure of the substances was established by ¹H NMR spectroscopy.

The prediction of the most probable types of biological activity, as well as the prediction of the probable toxicity for all synthesized substances, was carried out using the online resources of PASS and GUSAR.

Statistical processing of the results was carried out using correlation analysis and the STATISTICA 8.0 software package.

Results and discussion: For the obtained derivatives (*pic. 1*): *phenyl-2-[6-methyl-2,4-dioxo-3- (thietan-3-yl) -3,4-dihydropyrimidin-1 (2H) -yl] acetate*

(9), *o*-tolyl-2- [6-methyl-2,4-dioxo-3- (thietan-3-yl) -3,4-dihydropyrimidin-1 (2H) -yl] acetate (10), *m*-tolyl-2- [6-methyl-2,4-dioxo-3- (thietan-3-yl) -3,4-dihydropyrimidin-1 (2H) -yl] acetate (11), 2-isopropyl-5- methylphenyl-2- (6-methyl-2,4-dioxo-3- (thietan-3-yl) -3,4-dihydropyrimidin-1 (2H) -yl] acetate (12), 2-isopropyl-5- methylcyclohexyl-2- (6-methyl-2,4-dioxo-3- (thietan-3-yl) -3,4-dihydropyrimidin-1 (2H) -yl] acetate (13), cyclohexyl-2- (6- methyl 2,4-dioxo-3- (thietan-3-yl) -3,4-dihydropyrimidin-1 (2H) -yl] acetate (14), the melting point, mobility indices in the ethyl acetate system, which characterize the stability of these substances, were determined (Table 1). The structure was established by ^1H NMR spectroscopy.



Pic. 1. Scheme for the synthesis of 6-methyluracil derivatives

Table 1
Physicochemical characteristics of the synthesized derivatives

№	Percentage Yield,%	Melting poin, $^{\circ}\text{C}$	$R_{\text{fCH}_3\text{COOEt}}$
9	59	90-91	0.285
10	55	125-126	0.300
11	50	120-121	0.525
12	55	115-116	0.450
13	56	103-104	0.325
14	52	85-86	0.275

Analysis of the data of preliminary screening of possible types of biological activity showed (Table 2) that the most likely to be active substances of this series are found in the process of inhibition of thioredoxin. Note that thioredoxin in animal cells is a kind of buffer of reactive oxygen species (ROS). It should be added that, depending on the strength of the pathogenic factor acting on the cell, ROS

can act as inducers of adaptation processes, which, in further research, can be used to detect pathological situations in which synthesized biologically active substances can improve the adaptation process. This fact is also supported by a fairly high probability of stimulating MAP-kinases, which play an important role in cellular responses, including proliferation, gene expression, response to hyperthermia, etc.

In addition, the presence of the likelihood of exhibiting antianginal, hypoglycemic, analgesic activity, and rather low magnitudes of the probability of being inactive for all types of possible biological manifestations, also reveals promising directions in further research.

Table 2
Potentially possible types of biological activity of methyluracil derivatives containing alkylcyclohexane and alkylcyclohexanthriene pharmacophore fragment.

No.	Type of biological activity	* P_a	* P_i
	Inhibition of thioredoxin	0,512±0.05	0,048±0.002
	Antianginal	0,468±0.05	0,051±0.004
	Stimulation of MAP kinase	0,451±0.05	0,072±0.002
	Hypoglycemic	0,343±0.05	0,024±0.001
	Analgesic	0,306±0.06	0,123±0.008

*- P_a -probability of being active, P_i -probability of being inactive

According to the data obtained, based on the forecast of the GUSAR program, the synthesized compounds are low-toxic, non-teratogenic substances.

Conclusions: Based on a set of data, synthesis and computer modeling of types of biological activity, the following conclusions can be formulated:

1. For the first time synthesized biologically active substances based on 6-methyluracil are stable in external conditions, based on their physicochemical characteristics, as well as low toxic and teratogenic, but the latter fact needs more detailed confirmation *in vivo*.

2. Screening of probable types of biological activity allows us to assert that the obtained substances have a fairly wide range of possible types of biological activity, which in turn makes it possible to determine the vector of further researches.

References

1. *Sintez tietanilzameshennyh pirimidin-2,4(1H,3H)-dionov / Kataev V.A. [i dr. J]//Zhurnal organicheskoy himii. 2013. T.49. Vol.5. p.760-762.*

2. *Biologicheskie svojstva novyh proizvodnyh uracila / I.V. Petrova [i dr.]// Medicinskij vestnik Bashkortostana. -2013. –Vol.8, №6. – p.163-165*

3. *Sintez, izomerija i gipotenzivnaja aktivnost' tietansoderzhashhih gidrazonov uracililuksusnoj kisloty /Meshherjakova S.A. [i dr.]// Bioorganicheskaja himija. 2014. Vol. 40, № 3. p. 327.*

4. *Macrocyclic derivatives of 6-methyluracil as ligands of the peripheral anionic site of acetylcholine esterase // MedChemComm. 2014. Vol. 5. №. 11. p. 1729-1735.*

DOI 10.34660/INF.2020.70.68.017

具有获得性抗生素抗性的细菌对水的污染
**WATER CONTAMINATION BY BACTERIA WITH ACQUIRED
ANTIBIOTIC RESISTANCE**

Lykov Igor Nikolaevich

*Doctor of Biological Sciences, Full Professor,
Scientific Director of the Institute of Natural Science and the Medical
Institute of the Tsiolkovsky Kaluga State University
Kaluga*

Volodkin Vladislav Sergeevich

*Student
Medical Institute
Tsiolkovsky Kaluga State University
Kaluga*

抽象。 这项研究的目的是评估分离自卡卢加州州河流中受城市化和农业影响最大的细菌的抗生素抗性。 水样取自奥卡河，雅琴卡，卡卢日卡，乌格拉河。 最常见的是大肠杆菌，铜绿假单胞菌，金黄色葡萄球菌，粪肠球菌，产气肠杆菌，枯草芽孢杆菌，产气荚膜梭菌，克雷伯菌属，粪便产碱杆菌，气单胞菌。 从水样中播种。 研究表明，所有分离出的微生物都具有某种程度的多抗性。 但是大肠杆菌，铜绿假单胞菌，粪肠球菌和粪产碱菌对各种抗生素的抵抗力最大。

关键词：环境，水生生态系统，微生物，抗生素，抗药性

Abstract. *The aim of this study is to assess the antibiotic resistance of bacteria isolated from the rivers of the Kaluga Oblast that are most affected by urbanization and agriculture. Water samples were taken from the Oka, Yachenka, Kaluzhka, Ugra rivers. Most often, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus, Enterococcus faecalis, Enterobacter aerogenes, Bacillus subtilis, Clostridium perfringens, Klebsiella spp., Alcaligenes faecalis, Aeromonas spp. Were sown from water samples. Studies have shown that all isolated microorganisms have multi-resistance to one degree or another. But Escherichia coli, Pseudomonas aeruginosa, Enterococcus faecalis, and Alcaligenes faecalis had the greatest resistance to various antibiotics.*

Keywords: *environment, aquatic ecosystems, microorganisms, antibiotics, resistance*

Introduction

Infections caused by resistant organisms and the emergence of pathogenic and non-pathogenic bacteria with multidrug resistance are a global medical and environmental problem, since they increase morbidity and mortality, and reduce the effectiveness of treatment of infectious diseases [1, 2]. Various types of bacteria, antimicrobial substances and heavy metals mix in the environment, which contributes to the development and spread of antibiotic resistance [3]. Water plays a key role in these processes.

Many antibiotics are introduced into the aquatic environment with untreated wastewater and wastewater from treatment plants. In the form of micro-pollution, they enter surface and groundwater, potentially altering microbial ecosystems. The aquatic environment creates ideal conditions for the acquisition and spread of antibiotic resistance of microorganisms. The aquatic environment is not only a way of spreading antibiotic-resistant microorganisms among humans and animals, but also the way by which resistance genes are introduced into natural bacterial ecosystems [4, 5].

Most bacteria in natural aquatic ecosystems form biofilms that help them survive and spread. Biofilms are clusters of bacteria that live in a well-structured and organized community [6]. Biofilms contribute to the formation of antibiotic resistance, which is associated with a high density of cells and active horizontal gene exchange between them.

Antibiotics are sorbed by sediments, which function as an interface for a complex and dynamic community of microorganisms, facilitating the transfer, maintenance and spread of resistant microorganisms exposed to antibiotics [7, 8].

The sorption of antibiotics by bottom sediments slows down the processes of their biodegradation, which contributes to the long-term presence of antibiotics in the aquatic ecosystem. Antimicrobial agents are retained in sediment and soil through their association with soil chemicals. The spread of antibiotic-resistant bacteria in water sources is facilitated by the removal of manure to the fields, followed by washing away by rain streams [9].

Research methods

Water samples were taken from the Oka, Yachenka, Kaluzhka, Ugra rivers downstream of the city treatment facilities or the discharge of polluted wastewater. " Microbiological study of water was carried out in accordance with the methodological instructions MUK 4.2.1884-04 "Sanitary-microbiological and sanitary-parasitological analysis of surface water bodies"

Determination of the sensitivity of bacteria to antibiotics was carried out by the diffusion method using discs with antibiotics (table 1).

Table 1
List of antibiotics used

№	Name	Designation	№	Designation	Designation
1	Ofloxacin	OF	9	Levofloxacin	LFC
2	Clarithromycin	KTM	10	Phosfomycin	FOS
3	Benzylpenicillin	PEN	11	Tobramycin	TOB
4	Ciprofloxacin	CIP	12	Optokhin	OP
5	Cefoperazone	CPR	13	Lincomycin	LIN
6	Novobiocin	NB	14	Azithromycin	ARN
7	Tylosin	TLZ	15	Gentomycin	GENT
8	Doxycycline	DOC	16	Ampicillin	AMP
			17	Tetracycline	TETR

Results and discussion

In total, ten species of bacteria were isolated from the various samples analyzed. Among them are *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Enterococcus faecalis*, *Enterobacter aerogenes*, *Bacillus subtilis*, *Clostridium perfringens*, *Klebsiella* spp., *Alcaligenes faecalis*, *Aeromonas* spp. The total number of microorganisms in water from various sources ranged from 0.7×10^4 to 6.6×10^5 CFU/ml.

Most often, *Escherichia coli*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Bacillus subtilis* were seeded from water samples. The number of coliform bacteria ranged from 0.5×10^4 to 1.9×10^4 CFU/ml. The predominance of representatives of the intestinal microflora in river water indicates an intense anthropogenic, fecal pollution of aquatic ecosystems. These microorganisms negatively affect the bacteriological quality of water and can be pathogenic for humans and animals.

The isolated microorganisms, to one degree or another, have multiresistance to the investigated antibiotics (fig. 1). Among the antimicrobial agents tested, optoquin (OP) and ampicillin (AMP) had the highest bacterial resistance response (86.7% and 67.7%, respectively). They are followed by claritromycin (KTM), tylosin (TLZ), benzylpenicillin (PEN), lincomycin (LIN) and novobiocin (NB) with a lower bacterial resistance response. A low level of resistance in aquatic bacteria was noted in relation to ciprofloxacin (CIP), cefoperazone (CPR) and tobramycin (TOB).

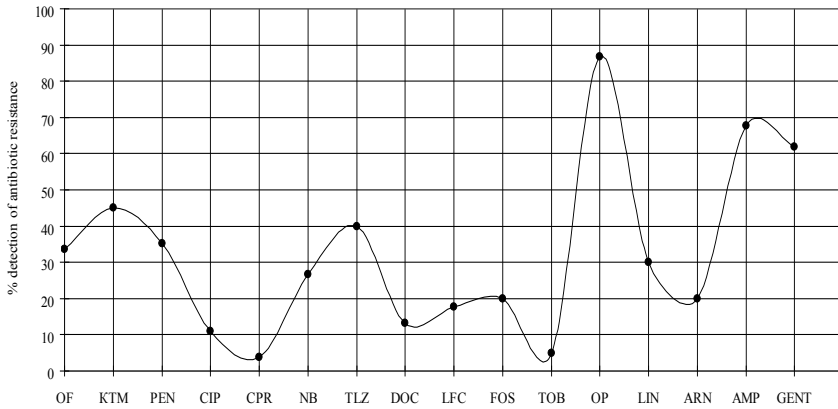


Fig. 1. Total resistance of aquatic microorganisms to antibiotics

Microorganisms of the intestinal group (*Escherichia coli*, *Pseudomonas aeruginosa*, *Enterococcus faecalis*, *Enterobacter aerogenes*, *Alcaligenes faecalis*) and *Staphylococcus aureus* were distinguished by the greatest resistance to antibiotics (fig. 2 a and b).

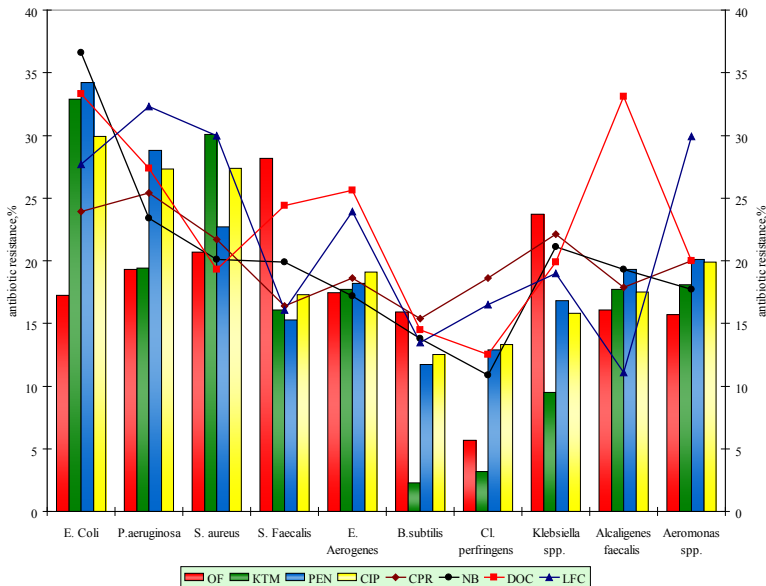


Fig. 2 a. Differential antibiotic resistance of aquatic bacteria

The widespread consumption of antibiotics and the development of resistant

bacteria are of great concern. Therefore, monitoring and surveillance programs, as well as further studies of environmental reservoirs, are needed to better understand the mechanisms of antibiotic resistance and develop management solutions to this serious problem.

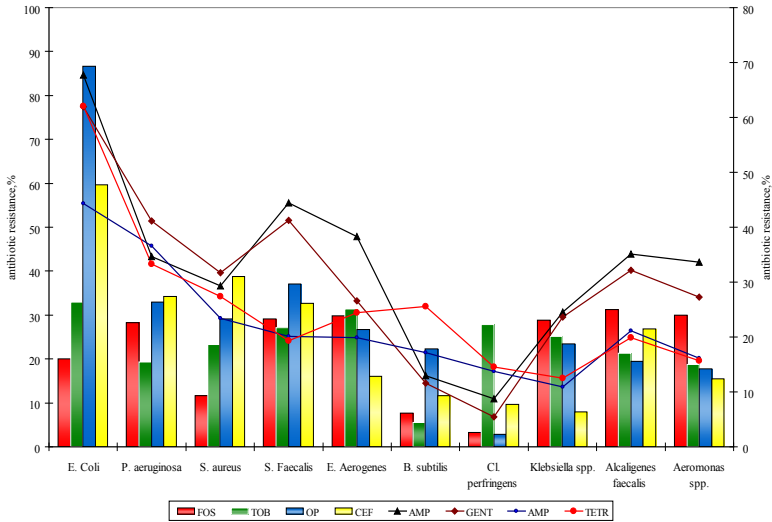


Fig. 3 b. *Differential antibiotic resistance of aquatic bacteria*

Conclusions

1. Antibiotic resistance is widespread among representatives of intestinal microflora and *Staphylococcus aureus* found in water samples from the rivers Oka, Yachenka, Kaluzhka, and Ugra.
2. All isolated microorganisms were characterized by multiple resistance to test antibiotics. The most common was the resistance of aquatic microorganisms to optochin, ampicillin, gentomycin, tetracycline.

References

1. *Antibiotic resistance – an increasing threat to human health. 2018.*
<https://antibiotic.ecdc.europa.eu/en/publications-data/antibiotic-resistance-increasing-threat-human-health>

2. Vaz-Moreira I., Nunes O.C., Manaia C.M. *Bacterial diversity and antibiotic resistance in water habitats: searching the links with the human microbiome* // *FEMS Microbiology Reviews*. 2014. V. 38. Issue 4. P. 761–778. <https://doi.org/10.1111/1574-6976.12062>

4. Callan A.C, Aitken B., Shearn R., Koenders A., Hinwood A. *Relationship between antibiotic resistance genes and metals in residential soil samples from Western Australia* // *Environ. Sci. Pollut. Res.* 2017. V. 24. P. 2484–2494. DOI 10.1007/s11356-016-7997-y

5. Kümmerer K. *Antibiotics in the aquatic environment – a review – part I* // *Chemosphere*. 2009. V. 75. P. 417-434.

6. Lykov I.N., Shestakova G.A. *Microorganisms: Biology and Ecology*. - Kaluga. Publishing house "SerNa". 2014. 451 P.

7. Lykov I.N. *Pharmaceutical pollution of the environment* // *Problems of regional ecology*. – 2020. – №3. – P. 23-27. DOI 10.24411/1728-323X-2020-13023

8. Nick G.H. Taylor, David W. Verner-Jeffreys and Craig Baker-Austin. *Aquatic systems: maintaining, mixing and mobilising antimicrobial resistance?* // *Trends Ecol. Evol.* 2011. V. 26. P. 278-284.

9. Heuer H., Schmitt H., Smalla K. *Antibiotic resistance gene spread due to manure application on agricultural fields* // *Curr. Opin. Microbiol.*, 2011. V. 14. P. 236-243 DOI: 10.1016/j.mib.2011.04.009

DOI 10.34660/INF.2020.60.75.018

局部麻醉狗前肢器官的方法
METHOD OF LOCOREGIONAL ANESTHESIA FOR ORGAN-PRESERVING OPERATIONS ON THE FORELIMBS IN DOGS

Voronova Maria Olegovna

Veterinarian

LLC "Biocontrol", Russia

Kornushenkov Evgenii Alexandrovich

Candidate of Biological Sciences, chief physician

LLC "Biocontrol", Russia

Vatnikov Yurii Anatolevich

Doctor of Veterinary Sciences, Full Professor, Director of the

Department of Veterinary Medicine RUDN University, Russia

抽象。 本文介绍了我们的经验，即在保存器官的前臂手术中伴有并发症的老年癌症犬中进行麻醉的方法已超过6年。 通过这种手术干预，在这一组患者中使用周围臂丛神经阻滞的方法和使用神经刺激器已显示出其有效性和安全性。 同样，我们得出的结论是技术和医师经验是成功的关键方面。

关键词：区域麻醉，神经刺激器，胸肢骨肉瘤，器官保存手术，犬癌骨科，生物植入物

Abstract. *The paper presents our experience in the approach to the conduct of anesthesia in elderly cancer dogs with concomitant complications during organ-preserving forearm surgeries over 6 years. The use of the method of peripheral brachial plexus blockade, with the use of a neurostimulator, has shown its effectiveness and safety with this surgical intervention in this group of patients. Also, we have come to the conclusion that technique and physician experience are key aspects of success.*

Keywords: *regional anesthesia, neurostimulator, osteosarcoma of the thoracic limb, organ-preserving operations, onco-orthopedics in dogs, bioimplant*

Introduction

Anesthesia during organ-saving operations requires a special approach, since many hours of interventions negatively affect the patient's condition. In this regard, in forearm surgeries, conduction or regional anesthesia is preferred as the main choice of anesthetic aid. The main advantages of which are determined by a

decrease in the need for systemic analgesics, control of postoperative pain relief, a decrease in the likelihood of postoperative nausea and vomiting, a decrease in respiratory depression and cardiac activity, blood loss during surgery due to a decrease in blood pressure, redistribution of blood flow to large vessels, and a local decrease in venous pressure [5]. However, the traditional "blind" method by anatomical landmarks accounts for 25-75% of success, because the success of the block development largely depends on the constitutional and anatomical characteristics of the patient and the skills of the anesthesiologist [2]. Therefore, accurate verification of the nerve trunks is required for successful conduction anesthesia. In this regard, we used a neurostimulator - an alternating flow generator with a given frequency measured in Hz (oscillations/second).

The aim of our study is to identify the most optimal technique for regional anesthesia in cancer patients with a high anesthetic risk.

Materials and methods

From 2013 to 2018, on the basis of Biocontrol Veterinary Clinic LLC, we performed 39 organ-preserving surgeries using a bioimplant as a replacement material, mainly the thoracic limbs, more than 50% of which is the distal forearm (n = 27). The main anesthetic risks: a comorbid geriatric patient with large blood loss, long-term surgery (3.5 to 6 hours, average 4.5 hours), consequences after chemotherapy.

As premedication, the animals received morphine 0.5 mg/kg and acepromazine 0.05 mg/kg. For induction into anesthesia, propofol was used for complete relaxation and intubation. Further, during the entire operation, sevoflurane MAK 2% was used as a hypnotic. Bupivacaine 0.5% at a dose of 2 mg/kg was used as the drug of choice for regional anesthesia of the forearm.

We used two methods to carry out the blockade. When using the "blind" method (n = 7), we counted a large percentage of unsuccessful blocks, so we decided to use the nerve stimulation technique for individual identification based on the characteristic twitching of the median, radial, ulnar and musculocutaneous nerves [3]. When switching to a new technique using a neurostimulator (n = 19), the percentage of successful blockades increased every year, which tells us that the doctor's skills are one of the key criteria for the success of a particular method [4].

We used the "Stimuplex HNS 12 neurostimulator with SENSE function" by B. Brown. "Stimuplex A" stimulating needles 50mm long, size 22G.

Patients who did not get blockade were transferred to intravenous analgesia. Constant rate infusions of ketamine and fentanyl were used as drugs of choice.

Results and discussion

Between January 2013 and December 2018, organ-preserving surgery on the distal forearm was performed on 27 animals. We carried out the blockade technique in the following way: we give an electrical stimulus close to the nerve (ul-

nar, radial, median and musculocutaneous) with a special needle and then observe the movements of the limb, which are innervated by this nerve. This requires a closed electrical circuit. In order to have a closed circuit, one electrode must go to the skin (by an ECG sensor). The second electrode is connected to a special needle for nerve stimulation. What is the difference between this needle. She has 2 lines: one of them is for supplying the solution, and the second carries the electrode. This needle is special, insulated, so the electrical signal can only come out from the very tip of the needle. This needle is not as sharp, so the potential for nerve damage is minimal. A syringe with an anesthetic is connected to the line intended for the solution and is filled. Then the electrode is connected to the device itself. We process the operating field, connect the electrode with the needle to the neurostimulator, the circuit is closed. The stimulating needle of the neurostimulator is inserted cranial to the acromion and medial to the subscapularis muscle. We start with high frequencies, because while we are looking for the nerve, this helps to create more impulse in the tissue, and so it is easier to find the nerve. I.e., at high frequencies (1.6 mA), we roughly look for where the nerve is, wait for the necessary muscle contractions, then we reduce the voltage by moving the needle in order to find the nerve at a lower frequency. When we go down to a frequency of 0.4 mA and observe the necessary movements, this means that we are close to the nerve, but not in it. While we are inserting the needle, we should see a constant contraction of the limbs, because if we do not see this, then the needle has shifted and we are not close to the nerve. When we lower the readings down to 0.4 mA, by this time we should not see contractions, otherwise it means that we are in a nerve and can damage it. Next, do not forget to conduct an aspiration test to make sure that we are not in the vessel and inject an anesthetic. With the introduction of anesthetic, we see how the contraction of the limb disappears. This means that the transfer of momentum has stopped due to the introduction of the solution [1]. Of these, in 19 patients, forearm block was used as the only method of analgesia during the intraoperative period. Eight patients received intravenous analgesia in addition to the block, which means that the regional anesthesia failure rate was 27%. In the period 2013-2014, the blockade technique was carried out in a "blind" method; the number of successful blocks was 45% (n = 7). In the period 2015-2017, the methodology has changed. Now, the blockade of the brachial plexus was performed under the control of a neurostimulator and the rate of successful cases was 67% (n = 9), and in 2017-2018 there were already 90% (n = 10). We estimate that the improvement in results in the last 2 years is associated with the acquisition of experience using the new methodology and this is an important aspect in the implementation and evaluation of the effectiveness of new methods.

Conclusions

Thus, we have clinically proven that the classical "blind" method of brachial

plexus conduction anesthesia, where the success rate was 45%, is inferior to the method of brachial plexus blockade using a neurostimulator, which has shown its effectiveness of up to 90%. This method can increase the accuracy of local anesthesia with bupivacaine 0.5% at a dose of 2 mg/kg, with blockade of the brachial plexus in dogs and thereby reduce anesthetic risks during prolonged (up to 6 hours) traumatic operations in elderly animals with concomitant complications, which makes affordable development of oncoorthopedics in veterinary medicine.

The increase in positive blockades in the group of nerve stimulation techniques from 67% to 90% in 4 years tells us that the perfection of the application of techniques always depends on the confidence and skills of the doctor, therefore constant practice is an integral part of success.

References

1. Peter Cronen. *Vasta: 3 training module. Locoregional anesthesia. Moscow 2019, P. 68-72.*
2. Iwao Sakonju, Kenichi Maeda, Ryoko Maekawa, Rie Maebashi, Tomoko Kakuta and Katsuaki Takase. *Relative Nerve Blocking Properties of Bupivacaine and Ropivacaine in Dogs Undergoing Brachial Plexus Block Using a Nerve Stimulator. 2009 Volume, 71 Issue, pages 1279-1284;*
3. Pablo E. Otero & Diego A. Portela. *Small regional Anesthesia; Inter-Medica, Argentina, 2018, pages 60-68;*
4. Perris T.M., J.M. Watt *The road to success: A review of 1000 axillary brachial plexus blocks; Anaesthesia peri-operative medicine, critical care and pain; Volume 58, Issue 12, December 2003, pages 1220-1224;*
5. Stock, MC., Barash, PG., Cullen, BF., Stoelting, RK., & Cahalan, M. *Handbook of Clinical Anesthesia, Seventh Edition. Wolters Kluwer Health/Lippincott Williams & Wilkins. March, 2013, page 1792;*

DOI 10.34660/INF.2020.19.24.019

不同年龄母牛的产奶量
MILK PRODUCTIVITY OF COWS OF DIFFERENT AGES

Fedoseeva Natalya Anatolyevna

Doctor of Agricultural Sciences, Associate Professor

Peryshkina Ekaterina Sergeevna

undergraduate

Migacheva Olga Sergeevna

undergraduate

Russian State Agrarian Correspondence University

Balashikha, Russia

抽象。为该国人口提供乳制品的问题的解决方案在很大程度上取决于奶牛养殖的有效性，即对其潜力的最充分利用。母牛的年龄是影响产奶量的重要生理因素之一。该研究的目的是确定梁赞州“Plemzavod” Dmitriev “Kasimovsky区”不同年龄母牛的产奶量。作为研究的起始材料，使用了在“Plemzavod” JSC中获得的动物技术注册信息。梁赞州卡西莫夫斯基区的“德米特里耶沃”，在那里养育了荷斯坦化的黑白牛。研究是通过每种研究因素的动物分组，然后对数字材料进行数学处理来进行的。通过泌乳获得的不同年龄的黑白花黑白奶牛的牛奶生产率的数据表明，第二次泌乳的母牛观察到305天的最大产奶量（6825公斤牛奶，4.05和3.36%），比普通小母牛多452公斤牛奶，0.05%的脂肪和0.02%的蛋白质。同时，牛奶生产率的终生指标从1次泌乳增加到6次泌乳，只有7次泌乳会降低牛奶生产率。在六次泌乳的母牛中观察到了最高的终生产奶量。牛群中有超过40吨牛奶被挤奶。因此，在梁赞州卡西莫夫斯基区的股份公司“Plemzavod Dmitriev”，荷斯坦化的黑白母牛在六次泌乳期将具有最高的终生生产力。

关键词：牛奶产量，脂肪质量分数，蛋白质质量分数，泌乳，母牛的年龄，品种。

Abstract. *The solution to the problem of providing the country's population with dairy products largely depends on the effectiveness of dairy farming, the fullest use of its potential. The age of cows is one of the important physiological factors affecting milk production. The purpose of the study is to determine the milk productivity of cows of different ages in JSC "Plemzavod" Dmitriev "Kasimovsky district of Ryazan Oblast. As a starting material for the research, the information*

of zootechnical registration was used, obtained in JSC "Plemzavod" Dmitriev "of the Kasimovsky district of Ryazan Oblast, where Holsteinized black-and-white cattle are bred. The studies were carried out by grouping animals for each of the studied factors, followed by mathematical processing of digital material. The data obtained on the milk productivity of Holsteinized black-and-white cows of different ages by lactation indicate that the maximum milk yield in 305 days is observed in cows in the second lactation (6825 kg of milk, 4.05 and 3.36%), which is 452 kg of milk, 0.05% fat and 0.02% protein more than the average heifer. At the same time, lifelong indicators of milk productivity increase from 1 lactation to 6 lactation and, only 7 lactation, there is a decrease in milk productivity. The highest lifetime milk productivity is observed in cows with six lactations. There are cows in the herd that have milked more than 40 tons of milk. Thus, in JSC "Plemzavod "Dmitriev" of Kasimovsky district of Ryazan Oblast, Holsteinized black-and-white cows will have the highest lifelong productivity at six lactations.

Keywords: *milk yield, mass fraction of fat, mass fraction of protein, lactation, age of the cow, breed.*

Introduction

The solution to the problem of providing the country's population with dairy products largely depends on the efficiency of dairy farming, the fullest use of its potential [5].

The age of cows is one of the important physiological factors affecting milk production [1,4,10]. The influence of the age of cows on milk production is determined by their individual characteristics. With the general growth and development of the whole organism, especially the mammary gland, the milk production of animals increases. Upon reaching a certain maximum due to the subsequent aging of the body, it begins to fall.

The results of many studies indicate that Holsteinized black-and-white cows can maintain milk productivity at a high level with a long period of use [8, 9].

Purpose of the study - to determine the milk productivity of cows of different ages in JSC "Plemzavod" Dmitriev "Kasimovsky district of Ryazan Oblast.

Research methods

As a starting material for the research, the information of zootechnical registration was used, obtained in JSC "Plemzavod" Dmitriev "of the Kasimovsky district of Ryazan Oblast, where Holsteinized black-and-white cattle are bred.

The level of milk yield, mass fraction of fat and protein in milk was established according to the results of monthly control milking for two adjacent days. The milk yield per month was determined by multiplying the daily milk yield of the control milking by the number of days in a month, and the milk yield for 305 days of lactation by the sum of the milk yield per months in accordance with the Rules for Evaluating the Milk Productivity of Dairy Cows SNPplem R-23-97.

The mass fraction of fat and protein in milk samples was determined based on the results of monthly control milking in a certified laboratory for selection control of milk quality.

The studies were carried out by grouping animals for each of the studied factors, followed by mathematical processing of digital material.

Research results and their discussion

Table 1 shows data on milk productivity of Holsteinized black-and-white cows of different ages for lactation. The maximum milk yield in 305 days with a high content of mass fractions of fat and protein is observed in cows in the second lactation (6825 kg of milk, 4.05 and 3.36%), which is 452 kg of milk, 0.05% of fat and 0.02% more protein than the average of first-calf cows.

Table 1. Milk productivity of cows of different ages

Lactation	Number of heads	Full milk yield, kg	Productivity in 305 days				
			milk yield, kg	fat		protein	
				%	kg	%	kg
1	306	6986	6373	4,00	280	3,34	233
2	242	7277	6825	4,05	296	3,36	245
3	122	7073	6773	4,02	285	3,35	237
4	88	7209	6788	4,02	293	3,34	243
5	30	6954	6456	4,00	278	3,34	231
6	23	6794	6167	4,02	274	3,35	228
7	5	6332	5249	4,02	253	3,35	211

When comparing the best indicators for 2 lactation with data for 7 lactation with the number of heads -5, then the milk yield in cows decreased by 1576 kg, the content of mass fractions of fat by 0.03% and protein by 0.01%.

One of the main features affecting the breeding process, the quantitative and qualitative growth of the herd, the life-long milk yield and economic indicators of the dairy farming industry is the duration of the economic use of cows. The economic life of individual animals under the same conditions of feeding and keeping varies within a very wide range. Some animals reduce fertility and productivity early and for this reason are culled from the herd at a relatively young age. At the same time, many animals retain their economic qualities at a high level for a long period and remain in the herd for a long time. Lifetime indicators of productivity are presented in table 2.

Table 2. Lifetime indicators of milk production

Lactation	Number of heads	Period of productive use, days	Lifetime productivity on average for 1 head, kg			
			full milk yield	milk yield in 305 days	milk fat	milk protein
1	148	434	7446	6449	298	248
2	130	819	14195	12985	569	480
3	75	1195	20385	19254	811	685
4	63	1593	28625	26925	1149	953
5	19	2001	31259	29292	1249	1029
6	18	2423	39280	37119	1607	1298
7	4	2939	37552	35216	1539	1230

Table 2 shows that lifelong indicators of milk productivity increase from 1 lactation to 6 lactation and only 7 lactation leads to a decrease in milk productivity. The highest lifetime milk productivity is observed in cows with six lactations. This is consistent with the studies carried out by I.P. Baranova [2], N.D. Vinogradova [3], M.V. Kukina [6] and K.S. Mekhtiyeva [7].

There are cows in the herd that have milked more than 40 tons of milk (Table 3). For example, the cow Sputnik 175 for 5 lactations milked 63897 kg of milk, 2553 kg of milk fat and 2087 kg of milk protein. It should be noted that the milk yield of a younger cow Svetlitsa 2230 for three lactations was 40645 kg of milk, 1569 and 1349 kg of milk fat and protein. Among the best cows in terms of life-long productivity are mainly the daughters of Leningrad breeding bulls Bubenchik 712 bred in the "Petrovsky" breeding farm, Peach 3601 bred in "Lesnoye" breeding farm.

Table 3. Best cows in terms of lifetime productivity

Name and № of the cow	Date of Birth	Name and № of the father	Age in lact.	Lifetime productivity, kg		
				Milk yield, kg	Fat, kg	Protein, Kg
1	2	3	4	5	6	7
808 Murzilka	24.02.07	Graf 4742	5	40413	1649	1326
2230 Svetlitsa	09.02.10	Bubenchik 712	3	40645	1569	1349
8555 Akatsiya Aks	08.08.10	Fels 462090	4	40835	1601	1360
100 Nalyvka	10.02.07	Persik 3601	6	41158	1708	1354

2113 Gospozha	07.11.09	Bubenchik 712	4	41192	1664	1368
603 Vyatka	30.11.08	Persik 3601	6	41331	1662	1360
763 Zhdanka	28.01.06	Lazurit 632844	7	41401	1689	1354
2069 Gubka	17.07.09	Drozd 889	5	42710	1696	1409
2158 Chereshnya	08.12.09	Bubenchik 712	4	42788	1699	1421
856 Volzhanka	19.06.06	Lazurit 632844	7	43371	1822	1418
373 Prima	02.03.08	Persik 3601	6	44245	1827	1482
9001 Khrizantema	05.05.06	Lazurit 632844	6	44866	1898	1463
235 Rosynka	01.03.08	Persik 3601	6	45056	1793	1496
1608 Zorka	03.10.09	Lombardo 61740360	5	46471	1826	1533
487 Ulovka	05.04.08	Persik 3601	6	47422	1973	1598
31 Mozaika	10.12.07	Persik 3601	6	53479	2177	1760
900 Metelica	29.04.06	Lazurit 632844	6	56846	2410	1876
175 Sputnitsa	03.04.08	Persik 3601	5	63827	2553	2087

Thus, in order to improve the economic indicators of the economy, it is necessary to increase the milk yield not only for lactation, but also for the entire period of the productive life of animals. A high lifetime milk yield characterizes the strength of the constitution, the health and longevity of cows.

Conclusions

Thus, in JSC "Plemzavod "Dmitriev" of Kasimovsky district of Ryazan Oblast, Holsteinized black-and-white cows will have the highest lifelong productivity at six lactations.

References

1. Babina, A. V. *Influence of the age of cows on their milk productivity in ZAO PZ "Petrovsky" [Text] / A. V. Babina // Coll. sci. pap. int. sci.-pract. conf. of young scientists.- 2017.- P. 115-119.*
2. Baranova, I. P. *Influence of the age of cows on their milk productivity [Text] / I. P. Baranova // Coll.: Scientific support of agro-industrial production - mat. int. sci.-pract. conf. - 2014.- P. 138-141.*

3. Vinogradova, N. D. *Productive longevity of Holsteinized black-and-white cows [Text]* / N. D. Vinogradova, R. V. Paderina // *Bulletin of the St. Petersburg State Agrarian University.*-2014.-№36.-P.71-75.

4. *The influence of the age of cows on their milk production [Text]* / V. A. Gusakov, M. E. Zherebtsov, E. A. Derevyanko, A. K. Kozina, K. S. Mekhtieva // *Forum of Young Scientists.*- 2017.- № 12 (16).- P. 522-524.

5. Dankvert, A. *The level of milk consumption - the health of the nation [Text]* / A. Dankvert, T. Japaridze // *Dairy and meat cattle breeding.*-2010.-№2.-P.2-5.

6. Kukina, M. V. *Influence of the age of cows on milk productivity [Text]* / M. V. Kukina, N. D. Vinogradova // *In coll.: Knowledge of young people for the development of veterinary medicine and the agro-industrial complex of the country.- mat. int. sci. conf. of students, graduate students and young scientists.*- 2019.- P. 147-148.

7. Mekhtieva, K. S. *Influence of the age of black-and-white cows on their milk productivity [Text]* / K. S. Mehtieva, T. V. Lepekhina, A. S. Shilyaeva // *coll.: Scientific research of higher education.- int. sci.-pract. conf.- 2019.- P. 62-64.*

8. Mungalova, T. N. *Influence of the age of cows on their milk productivity [Text]* / T.N. Mungalova, M.M. Shkuropatsky // *Bulletin of the Altai State Agrarian University.*- 2003.-№ 2 (10).- P. 266-268.

9. Omelkova, A. O. *Influence of the age of cows on their milk productivity [Text]* / A. O. Omelkova // *Youth and Science.* - 2016.- № 3.- P. 64.

10. Safonov, S. L. *Theoretical aspects of the duration of the economic use of cows in dairy cattle breeding [Text]* / S. L. Safonov, B. A. Rybkin // *Bulletin of the St. Petersburg State Agrarian University.*-2011.-№24.-P.99-102

DOI 10.34660/INF.2020.33.73.020

干燥粪便第一阶段的设备

DEVICE FOR THE FIRST STAGE OF DRYING MANURE

Gusev Valentin Alexandrovich

Candidate of Agricultural Sciences, Lead Research Officer,

Sysoeva Inna Grigorievna

Chief Specialist

Zazykina Liubov Alexandrovna

Candidate of Economic Sciences, Senior Research Officer

All-Russian Research and Technological Poultry Institute of Russian Academy of Sciences

Sergiev Posad, Russia

抽象。 该文章证实了季节或全年需要烘干笼式电池中产蛋母鸡的一部分或全部垃圾。 给出了将粪便干燥过程分为两个阶段的便利性的解释。 第一步是将粪便机械脱水至一定的水分含量。 第二阶段是产品的热脱水，这不会对环境构成威胁。 介绍了实验数据，进行的实验以及对滴落干燥第一阶段开发的设备的说明。

关键词：家禽养殖，粪便处理，压榨，副产品

Abstract. *The article substantiates the seasonal or year-round need for drying a certain part or all of the litter from laying hens contained in cage batteries. An explanation of the expediency of dividing the process of drying manure into two stages is given. The first stage is mechanical dehydration of the manure to a certain moisture content. The second stage is thermal dehydration of the product, which does not pose a threat to the environment. Experimental data, performed experiments and a description of the developed device for the first stage of dropping drying are presented.*

Keywords: *poultry farming, dung processing, press, by-products,*

Introduction

The ecological situation around modern poultry farms is deteriorating every year. Every year the number of produced edible eggs is increasing, and the number of egg poultry farms is decreasing. For example, in 2009 there were 284 poultry farms, and by 2019 there were 197.

If earlier there was an uneven distribution of the poultry population on the territory of Russia (based on arable land), now this unevenness is aggravated. The volume of production of eggs, and droppings too, at the remaining poultry farms increased by 1.5-3 times. For example, at the Borovsk poultry farm of the Tyumen Oblast, the production of edible eggs 3,000,000 pieces per day and droppings of more than 600 tons.

Materials and methods

The production of "droppings" increases, and the amount of arable land closest to the farm remains the same or in "many" cases is reduced. The land around the poultry farms is transferred to those most in need, for example, for garden plots. After a short period of time, there is an "explosion" of the problem associated with the existence of an unpleasant odor from bird droppings. Complaints are written, checks begin, heavy fines are issued.

To avoid environmental pollution, it is necessary to transport the droppings over long distances. It is not economically viable to transport raw manure with about 30% dry matter over long distances. It is even more unprofitable to transport compost on the basis of droppings, since for its production it is required to bring to the poultry farm a mass of peat that is almost equal to the initial mass of droppings.

Most of the research has led to the conclusion that it is necessary to dry manure for long distance transportation.

In England [1], before thermal drying, they tried to dehydrate manure by mechanical method, by adding water to it, thoroughly mixing it with compressed air, passing it through a certain set of sieves, settling and pressing on press rolls to a moisture content of 50-60%.

From our point of view, the result is good, but the authors, instead of improving the mechanical method for dehydrating the droppings, were carried away by drying it with ultra-high frequency (UHF) energy. As a result, an excellent by-product was obtained, in which all nutrients, including amino acids, are almost completely preserved, since the drying process takes place at relatively low temperatures of about 80-120°C.

It can be used as a feed additive, but veterinary questions arise. On the other hand, this method of drying manure turned out to be very costly due to the high cost of powerful UHF generators of the order of 25, 50 kW and was not widely used. Therefore, in most cases, a one-stage drying of manure is used by a thermal method - by evaporation of moisture. However, evaporation of moisture and subsequent purification of vapors from 75% to 10-14% is also a high-cost process.

Drum drying is the most widespread in our country and abroad. For example, at the Borovsk poultry farm, drum dryers are used. Table 1 shows the consumption of liquid fuel and heat energy depending on the initial moisture content of raw manure per 1 ton of dry manure.

Table 1. Consumption of thermal energy of liquid fuel per 1 ton of dry manure in drum-type installations, depending on the moisture content of the feedstock

Initial moisture content of raw manure, %	The amount of raw materials required for the manufacture of 1 ton of dry manure	Amount of water requiring evaporation, kg	Liquid fuel consumption, kg
90	8600	7600	555
80	4300	3300	241
73	3185	2185	160
65	2457	1457	105
50	1720	720	53
40	1433	433	32
30	1229	229	17

Note – moisture content of the final product (dry manure) – 14%

It can be seen from the table that 53 kg of liquid fuel must be consumed for drying manure with a moisture content of 75%, and 160 kg for drying it from 73%, i.e. about 3 times more. Therefore, it is more expedient to divide the process of dehydration "drying" into 2 stages: the first stage is mechanical dehydration from 70% -75% to 50-55% humidity and the second stage is thermal dehydration from 50-55% humidity to 10-14%

Research results

Therefore, the main operation for processing poultry manure for its cost-effective use is its separation into solid and liquid fractions, that is, dehydration.

From one ton of manure it is possible to mechanically remove 360 liters of liquid fraction with energy consumption for the entire dehydration process from 70% to 20%, approximately 2 times less than for removing liquid fractions from the manure by the thermal method (evaporation).

Table 2. The results of pressing the manure with a press

Pressure, kgf/cm ²	Liquid fraction yield, %	The rest of the solid fraction, %	Solid fraction moisture, %
13	16,2	83,8	62,5
26	24,8	75,2	59,5
52	31,4	68,6	56,9
78	34,3	65,7	55,1
91	35,7	64,3	54,0
104	36,2	63,8	53,7

Note: moisture content of liquid fractions 95-97%

Based on the research results, a new design of a press for the first stage of dehydration of poultry manure was developed (figure 1).

The device consists of a filter conveyor and a pressure conveyor located above it, at an acute angle, as well as a loading device and a device for removing sediment. Drive and tension drums, control panel. It is equipped with an additional hopper for coarse plastic material with a particle size of 3 ... 10 mm and a dispenser located in front of the hopper for poultry manure with a dispenser.

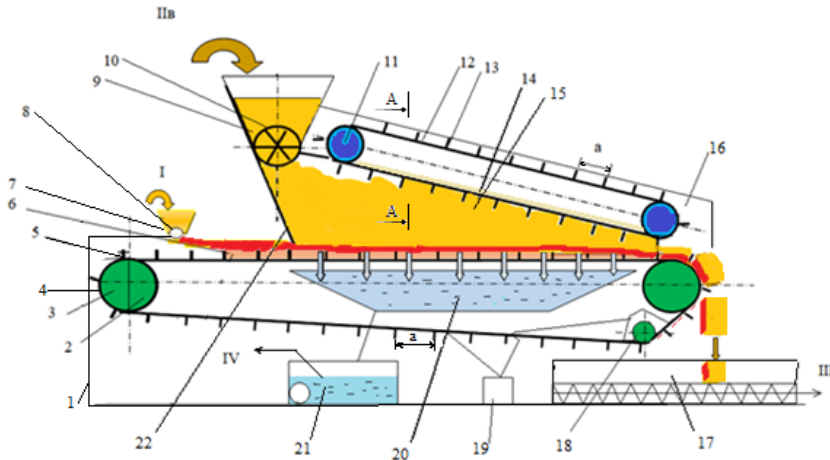


Figure 1. Conveyor press for manure dewatering contains: frame 1, placed on it a filtered conveyor 2 with a body 3, with a perforated filter belt 4, to it, sharp ribs 5 and a perforated support plate 6 are fixed, paired with a perforated belt 4; hopper 7 for straw (pulp) and with a dispenser 8, located in front of the hopper 9 for poultry droppings with a dispenser 10; a pressure conveyor 11 with a continuous belt 12 and rigidly, perpendicular to it, fixed by sharp ribs 13 and a support solid plate 14, paired with a continuous belt 12, side plates 15, hermetically attached to the bodies 3 and 16; a container 17 for collecting the compressed solid fraction of a mixture of poultry manure with coarse material; a unit for cleaning the perforated belt of the filter conveyor in the form of a chamber with a roller 18, which ensures the bending of the belt, and with the supply of compressed air impulses from the compressor 19, a bath 20 for collecting the liquid fraction of the suspension, located between the working and return branches of the filter conveyor belt and connected to the container for short-term storage of the liquid fraction of the suspension 21, front plate 20, hermetically connected to the side plates 15

In the proposed device, the function of a pre-filter to reduce the moisture content of poultry droppings is performed by constantly replaced straw (pulp), which is a useful ingredient in a mixture with the solid fraction of poultry droppings. Since the period of pressing the poultry droppings is short - it is 2 ... 3 minutes, because micro-holes (pores) in the crushed straw do not have time to clog up with particles of fine material - poultry droppings, and the liquid is passed through. Unlike other methods, the need for the consumption of auxiliary material for dehydration of poultry manure is 3 ... 7%.

This device received an invention patent № 2728467 "Conveyor press for dewatering poultry droppings."

The developed press can operate in a production line with a productivity of 10 - 15 t/h.

References

1. Malofeev, V.I. *Technology of waste-free production in poultry farming.* – M.: Agropromizdat, 1986 – 176 P.
2. *Environmental technologies for the prevention of local environmental pollution by wastes of poultry farms / Fisinin V.I. and et al. – 2018 – Raleigh. – 118P.*
3. *Patent № 2728467 Conveyor press for dewatering poultry manure № 2019145028: app. 30.12.2019: publ. 29.07.2020 / Gusev V.A., Zazykina L.A., Fisinin V.I., Efimov D.N., Kavtarashvili A.Sh., Sysoeva I.G. et al.; applicant, patentee of the Federal Research Center "VNITIP" of the Russian Academy of Sciences and the limited liability company "Scientific and Production Organization" Stimul-INK "*

在赫里福德公牛的饲养中使用饲料添加剂

USE OF FEED ADDITIVES IN THE REARING OF HEREFORD BULLS

Pristupa Vasily Nikolayevich

Doctor of Agricultural Sciences, Full Professor

Don State Agrarian University

Torosyan Diana Sergeevna

Chief Zootechnician

LLC "Agropark-Razvilnoe"

Babkin Oleg Aleksandrovich

Candidate of Agricultural Sciences, Associate Professor

Don State Agrarian University

抽象。饲料添加剂“Valopro”和“Ruprokol”对在LLC“Agropark”工业园区中从9到18个月大的赫里福德公牛犊生长能量的变化和肉生产率形成的影响罗斯托夫地区的“Razvilnoe”，使用自动喂食器并吃大量的粗饲料和浓缩饲料。在第一个实验组的公牛和第二个实验组的公牛中，将饲料添加剂“Valopro”以每天每头每天20克的速度添加到主要饮食中273天，添加到饲料添加剂“Ruprokol”中“—每头每天每天50克，第一天的日增重为1758–1500克，第二天–1670–1461克，比对照动物高200–300克。实验性公牛显示血液中总蛋白和葡萄糖含量更高，以及乳酸脱氢酶和 γ -谷氨酰转肽酶含量更高，这有助于降低瘤胃中淀粉的降解并增强肌肉组织的合成。在实验组的公牛中进行对照屠宰时，配对car体的平均重量为371和347 kg，比具有屠宰率的对照同龄人的体重分别降低了60%和36 kg。在第一和第二实验组的公牛cas体中，脂肪组织的质量分别为4和4.5 kg，而肌肉组织的质量比对照组的同龄人高60和54 kg。同时，实验性公牛的the体骨骼，软骨和肌腱的产量最低，这为它们提供了更高的肉质指数。实验组和对照组的牛犊生产牛肉的获利水平分别为13.4%，11.8%和10.1%。

关键词：赫里福德犬种，饲料添加剂，生长能量，屠宰前体重，盈利能力。

Abstract. *The influence of feed additives "Valopro" and "Ruprokol" on the change in the energy of growth and the formation of meat productivity in the Hereford bull calves when they are raised from 9 to 18 months of age in the industrial complex of LLC "Agropark-Razvilnoe" of the Rostov region, using self-feeders and eating plenty of coarse and concentrated feed. The addition of the*

feed additive "Valopro" to the main diet for 273 days at the rate of 20 grams per head per day to the bulls of the first experimental group, and to the bulls of the second experimental group of the feed additive "Ruprokol" - 50 grams per head per day contributed to the daily gain in the first at the level of 1758-1500 g, in the second - 1670-1461 g, which is 200-300 g higher than the control animals. Experimental bulls showed a higher content of total protein and glucose in the blood, as well as the enzymes lactate dehydrogenase and gammaglutamyl transpeptidase, which contributed to a decrease in starch degradation in the rumen and an intensification of muscle tissue synthesis. With the control slaughter in the bulls of the experimental groups, the weight of the paired carcass averaged 371 and 347 kg, which is 60 and 36 kg more than that of the control peers who have a slaughter yield by 5 and 3% lower. In the carcasses of bulls of the first and second experimental groups, the mass of adipose tissue is 4 and 4.5 kg, and muscle tissue is almost 60 and 54 kg more than in the peers of the control group. At the same time, the lowest yield of bones, cartilage and tendons from the carcass was noted in experimental bulls, which provided them with a higher meat index. The level of profitability of beef production from bull calves of the experimental and control groups was at the level of 13.4; 11.8 and 10.1%, respectively.

Keywords: Hereford breed, feed additives, growth energy, pre-slaughter weight, profitability.

Introduction

The increase in beef production is one of the most pressing problems of the agro-industrial complex of our country, since its demand is still satisfied on average in Russia by 64%, and in the Rostov region by 52%. To some extent, it is possible to compensate for the missing needs for beef by intensifying the rearing of the available young stock and increasing the number of beef cattle [2, 6, 8]. By 2025, according to Kh. A. Amerkhanov [1], the Russian Federation has set a task to increase the number of specialized beef cattle up to 10 million heads and in this cattle breeding industry it is necessary to receive at least 95 calves per 100 cows, as well as at least 600 kg of live weight at the age of 15-16 months. Using large industrial complexes for this, which will contribute to providing the population with livestock products at the expense of domestic production [3, 7, 10].

The intensification of production and an increase in productivity is accompanied by age-specific patterns of animal nutritional requirements and an increase in the efficiency of feed use. According to N.G. Makartseva [5], young cattle up to one year of age most intensively use feed nitrogen, this ensures maximum protein synthesis in the body and the growth of muscle tissue. With age, the protein content in the growth of young animals decreases, but the level of fat deposition increases almost 7 times. At the same time, the energy of growth of live weight

decreases and the activity of gluconeogenesis and glucose in the blood decreases. Glucose deficiency, especially with a high level of concentrates in the diet, can lead to fatty degeneration of the liver. Various premixes and feed additives containing biologically active substances can be used as protective factors in animal diets [4, 9]. They contribute to the maintenance of microbiocenosis in the rumen, stimulate the breakdown of fiber and synthesis of glucose, prevent fermentation and decomposition of protein components in the rumen and increase their availability for further metabolism. Their use increases the efficiency of feed protein use, reduces the concentration of urea and contributes to an increase in blood glucose and live weight of young animals [4, 5, 6, 9].

The production of beef in Russia is carried out by reproductive and fattening agricultural enterprises. The first ones produce and raise pedigree and marketable young animals under conditions, most often, of stall-pasture technology with the growth energy of young animals up to 900 grams per day. In order to obtain a pre-slaughter live weight of more than 550 kg at 18-20 months of age, it is advisable to supply over the replacement young stock of these enterprises for growing up in industrial fattening complexes.

The purpose of the study was a comparative assessment of the growth, development and meat productivity of Hereford bulls when feeding them with the main diet of feed additives "Valopro" and "Ruprokol" in the conditions of the industrial feeding complex of LLC "Agropark-Razvilnoe" in the Rostov Oblast.

Material and methodology

After acclimatization of young animals to the conditions of the complex, we formed 20 heads for the experiment, three groups of 9-month-old Hereford bulls. The bulls of the first (1) experimental group in the mixture of concentrates receive the feed additive "Valopro" at the rate of 20 grams, the bulls of the second (2) - receive the feed additive "Ruprokol" - 50 grams per head per day. The bulls of the control (3) group did not receive feed additives. The bulls of the experimental and control groups were kept loose in light-type premises with free access to the walking-feeding area. On it, under a canopy, they used water from drinking bowls, and from self-feeders they ate roughage (barley and pea straw, herb and alfalfa hay) and a mixture of concentrates (chopped barley and corn 40% each and wheat 20%). In addition, during 9 months of rearing, the calves of the experimental groups, in addition to the main diet, were added feed additives "Valopro" and "Ruprokol" to the mixture of concentrates.

The composition of the diet of the bulls in the experimental and control groups was identical. They, depending on live weight and daily gain, consumed on average 9.2-14.7 kg of dry matter and 95-145 MJ of metabolic energy per head per day. The account of food consumption and uneaten food residues was determined by the group method, weekly when changing food in self-feeders. The age dy-

namics of live weight and growth energy was determined on the basis of monthly weighing of bulls on electronic scales, as well as during setting up for experiment and before their slaughter. In the middle of the experiment, 3 bulls from each group were taken into account during the day the length of time for them to perform ethological actions, and from 5 bulls of each group blood samples were taken from the jugular vein for biochemical studies.

At the age of 18 months, 5 bulls were selected from each group according to the VIZ method for control slaughter, in order to take into account the carcass weight, internal fat yield, slaughter yield and morphological composition of the carcass. According to the comparison of the cost of feed, labor, energy resources and other costs with the receipt of funds from their sale for slaughter, the effectiveness of the use of feed additives when rearing bull calves was determined.

Research results and discussion

9-month-old bulls of the experimental and control groups in a feeding complex with free access and eating feed ad libitum, they ate for almost 7 hours and chewed feed for more than 10 hours a day. At the same time, bulls of the control and the first experimental groups spent almost the same amount of daily time on feeding and chewing it. Peers of the second experimental group were inferior to them in these actions of daily behavior by almost 7%, but they were resting 8-22% more while standing and moving around the pen. However, bulls from the experimental and control groups spent 17.6% (4.2 hours) of their daily time on sleep. When performing other considered behavioral actions, no significant differences between the bulls of the analyzed groups were noted. This indicates that the ethology of animals in equal conditions of keeping and feeding ad libitum does not cause any significant differences in behavior. In addition, they did not show any negative rank relationships in choosing a place of rest, or a place at a self-feeding trough, even with a new supply of feed.

Considering that with the "Valopro" feed additive, bulls of the first experimental group additionally received as active ingredients: zinc sulfate 371 mg, manganese sulfate - 372 mg, cobalt acetate - 2 mg, sodium sulfate - 3.1 g, calcium carbonate - 1, 6 g and tonins - 764 mg. The ions of these components, maintaining the constancy of the environment in the rumen at pH 6.4-7.5, stimulate the reproduction of microflora, increase fermentation and obtain energy from complex carbohydrates contained in fiber. These processes contributed to the acceleration and better absorption of nutrients from the feed. As a result, over a 9-month period of rearing (273 days), bulls of the first experimental and control groups consumed an average of 11.5 kg, and in the second experimental - 10.6 kg of dry matter per head per day. In addition, in the bulls of the experimental groups, due to the higher consumption of minerals, tannins, essential oils, choline chloride, metabolic processes, the synthesis of B vitamins, the use of free fatty acids of the rumen for

energy generation and the prevention of fat accumulation in the liver proceeded more actively. At the same time, tannins interacting with proteins, enzymes, sugars and cell walls of microorganisms form complexes with stable feed proteins and keep them from destruction in the rumen. They are destroyed and absorbed in the abomasum and intestines at pH less than 5, which causes a decrease in the activity of proteolytic microorganisms and the production of ammonia [https://f8f.by/item_valopro].

In addition, rumen microorganisms used non-protein nitrogen of feed to form protein of their own cells, which was then used to form animal protein, which contributed to an increase in the productivity of experimental bulls (table 1).

Table 1. Change in growth energy of Hereford bulls

Age, days.	Group (n = 20 per group)					
	Live weight, kg			Daily gain, g		
	1	2	3	1	2	3
274	221±	222±	222±	-	-	-
365	381±	374±	364±	1758±15	1670±	1560±11
456	5245,4**	512±	492±	1582±16	1516±	1406±12
547	6616,2**	645±	601±	1500±15	1461±	1198±16

*P≤0,05; **P≤0,01

Intensified digestive and metabolic processes with feed additives resulted in significant superiority in growth energy, absolute gain and live weight in the bulls of the experimental groups, in comparison with their peers in the control group. The average daily gain of the experimental bulls of the first group during all days of the reference period did not fall below 1500 grams and was 62 ... 296 grams higher than that of the peers of the second experimental and control groups. Therefore, the average growth energy for the former was 1611, for the latter - 1549, and for the third - 1315 g per head per day.

Already after 3 months of growing under the conditions of the complex, the reliability of the lag in live weight in the bulls of the control group constantly increased. At the end of the experiment (age 18 months), the bulls of the first experimental group had an average live weight of 661 kg, or 16 and 60 kg, respectively, higher than that of the peers of the second experimental and control groups (P≤0.01). Considering that the main diet and conditions of keeping the bulls of all groups were identical, therefore, the higher growth energy and live weight of the bulls of the experimental groups is due to the influence of biologically active substances of the feed additives "Valopro" and "Ruprokol". At the same time, they showed a higher content of total protein and glucose in the blood, as well as the en-

zymes lactate dehydrogenase and gammaglutamyl transpeptidase, which probably contributed to a decrease in starch degradation in the rumen and intensification of muscle tissue synthesis (table 2).

The lower content of the amylase enzyme in the blood of the bulls of the second experimental group and the higher content of asparagine aminotrasferase and creatine phosphokinase are associated with the catalysis of lactic acid oxidation, the acceleration of fat breakdown in the liver and the biochemical transformation of creatine and adenosine triphosphate into creatine phosphate, which increased the amount of metabolic energy and provided the processes of metabolic energy.

The high content of alkaline phosphatase in the blood of bulls from the control group is probably due to dystrophy of the liver parenchyma with manifestation of cholestatic hepatitis due to insufficient intake of protein in this organ.

Table 2. Indicators of slaughter of Hereford bulls at the age of 18 months.

Name	Group		
	1	2	3
Pre-slaughter live weight, kg	641**±	624*±10,1	581±7,9
Steam carcass weight, kg	371**±	347,5*±	311,4±0,8
Steam carcass weight,%	57,9	55,7	53,6
Internal fat mass, kg	24,3±	24,3±	18,0±0,4
Internal fat mass,%	3,8	3,9	3,1
Slaughter weight, kg	395,3**±	371,8*±	329,4±0,6
Slaughter output,%	61,6	59,6	56,7
Muscle tissue yield,%	76,4	75,3	73,8
Fat tissue yield,%	4,8	4,9	4,5
The yield of bones, cartilage and tendons,%	18,8	19,8	21,7
Meat index	4,86	4,51	4,07

*P≤0,05; **P≤0,01

In the bulls of the experimental groups, the weight of the paired carcass averaged 371 and 347.5 kg, which is 60 and 36 kg more than that of the control peers (P≤0.01). All the recorded indicators of the control slaughter in absolute and relative values were significantly lower for them than for bulls that received feed additives. In the control bulls, the slaughter yield was 56.7%, and in the peers of the

experimental groups - by 5 and 3% higher. At the same time, it is noteworthy that the bulls of the analyzed groups, which have relatively high growth energy, did not show a large accumulation and yield of internal and intermuscular fat, but a favorable ratio of edible and inedible parts of the carcass, with an advantage in favor of animals that received feed additives "Valopro" and "Ruprokol". During deboning, it turned out that in the carcasses of bulls of the first and second experimental groups, the mass of adipose tissue is 4 and 4.5 kg, and muscle tissue - almost 60 and 54 kg more than in the peers of the control group. At the same time, the lowest yield of bones, cartilage and tendons from the carcass was noted in experienced bulls, which provided them with a higher meat index.

Organization and implementation of 9-month intensive rearing of Hereford bulls with the use of experimental animals with feed additives "Valopro" and "Ruprokol" contributed to their increase in cost recovery and reduction of the cost of 1 kg of absolute growth by 5 and 3%. As a result, the level of profitability of beef production from bull calves of the experimental and control groups was at the level of 13.4; 11.8 and 10.1%, respectively.

Consequently, the inclusion in the diet of bulls raised for meat, relatively cheap feed additives "Valopro" and "Ruprokol", whose biological active substances contribute to a more intensive use of nutrients received ad libitum of feed. This ensures that in an industrial complex, more than 1500 g of daily gain and live weight at 18 months of age is more than 645 kg. At the same time, the Valopro feed additive turned out to be more effective. Its use contributed to an increase in the live weight of Hereford bulls by 10.3, and the feed additive "Ruprokol" - by 7.4%, in comparison with animals of the control group.

References

1. *Beef cattle breeding: a source of increasing production of high-quality beef in the Russian Federation* / Kh. A. Amerkhanov // *Meat cattle breeding - priorities and development prospects: materials of the international scientific and practical conference.* – Orenburg: Publishing house of FSC BST RAS, 2018. – P.4-7.
2. *Livestock subcomplex of the agro-industrial complex of Russia: development trends and financial and economic factors [Text]* / A.N. Tarasov [et al.]. – Rostov-on-Don. – 2019. – 159 P.
3. *Intensive technologies for growing and fattening bulls of specialized meat breeds [Text]* / D.S. Torosyan, V.N. Pristupa, A.A. Brazhensky, S.A. Dorozhenko // *Beef cattle breeding - priorities and development prospects; materials of the international scientific and practical conference.* – Orenburg, April 25-27, 2018 – P. 114-118.

4. Kosilov, V.I. *Consumption and use of nutrients and energy of feed by castrate bulls of the Simmental breed when introducing the feed additive Vetosporin-active [Text] // V. I. Kosilov, A.V. Kharlamov, I.R. Gazeev, E.A. Nikonova, Z. A. Galieva // Bulletin of the Orenburg State Agrarian University. 2018. № 6 (44). P. 210–214.*
5. Makartsev, N.G. *Feeding of young cattle when growing and fattening for meat [Text] / N. G. Makartsev // Feeding farm animals. – Kaluga: Publishing house Noosphere, 2017. –369 P.*
6. *Production of beef with intensive rearing of bulls of dairy and meat breeds [Text] / VN Priestupa, Yu.A. Kolosov, DS Torosyan, S.A. Dorozhenko // Bulletin of the Mountain State Agrarian University №56(1) 2019. – P. 54-60.*
7. Torosyan, D.S. *Formation and quality of meat products of livestock and poultry farming / D.S. Torosyan, K.E. Ermolaev, V.N. Pristupa // Polythematic network electronic scientific journal of the Kuban State Agrarian University (Scientific journal KubSAU) [Electronic resource]. – Krasnodar: KubSAU, 2017. – №09(133). – Access mode: <http://ej.kubagro.ru/2017/09/pdf/26>.*
8. *Federal scientific and technical program for the development of agriculture for 2017 - 2025. – M. – 2017. – 45 P.*
9. Fisenko, N. *Biological products reveal the potential of cattle [Text] / N. Fisenko // Effective animal husbandry. – 2019. № 9. – P. 40-41.*
10. Chamurliiev, N.G. *Efficiency of growing bulls of different breeds in the production of heavy carcasses [Text] / N.G. Chamurliiev, V.N. Pristupa, Yu.A. Kolosov, D.S. Torosyan, S.A. Dorozhenko // Bulletin of the Nizhnevolszhsky agro-university complex: science and higher professional education. – Volgograd SAU. – 2018. - № 4 (52). – P. 256-264*

红葡萄品种干果渣提取物的研究

RESEARCH OF EXTRACTS FROM DRY POMACE OF RED GRAPE VARIETIES

Shchetinina Anna Sergeevna

Lead Engineer

All-Russian National Research Institute of Viticulture and Winemaking "MAGARACH" RAS, Yalta

Yakuba Yuriy Fedorovich

Doctor of Chemical Sciences, Lead Research Officer

North Caucasian Federal Scientific Center for Horticulture, Viticulture, Winemaking, Krasnodar

Sabelnikova Tamara Alekseevna

Candidate of Technical Sciences, Consultant

North Caucasian Federal Scientific Center for Horticulture, Viticulture, Winemaking, Krasnodar

抽象。 红葡萄品种的葡萄渣是一种次要的酿酒资源，包含许多具有生物学价值的成分，这意味着其可用于食品生产。 然而，发酵的果渣不稳定，迅速变质，并且操作处理困难。 在这项研究中，我们研究了从干燥的葡萄渣中提取的提取物，包括储存一年后的提取物。 在室温下通过添加盐酸，糖浆和改性剂，通过输液获得干果渣的提取物。 提取物的成分组成使用毛细管电泳系统进行了研究。 测定所得提取物中钾，钠，镁，钙，有机酸的阳离子的定量含量。 酸性介质的使用使得有可能提取更多的成分，但是，糖浆的使用提供了大量的琥珀酸。

关键词：果渣，分析，组成，酸，阳离子

Abstract. *Grape pomace of red grape varieties, which is a secondary winemaking resource, contains a number of biologically valuable components, which implies its use in food production. However, the fermented pomace is unstable, quickly deteriorates, and operational processing is difficult. In this study, we studied extracts obtained from dry grape pomace, including after storage for a year. Extracts from dry pomace were obtained by infusion at room temperature with the addition of hydrochloric acid, sugar syrup with modifiers. The component composition of the extracts was studied using a capillary electrophoresis system. The quantitative content of cations of potassium, sodium, magnesium, calcium, organic acids in the obtained extracts was determined. The use of an acidic*

medium made it possible to extract more components, however, the use of sugar syrup provided a significant amount of succinic acid.

Keywords: pomace, analysis, composition, acids, cations

The skin of red grape varieties contains a number of biologically valuable substances: anthocyanins, phenolic and organic acids, cations of potassium, magnesium and others [1, 2]. During the fermentation of grape must, about 30% of the total supply of these components passes into the wine material, the rest remain in the skin. Grape pomace is mainly used for the production of distillates and less often for the production of other products [3]. The reason is the short shelf life of the pomace and its susceptibility to microbiological deterioration. A relative solution to the problem of stability and prolongation of processing may be drying the pomace to a moisture content of 12-15%, but this requires additional energy consumption and production areas for storage [4]. Nevertheless, the biological activity for human health of phenolic components of grape pomace and vines is known [5]. These components are in bound forms, which is the reason for the use of hydrolytic processes, carbon dioxide extraction [5, 6]. The purpose of this study is to examine the content of biologically valuable components of the extract obtained from dry grape pomace.

In the course of the work, extracts from dry fermented pomace of Cabernet-Sauvignon grapes (Krasnodar Krai, Abrau-Dyurso), harvest 2020, dry fermented pomace of Saperavi and Merlot varieties (Krasnodar Krai, Temryuk), harvest 2019 were studied. To prepare aqueous and acidified extracts (1% hydrochloric acid for pomace, 2019), grape pomace was mixed with an extractant at a hydromodule of 1:2, an extraction temperature of 30 °C and a contact time of 24 hours. The moisture content of the dry pomace was determined by the gravimetric method, the content of organic acids and cations was determined by the method of capillary electrophoresis, titration was used and the acidity was measured with a pH meter. To determine cations by capillary electrophoresis, an electrolyte of the following composition was used: 20 mmol/dm³ of benzimidazole, 4 mmol/dm³ of tartaric acid, and 2 mmol/dm³ of 18-Crown-6 (in a ratio of 3:1:2). As an electrolyte for the determination of organic acids, a mixture of solutions was used: dipicolinic acid, tetramethylethylenediamine, ethylenediaminediacetic acid in a volume ratio of 8:1:1. All studied dry pomace had a residual moisture content of 14%. For dry fermented pomace from Cabernet-Sauvignon variety, harvest 2020, a 50% aqueous solution of sucrose (sugar syrup) was used as an extractant at a hydromodule of 1:2, infusion was used for 7 days, the extraction temperature was 30 °C with periodic stirring, table 1.

Table 1 – The influence of sugar syrup modifiers on the quality indicators of the extract from dry fermented pomace of Cabernet-Sauvignon variety, 2020.

№	Sugar syrup modifier used	Tarable acidity of the extract, g/dm ³	Mass concentration of anthocyanins, mg/dm ³	Ph indicator, units
1	0,5% of citric acid	11,2	145	3,7
2	0,2 % of hydrochloric acid	8,4	102	3,2
3	0,1 % of acetic acid	7,3	103	4,0
4	0,1 % of boric acid	7,3	129	4,15
5	No added modifiers – control	6,4	30	4,25

The introduction of acidic modifiers reduced the pH of the solution and contributed to a significant extraction of anthocyanins - for the use of citric acid - 5 times more than control (option № 5 without a modifier - distilled water), more than 4 times for boric acid and about 3 times more for hydrochloric acid and acetic acids.

The dry matter content of the obtained extracts was 3%.

Then the content of biologically active cations and organic acids in the obtained extracts was investigated, tables 2, 3.

Table 2 – Content of cations in extracts (sugar syrup) from dry fermented pomace of Cabernet-Sauvignon variety, 2020

Sample	Mass concentration of components, mg/kg			
	K ⁺	Na ⁺	Mg ²⁺	Ca ²⁺
1	2000±100	101±5	118±5	154±5
2	2040±100	111±5	132±5	300±10
3	1390±60	250±8	80±4	100±5
4	1640±70	83±5	85±4	99±5
5 – control	2200±100	90±5	126±5	224±10

Table 3 – The content of organic acids in extracts (sugar syrup) from dry fermented pomace of Cabernet Sauvignon, harvest 2020

Sample	Mass concentration of acids, g/dm ³				
	Tartaric	Malic	Succinic	Citric	Lactate
1	0,7	0,2	0,94	3,3	0,45
2	1,62	0,24	0,82	0,15	0,18
3	1,18	0,14	0,91	0,10	0,28
4	1,57	0,17	0,92	0,10	0,32
5 – control	4,2	0,8	0,2	0,25	0,27

According to table 2, the accumulation of biologically valuable potassium cation at the control level was noted for the addition of citric and hydrochloric acids to the syrup. These modifiers were active for the extraction of magnesium and calcium cations.

The results of Table 3 showed that the mass concentration of tartaric and malic acids in sugar extracts was 2-3 times lower than the control, however, the amount of biologically active succinic acid was 4 times higher than the control. The acetate ion content for all variants was about 1.5 g/dm³ of the extract, the ammonium cation was not detected, which makes it possible to judge the absence of degradation of organic nitrogen derivatives. It should be noted that the resulting extract is susceptible to fermentation on sugar syrup. Most likely, this is due to a rather high concentration of yeast in the secondary raw materials, therefore, to achieve stability, a preservative was used - potassium sorbate at the rate of 250 mg/dm³. Microscopy of the extract samples showed the presence of a significant number of yeast cells in an active state - approximately the same in all samples. Additional introduction of potassium sorbate made it possible to stop the fermentation process.

Then the component composition of the aqueous extract of dry fermented pomace of the varieties Merlot and Saperavi was studied, table 4.

Table 4 – Biochemical composition of an aqueous extract of dry fermented pomace, grapes of the 2019 harvest.

The component being identified	Merlot	Saperavi
Potassium, mg/kg	2600	2080
Sodium, mg/kg	88	125
Magnesium, mg/kg	95	75
Calcium, mg/kg	110	180
Tartaric acid, g/kg	5,7	5,6
Malic acid, g/kg	0,6	1,1
Succinic acid, g/kg	0,15	0,24
Citric acid, g/kg	0,22	0,10
Titrateable acids, g/kg	6,4	6,4
pH, units	3,9	3,9
Dry water-soluble substances, % mass	3,0	3,0

The data in table 4 showed that the content of potassium, sodium, and magnesium cations was close to the control, the calcium content was less than the control. The content of organic acids, water-soluble solids and pH was close to the values of the control - Cabernet sample, harvest 2020. In general, after a year of storage, the dry pomace retained the main biologically valuable components.

Conclusions. To study the composition of extracts from grape pomace, it was effective to use the method of capillary electrophoresis in combination with chemical methods of analysis. The extracts obtained using sugar syrup from dry fermented pomace of Cabernet Sauvignon grapes in comparison with the control - water extraction - contained 0.82-0.94 g/dm³ of succinic acid and about 2000 mg/dm³ of potassium cations, in 3-5 times more anthocyanins. Extracts from dry fermented pomace, stored for a year in terms of their component composition, were close to the control - extract from pomace, harvest 2020. Extracts with sugar syrup, regardless of the modifier, were subject to fermentation, which required the addition of a preservative - potassium sorbate. At the same time, sugar extracts modified with acetic or citric acid may well be tested in cosmetic formulations, where the question of the naturalness of raw materials is considered. The storage of dry pomace had practically no effect on the content of biologically valuable components in it, which can simplify the procedure for its processing.

References

1. Xia, E. *Biological activities of polyphenols from grapes* / E. Xia, G. Deng, Y.-J. Guo, H.-B. Li // *Int. J. Mol. Sci.* – 2010. – V. 11. – P. 622–646.
2. Zhilyakova, T.A. *Determination of the mineral composition of wine and wine materials by the method of capillary electrophoresis* / T.A. Zhilyakova, N.I. Aristova et al. // *Scientific Notes of the Tavricheskiy National University. V.I. Vernadsky. Series "Biology, Chemistry"*. – 2014. – V. 27 (66). – № 1. – P. 270–276.
3. Ferzauli, A.I. *Influence of fern and grape pomace extracts on the quality of soft drinks* / A.I. Ferzauli, Y. V. Ushakova, A.A. Khokhlova, Yu.F. Yakuba, A.S. Schetinina // *Beer and drinks.* – 2020. - №1. – P.20-24.
4. Shchetinina, A.S. *Changes in the composition of the extract from pomace of red grape varieties during storage* / A.S. Shchetinina, Yu.F. Yakuba, T.A. Sabelnikova // *Scientific publication. Viticulture and winemaking. Collection of scientific papers.* - 2020.- V. XLIX. – P.267-270.
5. Machado, N.F.L. *Addressing facts and gaps in the phenolics chemistry of winery by-products* / N.F.L. Machado, R. Dominguez-Perles // *Molecules.* – 2017. – V. 22. – P. 1–48.
6. Panasyuk, A.L. *Deep processing of wine-making waste with the use of carbon dioxide extraction* / A.L. Panasyuk, E.I. Kuzmina, D.A. Sviridov, T.E. Kostsova // *Food industry.* – 2014. – №8. – P. 17-19.

DOI 10.34660/INF.2020.20.60.023

UDC 636.234.1.082.2

产犊季节对奶牛产奶量的影响
**INFLUENCE OF CALVING SEASON ON MILK PRODUCTION
OF COWS**

Voronov Mikhail Viktorovich

Director general

JSC "Elinar" Naro-Fominsk district of the Moscow Oblast

Fedoseeva Natalya Anatolyevna

Doctor of Agricultural Sciences, Associate Professor

Russian State Agrarian Correspondence University

Balashikha, Russia

Pimkina Tatiana Nikolaevna

Candidate of Agricultural Sciences, Associate Professor

Russian State Agrarian University - Moscow Timiryazev Agricultural

Academy (Kaluga branch)

Kaluga, Russia

抽象。作为研究产犊季节对产奶量影响的起始材料，使用了动物技术注册信息，该信息是在莫斯科地区的JSC“Plemzavod”Elinar“Naro-Fominsk区获得的，荷斯坦黑白花牛在那里不同产犊季节的母牛每次泌乳的产奶量存在差异，这是由于饲喂条件，维持和其他典型性因素的影响等原因造成的，因此从育种的角度出发，进行研究很重要。研究发现，犊牛产犊季节对产奶量的影响最大的产奶量是在冬季产犊期第一次泌乳 - 6652公斤牛奶，第二次泌乳 - 7309公斤牛奶和第三和更老的泌乳期为7295公斤牛奶，在秋季产犊季节的第二和全龄泌乳期，奶牛的脂肪质量分数最大（分别为4.12和4.07%）。其他产犊季节的欠款。在各个年龄段的母牛中，夏季产犊季节观察到的牛奶中蛋白质的最大质量分数为3.36%至3.38%。因此，母牛的出生季节对产奶量以及脂肪和蛋白质重量百分比的影响更为明显。

关键词：一年中的季节，品种，产奶量，脂肪和蛋白质的质量分数，产犊。

Abstract. *As a starting material for research on the influence of the calving season on milk productivity, the information of zootechnical registration was used, obtained in JSC "Plemzavod" Elinar "Naro-Fominsk district of the Moscow region, where Holstein black-and-white cattle are bred. Cows of different calving seasons have differences in milk production per lactation, which is due to the*

unequal feeding conditions, maintenance and the influence of other paratypical factors. Therefore, from a breeding point of view, it becomes important to study the influence of the calving season of cows on their milk productivity. It was found that the highest milk yield was obtained in cows of the winter calving period for the first lactation - 6652 kg of milk, for the second lactation - 7309 kg of milk and for the third and older lactations - 7295 kg of milk. Cows in the second and full-age lactations of the autumn calving season also have the largest mass fraction of fat in milk (4.12 and 4.07%) than cows in other calving seasons. In cows of all ages, the largest mass fraction of protein in milk is observed during the summer calving season from 3.36% to 3.38%. Thus, the cows' birth season had a more noticeable effect on milk yield and fat and protein weight percentages.

Keywords: *season of the year, breed, milk yield, mass fraction of fat and protein, calving.*

Introduction

Meeting the ever-increasing needs of the population for dairy products requires a systematic increase in milk production [4].

The milk production of a cow depends on many factors - breed, individual characteristics; from the season of calving cows; feeding and housing conditions; live weight of the animal; the age of the animal; duration of lactation, service period, sous-hostoy period, etc.

Scientists in the course of the experiment found that the milk productivity of first-calf cows calving in winter was 4862.7 kg for 305 days of lactation, which is 149 kg or 3.1% more than their counterparts, whose calving occurred in the summer period [2].

O. A. Butskikh, E.S. Stepanenko conducted research in a herd of black-and-white cattle in the Prigorodnoye educational and experimental farm in the city of Barnaul, Altai Territory, where they studied the influence of the calving season on the milk production of cows. The results obtained indicate that the productivity of cows is largely related to the calving season. So, the highest milk yield in 305 days of lactation was noted in cows of autumn calving and amounted to 4358, 7 kg of milk. The highest fat content was noted in the milk of cows during the winter and autumn calving periods - 3.94% and 3.90%, respectively. The protein content in the milk of winter calving cows was at the level of 3.08%, which exceeded the indicators of milk of summer calving cows [1].

O. A. Ivanova found that the calving season has a significant effect on the amount of milk yield of cows. Thus, the milk productivity of cows in the winter-spring calving season is significantly higher than that of cows in the summer-autumn calving. There was no significant effect of calving season on fat content. With the lengthening of the service period from 60 to 80 days and more, the milk

production of cows increases. The highest milk yield for the entire lactation is observed in the group with a service period of more than 81 days [5].

According to the research results of N.V. Litvinenko, it was established that the productivity of cows that calved in different seasons of the year is not the same. It should be noted that milk productivity is higher in cows that calved in the first half of the winter stall period [6].

I. A. Deshko in his studies cites data that the highest productivity of cows in the winter calving season was 5185 kg of milk, which is 10.8% higher compared to the productivity of animals in the autumn calving season, 32.6% higher compared to the productivity animals of the summer calving season and 18.2% more than the productivity of animals in the spring calving season [3].

Thus, breeders are faced with the task of studying the factor of the calving season of cows that affect their milk productivity.

Material and research methods

As a starting material for the research, the information of zootechnical registration was used, obtained in JSC "Plemzavod "Elinar" Naro-Fominsk district of the Moscow region, where Holsteinized black-and-white cattle are bred.

The studies were carried out by grouping animals for each of the studied factors, followed by mathematical processing of digital material.

Research results and their discussion

Cows of different calving seasons have differences in milk production per lactation, which is due to unequal feeding conditions, maintenance and the influence of other paratypical factors. Therefore, from a breeding point of view, it becomes important to study the influence of the calving season of cows on their milk productivity.

The purpose of these studies was to examine the influence of the calving season of cows on the milk productivity of Holsteinized black-and-white cattle.

For this, the selected cows were divided into four groups. The first group included animals where calving was in the spring, the second - in the summer, the third - in the fall, and the fourth - in the winter.

Table 1 shows data on the milk productivity of cows in different calving seasons. Despite the year-round stall keeping of cows in this herd, there are differences in productivity by calving seasons.

Table 1
Cow productivity by calving season

Season, year	Number of heads	Productivity in 305 days of the last completed lactation					Service period, days
		milk yield, kg	MFF, %	HMWF, kg	MFP, %	HMWP, kg	
1 lactation							
Spring	61	6196	4,01	275	3,35	229	130
Summer	74	6250	4,04	284	3,36	236	155
Fall	101	6387	4,01	279	3,36	233	108
Winter	67	6652	3,92	281	3,28	235	132
2 lactation							
Spring	53	6796	4,04	287	3,36	239	124
Summer	97	6597	4,05	280	3,38	242	119
Fall	43	6902	4,12	308	3,36	251	139
Winter	38	7309	3,97	306	3,32	257	140
3 lactation and older							
Spring	40	6072	3,94	249	3,36	211	131
Summer	82	6437	4,04	275	3,37	229	124
Fall	70	6734	4,07	296	3,35	242	145
Winter	66	7295	3,96	311	3,31	261	151

The highest milk yield was obtained in cows of the winter calving period for the first lactation - 6652 kg of milk, for the second lactation - 7309 kg of milk and for the third and older lactations - 7295 kg of milk. They surpass their peers who calved in the spring by 456 kg, 513 kg and 1223 kg of milk, in the summer - by 402 kg, 712 kg and 768 kg of milk and in the fall by 265 kg, 407 kg and 561 kg of milk, respectively.

Among first-calf heifers, animals of summer calving are distinguished by the highest mass fraction of fat in milk (4.04%). Cows in the second and full-age lactations of the autumn calving season also have the largest mass fraction of fat in milk (4.12 and 4.07%) than cows in other calving seasons. In cows of all ages, the largest mass fraction of protein in milk is observed during the summer calving season from 3.36% to 3.38%.

It should be noted about the differences in the duration of the service period depending on the calving season of cows of different ages. A shorter duration of the service period is observed in first calving heifers (108 days). For example, if first-calving heifers in the summer calving season had the longest service period

of 155 days, then cows in second and full-age lactations, on the contrary, differed in a short service period (119 and 124 days, respectively).

Conclusion.

Thus, the cows' birth season had a more noticeable effect on milk yield and fat and protein weight percentages. Thus, the highest milk yield was obtained in cows of the winter calving period and cows in the second and full-age lactations of the autumn calving season also have the highest mass fraction of fat in milk, and the highest mass fraction of protein in milk is observed during the summer calving season.

References

1. Butskikh, O.A. Influence of the calving season of cows on milk productivity / O.A. Buts-kikh, E.S. Stepanenko // Coll.: Science and innovation: vectors of development.- mat. int. sci.-pract. conf. of young scientists.- Coll. sci. art. - 2-nd. book. -2018. - P. 146-148.
2. Influence of the calving season of cows on milk productivity in the conditions of the agricultural collective farm "Kolkhoz" Rodina "of the Krasnoselsky district of the Kostroma region / Davydova A.S., Kirikova T.N., Ivanova E.V.// News of the International Academy of Agrarian Education. - 2018.- №38.- P. 126-129.
3. Deshko, I.A. Milk productivity of black-and-white cows depending on various factors / I.A. Deshko. // Coll.: Agriculture - Problems and Prospects. - Grodno, 2018. P. 69-76.
4. Dunin, I. M. Prospects for the development of dairy cattle breeding and the competitiveness of dairy cattle bred in the Russian Federation / I.M. Dunin // Milk and beef cattle breeding.- 2013.- № 3. P. 1-5.
5. Ivanova, O.A. Influence of the calving season and service period on the milk productivity of cows // O.A. Ivanova, E.E. Tsypushnikova // Coll.: Actual problems of the agro-industrial complex. - sci.-pract. conf. of teachers, students, masters and graduate students, dedicated to the 80th anniversary of the Novosibirsk SAU. - Novosibirsk State Agrarian University.- 2016. - P. 163-167.
6. Litvinenko, N.V. Milk productivity of Simmental cows of different calving seasons / N.V. Litvinenko // Coll.: Problems of zootechnics, veterinary medicine and animal biology. - Blagoveshchensk, 2019.- P. 43-46.

乌拉尔前陆盆地南翼的地质构造和油气前景

GEOLOGICAL STRUCTURE AND OIL AND GAS PROSPECTS OF THE SOUTHERN FLANK OF THE URALS FORELAND BASIN

Abilkhasimov Khairly Babashevich

*Doctor of Geologo-Mineralogical Sciences, Academician of the
Academy of Mineral Resources of the Republic of Kazakhstan,
General Director of "GEO-MUNAY XXI" LLP
Kazakhstan*

抽象。根据岩心研究的结果和位于西斯-乌拉尔南侧封闭带的希拉克地区的地震勘探结果，提出了ShR-1井段的岩相特征。槽。

以希拉克地区为例，考虑了该槽哈萨克斯坦部分的油气含量前景，并给出了有希望的资源。

在古生代沉积复合物中已经确定了一种新结构，这可能成为该地区最优先的勘探对象。

关键词：乌拉尔前海槽，地震勘探，反射层，结构，井，岩心，储层，天然气饱和度，有前途的资源。

Abstract. *The article presents the lithological-facies characteristics of the section of the well ShR-1 based on the results of core studies and the results of seismic exploration in the Shirak area, located in the zone of closure of the southern side of the Cis-Ural trough.*

On the example of the Shirak area, the prospects of oil and gas content of the Kazakh part of the trough are considered, promising resources are given.

A new structure has been identified in the Paleozoic sedimentary complex, which may become a top-priority prospecting object in this area.

Keywords: *Pre-Ural trough, seismic exploration, reflecting horizon, structure, well, core, reservoir, gas saturation, promising resources.*

In the structure of the sedimentary complex of the closure zone of the southern flank of the Cis-Ural trough, Devonian, Carboniferous and Lower Permian deposits are involved, differing in the variety of facies and the originality of their lateral and vertical alternation /1/.

As you know, on the territory of the Russian Federation in the Orenburg

Oblast, a number of oil and oil and gas fields are confined to the western part of this zone, located in a chain along the western side of the Cis-Ural trough. The closest of them is the Nagumanovskoye oil and gas field. A number of promising uplifts have been identified on the scheme of local structures for the Paleozoic complex (*figure1*). The southeastern side of the trough is considered promising, but its level of exploration is lower than that of the western side.

An increase in the thickness of subsalt deposits of the Lower Permian-Carboniferous age in the region of the Gornyak, Kazakhstan-III, Zhamansu salt domes is clearly traced in the time and depth sections. The structure of the subsalt complex, reflected in the wave pattern of seismic sections, suggests the presence of bioherm structures in the Lower Permian and Carboniferous sediments, which are distinguished by a characteristic pattern with the presence of clinofolds adjacent to the enclosing sediments to biohermal structures. When viewing the seismic sections of the northeastern part of the Kazakh territory of the Ural Foredeep in combination with the data of gravimetric studies, a high probability of the existence of biohermal traps for hydrocarbons (HC) in the sediments of the subsalt complex /2,3/ was noted.

Based on the results of the interpretation carried out by the "PGS" company, structural maps were built for the subsalt reflective horizons P1, P2b, P2t, P2d and P3, representing the structure of the subsalt complex.



Figure 1 – Map of local structures of the subsalt complex in the northeastern Caspian basin

The Shirak (formerly Zhamansu) structure was chosen as the most promising for exploration drilling into sub-salt deposits, where HC deposits are expected to be discovered (*figure 2*).

The Shirak area considered in this article differs from the adjacent structural-tectonic zones in its features of the subsalt section, morphology and strike of local structures. Brief results of deep drilling and seismic survey of recent years within this area are given below.

The drilling of a *deep prospecting well Shirak 1* was carried out on the OTG-07-30 profile, within the northern arch of the Shirak structure (along the P1 subsalt horizon) with a design depth of 7000 m and a target horizon - Devonian, the actual bottomhole is 6597 m. In the subsalt part of the section, to study the reservoir characteristics of sedimentary rocks and determine the stratigraphic age in five intervals, a core was taken: intervals 5597.18-5614.82 m, 5749.25-5766.92 m, 5887.70-5905.70 m, 6495, 00-6504.00 m, 6593.70-6596.90 m (undivided deposits of the Artinsk-Asselian stage of the Lower Permian and Upper Carboniferous).

Table 1 – Recovered actual section of the Shirak– 1 well

Revealed stratigraphic section	Depth interval, m	
	project	actual
Quaternary	0-20	0-20
Jurassic	20-300	20-420
Triassic	300-1200	420-652
Lower Permian, Kungurian stage	1200-5590	652-5368
Lower Permian, Artinsk-Asselian + Upper Carboniferous	5590-6270	5368-6597 (bottomhole)
Middle Carboniferous, Bashkirian	6270-6840	
Lower Carboniferous	6840-7000 (bottomhole)	

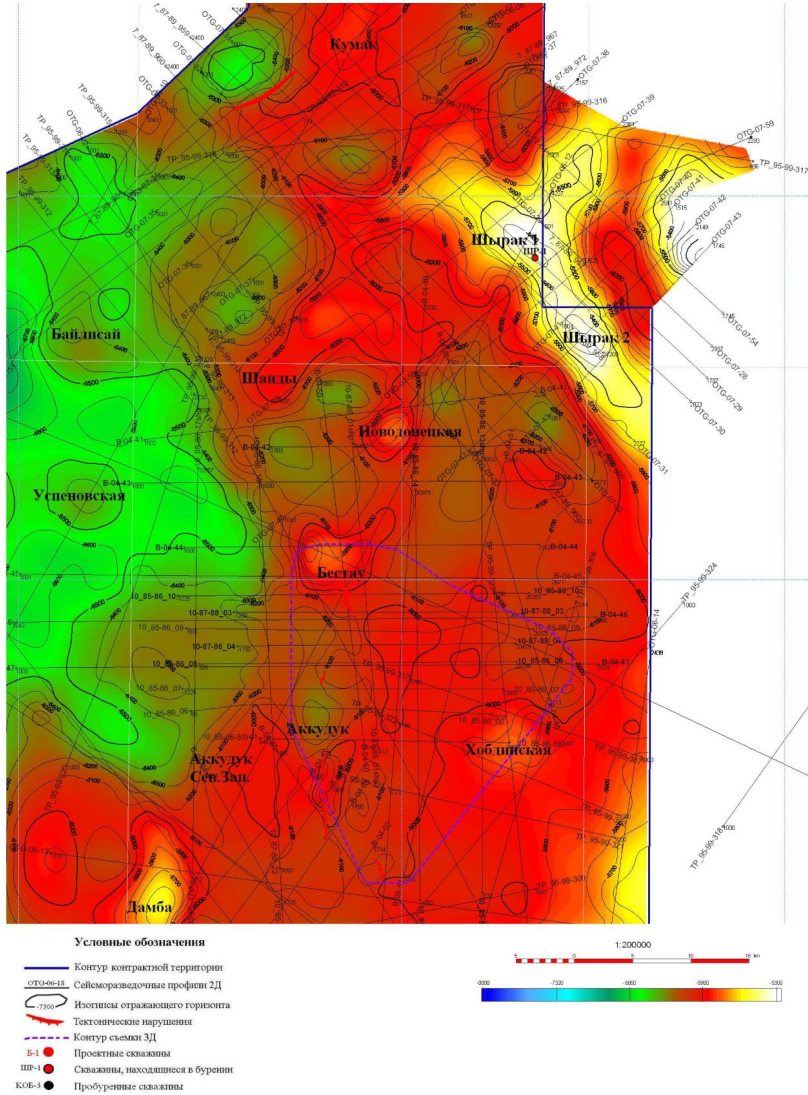


Figure 2 – Structural map of reflecting horizon P1 with identification of promising structures of the eastern side of the Pre-Caspian depression

According to the analysis of drilling data, wave pattern on seismic sections and well logging, in subsalt sediments attributed to the Artinsk-Asselian age, structural-formational strata can be distinguished, represented by interlayering of

terrigenous rocks: marls, argillites, sandstones, siltstones with rare thin layers of limestone, gravelstones (in the upper part) and siliceous rocks (in the lower part of the section).

I strata – the interval 5368-5550 m (thickness 182 m) was drilled without coring and is represented by alternating marls (5-70%), argillites (traces of 20-70%), limestones and dolomites (in the upper part of the section, from traces to 5-10 -15%) and siltstones (in the lower part of the section from 5 to 10%). With depth, there is a gradual increase in the percentage of argillites and a decrease in the content of marls, up to their complete replacement by argillites at the base of the interval (according to the GTI data).

Mergely is light gray, sometimes dark gray carbonate clayey, in places dolomitic, moderately hard.

Argillite is dark gray, gray, light gray semi-platy semi-block, strongly carbonated, sometimes with inclusions of black material (bitumen ?, coal?), moderately hard.

Limestone is off-white, light beige cryptocrystalline, partially dolomitized, moderately hard to hard.

Dolomites are light gray, gray, beige cryptocrystalline, partially carbonated, moderately hard.

Siltstones are light gray, gray, rarely dark gray, strongly carbonate, moderately hard to hard, pyritized, in places turning into silty limestone, moderately hard to hard, strong.

Sedimentation conditions are relatively deep-water, with constant input of terrigenous material.

II strata – interval 5550-5887 m (thickness 337 m). It is represented by interlayering of terrigenous rocks - argillites, siltstones, sandstones, thin layers of limestone (2-3 m) are rarely distinguished. In the base of the strata, according to the data of geological and technological studies (hereinafter GTI), traces of siliceous rocks are noted.

Coring was carried out in this formation in two intervals.

Interval I - 5597.18-5614.82 m. In percentage terms, the core is represented in the total thickness by 52% by sandstones, 18% by argillites and 30% by thin interbedding of argillites, sandstones, siltstones. The presence of gravel and limestone is noted in insignificant quantities.

Interval II - 5749.25-5766.92 m. In the total thickness, core II is 53% represented by argillites, 42% by sandstones, and about 5% by thin interbedding of argillites, sandstones, siltstones and rarely limestones.

In the intervals of core sampling I and II, fracturing is noted in sandstone interlayers (cracks at an angle of 10-20-30° to the core axis), the thickness of the interlayers is from 0.13 m to 1.15 m. In argillites, there is a violation of layering, traces

of sediment slipping. All this is confirmed by the FMI data carried out in the complex of geophysical studies in the well (hereinafter GIS). In sandstones, argillites, siltstones, impurities of carbonaceous detritus are everywhere (from 1-2 to 10%).

The stratigraphic age of the rocks of core samples I and II was determined from the Asselian foraminiferal assemblage of the Lower Permian. According to the data of spore-pollen analysis (H = 5716 m and 5718 m), poor preservation of the samples is noted, the age is P₁k/ar. Presumably age is accepted as P₁ar-s.

According to the lithological composition, cores I and II are represented by: black, dark gray *argillites*, represented by micro-grained clay mass, in places sandy with fragments of quartz and siliceous rocks, less often by feldspar grains with an admixture of single grains of sulfides. Non-carbonate argillites, in areas weakly carbonate with an admixture of carbonaceous detritus (2-10%), with single interlayers (1-3 cm thick) of fine-grained, dark gray feldspar sandstone with angular grains, with clay cement. Argillite has horizontal bedding oriented at an angle of 80° to the core axis. Sections of the interlayer of fine-grained sandstone have oblique bedding, in places disturbed by traces of flooding of the primary sediment, with the formation of microfolds.

Sandstones are fine and fine-medium-grained clayey, in places gravel and coarse-grained gray, light gray with dark gray stripes. They are composed of grains ranging in size from 0.05-0.1 mm to 0.5-0.7 mm, represented by fragments of siliceous rocks, quartz grains, angular-rounded feldspar, with an admixture of carbonaceous detritus (from 1-5 to 10%), with clay and calcite-clay cement.

Coarse-grained *argillite*, gravelly gray with light and dark gray specks. Grains 0.5-0.7 mm in size, represented by fragments of fine-grained siliceous rocks, with an admixture of grains of iron sulfide, quartz, as well as grains of calcite composition. All grains are angularly rounded, with clay and calcite-clay cement. The sandstone has an indistinct horizontal bedding, oriented at an angle of 80° to the core axis, in some areas - oblique bedding, disturbed by traces of flooding of the primary sediment. In some places the sandstone is massive, broken by cracks oriented at an angle of 10-20° to the core axis.

Gravelite - is lenticular interlayers, 5-6 cm thick, found in cores I and II in argillite lithoclasts. Gray gravelite with light gray specks, grains 1-2 mm in size are represented by fragments of fine-grained siliceous rocks (60%), gray, green-gray, dark gray with an admixture of grains of iron sulfide and quartz (20-30%) gray, brownish - gray. Less common is a calcite composition (brownish gray) with fragments of shells of fusulinids, pelitsipods, and branched bryozoans. All grains are angularly rounded, with clayey and fine-grained calcite-clayey cement.

Siltstone is dark gray, composed of quartz grains, fragments of siliceous rocks, less often feldspar grains. Grains are angular and angularly rounded, fine-grained calcite-clayey cement.

Limestone was found in core II in the form of interlayers 10 cm thick. Fine-grained limestone (wackstone) of brownish-gray color.

In the bottom of the II **strata**, according to the data of studies of cuttings, siliceous rocks, reddish-brown, very hard, were identified (in traces).

The sedimentation conditions are relatively deep-water with constant input of terrigenous material.

III strata – interval 5887-6195 m (thickness 308 m).

Lithologically, the section is represented by alternating layers of argillites, sandstones, siltstones, with a predominance of a sandy component. In the lower part of the strata there are thin layers of limestone. An abundance of charred plant remains is noted in the rocks throughout the entire interval.

In the upper part of the III strata, Kern-III (interval 5887.7-5905.7 m) was selected to study lithology, reservoir properties of rocks and their stratigraphic affiliation. The rocks exposed by drilling are represented by sandstones, argillites, siltstones and, in the lower part, by insignificant layers of limestone. The age of the rocks is not determined - there is not enough faunal material. Presumably accepted as the upper section of the Asselian.

Argillite is black, dark gray, represented by a micro-grained clay mass with an admixture of 1-2% to 10% of black carbonaceous detritus, 0.1-0.2-0.05 mm in size, areas with an admixture of single sulfide grains (1-2%) yellow-gray in color, with single lenses of black coal (from 1 cm to 1 mm), non-carbonate. The argillites contain single interlayers of fine-medium-grained sandstone and, rarely, limestone and calcite (it is possible that calcite can fill cracks). Argillite has horizontal lamination oriented at an angle of 80 ° to the core axis, in some areas the lamination is laminar.

Sandstone is fine-medium-grained dark gray, with light gray and gray specks, poorly sorted (grains from 0.05-0.2 mm to 0.1-0.5 mm). It is composed of quartz, fragments of siliceous rocks, less often - feldspar. Grains are angularly rounded and angular, with clay cement, in places calcite-clayey.

Coarse sandstone is (found in the upper part of the Core III sampling interval) - gray, with light gray specks, composed of grains 0.5-1.0 mm in size. It is represented by fragments of fine-grained siliceous rocks of gray, green-gray, dark gray color, sometimes with an admixture of grains of iron sulfide, quartz and grains of calcite composition. There is an admixture of carbonaceous detritus. All grains are angularly rounded, with clay and calcite-clay cement. The sandstone has indistinct horizontal bedding, oriented at an angle of 80° to the core axis.

In some areas, there is *massive sandstone* (there is no obvious bedding), has a lenticular-spotty structure, caused by intense disturbance of bedding by processes of flooding of the primary sediment with the formation of convolute bedding.

Siltstones are light gray, gray carbonated, with the inclusion of carbonaceous

detritus, sandy pyritized, sometimes with a transition to fine-grained sandstone with an abundance of charred plant remains, hard.

Limestone – low-power (2-3 m). Limestone interlayers are noted at the bottom of the sequence (interval 6151-6173 m). Limestones brown-gray, brown, off-white, light gray cryptocrystalline to the texture of wackstone, in places marked by fossils and inclusions of crystalline calcite, moderately hard to hard, without visible porosity.

According to FMI (GIS) and Kern III data, sandstones show increased fracturing, traces of the primary sediment slipping away with the formation of folds. Throughout the section, there is an abundance of carbonaceous detritus (from 1-2 to 10%), as well as black coal and siliceous rocks with clay and fine-grained calcite-clay cement.

IV structural-formational strata (interval 6195-6597.1 m) is distinguished from seismic sections by a lower-frequency recording of reflections, the consistency of occurrence and the relative continuity of thickness between the reflecting horizons. On this basis, more stable sedimentation conditions can be assumed. The age is presumably P_{1as}/C_3q .

According to the GTI data (description of cuttings), the interval below a depth of 6200 m is represented by alternating highly calcareous argillites, dark and light gray with sandstones. The lithological section of the well obtained by FMI (GIS) also indicates a change in lithology at a depth of 6200 m. Sandy (higher in the section) strata are replaced by alternating argillite and sandy strata with thin and rare (several cm) interlayers of limestone and dolomite found in the samples cuttings in the intervals 6225-6238 m, 6280-6295 m, etc. (and according to FMI - to the bottom of the well).

Argillites are dark gray, brown-gray, gray thin-bedded schistic with calcite veins, with finely dispersed charred plant remains, carbonate to strongly carbonate fractured, with crystalline calcite veins, often pyritized bituminous of medium hardness. Interlayers and lenses of white calcareous material are noted from a depth of 6427 m. According to the GTI data (calcmetry), the calcite content is from 8 to 40%, which makes it possible to classify argillites as calcareous.

Sandstones are gray, brown-gray, spotty fine-medium-grained, on lime cement (basal type of cement), slightly pyritized silty. Mineral composition - quartz, siliceous rocks, chlorite, mica, with rare charred plant remains, on lime cement. In some places, calcite nests are clearly visible. The shape of the grains is angular, semi-rounded. Sandstones are dense, solid, fractured.

Dolomites are found (in traces) in sludge samples in the range 6566-6582 m. Brown, dark brown microcrystalline calcareous bituminous solid.

The intervals of fractured sandstones and argillites (according to FMI) are in good agreement with the intervals of increased gas readings, reaching values in

the interval 6452-6597.1 m (bottomhole) from 14 to 100% of the total gas and from 8.34 to 43.6% in terms of methane. Moreover, from a depth of 6495 m to the bottomhole, an increase in the percentage of heavy hydrocarbons (isopentane - up to 0.212%) was noted, which indicates the presence of liquid HC in the formation (condensate).

In the base of the IV structural-formational strata core sampling was performed in two intervals. The age of the rocks is presumably the Upper Carboniferous - Lower Permian (based on the C_3q-P_1 as foraminiferal assemblage).

The interval 6495-6504 m (Kern IV, 9 m), is represented by alternating sandstones and argillites, with a predominance of sandstones.

Sandstone is fine- and fine-medium-grained gray, with light gray and dark gray stripes, in places dark gray with light gray specks. It is represented by quartz grains, fragments of granular rocks (10-20%) and feldspar, angularly rounded, with single fragments of carbonate composition, rounded shape and with an admixture of black carbonaceous detritus (1-5%). Clay cement, in areas of calcite-clayey. The bedding is indistinct horizontal, in places oblique wavy, oriented at an angle of 80° to the core axis. The structure is lenticular-spotty, there is an intense disturbance of the layering, traces of the primary sediment floating away with the formation of folds. Sections of massive sandstone (no stratification).

Argillite is black, dark gray, represented by a micro-grained clay mass, in places sandy, with an admixture (2-10%) of black carbonaceous detritus and single sulfide grains (1-2%) of a yellow-gray color. Non-carbonate, in areas slightly carbonate. The layering is horizontal, indistinct in places, lenticular in parts, oriented at an angle of $80-90^\circ$ to the core axis. In some places it is broken by single sinuous cracks, 3-5 cm long, 0.1-0.5 mm wide, made of light gray columnar calcite with dark gray bituminous material. The cracks are oriented at an angle of 80° to the core axis.

The sedimentation conditions are relatively deep-water with a constant input of terrigenous material by turbidite flows.

Interval 6593.70-6596.90 m - Core V "bottom hole", 3.2 m.

Age, also presumably, Upper Carboniferous - Lower Permian. The absence of foraminifera made it impossible to establish an exact age. Core V was taken in an incomplete volume due to the beginning of a significant gas show during drilling at a depth of 6597.1 m and measures to "kill" the well. The raised core is represented by sandstone in the upper part and argillite in the lower part.

Sandstone (interval 6593.7-6594.87 m) is fine-medium-grained gray with dark gray stripes. It is composed of quartz grains and fragments of siliceous rocks, less often grains of feldspar composition, angularly rounded, with an admixture of up to 2% grains of a carbonate composition, as well as from 1-5% to 30% of black carbonaceous detritus (interlayers up to 5 mm) with clayey and fine-grained calcite-clay cement. Horizontal layering, oriented at an angle of 80° to the core axis.

Sandstone (interval 6594.87-6594.97 m) -10 cm. Fine-medium-grained, gravelly dark gray, gray with small light gray spots. Composition: grains 0.1-0.3-0.5 mm of quartz (poor sorting), fragments of siliceous rocks (up to 20-30%), less often grains of feldspar and carbonate composition, among which fragments of limestone and fragments of skeletal grains are distinguishable (among these are fragments of shells of fusulinids and brachiopods, segments of crinoids), angularly rounded and rounded. An admixture of carbonaceous detritus (1-2%), black, 0.1-0.5 mm in size was found. Clay cement, calcite-clayey. The sandstone is massive, has no obvious bedding, the contact is sharp, clear, erosional.

Argillite (interval 6594.97-6596.90 m) - 1.93 cm. Black non-carbonate, with an admixture (from 5-10% to 20-30%) of calcite grains and (1-5%) quartz grains and fragments of siliceous rocks, angular, angular-rounded shape. There are single (1-2%) shells of thin-walled pelitipods, as well as grains composed of light gray carbonate material, in areas of siliceous (which can be attributed to radiolarians) 0.1-0.2 mm in size. The argillite bedding is laminar, oriented at an angle of 80° to the core axis. The argillite is broken by cracks 0.5-1 mm to 5 mm wide, made with light gray fine-crystalline calcite. Cracks are oriented at an angle of 70° to the core axis, according to layering. In the range of 6596.41-6596.90 m, there are fractures of a tortuous and complex shape, with a length of 0.5-1 cm to 5-10 cm, a width of 0.1-2 mm, made with calcite of a columnar structure with single intergranular pores and caverns 0.5-2 mm in size. Cracks are oriented at an angle from 0-10° to 30-70° to the core axis. It can be seen in the sections that these fractures occurred as a result of tectonic compression and slip mirrors are observed on some of the fracture surfaces.

The sedimentation conditions relative to this member are less deep-water, with a weakened input of terrigenous material. The exposed thickness of the Lower Permian deposits is 1229 m.

Thus, according to the data of seismic exploration and drilling of the well ShR-1, in the Yaysan trough, there is a large thickness of terrigenous Artinsk-Assel and, possibly, Upper Carboniferous deposits, which is not observed in the central zone of the Cis-Ural foredeep. The terrigenous material was demolished from the east, from the side of the growing Ural Mountains, and also, possibly, from the Temir (Enbek) uplift (from the southwest), which at that time turned out to be hypsometrically higher and terrigenous material could be washed away into the depression by turbidite flows. In the east, the Yaysan trough borders on the structures of the Aktobe Urals.

The pre-salt deposits uncovered by drilling in the well ShR-1 differ from the design section both in the lithological composition of the rocks and in the top of their occurrence (222 m higher than the design one). The four structural-formational strata in the subsalt sediments on the seismic deep sections, identified based on the results of the geological survey and well logging, are poorly distinguished

due to the non-optimal choice of velocities during the migration process. The velocity ($V_{pl} = 5800$ m/s) was applied, calculated for the carbonate composition of the rocks in the section.

The exposed subsalt complex turned out to be lithologically represented by terrigenous rocks. Taking into account the presence of abnormal formation pressure in these sediments, the assumed reservoir velocities should be of the order of 4000-4200 m/s, which will possibly improve the quality of traceability of the reflecting horizons in the Artinsko-Assel sediments during the migration procedure and subsequently for the underlying carbonate sediments. The depth of the reference reflective horizons can also change, therefore, the structural constructions on the maps can also change.

Based on the above, it is necessary to carry out additional high-resolution 3D seismic exploration and perform reprocessing and reinterpretation of all seismic material.

To identify reservoirs and assess their effective capacity, the entire complex of field geophysical studies carried out in wells was used. At the same time, first of all, the basis is the criteria established in the process of generalizing geophysical data of similar deposits of neighboring fields and comparing the latter with the results of reservoir testing.

The porosity curve for this well is very monotonic (no abrupt changes), so a small change in the boundary value leads to a significant change in net pay. This leads to a rather high degree of uncertainty in determining the thickness of the productive part of the formation in the section of the Shirak-1 well.

Reservoir-beds in this well are identified in the middle and lower parts of the Lower Permian sediments, in the interval 6020-6481 m. The total thickness of the horizon is 200 m, the thickness of the productive part is 70 m, the total porosity of the reservoirs is 7.0%, K_{ng} is 66%.

Thus, according to well logging and geological survey data in the lower part of the section, 4 structural-formational strata are distinguished, which are of interest in oil and gas bearing ratio. Of the listed strata, strata III and IV are distinguished, corresponding to the intervals of 5887-6195 m with a thickness of 308 m and 6195-6597.1 m with a thickness of 302 m, respectively.

According to gas logs, three intervals are distinguished (6026-6043 m, 6100-6114 m, 6170-6193 m), where the total gas is 100%, and the proportion of methane is from 58 to 74% during drilling. After tripping and building up pipes, high gas readings were constantly observed (total - 100%, methane - 70%). Sandstones show increased fracturing according to FMI and core analyzes. During drilling, high gas readings were noted in them (up to 100% of the total gas). The described sandstones are characterized by good reservoir properties: porosity - 4.25-10%, permeability – $0.017-0.43 \times 10^{-3} \mu\text{m}^2$, in fractured zones the porosity is 7.56-

13.86%, permeability – $0.844-3.49 \times 10^{-3} \mu\text{m}^2$. ***In this part of the section, according to the logging conclusion, 13 intervals were identified as promising and recommended for testing in a column.***

Section IV of *strata* changes with depth: sandy strata give way to alternating argillite and sandy strata with thin and rare (several cm) interlayers of limestone and dolomite.

The intervals of fractured sandstones and argillites (according to FMI data) are in good agreement with the intervals of increased gas readings - in the interval 6452-6597.1 m (bottom hole) values are from 14 to 100% of total gas and from 8.34 to 43.6% for methane. Moreover, from a depth of 6495 m to the bottomhole, an increase in the percentage of heavy hydrocarbons (isopentane - up to 0.212%) was noted, which indicates the presence of liquid HC in the formation (condensate).



SHYRAK-1 WELL GAS FLARING DURING DRILLING



SAMPLE OF CORE - SHYRAK RESERVOIR ROCK

Figure 3. Shirak structure.

- A). Bleeding gas from the annulus of the well.*
- B). A sample of oil-saturated sandstone from the productive horizon.*

While drilling at a depth of 6597 m, during coring, strong gas shows began with an increase in the volume of the outgoing drilling fluid (overflow) and an increase in pressure on the riser from 80 to 145 bar. The percentage of gas in the "bottom hole" was: 100% - total gas, 64.1% - methane. All this indicates the presence of a disturbance in the bottomhole zone (as well as loss of drilling mud when installing a 7" string), through which HC flows from the underlying sediments, which have great prospects for detecting HC deposits (**figure 3**). In the depth interval 6200–6485 m, six intervals with a thickness of 15–33 m were allocated for testing. Comprehensive analysis of the data obtained on well drilling, gas logging, luminescence analysis, cuttings, core samples, logging allowed us to identify three objects in the subsalt section of the well for testing in the Lower Permian sediments.

Assessment of promising resources

The Shirak structure is elongated in the north-west-south-east direction, is not complicated by tectonic faults, has two vaults, called Shirak-1 and Shirak-2. According to the general contouring isohypse (-5500m), the dimensions of the structure are 18.5 km × 3.5 km. The area of the structure is 64.75 km². Amplitude 300 m (minimum isohypsum - 5200 m). The thickness of the Artinsko-Asselian + Middle Carboniferous sediments? is about 800 m at the roof of the structure.

On horizon P₁, the northern arch (Shirak-1) is characterized by an isohypsum (-5400 m), the lengths of the greater and lesser axes are 7 km and 5.2 km, respectively, the minimum and maximum depths are (-5350 m) and (-5500 m). The area of the structure is 44.5 km². The southern vault (Shirak-2) is more elevated relative to the northern one, outlined by an isohypsum (-5400 m), the minimum elevation at the vault (-5200 m).

Along the reflective horizon P₂b, the structure is contoured by an isohypsum (-6200 m). From the northwest, it is complicated by tectonic dislocation of the northeast direction. The dimensions of the structure according to the indicated isohypse are 18 × 4.5 km, the amplitude is 300 m. The minimum isohypsum at the southern, most elevated arch is (-5900 m). The isohypical area of the structure (-6200 m) is 81 km².

Along the reflecting horizon P₂t, the structure is much smaller, has the same strike, is contoured by a common isohypse (-6800 m), and is divided into two arches, each outlined by isohypsum (-6600 m). The lengths of the greater and lesser axes are 12 km and 2 km, the area of the structure along the isohypse (-6800 m) is 24.0 km², the amplitude is 100 m. The thickness of the sediment strata of the middle-lower Carboniferous complex of deposits (horizons P₂b, P₂t) is 800 m.

Table 2 – Estimated parameters for assessing the resources of the Shirak structure

Structure parameters	Subsalt horizon P₁ (P_{1a}r+as)	Subsalt horizon P₂ (C₂b)	Subsalt horizon P₂ (C₁t)
Contouring isohypsum (m)	-5500	-6200	-6800
Minimum isohypsum (m)	-5200	-5900	-6700
Amplitude (m)	300	300	100
Structure dimensions (km x km)	18,5 x 3,5	18 x 45	12,0 x 12,0
Structure area (km ²)	64,75	81,0	24
Thickness of sediments	800	800	1800
HC resource volumes (cat. C ₃) geol./ext. (million tons)	295,85 88,76 (-5600)	164,8 49,44 (-6200)	-

The data on the estimated parameters adopted to assess the potential hydrocarbon resources of the Shirak structure are presented in Table 2.

The volume of HC resources (horizon P₂b - carboniferous deposits) in category C3, calculated by the volumetric method, is 164.8/49.44 million tons (PGS report 2009).

On the structural maps, built according to the results of 2D seismic on the reflecting horizons P2d and P3, the structure is not distinguished.

Based on the foregoing, it is planned to open a multilayer gas condensate, and possibly oil, deposits in the Shirak area after testing in the well ShR-1 and additional 3D seismic work and drilling new deep wells.

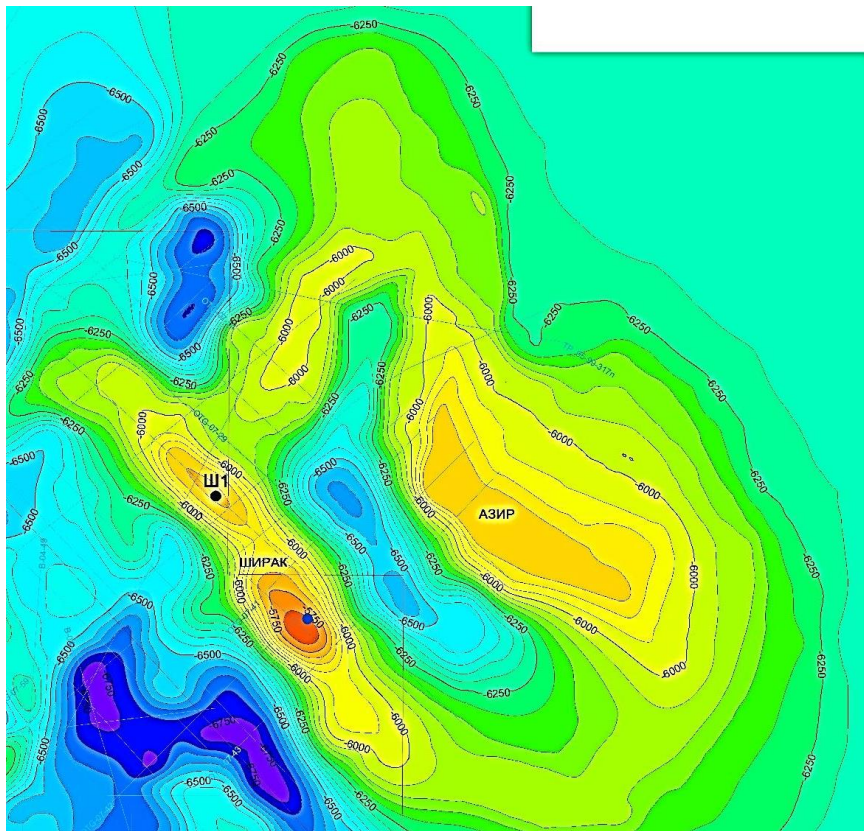


Figure 4. Structural map along the P_{2b} reflecting horizon with the identification of promising structures Shirak and Azir

On the structural maps of the reflecting horizons P₁ and P_{2b} to the northeast, parallel to the Shirak structure, another structure is outlined - Azir, large in size, located under the Nagorny salt dome (figure 4).

In the event that positive results are obtained when testing the Lower Permian objects of the ShR-1 well and drilling new wells, with the penetration of deep horizons of the Carboniferous and Upper Devonian, this structure will undoubtedly become the primary object of prospecting in this structural-tectonic zone.

Conclusions

- The Shirak structure is not inherited (in contrast to the structures of Novodonetsk, Shandy, Bailisai, located in the Temir carbonate zone and the Novo-Alekseevsk trough) and is noted only in the Carboniferous and Lower Permian complexes.

• In the Devonian period, a vast submerged zone existed on the Shirak area within the shelf of the southeastern margin of the East European Platform, where intensive sedimentation took place and filled with terrigenous and carbonate-terrigenous material (compensated type of sedimentation).

• The presence of a number of oil and oil and gas fields along the western side of the Cis-Ural trough makes it possible to assess the Paleozoic sedimentary complex of the closure zone of the southern edge of the Cis-Ural trough with a **highly promising area**.

References

1. *Kuandykov B.M., Matloshinskyi N.G. Santgiorgi K. and others. Petroleum potential of the Paleozoic shelf edge of the North Caspian depression. Almaty, 2011. 280 p. (In Russ.)*

2. *Abilkhasimov H.B. Features of formation of natural reservoirs of Paleozoic deposits of the Caspian basin and assessment of prospects of their oil and gas potential. Moscow: Publishing house of the Academy of natural Sciences, 2016. 244 p. (In Russ.)*

3. *Abilkhasimov H.B. Modeling the migration of hydrocarbons in their natural reservoirs in the Northern edge of the Caspian pool. Neft i gas. 2016; 2:83-97. (In Russ.)*

模拟工件直径减小的过程
**SIMULATING THE PROCESS OF WORKPIECE DIAMETER
REDUCTION**

Proskuriakov Nikolai Evgenievich

Doctor of Technical Sciences, Full Professor

Zverev Ivan Vaycheslavovich

Master, Deputy Head of Multiprofile Production,

Lisovskay Ekaterina Vladimirovna

Master, Lead Design Engineer,

Tula Arms Plant, Tula

抽象。 本文主要研究了用电磁脉冲加工空心圆柱形制品的工艺过程。 给出了“正文”部分计算的阶段和示例。 使用软件复合体LS-DYNA和我们自己的设计对过程进行建模。

关键字：材料的电磁脉冲处理，LS-DYNA，压接过程的仿真，“安装电感器工件”系统

Abstract. *The work is devoted to modeling and calculation of the parameters of the crimping process of body parts by the method of magnetic-pulse processing. The stages and an example of the calculation of the "Body" part are given. Modeling of the process was carried out using software complexes LS-DYNA and our own design.*

Keywords: *magnetic-pulse processing of materials, LS-DYNA, simulation of the crimping process, the system "installation-inductor-workpiece"*

A large number of scientific works and articles are currently devoted to the study of the process of manufacturing parts by the method of magnetic-pulse stamping [1-3]. The interest of business and industry is related to the technological and economic advantages of this material processing technology. However, the widespread introduction of the technology of magnetic-pulse material processing (MPMP) is hindered by well-known drawbacks - requirements for the material and geometry of the workpiece, the durability of the inductor, the complexity of predicting the properties of the material under high-speed loading, etc. As a result, the production of samples of new parts (which are critical structural elements) is

preceded by lengthy theoretical and experimental studies. It should be noted that a unified calculation methodology for MPMP processes, based on an integrated electromechanical approach to the study of this process, is currently absent. However, there are a number of software systems that allow simulating the MPMP process and optimizing the "installation-inductor-workpiece" system.

MPMP process development can be divided into the following steps:

1. Analysis of the drawing of the part, drawing of the workpiece.
2. Preliminary calculation of the inductor.
3. Development of the tooling drawing.
4. Calculation of integral indicators.
5. Theoretical modeling of the "installation-inductor-workpiece" process.
6. Optimization of the parameters of the "inductor-workpiece" system.

Let's give an example of calculation. It is necessary to crimp the "Body" part (fig. 1) with a diameter of 148 mm on a 20 mm long section. Part material - aluminum alloy AMg6 (5664 ASTM USA).

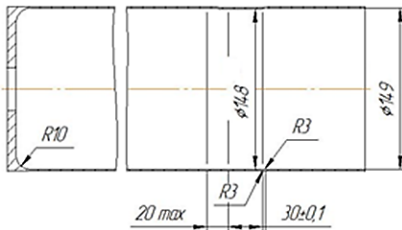


Fig. 1 The "Body" part

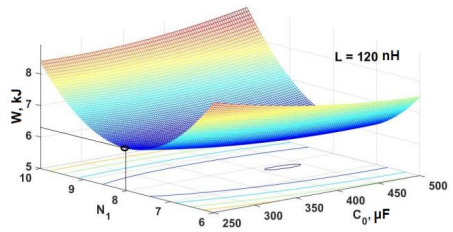


Fig. 2 Dependence of the energy intensity of the operation on the parameters of the installation and the inductor

This operation is performed according to the "crimp" scheme. The equipment used to perform this operation is a magnetic-pulse installation MIU-30-4 (Zaryad company, Samara) with a maximum stored energy of 32 kJ [4]. Installation resistance in short circuit mode 0.024 Ohm. For preliminary calculations, we will take the material of the inductor: copper M2, coil section 8*4 mm.

On the basis of the "Software complex for calculating the operations of forming parts by electromagnetic stamping" developed by the authors [5], studies of this technological operation were carried out on the basis of the obtained secondary mathematical model of the system "Installation-inductor system-workpiece" with the planning of a multifactor experiment and subsequent processing of the results based on regression analysis [6].

The variable parameters (factors) of the crimping operation were – C_0 - the capacity of the capacitor bank of the magnetic-pulse installation and N_1 - the number of turns of the inductor.

The factors and their intervals of variation in natural values are shown in Table 1. The power consumption of operation W was taken as the output variable.

Table 1. Factors and their intervals of variation

Factor X_i , units	Coded value x_i	Variation interval $X_{imin} \dots X_{imax}$
C_o , uF	x_1	200 ... 500
N_l	x_2	4 ... 10

Taking into account the previous calculations, which showed the non-linear nature of the expected relationship of factors, it was decided to vary each factor at least at 3 levels, which made it possible to obtain a regression dependence in the form of a second-order polynomial.

The fully saturated D-optimal plan of Box and Draper [6] was chosen for the computer experiment.

The minimum number of experiments for this regression model (in this case, the number of factors, $k = 2$)

$$N = (k + 1)(k + 2)/2 = 6. \tag{1}$$

According to the chosen plan of the machine experiment, a series of experiments was carried out, and after checking the significance of the coefficients of the regression equations according to the Student's t -test, insignificant coefficients were excluded from these dependencies, and then the models were recalculated with a check of their adequacy according to the Fisher F -test [6].

As a result of computer simulation of the operation of distributing the workpiece with the use of factorial planning of the experiment, the following secondary mathematical model of the "Installation-inductor system-workpiece" system was obtained in the form of a polynomial dependence on the varied parameters in a coded scale:

Energy consumption of the operation, kJ

$$W = 8,440 - 1,432 \cdot x_1 - 6,042 \cdot x_2 + 1,258 \cdot x_1 \cdot x_2 + 0,9382 \cdot x_1^2 + 4,737 \cdot x_2^2 ;(2)$$

Based on the simulation results, the dependence of the output factors was built for various combinations of input parameters C_0 , N_1 , which are shown in fig. 2. The analysis of dependence (1) revealed some tendencies in the interaction of the "installation-inductor-workpiece" system in the technological operations of crimping with a pulsed magnetic field (IMF). In particular, the analysis of the dependence of the energy consumption of the operation W on the capacity of the

capacitor bank and the number of turns of the inductor shown in fig. 2 shows that for each of the parameters under study there are optimal values at which the energy consumption of the operation will be minimal.

When designing the MPMP technological process, to select and determine the rational parameters of equipment and tools by the known values of deformations, you can use the graph shown in fig. 2, where there are zones with different ratios of the number of turns of the inductor and the energy consumption of the process. In further calculations, we take the number of turns of the inductor, $N_1 = 8$.

Further, according to the results of mathematical modeling using a computer program [5], the dependence of the IMF pressure on the workpiece was obtained, shown in fig. 3. This dependence was used as a loading parameter of the workpiece when simulating the dynamics of the swaging process in the LS-DYNA software package [7] to further refine the calculation results.

To clarify the description of the workpiece material (alloy AMg6), the MAT_POWER_LAW_PLASTICITY model was used [7, 8]. This model assumes the material is isotropic and allows taking into account the deformation and rate hardening of metals. The relationship between the yield stress σ_s and the intensity of the tensor of logarithmic deformations ϵ_i for a given material was specified by the power relation [4]:

$$\sigma_s = K_d \cdot B \cdot \epsilon_i^m,$$

where K_d – correcting dynamic factor; $K_d = 2,402$;
 B, m – work hardening curve parameters [4].

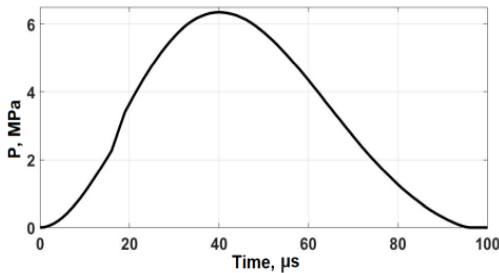


Fig. 3. Dependence of IMF pressure on the workpiece on time for the crimping operation

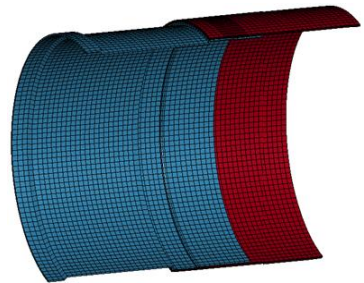


Fig. 4 Finite element model for simulation of the crimping process

To describe the behavior of the conductor material of the inductor (copper alloy M1 - C11000 ASTM USA), the MAT_ELASTIC model was chosen, and the matrix material (Art. 3 - A53GrB ASTM USA) was MAT_RIGID [7, 8]. For the correct operation of the electromagnetic solver LS-DYNA [7], additional data was

set, including for the model of the material EM_MAT_001 [9], in order to set the electrical conductivity of the conductors - the workpiece and the current lead of the inductor.

Table 2 shows the selected characteristics of the materials of the workpiece, inductor and matrix.

Table 2 – Electromechanical characteristics of materials specified in material models in the LS-DYNA software package

Material model	Density, kg/m ³	Young's modulus, MPa	Poisson's ratio	Parameters of the curve of deformation hardening		Electrical conductivity, Cm/m
				B, MPa	m	
Workpiece						
*MAT_POWER_LAW_PLASTICITY	2700	0.71·10 ⁵	0.33	1378	0.236	14.1·10 ⁶
Inductor						
*MAT_ELASTIC	8960	1.23·10 ⁵	0.35	-	-	56.2·10 ⁶
Matrix						
*MAT_RIGID	7900	2.06·10 ⁵	0.28	-	-	-

The calculations performed using the finite element model for computer modeling of the crimping process are shown in fig. 5 and 6.

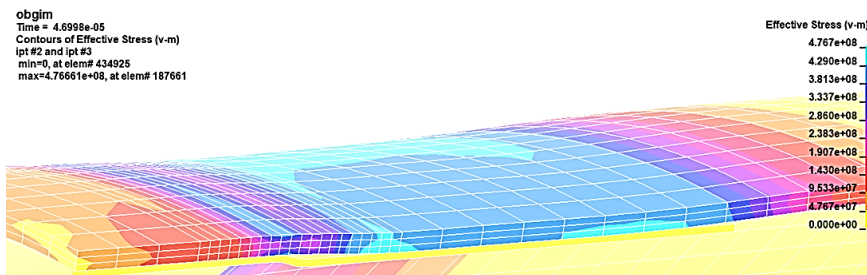


Fig. 5 Results of calculations using the LS-DYNA software package: equivalent plastic deformation

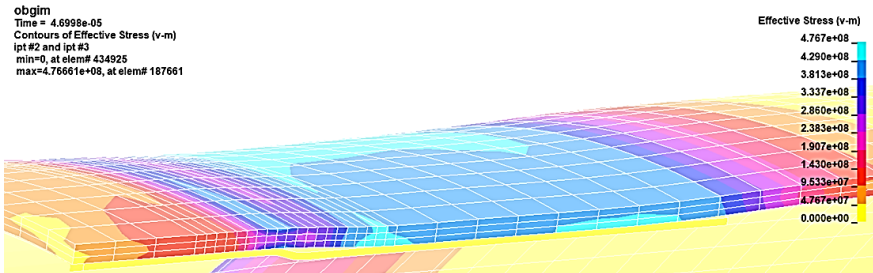


Fig. 6 Results of calculations using the LS-DYNA software package: equivalent stresses according to von Mises

Calculations show that it is most difficult to fit the workpiece at the junction of the radii R3 (see fig. 1, 5 and 6). Figures 5, 6 show the results of modeling this process at a maximum IMF pressure of 5 MPa.

Experiments carried out on the basis of PJSC "Tula Arms Plant" showed that the actual required energy consumption of the operation is about 7 kJ, and the discrepancy between these data and the results obtained by the mathematical model (see fig. 2) does not exceed 10%, which confirms the adequacy of the developed mathematical models.

References

1. Pysk, V., Risch, D., Kinsey, B.L., Tekkaya, A.E. and Kleiner, M. *Electromagnetic Forming – A Review* // *Journal of Materials Processing Technology*, (2011) 211. – P. 787-829. <http://dx.doi.org/10.1016/j.jmatprotec.2010.12.012>
2. Zverev I.V., Proskuryakov N.E. *Calibration of body parts by magnetic-pulse stamping* // *St. Petersburg: Innovative technologies and technical means for special purposes. Proceedings of the 12th All-Russian Scientific and Practical Conference. Library of the magazine "Voenmekh". Bulletin of the BSTU, №63, V. 2, 2020. – P. 44-47.*
3. Glushchenkov V.A., Karpukhin V.F. *Engineering method for calculating the processes of magnetic-pulse processing. – Samara: Publishing House "Fedorov", 2018. – 45 P.*
4. Glushchenkov, V.A. Yusupov R.Yu., Zverev I.V. *Multi-station magnetic impulse installations for industrial use* // *Forging and stamping production. Material processing by pressure, №2, 2020. – P. 20-27.*

5. RU 2018661638 – Certificate for state registration of the computer program "Software complex for calculating the operations of forming parts by electromagnetic stamping" // Proskuryakov N.Ye. et al. – Published 12.09.2018, Bull. № 9.

6. Nalimov V.V., Golikova T.I. *The logical foundations for planning an experiment.* - 2nd ed., rev. and add. - M.: Metallurgy, 1980.- 152 P.

7. *LS-DYNA Keyword User`S Manual Volume I, II, III.*

8. Proskuriakov N.E., Lopa I.V., Zverev I.V. *Longitudinal stress waves in viscoelastic and plastic rods* // *Journal of Physics Conference Series*, January 2020, Institute of Physics Publishing. <http://dx.doi.org/10.1088/1742-6596/1441/1/012109>

9. L'Eplattenier P., Cook G., Ashcraft C. *Introduction of an Electromagnetism Module in LS-DYNA for Coupled Mechanical Thermal Electromagnetic Simulations* // *Proceedings of the 3d International Conference «High Speed Forming 2008»*, Dortmund, Germany, 2008. - P. 85-96.

用于控制机器人复合体的不变系统的构建
**CONSTRUCTION OF INVARIANT SYSTEMS FOR CONTROLLING
ROBOT COMPLEXES**

Ternovaja Galina Nikolaevna

*Candidate of Technical Sciences, Associate Professor
Astrakhan State Technical University*

Parsheva Elizaveta Alexandrovna

*Doctor of Technical Sciences, Full Professor
Astrakhan State Technical University*

抽象。解决了为具有状态延迟的对象构造鲁棒的控制系统的问题，该系统可以补偿干扰和干扰。当物体暴露于输入端的不可测量的无界干扰和输出端的有界干扰时，控制系统的效率就得到了证实。使用构造性系统嵌入技术和辅助电路方法获得了主要结果。

关键词：不变系统，系统嵌入，零除数，矩阵正则化，辅助轮廓

Abstract. *the problem of constructing a robust control system for an object with a state delay, which makes it possible to compensate for disturbances and interferences, is solved. The efficiency of the control system is substantiated when the object is exposed to unmeasurable unbounded disturbances at the input and bounded disturbances at the output. The main results are obtained using the technology of constructive system embedding and the auxiliary circuit method.*

Keywords: *invariant systems, system embedding, zero divisor, matrix canonization, auxiliary contour*

1. Introduction

In this paper, an approach to the modification of existing methods of robust control, which makes it possible to compensate for external disturbances acting both at the input and at the output of the system, arising from the results of studies on the embedding of systems [1]. A multiply connected system with delay and without any control restrictions is considered. At the same time, for the formation of control actions, only measurable variables of local subsystems are used, that is, completely decentralized control is carried out [2]. The main results were obtained using the technology of constructive embedding of systems [1] and the auxiliary circuit method [2-3].

2. Statement of the problem

As you know, the mathematical model of any robotic complex is an interconnected object with undefined parameters. Consider a control object whose dynamic processes in a simply connected subsystem of a multiply connected system are described by the equation

$$\begin{aligned}
 Q_i(P)y_i(t) + G_i(P)y_i(t - \tau_i) &= \sum_{j=1}^m k_{ij}R_{1ij}(P)u_{ij}(t) + R_{2i}(P)\xi_i(t) + \\
 + \sum_{j=1}^l R_{3ij}(P)f_{ij}(t) + \sum_{j=1, i \neq j}^M y_{sij}(t), & \tag{1} \\
 \dot{x}_{sij}(t) = A_{sij}x_j(t) + B_jy_j(t), \quad y_{sij} &= L_{sij}x_j + D_jy_j, \quad i = \overline{1, M},
 \end{aligned}$$

where $P = d/dt$ – differentiation operator, $Q_i(P), R_{1ij}(P), R_{2i}(P), R_{3ij}(P), G_i(P)$ – linear differential operators with constant coefficients, τ_i – known lag; $f_{ij}(t)$ – uncontrollable external indignation; $\xi_i(t)$ – noise at the output of the static link of the system model; $u_{ij}(t)$ – control action; $y_i(t)$ – scalar adjustable variable, M – number of subsystems. $A_{sij}, B_j, D_j, L_{sij}$ – transfer function implementation

$$W_{sij}(\lambda) = L_{sij}(\lambda I_n - A_{sij})^{-1}B_j + D_j = \frac{R_{sij}(\lambda)}{Q_{sij}(\lambda)}.$$

In this case, all signals are

measured, but the state vector is measured with noise, and it follows that there is noise at the output of the system. The object equation (1) can be represented in vector-matrix form:

$$\begin{aligned}
 \dot{x}_i(t) = A_i x_i(t) + \Gamma_i x_i(t - \tau_i) + B_i u_i(t) + D_i f_i(t) + \\
 + \sum_{j=1, i \neq j}^M T_i y_{sij}(t), \quad z_i(t) = x_i(t) + S_{1i} \xi_i(t), & \tag{2}
 \end{aligned}$$

$$y_i(t) = L_i x_i(t) + S_{2i} \xi_i(t), \quad i = \overline{1, M}, \tag{3}$$

where $x_i \in \mathfrak{R}^n$, $u_i \in \mathfrak{R}^m$, $z_i \in \mathfrak{R}^n$, $y_i \in \mathfrak{R}$ – vectors of state, control, measured and controlled parameters, respectively, $f_i \in \mathfrak{R}^l$ – vector of external disturbances, $\xi_i \in \mathfrak{R}^r$ – noise at the output of the static link of the system model; M – number of subsystems; $A_i, B_i, D_i, L_i, S_{1i}, S_{2i}, \Gamma_i, T_i$ – numerical matrices of the corresponding orders, τ_i – known lag time. In this case, the matrix Γ_i has the form,

$$\Gamma_i = \begin{bmatrix} 0 \dots & 0 \\ g_{i0} \dots & g_{i(n-1)} \end{bmatrix}, \quad g_{i0}, \dots, g_{i(n-1)} \text{ – polynomial coefficients } G_i(\lambda).$$

It is required to obtain an algorithm for the functioning of the control system, which ensures the fulfillment of the target condition

$$|L_i x_i| < \delta \text{ at } t > T, \tag{4}$$

where δ – rather small value, T – the time after which the required dynamic accuracy must be ensured after the system is put into operation.

Assumptions:

- i) pairs (A_i, B_i) – controllable, and pairs (A_i, L_i) – observable;
- ii) disturbance $\xi_i(t)$ – limited function;
- iii) all matrices in (1) – (3) are known;
- iv) τ_i - known lag time

3. Solution method

We will form a decentralized control law in the form

$$u_i(t) = -C_i \tilde{y}_i(t), \quad \tilde{y}_i(t) = z_i(t) + S_{1i} u_{vi}(t), \quad (5)$$

where $u_{vi}(t)$ – auxiliary measurement control; C_i – numerical matrix of the controller. Thus, the invariance of system (1) – (3) to external disturbances $f_i(t)$ is associated with the fulfillment of the equality

$$W_y^f(\lambda) = L_i \left(\lambda J_n - A_i - B_i C_i - \Gamma_i e^{-\lambda \tau_i} \right)^{-1} D_i = 0, \quad (6)$$

where $W_y^f(\lambda)$ – transfer matrix from disturbance to output.

We will use the algorithm for determining the parameters of the controller (5) using the technology of embedding systems [1, p.473]. Let us formulate the following statement.

Statement. System (1) – (3) for given matrices A_i, B_i, L_i is invariant to external perturbations $f_i(t)$ if and only if there is a nonzero gauge invariance matrix π , for which the following condition is true

$$\overline{\overline{L_i^R \pi}}^L B_i \overline{\overline{L_i^R \pi}}^L A_i \overline{\overline{L_i^R \pi}}^L \pi = 0,$$

perturbation efficiency matrices belong to the sets

$$\{D_i\}_\mu = \overline{\overline{L_i^R \pi}}^L \mu, \quad \{\rho_i\}_\mu = \overline{\overline{L_i^R \pi}}^L \mu$$

where μ – an arbitrary numerical matrix of suitable size, and a system closed by any controller (5) from the set

$$\{C_i\}_{\chi, \gamma} = \left(\overline{\overline{L_i^R \pi}}^L B_i \right) \sim \overline{\overline{L_i^R \pi}}^L A_i \overline{\overline{L_i^R \pi}}^L \left(\overline{\overline{L_i^R \pi}}^L \right) \sim + \overline{\overline{L_i^R \pi}}^L B_i \chi + \gamma \overline{\overline{L_i^R \pi}}^L, \quad (7)$$

where χ, γ – matrices of suitable sizes with arbitrary elements. In this case, the control action of the form

$$u_{vi}(t) = -\hat{\xi}_i(t) = -\frac{Q_{0i}(P)}{R_{2i}(P)} \eta_i(t),$$

where error signal, $\eta_i(t) = y_i(t) - \bar{y}_i(t)$ and

$Q_{0i}(P) \bar{y}_i(t) = R_{1i}(P) u_{vi}(t) + G_i(P) y_i(t - \tau_i)$, will ensure the fulfillment of the

target condition (4). In this case, the minimum phase character of the polynomial is required

$$R_{2i}(P) = L_i(I_n P - A_{0i})^+ (-B_i C_i S_{1i}) + S_{2i}.$$

Proof

We use control law (5) with parameters (7), then the equation of the object (2) – (3) takes the form

$$\begin{aligned} \dot{x}_i(t) &= (A_i - B_i C_i)x_i(t) + \Gamma_i x_i(t - \tau_i) - \\ &- B_i C_i S_{1i}(\xi_i(t) + u_{vi}(t)) + D_i f_i(t) + \sum_{j=1, i \neq j}^M T_{ij} y_{sj}(t), \\ y_i(t) &= L_i x_i(t) + S_{2i} \xi_i(t), \end{aligned}$$

where the Hurwitz matrix is $A_{0i} = A_i - B_i C_i$ that is, the eigenvalues satisfy the condition $\text{Re } \lambda(A_{0i}) < 0$. With the help of the technology of constructive nesting of systems, defining the regulator by formula (7), we achieve the invariance of the system. It follows from this that the transfer function from the disturbance to the controlled output $W_y^f(\lambda)$ will become equal to zero, and, accordingly, the $D_i f_i(t)$ component is compensated. Now let's move on to representing the system in the form of input - output,

$$Q_{0i}(P)y_i(t) = R_{1i}(P)u_{vi}(t) + G_i(P)y_i(t - \tau_i) + R_{2i}(P)\xi_i(t) \quad (8)$$

where $P = d/dt$ – differentiation operator; $Q_{0i}(P) = \det(I_n P - A_{0i})$, $(I_n P - A_{0i})^+$ – transposed matrix of algebraic complements of a matrix $(I_n P - A_{0i})$; $R_{1i}(P) = L_i(I_n P - A_{0i})^+ (-B_i C_i S_{1i})$,

$$G_i(P) = L_i(I_n P - A_{0i})^+ (\Gamma_i),$$

$$R_{2i}(P) = L_i(I_n P - A_{0i})^+ (-B_i C_i S_{1i}) + S_{2i}.$$

Next, we use the auxiliary loop method [2, 3], and select the signal carrying information about disturbances, for which we take a subsystem described by the equation

$$Q_{0i}(P)\bar{y}_i(t) = R_{1i}(P)u_{vi}(t) + G_i(P)y_i(t - \tau_i), \quad (9)$$

Let us write the equation for the error signal $\mathbf{h}_i(t) = y_i(t) - \bar{y}_i(t)$, subtracting (9) from (8):

$$Q_{0i}(P)\eta_i(t) = R_{2i}(P)\xi_i(t). \quad (10)$$

From equation (10), select the signal $\xi_i(t)$

$$\xi_i(t) = \hat{\xi}_i(t) = \frac{Q_{0i}(P)}{R_{2i}(P)}\eta_i(t). \quad (11)$$

It is clear that the implementation of (11) requires the Hurwitz polynomial R_{2i} ,

(P), to be Hurwitz, which can be ensured by an appropriate selection of the matrix C_i . However, this selection is not always possible. Thus, there must be a matrix C_i , that ensures the Hurwitz property of the polynomial $R_{2i}(P)$, which is an additional constraint not specified in the assumption. Since $\deg Q_{0i} = \deg R_{2i} = n$, then (11) is realizable, and having formed an auxiliary control signal $u_{vi}(t)$ in the form

$$u_{vi}(t) = -\hat{\xi}_1(t) = -\frac{Q_{0i}(P)}{R_{2i}(P)}\eta_i(t) \tag{12}$$

we obtain the equation for the object state vector

$$\dot{x}_i(t) = A_{0i}x_i(t),$$

from which the fulfillment of the formulated target condition (4) follows.

4. Example

Consider the stabilization problem for a multiply connected control object, the dynamic processes in which are described by the equations (1) – (3), where $x_i \in \mathfrak{R}^3$, $u_i \in \mathfrak{R}^2$, $y_i \in \mathfrak{R}^1$, $f_i \in \mathfrak{R}^2$, $\xi_i \in \mathfrak{R}^1$.

$$\begin{aligned} \dot{x}_1(t) = & \begin{bmatrix} -1 & 1 & 0 \\ 1 & -2 & 3 \\ -1 & 3 & 0 \end{bmatrix} x_1(t) + \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ -3 & -3 & -3 \end{bmatrix} x_1(t-3) + \\ & + \begin{bmatrix} 0 & 0 \\ 0 & 1 \\ 1 & 2 \end{bmatrix} u_1(t) + \begin{bmatrix} 1 & 0 \\ 0 & 0 \\ 1 & 2 \end{bmatrix} f_1(t) + y_{s1}, \end{aligned}$$

$$y_{s1} = \frac{1}{p+1} y_2, \quad z_1(t) = x_1(t) + \begin{bmatrix} 1 \\ 1 \\ 0.5 \end{bmatrix} \xi_1(t), \quad y_1(t) = [0 \quad 1 \quad 0]x_1(t) + 2\xi_1(t)$$

$$\begin{aligned} \dot{x}_2(t) = & \begin{bmatrix} -1 & 2 & 0 \\ 2 & -4 & 6 \\ -2 & 6 & 0 \end{bmatrix} x_2(t) + \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ -6 & -6 & -6 \end{bmatrix} x_2(t-5) + \\ & + \begin{bmatrix} 0 & 0 \\ 0 & 1 \\ 2 & 4 \end{bmatrix} u_2(t) + \begin{bmatrix} 4 & 0 \\ 0 & 0 \\ 2 & 3 \end{bmatrix} f_2(t) + y_{s1}, \end{aligned}$$

$$y_{s2} = \frac{1}{p+2} y_1, \quad z_2(t) = x_2(t) + \begin{bmatrix} 1 \\ 1 \\ 1 \end{bmatrix} \xi_2(t), \quad y_2(t) = [0 \quad 1 \quad 0]x_2(t) + 3\xi_2(t)$$

It should be noted that unknown disturbances are present at both the input and output of the object. We form the control law in the form $u_i(t) = -C_i(y_i(t) + u_i(t) = -C_i(y_i(t) + S_{1i}u_{vi}(t))$. For simplicity, we take all variable parameters equal to zero and obtain the following matrices of regulators in each subsystem:

$$C_1 = \begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 3 \end{bmatrix}, C_2 = \begin{bmatrix} 0 & 0 & 0 \\ 2 & 0 & 6 \end{bmatrix}.$$

The auxiliary control action is formed in the form

$$u_{vi}(t) = -\hat{\xi}_i(t) = -\frac{Q_{0i}(P)}{R_{2i}(P)}\eta_i(t),$$

where $Q_{0i}(P) = \det(I_n P - A_{0i})$, $R_{2i}(P) = L_i(I_n P - A_{0i})^+ (-B_i C_i S_{1i}) + S_{2i}$.

For the example under consideration, we obtain the following auxiliary control actions:

$$u_{v1}(t) = -\frac{\det(I_n P - A_{01})}{L_1(I_n P - A_{01})^+ (-B_1 C_1 S_{11}) + S_{21}}(y_1(t) - \bar{y}_1(t)) = \frac{P+2}{2P+1.5}(y_1(t) - \bar{y}_1(t)),$$

$$u_{v2}(t) = -\frac{\det(I_n P - A_{02})}{L_2(I_n P - A_{02})^+ (-B_2 C_2 S_{12}) + S_{22}}(y_2(t) - \bar{y}_2(t)) = \frac{P+4}{3P+4}(y_2(t) - \bar{y}_2(t)).$$

Then we get the matrices A_{01} and A_{02} in the auxiliary contour

$$A_{01} = \begin{bmatrix} -1 & 1 & 0 \\ 0 & -2 & 0 \\ -3 & 3 & -6 \end{bmatrix}, \text{ with eigenvalues } \lambda_1 = -6, \lambda_2 = -2, \lambda_3 = -1,$$

$$A_{02} = \begin{bmatrix} -1 & 2 & 0 \\ 0 & -4 & 0 \\ -10 & 6 & -24 \end{bmatrix}, \text{ with eigenvalues } \lambda_1 = -1, \lambda_2 = -4, \lambda_3 = -24.$$

The block diagram of the local control subsystem is shown in fig. 1.

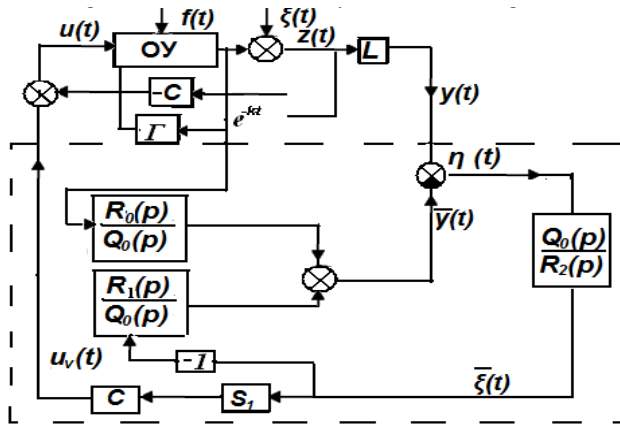
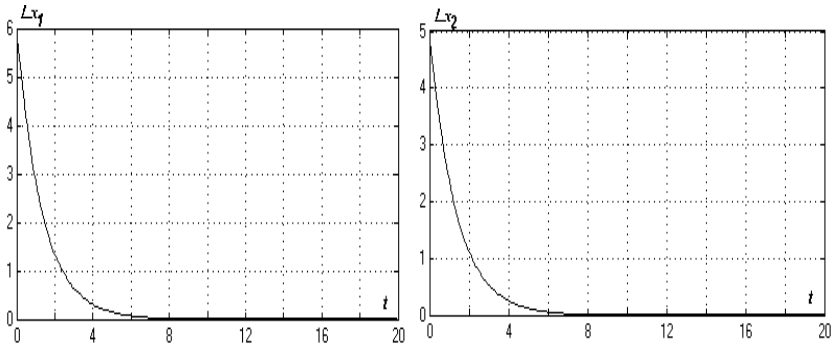


Fig. 1. Block diagram of the local control subsystem

Fig. 2 shows the results of modeling the control system with the following initial data: initial conditions in the first subsystem $x_1^T(0) = [2 \ 6 \ 3]$, in the second $x_2^T(0) = [1 \ 5 \ 2]$, disturbing influences at the input of each local subsystem are unlimited $f_1(t) = [2t \ 5t]^T$, $f_2(t) = [3t \ 4t]^T$, the output noise is a harmonic function $\xi_1(t) = \sin 0.5t$, $\xi_2(t) = \sin 1.5t$.



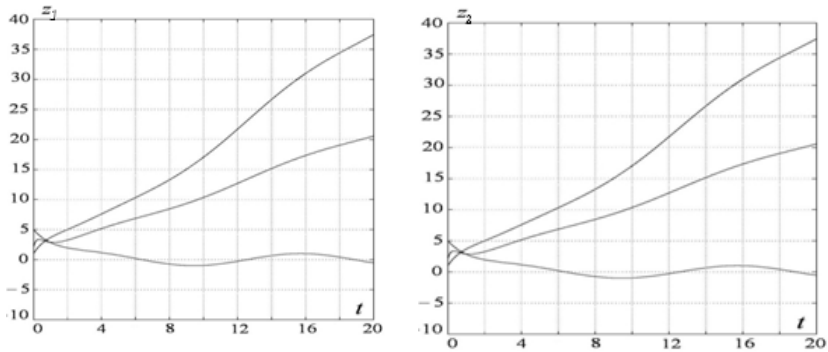


Fig. 2. Transient processes in the system

In this case, the target condition is met after 7 seconds.

5. Conclusion

The problem of decentralized control is considered for a multiply connected object with state delay, for which all parameters are known, and disturbances act at the input and at the controlled output of each of the subsystems, and these disturbances are different. The proposed control system makes it possible to compensate for the influence of disturbances on controlled variables with a given accuracy and make them independent of disturbances at the input of the system, which is demonstrated by an example.

References

1. Bukov V.N. Nesting systems. Analytical approach to the analysis and synthesis of matrix systems. - Kaluga: N.F. Bochkareva publishing house of scientific literature, 2006, 720 P.
2. Parsheva E. Robust decentralized control with scalar output of multivariable plants with uncertain structures // 6th IFAC Symposium on Robust Control Design, ROCOND'09. Haifa, Israel, June 16-18, 2009. Pp.54-59
3. Tsykunov A. M. Adaptive and robust output control of dynamic objects. - M.: Fizmatlit, 2009. - 268 P.

科学出版物

上合组织国家的科学研究：协同和一体化

国际科学大会的材料

2020年12月8日。中国北京

编辑A. A. Siliverstova

校正A. I. 尼古拉耶夫

2020年12月12日。中国北京

USL。沸点：98.7。 订单253. 流通500份。

在编辑和出版中心印制

无限出版社

