



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

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这些会议文结合了会议的材料 – 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。

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从欧亚经济联盟国家领土到俄罗斯市场的鱼产品再出口问题

RE-EXPORT ISSUES OF FISH PRODUCTS FROM THE TERRITORY OF THE EAEU COUNTRIES TO THE RUSSIAN MARKET

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抽象的。文章探讨了西方有条件制裁下欧亚经济联盟国家对外贸易关系的热点问题以及俄罗斯在该领域的报复性限制措施。根据俄罗斯科学家的专家评估分析和笔者的计算,分析了欧亚经济联盟国家对俄罗斯市场的鱼产品出口量,总结了专家对维持高水平受制裁鱼产品再出口的原因的看法,提出了这个问题的一些解决方案。

关键词: EAEU, 欧盟, 鱼市, 制裁, 食品禁运, 再出口

Abstract. *The article examines topical problems of foreign trade relations between the countries of the Eurasian Economic Union under the sanctions of the conditional West countries and the retaliatory Russian restrictive measures in this area. Based on the expert assessments analysis of Russian scientists and the author's calculations, the fish products export volume from the EAEU countries to the Russian market is analyzed, expert opinions on the reasons for maintaining a high level of sanctioned fish products re-export are summarized and some solutions of this problem are proposed.*

Keywords: *EAEU, EU, fish market, sanctions, food embargo, re-export*

Introduction

The fishing industry in Russia plays a significant role in maintaining food security and developing the country's agricultural exports. The volume of fish and other aquatic biological resources caught in Russia in 2020 amounted to 4.97 million tons, the export of fish and seafood - 1.9 million tons, or about 20% of the agricultural products exports.

According to BusinesStat estimates, from 2015 to 2019, the fish and seafood production in Russia increased by 22.9% and reached 5.4 million tons. The production growth was facilitated by high values of fish catch. In addition, the weakening of the ruble made Russian products more competitive in foreign markets. Russia is one of the world leaders in fish and seafood exports. The export share

in production over the past five years in physical volumes varied from 38.9% to 41.0%. Among all income items from the agricultural products export, fish exports in monetary terms occupies one of the leading positions. The natural volume of Russian exports during this period increased by 16.5%. At the same time, frozen fish has the largest share in the total volume of fish and seafood exports, with China and South Korea being the key buyers.

In the future, the share of frozen fish, seafood and canned fish production is expected to increase as they have a longer shelf life, while the share of fish and seafood delicacies and caviar will decline¹.

The current development of the fishing industry is characterized by such trends as an competition increase for the right to use aquatic biological resources and markets for fish products, a progressive decrease in the stocks of the main fishing objects, primarily in the exclusive zone of the Russian Federation, tightening of regulation in the exclusive economic zones of foreign states and of international convention areas.

Russia is also an importer of live fish, fish processing products and other seafood. Over the past 3.5 years in 2018-2020 and the first half of 2021 the Russian market received 1,794.6 thousand tons fish and seafood in the amount of 6,266.7 million dollars.

Issues analysis

In fact, one of the main Russian fish market issues is illegal fish and fish products re-exports from the EAEU countries, which are purchased from joined the anti-Russian sanctions countries in 2014. Let us clarify that a food embargo was introduced against these countries by the President V. Putin on August 6, 2014. In addition to fish and fish products it includes such categories of goods as meat and meat products, milk and dairy products, vegetables, fruits and products of their processing. Later this list was supplemented by live pigs, offal, animal fat and animal oils.

Initially, the ban was applied to agricultural products from the USA, EU, Australia, Norway, Canada (and partially from New Zealand and Switzerland). But on August 13, 2015, Albania, Montenegro, Iceland and Liechtenstein were included in the list, and on January 1, 2016 also Ukraine. However, the volumes of illegal re-export deliveries of sanctioned foodstuffs to Russia are practically not decreasing. In 2017-2019 the real volume of agricultural products in the Russian Federation was at least 20% higher than the officially registered one. Sanctioned products accounted for half of these goods, and over 50% of which were supplied by the EAEU countries².

¹Analysis of the fish and seafood market in Russia in 2015-2019, assessment of the impact of coronavirus and forecast for 2020-2024. <https://marketing.rbc.ru/research/27828/>

²Igor Leonov. Eurasian integration. 08/30/2020. URL: <https://www.rim Eurasia.org/news--2020-08-30--reeksport-v-rf-podsankcionnyh-tovarov-nezakonnyj-ili-neizbezhnij-50640>

The main part of the sanctioned fish products comes to Russia from Belarus. Russian Federal Service for Veterinary and Phytosanitary Supervision (Rosselkhoznadzor) has repeatedly appealed to the Eurasian Economic Commission (EEC), the government and the Ministry of Agriculture and Food of Belarus with a proposal for joint phytosanitary control of the external border of the Customs Union to account for products entering Belarus. Back in 2014 an agreement on the creation of a working group to develop agreed approaches in the field of identifying and preventing the supply of sanctioned goods through the Belarusian territory to the Russian Federation was reached. Rosselkhoznadzor has also repeatedly reported on numerous attempts to import into the Russian Federation prohibited products from the European Union (EU) and the United States. It should be admitted that since the imposition of the embargo, Belarus has detained at the border and returned to European consignors thousands of cars with prohibited cargo³.

With regard to the import of fish and fish products, the Russian side took a number of measures. In June 2015, the Rosselkhoznadzor banned the supply of fish products from Estonia and Latvia due to violations of safety requirements. In turn, Belarus has also banned the re-export of fish products from Estonia and Latvia to Russia.

However, statistics show that in just the first quarter of 2017, fish supplies from Belarus to the Russian Federation increased 15 times - up to 2.3 thousand tons and are estimated at \$ 4.4 million, which corresponds to export volumes for the entire 2016. Frozen fish is mainly supplied to the Russian market from the EU countries, Norway and Iceland. In order to prevent the supply of substandard or harmful fish products to Russian consumers, the Rosselkhoznadzor carried out inspections of Belarusian producers, as a result the import of fish products of three Belarusian enterprises was prohibited - Kamchatskaya Ryba LLC (Grodno Region), Pink Kit LLC (Minsk Region) and CJSC "Mera Gold" (Gomel region). However, the Belarusian authorities referred to the fact that all exported fish was not prohibited re-exported, since it was processed and repackaged on the territory of Belarus⁴.

It should be concluded that the measures taken by Russia to prevent the export of sanctioned fish products turned out to be insufficiently effective. Volumes of sanctioned fish products and raw materials re-export to the Russian Federation from Norway for 2016-2019 increased by about 25%, that is, up to about 300 thousand tons per year and amounted to 15% of all Norwegian fish exports⁵.

³The Eurasian Economic Commission (EEC) creates a working group. URL: 25.02.10.2014. URL: <https://ria.ru/2014/10/02/1026676195.html>

⁴Russian fishmongers reproach Belarus for re-exporting "sanctioned" fish. 24.05.2017. URL: <https://sputnik.by/20170524/rossijskie-rybniki-uprekayut-belarus-v-reeksporte-sankcionnoj-ryby-1028931136.html>

⁵Fish "stumbling block" of the unified foreign trade regulation in the EAEU. February 3, 2020. URL: <https://www.fishnet.ru/news/rynok/rybnyy-kamen-pretknoveniya-edinogo-vneshnetorgovogo-regulirovaniya-v-eaes>

On January 9, 2020, the Rosselkhoznadzor imposed a ban on the re-export of fish products made from Norwegian raw materials and supplied by other EAEU countries. The decision was based on phytosanitary restrictions, namely due to the fact that residues of prohibited and / or harmful substances were repeatedly found in processed products and “due to the refusal of the Norwegian competent authority to inspect aquaculture production enterprises”.

The calculations made for all EAEU countries, taking into account the latest data for first half of 2021, allow us to draw the following conclusions. Fish products supply from the EAEU countries for 3.5 years from 2018 to the first half of 2021 in the Russian market, according to the Federal Customs Service (FCS), is estimated at about 132 thousand tons in the amount of 568 million dollars. About 22.7 thousand tons worth \$ 117.7 million were imported from Armenia, from Belarus - 66.1 thousand tons worth \$ 405.0 million, from Kyrgyzstan - 3.0 thousand tons for \$ 13.4 million, from Kazakhstan - 40.2 thousand tons worth 31.8 million dollars. Thus, it is obvious that the lion's share of fish products, more than 70% of all imports, came from fraternal Belarus⁶.

According to our estimates, the Belarusian fish products supplies to the Russian Federation during the COVID-19 period remained at a high level. In 2020 and first half of 2021 from Belarus it was imported 29.6 thousand tons of fish and processed fish products for 160.2 million dollars. The main share in the import structure was smoked, dried and salted fish (0305, according to the commodity classification of the EAEU) for 140.5 million dollars. The import basket also included live fish (0301) – for 999.4 thousand dollars, fresh and chilled fish (0302) – for 1926.7 thousand dollars, frozen fish (0303) - 14956.1 thousand dollars, fish fillet (0304) - 1768.5 thousand dollars, shrimp (0306) and other cuttlefish and squid (0307) - 66.7 thousand dollars.

Main results and conclusions

As can be seen, the measures taken to curb the sanctioned imports were not enough. Our analysis of expert opinions showed that there are a number of factors that do not allow the EAEU countries to collectively prevent and identify illegal re-exports. They boil down to the following:

1. Various types of illegal fish products re-export are very profitable business in the EAEU countries and bring significant income to entrepreneurs and to the country budget. On the territory of Belarus there are a number of factories specializing in the purchase of food raw materials in Europe (mainly in Norway), their processing and shipment to Russia. Thus, according to estimates, in 2018 the real total share of re-export revenues in the Republic of Belarus budget was about 25%, in Kazakhstan - 20%, Kyrgyzstan - 30%. At the same time, these countries did not join the Russian embargo against Western countries, and Russia does not

⁶Author's calculation on the data of the Federal Customs Service of the Russian Federation

insist on this⁷.

2. An important fact is that Russian counter-sanctions do not apply to the entire territory of Norway, but only the “mainland” part of this country. In the official register of foreign trade partners of the Russian Federation, the Norwegian island of Bouvet, located in the South Atlantic, is separately listed. Fishing in the adjacent Norwegian waters provides Norway with up to 17-20% of the total national fish stock annually. The waters around the Arctic archipelago of Svalbard and the North Atlantic island of Jan Mayen are also listed as separate foreign trade partners of the Russian Federation and provide at least 25% of fish raw materials.

3. According to the Belarusian side, the bulk of the sanctioned products that enter Russia from the territory of Belarus are imported by the Russians themselves. They purchase imported products in Belarus and try to transport prohibited goods to Russia under forged documents as Belarusian products. The Belarusian authorities are actively fighting this illegal re-export.

4. Within the framework of the EAEU, since the beginning of the 2010s, there has been a preferential regime for imports of agricultural products from developing and least developed countries: duty-free regime or the regime of minimum (no more than 4%) rates is applied. More than 60 of 150 such countries⁸ have a free trade agreement with the EU and the US or are associated members of the EU. At the same time, Albania and Montenegro, associated with the EU, have been on the Russian sanctions list since 2015 and at the same time are on the list of countries with a preferential trade regime. Croatia, which enjoys Russian trade preferences, is a member of the EU. This register also includes various dependent territories of the United States (Federated States of Micronesia, Republic of the Marshall Islands) and Great Britain (Solomon Islands, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Republic of Mozambique), retained anti-Russian sanctions after Brexit, which are located outside the main territory of these countries and are separate foreign trade partners of the Russian Federation.

Thus, the above reasons create a condition not only for illegal re-export to the Russian Federation and the EAEU, but also for conducting "shadow" trade and financial transactions with the participation of the EAEU countries and Western states.

At the same time, it should be noted that the legal framework governing foreign trade operations in the market of the EAEU countries is constantly being improved and supplemented by new rules. Thus, by the decision of the Council of

⁷Igor Leonov. Eurasian integration. 08/30/2020. URL: <https://www.ritemeurasia.org/news--2020-08-30--reeksport-v-rf-podsankcionnyh-tovarov-nezakonnyj-ili-neizbezhnij-50640>

⁸List of developing countries - users of the unified system of tariff preferences of the Eurasian Economic Union. Appendix No. 2. To the Decision of the Customs Union Commission of November 27, 2009 N 130 (as amended by the Decision of the Council of the Eurasian Economic Commission of May 27, 2020 N 50).

the Eurasian Economic Commission dated July 10, 2020 N 57 "On Amending the Rules for Determining the Origin of Goods Imported into the Customs Territory of the Eurasian Economic Union (Non-preferential Rules for Determining the Origin of Goods)", paragraph 25 of the rules was supplemented with a new condition: "In the case of the application of measures to protect the internal market stipulated by the Agreement, due to the origin of goods, the origin of similar goods imported into the customs territory of the EAEU within the framework of international treaties specified in paragraph 2 of clause 1 of the Rules, with the submission of a certificate of origin of goods used in within the framework of preferential trade, additionally confirmed by a certificate of origin of goods in accordance with the rules or in cases stipulated by the legislation of the Member States, a declaration of origin of goods (without the obligatory presentation of a certificate of origin of goods provided for by the Non-Preferential Rules)"⁹.

Also, on December 11, 2020, the Rules for determining the country of origin of certain types of goods for the purposes of public procurement were adopted and entered into force. The rules regulate the procedure for determining the country of origin of certain goods types on the territory of a EAEU member state for the provision of national treatment with the participation of suppliers from the EAEU in state (municipal) procurement of another Union member state¹⁰.

However, many experts believe that currently the EAEU has not formed an effective anti-re-export regulatory and legal framework. We agree with the opinion of the head of Rosselkhoznadzor Sergey Dankvert that it is necessary to tighten measures against those who import sanctioned products into Russia, introduce liability for carriers and transport drivers, including the confiscation of cars and goods, as well as a ban on transportation for five years¹¹. At the same time, only prohibitive measures in relation to re-export in the Russian Federation and in the EAEU in general are not sufficient. It is proposed to introduce general criteria for the legality and illegality of re-export operations in the EAEU, on the basis of which it is necessary to pursue an agreed sanctioned policy.

References

1. *Analysis of the fish and seafood market in Russia in 2015-2019, assessment of the impact of coronavirus and forecast for 2020-2024.* <https://marketing.rbc.ru/research/27828/> (accessed: 09/07/2021)

⁹Letter of the FCS of Russia of the Ministry of Finance of the Russian Federation dated February 15, 2021 N 06-94 / 07973 "On non-preferential rules for determining the origin of goods."

¹⁰Decision of the Council of the Eurasian Economic Commission of November 23, 2020 No. 105 "On approval of the Rules for determining the country of origin of certain types of goods for the purposes of state (municipal) needs".

¹¹Igor Leonov. Eurasian integration. 08/30/2020. URL: <https://www.rimteurasia.org/news--2020-08-30--reeksport-v-rf-podsankcionnyh-tovarov-nezakonnyj-ili-neizbezhnij-50640>

2. Igor Leonov. *Eurasian integration*. 08/30/2020. URL: <https://www.ritm Eurasia.org/news--2020-08-30--reeksport-v-rf-podsankcionnyh-tovarov-vezakonnyj-ili-neizbeznyj-50640> (accessed: 09/07/2021)

3. *The Eurasian Economic Commission (EEC) creates a working group*. URL: 25.02.2014. URL: <https://ria.ru/20141002/1026676195.html> (accessed: 09/07/2021)

4. *Russian fishmongers reproach Belarus for re-exporting "sanctioned" fish*. 24.05.2017. URL: <https://sputnik.by/20170524/rossijskie-rybniki-uprekayut-belarus-v-reeksporte-sankcionnoj-ryby-1028931136.html> (accessed: 09/07/2021)

5. *Fish "stumbling block" of the unified foreign trade regulation in the EAEU*. February 3, 2020. URL: <https://www.fishnet.ru/news/rynok/rybnyy-kamen-pretknoveniya-edinogo-vneshnetorgovogo-regulirovaniya-v-eaes/> (accessed: 09/07/2021)

6. *Database of the Federal Customs Service of the Russian Federation*. URL: <http://stat.customs.gov.ru/analysis> (accessed: 09/07/2021)

7. *List of developing countries - users of the unified system of tariff preferences of the Eurasian Economic Union. Appendix No. 2. To the Decision of the Customs Union Commission of November 27, 2009 N 130 (as amended by the Decision of the Council of the Eurasian Economic Commission of May 27, 2020 N 50)*.

8. *Letter of the FCS of Russia of the Ministry of Finance of the Russian Federation dated February 15, 2021 N 06-94 / 07973 "On non-preferential rules for determining the origin of goods."*

9. *Decision of the Council of the Eurasian Economic Commission of November 23, 2020 No. 105 "On approval of the Rules for determining the country of origin of certain types of goods for the purposes of state (municipal) needs"*.

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负面影响条件下区域经济适应性管理理论的发展
**DEVELOPMENT OF THE THEORY OF ADAPTIVE MANAGEMENT
OF THE REGIONAL ECONOMY IN THE CONDITIONS OF
NEGATIVE IMPACTS**

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抽象的。文章解释了负面影响的本质、它们之间的因果关系以及该地区社会经济系统的稳定状态，提出了一种确定适应性机制功能有效性依赖程度的方法。变形因素对局部空间地层影响的发展。

关键词：适应管理机制，制裁压力，负面影响，风险，损害，区域经济

Abstract. *The article explains the essence of negative impacts, cause-and-effect relationships between them and the state of stability of the socio-economic system of the region, presents a method for determining the degree of dependence of the functional effectiveness of the mechanism of adaptive development on the impact of deformation factors in local-spatial formations.*

Keywords: *adaptation management mechanism, sanctions pressure, negative impacts, risks, damage, regional economy*

Today, the nature, essence and sources of negative impacts on the regional economy have not been sufficiently studied. The tools for assessing the deformations of economic trends at the regional level have not been fully developed. The theory of the adaptive mechanism for managing the socio-economic development of the region, which is currently being formed, is focused on explaining the essence of negative impacts, identifying cause-and-effect relationships between them and the state of stability of the socio-economic system of the region, which will determine the degree of dependence of the functional effectiveness of the mechanism of adaptive development on the impact of deformation factors in local-spatial formations. In recent years, the economic trend of organizing economic activity in the Russian Federation has experienced several negative influences

from the external environment at once: there has been a tightening of political, legal, economic and other restrictions. A new economic reality has formed in the Russian economy, largely associated with the interference of two processes: the instability of the global economic system and the application of the international sanctions regime to the Russian economy by Western countries, which distorted the dynamics of economic trends in Russian regions. The functioning of the modern economic system of Russia in conditions of external pressure is faced with a number of contradictions caused by the imperfection of the institutional environment for economic development.

Within the given architectonics of the system of the national economy of Russia, these contradictions limit the institutional, organizational, economic and infrastructural conditions for economic development. All contradictions (external and internal) of the modern economic system determine the specific imperatives of the adaptive potential of the regional development mechanism and are deeply interconnected. They take the form of factors that limit the formation of an integral adaptive national economic system. The contradictions are manifested in the instability of the connections between the structural elements of the system, in the isolation of the functioning of the subjects of the scientific, technical, educational spheres, entrepreneurship, industrial enterprises and infrastructure services. A list of the main deformations in terms of their degree of significance, which exist in the regions and impede the functioning of the adaptation mechanisms of development, is presented in table 1.

These impacts are not only the result of sanctions, which limit the economic mechanism for the functioning of regions. Deformations are the result of a particularly complex trajectory of economic trends, which introduces a set of specific features into the mechanism of adaptive development of individual subregional economic entities. The latter have to constantly maintain the stability of the current state and ensure progressive and positive development in order to overcome the pressure of sanctions.

Table 1 - List of major deformations in the process of socio-economic development of regions according to their degree of significance (%)

| Deformation content | Number of reviews | Specific gravity, % |
|---|--------------------------|----------------------------|
| Deficit of demand for business | 12 | 48 |
| Financial constraints (in addition to the deficit of own funds) | 12 | 48 |
| Restrictions on the import of a number of categories of industrial and food products from the countries of the European Union | 10 | 40 |

| | | |
|--|----|----|
| Deterioration of the demographic structure of the population and increasing imbalances in the labor market, a decrease in the quality of human capital | 10 | 40 |
| Aggravation of interregional and global competition for product markets and development resources (including the market for educational services) | 10 | 40 |
| Weakening of business activity of local entrepreneurs in the Russian market due to sanctions | 9 | 36 |
| Technogenic and environmental problems of regional development | 7 | 28 |
| Influence of the "external" conjuncture on the economy of the region | 6 | 24 |
| Technological lag in some sectors of the economy | 6 | 24 |
| Incompleteness of the legislative system in relation to the spatial and economic development of the Russian Federation (including insufficient stimulation of development) | 5 | 20 |
| Disorder of interregional labor migration | 5 | 20 |
| Divergence of territorial unevenness (including interregional and intraregional) | 4 | 16 |
| Growth of tariffs for energy resources, transport tariffs | 4 | 16 |
| Unstable indicators of macroeconomic development (inflation, tax, credit, customs policy) | 3 | 12 |
| Increase in the value of investment resources | 3 | 12 |
| Infrastructure constraints | 3 | 12 |
| Low wages | 3 | 12 |
| Increase in freight and passenger flows on all types of transport | 2 | 8 |
| Falling real incomes of the population | 2 | 8 |
| High income differentiation of the population | 2 | 8 |
| Depreciation of fixed assets to a critical level | 2 | 8 |
| Negative trends in the development of culture | 2 | 8 |
| Difficult border situation around the regions of the South of Russia (including the proximity to the conflict zones in Ukraine, the Caucasus) | 2 | 8 |

From the list of deformations presented in table 1, it follows that external influences are perceived by regions not unambiguously, some of them have a really pronounced danger of damage, others are characterized by a low probability of destabilization.

When identifying deformation factors, the stochastic nature of the probable negative impact - damage model is taken into account. This makes it possible to identify the specifics of the development potential through the ratio of the probability of infliction and the potential of damage with the degree of risk of negative impact through the adaptation of the Chaddock scale. The tightness of the relationship between the probability of potential damage and the degree of risk of negative impact is shown in Table. 2.

Table 2 - The scale for identifying the degree of risk of negative impacts by the likelihood of causing and potential damage to the economic system

| The likelihood of a threat from the influence of negative factors | Potential damage to the economic system from negative impacts | Identification of the degree of risk of exposure to negative factors |
|--|--|---|
| from 0.0 up to 0.3 | not very significant | negative factor |
| from 0.3 up to 0.5 | not significant | risk |
| from 0.5 up to 0.7 | moderately significant | risk-forming threat |
| from 0.7 up to 0.9 | significant | threat of damage |
| 1.0 | very significant | damage |

Negative impacts on the economy of the region will be such only if they, with some degree of probability, can damage the socio-economic system in the deviations determined by the indicators within the current trends in the region.

Fig. 1 shows the order of transformation of negative impacts from the source of their occurrence to damage.

The damage estimated today is represented by the expected negative effect of international sanctions by the following components: an increase in the cost of means of providing for living needs; reduction of regional budgetary funds allocated to ensure economic security, to meet the vital needs of the population; to protect the economy from the influence of negative influences.

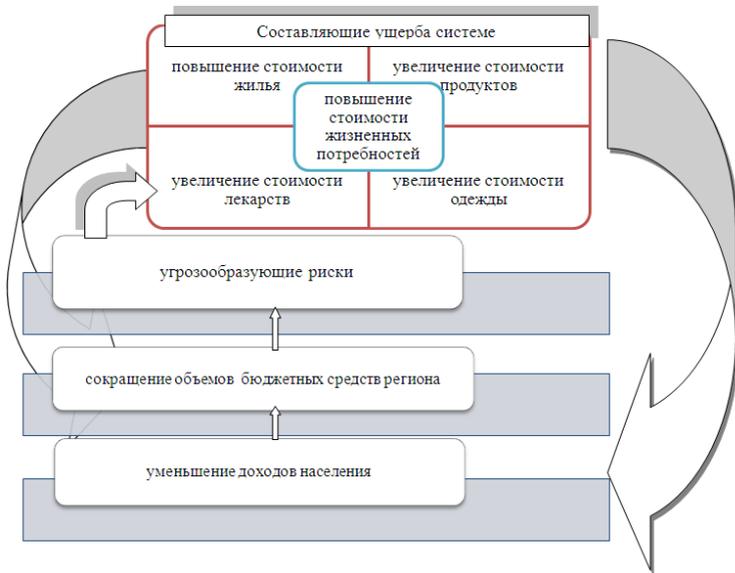


Figure 1 – Development of negative impacts and components of damage to the socio-economic system of the region

Each separately component of the damage shown in fig. 1, is not so in the absence of additional conditions. For example, an increase in the cost of living needs while increasing the region's funds allocated to meet these needs will not be an element of damage. A decrease in the region's funds allocated for ensuring sustainable growth should be considered as an element of damage only if its volume is less than the value of the total value of living needs.

Reducing the sources for the reproduction of the region's funds will become an element of damage, while reducing the volume of the region's funds allocated to meet the needs of life.

Thus, the deterioration of the values of individual indicators characterizing the socio-economic state of the region does not mean an automatic decrease in the level of economic stability. At the same time, the decline in the level of economic stability indicates a deterioration in the socio-economic situation in the region.

Summarizing the above, we can conclude that the introduction of an adaptation mechanism into the management system for the socio-economic development of regions will reduce the impact of extra-regional impacts, on the one hand, and on the other hand, minimize the reproduction of negative impacts in the region that affect sustainable development. Currently, there are no universal tools to reduce negative impacts on the objective trends in the socio-economic development of

regions. Therefore, solving individual problems for a particular region seems to be the most rational in conditions of limited resources and selective susceptibility to external factors.

References

1. Zhukov B.M. *Management technologies for flexible development of an enterprise based on the processes of restructuring, logistics and increasing capitalization. Monograph. // 2nd ed., sr. / Moscow: Publishing and Trade Corporation "Dashkov and K", 2019.- 294 P.*

2. Zhukov B.M., Russov A.S. *The mechanism of effective management of the use of material conditions for the intensification of the spatial and economic development of the region // M.: Publishing and Trade Corporation "Dashkov and K", 2018. — 176 P.*

3. Khodzinskaya, A.B. *Adaptive management of the sustainability of the development of the region in the conditions of the destabilization of the economic situation / A.B. Khodzinskaya // Economics and Entrepreneurship. – 2014. – № 11 (V.4).*

4. Khodzinskaya, A.B. *Adaptation of the regional economic system to changing factors of the external and internal environment of functioning / A.B. Khodzinskaya // "Bulletin of the Adyghe State University", series "Economy", Iss. 3. –2014.*

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评估预算支出的有效性
**ASSESSMENT OF THE EFFECTIVENESS OF BUDGET
EXPENDITURES**

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抽象的。 本文以下萨尔达市区为例，评估了斯维尔德洛夫斯克州一个组成实体地方预算支出执行效率方面的数据，下萨尔达市区行政部门的财务管理报告 斯拉达经下萨尔达市区杜马的决定批准。 基于对所提供数据的评估，得出了预算支出的有效性和市区预算资金支出过程中问题点的识别结论。 最后，提出了改进下萨尔达市区预算支出制度的可能途径。

关键词：预算、预算支出、地方预算、执行效率、预算流程、预算制度。

Abstract. *The article assesses the data in terms of the efficiency of the execution of local budget expenditures of a constituent entity of the Sverdlovsk Oblast on the example of the urban district of Nizhnyaya Salda, reports of the financial management of the administration of the city district of Nizhnyaya Slada approved by the decisions of the Duma of the city district of Nizhnyaya Salda. Based on the assessment of the data presented, a conclusion was drawn about the effectiveness of budget expenditures and the identification of problematic points in the process of spending budget funds of the urban district. In the conclusion, possible ways of improving the system of budget expenditures of the city district of Nizhnyaya Salda are formulated.*

Keywords: *budget, budget expenditures, local budget, efficiency of execution, budget process, budget system.*

State management of budgetary funds allocates to the local budget treasury an insignificant share of all revenues collected on the territory of the Russian Federation. The funds received, directed to the implementation of various kinds of measures, are able to only partially meet the needs of the municipality and its

population in view of their limitations. This moment forms among the population negative sentiments and dissatisfaction with what is happening, which leads to a negative perception of any activity of local self-government bodies.

As a result, local governments need to take measures to effectively distribute available monetary resources in order to meet current needs and planned projects, as well as measures to find additional sources of funding the budget with monetary funds.

The executive authorities of municipalities, on the basis of the RF BC, are assigned the right and obligation to independently ensure the balance of budgets and the effectiveness of the use of budgetary funds; carry out the budgetary process; establish, in accordance with the Tax Code of the Russian Federation, taxes that are credited to the local budget; determination of the forms and directions of expenditures of budgetary funds, as well as the authority for the formation and development of local budget revenues.

The presence of budgetary expenditures is primarily associated with public needs and the costs necessary to meet them. A significant part of these expenses is made at the expense of the funds of the budget of the municipality, and only a small part - at the expense of decentralized public finance or private funds.

As a result, the local budget funds are no longer sufficient for the implementation of large-scale projects, therefore, their implementation is largely borne by the funds of higher budgets.

In order to receive cash subsidies from higher budgets, the municipality is assessed in the field of the efficiency of using budget funds at all levels, in other words, whether material investments in large-scale projects are being successfully mastered, whether they are turning into "long-term construction", representing illiquid and unpromising assets in the future.

Referring to the concept of "efficiency of budget expenditures" or "efficiency of budget funds utilization", it should be said that at present there is no precise formulation of them in the Federal legislation, which leads to terminological confusion and complicates the introduction of mechanisms for assessing efficiency into the budget process.

In foreign theoretical and applied literature, two basic models were initially identified that characterize the efficiency of budget expenditures:

1. "economy — efficiency — effectiveness", or the "3Es" model, since all three terms start with one letter;
2. "input — output — outcome", or the "IOO" model.

Further, these models were combined into one, which is shown in figure 1 [1, p. 62].

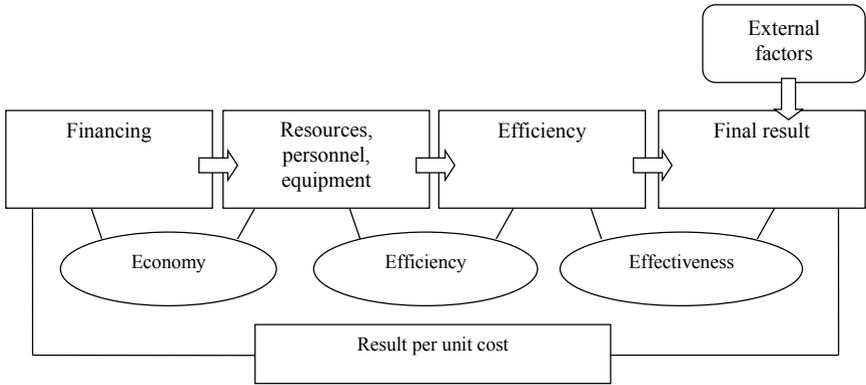


Figure 1. The concept of "efficiency" in foreign literature [2, p. 4]

Evaluating the efficiency of the executive authorities of the constituent entities of the Russian Federation, the concept of cost efficiency was used. Resolution of the Government of the Russian Federation dated 15.04.2009 № 322 "On measures to implement the Decree of the President of the Russian Federation dated June 28, 2007 No. 825" On assessing the effectiveness of the activities of executive authorities of the constituent entities of the Russian Federation "(hereinafter - PP № 322, became invalid due to the adoption Decree of the Government of the Russian Federation of 03.11.2012 № 1142) contained a system of methods for assessing "ineffective costs" in certain areas. The methodology approved by PP № 322 was based on data that reflect infrastructure provision and employment in the public sector. In its formulations, "ineffective expenses" were considered expenses exceeding a certain standard value, thus, in the interpretation of PP № 322 "effective expenses" are expenses that do not exceed a certain level calculated on the basis of specified standards.

As an example, the volume of "ineffective spending" in the field of general education was estimated based on the normative number of pupils per teacher and the class size in urban and rural areas. With this approach, the spending of budgetary funds could be recognized as more effective in the constituent entities of the Russian Federation, where the level of development of social infrastructure and low employment in the social sector is low, even if there was a low quality of provision of budgetary services in the region. The decoding of the term "efficiency" in PP № 322 demonstrates the incorrectness of the estimates characterizing the consumption of resources, not taking into account the results achieved.

The formation of the budget of the urban district of Nizhnyaya Salda consists of: tax and non-tax revenues, budget allocations (grants, subsidies, subventions),

and off-budget revenues (profit from the sale and use of municipal property, voluntary donations, etc.).

The assessment of financial regulation of local budgets consists of a statistical comparison of the numerical indicators of the estimated period with the indicators of previous periods, referring to table 1, which shows the official data provided by the Federal State Statistics Service, you can see the dynamics of budget revenues of the city district of Nizhnyaya Salda. (tab. 1)

Table 1 - Dynamics of revenues and expenditures of the budget of the urban district of Nizhnyaya Salda for 2018-2020, in thousand rubles [3]

| Indicator/year | 2018 | 2019 | 2020 | Growth (decline) rates,% | |
|--|-------------|-------------|-------------|--------------------------|-----------|
| | | | | 2019/2018 | 2020/2019 |
| Tax income | 178 468.023 | 205 696.620 | 172 117.123 | 115.3 | 83.7 |
| Non-tax income | 21 721.445 | 14 525.977 | 14 696.445 | 66.9 | 101.2 |
| Grants | 1 606.000 | 15 087.000 | 237 031.000 | 939.4 | 157.1 |
| Subsidies | 211 924.343 | 319 131.548 | 336 402.699 | 150.6 | 105.4 |
| Subventions | 176 309.743 | 190 732.822 | 376 957.380 | 108.2 | 197.6 |
| Other gratuitous receipts | 5 715.500 | 67 313.200 | 8 096.650 | 1 177.7 | 12.03 |
| Return of the remaining subsidies (in both directions) | - 1 359.753 | - 5 710.075 | - 4 044.381 | 419.9 | 70.8 |
| Total income | 594 385.301 | 806 777.092 | 925 078.079 | 135.7 | 114.7 |
| Total expenses | 556 223.905 | 735 815.822 | 931 793.519 | 132.3 | 126.6 |
| Budget surplus/deficit | 38 161.401 | 70 961.272 | - 6 715.440 | 186.0 | 9.5 |

After examining the table, you can see a downward trend in tax revenues in 2020 compared to 2019. This moment is associated with the lockdown period and the introduction of strict restrictions and prohibitions regarding the reduction of the spread of the new coronavirus infection in the urban district of Nizhnyaya Salda.

Non-tax revenues have tended to be stable over the past two years, but at the same time they have decreased compared to 2018.

The sharp increase in funds in the form of grants and subventions in 2020 is regarded as a measure to support the balance of the budget due to the shortfall in tax revenues due to the pandemic of the new coronavirus infection. Also to support the financial cushion for financing large-scale projects that won the selection.

Thus, as of 2020, the implementation of the following projects continues: overhaul of the hydraulic structure on the Salda River, overhaul of the area named after A.K. Bykov, overhaul of the Paris Commune street, and the construction of capital construction facilities continues: a biological wastewater treatment facility, three gasification facilities (gas boiler houses), a ski base.

As and when these projects are implemented, new projects are developed, the standard of living of the population, based on the results of the socio-economic state of the urban district of Nizhnyaya Salda, a conclusion can be drawn about the effectiveness of the use and expenditure of budgetary funds, both of the local budget and higher budgets.

Assessing the effectiveness of budget expenditures, it is necessary to study the dynamics of budget execution in the urban district of Nizhnyaya Salda in the context of 2018, 2019, 2020. Let us refer to table 2, which provides information on the direction of budget expenditures for three reporting years (see tab. 2).

Analyzing the data presented, it should be said that for the period under review, the value of the budget execution of the urban district of Nizhnyaya Salda never reached 100%, at the same time this value is at a level above the average. Since the achievement of a result of 100% is extremely unlikely due to objective reasons and other circumstances arising in each of the periods presented and independent of the actions of the administration of the city district of Nizhnyaya Salda, whether it be: natural disasters, a pandemic of a new coronavirus infection, unscrupulous contractors, etc., we can talk about satisfactory dynamics of spending budget funds. The largest leaps in deviation from planned values were recorded in the following areas: health care, housing and communal services, national economy and environmental protection. Their values range from 45 - 100 percent, therefore, it is impossible to assess unambiguously the effectiveness of their implementation based on the data presented in the table.

Identifying different approaches to assessing the effectiveness of budget expenditures, it is necessary to refer to the research works of colleagues touching upon this topic in the conditions of other territorial entities.

Table 2 - Dynamics of execution of the budget of the urban district of Nizhnyaya Salda by expenditures in 2018-2020, in thousand rubles [4]

| Expenditures | 2018 | | | 2019 | | | 2020 | | |
|-----------------|---------------|---------------|---------|----------------|----------------|---------|---------------|---------------|---------|
| | Plan | Fact | % exec. | Plan | Fact | % exec. | Plan | Fact | % exec. |
| Health care | 861.803 | 690.918 | 80.17 | 4 511.250 | 2 313.334 | 51.28 | 1 337.399 | 811.261 | 60.66 |
| National issues | 46 741.587 | 45 386.477 | 97.1 | 97 791. 562 | 74 589. 756 | 81.26 | 54 660.816 | 52 938.351 | 96.85 |

Scientific research of the SCO countries: synergy and integration

| | | | | | | | | | |
|---------------------------------------|--------------------|--------------------|--------------|--------------------|--------------------|--------------|----------------------|--------------------|--------------|
| National security and law enforcement | 7 482.908 | 7 451.021 | 99.57 | 8 608.499 | 8 558.842 | 99.42 | 8 631.000 | 8 604.471 | 99.69 |
| National economy | 50 799.419 | 46 386.706 | 91.31 | 192 206.577 | 107 327.556 | 55.84 | 194 234.101 | 157 706.379 | 81.19 |
| Housing and communal services | 93 081.044 | 42 800.961 | 45.98 | 232 887.491 | 124 995.421 | 53.67 | 364 193.449 | 246 888.439 | 67.79 |
| Environmental protection | 128.372 | 128.370 | 100.0 | 1 066.000 | 933.580 | 87.58 | 1 134.511 | 973.772 | 85.83 |
| Education | 355 815.656 | 337 400.213 | 94.82 | 359 356.590 | 329 368.817 | 91.66 | 380 498.066 | 370 255.322 | 97.31 |
| Culture, cinematography | 31 901.960 | 31 895.293 | 99.98 | 44 355.093 | 44 352.532 | 99.99 | 46 544.600 | 46 540.630 | 99.99 |
| Social politics | 33 418.600 | 30 516.123 | 91.31 | 31 937.084 | 29 782.209 | 98.16 | 34 196.259 | 33 402.175 | 97.68 |
| Physical Culture and sport | 11 433.366 | 11 333.823 | 99.13 | 11 397.762 | 11 393.775 | 99.96 | 11 479.500 | 11 472.719 | 99.94 |
| Mass media | 2 244.000 | 2 244.000 | 100.0 | 2 200.000 | 2 200.000 | 100.0 | 2 200.000 | 2 200.000 | 100.00 |
| Total expenses: | 633 908.715 | 556 233.905 | 87.75 | 977 295.408 | 735 815.822 | 75.29 | 1 099 109.701 | 931 793.519 | 84.78 |

For example, Astapov K.L., Musaev R.A., Malakhov A.A., representatives of M.V. Lomonosov MSU, in his scientific work, the final integral index is distinguished, as a reflection of the assessment of the effectiveness of the budget spending policy, which is calculated by weighing all measurements, taking into account the established specific weights, according to formula 1:

$$E = \frac{x_i - x_{min}}{x_{max} - x_{min}} \times 100, \quad (1)$$

where x_i – indicator value over time i , x_{min} – the worst value of the indicator within the period under consideration, x_{max} – benchmark, reference point for the indicator.

Based on the calculations in the period from 2009-2019, using the example of budget expenditures of the Russian Federation for education and health care, colleagues concluded that the indicative indicators of budgetary policy increased, but did not reach the higher indicators that existed several years ago [5, p. 17].

As a second point of view, let us consider the methods identified by D.V. Tsydenova, a representative of the D. Banzarov BSU, for assessing the budgetary expenditures of the Zakamensk district of the Republic of Buryatia. These include:

1. Evaluation of the effectiveness of budget expenditures based on their structure.
2. Evaluation of the effectiveness of budgetary expenditures based on the ratio of budgetary provision. The budgetary security ratio is the sum of budget expenditures for a certain period per capita. Calculated by formula 2:

$$C_{bs} = \frac{E}{S}, \quad (2)$$

where C_{bs} – budgetary security coefficient, E – budget expenditures for the period, S – population size in the region at a given period.

Thus, after analyzing the education sector of the Zakamensk region, D.V. Tsydenova. came to the conclusion that the main direction of cost optimization under the item "Education" is to reduce the cost of utilities and channel the released funds to increase staff salaries, purchase materials, food, etc. [6, p. 2].

Based on the considered methods for assessing the spending of budgetary funds of the Russian Federation and the Republic of Buriatia, one can make our own assessment of the efficiency of spending the budget of the urban district of Nizhnyaya Salda, using the formula for the budgetary provision coefficient applied by D.V. Tsydenova. when considering the effectiveness of spending budget funds on the education sector in the Zakamensk region of the Republic of Buryatia, and suitable for assessing in this scientific work (tab. 3).

Table 3 - an assessment of the efficiency of spending the budget of the urban district of Nizhnyaya Salda [3;4]

| Indicator | 2018 | 2019 | 2020 |
|-------------------------------------|---------|---------|---------|
| Budget expenditures, million rubles | 556.234 | 735.816 | 931.794 |
| Population, people | 17 627 | 17 605 | 17 508 |
| Fiscal security ratio | 0.03 | 0.04 | 0.05 |

Summarizing Table 3, we come to the conclusion that an average of 0.04 million rubles is spent for each resident of the urban district of Nizhnyaya Salda in all the presented areas of spending budgetary funds of the urban district of Nizhnyaya Salda. There is also a noticeable trend towards an increase in the ratio of budgetary provision, which in turn indicates an annual increase in the funds spent.

Summing up the scientific work, we can agree with the fact that the assessment of the efficiency of spending budget funds is of a conditional nature, which straightforwardly evaluates digital values, overshadowing the realities and exist-

ing deviations, which in turn distorts the idea of the budgetary policy of a particular territorial entity.

Each author under consideration singles out for himself the most priority and easy-to-use method for assessing the effectiveness of budget expenditures. Often, using several methods at once to form a more complete picture. Based on the assessment made, one can talk about the effective or ineffective spending of the budget, looking for additional directions and opportunities for adjusting the budgetary policy in order to improve efficiency.

References

1. Afanasyev R.S. "The concept of the effectiveness of budget expenditures: theory and legislation" // *Financial journal*. – 2016. № 1. URL: https://nifi.ru/images/FILES/Journal/Archive/2016/1/stftii_1/fm_2016_1__06.pdf (appeal date 07.07.2021).

2. Noman Z. *Performance Budgeting in the United Kingdom / OECD Journal on Budgeting*. 2008. V. 8. № 1 URL: <http://www.oecd.org/unitedkingdom/43411005.pdf> (appeal date 07.07.2021).

3. Official website of the Duma of the urban district of Nizhnyaya Salda URL: <http://duma-nsalda.ru/solutions> (appeal date 14.07.2021).

4. Official website of the administration of the urban district of Nizhnyaya Salda URL: <https://nsaldago.ru/economy/budget> (appeal date 16.07.2021).

5. Astapov K.L., Musaev R.A., Malakhov A.A. Evaluation of the effectiveness of the policy of budgetary expenditures // *Financial Journal*. – 2020. N 6. URL: <https://cyberleninka.ru/article/n/otsenka-effektivnosti-politiki-byudzhetnyh-rashodov/viewer> (appeal date 20.07.2021).

6. Tsydenova D.V. Evaluation of the efficiency of budget expenditures in the field of education (on the example of the Republic of Buryatia) // *Ogarev online*. – 2019. N 2 (128). URL: <https://cyberleninka.ru/article/n/otsenka-effektivnosti-rashodov-byudzhetna-v-sfere-obrazovaniya-na-primere-respubliki-buryatiya/viewer> (appeal date 25.03.2021).

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大图们江倡议的发展 – (GTI) 作为对该地区经济的影响机构之一
**DEVELOPMENT OF THE GREATER TUMEN INITIATIVE – (GTI) AS
ONE OF THE INSTITUTIONS OF INFLUENCE ON THE REGION'S
ECONOMY**

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抽象的。该研究的主题是研究大图们江倡议的发展机构对其对该地区经济的影响。这个问题的紧迫性与建立包括工业园区在内的经济特区与经济发展和地区吸引外国直接投资的能力有着特殊的积极联系有关。东北亚国家具有经济互补性强、经济合作以信任为基础的优势，以及以各种实体形式优化经济结构、振兴贸易、拉动投资、加强经贸联系的产业集群经验。正是出于这样的目的，大图们江倡议应运而生，如今它已成为该地区经济发展的源泉之一。根据对参与该倡议的国家的互动分析，确定了大图们江倡议互动的优先领域：简化跨境贸易；发展交通基础设施系统、旅游目的地；改善该地区的物流和运输系统；深化科技合作；解决领土的环境问题；大图们江倡议的领土参与全球经济。大图们江倡议作为协调该地区各国行动的唯一国际平台的重要性得到证实。

关键词：国际合作，大图们江倡议，东北亚，国际贸易，投资，区域战略协调，一体化，国际平台，经济特区，GTI。

Abstract. *The subject of the study is the study of the development institutions of the Greater Tumen Initiative in relation to their impact on the economy of the region. The urgency of this problem is connected with the fact that the creation of special economic zones, including industrial parks, has a special positive connection with economic development and the ability of regions to attract foreign direct investment. The countries of Northeast Asia offer the advantages of high economic complementarity, trust-based relations underlying economic cooperation, and the experience of industrial clustering in the form of various entities that optimize the economic structure, revitalize trade, stimulate investment and strengthen business ties. It is for such purposes that the Greater Tumen Initiative was created, which today acts as one of the sources of economic development of the region.*

Based on the analysis of the interaction of the countries participating in the initiative, priority areas of interaction of the Greater Tumen Initiative were

identified: simplification of cross-border trade; development of the transport infrastructure system, tourist destinations; improvement of the logistics and transport system in the region; deepening of scientific and technical cooperation; solving environmental problems of the territory; involvement of the territories of the Greater Tumen Initiative in the global economy. The importance of the Greater Tumen Initiative as the only international platform for coordinating the actions of the countries of the region is substantiated.

Keywords: *international cooperation, Greater Tumen Initiative, Northeast Asia, international trade, investment, coordination of regional strategy, integration, international platform, special economic zone, GTI.*

A quarter of a century has passed since the intergovernmental agreement on the organization of an advisory body within the framework of the UN program for the creation and improvement of mechanisms for technical and economic cooperation for the development of territories adjacent to the basin of the Tumen River was signed in 1995. Later, in 2005, it was this agreement that served as the basis for the creation of an international cooperation body on its basis, known as the "Greater Tumen Initiative" (GTI). Its participants were Russia, China, both Koreas (North and South) and Mongolia [1].

However, later, on 05.05.2009, the North Korea stopped its cooperation with the GTI due to the adoption by the UN Security Council of a resolution violating its sovereignty. But Japan has joined the RTI, so far, in the status of an "observer" [4].

From a geographical point of view, the economic district of the Tumen River basin covers part of the territory of the Russian Primorye (the port cities of Vladivostok, Zarubino, Vostochny and Nakhodka), the Rason trade and economic agglomeration in the DPRK, the eastern part of Mongolia, several provinces of the PRC, as well as ports in South Korea (Sokcho, Pusan, etc.).

According to the decree of the Government of the Russian Federation No. 1245-r of 25.08.2008, Russia takes an active part in the activities of the GTI.

Gradually, the GTI acquired the status of a universal organization for international economic cooperation and an effective intergovernmental mechanism for regional economic cooperation in Northeast Asia. The main goal of the GTI is to promote the growth of the attractiveness of the mainland of the North-East of the Asian continent for investment, trade organization and business development in the interests of balanced progressive development of these territories [2, 5].

Russia participates in the work of the GTI in all areas, paying attention to the promotion and implementation of large-scale research and infrastructure projects, and the development of the potential for international cooperation. At the same time, it should be noted that the share of Russia in the structure of the country's trade turnover of GTI has decreased since 1996 (Fig. 1)

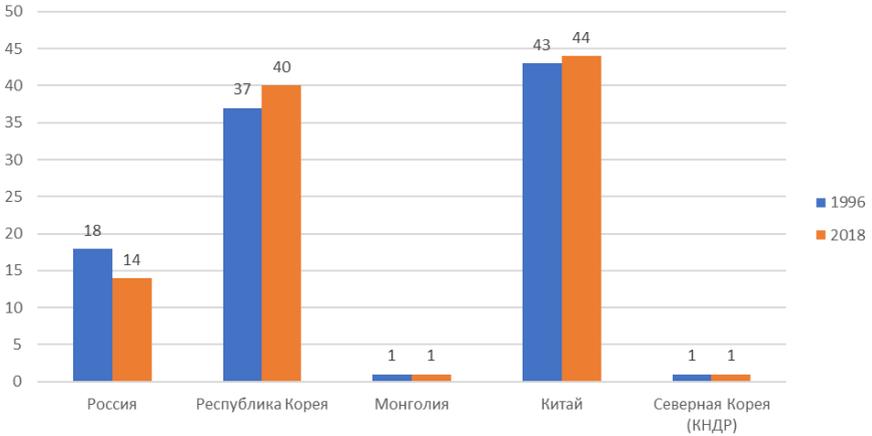


Figure 1 - Structure of the GTI country trade turnover [6]

As we can see, the share of Russia decreased by 4 % and amounted to 14%, the share of China increased by 1% (44%), and the share of the Republic of Korea by 3% (40%). Since Russia proceeds from the long-term interests of both the development of its own Far East and the acceleration of integration processes in the Asia-Pacific region as a whole, it is necessary to improve the coordination of various processes when organizing the Association of Foreign Trade Banks of countries located in Northeast Asia. That is, the GTI should contribute to the expansion and deepening of negotiations on the further transformation of the initiative into a full-fledged international economic association of the countries of Northeast Asia (NEA).

GTI now

Currently, the GTI is positioned as a convenient platform for the participating countries, significantly facilitating the processes of interaction on economic development, interstate cooperation, etc. The GTI declares a steady growth of international cooperation in the region, which contributes to the economic well-being and progressive development of all participating states, as well as improving regional stability and relations between these countries [8].

On October 11, 2019, the next, 9th meeting of the Transport Council under the GTI was held, which was mainly devoted to the implementation of large-scale projects for the development of transport infrastructure, the implementation of which was provided for by the GTI Medium-term Plan for the Development of logistics until 2019, and the preparation of a similar plan for the next time period. A number of project initiatives proposed for the implementation of the GTI during 2020 were also considered.

The participants of the discussion agreed on the need to deepen regional cooperation through strengthening cooperation and improving the system of coordination of actions for the development of logistics infrastructure.

The next time the Transport Council at the GTI was supposed to meet in Seoul. The meeting was scheduled for September 2020. But because of the epidemiological situation. On September 23, the online conference Political Dialogue of the GTI on Industrial Parks was held, chaired by the Director of the GTI secretariat, Andrey Smorodin [3].

In the course of the study, priority areas of interaction in the GTI were identified [7, 9, 12]

- * Simplification of the process of cross-border trade.

- * Creation and comprehensive development of transport infrastructure facilities and systems, tourist destinations, etc., mainly through active investment attraction.

- * Improving the logistics and transport system in the region, including international transit.

- * Deepening of scientific and technical cooperation and contacts at the regional level.

- * Active involvement of the GTI territories in the global economy at the level of the Asia-Pacific region.

- * Environmental issues.

- * Conducting various studies aimed at improving and improving competence in the fields of energy, transport logistics, tourism, environmental protection, removing excessive trade barriers, etc.

In our country, the Ministry of Economic Development is responsible for coordinating the work of domestic departments and federal bodies on Russia's participation in the activities of the GTI (according to the decree of the Government of the Russian Federation No. 732 of 17. 06. 95). In addition, the Ministry of Foreign Affairs actively interacts with the GTI.

Achievements, problems, prospects

Over the past quarter of a century, the countries participating in the GTI have made significant progress on the path of intergovernmental cooperation aimed at mutually beneficial development of cross-border trade, tourism, and improvement of the transport system. There are plans to transform the GTI into a full-fledged independent international organization. Many different projects are being implemented within the framework and with the support of the GTI, but a number of problems that significantly reduce the effectiveness and limit the potential of this mechanism of international cooperation have not yet been solved [10].

First of all, this is the problem of the North Korea is non-participation in the

work of the GTI and the limited membership of Japan, which is still content with the observer status. Japan played a very important role in the creation of the GTI concept and its full implementation in the future is very beneficial to Tokyo, since it will provide Japan with a diversification of sources of energy and electricity, reduce transport costs, etc. However, Japan itself has not yet come to a unified position on cooperation with the NEA. At the same time, the GTI is actively promoted by the Japanese scientific circles and the political forces of the maritime prefectures, but at the same time, Tokyo does not show readiness to recognize the GTI as an all-Japanese initiative. In addition, the insufficiently high level of priority of this mechanism for the Governments of all participating countries has a consequence of the low effectiveness of the GTI and does not yet allow it to be transformed into a full-fledged and self-sufficient international organization. And the third problem is the lack of efficiency in coordinating the interests of all participating countries, for example, in the areas of transport logistics. For Russia, the most priority projects are related to the transit of foreign cargo through the ports of our Far East. The PRC considers the most important direction to be the improvement of transport logistics from its north-eastern part and is actively modernizing the transport infrastructure. A railway line to the Russian border and a highway to the border of the North Korea have already been laid. Thus, despite the obvious similarity of regional projects of different countries, there is no complete agreement on their harmonization yet. In addition, the development of the region requires solving a number of problems in the field of ecology. A significant part of these territories are rather fragile ecosystems of wetland landscapes, and some GTI districts are unique natural objects and are protected by law as nature reserves. For example, there is such a reserve in the Khasansky district (Russian Federation, Primorsky Krai) [11].

Nevertheless, the work of the GTI helps to form equal partnership relations between the governments and businesses of all participating countries. The solution of the urgent problem of incomplete entry of Japan, the accession of the North Korea, increasing the priority for the governments of the participating countries, more energetic actions to protect nature in the region can help to increase the effectiveness of the GTI. And this will contribute to the achievement of economic well-being and sustainable progressive development of the territories, as well as the growth of the contribution of the GTI to these processes, and, consequently, the status of this association. The contribution of the GTI to ensuring the political stability of the NEA region is also important.

The COVID-19 outbreak has put all aspects of our lives at risk. In particular, this affected the global economy, including the global value chain (GVC) and the trading system. Industrial parks play a catalytic role in economic development, providing a healthy business environment and policy. In the face of uncertainty,

the concept of industrial parks can become a tool for responding to the challenges of COVID-19, strengthening the value chain in Northeast Asia.

Despite the existing difficulties, the Russian Foreign Ministry will continue to provide political support to almost all GTI humanitarian initiatives, but the real work coordinated by the Ministry of Economic Development continues to be hindered due to the lack of material resources, which is due to the general crisis of the world economy and the consequences of the coronavirus pandemic (which has not yet ended).

It should be noted that the Tumen project in any form has not lost and will remain relevant for a long time and will largely serve as a determining factor in the economic and partly political international relations of the NEA countries. Its importance for regional cooperation is as great as it was a quarter of a century ago.

Its effectiveness is hindered by the desire of countries to realize their own (each) interests to the detriment of their partners, and in addition, the stereotypical perception by the leadership of the participants of this region as far from the center of the periphery, bordering on the same remote provinces of other countries. And in such a situation, the importance of the GTI as the only international platform for coordinating the actions of the countries of the region, especially in the regions of the Tumen Triangle, is very great.

References

1. *GTI Brochure. General. 2018. URL: <http://www.tumenprogramme.org/content/show.asp?m=115&d=36>*
2. *GTI Policy Brief 1 : Special Economic Zones in the Greater Tumen Region. URL: <http://www.tumenprogramme.org/content/show.asp?m=115&d=37>*
3. *GTI Policy Dialogue on the Industrial Parks (23rd September 2020, Online). 2020. URL: <http://www.tumenprogramme.org/?info-763-1.html>*
4. *GTI workshop on FTAs/RTAs information sharing. Trade and Investment. 2018. URL: <http://www.tumenprogramme.org/content/show.asp?m=115&d=39>*
5. *Report of the Training on Marketing and Promotion of Tourism Destinations held in 2018 in Hunchun. Tourism. 2018. URL: <http://www.tumenprogramme.org/content/show.asp?m=115&d=38>*
6. *World Integrated Trade Solution. URL: <https://wits.worldbank.org/>*
7. *Andreev V. A., S. Y. Astropulse Cluster effect of international transport routes // EKO. 2016. No. 7 (505). Pp. 129-138.*
8. *Wang Bin, Xiang Izzun Problems and prospects of implementation of cross-border economic projects in North-East Asia on the example of Extended GTI meetings Initiative // ANI: Economics and management. 2016. No. 4 (17). pp. 69-72.*

9. Isaev A. G. *XII joint seminar of KIEP- IEI FEB RAS // Spatial Economics*. 2017. No. 3. pp. 180-183.

10. Kadochnikov P. A., Meschistova N. I., Gushchin E. S. *Russia's foreign economic policy in Asia and the transformation of the Greater Tumen Initiative // Russian Foreign Economic Bulletin*. 2016. No. 3. pp. 14-28.

11. Lazarev V. A. *The Northern Sea Route as a factor of attraction of commodity flows from Northeast Asia // Regionalism*. 2019. No. 6. pp. 77-87.

12. Niyazova M. V. *Greater Tumen Initiative (dynamics, structural changes, prospects) // Russian Foreign Economic Bulletin*. 2019. No. 5. pp. 79-91. doi: 10.24411/2072-8042-2019-00057.

公司在数字经济中的战略成熟度
**STRATEGIC MATURITY OF THE COMPANY IN THE DIGITAL
ECONOMY**

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抽象的。数字经济已经牢固地进入我们的生活，它不仅包括IT公司，还包括所有行业和地区和州的管理。在变化的条件下，我们可以谈论数字经济的异常现象，这些现象无法从经济学理论和管理科学的角度进行描述。然而，正是在这些条件下，有必要为所有公司建立市场关系，转向高质量的互动。文章讨论了在这些条件下领导力的特征和战略目标的实现

关键词：数字化，数字经济异常，战略领导，混合能力。

Abstract. *The digital economy has already firmly entered our life and it includes not only IT companies, but all industries and management of regions and states. In the changed conditions, we can talk about the anomalies of the digital economy, phenomena that defy description from the standpoint of the theory of economics and the science of management. However, it is in these conditions that it is necessary to build market relations for all companies, to switch to high-quality interaction. Features of leadership and achievement of strategic goals in these conditions are discussed in the article*

Keywords: *digitalization, digital economy anomalies, strategic leadership, hybrid competencies.*

The level of digital development of a company, that is, its ability to create value using digital technologies, serves as a key predictor for assessing the chances of success for digital transformation. Digitally evolved companies demonstrate competitive advantage on a number of metrics, including revenue growth, time-

to-market, cost efficiency, product quality, and customer satisfaction. Companies with low levels of digitalization are failing to reap these benefits. As digital technology increasingly contributes to business performance, the gap between digital leaders and laggards is likely to only widen.

Only 33% of organizations successfully deal with digital disruption. Those who do this tend to make large strategic bets — on the order of 10% of their market capitalization.

A digital strategy roadmap provides powerful digital business strategy capabilities and helps you improve strategic planning to better understand how to incorporate new technologies into business strategy and operations. Before digital transformation begins, companies can use dedicated criteria to compare their digital metrics across 36 categories, such as customer journey, digital supply chain, and marketing personalization. The value of this early benchmarking experience exponentially increases during the digital transformation itself, as organizations begin to track current results to understand where they are gaining momentum and where they are lagging.

As international practice shows, the success of a digital product implementation depends by 80% on the readiness and ability of a business to transform. Hence the idea was born to combine the best available technology solutions with world-class management and transformation expertise. Digital transformation projects implemented according to this methodology will be able to provide plus 10-20%. Among the tasks, it is important to note the development of digital solutions based on artificial intelligence, BIG DATA, advanced analytics and the Internet of things for the mining and metallurgical and potentially other sectors of the heavy industry. These are digital advisors, optimizers of technological modes, predictive systems, as well as the creation of complex solutions of the "digital twin of an asset" class.

How to create a digital strategy roadmap? The digital strategy model must provide the necessary rigor at every stage. The digital strategy roadmap provides five key outcomes that answer key questions:

1. Digital vision. How is digital technology changing your industry? What new offerings, operating models, and business models could it include? What new competitors might this provide opportunities?

2. Assessment of competitive advantages. How does digital technology affect competitive advantage? Where are we in an advantageous position? Where are we at a disadvantage?

3. Priority list of digital bets. Which digital opportunities match your value-based business strategy, as well as your ambitions and capabilities? In what order should you chase them?

4. Gap analysis. Based on your bets, what are the capacity, organization and

system gaps you need to fill in order to win?

5. Roadmap for reforms. What are the time frames, goals and responsibilities for each of your programs? What steps are required to finance a trip?

All of the above strategies must be applied taking into account modern features, manifested by the digital economy, which can be classified as anomalies. (L.V. Lapidus 2020.)

Anomalies in the digital economy include phenomena that:

1. cannot be explained by economics and management science
2. difficult to calculate, describe and predict
3. become noticeable with great delay, when the leading players are already threatened with the loss of strategic stability

These anomalies include:

1. The speed of reaching a record level of capitalization of companies. The so-called "unicorn startups" have reached a capitalization level of \$ 1 billion or more in less than 7 years. An example is Airbnb, which has a capitalization of \$ 30 billion, **YouTube which** was bought by Google for \$ 1.65 billion 9 months after its inception.

2. Correlation of the company's capitalization from new factors. These factors now include - the number of visits, the creation of communities, the number and cost of leads, the rate of increase in visits.

3. The transition to a sharing economy has turned the pyramid of profitability. Avoiding the need to own expensive property (house, apartment, car) significantly and unpredictably changes the consumption market.

4. High viability of the companies with the "Divesting of Assets" business model.

The prominent representatives of this direction are Airbnb, Uber, BlaBlaCar. Companies provide users only with a platform for information exchange and at the same time have a high capitalization and IPO. For companies from other industries using similar business models, a new term "Uberization" has appeared.

5. Abnormal behavior of financial bubbles with a digital nature.

Digital currencies issued and maintained using blockchain can change the way individuals and organizations exchange value, eliminating the need for costly payment intermediaries, providing greater price stability and reducing counterparty risks. A digital dollar, euro, or other digital tender could democratize access to financial systems, making it easier for "nonbank" populations in poor or remote regions to buy, sell, save and invest more easily than before.

Digital currencies could help solve these problems. Blockchain technologies prevent data changes and provide payment authentication. Transactions can be correlated in near real time and stakeholders can view the entire transaction route. These opportunities mean that blockchain-based currencies can supplant interme-

diaries such as brokers, settlement agencies and notaries who provide independent third-party verification. Blockchain can also minimize the need for market arbiters, price reporting agencies, benchmark data providers, and others whose businesses create value by capitalizing on information asymmetries.

Digital currencies are poised to revolutionize our financial infrastructure over the next five years. Participants in the financial system should use this time to analyze potential consequences, prepare for possible disruptions, and begin to actively explore what role they want to play and what partnerships they need to establish in order to maximize the value of digital currencies and influence the direction of their development.

References

1. *Analytical research Hays and Oxford Economics. The Hays Global Skills Index dated 2021 [Electronic resource] URL: https://hays.ru/wp-content/uploads/Hays-global-skills-index_23.09.pdf (appeal date: 23.02.2020)*
2. *Be ready for the future of money [Electronic resource] URL <https://www.bcg.com/ru-ru/publications/2020/get-ready-for-the-future-of-money> (appeal date: 10.09.2021)*
3. *Digital strategy roadmap [Electronic resource] URL <https://www.bcg.com/ru-ru/industries/education/primary-secondary-education> (appeal date: 10.09.2021)*
4. *Assess digital maturity to improve performance [Electronic resource] URL <https://www.bcg.com/ru-ru/capabilities/people-strategy/talent-development> (appeal date: 10.09.2021)*
5. *BCG Upskilling Bootcamp accelerates your digital future [Electronic resource] URL <https://www.bcg.com/capabilities/people-strategy/upskilling-virtual-bootcamp> (appeal date: 10.09.2021)*
6. *Lapidus L.V. Evolution of the digital economy. Lomonosov Readings-2018. Section of Economic Sciences. Digital economy: people, technologies, institutions: a collection of theses of speeches. – M.: Faculty of Economics, Lomonosov Moscow State University, 2019. P. 153-158.*

人力资本是全球化进程和“绿色经济”发展的最重要因素
**HUMAN CAPITAL AS THE MOST IMPORTANT FACTOR IN THE
PROCESS OF GLOBALIZATION AND THE DEVELOPMENT OF THE
"GREEN ECONOMY"**

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抽象的。 论文考虑了现代世界的主要社会政治趋势——全球化,这导致了“全球治理”和“全球领导”等术语的出现。 现代世界的特征之一是“绿色经济”和可持续发展的概念。 提出了一种新的“全球治理”模式,需要领导者,能够控制现代生活中的重组变化,特别是考虑到外部环境的不确定性和风险。 只有具有高度文化智慧的领导者才能影响未来的变革轨迹。

关键词:“全球领先”、“绿色经济”和可持续发展理念、创新发展、人力资本。

Abstract. *The paper considers the main sociopolitical trend of the modern world - globalization, which led to the emergence of terms such as "global governance" and "global leadership". One of the characteristic features of the modern world is the concept of a "green economy" and sustainable development. A new model of "global governance" is proposed, for which leaders are in demand, capable of controlling reorganization changes in modern life, especially taking into account the uncertainties and risks of the external environment. Only leaders with a high level of cultural intelligence will be able to influence the trajectory of changes in the future.*

Keywords: *"global leadership", the concept of "green economy" and sustainable development, innovative development, human capital.*

"To be successful these days, you need to be a globally educated person."

Robert Rosen [1]

Globalization - is a process of economic, political, cultural and religious integration and unification [2] (diagram 1).

Globalization

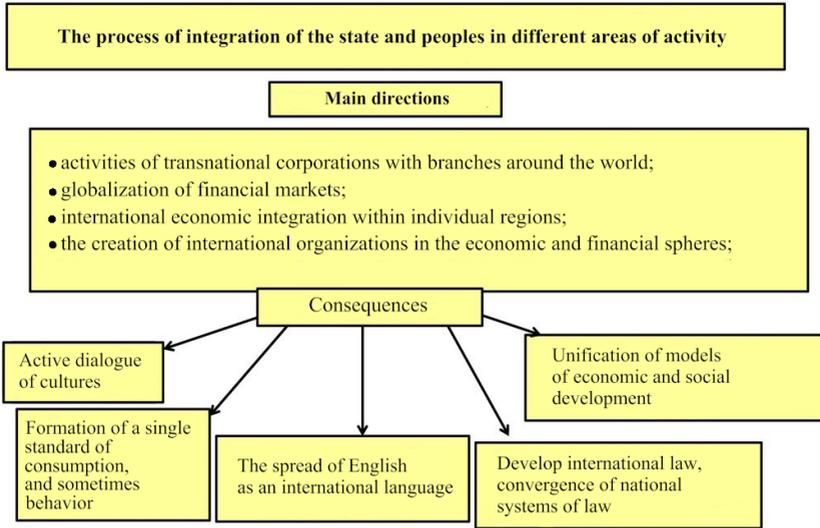


Diagram 1. Globalization: main directions and consequences

Globalization is also a characteristic feature of all processes affecting the world economy. This can include changes in the structure of the world economy, represented as a set of national economies linked to each other by a system of international division of labor, economic and political relations, through inclusion in the world market and the close intertwining of the economy on the basis of transnationalization and regionalization. On this basis, the formation of a single world networked market economy - geoeconomics and its infrastructure, a decrease in the influence of state sovereignty [3], which has been the main actor in international relations for many centuries, is taking place. The process of globalization is a consequence of the evolution of state-formed market systems.

The processes of globalization are multifaceted and cover all areas of the economy, business, and all aspects of human activity. The exchange of knowledge, ideas, products and services, the acceleration of investment flows expands the national boundaries of business, creates international corporations with a diverse staff and a variety of national cultures. In addition to mutually beneficial cooperation, competition is also increasing.

"Competition permeates our entire life, notes R. Rosen. - We are all, to some extent, each other's consumers, suppliers, employers. The point is to take its rightful place in this global market that has no borders". [4]

Changes in the conditions in the economic market and new features of the competitive struggle require certain modernized qualities from leaders. To succeed in the conditions of globalization, a leader must be a versatile "globally" educated person.

Global education, according to R. Rosen, can be of four types: [1]

Personal global education is the leader's ability to correctly understand and evaluate himself. In addition, a global leader must continually improve his educational level.

Social global education is social support for representatives of various social groups. In the conditions of the technological revolution, the acceleration of the pace of life, a leader needs to establish cooperation, find talented specialists and direct their efforts towards achieving common goals.

Business global education is the ability to mobilize an organization in the face of constant change. To do this, the leader must be able to form a culture in which value, learning and innovation are important.

Cultural global education is about knowing and supporting cultural differences. A leader must understand the peculiarities of national cultures, be able to establish communication with representatives of other cultures, apply knowledge about cultures in his work [5].

A global manager is a specialist whose functions include developing a strategy, planning, coordinating a company's transactions outside the country. Its main goal is to achieve the company's competitiveness on a global scale [6]. Thus, advantages in the global competition for a leader are impossible without innovations. The development of scientific and technological progress in the economy at the final stage of the innovation cycle occurs on the basis of active investment activity, which ensures the growth of the scale of innovations and their significant impact on the rate of economic growth. The costs of the commercialization of innovations, the development of entrepreneurship in this area are dozens of times higher than the costs of science and R&D. This means that it is necessary to organize the rational management of innovative activities, including incentives from the state. Such management should have a strategic character and be based on the state's innovation policy.

On September 2, 2020, the next report "Global Innovation Index" (GII) [6] was presented, containing the results of a comparative analysis of the innovation systems of 131 countries and their rating by the level of innovative development. The leaders, like last year, were Switzerland, Sweden and the United States. Russia took 47th place, having lost one position compared to 2019 [7].

Ranking leaders. Switzerland again topped the ranking this year. Together with it, Sweden, USA, Great Britain, the Netherlands, Denmark, Finland, Singapore, Germany and the Republic of Korea entered the top ten (fig. 1). There

is a steady strengthening of positions in the GII of individual Asian countries. In 2020, the Republic of Korea entered the top 10 for the first time, and India, China, the Philippines and Vietnam have consistently demonstrated the fastest progress in the ranking over the past years. In GII-2020, they all entered the group of 50 leading countries.

Fig.1 Leading Countries of GII-2020

| | |
|---------------------------------------|----------------------------------|
| 1 Switzerland (1st in 2019) | 11 Hong Kong (China) (13) |
| 2 Sweden (2) | 12 France (16) |
| 3 United States of America (3) | 13 Israel (10) |
| 4 United Kingdom (5) | 14 China (14) |
| 5 Netherlands (4) | 15 Ireland (12) |
| 6 Denmark (7) | 16 Japan (15) |
| 7 Finland (6) | 17 Canada (17) |
| 8 Singapore (8) | 18 Luxembourg (18) |
| 9 Germany (9) | 19 Austria (21) |
| 10 Republic of Korea (11) | 20 Norway (19) |

***The positions of the country in the GII in 2019 are given in brackets.**

Russia in the Global Innovation Index - 2020 In GII-2020, Russia took 47th place, down one point compared to last year 2019 (tab. 1) [7].

Russia's position in the innovation resources sub-index has traditionally turned out to be significantly higher than in the innovation results sub-index (42nd place against 58th). Moreover, if in the first case there is a slight deterioration of the situation (-1 row) compared to the previous year, then in the second case there is a symmetric correction of positions (+1). Taking into account the increase in the number of countries in the ranking, we can conclude that the position of our country has not actually changed. (tab. 1)

Table 1. Dynamics of Russia's positions in the GII: 2015 - 2020

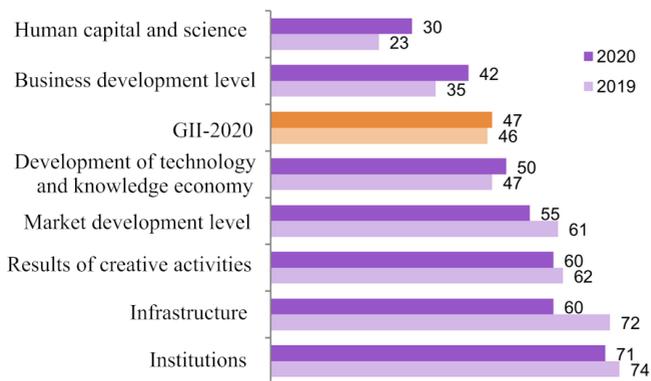
| | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|
| Global Innovation Index | 48 | 43 | 45 | 46 | 46 | 47 |
| Resources of innovation | 52 | 44 | 43 | 43 | 41 | 42 |
| Results of innovation | 49 | 47 | 51 | 56 | 59 | 58 |

*Number of countries: 2015 – 141; 2016 – 128; 2017 – 127; 2018 – 126; 2019 – 129; 2020 – 131.

Thus, based on the above statistical data presented in the report "Global Innovation Index" (GII) [8], in economically developed countries the share of inno-

vations is about 80%, in the Russian Federation - already more than 60%; at the heart of this process is the acceleration of the development of scientific and technological progress, and the natural advancement of business to the best indicators of its competitiveness, which is possible on the basis of innovations; at the same time, with the use of new products and the introduction of digital technologies, the capital intensity of the economy significantly decreases, and the labor intensity increases. And therefore, at present, investments in human capital significantly exceed investments in materialized capital, which predetermines the shift of emphasis in the development of the national economy from "capital" to "labor" (fig. 2)

Fig. 2. Positions of Russia in GII-2015 and GII-2020 by elements of the innovation index



*Number of countries:2019 – 129; 2020 – 131.

Advantages and disadvantages of the Russian innovation system. According to-GII 2020, the strengths of the Russian innovation system (fig. 2) include:

Human capital and science (30th place in the ranking):

Market development level (55):

Business development level (42):

Development of technology and knowledge economy (50):

Weaknesses that have a negative impact on the efficiency of innovation in Russia include the following: [7]

Institutes (74):

Infrastructure (60): environmental sustainability (101), energy efficiency (115) and ISO 14001 certification (106).

The level of market development (55): lagging in the entire direction of investment (106), including the availability of microfinance (77).

Business development level (42): number of companies with educational programs (91); cluster development (95).

Development of technology and knowledge economy (50): number of obtained quality certificates ISO 9001 (105).

The results of creative activity (60): feature films (81), print and other media (76).

It should be noted that the main difference between human capital and materialized is the property of its economic reflexivity (activity), that is, the desire to predominantly achieve their own goals to the detriment of entrepreneurial or state ones; a consequence of this, in our opinion, is the presence of a "shadow" sector in the national economy, the size of which is comparable to the legal sector and "do not want" to shrink, despite the abundance of penalties; the basis of such a world order is, apparently, systemic corruption, that is, the desire of civil servants to privatize the income received from the provision of public services. Also, predominantly technogenic emphasis in the process of socio-economic development of Russia; Scientific and technical progress is carried out in many respects spontaneously (market), without state examination of the introduced innovations for the ability to preserve the long-term positivity of the socio-economic effect. This is especially true for durable goods. The short-term useful effect of economic innovations is a direct consequence of the desire of business to obtain "momentary" profit, lack of faith in the economic efficiency of investment activities.

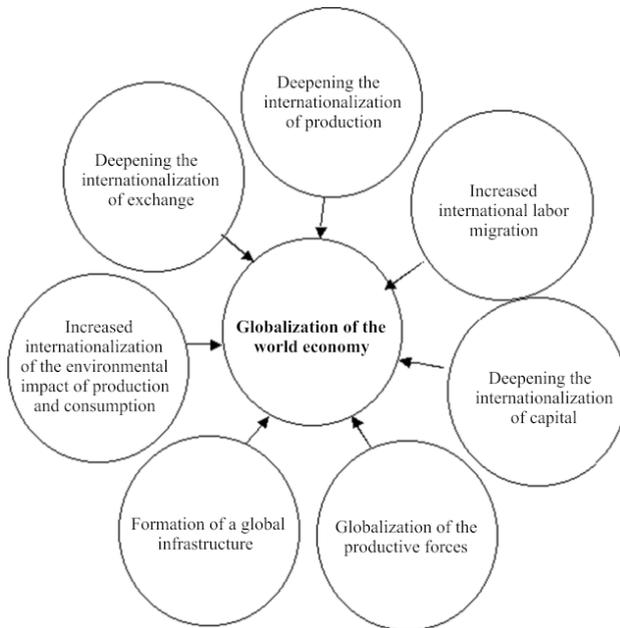


Fig. 3 Globalization of the world economy

It is impossible not to pay attention to the consequences of globalization. One of the results of globalization [2], is the world division of labor, migration (and, as a rule, concentration) on a planet-wide scale of capital, labor, production resources, standardization of legislation, economic and technological processes, as well as the convergence and fusion of cultures of different countries. This is an objective process that is systemic in nature, that is, it covers all spheres of society. As a result of globalization, the world is becoming more connected and more dependent on all its subjects. There is both an increase in the number of common problems for a group of states, and an increase in the number and types of integrating subjects [4].

"Green" economy [9] - a new concept of sustainable development

The essence of the expression "green" economy, currently the society understands differently. The first point of view: these are new sectors of the economy that will improve the nature of the country. The second point of view: these are new assistive technologies, ecosystems that are designed to help and benefit nature. The third point of view: this is a transition to a new stage of development, the purpose of which is to create environmentally friendly products. Thus, the "green" economy is an environmental economy aimed at preserving the well-being of society through the efficient use of natural resources, as well as ensuring the return of end-use products to the production cycle. First of all, the "green" economy is aimed at the economical consumption of those resources that are currently subject to depletion (minerals - oil, gas) and the rational use of inexhaustible resources. Essentially, a green economy means clean or "green" technologies.

More and more countries are taking aim at "greening" their economies, realizing that sustainable development is hardly possible without environmentally friendly, energy and resource saving technologies. Belarus does not stand aside from these processes and, following the global trend, is gradually planning the transition to "green rails". Large international financial organizations are helping our country to take concrete steps to introduce "green" innovations. A good example is the large-scale "Green" Economy in Belarus" project launched under the financing agreement between Belarus and the European Union [10].

The structure of the "green" economy - the basis for sustainable development

(European Environment Agency (2013). Towards a green economy in Europe)

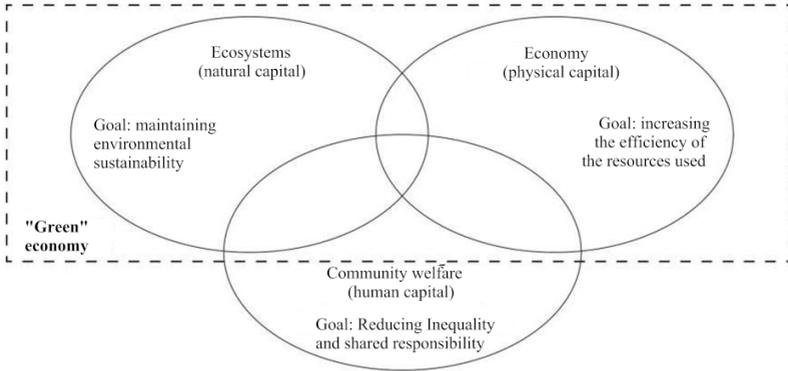


Fig. 4 The structure of the "green economy"

All of the above expected and planned changes are impossible without modernized human capital and new leadership concepts. It should be noted that in the era of globalization, there is a fundamental problem of leadership. A multilateral transformation is taking place against the background of the post-industrial period of society's development, which directly affects the formation of intellectual human capital. We can see the emergence of new working conditions (intellectual work is more in demand), management systems are being rebuilt, both in business – "project management" (and in government structures). The emphasis in management principles is shifted, the criteria for assessing the quality of work are changing. For example, creativity is more popular than diligence.

In connection with the flow of powerful transformations in society - social, democratic, economic in connection with the introduction of digital technologies, the role of the state, its impact on organizations and individuals, is becoming different. Naturally, the system of public administration is being rebuilt, since the concept of "multitasking" of functions and decision-making appears for a leader - a leader, especially taking into account the factors of uncertainty and risks of the external environment. All these characteristics require action in improving human resources and the formation of rational leadership in public administration.

Under these circumstances, a leader is in demand - a leader of a new type, both in business and in the public administration system. New competencies inherent in such a leader are: systems thinking, a set of knowledge and skills in the digi-

tal economy, a high level of responsibility for decisions made and the results of their activities. Leaders - leaders are agents of change and initiators of successful reforms, I develop development strategies, ways to implement them, taking into account the natural resistance to change among the employees of the organization.

Stable and effective development of the welfare state should be ensured by the formation and development of managerial competencies in society. Close attention to the topic of leadership in the public administration system ensures that numerous factors are taken into account: psychological, value, historical and moral. The transformative personality of a leader plays an important role in the life of small and large groups, in organizing their activities, in making group decisions.¹

Leadership - has a certain collective meaning and requirements put forward to leaders of various levels. At the same time, you need to be not only a leader - an administrator appointed according to the staffing table, but also a leader - a leader leading people, be able to convince them, take on more responsibility than is written in the job description, motivate them to be creative in achieving tasks placed in front of the organization. And, of course, the question arises about what competencies a professional should have a leader, what potential he should have (fig. 4).

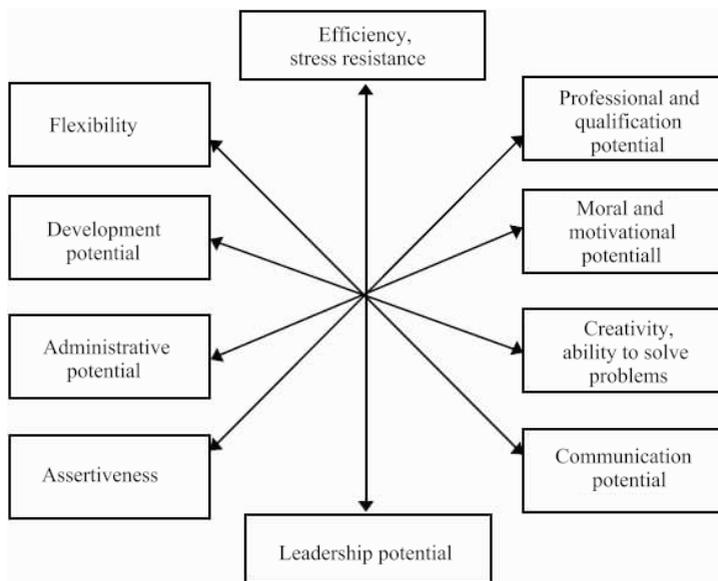


Fig. 5 Leader's potential

¹Ofitserov M.A. Modern leaders in public administration: methodological aspects of the formation of knowledge, skills and abilities

The UN World Report "Unlocking Human Potential for Improving Public Sector Effectiveness" notes that "the ability of government agencies to make their staff work effectively in the public interest depends on the ability, motivation, virtue of the individuals who work in these institutions, as well as on their leadership qualities"[11].

References

1. Savinova S. Yu. *Leadership in business: textbook and workshop for academic bachelor's degree* / S. Yu. Savinova, E. N. Vasilyeva. — 2-nd ed., rev. and add. — Moscow: Yuray Publishing House, 2019
2. Tsukarev S.S., Haag A.V., Kovaleva O.S. *Economic aspects of management activity. Textbook*. Novosibirsk: NSAU, 2015, 403 P.
3. Novikova I. V. *Globalization, state and market: retrospective and perspective of interaction*. — Mn: Academy of Management under the President of the Republic of Belarus, 2009. 217 P.
4. Erofeeva, A.V. *Pedagogical dialogue at the university: theory, position, practice: monograph* / A.V. Erofeeva, E.I. Perfilieva. — N. Novgorod, 2012, 134 P.
5. Daft R.L. *Leadership lessons*. — Eksmo, 2006. P.32.
6. Novikova I. V. *Globalization, state and market: retrospective and perspective of interaction*. — Mn: Academy of Management under the President of the Republic of Belarus, 2009. 217 P.
6. https://studme.org/343543/menedzhment/globalnoe_liderstvo_natsionalnye_kultury Date: March 20, 2021
7. *Global Innovation Index – 2020 — News— Institute for Statistical Studies and Economics of Knowledge — National research university "Higher school of economics" (hse.ru)* (appeal date 02.02.2021)
8. Cornell University, INSEAD, and WIPO (2020). *The Global Innovation Index 2020: Who Will Finance Innovation?* Ithaca, Fontainebleau, and Geneva. (appeal date 02.02.2021)
9. <http://ukrbukva.net/67-What-strategy-are-most-effective-in-the-conditions-of-globalization.html>(appeal date 02.02.2021)
10. <http://vlib.by/index.php/by/100-exb-on-line/exb-on-line-2017/1931-zelenaya-ekonomika-novaya-kontseptsiya-ustojchivogo-razvitiya> (appeal date 02.02.2021)
11. Ofitserov M.A. *Modern leadership in public administration: methodological aspects of the formation of knowledge, skills and abilities*

根据 1993年12月12日俄罗斯联邦宪法（经 2020 年修订法修订），俄罗斯联邦总统机构概念的特点（基于俄罗斯联邦总统制度分析方法的研究）现代国家和法律的发展，考虑到协同学作为一种新的科学范式的思想）

FEATURES OF THE CONCEPT OF THE INSTITUTION OF THE PRESIDENT OF THE RUSSIAN FEDERATION IN ACCORDANCE WITH THE CONSTITUTION OF THE RUSSIAN FEDERATION OF DECEMBER 12, 1993, AS AMENDED BY THE LAW ON ITS AMENDMENTS IN 2020 (RESEARCH BASED ON THE METHODOLOGY OF SYSTEM ANALYSIS OF THE DEVELOPMENT OF MODERN STATE AND LAW, TAKING INTO ACCOUNT THE IDEAS OF SYNERGETICS AS A NEW SCIENTIFIC PARADIGM)

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协同学学科和方法论的主要科学思想的系统化及其作为新科学方向的意义——信息革命时期的开展，提出了作者对这些问题的看法；在俄罗斯国家组织作为全球自我调节和自我发展的社会体系的研究方法的基础上，尝试研究俄罗斯联邦总统的现代宪法地位。

关键词：协同学、跨学科科学研究、信息革命、技术革命、全球化、区域化、复杂的自我调节系统、俄罗斯国家权力组织体系、俄罗斯联邦总统权力体系、俄罗斯联邦政府形式，俄罗斯联邦结构，俄罗斯联邦国务院

Annotation. *The systematization of the main scientific ideas on the subject and methodology of synergetics and its significance as a new scientific direction - the period of information revolutions is carried out, the author's visions on these issues are presented; an attempt was made to study the modern constitutional status of the President of the Russian Federation on the basis of the research methodology of the organization of the Russian state as a global self-regulating and self-developing social system.*

Keywords: *synergetics, interdisciplinarity of scientific research, information revolution, technological revolution, globalization, regionalization, complex self-regulating systems, systems of organization of state power in Russia, systems of Presidential power in the Russian Federation, form of government in the Russian Federation, federal structure in Russia, State Council of the Russian Federation.*

1960 to 1990 semiconductor production technologies were invented and developed, as a result computers and the Internet appeared, which gave reason to experts to talk about the entry of the world into the period of the third industrial revolution. New technologies, the web of the Internet that arose on their basis, which connected the whole world, stimulated the development of the processes of globalization and regionalization. The journalism notes that: The World Wide Web changed our lives, created unrest in the media and entertainment, but at first did not lead to a breakthrough in the industry, but created the preconditions for the world to enter a new reality, which is called the beginning of the fourth industrial revolution (since 2000), identifying it with forecasts of mass adoption of digital technologies.¹ Different definitions of the fourth industrial revolution are given. Dr. Klaus Schwab, who in the media is called the author of the concept of this revolution in his speech at the economic forum in Davos in 2016. defined it as: "a mixture of technologies of the physical, digital and biological world, which creates new opportunities and affects political, social and economic systems"² At the same time, he described it as an impending threat, said that: "This fourth revolution is coming at us like a tsunami. The speed cannot be compared with past revolutions, and ... the speed of this revolution is so high that it is difficult or even impossible for the political community to keep up with the necessary regulatory and legislative framework."³ The journalistic literature also notes that: digital transformation as "the main term of the fourth technological revolution" means that "big data, systems for their analysis and subsequent forecasting will change absolutely all spheres of human life: work, relations with the state, study, science, medicine. , communication, personal relationships. Already, the introduced technologies are fundamentally changing humanity. We do not just use the benefits of the fourth industrial revolution, we are used to them and take them for granted."⁴ Attention is drawn to the technologies of the fourth industrial revolution, which "humanity is using right now: the state as a platform; internet of things; artificial intelligence; machine vision; analytics based on big data; augmented reality"⁵.

Critics of the forecasts of the industrial revolution note the challenges and threats of the introduction of "Industry 4.0", indicate that it: "will increase the threat of cyberterrorism and fundamentalism, will contribute to an even greater dominance of the economies of developed countries over developing countries; "In the conditions of blurring the boundaries between the physical and virtual world,

1 The fourth industrial revolution: technologies and their features | Boodet.online
What does the concept of the 4th technological revolution mean? What technologies are used in it and why our era is so defined. IT GirL // <https://boodet.online/science-revolution> 25 September 2020 16:17

2 Mesnyanko Anton. The fourth industrial revolution is approaching

3 Klaus Schwab, Source- <http://www.weforum.org/about/k..>

4 The fourth industrial revolution: technologies and their features | Boodet.online

5 ibid

a person is more and more open not only for progress, but also for manipulation, a kind of “reading”, which creates problems of protecting personal information.⁶ Experts see in connection with the expanding practice of commercial activity on the Internet the threat of invasion into the sphere of the budgetary sovereignty of the nation state, since there are problems of taxation of subjects of electronic commercial activity, etc.

It draws attention to the fact that the beginning of two information revolutions (the 3rd and 4th industrial revolutions - from the 60s of the XX century) coincides with the period, which, according to popular beliefs, coincides with the beginning of the processes of globalization and regionalization. This gives reason to believe that the modern processes of globalization and regionalization are largely caused by "information revolutions". The definitions of globalization given by the authors of the textbook from MGIMO on the broad and narrow definitions of globalization seem to be fair, each of which the authors say that globalization is "based on the achievements of the modern information, communication and technological revolution."⁷ Some Russian and foreign researchers raise the topic of “fragmentation of law”. So, Russian scientists - N.N. Chernogor, and A.S. Emelyanov, drawing attention to the challenges of globalization for the nation state, in relation to Russia, believe that this process "seriously affects the unity of the Russian legal space." The authors note that today the processes of globalization and regionalization "are based on the concept of an" open society", the basis of which is international trade, entailing the erosion of national legal spaces, the revival of the seemingly long forgotten idea of "Lex mercatoria "(from the Latin. commercial law"). The absence of real trans-subject connections may entail the inclusion of border territories in the zones of influence of foreign states and transnational corporations. In fact, if such a process develops, the "crumbling" of the legal space of the Russian Federation will begin. Individual municipalities, and perhaps regions, without de jure separating from Russia, will find themselves de facto in a different legal space, on their territory the laws of other states or trade customs will prevail."⁸ The same Russian researchers cite a scientist from China Zhou Yizhi, according to whom: “There is a very dangerous situation in the world, within which some powerful states and transnational companies, under the slogans of globalization and regionalization, are trying their best to introduce into the public consciousness the idea of the disappearance of state borders,

6 Andrey Torin, editor of the International Affairs magazine. What does the fourth industrial revolution bring to humanity? 14:11 26.07.2016 • A lecture on the prospects of the "fourth industrial revolution" and its consequences for modern society was held at the ZIL Cultural Center.

7 Regional subsystems and regional problems of international relations. Textbook // Edited by A.D. Voskresensky. Moscow State Institute of International Relations (University). East / West

8 Chernogor N.N., Emelyanov A.S. Spatial-legal matrix of modern Russia. // Journal of Russian Law, 2020, N 5. P. 16

elimination of state sovereignty, which will undoubtedly weaken the position of sovereign states in solving domestic and international problems ... According to representatives of the PRC, no goals of international economic integration, which they indisputably recognize and which they strive to achieve, can justify the elimination or the slightest infringement of the sovereignty of national states; without strong sovereign national states supporting market relations, progressive economic development of all mankind is impossible"⁹.

Taking into account the above arguments, one should also agree with the authors from MGIMO that: "The very fact of raising the issue of globalization of world economic and political development is an intellectual challenge to Mankind. And it is very important to respond to it in a timely and accurate manner. In the modern computerized world, those who have intellectual initiative are able to direct the development of world political and economic thought in the direction they need. And, ultimately, he gets the opportunity to rule the world, although not directly, not directive. It is bad if, when solving conceptual and fundamental problems of world social development and world security, an intellectual initiative turns out to be monopolized by any one country or one intellectual group. Bad - not only for the global co-development process or for other countries, but also for the monopolist country itself. Bad - because to develop a historically significant theory without benevolent and interested in the ultimate success of opponents means introducing the risk of ruining even the greatest idea."¹⁰

In the Russian Federation, the relevance of solving conceptual and fundamental problems of world social development and world security in a computerized world is maintained at a high official level. According to the Kremlin press service, at a meeting of the Council for Science and Education, President of the Russian Federation V.V. Putin called the factor determining the further development of mankind: "The one who wins the global competition for technology and knowledge will determine the further development of mankind." It is quite obvious that the one who gets ahead will determine the further development of all mankind. And therefore, scientific and technological sovereignty is without any exaggeration a question of the present and future of Russia". The President also noted that the security of the country, the competitiveness of the national economy and domestic companies, everyday life and the well-being of people depend on the level of scientific and technological development. Russia has everything to be among the leaders in the field of science. First of all, these are talented youth and strong scientific schools. "We need to build up this potential"¹¹.

In view of the above, interdisciplinary ones related to the impact of information

9 Chernogor N.N., Emelyanov A.S. The specified article. P. 17-18

10 Regional subsystems and regional problems of international relations. Textbook // Edited by A.D. Voskresensky. Moscow State Institute of International Relations

11 Vedomosti. February 08, 18:19 / Technology

revolutions on changes in various spheres of life of states, institutions of civil society, humans, as well as changes in artificial systems are relevant. In this context, scientific research in the framework of a new scientific direction called "synergetics" is of particular interest. The subject of synergetics is the study of large self-regulating and self-developing natural and artificial systems. As for the method, according to the definition given by V.S. Stepin: "The key idea of substantiating synergetic concepts included in the general scientific picture of the world is universal (global) evolutionism"¹²; which "is not reduced only to the idea of development, extended to all objects of the Universe. It also includes the idea of a connection between evolutionary and systemic concepts When constructing a "synergetic version" of the general scientific picture of the world, it will be necessary to solve the problem of including a person and his values in it."¹³ Characterizing the main ideas of synergetics, Russian scientists Knyazeva E.N. and S.P. Kurdyumov is called among them the following: "The basic, pivotal for cybernetics and general systems theories are the concepts of "information" and "information approach", and the focus of synergetics is on the concept of organization and self-organization and their mechanisms."¹⁴ V.S. Stepin also draws attention to the fact that: "Research into complex self-regulating systems has become especially active with the emergence of cybernetics, information theory and systems theory."¹⁵ The main ideas of synergetics also include the following: "three key ideas: self-organization, open systems, nonlinearity"¹⁶. It is also pointed out that according to synergetics: "complexly organized socio-natural systems cannot be imposed on the ways of their development", that "for complex systems, as a rule, there are several alternative ways of development"¹⁷. According to the theory of synergetics: chaos should not frighten and should not be perceived as "a purely destructive beginning of the world" that "leads to nowhere", and chance should not be "expelled from scientific theories", should not be considered "secondary, secondary, not of fundamental importance factor ". "Imbalance and instability" cannot be perceived "from the standpoint of the classical mind as annoying troubles that must be overcome", as "something negative, destructive,

12 Stepin Vyacheslav. Self-Developing Systems and Philosophy of Synergetics "Economic Strategies", MIR VRAZDOS, 2009, No. 07. Pp. 24-35 Stepin Vyacheslav Semenovich - Academician of the Russian Academy of Sciences Stepin V.S. Issue 7. Error Detector 2009 This publication is a report by the author at the international conference "The Way to the Future - Science, Global Problems, Dreams and Hopes", held on November 26-28, 2007 at the Mstislav Keldysh Institute of Applied Mathematics of the Russian Academy of Sciences in Moscow.

13 Stepin Vyacheslav. The specified article

14 Knyazeva E.N., Kurdyumov S.P. The laws of evolution and self-organization of complex systems. M "Science". 1994. p.9, p.15.

15 Stepin V.S. Self-developing systems and post-nonclassical rationality. P.2

16 Knyazeva E.N., Kurdyumov S.P. Specified work. P. 15

17 Knyazeva E.N., Kurdyumov S.P. Specified work. P. 3-4

misleading, from the correct trajectory."¹⁸

In our opinion, not all the ideas of synergetics can be agreed with, but taking into account the subject of this direction, its connection with the topic of information revolutions (3rd and 4th industrial revolutions - from the 60s of the XX century) and processes of globalization and regionalization, but a benevolent and interested in ultimate success opposition to this theory is relevant. So, it is difficult to agree with the idea of the world development through dynamism (development of instability), through the competition of complexly organized systems, reaching the stage of chaos. This view is associated with the economist Adam Smith's theory of the invisible hand of the market about market power, which helps supply and demand in a free market automatically reach equilibrium. We must agree with the opinion that: "The theoretical description of the processes of achieving a state of dynamic chaos" as a factor of progress "generating this or that organization, order ... is based on the introduction of special idealizations"¹⁹, it has been repeatedly refuted by practice.

At the same time, the ideas of synergetics concerning the definition of synergetics "as knowledge about self-developing systems" are very interesting, referring to self-developing systems not only biological objects, modern design systems, modern complex computer networks, the Global Web - the Internet, but also "all social objects", Which, according to researchers of the synergetic scientific direction, also "belong to the type of complex self-developing systems."²⁰ It is proposed to carry out research in order to better adapt the research methodology of natural and technical sciences in interdisciplinary research with social and human sciences, taking into account the correlation of natural and artificial. As V.S. Stepin: "in the transition to the study of large systems, the categorical apparatus developed on the basis of classical mechanics becomes inadequate and requires serious adjustments. Large systems acquire a number of new characteristic features."²¹ Among such new characteristic features, the following are noted: "Complex self-developing systems are characterized by openness, the exchange of matter, energy, information and with the external environment;²² in the Russian scientific literature it is noted that the specifics of synergetics (as a method of scientific research) is largely associated with the term "interdisciplinarity", but it cannot be considered that this is a radical difference and even the complete opposite of synergetics to the disciplinary approach. According to V.S. Stepin,

18 Knyazeva E.N., Kurdyumov S.P. Specified work. P. 6, 7

19 Stepin V.S. Self-developing systems and post-nonclassical rationality

20 See: Stepin V.S. Self-developing systems and post-nonclassical rationality; Knyazeva E.N., Kurdyumov S.P. Specified work

21 Stepin V.S. The specified article. P. 2

22 Stepin Vyacheslav. Self-Developing Systems and Philosophy of Synergetics "Economic Strategies", MIR VRAZNOS, 2009, No. 07. P. 24-35

which seems convincing: "this interpretation is concretized through the description of disciplinary research as a solution to problems determined by ideas about the subject, where vertical connections from theory to experience and vice versa dominate. In interdisciplinary research, on the contrary, it is assumed that the main thing is horizontal connections, knowledge of the method and the transfer of the method from one science to another. This kind of reasoning, which outwardly seems plausible, requires clarification."²³ You should also support V.S. Stepin on the need to expand interdisciplinary synthesis in scientific research: connecting in research subjects such branches as: physics, biology, social sciences and humanities²⁴.

Taking into account the previous characteristics of synergetics as a scientific direction, the peculiarities of its subject, which is "universal (global) evolutionism", and methods that are associated with the possibilities and development of information technologies, interdisciplinary studies of natural and humanitarian sciences with the law: domestic and international are relevant. The organization of the world during the period of industrial information revolutions is compatible with the institutions of state and law, but needs their modifications. The principle of the rule of law should remain the limit of the development of nonlinearity in global social self-developing systems; global practice also testifies to the relevance of supporting state sovereignty. It seems that the concept of national states in the period of globalization also implies their strengthening as accomplices of financial, socio-political changes in the world, as complex economic and social corporations operating in a transnational format, both in natural and artificial spaces, organized on the principle of nonlinearity, open to surrounding external systems, and open in internal relationships between their constituent subsystems, like other systems, to the exchange of "matter, energy, information"²⁵.

Based on the constructive ideas of synergetics, let us turn to the analysis of the features of the constitutional institution of the President of the Russian Federation.

The modern constitutional model of the institution of presidential power in Russia was created in connection with significant and large-scale changes and additions to the status of the President of the Russian Federation introduced by the Law of the Russian Federation on amendments to the Constitution of the Russian Federation of 1993, introduced by the Law of March 14, 2020 N 1-FKZ "On improving the regulation of certain issues of organization and functioning of public authorities." 77.92% of citizens voted for the amendments in the all-Russian vote on the ratification of this Law. Residents of most Russian regions were in favor of the amendments. The law of the Russian Federation on the amendment to the Constitution of the Russian Federation retained the strong position of the

23 Stepin V.S. The specified article. P. 7

24 Stepin V.S. The specified article. P. 8

25 Stepin V.S. Self-developing systems and post-nonclassical rationality. P.5

President of the Russian Federation in the system of organization of the highest power in Russia, but at the same time, the Russian system of "separation of powers" was largely rationalized, changes were made to the ratio of collegiality and one-man management, taking into account the processes of globalization and regionalization taking place in the world and updating the issues of ensuring the state sovereignty of Russia and the sovereignty of Russian law. With the adoption of the Law on Amendments to the Constitution (of March 14, 2020), the residency qualification for a candidate for the President of the Russian Federation has significantly "grown", new requirements for candidates for the President of the Russian Federation have been introduced: permanent residence in the Russian Federation for at least 25 years who previously had citizenship of a foreign state or a residence permit or other document confirming the right to permanent residence of a citizen of the Russian Federation on the territory of a foreign state. The requirement for a candidate for the post of President of the Russian Federation that he does not have citizenship of a foreign state does not apply to citizens of the Russian Federation who previously had the citizenship of a state that was adopted or part of which was adopted in the Russian Federation and permanently resided in the territory of a state adopted in the Russian Federation or a territory adopted in The Russian Federation is a part of the state. The President is prohibited from opening and having accounts (deposits), keeping cash and valuables in foreign banks located outside the territory of the Russian Federation" (part 2 of article 81 of the Constitution of the Russian Federation of 1993 as amended by the Law on the amendment to the Constitution of 2020).

President of the Russian Federation in the systems of horizontal organization of power in the Russian Federation. The current model of the organization of presidential power in Russia, according to the Law on the amendment to the Constitution of March 2020, presupposes the implementation by the President of the Russian Federation of his powers on the basis of his inclusion in a number of systems of organization of state power in Russia. From the standpoint of the scientific and theoretical approach, these systems can be differentiated into small and large. In the first case, we are talking about state bodies that ensure, under the leadership of the President of the Russian Federation, his powers as the sole head of state, the guarantor of the Constitution, the sovereignty and integrity of the Russian Federation, the guarantor of fundamental rights and freedoms. Among them, we will especially note the constitutionally established ones - the Security Council, the Presidential Administration, the plenipotentiary representatives of the President in federal districts and in federal government bodies. By "large systems of organization of state power" in our classification, we mean constitutional systems that make up the mechanism of "division of powers" horizontally, and a system of federal structure.

With the adoption of the Law on the amendment to the Constitution of the Russian Federation of 03/14/2020, the powers of the President of the Russian Federation in the sphere of executive power are strengthened. The high importance of the post of the Chairman of the Government of the Russian Federation is preserved and confirmed (Article 111 of the Constitution of the Russian Federation of 1993). At the same time, in the Constitution of the Russian Federation, as amended by the Law on the 2020 amendment, it is said that: the President of the Russian Federation "carries out general management of the Government of the Russian Federation"; he has the right not only to "preside over meetings of the Government of the Russian Federation", but also to exercise general management of the executive branch (paragraph "b" of Art. 83, Part 1 of Art. 110 of the Constitution of the Russian Federation as amended by the Law of 2020). Of the Constitution, the Chairman of the Government "bears personal responsibility to the President of the Russian Federation for the exercise of the powers vested in the Government of the Russian Federation (Article 113 of the Constitution as amended by the Law on Amendment, 2020). The President not only "appoints the Chairman of the Government of the Russian Federation, whose candidacy has been approved by the State Duma on the proposal of the President of the Russian Federation ", but also "relieves the Chairman of the Government of the Russian Federation from office" (clause "a" of Article 83 of the Constitution of the Russian Federation of 1993 as amended by the Law of 2020).

Prior to the adoption of the 2020 Constitutional Amendment Law. in the Constitution of the Russian Federation of 1993. they spoke first of all about the collegial responsibility of the Government to the President. The peculiarity of the new concept of the President is related to the fact that the collegial responsibility of the Government to the head of state at the constitutional level is supplemented by norms on the individual responsibility of executive bodies and officials to the President of the Russian Federation. This means the strengthening of the signs of the presidential form of government in Russia, which corresponds to the history and traditions of the practice of one-man rule in Russia. Strengthening the signs of the presidential form of government in the version, which is formulated in the Law on the amendment to the Constitution of 2020, does not remove, but, on the contrary, increases the responsibility of the President of the Russian Federation for the quality of the exercise of his personnel powers before the voters in the next presidential election: after all, according to the analyzed Law in the power of the President to replace the ineffective Prime Minister.

The law on the amendment to the Constitution of the Russian Federation of 2020. the powers of the President of the Russian Federation related to criminal appointments in the system of the prosecutor's office and in the system of judicial power have been expanded, the powers of the President have been envisaged

related to the functional interaction of the head of state with these institutions.

President of the Russian Federation in the systems of the federal organization of Russia. One of the very interesting novets of the modern constitutional development of Russia, which, in our opinion, is associated with the development of the model of the federal structure of Russia, is the constitutional legitimation of the State Council - a federal state body that initially functioned under the President of the Russian Federation (in 2000-2020) as a consultative institution, based on the Decrees of the President of the Russian Federation. In his Address to the Federal Assembly (dated January 15, 2020), the President of the Russian Federation made a proposal to “radically increase the role of governors in the development and adoption of decisions at the federal level. In connection with the adoption of the Law on Amendments to the Constitution of the Russian Federation of 1993 (from 03/14/2020) and the Law "On the State Council of the Russian Federation" (from 08/12/2020), the legal characteristics of the State Council are radically changing. The status of the State Council is being developed in the context of the concept of "public authority" introduced for the first time in the text of the Constitution of the Russian Federation and is defined as a constitutional state body formed by the President of the Russian Federation, functioning in a unified system of public authority (clause 1 of article 3 of the Federal Law). At the same time, according to the Federal Law, “the unified system of public power means” the authorities of three levels: “federal government bodies, government bodies of the constituent entities of the Russian Federation, other government bodies, local government bodies in their aggregate, exercising within the constitutionally established limits on the basis of principles of coordinated functioning and established on the basis of the Constitution of the Russian Federation and in accordance with the legislation of organizational, legal, functional and financial and budgetary interaction, including on the transfer of powers between levels of public authority, its activities in order to respect and protect the rights and freedoms of man and citizen, creating conditions for the socio-economic development of the state” (clause 1 of Article 2 of the Federal Law). The essence of the novel is that through the new concept of the State Council, regionalization mechanisms are included in the process of successful fulfillment of social obligations of the state as ways to expand the foundations of governance, to include the regional and municipal levels in the implementation of national obligations. The importance of the powers that are in the 2020 Constitutional Amendment Law. entrusted to the State Council lies in the fact that their list includes such directions as: "Ensuring the coordinated functioning and interaction of public authorities, determining the main directions of the domestic and foreign policy of the Russian Federation and priority directions of the socio-economic development of the Russian state. "To understand the political and legal

nature of the State Council, it is important to pay attention to the provisions of the Federal Law, which provide for the rules governing the interaction of the State Council with bodies and organizations of the public power system: Federation, other state bodies, local self-government bodies, consultative and advisory bodies under the President of the Russian Federation, organizations, institutions of civil society (Article 15).

In conclusion, we note that the constitutional legitimation of the State Council in the Russian Federation and its new concept, provided by the Law on the State Council, the range of public authorities of the Russian Federation included in the system of interaction with the State Council, along with the one originally provided for in Article 71 of the 1993 Constitution of the Russian Federation. institute of subjects of joint jurisdiction of the Federation and its subjects give grounds for the conclusion that the constitutional novelties of 2020 in the form of the state structure of Russia, signs of cooperative federalism are increasing. Taking into account the enormous scale of the state territory and the composition of the population, the diversity of climatic and time zones, the large length of the state border, the large number of subjects of the Russian Federation - regions, territories, republics, autonomies, cities of federal significance, the multinational composition of the population, etc., the idea of constitutional legitimation of the State Council deserves special attention to the subject of steps towards a new quality of management.

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为提高学士准备过程中英语课程的有效性而实施教学资源配置的结果
**THE RESULTS OF THE IMPLEMENTATION OF THE PEDAGOGICAL
RESOURCING IN ORDER TO INCREASE THE EFFECTIVENESS OF
THE ENGLISH CLASSES DURING THE PROCESS OF BACHELORS'
PREPARATION**

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抽象的。 本文论述了有效性数字化的提出和论证，旨在解决当前教育标准中存在的问题，以提高未来学士教师的英语课程的有效性。 本文介绍了实施教学资源形成外语交际能力的主要结果，以提高未来学士教师的英语课程的有效性，他们在数字环境中参与教育过程。

关键词：数字化，教学资源，英语课程，动机，参与，学士准备。

Abstract. *The article deals with the presentation and justification of the effectiveness digitalization, aimed at solving the problems existed in the current educational standards for increasing the effectiveness of English classes for the future bachelors-teachers. The article presents the main results of the implementation of the pedagogical resourcing forming the foreign language communicative competence to boost the effectiveness of the English classes for future bachelor-teachers, their involvement in the educational process in the digital surrounding.*

Keywords: *digitalization, pedagogical resourcing, English classes, motivation, involvement, preparation of bachelors.*

Modern higher education is designed to prepare productive potential for an innovative economy with the help of a wide range of new knowledge. The fourth industrial revolution is transforming digital technology and brings with it the opportunities to transform education by finding new methods and ways of implementing new ways in the classroom. By the Decree of the President of the Russian Federation dated 05/07/2018 «On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024» as one of the

priority tasks in the field of education, «the creation of a modern and safe digital educational environment that ensures high quality and accessibility of education for all types and levels [1].

The digital educational environment of a pedagogical university has a pronounced career guidance orientation, that is, it is goal-oriented towards the transfer of professional knowledge, special skills and abilities, stimulating the adoption of a professional role, the formation of strategic thinking in the presence of a personalized trail of the student, since the subject of digital didactics of vocational education and training is “the learning process taken as a whole, as a system of organizing the learning environment in the digital educational environment” [6].

By pedagogical resourcing for the formation of foreign language communicative competence of future bachelors-teachers - philologists, we mean the type of such professional and pedagogical activity aimed at activating such educational resources that allow the student to constructively solve professional problems of foreign language communication in the digital educational environment of the university, while observing the principles of its organization: *the principle of personalization; the scientific principle; the principle of professional and communicative orientation; the principle of demand and success; the principle of integrity and expediency; the principle of complexity and interactivity, combining types of foreign language communication activities with an individual student's self-development program; the principle of flexibility and adaptability.*

Based on the analysis of scientific papers, the following pedagogical resourcing has been developed on the basis of SAMR technology for the formation of foreign language communicative competence of future bachelors-teachers of philologists. 1) Substitution: digital technologies in some cases can replace traditional ones (for example, interactive texts); 2) Accumulation (Augmentation): digital technologies become a tool for optimization in solving educational problems (for example, current or diagnostic, or final assessment using an interactive platform, such as Progressme, Moodle mobile applications and services); 3) Modification: significant functional changes in the educational process of the university and the interaction of its participants; 4) Transformation (Redefinition): the formulation and solution of new pedagogical problems that could not be solved earlier.

Pedagogical resourcing for the formation of foreign language communicative competence of future bachelors-teachers-philologists at the university includes: enriching the educational environment of the university with digital and interactive elements: gamification, case study method and group discussion in a digital educational environment; interactive, informational teaching aids, which is due to the need to involve subjects of the digital educational environment in foreign language communication in the digital educational environment of the university; development and implementation of the work program of the discipline of training

sessions, creating situations of professional communication using digital resources and interactive methods (Progressme, Moodle platforms) *while tracing the digital trail of the student*; conducting classes in English using game mechanics; activation of the cognitive activity of future bachelors-teachers of philologists through the optimal combination of individual, group and collective forms of education in a digital educational environment; organization and testing of interdisciplinary activities with native speakers on the basis of modern multimedia technologies, which allows future bachelors-teachers of philologists at the university to develop the ability to interact in a foreign language professional sphere, master the methods of searching and exchange professionally oriented foreign language information to understand the professional context of partner countries.

The effectiveness of the implementation of pedagogical resourcing in the digital educational environment of the university in the formation of foreign language communicative competence will be determined by the implementation of the following principles: the principle of personalization, which implies the freedom of choice of the student in setting educational goals, designing an individual educational route, determining the pace and level of mastering certain elements of the educational program, preferred technologies, forms and methods of teaching, taking into account his educational needs, personal inclinations and preferences, cultural characteristics; scientific principle, implemented with the optimal use of various algorithms and appropriate digital means to reflect advances in scientific aspects; the principle of professional and communicative orientation, in which the content and strategy of linguistic training are aimed at the implementation of the tasks of the professional and communicative areas; the principle of demand and success, initiating the relevance of the student's needs and the needs of society as a whole; the principle of integrity and expediency, ensuring the integration of disciplines of various subject blocks in the logic of professional training; the principle of complexity and interactivity, combining types of foreign language communication activities with an individual student's self-development program; the principle of flexibility and adaptability, combining student self-organization in the course of linguistic training and pedagogical influence based on dialogue and cooperation.

Pedagogical resourcing for the formation of foreign language communicative competence of future bachelors-teachers in the digital educational environment of a pedagogical university involves the formation and development of personal, theoretical and practical components of foreign language communicative competence. Therefore, the identification of the level of each of the components of the foreign language communicative competence after completing tasks in the classroom according to the program of the working discipline of the course "Practical course of the English language" is preliminary and only at the productive stage

during interaction with colleagues from different countries and in the process of reflection can the final result be revealed.

The belonging of future bachelors-teachers of philologists to a certain level of foreign language communicative competence in the digital educational environment was determined by the total score of all criteria. The proposed methodology provides for the assessment of the manifestation of each indicator characterizing the components of the structure of foreign language communicative competence, on a discrete scale: 0; 0.5; 1; 1.5. For a quantitative assessment of the criterion, it is necessary to summarize the assessments of all the indicators included in it, and to assess the formed foreign language communicative competence of future bachelors-teachers, it is necessary to summarize the assessments for each criterion of the foreign language communicative competence. In accordance with this, students who scored 19-25 points will have a professional level of knowledge, those students who scored 16-19 will have a free level, students who received 10.5 - 15 points will have a creative level, advanced 5.5 - 10, threshold 3.5 - 5, adaptive 0 - 3. At the same time, 10.5 - 15 points will correspond to a high level only if the communicative criterion has a high level. The effective-evaluative criterion of the foreign language communicative competence of future bachelors-teachers in the digital educational environment of the university includes the criteria and levels of formation of the content components of the foreign language communicative competence. Let us consider a summary analysis of the results of the formation of the foreign language communicative competence of future bachelors-teachers of philologists in a digital educational environment by components. The study was carried out at the beginning of the experimental work, during and after training according to the program of the work program of the discipline of the course "Practical course of the English language" within the framework of the developed pedagogical resourcing. The research was carried out by the methods of questioning, testing and expert assessments of teachers and employers. The research data are presented in the table below. The adaptive, threshold and basic levels are not presented in the table below, since they are already formed and constitute the remaining percentage.

Table - Summary dynamics of changes in the level of formation of the foreign language communicative competence of future bachelors-teachers for professionally oriented foreign language communication at the beginning and end of experimental work

| Levels | Formative stage | | Control stage | |
|--------------|-----------------|--------------------|---------------|--------------------|
| | Control group | Experimental group | Control group | Experimental group |
| Creative | 46 % | 36,7 % | 38 % | 12,4 % |
| Fluent | 15 % | 20,4 % | 23 % | 37 % |
| Professional | 3,8 % | 14,3 % | 4,4 % | 47,1 % |

References

1. Decree of the President of the Russian Federation "On national goals and strategic objectives of the development of the Russian Federation for the period up to 2024" dated 05/07/2018 No. 204 // [Electronic resource] URL: <http://kremlin.ru/acts/bank/43027>
2. Federal Law of December 29, 2012 No. 273-F-3 "On Education in the Russian Federation" [Electronic resource] - Access mode: <http://minobrnauki.rf/documents/2974>
3. Adolph, V. A. Selected works: collection of scientific papers: in 2 volumes / V. A. Adolph. - Krasnoyarsk: KSPU im. V.P. Astafieva, 2020 - Volume 2 - 2020. - 220 p. - Text: electronic // Lan: electronic library system. - URL: <https://e.lanbook.com/book/151533> (date of access: 07.08.2021). - Access mode: for authorized users.
4. Adolph, V.A., Petrova, E.O. Competitiveness as a result of professionally oriented teaching of foreign language speech communication of future bachelors-pedagogues of doctors / V.A. Adolph, E.O. Petrova // *International Journal of Applied and Fundamental Research*. - 2015. - No. 1. - Pp. 121 - 125.
5. Adolf, V.A., Yurchuk, G.V. Organization of practice-oriented speech activity of future bachelors-teachers in the process of teaching a foreign language V.A. Adolf, G.V. Yurchuk // *Fundamental research*. - 2013. - No. 6 (part 4). - Pp. 1012 - 1016.
6. Verbitsky, A. A. "Digital generation": problems of education / A. A. Verbitsky. - Text: direct // *Professional education*. - 2016. - No. 7. - Pp. 10-13.

7. Morozov A.V. *Professional training of leaders of the education system using modern digital technologies // Man and Education. - 2018. - No. 4 (57). - Pp. 105-110.*

8. Ozolina, I.A. *Gamification in the educational process of the university and its use for future bachelors of teachers // V All-Russian scientific and practical conference with international participation "Theory and methods of teaching foreign languages in a multicultural society" (within the framework of the V International Scientific and Educational Forum "Man, Family and Society : history and development prospects. "Krasnoyarsk, December, 2016).*

9. A.Barkhatova, P.S. Lomasko, N.I. Pak, I.A. Ozolina, *The Organization of the Research Activity of the Future It-Teachers Based on the International Cluster Laboratory at the Pedagogical University Krasnoyarsk State Pedagogical University named after V.P. Astafyev. Jour of Adv Research in Dynamical & Control Systems, Vol. 11, Special Issue-08, 2019*

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用于管理非标准几何问题解决方案的模块化支持系统
**MODULAR SUPPORT SYSTEM FOR MANAGING THE SOLUTION OF
NON-STANDARD GEOMETRIC PROBLEMS**

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抽象的。 本文讨论了使用训练计算机系统解决非标准几何问题的问题，以支持其解决方案的管理。 作为系统开发的基础，教学方法采用交互式对话模式。 关注以寻找问题解决方案的形式进行学习，并因此发展一种思维方式，将其过渡到更加算法和数学化的水平。 作为示例，给出了用于开发解决问题的场景的典型问题。

关键词：非标准几何问题，解管理支持系统，交互对话，模块化系统，解搜索。

Abstract. *The article discusses the issues of solving non-standard geometric problems using a training computer system to support the management of their solution. As a basis for the development of the system, teaching methods are used in the interactive dialogue mode. Attention is paid to learning in the form of finding solutions to problems and, as a consequence, the development of a type of thinking, its transition to a more algorithmic and mathematized level. As an example, typical questions are given for developing a scenario for solving problems.*

Keywords: *non-standard geometric problems, solution management support system, interactive dialogue, modular system, solution search.*

Currently, especially during a pandemic, the use of various training software products is becoming the most urgent. Achievement of the modern level of mathematical education is possible when using the enormous potential of extracurricular work, since only in unity with the compulsory course of studying mathematics, extracurricular activities can create conditions for a more complete implementation of practical, educational, general educational and developmental learning goals. In education, new requirements are being presented to the results of mastering the basic educational program by students. The organization of classes in the areas of extracurricular activities is becoming an integral part of the educational process. This work not only deepens and expands the knowledge of mathematical educa-

tion, but also contributes to the formation of universal (metasubject) skills and abilities, the development of cognitive and creative abilities and interests and, as a result, increases the motivation to study the discipline.

There are many tutorials for a number of areas of mathematics, but most of them are testing programs. The created version of the proposed computer system allows teaching the solution of non-standard geometric problems, which will be especially in demand when preparing for various kinds of mathematical Olympiads and passing the unified state exam.

The methodology for designing new pedagogical technologies requires the development of training systems that ensure the development of students' creative activity and the introduction of methodological innovations in the educational process. With regard to the problems associated with the development of new pedagogical technologies, the analysis of the possibilities of computer support for various aspects of education is of particular interest. The pedagogical capabilities of the computer as a means of teaching in a number of indicators far exceed the capabilities of traditional means of supporting the educational process. In order to successfully apply computer learning technology, it is necessary to clearly understand the basic principles and techniques that contribute to the enhancement of human intellectual capabilities [3].

Guided by the methods of teaching in the interactive dialogue mode, proposed by G. Polya [9,10], V.A. Ufnarovsky [11] and N.K. Kosovskiy [7], a computer system was created to support the management of the solution of non-standard geometric problems. This system is primarily intended for students who want to study geometry in more depth.

Often in the classroom of mathematics and especially geometry we hear: non-standard problem, non-standard situation, non-standard approach, non-standard solution. Different authors have their own approach to the interpretation of these concepts. A.A. Carpenter wrote: "When it comes to teaching the solution of atypical problems that require a creative approach, when the learned algorithms are not applicable (do not lead to the solution of the problem), the teaching should orient students to find a solution with the help of some useful recommendations, which, although not of an algorithmic nature and do not guarantee the success of the search, they still contribute to it". Solving non-standard problems is an art that can be mastered only as a result of deep constant self-analysis of actions to solve problems and constant training in solving various problems [8].

Let us call the assumed solutions of the problems control. The support system is designed to familiarize oneself with geometric sophisms and paradoxes [4], and allows the user to find a control solution to the proposed problems in an interactive dialogue with a computer. Mathematical sophism is plausible reasoning leading to an implausible result. Moreover, the result obtained may contradict all our ideas,

but it is often not so easy to find an error in reasoning. The paradox by its definition is close to sophism. According to the dictionary of S.I. "A paradox is a strange statement that is at odds with the generally accepted opinion, as well as an opinion that contradicts (sometimes only at first glance) common sense".

In solving each of the problems, there are about ten stages of considering the way to find a solution. Essentially, a multi-stage menu system is used. The system consists of modules of the same type. The creation of a modular system will make it possible to expand it by adding new modules containing the next tasks. Writing the source code of the system in one file, without using modules, will make it difficult to work with it, and when the system starts, it may lead to a lack of computer memory.

For each problem under consideration, its own scenario has been developed, based on the principles proposed by G. Polya and V.A. Ufnarovsky. They consist in the fact that the solution of the problem is divided into several stages, each of which has its culmination with a question (or advice), which can serve as a concentrated expression of this particular stage. So G. Polya, for example, points out that each of the questions, when asked at the right time and in the right place, can stimulate the right answer, the right idea, a well-directed movement of thought that can move the solution forward. Thus, the question can play the role of a stimulant that accelerates the desired response of the learner. Of course, in some cases, you may not know exactly which question you should ask. But then you can iterate over them from a certain set, one after another, until, in the end, there is such a question that turns out to be useful.

The principle of the scenario is to develop a solution for each problem under consideration, that is, it comes down to creating a system of questions, organized in several menus. Typical questions used in the development of scripts are questions such as [2]:

1. What science can be used to solve this problem?
2. Which of the branches of mathematics is appropriate to use in solving the problem?
3. What does this branch of mathematics study?
4. What shapes are used in this task?
5. How can you characterize these figures?
6. Which of the presented theorems (formulas) should be applied to find the unknown parameter?
7. What will be the solution to the problem considered?

The support system is focused on learning how to find solutions to problems. It allows you to individualize the course of solving a problem. In the process of finding a solution, an average of about ten screens of the interactive dialogue menu changes on the screen. If the user does not solve the problem, this system allows

(sometimes by exhaustive search) to obtain a control solution.

After starting the program, the task selection window is displayed in front of the user. When you select a problem, a window appears on the screen containing the wording and picture for the problem, a question and answer options. Depending on the selected answer option, the corresponding comment is displayed on the screen. If you select an answer for which there is no path leading to a solution in the program, the question is asked again. If you choose the correct answer (of which there may be two), the program asks the user a follow-up question. At the same time, the user is provided with service capabilities, including instructions for working with the program, viewing the record of control solutions of the proposed problems, a list of definitions of mathematical terms and formulas, the use of some of which can lead to the solution of the problem, as well as brief information about the program. If desired, you can interrupt work with the program at any time, and exit to the task selection window.

The tools [5,6] of the visual logic programming language Visual Prolog were used as a development environment.

The Visual Prolog programming environment, created by PDC (Prolog Development Center), is based on the powerful logic programming language Prolog. Prolog is a declarative (descriptive) language. This means that given the necessary facts and rules, he will use the deductive method (from general to specific) to solve programming problems. Prolog rules describe the relationship between input data and output, that is, the results to be generated from the available data. Thus, the main task of Prolog is to find the necessary solution to the problem. The universal development environment Visual Prolog has a visual, object-oriented programming environment, a full-fledged database support mechanism. Web development tools allow a system written in Visual Prolog to be connected to Web pages. These capabilities make Visual Prolog a powerful tool for creating training systems with a large coverage of the potential training audience [1].

The system has been successfully tested on students and this gives reason to believe that this system will be able to provide an individual systematization of knowledge for active direct use in training, both with the use of a computer and without using it, using only the developed scenario.

The application of the proposed system in the educational process will allow to consolidate and apply the acquired knowledge in practice. The developed structure of the system can be used for the development of computer programs used to study the basic course of mathematics, as well as to deepen skills in a number of its sections.

Learning in this way is considered as one of the possible factors contributing to a faster and better assimilation of the material. This addition to the learning process will allow you to control each student even with different levels of knowl-

edge, can speed up the learning process and make it more diverse and interesting. Working with a computer support system for managing the solution of non-standard geometric problems can lead to a change in the type of thinking, its transition to a more algorithmic and mathematized level.

References

1. *Evgrafova I.V. Analysis of the functionality of ToolBook and Visual Prolog as training systems development tools. Collection of scientific works "Shipbuilding education and science - 2003", V. III. – SPb.: Publishing house of SPbSMTU, 2003., P. 339-342.*
2. *Evgrafova I.V. Using the Visual Prolog environment to create a computer guiding question system. Interuniversity collection of scientific papers, Iss. 5, "Computer Science – Research and Innovation". – SPb.: Publishing house of A.S. Pushkin Leningrad State Regional University, 2001, P. 19-22.*
3. *Evgrafova I.V., Kosovskiy N.K. The relevance of systems teaching problem solving. Journal: "Scientific Notes". Iss. 34. – Moscow: Publishing house of IIO GAN RAO, 2011, P. 88-90.*
4. *Ignatiev E.I. In the kingdom of ingenuity. – M.: "Science", 1987, 175 P.*
5. *Ying C., Solomon D. Using Turbo Prolog: Transl. from Engl. – M.: "Mir", 1993, 608 P.*
6. *Kerov L.A., Chastikov A.P., Yudin Yu.V. Expert systems: Development tools. – SPb.: "Polytechnic", 1996, 220 P.*
7. *Kosovskiy N.K. Heuristic Techniques in the Scheme for Solving Non-Standard Problems / Problems of Integration in Natural Science Education. – SPb.: 1993, P. 23-24.*
8. *Malinina I.S. Non-standard tasks in geometry lessons and methods of their solution. – M.: "Science and School", № 5, 2013, P. 108-110.*
9. *Poya G. How to solve a problem. – M.: "Uchpedgiz", 1959, 320 P.*
10. *Poya D. Mathematical discovery. – M.: "Science", 1976, 448 P.*
11. *Ufnarovskiy V.A. Mathematical aquarium. – Chisinau: "Shtiintsa", 1987, 216 P.*

非语言类大学借助“外语”学科软技能的形成

**THE FORMATION OF SOFT SKILLS BY MEANS OF THE DISCIPLINE
"FOREIGN LANGUAGE" IN A NON-LINGUISTIC UNIVERSITY**

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抽象的。 所需的专家必须具备能力矩阵和成功工作所必需的许多技能,这在现代教育学中被称为“软技能”。 文章讨论了“软技能”的概念,作者尝试将软技能的构成要素系统化并描述其内容。 在教学经验的基础上,提出了最有利于软技能形成的非语言类大学外语教学组织形式。

关键词: 软技能、特殊用途外语、交际、专科、教学方法

Abstract. *A demanded specialist must have a competency matrix and a number of skills that are necessary for successful work, which in modern pedagogy are called "soft skills". The article discusses the concept of "soft skills", the authors made an attempt to systematize the component composition of soft skills and describe their content. On the basis of pedagogical experience, the most effective forms of organizing foreign language teaching in a non-linguistic university are proposed, which are optimal for the formation of soft skills.*

Keywords: *soft skills, foreign language for special purposes, communication, specialist, teaching methods*

Modern society is constantly changing, which is reflected, firstly, in the labor market, forming a demand for specialists of a new formation, and secondly, in the Federal State Educational Standards. Changes in the educational paradigm from “knowledge-centric” to competence-based can no longer fully reflect the current situation in education: in addition to professional competencies, employees must possess professional or soft skills, since they are the ones that arouse increasing interest from companies and scientists. The purpose of this work is to clarify the concept of "soft skills", to analyze the component composition of the universal skills of a modern specialist, as well as to determine the methods and technologies

of teaching a foreign language in order to effectively form the soft skills of students at a non-linguistic university.

According to Margaret Andrews, a lecturer at Harvard University in the United States, «regardless of the country, industry or field in which graduates will work, the desire for leadership, the ability to work well in a team, communication skills are those «soft skills» that can provide significant influence on future career» [4]. This opinion is confirmed in a number of studies, in particular, in the large-scale project of 2013 by Google Project Oxygen. The company-leader has analyzed the career success of its employees since 1998 and has come to the conclusion that among the eight most important qualities of top managers that have determined their success in the company, seven are soft skills. These skills include the ability to communicate, listen, understand others, their values and opinions, show empathy and support colleagues, solve problems, be a good mentor, and have critical and analytical thinking. In 2015, the Organization for Economic Development and Cooperation (OECD) conducted a study "Skills for Social Progress. The Power of Emotional and Social Skills", which confirmed that soft skills are essential for success in careers and in life today.

First of all, let us define the concept of "soft skills". In the domestic scientific and methodological literature, the foreign term «soft skills» has a number of analogues: "flexible", "soft", "human" skills, "skills of the XXI century"; "Key", "basic", "end-to-end" or "universal", "meta competence", etc.

"Soft" skills began to form in the US Army in the 1970s and belonged to work-related skills. The term encompasses the human skills, social skills and personality traits required to build a career. However, in the Russian labor market, «soft» skills have appeared relatively recently, and in domestic pedagogy they have not yet been sufficiently studied. The concept of "soft skills" has been used in the scientific works of foreign scientists since the end of the 60s in the field of business, in the domestic scientific literature it appears in the 90s. XX century. It is customary to consider «soft» skills or soft skills in addition to technical, «hard» skills, i.e. professional skills to ensure the performance of professional actions. Thus, soft skills are mainly associated with communication, creativity and management; they determine the effectiveness of the employee's thinking in a decision-making situation. Research shows that "hard" skills only guarantee 15% of success, while the remaining 85% depend on "soft" skills.

What are the main components of soft skills?

Modern pedagogy combines soft skills into three large groups:

- personality cognitive skills;
- social and communication skills;
- the skills that make up emotional intelligence.

The National Association of Colleges and Employers (USA) conducted a study

of 260 organizations, which identified the following five soft skills that are considered the most valuable in employees. They are listed below in order of importance:

- 1) the ability to work in a team;
- 2) make decisions and solve problems;
- 3) communicate with people inside and outside the organization;
- 4) plan, organize and prioritize;
- 5) search and process information

In 2016, in Davos (Switzerland), within the framework of the World Economic Forum, the main soft skills (or "soft skills") were formulated, which are necessary for a modern specialist to carry out successful professional activities. According to the report, soft skills include the characteristic features of cognitive and intellectual activity in general, emotional intelligence, managing one's own activities and ways of constructive interaction with other people.

The soft skills below are compiled from the 2020 Soft Skills Rankings voiced by the World Economic Forum.

1. **Problem solving** is associated not only with the usual analytical work of finding the right solution, but also with the ability to correct mistakes.

2. **Confidence**. This skill refers more to a team leader who demonstrates not only confidence in himself and his decisions, but also confidence in the team and each participant.

3. **Emotional intelligence and empathy**. The ability to reflect, assess past experience, the behavior of team members, the ability to "understand the reality of another."

4. **Time management and stress management**. Competent distribution of resources (human, time) is the key to success. Fatigue and emotional burnout affects the efficiency of work, only a clear planning of work, the climate in the team are ways to solve this problem.

5. **Creativity**. All innovations are born in creative search. Modern researchers note the significant role of creative thinking, the ability to go beyond.

6. **Courage and enterprise**. In the Russian language there is a catch phrase that cheek brings success. The ability to make a risky decision, try something new, generate bold ideas is soft skills

7. **Motivation**. A stimulus always provokes a reaction, but at the stage of burnout, fatigue, it is difficult to maintain a high level of motivation. The bearer of such a soft skill sets promising goals "ahead of the curve," in which the achievement of the median result is not final.

8. **Vision and visualization**. Imaginative thinking, building a plan, including an educational trajectory, is an integral component of the work. Brainstorming, discussions, playing roles in organizing a meeting often become an element of corporate management.

9. **Teamwork.** Individualism and independence are no longer the hallmarks of a leader; modern conditions require collective decisions, the ability to work in a team.

10. **Curiosity** - the implementation of the principle of life-long learning. The modern specialist is forced to learn throughout his life. Awareness of the need for training, the search for educational resources, self-regulation in teaching MOOCs or other forms ensures the demand for a specialist.

All of the above terms of soft skills are reduced to the formed communicative competence. Students of non-linguistic specialties study not only a foreign language for general purposes, but also a foreign language for professional purposes. The task of teaching a special language, or professionally oriented teaching of a foreign language, is the formation of intercultural professional communicative competence as the ability to solve professional problems using a foreign language within the framework of a dialogue of cultures, and the indicator of the quality of education is the level of formation of this competence [3]. The discipline "Foreign language" is considered one of the most effective in the formation of soft skills. Let us analyze the methods and technologies of teaching a foreign language, which include the formation of "universal skills" of a specialist.

There are not many foreign studies devoted to role-playing as a means of forming "soft" skills. For example, R. Latif, S. Mumtaz, R. Mumtaz et. al. found that role play is more effective in developing critical thinking and communication skills than discussion. R. Taplin, A. Singh, R. Kerr proved that 10-minute role-playing games teach verbal communicative behavior in a foreign language in the workplace, the vision of conflict situations and their resolution [5]. Role play motivates, builds self-confidence and builds soft skills.

The technology of project activity allows students to show independence in planning and organization, determines the fulfillment of a didactic goal with a detailed development of the problem under consideration and its practical effective design in the form of a presentation, poster, booklet, newspaper, memo, etc. Formation of time planning skills, drawing up a work plan, teamwork and distribution of roles - all tools and organizational forms of project work serve to form soft skills.

Problem solving is best taught by such a form of work as a case study, or a method for solving problem problems. The method of working with a case goes through several stages:

- carefully read the conditions of the case, highlight key points, ignoring deliberately redundant information;
- formulate and analyze the problems in the case;
- search for the necessary information that is absent in the text of the case;
- keep track of the time, return to the terms of the assignment; - distribute functions participants: organizer, expert, generator of ideas, critic, performer (person,

who is responsible for formalizing the results of the decision);

- remember that each participant must prove himself; - support and to record in writing any, including non-trivial, ideas received brainstorming;

- to develop a unified position in the group;

- register the results;

- to present them succinctly and fully. [1, p. 59]

Thus, it can be stated that soft skills are a construct of social and psychological skills, which are over professional skills that can lead to success not only in the profession, but also in life. The structure of soft skills varies and a clear classification has not developed, however, the article attempts to describe its main components. The analysis of the pedagogical experience of using various teaching methods made it possible to identify the most effective methods of teaching a foreign language, contributing to the formation of soft skills: project activity, role play, solving problem situations.

References

1. Aikina T.Yu. *The method of cases in the formation of the communicative competence of students // Bulletin of TSPU (TSPU Bulletin). 2013.1 (129). S. 58-61*

2. Slezko Yu. V. *Formation of "Soft" skills in the process of professionally oriented foreign language teaching of international students // Philological sciences. Questions of theory and practice. 2019. No. 9. URL: <https://cyberleninka.ru/article/n/formirovanie-myagkih-navykov-v-protssesse-professionalno-orientirovannogo-obucheniya-inostrannomu-yazyku-studentov-mezhdunarodnikov> (date of access: 09/11/2021).*

3. Syrina TA *The case study method in the context of teaching a foreign language in higher education // Philological sciences: problems of theory and practice. - 2015. - No. 10, part 2. - S. 154-157.*

4. Andrews M. *What Do Employers Want? URL: <https://www.insidehighered.com/blogs/strategy/what-do-employers-want>*

5. Taplin R., Singh A., Kerr R., Lee A. *The use of short role-plays for an ethics intervention in university auditing courses // Accounting Education. 2018. No. 27 (4). P. 383 - 402. URL: <https://doi.org/10.1080/09639284.2018.1475244> (date of access 20.01.2019)*

6. Waters B. *"A part to play": The value of role-plays simulation in undergraduate legal education // Law Teacher. - 2016. - No. 50 (2). P. 172 -194. URL: <https://doi.org/10.1080/03069400.2016.1162404> (date of treatment 02.23.2021)*

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教学人员对附加教育机构创新活动条件变化的积极准备

**MOTIVATIONAL READINESS OF TEACHING STAFF TO CHANGES
IN THE CONDITIONS OF INNOVATIVE ACTIVITY OF THE
INSTITUTION OF ADDITIONAL EDUCATION**

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注解。动机领域传统上被区分为专业活动中的一个连接环节，它决定了一个人行为的有目的的、有意识的性质，并决定了个人的潜在能力。与此同时，在附加教育机构中进行的创新转型通常是在不考虑教师介绍它们的积极性的情况下进行的。由于这种情况，管理者往往面临某些防御行为的表现，即教师要么否认创新的重要性，要么以某种方式诋毁创新，表现出对创新的抵制。这类问题的解决是从传统的方法开始——信息、说服等。同时，需要用根本不同的工作形式来补充已经掌握的工作形式。

关键词：附加教育、创新过程、创新、教师动机、变革动机、变革的动机准备。

Annotation. *The motivational sphere is traditionally distinguished as a connecting link in professional activity, which determines the purposeful, conscious nature of a person's actions and determines the potential capabilities of the individual. At the same time, innovative transformations taking place in the institution of additional education, as a rule, are carried out without taking into account the motivational readiness of teachers to introduce them. As a result of this circumstance, managers often face certain manifestations of defensive behavior, when the teacher either denies the importance of innovations, or discredits them in one way or another, revealing resistance to innovations. The solution of such problems is started by traditional methods - information, persuasion, etc. Meanwhile, it is necessary to supplement the already mastered forms of work with fundamentally different ones.*

Keywords: *additional education, innovation process, innovations, motivation of teachers, motivation for changes, motivational readiness for changes.*

The process of dynamic changes, in which modern Russian additional education is located today, is considered by the pedagogical community as an active impact on the development of human capabilities, providing him with greater freedom of choice, the formation of an individual growth strategy. That is why additional education is now considered not only as a preparation for life or mastering the basics of a profession, but also recognized by the community as the basis of the continuous process of self-improvement of a modern person.

In these conditions of changes, one of the trends in the development of additional education is the transition to innovative activities that allow meeting the requirements of the surrounding social environment, the needs of children and their parents [1, p. 4]. The concept of "innovation" in Latin means "renewal, innovation or change" [2]. In relation to the pedagogical process, innovation means the introduction of new things into the goals, content, methods and forms of education and upbringing, the organization of joint activities of the teacher and the student.

The content of innovation can be: scientific and theoretical knowledge of a certain novelty, new effective educational technologies, a project of effective innovative pedagogical experience made in the form of a technological description, ready for implementation.

It is extremely important to optimize the educational space of additional education organizations in the context of innovative changes. To implement this task, it is necessary: 1) to create conditions and incentives in the innovative educational space for the development of students' motivation, self-analysis skills at the collective and individual levels; 2) to form the foundations of innovative behavior among students and teachers, which presupposes the manifestation of initiative, independence and responsibility in choosing creative, extraordinary solutions [3].

Educational institutions of additional education operating in an innovative mode allow a developing society to meet the need for modernly educated, moral, enterprising people who can independently make responsible decisions in a situation of choice, predicting their possible consequences; are capable of cooperation; are distinguished by mobility, dynamism and constructivism; have a developed sense of responsibility.

Innovative activity has its own carriers – individual and collective subjects of the innovation process. The developing pedagogical collective as a collective subject is a favorable environment for the professional and personal development of teachers (individual subjects), which, of course, affects the improvement of the effectiveness of the educational process as a whole.

In pedagogical activity, the result is the cumulative, collective result of the

activities of all participants in the pedagogical process. It is almost impossible to determine the contribution of an individual teacher, an employee of an educational organization, a parent, a family as a whole, or other sources of educational influence to the qualitative transformation of the subject of activity - the student.

Innovations are a certain system of ordered elements, actions and relations aimed at ensuring a high progressive result that is widely used and can lead to significant changes in the life of society and the state [10].

The innovation process in education is a certain complex activity aimed at the creation, development, use and dissemination of innovations in the education system [10].

For example, M. V. Clarin puts the following meaning into the concept of "innovation": "Innovation refers not only to the creation and dissemination of innovations, but also to transformations, changes in the way of activity, the style of thinking that is associated with these innovations" [7, p.23].

Currently, the development of an institution of additional education cannot be carried out otherwise than through the development of innovations, through innovative activity [5].

We know that changes in the organization of additional education can relate to any aspect or factor: the main structure, in goals, tasks and activities, in the use of technologies, in management structures, in organizational culture, in the effectiveness (quality) of work.

Of course, it is impossible to imagine the activity of a modern educational institution of additional education without an innovative component. For example, A.V. Bychkov notes that during the survey, teachers answered that they need various types of support when introducing innovations. Someone needs psychological support: some teachers would not refuse individual consultations of methodologists, practical teachers, from participating in seminars on innovative activities, they are ready to undergo course training [2].

Motivation is an incentive to any activity, efforts, achievements. In other words, to motivate someone means to ensure that a person wants to show diligence, a conscientious attitude to their duties [9, 15].

A motivated teacher psychologically feels himself a full-fledged part of any process that takes place in an institution, realizes his significance and value in society.

It is difficult to manage the motivational readiness of teachers, since each teacher is a unique person who has his own priorities, interests, needs, value orientations, expectations, motivational attitudes.

In the development program for 2019-2022, MBU TO DDT c. The main role of the Kochubeyevsky Stavropol Territory is assigned to innovative processes, and the effectiveness of the implementation of this program directly depends on

the desire of the members of the teaching staff to participate in solving the tasks set. In the period 2019-2022, the institution implements an innovative program of work with adolescents of the "risk" group "Vector".

To understand the motivational readiness of MBU teachers BEFORE DDT with Kochubeyevskoe to the changes in the conditions of the implementation of this program, we conducted a diagnostic study.

The package of diagnostic materials included:

* A set of questionnaires to determine the level of readiness of teachers for innovative activities.

* Methodology "Diagnostics of the structure of motives of labor activity" (T. L. Badoev).

• "Methods for diagnosing the motivational environment" and the questionnaire "Determining the motives of teachers 'work", developed on the basis of materials by T. L. Badoev and K. Zamfir.

* Self-actualization Test (SAT).

47 people, teachers of MBU BEFORE DDT, took part in the diagnostic study.

The experience in teaching activities, work experience in the institution, age, education of teachers were taken into account.

The survey revealed that the stronger the motives associated with the possibility of self-realization of the individual prevail among teachers, the higher the level of innovative potential of the entire teaching staff. Anti-innovation barriers: 35% of teachers are poorly informed about possible innovations in the team; 25% are convinced that it is possible to teach effectively in the old way; 30% have poor health and other personal reasons; 5% have little work experience, in which teaching activities in traditional forms do not work; 55% lack material incentives %; the feeling of fear of negative results-in 21%; disagreements, conflicts in the team - in 4 %.

Thus, such barriers as lack of material incentives, personal reasons, poor health prevail.

The analysis of the diagnostics of teachers ' motivation for innovation activity showed that different categories of teachers give different preferences to one or another factor (from maximum acceptance to rejection). For example, the following factors were important for teachers: "salary level", "recognition of work by managers and colleagues", "material and technical equipment of the workplace". Moreover, the factor "the level of workplace comfort" was higher for all categories of teaching staff with a long work experience and novice teachers.

Also, the subjects were asked to group the selected factors according to the degree of their influence on the desire to work effectively according to the following criteria: affect; significantly affect; rather significantly affect; rather slightly affect; slightly.

The analysis of the results showed that the following motivating factors have a significant impact on the degree of efficiency of teaching staff: the level of salary (98%) recognition of work by managers (87%), good relationships in the team (68%) interest in work (87%) the amount of bonuses, allowances, allowances (96.4 %).

For teachers of MBU BEFORE DDT, the most important factors, according to the degree of their influence on the desire to work effectively, were the following:

- "salary level, example and influence of managers";
- "good relationships in the teaching staff";
- * "recognition of pedagogical work by colleagues, managers, students and their parents".

One of the most powerful motivations of pedagogical activity is an interest in work. Almost every teacher strives for personal self-realization. For him, the attitude and professional recognition from colleagues is extremely important.

The structure of the main labor motivation also includes material interest. This factor is especially pronounced among novice teachers (97% of the number of novice teachers). Of course, on the one hand, in the conditions of regulated municipal financing, the director of DDT often does not have additional resources to stimulate employees.

The conducted research shows that the satisfaction of teaching staff with material remuneration depends not only on their size, but also on the conformity of people's ideas about social justice in assessing their efforts and work.

It should be noted that the professional activity of DDT teachers is highly motivated (arising from a number of motives). In the mind of each teacher there is a unique, complex "pyramid" of a wide variety of motives, where the upper "floors" prevail in terms of the degree of complexity of the internal organization; they act as internal landmarks. These statements are confirmed by the theory of the elevation of needs of A. Maslow: in addition to the need for material well-being, a person needs to satisfy other needs for happiness, such as self-respect, self-realization, communication and recognition, curiosity, the need for creativity and beauty [9].

People work not only for the sake of money. The reward does not necessarily come down to money, because for many, the recognition of a personal contribution is as valuable as material incentives. Striving for perfection is a great incentive. It promotes the growth of personal professionalism, causes pride and allows a person to feel their value. Everyone likes to experience their own importance. Paying attention to a person, showing interest in his capabilities and results, you can see that he is able to achieve great results even under the worst conditions.

Another significant aspect is the need to feel needed by the team, to pay attention to their work and their problems. The attitude of the manager and the team to

the teacher, to his problems, assistance in solving them, care about creating opportunities for him to grow-qualification, material, official-all this creates an idea in a person about how much he needs DDT, his colleagues.

There is also such an important factor of labor motivation as satisfaction with a favorable psychological climate in the team. The need for good relations with others is natural for every person, and if they have not developed or even worsened, it is always difficult psychologically, leads to alienation from employees, to a decrease in professional return and, as a result, to a change of job.

The conducted diagnostics and monitoring of DDT teachers made it possible to identify teachers with a different ratio of motivational dominants, depending on their work experience.

Teachers with a dominant internal and external positive motivation are characterized by a desire to achieve various successes in their professional activities, a desire to achieve recognition, and a focus on self-development. This group of teachers is the most numerous, its representatives are fairly evenly represented in percentage terms in groups with different work experience. Teachers of this group are guided by external assessments of their work, but at the same time, the needs for guarantees and security from the management are more relevant for them, since teachers of this category tend to avoid disciplinary penalties and criticism. Work experience-more than 20-30 years.

The obtained data indicate an acceptable level of readiness of DDT teachers for innovative activities, since they identify motives associated with self-realization and self-development.

The dependence of the level of motivational readiness of a teacher on his qualification category is of interest: according to the results of the questionnaire, we can conclude that the higher the qualification category of a teacher, the lower the average score of external motives.

From the analysis of the obtained result, it can be concluded that the leading positions are occupied by motives associated with self-affirmation, personal self-realization. The motivational readiness for changes in this category of teachers is sufficient, which positively affects the innovative processes taking place in MBU BEFORE DDT.

After analyzing the results of diagnostic studies, we can conclude that the DDT teaching staff has a good innovative potential. But the support of the institution's administration is necessary.

In this regard, the methodological service of the institution has developed a program "Increasing the motivation of teachers for innovative activities", taking into account individual needs. The program is supposed to use different forms of work: advanced training courses, webinars, the School of Professional Growth "Dialog", zoom conferences, participation in the regional online platform of pro-

professional skills "There is an idea", the mentoring program "Trajectory of the future", forms of network interaction with the GAOU VO NGGTI.

References

1. Akimov S. S. *Evaluation of the effectiveness of management of the development of institutions of additional education for children // Young scientist.* - 2014. - No. 16. - pp. 317-319.
2. Bychkov A.V. *The human factor in basic general and additional education (on the example of technological education).* - Moscow: ABV-IZDAT, 2016
3. Erofeeva N. Yu. *Management of educational systems. Educational and methodological manual.* - Izhevsk: Publishing house "Udmurt University", 2014. - 120 p.
4. Zvereva A. S. *Project approach in innovation activity // Economics and management of innovative technologies.* - 2013. - No. 11. [Electronic resource]. Access mode: <https://ekonomika.snauka.ru/2013/11/3373>
5. Zolotareva A.V. *Management of the development of an educational institution of additional education for children. Educational and methodological manual.* - Yaroslavl: YaGPU Publishing House, 2010. - 314s.
6. Kovaleva U. Yu. *The system of management of the development of an educational institution of additional education for children on the basis of a program-targeted approach // Theory and practice of education in the modern world: materials of the II International Scientific Conference (St. Petersburg, November 2012).* - St. Petersburg: Renome, 2012. - pp. 120-124.
7. Klarin M. V. *Challenges of mastering innovative educational practices. // Education and Society.* - 2017. - No. 4. - p. 39-45.
8. Korznikova, N. V. *Innovative activity as a vector of development of an institution of additional education // Pedagogy today: problems and solutions: materials of the II International Scientific Conference (Kazan, September 2017).* - Kazan: Young Scientist, 2017. - pp. 6-9.
9. *Hierarchy of personal needs. Abraham Maslow // Journal of the psychologist.* anyPSY.ru -All psychology [Electronic resource]. Access mode: <http://www.anypsy.ru/content/ierarkhiya-potrebnostei-lichnosti-abrakham-maslou>.
10. Yumunova L. N., Sanzhieva T. B. *A short dictionary of modern pedagogy.* Ulan-Ude: Baikal, 2010. - 104 p.
11. Hogan K. *The psychology of persuasion: How to achieve this goal: Trans. from English-M.:* RIPOLL CLASSIC, 2004 – – 315.

医学继续教育体系建设

**DEVELOPMENT OF THE SYSTEM OF CONTINUING EDUCATION IN
MEDICINE**

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抽象的。分析了终身学习的特点。Lifelong Learning 将工作场所视为最刺激的学习环境，每个人都可以在其中独立或团队学习。医疗保健系统中的医生和其他专业人员可能会将持续学习和不断更新的想法视为额外的负担。与此同时，鼓励获取新知识的组织变得更有活力和进步性。

职业在不断变化，因此在医疗保健领域出现新的诊断、治疗和预防技术的过程中，专业人员必须为这些变化、新角色和新要求做好准备。

关键词：终身学习，人生成功，继续教育，医学，研究生教育。

Abstract. *The features of lifelong learning are analyzed. Lifelong Learning recognizes the workplace as the most stimulating learning environment in which everyone can learn on their own or as a team. Physicians and other professionals in the health care system may perceive continuous learning and the idea of constant renewal as additional burdens. At the same time, organizations that encourage the acquisition of new knowledge become more dynamic and progressive.*

Professions are constantly changing, so professionals must be prepared for these changes, for new roles and new requirements, in the process of emerging new diagnostic, therapeutic and preventive technologies in the healthcare sector.

Keywords: *lifelong learning, life success, continuing education, medicine, postgraduate education.*

In the modern information society, there is an awareness that the development of economic and social relations in the state depends on the level of education of citizens who are able to independently set and implement goals aimed at achieving success in life. It is no coincidence that in all post-industrial countries education is attributed to priority spheres of activity, because it not only acts as the basis for the self-realization of each individual, but also is the basis for the dynamic development of society.

It is education that plays the main role in the formation of human capital, which is now becoming a decisive factor in both the economic development of the country and the achievement of a person's life success. So, in spite of the fact that the knowledge of an individual today is turning into the main resource of his self-realization, the task of analyzing the problem of learning throughout his life becomes urgent, which largely determines the achievement of a person's life success¹.

The purpose of this article is to analyze the problem of learning throughout life, lifelong education as a necessary prerequisite not only for self-realization of a person, but also for the dynamic development of society in an information society.

Given the rapid pace of development of society and the processes of globalization and informatization, the new reality of our time is that human knowledge becomes obsolete very quickly. The requirement for constant and prompt retraining of a person, the expansion of acquired knowledge, skills and abilities, without which it is no longer possible not only to make a career, but also simply to stay in the workplace, is becoming more and more urgent. Therefore, in the conditions of an information society, achieving a person's life success is impossible without constant mastering of new knowledge, without improving skills and competencies that will contribute to the formation of a creative personality who can not only independently and critically rethink existing frames of everyday practices, but also form new ones, ahead of social development. This will allow a person to effectively adapt to difficult living conditions, independently set and achieve goals, cultivate the necessary qualities and acquire knowledge that will be in demand in the future².

The principle of "lifelong learning" today operates in all civilized countries, since in the conditions of an information society, each person constantly lacks certain knowledge and needs to be regularly updated. The number of people who continue their education and master new professions or improve their qualifications is growing. This is for many reasons: existing medical professional knowledge is

¹Malinin E. D. Philosophy of Life Success. Practical guidance: textbook. allowance / E. D. Malinin. – [2-nd ed., add.]. – Moscow: Publishing House of the Mosc. Psych.-Soc. Inst.; Voronezh: Publishing house of NGO "MODEK", 2004. – P.206-211.

²Titov V. N. Evolution and theoretical prerequisites for the formation of the concept of "education throughout life" / V. N. Titov // Professional education in Russia and abroad. – 2014. – №1 (13). – P. 10-19.

rapidly becoming obsolete; the professions popular in the old days are becoming unclaimed; a person loses interest in the profession in which she is engaged, or seeks to improve the quality of professional knowledge.

With a personalized, evidence-based approach, doctors use the principle of lifelong learning.

Lifelong learning principles are considered to be at play when:

- professional development programs are based on already acquired knowledge and skills;
- ideas are discussed between different professionals in the health care system;
- achievements lying within and outside one specialty are used to improve practice;
- reflection and evaluation are translated into practice and contribute to personal and professional development.

Auditing and external peer review, along with personal development planning, are tools that physicians use to deliver quality care to their patients and create a creative environment that fosters learning for all members of the healthcare team.

Continuous training should and can improve the quality of medical care and intensify the professional growth of each specialist.

As a result of this process, physicians are expected to become:

- innovators in their work;
- flexible in the process of changing requirements of clinical practice;
- capable of disseminating knowledge and principles of good practice through external assessment and audit;
- able to adapt to the changing needs of the healthcare system and patient expectations;
- capable of realizing a creative approach to work;
- confident in themselves and their activities thanks to the knowledge of the manager and excellent business qualities.

Postgraduate education has become the main area of implementation of the idea of mass lifelong education. It is here that the problems of modern education turned out to be especially acute. It is important to see that this area is not a usual continuation of the existing education system, an additional superstructure over it, designed to compensate for the shortcomings of formal education, but it acts as a special industry, with special relations between the participants in the educational process, special educational motivation, the goal of people who combine study with work³.

In modern society, knowledge, innovations, technologies and methods of their practical application are increasingly the source of profit. At the same time, the

³Zdravomyslova O.M. From 80's to 90's: transformation of success models / O. M. Zdravomyslova, I. I. Shurygina // Population. – 1998. – №1. – P. 17-22.

sphere of education, which is significantly dependent on the economic sphere, and educational activity becomes an important component of the economic development of society. In addition, information and theoretical knowledge are the country's strategic resources and, together with the level of education development, largely determine its sovereignty and national security of the state.

Today, the following important trends in the development of education are distinguished: the transition from the concept of functional training to the concept of personality development, intensive interaction between states in the field of education, the development of market relations in this area. They determine the main directions in the development of the new education system. The fundamental difference between the new system and the traditional one lies in its technological base.

The new education system is focused on informatization: the realization of the high potential of computer and telecommunication information technologies with the implementation of one of the main advantages - distance learning⁴.

State budgetary professional educational institution of the Republic of Sakha (Yakutia) "Neryungri Medical College", SBPEI RS (Y) "Yakutsk Medical College" offer a new system of additional education for specialists with secondary medical and pharmaceutical education.

Continuing medical education (CME) is a new system of additional professional education (APE), which provides continuous improvement of knowledge and practical skills in the specialty throughout the entire working life⁵.

One of the conditions for continuing medical education is full-time professional retraining of medical workers on the basis of an educational institution using simulation technologies, practical training in a clinical setting.

Under CME, educational institutions implement advanced training programs for medical and pharmaceutical workers with secondary vocational education.

The Small Medical Academy is a structural unit of the NEFU Medical Institute.

The Small Medical Academy is the Center for Medical Career Guidance in the Republic of Sakha (Yakutia) for schoolchildren who are willing to devote their lives to medicine⁶.

Forms of student learning:

- for schoolchildren of grades 9-11 in Yakutsk;
- MMA schools: Summer, Autumn, Winter, Spring (grades 5-11 of secondary schools in Yakutsk and the RS (Y) - during vacation time, upon individual request;

⁴Modyanova T. Modern concepts of the formation and implementation of personnel policy. The experience of European countries and the USA / T. Modyanova // HR . Personnel management. – 2011. – №2. – P. 143-149.

⁵<http://nermedkolleg.ru/>

⁶<https://www.s-vfu.ru/universitet/rukovodstvo-i-struktura/instituty/mi/mma/mma.2>

- distance (correspondence) with schoolchildren of grades 9-11 of the RS (Y) and other regions of the RF;
- vocational guidance classes in MMA (grades 1-11 of secondary school in Yakutsk and the RS (Y)).

During the existence of the Small Medical Academy, about 1200 students graduated from it. The percentage of admission of "little academicians" to higher educational institutions of the country was 83%.

Long-term, fruitful career guidance work with schoolchildren of the Republic of Sakha (Yakutia) became a prerequisite for the fact that the Small Medical Academy was repeatedly noted by school directors, heads of municipal education departments, chief doctors of central ulus hospitals, as well as MI colleagues.

The Small Medical Academy of the North-Eastern Federal University and School № 31 of the city of Yakutsk signed a cooperation agreement in 2016 - a medical class was opened in the educational institution, where children planning to become doctors study.

In the conditions of the intensive formation of the information society, the "era of knowledge" begins and a model of education, work and life itself is created, which are "based on knowledge", which is accompanied by the process of continuous education. Continuing education is a complex of public, private and public educational institutions that provide organizational and substantive unity and further interconnection of all levels of education, satisfying a person's desire for self-education and development throughout his life. The basis for building a system of continuous, professional education is the constant renewal of the education received, the acquisition of new skills and abilities necessary for a successful and effective professional activity. At the same time, diversity and continuity is viewed not only as a promising trend, but also as a condition for achieving a new quality of education⁷.

The characteristic features that determine lifelong education as a factor in personality development are the staging and integrity of the process, the temporal and spatial parameters of the doctor's interaction with various sources of information, the personality parameter of lifelong education. From the standpoint of a systems approach, this process is a matrix that consists of all possible elements of the system in a series of mutual communications.

Fixed assets of continuing education: short-term courses, seminars, lectures, long-term programs (specializations, internships, with the possibility of their implementation abroad), modular programs, distance learning, summer schools, scientific seminars, master classes.

Continuing education is one of the foundations of the strategic development of postgraduate education of a family doctor, implemented by optimizing the train-

⁷<https://www.s-vfu.ru/>.

ing system, retraining employees, improving their qualifications, modernizing the software system based on state standards.

The World Federation for Medical Education (WFME) recognizes the priority of continuing education as a professional duty of a physician, and also as a condition for improving the quality of medical care.

In SBPEI RS (Y) "Yakutsk Medical College" in the WFME standards it is noted that the institution's library should be aimed at increasing the importance of both clinical and theoretical experience of a doctor, teaching organizational skills, developing communication skills, conducting research and administrative work, mastering the provisions medical ethics⁸.

Thus, in connection with the intensive dynamics of socio-economic, information and technological changes, intensive updating in education and the requirements for professional skills of specialists, it is obvious that there is a need to optimize existing and develop new programs for improving the qualifications of medical personnel.

The use of innovative technologies in teaching makes it possible to get a world-class education, become a competitive specialist, provide every citizen with modern medical care and have the opportunity to choose a job in any country.

The main requirement for the competitiveness of education, without a doubt, is its quality. But at present, the education system has certain difficulties and contradictions. In the modern world, education is a priority area of human activity, the significant achievements of which formed the basis for global social, scientific and technological social changes. And education reacts more quickly to all those changes that are taking place in society⁹.

⁸<http://ybmkykt.ru/>.

⁹Monitoring of continuing education: a management tool and sociological aspects. Ser. "Monitoring. Education. Personnel" / Sci. adv. A.E. Karpukhin. M.: MAX Press, 2006. – P. 178-184.

混合式教育——以音乐理论课程为例
**ON BLENDED EDUCATION--AN EXAMPLE OF THE MUSIC THEORY
COURSE**

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抽象的。在提供素质教育的过程中,各种创新教育模式受到广泛关注。为适应素质教育的核心要求,大量教师致力于理论分析与实践研究相结合,进而优化教育资源利用,使学生达到良好状态,促进学生成长发展,积极主动 营造良好的学习成长氛围。在这种现实背景下,多所高校开始将混合式教育模式作为乐理课程教学实践的主题,从而进一步促进乐理课程的正常发展。

关键词:混合式教学模式; 创意教育; 音乐理论课程; 教学实践

Abstract. *In the process of providing quality education, various innovative education modes are attracting wide attention. In order to meet the core requirements of quality education, a plenty of teachers are committed to combining theoretical analysis with practical research, and then optimize the use of educational resources to enable students to achieve a good state, promote their growth and development, and actively create a good learning and growth atmosphere. Under this realistic background, multiple universities have started to use the blended education mode as the theme in the teaching practice of music theory courses, thereby further promoting the normal development of music theory courses.*

Keywords: *Blended Teaching Mode; Creative Education; Music Theory Course; Teaching Practice*

Accordingly, this paper takes the educational practice of college music theory courses as the analysis object, discovers the application and practical requirements of blended education mode in subject education, and provides specific reference, so as to reflect the function and value of appropriate education mode.

1. Theoretical construction of blended teaching mode

1.1. Definition

"Blended teaching" is put forward by Smith J and Elliot Masier, which is the combination of traditional learning concept and E-learning pure technology learning concept. The theoretical basis of blended teaching includes constructivist learning theory, structure theory and humanistic learning theory. Among them,

blended education is greatly influenced by constructivist learning theory. Bruner's educational theory holds that students are willing to accept knowledge and act as information processors. Constructivist learning theory supports brainstorming on autonomous learning programs, enabling learners to actively explore and discover what they have learned. The educational nature of blended teaching style corresponding to modern distance learning has aroused widespread concern in the field of education. It is worth noting that Hao Kekang, professor of Beijing Normal University is the first official supporter of China's integrated teaching concept.

1.2. Network resource construction of blended teaching mode

The blended teaching mode applies online teaching to enhance students' learning ability, suggesting that the establishment of network resources is an important supplement and expansion of face-to-face education. (1) build a network platform. Today's highly developed network technology and virtualization require the construction of educational network platform to be closely integrated with educational content, and thus, creating a learning network environment. Firstly, we should establish an educational resource database, divide the educational content, and use knowledge units such as micro-video library to establish the material resource library of the network platform. Then, it is necessary to design the structural framework of the education network platform. The entire educational process should be designed with several links, including educational goals, educational processes, and after-school follow-up services. Finally, it improves the construction of software and hardware infrastructure, and provides technical support for the resource service network. (2) Establish the technical support of learning content. One of the main disadvantages of online learning is the lack of interaction and communication between teachers and students. Faced with boring textbook content, students feel anxious, bored and lonely, this indirectly implies that students should innovate their way of learning in order to solve practical problems that cannot be ignored. Martens, an American psychologist, points out that built-in support designs can be used in printed and electronic textbooks to solve these problems." For example, we may take the form of a built-in QR code in a paper textbook. Specifically, the content of each chapter may be designed as a QR code, corresponding to the corresponding video and item bank on the network resource platform. In addition, we can also add expanded and supplementary learning resources related to the course content. (3) Provide personalized service. Data mining and analysis help to track learners' normal online learning behavior, understand their learning conditions, state of mind, etc., so that students can quickly find them in terms of learning platform, age, interest and major. In addition, it is considered that the development of personalized "learning packages" and the design of "order-style" learning recommendation services allow students to learn in a targeted, multi-faceted and multi-angle approach.

1.3. Teaching process design of the blended teaching mode

The first step in the educational process of the blended teaching mode is to prepare for learning, including pre-class and online course design, which are very effective in creating network resources, classroom curriculum design and sequential action design. The second stage involves online tutoring, classroom teaching and hands-on activities. The focus of classroom teaching is to explain the key points and difficulties of the course, as well as the communication and interaction between teachers and students. Students may be able to apply hands-on activities and innovative theories to address practical and innovative problems. The third step is evaluation, which is the sum of the evaluation results and the overall evaluation results.

2. Application of blended teaching mode in innovative education

2.1. Teaching preparation of innovative education

If the teachers' teaching behavior is extended from the classroom to the outside of the classroom, the students' learning efficiency will be greatly improved and the learning effect will be optimized. In other words, you can play both the protagonist of the teacher and the subjective role of the student. Classroom teaching focuses on the design of teaching activities, and regard it as an important part of teaching preparation. Teachers are no longer the center of classroom teaching activities. Instead, they will stimulate students' initiative, participate in educational activities, encourage students to obtain innovative content and engage in creative work in the classroom. The educational practice of design innovation breaks the traditional concept, stands out in the innovation, and allows students to carry out innovative work according to their innovative knowledge learned, and thereby improving the innovative ability and achieving the purpose of teaching.

2.2. Online teaching

Most students study independently on the educational resource platform. Innovative online education formats for learning courses include course video library, PPT course, test question library, online learning guide, online evaluation, etc. Teachers design educational activities in three modules: goals, stages and educational tasks. Students can learn independently with reference to the contents of this module. The platform will set up a research group for students to learn and communicate online, and create a chat and question-and-answer area where teachers and students can interact and teach in real time. The teacher assigns homework and homework, while students are required to finish the homework on time and submit it to the platform. The teacher should then evaluate the assignments uploaded and submitted by the students and provide feedback. Perhaps, we can also organize videos of innovation, current affairs and academic research into one application, enabling students to learn and innovate anytime, anywhere.

2.3. Classroom teaching

The classroom teaching under the blended teaching mode should be student-centered. In the process of innovative education, students are free to group, discuss, play creative games, display their creative works, create and cultivate their ideas. In the aspect of imparting textbook knowledge to students, different from the traditional classroom teaching, the course video takes the teaching content as a unit, and records a video resource closely linked to the teaching content of the teaching material for each section content, which enables students to order videos according to their actual situation. In classroom teaching, teachers do not explain to students the knowledge in the textbook and make innovations, but bring difficulties to the classroom and students. Therefore, it is necessary to adjust the course content in the classroom, answer questions based on online evaluation feedback and solve the problems you actually encounter. In addition, we should suggest ways of learning for students.

2.4. Practical activities

Innovative courses aim to cultivate innovative spirit, improve creativity and develop innovative practical skills. Thus, the educational process should pay attention to the connection between practical activities, and the practice of innovative theory. In online and classroom education, you are asked to design innovative creative content and cultivate students' innovative thinking, and enable them to master core innovative methods. We also need to focus on combining innovation with the actual needs of the organization and society, using innovation theory to address practical social problems, and achieve the goal of truly improving innovation ability.

2.5. Summative evaluation

According to the design of blended teaching mode, the evaluation of innovative courses can be divided into formative evaluation and comprehensive evaluation. "Formative evaluation refers to the evaluation formed in the process of teaching for the purpose of modifying and revising later teaching activities by observing students' performance and attitude, obtaining feedback by asking questions or tests, and inspecting the completion of teaching goals, also known as in-learning evaluation." The educational curriculum format for evaluating innovation (including viewing the innovative results of classroom education) includes online learning test question bank, unit exercises, online discussion and presentation. These data are recorded on the network platform and are the basis of the evaluation. Mode evaluation is the evaluation of students' learning process, which helps teachers and students better understand the previous learning in a period of time, and provides reference for future learning. The comprehensive evaluation is the last class, in which the previously assigned innovative works are presented, and a mutual evaluation form is sent to each student to evaluate each other as the

basis of the comprehensive evaluation. The final evaluation result of students is the sum of the results of formative evaluation and comprehensive evaluation.

3. Current Teaching Status of School Music Courses and Teaching Theory and Practice Courses

Music courses and educational theory and practice is a new practical course, which combines theory with practice. High-quality primary and secondary school teachers have strong teaching practice and research ability. Education and teaching theory and teaching practice are also the main reasons why school music courses and practical theory teaching courses are in line with the training goal of art and music education. Since it is difficult to emphasize the difference between a purely theoretical course and a purely practical course, this course is difficult to survive, and most of the courses have been proven in three aspects.

3.1. Mechanical nature of teaching methods

At present, this course usually adopts the traditional teaching mode to practice the mastery of art on the basis of theoretical teaching, small discussion and teaching demonstration, its advantage lies in the concentration of curriculum content information, and that teachers are in the primary position of organizing, classroom management and teaching control, while its disadvantage is the lack of teaching information. Not only that, but it is also difficult to create in-depth interactions. At present, most of the teaching theory courses are subjective, and teachers and students have passively accepted this teaching method, which affects students' learning initiative and limits their desire to explore to a certain extent. Mechanical teaching mode directly affects the development of students' independent thinking ability, resulting in students' neglect of books and teachers, which further leads to the neglect of many practical problems.

3.2. Unity of teaching content

According to the available teaching content, the course is divided into two parts: school music course and practical theory teaching. Course-based teaching is based on classical teaching methods, which is the core of emphasizing and integrating the educational concepts learned during the bachelor's degree and applying them to practical teaching. The advantage is that it provided new insights, while examining and consolidating shortcomings because it does not emphasize the modernity and innovation of course teaching. The uniform distribution of teaching materials does not prevent students from continuing to learn knowledge that they are interested in or are not fully proficient in the classroom.

3.3. Limitations of the teaching process

According to the learning content provided by the former classroom teacher, this course enables students to make oral reports and comments on learning progress, and then write a summary report. Its advantage is that teachers can understand the teaching progress and students' professional knowledge in real time on

the relevant learning content, while students are able to express their opinions in a limited time, communicate orally, and re-establish their understanding through the speeches of other students. But in terms of the objects that learners can discuss, most of them are students who are compatible with day and night, and they accept basically the same knowledge system, with small conversation circles, limited communication, and a wide range.

4. Practice of blended teaching in college music theory courses

In the process of early education practice, in order to play an effective role in the mixed education model, university music teachers have to analyze the actual situation of theoretical curriculum education and formulate correct application strategies and skills to create a good environment for the growth and understanding of students. It is necessary. In addition, they would actively learn and impart knowledge to students in a timely manner to ensure that they master the skills of music theory learning in the process of independent analysis and practical research.

4.1. Concentrated learning

The intensive training mode takes students' intensive training and creativity as the theme, and its real-time performance is very long, which suggests that teachers should focus on the study of theoretical knowledge and basic knowledge of related music theory, which is very important for freshmen. Some freshmen misunderstand their ability to perceive music. Theoretical research helps students better understand music, develop personal music recognition and listening skills, music learning skills, and accept teachers' feedback and suggestions. Secondly, this form of intensive training helps to allocate and make the best use of educational resources, enable students to concentrate on the key contents of theoretical learning, overcome multiple difficulties, improve efficiency, promote learning quality, and constantly develop their learning ability. Through learning and technology, teachers are empowered to guide students to mobilize their enthusiasm in the form of teamwork. In specific group exercises, teachers should analyze students' characteristics and hobbies, and encourage them to share ideas. Specifically, the teacher must choose the group as the learning unit, and the better-performing group can learn from the members in the group more efficiently. In addition, active learning, theoretical learning fundamentals and timely notes can be used to modify future teaching and practice activities.

4.2. Individual training

Teachers should reflect students' personal development needs from the perspective of students themselves, because students who participate in university teaching and practicing music theory courses come from different educational backgrounds. The form of personal training should be adopted to ensure that students effectively learn and master the skills and essence of music theory under the

guidance of the teacher. Secondly, students' understanding of music is obviously different, which requires teachers to seriously consider the students' early learning situation, as well as formulate scientific and reasonable plans and strategies. Additionally, teachers should combine music and learning courses to learn for life and practice correct learning skills and new methods to learn better theoretical knowledge. Therefore, it is necessary to offer online supplementary literacy courses to prepare students with insufficient knowledge, so that everyone in the classroom can study as planned as possible and improve their learning efficiency.

4.3. Group learning

Group tutoring and test tutoring are new teaching modes, which are very important to attract students' attention. Before using the blended teaching mode, teachers can use group exercises to encourage students to participate actively. Before applying this teaching strategy, teachers must pay attention to analysis and judgments based on the learning ability and music knowledge of each group member, so that students can recognize the integrity of positive and negative, actively assume group responsibilities and complete homework. Teachers should set consistent learning goals according to their comprehensive membership level, verify the correct learning direction of students, provide appropriate guidance for students, and develop effective collaborative learning styles in the process of independent analysis and group exercises, so as to develop good learning effect behavior, habits and interest in learning music theory. In addition, since each student's learning background is also different, teachers should focus on providing guidance according to their own abilities, and actively improve themselves through layered teaching methods to achieve contact and interaction.

5. Conclusion

The application of blended teaching mode is particularly significant for the practical course of college music theory class. Teachers should pay attention to analyzing and understanding this educational mode, understand its key points and difficulties, adopt appropriate application strategies and methods, and give full play to the role and benefits of this educational mode.

References

1. Li Qing. *A Brief Talk on Blended Teaching [A]. Reading and Writing-Education and Teaching Edition*, (2018) 01-0040-02.
2. Li Xianghong. *On "blended teaching" [A]. Jiangsu Vocational and Technical College of Economics and Trade*, (2006) 01—0083—03.
3. Yu Shengquan, Lu Qiuli, Chen Shengjian. *A new teaching mode of blended teaching in the network environment [J]. Chinese University Teaching*, 2005(10).

4. He Kekang. *Educational Technology [M]*. Beijing Normal University Press, 2002.

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1990–2002 年俄罗斯主要报纸的专业领域和专业王朝的转变
**TRANSFORMATION OF THE FIELD OF PROFESSIONS AND
PROFESSIONAL DYNASTIES IN THE MAIN RUSSIAN NEWSPAPERS
OF 1990-2002¹**

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抽象的。这项工作致力于研究 1990–2002 年俄罗斯媒体领域的专业王朝和专业群体。从计划经济向市场经济转型、大规模私有化、快速通货膨胀和金融灾难的所有失败都影响了职业王朝。我们研究的目的是对 1990–2002 年俄罗斯职业王朝和职业群体的媒体话语进行社会学重构。该研究的目标包括分析新现实建设的具体细节，以及俄罗斯中央新闻界职业领域转型的表现。实证基础是由《真理报》和《消息报》1990–2002 (N = 2498) 出版物的话语分析结果形成的。以下话题在当时的媒体上很受欢迎：国家干预经济的界限、改革过程及其后果分析、社会贫富分化、各种社会群体的地位、生活水平的下降以及社会保护的丧失，物价的迅速上涨。媒体话语有助于巩固商业变革时代所要求的新专业群体，商人，企业家，广播他们的活动在成功和经济盈利方面的重要性。媒体话语的合法化通过三个主要策略进行：使用社会学调查的证据基础，诉诸劳动者的叙述，再现生活事实和事件。

以前流行的工人和知识分子王朝，但在市场经济中已经失去了价值，正在被排除在话语领域之外。新的社会认同的组成部分正在铺设。积极推进风险创业快速致富策略，灵活转换专业方向，灵活运用市场环境，自由竞争，严惩敲诈勒索等业务领域。

关键词：专业群体，王朝，媒体话语

Abstract. *The work is devoted to the study of professional dynasties and professional groups in the Russian media space 1990-2002. The professional dynasties were affected by all the failures of the transition from a planned to a*

¹The study was carried out with the financial support of the Russian Science Foundation (project № 19-18-00320)

market economy, mass privatization, rapid inflation and financial catastrophes. The purpose of our research is the sociological reconstruction of media discourses about professional dynasties and professional groups in Russia 1990-2002. The objectives of the study include the analysis of the specifics of the construction of a new reality and representations of the transformation of the field of professions in the central Russian press. The empirical base was formed by the results of the discourse analysis of publications of the newspapers "Pravda" and "Izvestia" 1990-2002 (N = 2498). The following topics were popular in the press of this time: the boundaries of state intervention in the economy, reform as a process and analysis of its consequences, social stratification into rich and poor, the position of various social groups, a decline in living standards and a loss of social protection, a rapid rise in prices. Media discourses contribute to the consolidation of new professional groups demanded by the era of business shifts, merchants, entrepreneurs, broadcasting the significance of their activities in terms of success and economic profitability. The legitimization of media discourse is carried out in three main strategies: the use of the evidence base of sociological surveys, the appeal to the narratives of the working person, the representation of life facts and events.

Dynasties of workers and intelligentsia that were previously popular, but which have lost their value in a market economy, are being pushed out of the discursive field. The components of a new social identity are being laid. Strategies for getting rich quick and risky entrepreneurship, flexible change of professional orientations, skillful maneuvering in the business field between market conditions, free competition and the tutelage of racketeering are actively promoted.

Keywords: *professional group, dynasty, media discourse*

Introduction

The work is devoted to the study of professional dynasties and professional groups in the media space of the last decade of the XX century and the beginning of the XIX century. The professional dynasties were affected by all the failures of the transition from a planned to a market economy, mass privatization, rapid inflation and financial disasters. The media did not stand aside and diligently recorded the current changes.

During the period of the party monopoly of the 1960s-1980s, the state provided the population with employment and measures of social support, and the official press (the newspapers "Pravda" and "Izvestia") acted as the mouthpiece of the authorities. With the collapse of the USSR, the government lost control over a number of social institutions, primarily economic ones, which had embarked on the path of liberalization. Traditional print media began to explore new discursive fields.

The purpose of our research is to reconstruct sociological media discourses

about professional dynasties and professional groups in Russia 1990-2002. The objectives of the study include the analysis of the specifics of the construction of a new reality and representations of the transformation of the field of professions in the central Russian press. The empirical base was formed by the results of the discourse analysis of the publications of the newspapers "Pravda" and "Izvestia" 1991-2002 (N=2436).

Dynasties in the media space

Professional dynasties did not arouse much interest among editors of central publications. At the same time, from 1990 to 2002, the mention of dynasties occurs on the pages of "Izvestia" 343 times, in "Pravda" 128 times. Most of the articles are devoted to the Romanov and Rothschild dynasties, the TV series "Dynasty", but there are also materials about other dynasties (N=78): labor dynasties, working dynasties, peasant dynasties, doctors dynasties.

The country required new professions that did not exist before, new competencies were required from old workers, so publications are discursively divided into several groups: nostalgia for working-class dynasties and an assessment of their unenviable position in post-reform Russia; the revival of interest in dynasties that were previously ousted from public consciousness (the royal family, families of emigrants, dynasties of magnates); new business dynasties (both criminal and reputationally impeccable); dynasties of the intelligentsia (most often as victims of economic reforms, but also as an example of resilience and social adaptability). But in general, the general nature of newspaper reports is associated with the idea of capitalizing their business, entrepreneurship, commerce, which marks the processes of institutionalization of new professional groups.

The businessman is portrayed in the newspapers as a "man with a head" with the necessary connections to obtain favorable conditions for doing business and provide protection from racketeering, support from law enforcement agencies, and has capital for investment. The identity of a new professional group is being formed - here it makes sense to turn to the ideas of J. Boone, A. Cohen that identity (both personal and social, and in our case, professional) is determined by implicit or explicit contrast / opposition. Orientation towards the "significant other" implies the need to be aware of and express such contrasts, which allows for the formation of a sense of group members as united and distinctive in opposition to others. At the same time, the need for opposition leads to an exaggeration of oneself and one's community (Boon 1981; Cohen 2001).

The publications of the end of the century more and more often reflect the moment of professional transformation. Mobility is presented as one of the key values of the new time: if earlier the strategy of success was considered to graduate from a technical school, institute and work in a specialty (the norm of a stable and consistent formation of a professional career), then by 2002 a new social

norm was advancing - a quick response to rapidly changing conditions (the norm professional flexibility, not directly related to the existing education and assuming the rapid acquisition of the necessary competencies in the mode of professional retraining).

It is clear that the old management practices no longer met the demands of the times. Reliable and proven technology was required. And they came from the West. Business schools were opened, opportunities for academic exchanges were provided, scholars and businessmen, employees and public activists became recipients of grants from foreign funds, new professional associations emerged as agents of social management.

Business beckons

Since 1990, business topics have been gaining popularity in the official press. Thus, in the "Izvestia" newspaper, the word business in the titles of articles is found in 246 documents (1990-2002). It should be noted that the communication of workers with foreign partners, who are initially considered to be the bearers of success, are endowed with special value.

Quite often, propaganda materials are posted that motivate citizens to search for alternative employment opportunities, primarily business, and new professional self-realization. One of the "Izvestia" publications tells about a pensioner from Revda Vassa Zheleznova, who manages to earn 20 thousand rubles per hour selling honey mushrooms (Izvestia. 09.09.1995. № 170 (24529)), in an article dated 04.10.1995.

New success stories meet all the requirements of the morphology of a fairy tale plot: at first everything is fine, then the hero meets a number of hardships and trials and, finally, overcoming difficulties, wins, achieving the promoted success. One article tells about the Vologda writer Vyacheslav, who was nominated for the Guinness Book of Records, wrote novels, then was homeless, but pulled himself together and began to engage in long-distance transportation of goods.

He has no time to write novels in his business. But if the magazine "goes", Golyashevich is ready to sit down at his typewriter again and put out a novel a month "Vologda Dumas" went into business, but yearns for literature / Izvestia. 04.10.1995. № 187 (24546)

In publications of this period, the image of an ambitious businessman with the right connections is often found, not afraid of local racketeering. This image of a not entirely honest agent (through tricks and manipulations providing an influx of buyers), but who has achieved high economic profits, and increases his capital, is a reflection of a new form of socio-economic strategies in the context of the "devaluation of mutual contractual expectations" (Christmas 2019: 64) era 90s, marked by a changed (in comparison with the era of Soviet regulation) social contract, distributing rights and obligations between the state and the population.

The impoverishment of the old and the emergence of new dynasties and elites

From 1990 to 2002, the newspaper "Izvestia" devoted 52 publications to the dynasties of workers. Let us note the peculiarity of discursive landmarks in appeals to dynasties. Since the beginning of the 90s, the main motive has been the plight of workers' dynasties, non-payment of wages, and the destruction of industry. One can hear reproachful notes of comparison with the still recent past.

Difficult times of the "golden" dynasty. In the museum of the Saratov aircraft plant there is a color photograph of members of the "golden" dynasty of the Kovshovs. The benevolent faces of the founder of the dynasty, his three sons, as well as sons-in-law and daughters-in-law, whose total work experience at the aircraft plant has exceeded one hundred years, shine with happiness. Today the Kovshovs live much worse. Because the flagship of the Saratov industry, the beauty and pride of the domestic aircraft industry, the pioneer of market reforms in the region has long been working in a "torn" mode, and in recent months has been generally idle... ..The most extreme, as always, were the workers and engineers.

Kislov A. What is worse - without pay or without work? / Izvestia 30.01.1996. № 18 (24625)

In publications of the 90s, there are separate references to circus, artistic, dynasties of artists and other creative professions (in "Izvestia" there are 18 publications, in "Pravda" - 5). The general tone of the publications is enthusiastic. They write about representatives of the creative professions with respect and reverence. As a rule, talent and social adaptability are celebrated. The representation of circus dynasties often gives an example of vitality and the ability to overcome difficulties, to rely only on oneself.

- Today they stopped funding me. Rather, if they finance it, they are in the red. For example, you need to pay a million, but they pay one hundred thousand. Now I am preparing a new program "Tigers on Mirror Balls". In order to start this work, I paid my ten thousand dollars. I am trying to explain to those on whom the financial side depends that I am not building a factory for the production of white slippers for the dead, so that later these slippers can be sold and put money in my pocket. I am making a new program, which has no analogues in the world. I'm no stranger to it. There would be desire and striving. Probably, you need to go through all this. But the main thing is to resist.

Akimova L. Mstislav ZAPASHNY: The main thing is to resist/Izvestia. 04/22/2000. № 246 (24853)

Often, the topic of dynastic strategies of the intelligentsia is revealed in the discourse of social deprivation, since it was the intellectuals of the Soviet era who were left behind the privatization board and lost the support of the state. The

change in forms of ownership divided society into polar camps. Some advocated the rights of workers, others defended social groups without access to productive capital. The protest against participation in privatization only of employees of enterprises occupies a significant place in publications of the 90s.

Since 1993, references to the families of businessmen have appeared in the headlines of the "Izvestia" newspaper. In № 233 of 04.12.1993 there is an article "Business of the Kamentsev family", which tells about the father and son of the Kamentsevs: *"Kamentsev Sr., now a successful businessman, is the chairman of the stock exchange committee of the International Fisheries Exchange. Kamentsev Jr. (son) works abroad - in Japan as a member of the fisheries commission."*

An absolutely new discursive accent is the public approval of child and adolescent self-employment, the practice of including children in spontaneous business practices, in particular, playing the accordion in subway cars, is shown encouragingly. A couple more discourse novelties concern the popularization of gambling and shuttle businesses (2 publications in 1994 editions).

In the articles on business and business dynasties, two discursive lines are clearly visible. One of them is criminal mafia, the other is civilized, built on the Western model. We find the criminal orientation of the family business in 15 articles in "Izvestia" and 9 articles in the newspaper "Pravda".

Publications of opinion polls that are gaining popularity indicate that in the minds of Russians, power, business and crime merge into an indivisible whole:

To the extent that corruption is attributed to political power and criminality is attributed to business, they turn out to belong to a certain unified field. Further, it specifically indicates (or implies) the merger of power and business on the basis of crime.

Officials were baptized from "bureaucrats" to "mafia"/Izvestiya, 04.12.1993. № 233

In the central press, there are reports of criminal dynasties using the resources of power and business:

As you know, cadres decide everything. Especially in the Ministry of Railways, where, like no other department, the traditions of nepotism are strong. ...In general, the Aksenenko dynasty continues to move the locomotive of history in the direction it needs.

Egorov N. For whom the locomotive whistle is buzzing/Pravda.05.04.2000 №38

In public space, the topic of security and the prestige of the security guard is becoming noticeable.

Imperceptibly in our society, a huge new class has formed - guards, bodyguards, watchmen, private security agents; I foresee that the security guard pro-

fession will soon become one of the most scarce

Vasinsky A. Announcement of the century: "an honest man is required"/Izvestia 25.06.1994. № 119

By the mid-1990s, the business elite of the post-Soviet space crystallized. In the tandem of sociological and media interpretations of mass opinions, the expertise and significance of business elites for the formation and assessment of current social transformations are consolidated. Both on the pages of newspaper editions and in the mass consciousness, the image of a "new influential group of persons" is being built, capable of implementing the demanded social changes.

Rural entrepreneurs: where are the dynasties?

In 1990-2002 "Izvestia" published 830 materials, one way or another related to the formation of a professional group of farmers. However, no publications were found about rural dynasties. Actually, they did not exist. As the results of sociological studies show, groups of workers from former collective and state farms become the main channel for recruiting farmers (they did this sometimes voluntarily, sometimes forcibly). The detachment of farmers was replenished by clerks from rural areas, party workers, as well as specialists from education, medicine, culture, who formed a group of "independent entrepreneurs" starting their own business for a set of loans or their own savings (Bokontaeva 1998: 33-34).

Readers' attention is directed to the activity of farmers in neighboring countries, the life of American, European and even Zimbabwean farmers, and the legislation that regulates their activities.

Several main themes can be distinguished: farmers and authorities, land registration and land legislation; farmer training; professionalization of the new group; association in cooperatives; sales of products; problems and ways to solve them; crisis and criticism of reforms and power.

The image of a rural commodity producer is represented in the same categories of reaching high profitability in a short time due to the "gain" from sales and the establishment of reliable social ties, without which it is impossible to conduct business. Thus, the main strategy for doing business is to identify oneself with the professional community, to demonstrate involvement and belonging to a certain association (in this case, an association). Such a union, of course, symbolizes some opposition to the previous cultural landmarks, as well as other solidarities from which a threat emanates. This provides a sustained sense of self and a call for resistance (Cohen: 110-111).

Conclusions

The central press, the most rooted and popular editions "Pravda", "Izvestia", "Argumenty i Fakty" act as a kind of fragments of the general transformation processes taking place in Russia in the period 1990-2002. Along with academic sociologists, the press builds public interest and discursive attitudes towards

the market/entrepreneurship, highlighting both opportunities and constraints and risks; to the collapse of the old social institutions and the difficult formation of new ones; ideology and culture, including value conflicts; civic activism. These transformational processes are implemented in the context of liminality, characterized by the destruction of previous norms, the loss of familiar landmarks, duality, shuttle movements between the past and the future.

What happens to the professional dynasties in the media space of post-reform Russia? They shift to the periphery of public interest, significantly yielding in popularity to social nostalgia, social protest, or euphoria from democratic freedoms.

A new type of social contract between citizens and the authorities is sometimes implemented in the space of wandering fogs, where actors are forced to search for niches that contribute to the retention or accumulation of capital. The field of business is discursively formed - family, women, military, children, farms - any. New professionals are businessmen, entrepreneurs who make money in an "almost honest" way, successfully maneuvering between the conditions of a market economy and the tutelage of racketeering. These are new rational business practices that took shape on the basis of market relations based on a speculative economy and dishonest trade (condemned in the Soviet era), justified by the demand of modern times of free competition and state non-intervention of the 90s.

Dynasties are constructed in the discourse of catastrophe (workers, peasants), heroic trials and victories (creative intelligentsia), risky business (military). An important role in the development of professional strategies is assigned to retraining and the study of Western experience.

One of the brightest discourse lines of newspaper reports is the propaganda of the ability to make money, risky entrepreneurship, and the ability to overcome difficulties. The monetary success of entrepreneurs and merchants broadcast in newspapers, their successful strategies for capitalizing their business mark the emergence and institutionalization of business elites and new professional dynasties. Business attracts representatives of all professions - from actors to agricultural workers. The process of professionalization of farmers is under way: solidarities (cooperatives) are being created as a resource and repository of new meanings as opposed to the previous collective farms, as an opportunity to work out collective labor scenarios.

References

1. Bokontaeva D.K. (1998) *Farmers as a socio-professional group. Sociological research*, 3: 31-35.
2. Vorobieva N.S. (2019) *Communitas as an "essential We": the possibility of dialogical relations in a community. Sociology of power*, 31(4): 155-184.

3. Mansurov V., Yurchenko O. (2011) *Russian doctors: professionalization from above or self-regulation of the profession?* Romanov P.V., Yarskaya-Smirnova E.R. (ed.). *Anthropology of professions, or unauthorized entry is allowed*. M.: LLC "Variant", TsSPGI: 171-188.
4. Rozhdestvenskaya E. Yu. (2019) *Social contract in the era of the 90s* // *INTERaction. INTERview. INTERpretation*, 11 (18): 55-79.
5. Turner W. (1983) *Symbol and ritual*, M.: Science.
6. Chernyaeva K.O., Sorokina N.V. (2020) *Representation of professional groups and dynasties in the Soviet media space (based on publications of the "Izvestia" newspaper 1965–1980)* // *Bulletin of the Saratov University. New series*, 20 (2): 138-144.
7. Yasaveev I. (2010) *Social problems and media: a constructionist reading*. LAP Lambert Academic Publishing/
8. Boon J.A. (1981) *Other tribes, other scribes: symbolic anthropology in the comparative study of cultures, histories, religions and texts*, Cambridge: Cambridge University Press.
9. Cohen A. P. (2001) *The Symbolic Construction of Community*. London and New York: Taylor & Francis e-Library.

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达吉斯坦山区“民间”医学的民族生态学
**ETHNOECOLOGY OF “FOLK” MEDICINE OF MOUNTAIN
DAGESTAN**

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抽象的。 文章讨论了达吉斯坦山区人民的传统医学。 治疗(理性的、非理性的和混合的)不是作为食谱指南呈现的,而是作为一种文化现象,作为当地医生如何成功的示范,这要归功于数百年的经验、世界各国人民的医学论文翻译和改编人类社会对生活条件的影响,将所有动物、植物、矿物质用于药用 - 周围的一切都可以成功地治疗人们。

关键词: 达吉斯坦, 民族生态学, 民间医学, 治疗师, 植物疗法, 理性医学, 非理性治疗

Abstract. *The article discusses the traditional medicine of the peoples of Mountain Dagestan. Healing (rational, irrational and mixed) are presented not as a recipe guide, but as a cultural phenomenon, as a demonstration of how local medics succeeded, thanks to centuries of experience, translated medical treatises of the peoples of the world, and the adaptation of human society to living conditions, the use using for medicinal purposes all the fauna, flora, minerals - everything that is in the surrounding kind of successfully treating people.*

Keywords: *Dagestan, ethno-ecology, folk medicine, healers, phytotherapy, Rational medicine, irrational treatment*

Introduction

The most important conditions for finding the right life path are mental balance and harmony, reasonable ways of working, relaxing, eating, and knowing how to improve the body. From the point of view of ethno-ecology, Dagestan healers used to successfully treat a wide variety of diseases with only local ingredients,

some of which seem most improbable to modern readers. Ethno-ecology is “a special area of ethnography that studies the relationship between ethnic communities and the environment, related to the development of their material and spiritual environment and the use of its resources”, and culture is the mechanism by which adaptation was transformed into reality. [1] Adaptation to the environment was achieved by the sociocultural restructuring of their external and internal surroundings [2]. If man is a product of nature and his environment, the structural elements of ecology, his habitat, traditional management of nature and his worldview are clearly interconnected [3].

The medicine of Dagestan was influenced by the experience and knowledge of all the peoples of Dagestan and externally from the rich heritage of oriental medicine, which arrived with Islam and Arab-Muslim culture. “... Almost all treatises of medieval medicine were known in Dagestan,” often brought back from the hajj, the most popular being the world-famous work of Abu Ali ibn Sina (Avicenna), “The Canon of Medicine,” which incorporated the medical knowledge of ancient Rome, Greece, Iran, India, and Central Asia. The earliest Canon found in Dagestan dates from 1400. [4]

The healers both translated medieval medicinal texts using Arabic letters “*Ajam*” into local languages and “created works themselves in various fields of medicine.” [5] The *Hannal Murad (Damadan)* medical guide known throughout Dagestan is a translation from Persian to Lak of the medical guide of Muhammad al-Dailami al-Mazandarani, under the name *Tukhfatal-Muminin*. [6; 7] Lukman al-Hakim’s book of medicines was also widespread among the doctors of Dagestan because it presented formulation methods for medical drugs from minerals, plant and animal products, with their methods of use and dosage. [8]

The fame of doctors was passed down from generation to generation, building medical dynasties known throughout Dagestan. Healers (some women) came from almost every village. [9]

The lifestyle of the mountaineers, with their ethnic foods, work, leisure and relationships between people, contributed to a healthy, hardworking old age. Specialized work, reasonable nutrition, fasting and treatment with natural remedies prevented most serious illnesses.

Evil spirits

A serious illness arose either as punishment for sins; or as a test of perseverance and faith in predetermined destiny of the Almighty. When a disease penetrated a person, it mystically “resided” in his body for as long as the patient allowed. Diseases were transmitted by magic to the earth, plants, animals, people and even to sacred domestic objects (the home, grain store and clothing such as a headdress or sheepskin coats and a cradle).

The common irrational treatment for diseases ‘caused’ by the “evil eye” was

with talismans and prayers. The healers' magic words and ritual actions punished the objectionable and banished the disease to distant mountains, forests, rivers or steppes, it could even change the weather and inspire love. [9]

Infectious diseases

The transmission of a disease by air and wind caused obesity, denoting a “sticky” contagious disease. Hundreds died from smallpox in the mountains of Dagestan in 1890. In 1892 cholera infected some 23,000 and almost 10,500 died. [10;11] Other infectious imports were typhoid, tuberculosis, plague and dysentery.

Fire and water

Fire and water were purifiers, so during epidemics, both healthy and sick walked or jumped over a small bonfire, carrying their babies. Ritual fire was manipulated by jumping, circling or fumigating. Widespread magic healing properties were associated with spring-water, rainwater and dew. Water that washed away dirt and impurities, could (rationally) cleanse diseases.

Plants

Edible vitamin-rich wild plants provided proteins, fats, carbohydrates, vitamins, and potassium, iron, and phosphorus salts. The healers recipes were secret. For unusual diseases a larger number of plants were combined, in the hope that one would work. Respiratory diseases were treated with an infusion of coltsfoot, plantain, sage, oregano and mint. Narcotic and poisonous plants - poppy, rabbit cabbage", milkweed, and celandine - were applied externally on humans and animals, as well as small doses for infusions, tinctures or juices Monk's Hood bulbs with horseradish infused with vodka were a popular rheumatic embrocation. Highlanders traditionally picked raspberries for colds, blueberries for intestinal disorders and rose hips as a restorative and against flu and colds, as well as diseases of the liver, bladder, gastric catarrh, low acidity, stomach ulcers, anemia and atherosclerosis. At home compotes, marshmallows and teas were prepared from dried rose hips. Regular consumption of wild plants as medicine and tonics, combined with low-calorie food, plausibly helped villagers to adapt to extreme weather. [12]

In folk medicine, cauterization by medicinal plants, now known as reflexology, was used. Wormwood was heated with hot charcoal in ancient cast-iron culenders and set alight to make “wormwood cigarettes”, with which the patient massaged himself to improve arthritis, myositis, bronchial asthma, hypertension and gastric ulcers.

Honey

Beekeeping was important in the Highlanders economy. Honey had a universal therapeutic effect, prescribed orally for diarrhea and cold and externally for purulent wounds, ulcers, dental treatment, to treat skin burns, wounds, and sore eyes. Flower honey was mixed with oil, salt, baked onions, and decoctions of medicinal herbs. Honey-derived wax, royal jelly and propolis were widely used for

medical purposes and bee stings for rheumatism. Modern science confirmed that honey is bactericidal.

Animal products

A Russian physician about 1850 wrote that “There are curious methods of treatment [of consumption] that were randomly applied by mountain doctors. They gave the patient plant rot with an admixture of minerals and mold from under large stones. Alternatively, they forced him to swallow powdered stone with and finally treated him with a patch, smeared with ointment. They even resorted to vodka, obviously to the detriment of the patient and to donkey milk, which acted as a cleanser.” [13]

Minerals

In folk medicine, many volcanic soda, salt, ash, chalk, and mercuric chloride were cures for a diseased digestive system. Skin diseases were cured with earth, copper sulfate, iron, ash, soot, gunpowder, salt, clay, tar, sulfur, oil, and amber. In folk surgery, lime, soda, salt, clay, copper, kerosene, dust, grease, earth, ash, yellow arsenic, and lapis. copper, salt, sand, clay, kerosene, and amber were used for the treatment of internal organs. Kerosene, stone, pebble, salt, sulfur, and camphor were used against infectious diseases. Iron, salt, ash, tin, lead, and copper were used to “cure the evil eye and fright,” as were red corals, porcelain, ultramarine and natural silk.

Summary

Rational methods of healing were mixed with talismans, prayers, fasting, charity and repentance. In the past wellbeing and the prevention of diseases was the result of an established lifestyle and a traditional nutrition, harmonized with ethno-environmental factors.

Successful healing combined plant, animal and mineral medicines with ritual actions. In sacred medicine, supernatural forces and faith in their ability to cause diseases and healing were necessary. Belief in the universal animation of matter served as the basis for diagnosis. The ethno-ecological power of traditional medicine was that the mountaineers realized that their health entirely depended on the impact of the environment, sanitary conditions and the health of their neighbors, implying that healing and nutrition act both at individual and social levels, satisfying material and spiritual needs.

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References

1. Alekseev V.P. *Essays on human ecology [Ocherki ehkologii cheloveka]*. M. 1993. pp. 32–6.
2. Krupnik I.I. *Arctic ethnoecology [Arkticheskaya ehtnoehkologiya]*. M.: Nauka, 1989. pp. 14-5.
3. Bromlej Yu.V., Voronov A.A. *Traditional medicine as a subject of ethnographic research [Narodnaya meditsina kak predmet ehtnograficheskikh issledovaniij]*. SE №5. 1976. p16.
4. Saidov M.-S. *Dagestan literature of the XVIII-XIX centuries in Arabic [Dagestanskaya literatura XVIII-XIX vv. na arabskom yazyke]/ proc. XXV international conference of the East. Vol. 2. M. 1960. p.121.*
5. Shtanchaev S.Ts. *Folk doctors of Dagestan in the XIX century [Narodnye lekari Dagestana v XIX v] // Soviet health protection. № 7. 1963. pp.59,121.*
6. Akhmedov S.Kh. *History of Lak literature/ pre-revolutionary literature [Istoriya lakskoj literatury: Dorevoljutsionnaya literatura]: vol. 1. Makhachkala. 2008. pp. 45-48.*
7. Many'shev S.B. *Hannal Murad - a source on the history of medicine in Dagestan [KHannal Murad] – istochnik po istorii meditsiny Dagestana // Lavrov collected Materials XXXIV and XXXV. SPb. 2011. pp. 76,151-3.*
8. Lukman al-Hakim. *The book of medicines [Kniga lekarstv Lukmana al-KHakima]*. ed. A.A. Isaev. Makhachkala, 2008.
9. Alieva P.Sh. *Traditional medicine of Avars [Narodnaya meditsina avartsev]*. Makhachkala. 2009.
10. *Overview of the Dagestan region for 1892 [Obzor Dagestanskoj oblasti za 1892 g.]*. Temir-Khan-Shura. 1893. pp57-58.
11. Dibirov M.A. *Folk medicine of the Avars [Narodnaya meditsina avartsev]*. Makhachkala. 1984. pp 9,46.
12. Grigulevich N.I. *Traditional nutrition of Azerbaijanis and the problem of longevity [Traditsionnoe pitanie azerbajdzhantsev i problema dolgozhitel'stva // Dolgozhitel'stvo v Azerbajdzhane. M. 1989. p.111.*
13. Piotrovsky S. *A trip to the mountains [Poezdka v gory]*. Kavkaz. № 71 . 1853.

儿童和成人：达吉斯坦人民之间关系的传统做法
**CHILDREN AND ADULTS: THE TRADITIONAL PRACTICE OF
RELATIONSHIPS AMONG THE PEOPLES OF DAGESTAN**

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抽象的。过去几十年的特点是世界全球化进程加速。它们直接或间接影响现代人生活的所有领域。信息的流动，并不总是对今天的青年产生积极的影响，引起代际冲突，向经典的“父子”传递永恒的信息。在这种情况下，重新了解有关达吉斯坦人民为成人和儿童之间关系做准备的传统的信息是非常重要的。这是文化不断代际传承、影响世代相传的条件之一。

关键词：高加索、达吉斯坦、大家庭、家庭内部传统、性别不对称、年龄范围

Abstract. *The last decades have been characterized by accelerated globalization processes in the world. They directly or indirectly affect all spheres of life of a modern person. The flow of information, which does not always have a positive impact on today's youth, causing a conflict between generations and an eternal message to the classic "fathers and children". Under these conditions, a return to information about the traditions of preparing for the relationship between adults and children among the Dagestan peoples is quite relevant. This is one of the conditions for the continuous intergenerational transmission of culture, influencing a worthy change of generations.*

Keywords: *Caucasus, Dagestan, large families, intra-family traditions, gender asymmetry, age range*

The relationship between children and adults among the peoples of Dagestan, although mediated, began long before the birth of a child in the family: according to popular beliefs, the most important family and social responsibility of a person was the continuation of the life of the family and family line. Perhaps due to the importance of the moment, marriage was (and is still being furnished) with a variety of ceremonial actions and rituals, both spectacular and secret. Most of them were aimed at informing and strengthening the producing abilities in the new family, since procreation was and is considered to be the natural and main pur-

pose of marriage. Numerous proverbs, the focus of centuries-old folk wisdom and experience, testify to the great importance attached to the birth of children, which was associated with the full existence of the family. Such Dagestan proverbs as: "*The sweetest breath is the breath of a child, the sweetest voice is the voice of a child*", "*He who has no children has no faith*", "*Where there are children, there is no evil spirit*", pointed to the importance of motherhood, to the importance of this function for society. Among the Lezghins, for example, the most terrible curse for a young woman was: "*Vaz veledin rank takurai!*" (May you not see the face of your child!) [1].

Having many children was seen as a sign of family well-being. Wishes to be a happy mother with many children were expressed to the bride during her first visits to the house of her future husband.

The good wishes, which were typical for almost all the peoples of Dagestan [2], most often spoke of 7 sons and one daughter. A number of rituals and magic techniques typical of the wedding ceremony were also aimed at ensuring large families. To do this, they carried out such techniques as showering the bride with grain, peas or other "seeds of the earth", which symbolized fertility and the tree of life among the peoples of Dagestan. Even the fact that the bride was greeted with honey, they wished her a sweet life in a new home and the same relationship with her husband's relatives [3], also implied the productivity of the bees, and the transfer of these abilities to the bride.

Traditionally, in any Dagestan family, the birth of the first male child was preferable. The reasons for this preference in the mountain society were both economic (the girl takes away her dowry, her working hands) and socio-political roots (a man is the successor of the family; a warrior, defender of the honor of the family and homeland; bearer of spiritual and secular power).

In a situation of constant fear for the life of a woman in childbirth and a newborn, a successful birth was a very joyful event, which, however, depending on the gender of the child born, was furnished in different ways. For example: among some Avars (Koisubuli society) one of the assistants ran out and shouted, if a boy was born: "They put a stone in the wall!" ("*Kiedal kono luna*"). When the news reached the father or grandfather, they went out on the roof and fired into the air, announcing the birth of their son, and immediately marked the cattle. When the girl was born, they said: "The stone was taken from the wall" ("*Kyedasa kono bosun ana*"). And supposedly the girl's father hid for three days.

Shooting from the rooftops at the birth of a son was widespread among the peoples of Dagestan. In all the peoples of Dagestan, at the birth of a first-born boy, the father slaughtered a ram, relatives, friends and just fellow villagers were summoned to a treat.

The birth of a girl was greeted with more restraint, celebrated modestly or not

at all. Among the Laks, for example, they said: "*Dush zhula hus Dakar*" ("Daughter is not our wealth") and limited themselves to preparing a special ritual porridge "*kurch*" or halva, which were treated to women who came with congratulations. One of the aspects of gender-role differentiation, which definitely has not only biological, but also social prerequisites, is the ratio of maternal and paternal functions.

Due to the fact that a woman is more closely involved in the reproductive process than a man (she bears a child, gives birth to him), breastfeeds, takes full care of him, the primary socialization of the child depends on her to a greater extent. In Dagestan society, motherhood, her own home and hearth are the main components of the female stereotype. For males, what is more important is what happens outside the home, "the community as a whole serves as its microcosm" [4] In accordance with these ideas, relationships were built and children were brought up in the family.

A man in Dagestan society began to realize himself fully as a father only after the birth of his son, since, according to tradition, the father was not involved in raising his daughters - this was completely the prerogative of the mother. The children's and adolescent life of girls, until marriage, proceeded surrounded by women and with constant and varied contacts with them, in an atmosphere of male dominance - the father, on the basis of paternity, enjoyed indisputable authority, although he almost did not engage in their upbringing (if he was because of what he was dissatisfied and needed to make a remark to his daughter, he most often applied not directly, but through his wife). As for the boys, they were in the same environment for 5-7 years, and then passed under the tutelage of their father. In the family, the boy who grew up among the girls was, of course, the leader, and the girls had to obey him in everything, regardless of the age of the brother.

The milestone, the achievement of which officially consolidated the division of children by sex, was considered the age of seven, traditionally defined as the norm, which in practice could have minor displacements: hence the digital fluctuations for each of the peoples of Dagestan (5-7 years old, 6-8 years old). The formation in an accessible form, through instructions and explanations of certain gender stereotypes adopted by the peoples of Dagestan and adequate to their culture and ideas, the reproduction of family and social gender roles was considered one of the important tasks of raising and socializing a child in any society (in this case, among the peoples of Dagestan). And from the age of seven it became strictly specialized: mother, grandmother - taught girls; father, grandfather - boys.

Conventionally, the age limit began from 7-8 years old, which was brought up to 15 years old, i.e. until the age of majority. But within this age group, there were also conditional gradations. In any case, 10 years of age was considered a serious boundary in the formation of a person - in the adats of the peoples of

Dagestan there were articles saying that upon reaching this age, the child, and not the parents, should have been punished for criminal offenses [5]. By the age of 12, children of both sexes had to master all the etiquette provisions and learn all labor processes, both in housekeeping and in the crafts that were characteristic of a particular society. Moreover, it is known that in Dagestan there was not a single village where women did not produce any items from wool, from high-quality pile carpets and sumax to woolen ropes. The father taught the boys to be male, by this time he already had the concept of "man's" and "woman's" job.

The main condition for attracting young children to work was that he had to be feasible. At the same time - female labor - performing and serving; and masculine - creative, creative. This was especially true of the content of labor - in each region there were only male and only female jobs. This state of affairs was constant, even temporary labor substitution was not allowed under any circumstances.

The relationship between adults and children was built, first of all, in the process of education. The traditional upbringing system was built as a whole in such a way as to develop children's independence, initiative, and self-confidence. Therefore, the child was always encouraged in every any important and useful business or undertaking. First sat on a horse - celebrated by distributing sweets to children; the first success in teaching literacy was celebrated with a treat. Girls who first baked bread on their own, cooked khinkal, finished weaving carpet for the first time, made the first clay pot, were awarded the same honor. The upbringing of children at home was taken very seriously and usually in this connection they constantly emphasized: "What the chick gets in the nest, so it will fly." The main thing is that upbringing in the family should be systematic, planned and continuous. As experience suggested that it is difficult to educate those who did not receive it in due time. It was recommended to love children so that they do not doubt it, but do not abuse it. They believed that surrounded by love and attention, they themselves would treat others in the same way, and especially their younger brothers and sisters. In any family there was a cult of the youngest child, he got the most delicious, the best, he was more than others surrounded by the attention of his mother, and in the absence of strangers, and the father. However, love had to be combined with such severity that would not allow the child to be pampered.

The organization of intra-family ties and relations among the peoples of Dagestan was carried out under the influence and control of traditional ideas about the father, mother, sons and daughters, about what role each member of the family plays and is called upon to fulfill. Relations with parents were built taking into account the notions accepted in society that "there is paradise under the feet of the mother" - she was dearly loved and adored, but should have been tender, open and close enough; grandparents are sociable and affectionate. The peoples of Dagestan did not consider it shameful for a grandfather to go out for walks with his grand-

son, and even sit with him in his arms in a public place. The father was outwardly stern and sufficiently distanced - he was respected and feared, although the system of physical punishment for misconduct was not practiced. The most terrible punishment was considered to be ignoring the guilty person.

Such a mode of relationship absolutely excluded familiarity between parents and children, bickering. The regulation of intrafamily relations was also facilitated by the custom of avoidance that existed among the majority of the peoples of Dagestan, although not in the classical form, as among the peoples of the North Caucasus [6], which was strictly observed in people between spouses, in the family between father and children. The father did not take his child, even his son, in his arms, did not caress, did not play with him. In general, I avoided being near the child in front of strangers and in the presence of elders, talking about him with anyone. The younger he was, the less his father paid attention to him. As they grew older, the relationship between son and father remained the same strictly regulated. These are the ideal educational attitudes that operated in a traditional society.

Children's daily life was not limited to relationships with individual family members. The children were taught to build relationships in the family, gradually introducing them into the course of affairs that adults were engaged in, so that, first of all, they would learn the "skills of the complex art of "being among people"[7]. The best place to learn this was considered to be at public events, at weddings, but participation in the custom of hospitality was considered the most effective. When guests came to the house, as a rule, from the age of 7-8, it was the duty of each boy to go out to the guests, to greet them. Often, older children were allowed to stay and stand along the walls of the room in which they received guests, so that they had the opportunity to observe the course of the feast, "so that the eyes could see, the soul absorbed", remembering everything that the elders talk about, sometimes doing their assignments. The guests themselves tried to involve girls and younger boys in communication, specifically reminding parents of their desire to see their son or daughter. Willingness and ability to communicate with a child, to attract his attention, to make him laugh, to talk, to please him was considered an indicator of the intelligence and high culture of an adult.

Public assessment served as a criterion for determining the quality of home education. As a rule, the public opinion did not take shape overnight. If we were talking about a girl, it was important to look neat, to be "always busy", to be able to communicate both with peers and with children younger than myself, and most importantly, be able to please elders with respectful attitude towards them. If it was about a boy, the main thing is not to be considered a coward, lazy, and glutton.

It should be noted, however, that not everything in life was subordinated to the ideal, age-old proven system of education, and, as they said: "As in honey there is wax, and in cheese there is a hair, so the family has its black sheep". Such children

caused a lot of trouble for their parents. they were the first to be responsible for the children, for their moral character. The children's actions, both serious and insignificant, were shameful not only on the family, but on the whole tukhum. In this regard, a very indicative proverb, which is very popular among the Avars: "The evil of bad children goes even to the fish in the sea".

A positive assessment of the correct upbringing of a son or daughter, expressed by neighbors, was the best reward for parents for home upbringing. There was an interdependent and inextricable bond between family and society.

It should be added to this that in a traditional society, the socialization of children was carried out under the influence on the child not only of his parents and other family members, but also under the great influence and strict control of the rural community. Therefore, any adult considered for himself not only possible, but also necessary to give any order, if necessary, and to expect its quick execution, depending on how it was carried out, to praise or scold the child. Any adult could stop and make a suggestion to children or young people who disturb the public order. In such cases, he found out from the guilty, from whose family they were, who their parents were. If necessary, he could report the unseemly actions of children to their father, mother, elder brother; their family as a whole had to be ashamed of the misdeeds of children, especially its adult members responsible for the upbringing of the younger ones.

At the same time, no one considered this an interference in the internal affairs of the family. Society not only sanctioned such actions by elders, but also obliged them to do so.

As we can see, the relationship between children and adults is based on a variety of facts, relationships, attitudes. The love of children raises the authority of an adult, such a person is considered kind, sensitive, almost saint. Conversely, the ability to inflict pain and suffering on a child is seen as evidence of a person's baseness. It is no coincidence that in the most severe institutionalized in Dagestan custom of "blood revenge", where the rule "an eye for an eye, a tooth for a tooth" was in effect, women, old people and children were excluded from the objects of revenge. In a humane, attentive and sensitive attitude towards children, there was, of course, a certain socially oriented calculation: correctly built relationships between adults and children gave an excellent educational result, which made it possible to hope that a worthy change would grow and the intergenerational transmission of the existing culture would be continuous.

References

1. Rizakhanova M.Sh. *Lezgins in XIX – early XX century. Historical and ethnographic research. Makhachkala, 2005. P. 164.*
2. Musaeva M.K. *Traditional customs and rituals of the peoples of Nagorno Dagestan associated with the birth and upbringing of children. Makhachkala, 2006. P. 21-22.*
3. Bulatova A.G. *Rutulians in XIX – early XX century. Historical and ethnographic research. M., 2003. P. 184.*
4. Karpov Yu.Yu. *Dzhigit and wolf. Male unions in the socio-cultural tradition of the Caucasus mountaineers. SPb, 1996. P.8-9.*
5. *Monuments of the customary law of Dagestan. XVII - XIX centuries: Archival materials / Comp. H.M. Khashaev. M., 1965. P. 126, 149, 152.*
6. Smirnova Ya.S. *Avoidance and the process of its withering away among the peoples of the North Caucasus // Ethnic and cultural processes in the Caucasus. M., 1978. P.124-134.*
7. Bgazhnokov B.Kh. *The social organization of the family based on the materials of the historical ethnography of the Circassians. Nalchik: Publishing Department of KBIGI, 2010. P. 112.*

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远东联邦区主体人口再生产动态的地域特征
**TERRITORIAL FEATURES OF THE DYNAMICS OF POPULATION
REPRODUCTION IN THE SUBJECTS OF THE FAR EASTERN
FEDERAL DISTRICT¹**

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抽象的。考虑了 1989–2019 年远东联邦区主体人口再生产过程的动态。显示了他们变化的后果，这不仅对该地区的人口潜力构成威胁，而且对该地区的社会经济发展构成威胁。根据人口预测的平均变量，预计常住人口将进一步减少。

关键词：人口动态，人口减少，移民外流，人口年龄结构，预期寿命，人口预测，远东联邦区。

Abstract. *The dynamics of the processes of population reproduction in the subjects of the Far Eastern Federal District for 1989-2019 is considered. The consequences of their changes are shown, which pose a threat not only to the demographic potential of the district, but also to its socio-economic development. According to the average variant of the demographic forecast, a further decrease in the resident population is expected.*

Keywords: *population dynamics, depopulation, migration outflow, age structure of the population, life expectancy, demographic forecast, Far Eastern Federal District.*

The Far East is Russia's strategic priority in the XXI century. In this regard, demographic policy should ensure not only stabilization, but also the growth of the resident population in the constituent entities of the Far Eastern Federal District (FEFD), the creation of a sustainable growth in the birth rate and life expectancy, a reduction in mortality, a decrease in migration outflow, an increase in migration attractiveness for potential migrants and formation of migration population influx.

¹The results of research presented in the article were obtained within the state assignment of Ministry of Science and Higher Education of the Russian Federation/ (Russia) (theme «Geographical and geopolitical factors in inertia features, dynamics and development of different rank territorial structures of economy and settlement of the population of Pacific Russia» No. AAAA-A16-116110810013-5).

As of January 1, 2020, 8169.2 thousand people², or 5.6% of Russians, lived in the Far East, with the huge scale of its territory (6952.6 thousand km²). The Russian Far East (within its new borders) is heterogeneous. It includes the north (the Republic of Sakha (Yakutia), the Chukotka Autonomous District, the Magadan and Sakhalin Oblast, Kamchatka Krai), the south (Primorsky and Khabarovsk Krai, the Amur Oblast, the Jewish Autonomous Oblast) and the southwest (the Republic of Buryatia, the Zabaykalsky Krai). These territories have differences in demographic development due to the peculiarities of development, economic-geographical and transport-geographical location, spatial organization of settlement, and the level of economic development.

The population density (1.2 people/km²) is the lowest among the federal districts; significantly lower than the average Russian level (8.6 people/km²). The population is distributed extremely unevenly across the territory. The highest density (11.5 people/km²) is in Primorsky Krai, while in the Republic of Buryatia it is 2.8 people/km², Amur Oblast - 2.2 people/km², in the Republic of Sakha (Yakutia) and in In Magadan Oblast, it does not exceed 0.3 people/km², and in the Chukotka Autonomous Okrug - 0.1 people/km².

This heterogeneity of the Far Eastern territory requires different approaches to solving demographic problems. The northern territories are distinguished by harsh climatic conditions and are practically unsuitable for the existence of an extensive network of settlements. Here it is advisable to have a network of strong points, and compensate for the lack of labor resources on a rotational basis, including from the southern regions of the Far East [1]. Economically, the northern and southern territories should be linked through forms of rotational migration, while the south should be considered as a springboard for the effective development of the north.

According to the 1989 All-Union Population Census, 10,440.4 thousand people (7.0% of the population of the Russian Federation) lived in the FEFD, in 2002 - 8829.4 thousand (6.1%), in 2010 - 8372.3 thousand (5.9%), and in 2019 only 8169.2 thousand people (5.6%). The most intense population decline occurred in the period 1989-2002, when the district lost 1,611 thousand people, or 15.4%. During this period, the urban population decreased (by 1,182.1 thousand people, or 15.6%). The rural population also decreased, but to a lesser extent than the urban population (by 428.6 thousand people, or 15.0%) (tab. 1). The northern subjects of the Federation during this period lost 740.4 thousand people or 26.1%, while the southern ones - 516.5 or 10.1%. Significant reductions in the resident population were noted in the Chukotka Autonomous Okrug (67.2%), Magadan Oblast (53.4%), Kamchatka Krai (24.0%), Sakhalin Oblast (23.0%), Transbaikal

²In accordance with the Decree of the President of the Russian Federation dated November 3, 2018 № 632 "On amendments to the list of federal districts approved by the Decree of the President of the Russian Federation dated May 13, 2000 № 849", the Republic of Buryatia and the Trans-Baikal Krai were included in the Far Eastern Federal District.

Krai (20.5%). In Primorsky and Khabarovsk Krai, the Republic of Sakha (Yakutia), and the Republic of Buryatia, the rate of population decline was slower than in the Far East as a whole.

In the period between the population censuses of 2002-2010, the population decreased by 457.1 thousand people, or 5.2%, while the number of urban residents decreased to a greater extent than rural (-6.3% versus -2.3%). Against this background, the Republic of Sakha (Yakutia) stands out: the northern subject of the Federation, where some population growth is noted. In the north of the Far East, as well as in Primorsky Krai and the Republic of Buryatia, there is an increase in the rural population.

Table 1
Dynamics of the population of the Far East [2.5]

| | Population, thousand people | | | | Decrease (growth) of the population (%) | | | |
|---------------------------------|-----------------------------|---------------|---------------|---------------|---|-------------|-------------|--------------|
| | 1989 | 2002 | 2010 | 2019 | 1989-2002 | 2002-2010 | 2010-2019 | 1989-2019 |
| Far East | 10440.4 | 8829.4 | 8372.3 | 8169.2 | -15.4 | -5.2 | -2.4 | -21.7 |
| <i>north</i> | 2831.7 | 2091.3 | 1986.2 | 1963.7 | -26.1 | -5.0 | -1.1 | -30.6 |
| The Republic of Sakha (Yakutia) | 1094.0 | 949.3 | 958.5 | 972.0 | -13.2 | +1.0 | +1.4 | -11.2 |
| Chukotka Autonomous District | 163.9 | 53.8 | 50.6 | 50.3 | -67.2 | -5.9 | -0.6 | -69.3 |
| Magadan Oblast | 391.7 | 182.7 | 157.0 | 140.1 | -53.4 | -14.1 | -10.8 | -64.2 |
| Kamchatka Krai | 471.9 | 358.8 | 322.1 | 313.0 | -24.0 | -10.2 | -2.8 | -33.7 |
| Sakhalin Oblast | 710.2 | 546.7 | 498.0 | 488.3 | -23.0 | -8.9 | -1.9 | -31.2 |
| <i>south</i> | 5118.0 | 4601.5 | 4307.0 | 4159.9 | -10.1 | -6.4 | -3.4 | -18.7 |
| Primorsky Krai | 2255.9 | 2071.2 | 1956.5 | 1895.9 | -8.2 | -5.5 | -3.1 | -16.0 |
| Khabarovsk Krai | 1597.7 | 1436.5 | 1343.9 | 1315.7 | -10.1 | -6.4 | -2.1 | -17.6 |
| Amur Oblast | 1050.3 | 902.9 | 830.1 | 790.0 | -14.0 | -8.1 | -4.8 | -24.8 |
| Jewish Autonomous Oblast | 214.1 | 190.2 | 176.5 | 158.3 | -11.2 | -7.2 | -10.3 | -26.1 |
| <i>southwest</i> | 2490.7 | 2136.6 | 2079.1 | 2045.6 | -14.2 | -2.7 | -1.6 | -17.9 |
| The Republic of Buryatia | 1038.2 | 981.3 | 972.0 | 985.9 | -5.5 | -0.9 | +1.4 | -5.0 |
| Transbaikal Krai | 1452.5 | 1155.3 | 1107.1 | 1059.7 | -20.5 | -4.2 | -4.3 | -27.0 |

In general, over the past thirty years, the population in the Far East has decreased by 2,771.2 thousand people, including the urban population - by 1,629.2 thousand people (71.7%). The main outflow of the population (958.1 thousand people, or 42.2%) occurred in the southern regions of the Federation (in Primorsky

Krai - by 360 thousand people, Khabarovsk Krai - by 282, in Amur Oblast - by 260.3 thousand people). Although the economies of these constituent entities of the Federation are more differentiated, it was these territories that experienced the greatest decline in employment in labor-intensive manufacturing industries, which experienced the maximum structural shock to demand after 1991 [4].

The decline in the population in the Far East occurs both due to the migration outflow of the population (in 1991, the outflow of the population for the first time exceeded its natural increase), and due to the negative natural increase. According to P.A. Minakir, the reasons for the outflow of the population were objective: firstly, the reduction in the scale and change in the structure of economic activity in the district in the 1990s, and secondly, the desire to protect their property rights in the new states (the previous guarantees of the preservation of the right to housing for those who left for the Far East in their "native" areas were automatically lost by immigrants from the former Soviet republics), thirdly, the loss of confidence that the incomes received in the Far East are a guarantee of savings for future life. Previously, it was this guarantee, and not even the current level of nominal income, that was the incentive for migrants coming to the region [3, p. 1025].

In 2019, population growth was noted in three regions: in the Republic of Sakha (Yakutia) due to the excess of the natural increase in population losses as a result of migration processes. In the Republic of Buryatia and the Chukotka Autonomous Okrug due to natural and migration growth.

In addition to the reduction in the resident population, its qualitative indicators have changed. First of all, due to the aging of the age structure. In 1989, in the FEFD, the share of the population younger than the working age was 2.7 times higher than the share of the population older than the working age (tab. 2). Since 2008, the share of people over 60 years old (17.7%) in the total population exceeds the share of the youth population (17.3%) both in the whole district and in individual subjects: in Primorsky Krai, Sakhalin Oblast. From 2011 to the present, this trend continues both in the FEFD as a whole, and in Kamchatka Krai, Magadan and Sakhalin Oblasts, Khabarovsk Krai, Amur Oblast, Jewish Autonomous Oblast. The share of the population over the working age in 2019 was 24.1% of the total population (the largest indicator of all subjects of the FEFD). In the Far Eastern Federal District, as well as in Russia as a whole, the aging of the population is determined by the long-term trend of declining birth rates.

Table 2

The structure of the population of the Far East by main age groups [2,5]

| | 1989 | | | 2019 | | |
|----------------------------|-------|-------|-------|-------|-------|-------|
| | total | urban | rural | total | urban | rural |
| Russian Federation | | | | | | |
| - younger than able-bodied | 24.5 | 23.8 | 26.4 | 18.7 | 18.3 | 19.9 |
| - able-bodied | 57.0 | 59.0 | 51.5 | 56.3 | 57.1 | 54.2 |
| - older than able-bodied | 18.5 | 17.2 | 22.1 | 25.0 | 24.6 | 25.9 |
| Far East | | | | | | |
| - younger than able-bodied | 28.9 | 27.3 | 33.3 | 20.8 | 19.8 | 23.4 |
| - able-bodied | 60.2 | 61.9 | 55.7 | 57.8 | 59.1 | 54.5 |
| - older than able-bodied | 10.9 | 10.8 | 11.0 | 21.4 | 21.2 | 22.1 |

Another consequence of the low birth rate was the entry of the FEFD since 2005 (the Russian Federation since 2007) into a long period of decline in the working-age population, the rate of which accelerated after 2010. This was due to the fact that the replenishment of the working-age contingent was due to the small number of those born in the post-Soviet period while leaving the working age of numerous births in the post-war period, the birth rate increased. It was also complicated by the migration outflow of the population of this age group from the FEFD (tab. 3). In 2019, the working-age population in the Far East was 1,559.3 thousand people, or 24.8% less than in 1989 (in the Russian Federation - by 1,068.7 thousand people, or 1.3%). That is, the FEFD lost the population of this age group more intensively than Russia as a whole.

Table 3

Age composition of migrants from the Far East, %

| | Aged migrants | | | | | |
|--------------------|--------------------------|-------------|------------------------|--------------------------|-------------|------------------------|
| | younger than able-bodied | able-bodied | older than able-bodied | younger than able-bodied | able-bodied | older than able-bodied |
| | 2002 | | | 2019 | | |
| | Arrived | | | | | |
| Russian Federation | 14.3 | 72.8 | 12.9 | 18.8 | 70.3 | 10.9 |

| | | | | | | |
|--------------------|---------|------|------|------|------|------|
| Far East | 16.0 | 75.0 | 9.0 | 17.0 | 74.6 | 8.4 |
| north | 16.3 | 76.1 | 7.6 | 14.7 | 77.0 | 8.3 |
| south | 15.4 | 74.6 | 10.0 | 16.4 | 75.1 | 8.5 |
| southwest | 17.3 | 74.7 | 8.0 | 18.4 | 73.8 | 7.8 |
| | Retired | | | | | |
| Russian Federation | 14.3 | 73.2 | 12.5 | 19.2 | 69.8 | 11.0 |
| Far East | 16.6 | 73.8 | 9.6 | 17.6 | 72.3 | 10.1 |
| north | 15.9 | 73.0 | 11.1 | 15.2 | 73.6 | 11.2 |
| south | 16.1 | 74.3 | 9.6 | 17.0 | 73.3 | 9.7 |
| southwest | 18.1 | 73.9 | 8.0 | 18.4 | 73.5 | 8.1 |

The most important feature of the age structure of the northern FEFD subjects in comparison with the average Russian and Far Eastern indicators is a high proportion of the working age population, a low proportion of pensioners and, accordingly, a higher proportion of children in the total population. Similar trends in the change in the age structure of the population are characteristic of almost all Russian subjects: the proportion of children is decreasing, while the proportion of the elderly population is growing. At the same time, the scale of these changes in the northern subjects of the FEFD is higher than the Far Eastern and average Russian indicators, and the proportion of people over working age is significantly lower in comparison with the average Russian level.

Among the federal districts, FEFD has the lowest rates, both in terms of life expectancy (70.22 years, 2019) and in absolute (2.62 years) and relative (3.9%) rates of change. For 1989-2019, the life expectancy of the Far East increased by 2.62 years. At the same time, in the district itself, the indicators of individual subjects of the Federation are significantly differentiated. Only in the Republic of Sakha (Yakutia), Kamchatka Krai, the Republic of Buryatia, Sakhalin Oblast, Khabarovsk Krai, Magadan Oblast, the growth in life expectancy exceeded the Far Eastern level, and the Chukotka Autonomous Okrug occupies the penultimate place in the district and 85th among Russian subjects (68.09 years), 86th place belongs to the Jewish Autonomous Oblast (68.08 years).

Despite the positive dynamics over a thirty-year period, in all Far Eastern regions, life expectancy indicators in 2019 exceeded the level of 1989-1990, mortality in the FEFD remains high.

In all Far Eastern regions, there is a decrease in the absolute number of births. This process will continue in the coming years, since there are objective reasons for the decline in women of reproductive age due to the low birth rate in the 1990s.

In the Far East, due to the young age structure of the population and ethnic composition, the birth rate exceeds the national average. The number of births

per 1000 population in 2019 was 11.1 ppm, with the national average of 10.1. The subjects in which the value of the coefficient turned out to be lower than the average for the Russian Federation were Primorsky Krai (9.6 ppm) and Magadan Oblast (9.1 ppm). Natural population growth was recorded in three regions: the Republic of Sakha (Yakutia), the Republic of Buryatia, and the Chukotka Autonomous Okrug. In Transbaikal Krai, Kamchatka Krai, Sakhalin Oblast, the balance of natural movement was negative, but the relative population losses were less than the national average. And only in Primorsky Krai, Amur Oblast, Jewish Autonomous Oblast, Magadan Oblast, Khabarovsk Krai, the rate of natural loss exceeded the average Russian indicator.

In 1989-1990, a number of Far Eastern subjects had a total fertility rate (TFR) higher than the level of simple reproduction. These are the Republic of Buryatia, the Republic of Sakha (Yakutia), Transbaikal Krai, Amur Oblast. The rural areas of both the FEFD in general and all subjects, with the exception of Kamchatka Krai, had TFR significantly higher than the level of simple reproduction. The growth in the total fertility rate was noted in 2012-2016, but by 2019 in all constituent entities of the district this indicator was less than in 1989-1990.

Among the factors that hinder the achievement of expanded reproduction of the population in the Far East, there is a high level of infant mortality and mortality of the working-age population. In 2019, the infant mortality rate (5.7), which is higher than the national average (4.9), decreased by 1.7 times over the period 2013-2019. But although there is a positive downward trend in the indicators of infant mortality, its overall level is still high compared to the national average. All Far Eastern regions are at risk (with a high level formed by the Chukotka Autonomous Okrug and the Jewish Autonomous Oblast), with the exception of the Republic of Sakha (Yakutia), Khabarovsk Krai, Sakhalin Oblast, which is due to the improvement in the provision of medical services to women and newborns.

The mortality rate of working-age residents of the Far East (593 cases per 100 thousand people of the corresponding age) is 1.3 times higher than the national average (470). The only region in which the number of deaths of working age from all causes over the past five years has decreased to below the national average is the Republic of Sakha (Yakutia). Chukotka Autonomous Okrug and Jewish Autonomous Oblast have the highest mortality rates in FEFD - 801.3 and 388.7, respectively. The supermortality rate of the working-age population, especially men, remains very high.

Thus, since the Far East is distinguished from other Russian territories by spatial heterogeneity and significant economic differences in ensuring favorable and comfortable living conditions for not only the arriving, but also the local population, the achievement of positive trends in regional demographic dynamics is possible only with an active state policy.

References

1. Avdeev Yu.A., Sidorkina Z.I., Ushakova V.L. *Demographic development trends in the regions of the Russian eastern Arctic // Population.* – 2020. – V.23. – № 3. – P. 130-144. DOI: 10.19181/population.2020.23.3.12.
2. *Demographic Yearbook of the Russian Federation // Goskomstat of Russia.* M., 1994. 419 P.
3. Minakir P.A. *Expectations and realities of the policy of "turning to the East" // Economy of the region.* – 2017. – V.13, Iss.4. – P. 1016-1029. DOI: 10.17059/2017-4-4.
4. Minakir P.A., Naiden S.N. *Social Dynamics in the Far East: Defect of Ideas or Failure of Institutions? // Region: Economics and Sociology.* – 2020. – № 3 (107). – P. 30-61. DOI: 10.15372/REG20200302.
5. *Regions of Russia. Socio-economic indicators. 2020: Stat. coll. / Rosstat.* – M., 2020. – 1242 P.

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设计分析
ANALYTICS IN DESIGN

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抽象的。本文讲述了设计项目分析部分的重要性，考察了设计的各个阶段，展示了产品设计开发过程中的动作顺序，并反映了分析在现有结构中的重要性。

关键词：设计、设计师、概念、分析、项目前分析、设计阶段。

Abstract. *This article tells about the importance of the analytical part of design projects, examines the stages of design, showing the sequence of actions in the development of product design and reflecting the importance of analytics in the existing structure.*

Keywords: *design, designer, concept, analytics, pre-project analysis, design stages.*

Analysis is a method of studying individual parts of an object or phenomenon in order to make a judgment about the whole. In the presented article, the term "analysis" is considered from the point of view of its application in the field of design.

Regardless of the object being designed, whether it is the corporate identity of the company, the interior of the apartment, packaging for tea with mint or an advertising banner at a bus stop, etc., the designer must understand: in order to make a high-quality design, he needs to go through all the design stages, starting from the analytical parts, the development of a conceptual solution and ending with the presentation of the finished work to the customer [7]. Newbies who are just starting their design path do not always realize and understand the importance of the elements of the structure that has developed over the years. It is worth noting the fact that the aesthetic side is not always the key to the success of the project. The work can be done in an interesting way and attract the audience with

its aesthetics, but it will not fulfill its intended function, its commercial value will be minimal. This is why there is such a profession as a designer, and an artist can present aesthetics in its pure form. V. F. Runge and V. V. Senkovsky propose the following definition: “Design is a specific area of activity for the development of a subject-spatial environment, as well as life situations in order to give the results of design high consumer properties, aesthetic qualities, optimize and harmonize their interaction with a person and society” [6, p. 12]. As you can see from the above definition, a designer is a kind of conductor between a person and his environment. The tasks of this profession include not only the modernization of the subject-spatial environment in order to improve the quality of people's life, but also the consideration of these changes, coupled with the psychological state of a person, his readiness and acceptance of the changes introduced into his life.

To get a deeper understanding of the analytical part, you should consider the stages of design - design themselves. They reflect the sequence of actions in the development of product design. So, the design stages contain pre-design and design parts. The first is just analytics. A novice designer should remember that any project requires a thorough and thoughtful analysis. This should not be neglected and completely devote all your attention only to aesthetics, since many questions will arise in the course of work. There is also a great risk of getting completely off the intended trajectory, getting an unstructured mixture of various elements and styles at the output, not putting together a single project, since there will not be a common concept that would unite all its component parts. A designer, in search of the best option, gets stuck between ideas, which ultimately affects his project in a negative way. The work runs the risk of not being collected, not having a clear and logical completeness. Often, newcomers to the field understand the importance of the analytical part only after a series of unsuccessful projects.

S. G. Azhgikhin and O. V. Gnutova write in one of their articles: “Without a clear plan (in our case, a project), you risk wandering in the darkness of uncertainty, and every decision will not be easy for you. Working without a plan, you are completely deprived of the opportunity to go through the countless design options that a project allows you to make at the sketching stage. In a project, you can move furniture around a room or apartment countless times and choose the most suitable arrangement option instead of dragging bulky furniture around the room in search of a suitable place for it” [3, p. 5]. They clearly, using the example of the interior of a dwelling, show that the analytical part in design planning takes a very important place. All subsequent work on the project depends on its quality. If the pre-project analysis is not done thoroughly, not completely, not to mention those cases when it is completely skipped, then the quality of the project will be very doubtful.

Speaking about a low-quality project, it is worth clarifying some points related

to this concept itself and what it means by itself. The quality of a design project is determined by many criteria. They also include the subsequent implementation of the project, its further path in the market, people's reaction to the manufactured product, etc. Design is predominantly a commercial activity and therefore the product that is produced by designers must be commercially effective and fulfill all the marketing requirements of the business. Thus, a designer creates a certain positive image of a product or company in the eyes of his target audience even at the first meeting. Therefore, even at the very beginning of work on a project, you need to delve into the customer's business, consider it and analyze the elements that are important for design planning.

At the pre-design stage, the designer collects information, identifies the functional properties of the future object. There is a formulation of a problem that needs to be solved by means of a design solution. S. G. Azhgikhin and O. V. Gnutova also express their opinion that: "All analytical material reveals the problem of the project theme and ways to solve it" [3, p. 5]. It is very important even at the pre-project stage to correctly formulate and formulate the problem, since the further development of the project will rely on it. The designer will deal with the very solution of the current situation, which he formulated and identified initially. The target audience is considered, to which the work will be directed, its needs are analyzed, since what will be interesting to some people may not find a response at all from others. It is very important to consider the consumer to whom the upcoming design will be directed, since the future promotion of the developed product on the market depends on it. Target audience is a group of people united by a common need for a specific product. Typically, these are the people who are more likely to purchase the product presented to them. As a result, it is necessary to correctly and competently think over a design solution so that a potential buyer is interested and chooses the presented one from a variety of similar products. Without taking into account the target audience, it is impossible to promote a product in the modern market, since the offer that can solve its problem depends directly on the knowledge of its clientele. The consumers to whom the design activity will be directed may represent not only potential buyers, but also, depending on the type of project, it may also be working personnel. Design, in addition to working directly on the product being sold, can help improve internal discipline. So, in working with this type of audience, the task is to unite the working personnel in the system, give them strength and confidence in this work, create in their minds the image of an ideal institution for which they can work fruitfully. This is very important, since the reputation of the company and the quality of customer service depend to a large extent on the working staff, which subsequently affects the number of sales. As you can see, the target audience can be completely different and the designer's task is to consider all its options, analyze and take into account when developing

a design project. It is also necessary to determine the methods by which the search for new ideas will take place, depending on the task at hand. There is a fairly large list of methods that are important to know, understand and be able to apply when working with a design object. Speaking about the methods of scientific research, it is worth noting that their choice, first of all, depends on what goals and objectives are set in this project. The choice is based on the situation in which the object in question is. This is followed by the development of a conceptual solution for the project. This is a very important and time-consuming process that needs a lot of time. The word “concept” itself comes from the Latin “conception” and translated into Russian means “system, understanding”. This is a certain vision of the project, its main idea, which it carries in itself, combining all the constituent design elements into a single whole. A good and well thought-out concept that carries new and unusual ideas is what is able to attract the attention of a potential target audience to a greater extent. Without a concept, the project will not be unified and holistic, it will not have a starting point, a support that keeps all subsequent work within a certain framework that does not allow the designer to go astray. Therefore, the development of a conceptual solution must be approached responsibly.

Conducting a pre-project analysis, you need to pay great attention to all the little things, deeply imbued with the initial situation, the problems posed. The more deeply the designer studies the design object and all its constituent elements, the more likely it is to get a high-quality, competitive and effective product of design activity. An idea will be more valuable if it carries some specific features that will distinguish the object under consideration from the background of competitors, cause them positive emotions. And such a designer can only come to a thorough and careful study, collecting information about the design object.

Lately, a lot of people have developed some kind of immunity to advertising and to many design elements. They have a subconscious blocking mechanism due to the large oversaturation of the advertising market. And this applies not even to the amount of funds invested in it, but to the very attitude of the audience to this type of presentation of information. People simply stopped paying attention to it, which is why the return on advertising in the markets decreases, although prices for it are growing. To overcome this barrier, the designer must be able to go beyond the usual, since only in this way will he be able to attract the attention of the audience. Modern consumers are mainly attracted only by unusual and interesting solutions that go beyond the ordinary. Design in any of its manifestations, if the goal is to stand out from the "crowd", should arouse consumers' interest, or play on some positive emotions that will already be in the consumer's memory associated with the advertised product or the company represented by means of an emotional connection, which, as along the chain, will lead a person to the idea of the product the customer needs. One way or another, it is postponed at a subconscious level,

which plays its role in the future. That is why it is so important to come up with an unusual idea that can be developed into a completely workable and realizable concept.

And finally, the design part contains a certain structure that should be adhered to in the analytics of the design project. It is based on the creation of a functional diagram of the designed object from the point of view of its interaction with consumers, being in the environment, etc. This is followed by the collection of analogues, analysis of competitors and their design solutions, identification of pros and cons. Analysis of analogs is necessary in order to avoid mistakes in work. It is very important to carry it out precisely at the initial stages of development, since there is a possibility of a secondary nature, as well as the creation of an environment that will negatively affect its use by consumers and at the level of sales. Analyzing competitors is just as important as it helps to better understand their advantages and disadvantages that affect the commercial side of the business. Competition is a kind of "engine" forcing organizations to fight for the right to exist in the market. Well thought out design is one of the main ingredients of a competitive company. Thanks to the information received, you can initially be able to avoid mistakes, walk along the beaten track, study which elements in the end turned out to be winning, and which ones lost in the fight against competitors, which, as a result, can help the business save a large amount of resources, both time and money. At the stage of sketching and developing the visual part of the project, the concept is visualized. The search for plastics, shape, colors, compositional solutions, line thickness, the degree of detail of the objects depicted is carried out. A certain atmosphere of the future design is already being set in them. Subsequently, by screening out dead-end ideas that do not meet the requirements laid down at the initial design level, the final variants of the clauses are selected. When a certain style state has been formed, the design proceeds to the next stage - drawing up sketches of the future design. At this stage, the designer immerses himself in the environment he is designing, examines it from the point of view of the end user, taking into account all the data he has collected earlier. Next, the optimal options are selected according to the concept and finalized to the logical end. The chosen concept, often, can undergo a number of adjustments on the part of the design customers. They also decide which of the presented concepts will be refined and which will remain untouched. But in some cases, depending on the psychological component of the communication between the designer and the client, the designer can influence the final decision of the project customer. As a result, the project is presented to the customer with the substantiation of the conceptual solution and ideas. This also includes an assessment of the work done, criticism.

A designer, especially one who is just starting his professional path, should not neglect the analytical part and repeat the mistakes of inexperienced designers.

From the very beginning of entering the profession, you should accustom yourself to the order and structure of the information received, as well as learn to find it. Step-by-step work on a project will always be more efficient and faster.

References

1. *Art market // New world of art. –1998. - No. 3.*
2. *Bystrova T. Yu. Thing. The form. Style: An Introduction to Design Philosophy. Yekaterinburg, 2001.*
3. *Gnutova O. V, Azhgikhin S. G. Features of pre-project analysis in the design of residential interiors. Collection of scientific papers. 2018. p. 38-43.*
4. *Jones J. K. Design methods. M., 1986.*
5. *Laptev V. Typography. Order and chaos. M., 2008.*
6. *Runge V. F., Senkovsky V. V. Fundamentals of theory and methodology of design: Textbook. allowance. - M.: MZ-Press, 2003.*
7. *Trumpet V. V., Azhgikhin S. G. The main stages of environmental design / Design and architecture: a synthesis of theory and practice. Collection of scientific papers. 2017. P. 475-479.*

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伟大的丝绸之路与世界文化的融合：东西方传统对话中爱观念的发展
**THE GREAT SILK ROAD & INTEGRATION OF WORLD CULTURE:
DEVELOPMENT OF CONCEPTS OF LOVE IN THE DIALOGUE OF
EASTERN & WESTERN TRADITIONS**

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抽象的。文章旨在通过东西方传统的对话，揭示丝绸之路在爱情观演变中的作用。这一分析的结果证明，由于城市作为东方文化中丝绸之路沿线独特的文化中心的出现，乌兹里特和奥马里特的抒情传统被综合起来，从而形成了高级概念。爱。东方释爱传统对欧洲抒情诗的深刻影响得以显露，由此形成了以行吟诗人诗歌为代表的礼义释爱传统的形成。

关键词：乌兹里特诗歌、奥马利抒情诗、高爱的概念、苏菲派诗歌的象征意义、礼节传统、游吟诗人的诗歌。

Abstract. *The article aims to reveal the role of the Great Silk Road in the evolution of the concept of love in the dialogue of the traditions of the East and the West. As results of this analysis have been proved that thanks to the emergence of cities as unique cultural centers along the Great Silk Road in the culture of the East, the Uzrit and Omarite lyrical traditions were synthesized, which led to the formation of the concept of high love. The meaningful influence of the eastern tradition of the interpretation of love on European lyrical poetry was revealed, which allows a new look at the formation of the courteous tradition of interpretation of love, embodied in the poetry of troubadours, was formed.*

Keywords: *Uzrit poetry, Omarite lyric poetry, the concept of high love, the symbolism of Sufi poetry, the courteous tradition, the poetry of troubadours.*

The Great Silk Road can be studied from the point of view of various scientific disciplines: history, geography, cultural studies, etc. However, a purely disciplinary approach does not reveal the full depth of this phenomenon, which has played an outstanding role in the history of civilization. The Great Silk Road can be considered not only in a particular historical context, but also as a unique phenomenon of cross-cultural interaction that integrated such large-scale cultural patterns, which allows us to speak of its role in shaping the culture of humanity as a whole.

In civilizational terms, the Great Silk Road largely ensured the unity of the ancient and medieval world, integrating East Asia and the Mediterranean into a single civilizational space and ensuring the spread of the most important achievements of civilization (paper, gunpowder, silk, glass, etc.).

In cultural projection, the Great Silk Road represented not only trade communication, but also a channel for the exchange of new ideas, enriching the spiritual life of countries and peoples. Scientists, philosophers and poets traveling with caravans ensured not only the acquaintance of Europe with Islam and Asia with Christianity, but also the integration of traditions on an *East-West* scale.

One of the most interesting areas of this large-scale interaction of the cultures of the East and West is the sphere of the interpretation of such a phenomenon as love. Among the worldview universals of culture, universal *love* occupies one of the central places, acting as a base for cultural traditions of various types, but in different traditions (both lyric-poetic and cultural traditions in general) it is interpreted differently [1, p. 588-590], and the ups and downs of the development of these interpretations in certain moments were influenced by the factors brought about by the Great Silk Road.

1. Lyrics of the East: the development of ideas about love in the culture of a medieval city

The Great Silk Road gave birth to the unique cities of the ancient and medieval East, that is, gave birth to outstanding cultural centers, whose significance in the history of mankind goes far beyond national cultures, acquiring an international character. So, in particular, in the context of these cities, a fundamental transformation of ideas about love in the eastern poetic tradition was carried out.

The symbolic system of classical oriental poetics, which is based on a systemic, philosophically based idea of love as a phenomenon of human existence and cosmic existence in general, has gone through several stages in its formation.

As the earliest, the traditional Uzrit lyrics can be singled out, which took shape on the basis of archaic epics, in which love is thought in the context of archaic ideas about the connection of human sexuality with recitations of the cosmogonic marriage of sacred ancestors and the fertility of natural forces. So, for example, in Imruulkais: "Seeing, hearing Suad, "Appear again!" - the land will ask: / Where its tents are, the earth bears fruit more abundantly" [2, p. 23]. In traditional Uzrite poetry, the construction of a lyric line is not formalized by a stable code, but the analysis of the *gazal uzri* allows us to say that the feeling glorified by Uzrite authors is thought of as chaste and pure: Jamil, who praised his love for Busseina; Qays Ibn Zariqh, who immortalized the name of Lubna; Qais Ibn al-Mullawah, nicknamed for his boundless love for Leila Majnun - maddened with love. This feeling, however, is tragic due to the inevitable separation: "I saw that the time has come for us: / The camels are already loaded ..." (Antara [3, p. 47]) "Say Goodbye

to Hurayra!" - we had a time to part: / The caravan is leaving ..." (al-Asha [3, p. 64]). The classic plot of *ghazal uzri* is the cry of a lover over the former parking lot of the beloved's caravan, which had long been taken away and passed off as another: "They hid Lubna in patterned tents, / A lot of her were guarded by sentinels, - / But the wind would mix the lovers' breath...<...> / ...and in a woeful tremor / The constellations will mourn the sleepless bed"[2, p. 81].

The second most important stage in the formation of the symbolic system of classical oriental poetics was the design of the Omarite lyric tradition, which was directly related to the culture of medieval cities. Early urban oriental culture gives rise to the tradition of Omarite lyric poetry, whose poetic plots - in contrast to the Uzrit tradition - are focused not so much on the analysis of emotional movements as on the fixation of sensual eventfulness. For example, in Omar Ibn Abi Rabia: "Yes, I knew her! She smelled of musk, / Only the Yemeni cloak covered beauty without blemish. She was sneaking secretly, her heart trembled with joy, / The body in the folds of her cloak shone with the blush of the east..."[4, p. 190].

If in the context of the Uzrit tradition love appeared as a fateful totality, then in the Omarite one - as a motley scattering of joyful episodes ("My beloved said: "So, desires have come true." / Easy, without care, without sorrow - like a game" by Omar Ibn Abi Rabia [4, p. 184]). The situation of meetings and partings, tragically comprehended in *ghazal uzri*, in Omarite lyrics takes on a purely hedonistic semantics, it is no coincidence that the main genre form of Omarite lyrics is such a kind of ghazal as *ghazal ibakhi* (from the Arabic *abakh* 'allow').

The most important stage in the development of ideas about love in Eastern culture is the period of the VIII-IX centuries.: at this time, in the culture of medieval cities, there was a process of imposing Muslim culture on pre-Islamic traditions, acquiring new meanings in a new context, as a result of which, by the end of the IX century, there was a kind of synthesis of the Uzrit (Bedouin) and Omarite (urban) oriental lyric trends, giving rise to the phenomenon of specific love poetry based on a clearly articulated concept of love. In the X century, the Baghdad school finally formalized this cultural vector into a poetic tradition praising a special *supreme love*. The unattainability of the beloved, who in the uzrit lyrics acted as an objective circumstance of nomadic life, was rethought as a normative value: an unrequited but sensually vivid love for a "cruel" married lady is the canonical plot of the poetic tradition of the eastern cities of the mature middle ages.

Thus, the interpretation of love in classical oriental poetry was a product of the interaction of the traditional Uzrit poetic system, on the one hand, and Omarite poetics, on the other.

2. Courtesy poetry of Europe

as a product of interaction of cultural traditions of East and West

The Great Silk Road largely ensured the unity of the ancient and medieval

world, integrating Asia, Africa and Europe into a single civilization space and ensuring the spread of the most important achievements of civilization (paper, gunpowder, silk, glass, etc.). However, the Great Silk Road was not only a trade communication, but also a channel for the exchange of new ideas, enriching the spiritual life of countries and peoples. Scientists, philosophers and poets traveling with caravans ensured not only the acquaintance of Europe with Islam and Asia with Christianity, but also the integration of traditions on an *East-West* scale.

One of the spheres of this integration was the interpretation of love in the courtly tradition of Europe, which originally took shape in the south of medieval France. The interpretation of love proposed by the troubadours is distinguished by a high level of complexity and, with the help of complex semiotic constructions, tries to carry out a kind of legalization of the phenomenon of corporeality, giving it a special symbolic interpretation. The concept of love, characteristic of troubadours, was formed on the basis of the influence that the courtly tradition experienced from the culture of the East. The mediating link here was the Andalusian culture - the culture of Arabized Spain.

The substantial influence of the Eastern tradition on the formation of a courtly worldview can be considered in two layers.

The most important factor in the formation of the courtly concept of love was the fact that the spiritual life of Provence proceeded in the field of interaction of extremely diverse cultural influences. For geographical and historical reasons, the south of France was a kind of crossroads of trade relations between France, Italy, Greece and other European countries with the East. The interpretation of love in the courtly tradition was especially influenced by the Arab-Spanish culture. According to IM Filshtinsky, it is difficult to overestimate the importance of the "role played by the Arabs of Spain in the cultural exchange between East and West, which so fruitfully influenced the development of world culture" [5, p. 251].

The process of interaction between Muslim culture and the pre-Islamic cultural tradition of the peoples of the Caliphate that took place in the VIII-IX centuries in Arabic literature resulted, as already noted, in the formation by the end of the IX in the concept of *high* love. In the Arabized (in the process of Moorish rule) Spain XI, Ibn Hazm, the author of the famous treatise on love "The Necklace of the Dove" [6], acted as a theorist of this trend. In the XII century, such a genre of stanza poetry as *zajal*, which was created not in the classical Arabic language, but in the colloquial language typical of Moorish Spain, which contained a large admixture of Romanic vocabulary and was equally understandable to both Arabs and Europeans, became widespread in Arab-Spanish literature. The most important monument of *Zadjala* is the *sofa* of the Cordoba poet of the early XII century Ibn Kuzman, widely known in the neighboring Spain of Provence. Moreover, the stanza structure of the songs of the first of the known troubadours, Guillem of

Aquitaine, largely coincides with the structure of the zajals of Ibn Kuzman.

A deeper layer of influence on the courtly representations of southern French knighthood from the eastern cultural tradition can also be distinguished: through the Arab-Spanish culture, the foundations of the courtly system of values (and above all, the interpretation of the phenomenon of love within its framework) experienced a meaningful impact as some areas of Muslim culture (first of all, Sufi mysticism and the Sufi allegorical poetry that developed on its basis, characterized by a high level of semiotism), and the moments of the ancient (namely, ancient Greek) cultural heritage assimilated by Eastern culture (first of all, the Platonic ideas that existed in Arab culture, not deformed ideas of Christian asceticism).

The core of the Sufi concept is the doctrine of revelation, interpreted as the fusion of the soul with the Absolute (tawhid), at the moment of which the mystic comprehends both his essence and the truth of God (the metaphor about a drop that poured into the ocean and became it is widespread). When a murid experiences *hakykat*, that is, a direct feeling of oneness with God, a good thought fills his heart, demanding permission. This connection of the heart with the tongue (*dhikr*) presupposes two forms of its manifestation: one of them is silence ("How strange a Sufi is silent! - How strange that you have no ears" in Jelal ad-Din Rumi [see 7, p. 39]), the other is the verbalization of mystical experience in a poetic text by means of allegories and allusions to an ineffable mystery. Early Sufism used ready-made lyrics of lyric songs for this purpose (a significant role in this was played by the fact that one of the key figures in the formation of Sufism, Rabi'a al'Addaviya with her classic thesis "the ardor of love for God burns the heart" [see. 8, p. 317], was a professional singer). In addition, in the early stages of development, Sufism was persecuted as a heresy for the idea of the possibility of direct merging with the Absolute, due to which the use of secular lyrics to address the mystic to God had a disguising function [see. 8, p. 61].

We can talk about a wide range of symbolic structures that make up the symbolic arsenal of Sufi texts: a Sufi is denoted as *ashik* (lover) or *rind* (vinopian), God is conveyed by the term *durst* or *hum-mar* (respectively 'beloved' and 'intoxicating'), a spiritual mentor - as butler, etc. The special dictionary of Mahmud Rabbi Shabistari (XIV century) provides an interpretation of such terms of Sufi texts as eyes, lips, curls, fluff, mole, belt, and many others. others [see 8, p. 110-111] So, if the face of the beloved symbolizes the authenticity of the existence of the Absolute, then the curls that hide it are the transient phenomenality of the temporary existence of the objective world. Consequently, the rings of curls, in which the heart of a lover is entangled, is a symbolic designation of the temptations of the external world, which the soul, aspiring to God, must cast aside; and the lover, removing the curls from the girlfriend's face, symbolizes tawhid and the contemplation of the divine light. As Omar Ibn al-Farid writes, "My love, I'm drunk only

with you, / The whole world has blurred, hid in fog, / I myself disappeared, and only you are alone / My eyes, looking inside, are visible" [8, p. 521]. Thus, the motives widespread in Sufi texts, which are evaluated from the outside as erotic by an outside reader, in fact act as complex symbolic systems for verbalizing mystical experience. In turn, Sufi poetics significantly influenced the secular lyric tradition, within which the concepts of sublime love took shape, which, describing interpersonal relationships, preserved the religious and philosophical symbolism of Sufi texts.

This symbolism of Sufi poetry had a significant impact on the European cultural tradition, and above all on the southern French knightly tradition, which found its expression in the poetry of the troubadours, who created the cult of sacred love for Donna as a path to truth and perfection.

Later, the symbolism of the troubadours formed the basis for such a direction of European lyricism as *le dolce stil novo* ("new sweet style"), which, in turn, influenced the symbolic systems of Petrarch and Dante. The semantic conjugation of love and the comprehension of truth was preserved in European culture up to the 20th century, in the last decade of which P. Sloterdijk wrote about the need for a kind of "decognitization of love", which in European consciousness is closely linked with the semantic figures of "love of knowledge" and "knowledge through love "[see. 9].

Thus, the interpretation of the phenomenon of love in European culture reveals the deep meaningful influence of the spiritual heritage of both pre-Islamic and Muslim Eastern cultures.

References

1. Mozheiko, M. A. *Lyubov / World Encyclopedia: Philosophy*. – Moscow: AST – Minsk: Harvest, Contemporary Writer, 2001. – P. 588-590.
2. *Arab love lyrics: poems / Intro. article, information about the author, and notes by B.Ya.Shidfar; transl. from Arab.; Fictions in Moscow, 1974*. – 316 P.
3. *Arabian antiquity: From ancient Arabic poetry and prose / Ex. ed. B. Ya. Shidfar; lane with arab. L.A. Dolinina and V.V. Polosin*. – Moscow: Science: Gen. ed. eastern literature, 1983. – 142 P.
4. *Arabic poetry of the Middle Ages / transl. from Arab. Eppel Asar*. – Moscow: Fiction, 1975. – 768 P.
5. *Filshtinsky, I.M. Arabic classical literature*. – Moscow: Science: Gen. ed. eastern literature, 1965. – 309 P.
6. *Ibn Hazm. Dove's necklace / Ed. I. Yu. Krachkovsky; transl. from Arab. M.A.Salye*. – St. Petersburg: Lenizdat, 2014 – 288 P.

7. *Stepanyants, M.T. Philosophical aspects of Sufism. – Moscow: Science: Gen. ed. eastern literature, 1987. – 192 P.*
8. *Bertels, E.E. Selected Works: Sufism and Sufi Literature. – Moscow: Science, 1965. – 527 P.*
9. *Sloterdijk, P. Critique of Cynical Reason / Transl. A. Pertseva. – Yekaterinburg: Ural University Publishing House, 2001. – 584 P.*

合并重型颅脑损伤急性期血的临床及生化指标

CLINICAL AND BIOCHEMICAL PARAMETERS OF BLOOD IN THE ACUTE PERIOD OF CONCOMITANT SEVERE TRAUMATIC BRAIN INJURY

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抽象的。及时的输血治疗使红细胞、血红蛋白、血细胞比容的参数保持在规范值内成为可能。血液中葡萄糖增加的趋势在第 4.5 天显示,这对应于炎症反应约一周节律的高峰期。在第 5 天,刺伤增加了 $11\pm 4.8\%$,第 6 天增加了 $13\pm 2\%$ 。第 4-5 天每周生物节律末期的高血糖导致免疫耐受性降低和第 6 天全身炎症反应加剧。整个观察期间 AST 增加的趋势导致高凝状态的趋势,降低 APTT (-0.89)。揭示了 CSTBI 急性期造血功能的功能活性与免疫反应的协同作用。

关键词: 临床和生化血液参数,急性伴随严重创伤性脑损伤。

Abstract. *Timely blood transfusion therapy made it possible to maintain the parameters of erythrocytes, hemoglobin, hematocrit within the normative values. The tendency to an increase in glucose in the blood was revealed on day 4.5, which corresponds to the acrophase of the about-week rhythm of the inflammatory reaction. On the 5th day, an increase in stabs was noted up to $11\pm 4.8\%$ and up to $13\pm 2\%$ on the 6th day. Hyperglycemia in the acrophase of a weekly biorhythm on days 4-5 caused a decrease in immune tolerance and an exacerbation of the systemic inflammatory response on days 6. The tendency to an increase in AST throughout the observation period caused a tendency to hypercoagulability, decreasing APTT (-0.89). The synergism of the functional activity of the hematopoietic function and the immune response in the acute period of CSTBI was revealed.*

Keywords: *clinical and biochemical blood parameters, acute concomitant severe traumatic brain injury.*

Relevance. The International Normalized Ratio (INR) is 0.8-1.2 in a healthy person. An increase in INR is caused by: hypofibrinogenemia (deficiency of factor I), dysfibrinogenemia (synthesis of a defective protein that is not able to participate in the cascade of biochemical reactions), hereditary or acquired deficiency of

factors II, V, VII, deficiency of factor X (for example, purpura in amyloidosis), deficiency vitamin K, hemorrhagic disease of newborns, malabsorption with impaired fat absorption (due to celiac disease, chronic diarrhea), acute leukemia, congestive heart failure, liver pathology (hepatitis, cirrhosis, alcoholic liver disease). The reasons for the decrease in INR are (indicate a tendency to form blood clots): DIC syndrome (period of hypercoagulation), deep vein thrombosis (initial stages), polycythemia, pregnancy (recent months), increased factor VII activity. APTT - activated partial thromboplastin time. Reflects the activity of the factors of the internal path. The test is sensitive to a deficiency of all factors, except for VII, to heparin, to specific and nonspecific inhibitors. Activated Partial Thromboplastin Time (APTT): 21.1 - 36.5 sec. Prolongation of APTT – DIC syndrome, liver disease, massive blood transfusions, administration of anticoagulants, deficiency of clotting factors, vitamin K deficiency, presence of clotting inhibitors, presence of VA, leukemia, hemophilia. Shortening of APTT - hypercoagulation, risk of thrombosis. With hypofibrinogenemia, anemia, low hematocrit, the clot is small and this leads to a false overestimation of the retraction index (even when the latter is reduced). On the other hand, with an excess of erythrocytes (polyglobulia, erythremia), an increase in hematocrit, hyperfibrinogenemia, the clot is large, which leads to a false decrease in the retraction index [1,2]. Due to the lack of sufficient information on changes in clinical and biochemical blood parameters in the acute period of CSTBI, we tried to present the results of the study of parameters in dynamics after CSTBI.

Purpose of work. To study and assess the dynamics of clinical and biochemical blood parameters in the acute period of combined severe traumatic brain injury.

Material and research methods. We studied the indicators of a comprehensive examination of 30 patients with concomitant severe traumatic brain injury (CSTBI) who were admitted to the ICU of the RSCEMA neurosurgical department in the first hours after an accident - 28, catatrauma in 2 patients. Continuous daily monitoring of the general blood test, hemostasiogram, biochemical parameters was carried out: alanintransferase - AIT, creatine - Cr, hematokritis - HMT, international normalized relation - INR, activated partial thromboplastin time - APTT, platelets - Pl, asparantransferase - AST, protrombin index - PI, diastase - Dias, retraction - R, urea, hemoglobin – HG, monocytes, fibrinogen, lymphocytes, palcoidal - plc, potassium, segmented - Segm, glucose - gl, general protein - GP, leukocyte, direct bilirubin - DB, general bilirubin - GB, fibrinolytic activity - FA, trombotest - TT, estimation of vegetative tone - EVT, the need of myocardium in oxygen - TNMO were performed for 25 days after CSTBI (daily in the first 8 days, average values on days 9-17 and 18-25 after CSTBI).

Mechanical respiratory support (MRS) was initiated by mechanical lung ventilation (ALV) for a short time and then switched to SIMV. Mechanical ventilation was performed in the mode of normoventilation or moderate hyperventi-

lation (pCO₂— 30—35 mmHg) with an air-oxygen mixture of 30—50%. The assessment of the severity of the condition was carried out using scoring methods according to the scales for assessing the severity of concomitant injuries - the CRAMS scale, the assessment of the severity of injuries according to the ISS scale. On admission, impaired consciousness in 29 injured patients was assessed on the Glasgow Coma Scale (GS) 8 points or less. The above parameters of patients aged 19 to 84 years were studied.

Results and its discussion

*Table 1
Dynamics of blood analysis in the acute period of CSTBI*

| Days | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9-17. | 18-25. |
|-------------------------|----------------|---------------|----------------|----------------|----------------|-----------------|----------------|----------------|----------------|----------------|
| Age, years | 45.3± 16.8 | 49.5± 17.3 | 26.1± 3.6 | 47.7± 16.1 | 49.9± 17.9 | 43.2± 19.2 | 48.0± 18.6 | 49.9± 17.5 | 52.6± 15.6 | 52.2± 17.0 |
| Erythrocytes *10*9/l | 3.5± 0.9 | 3.4± 0.4 | 4.1± 0.2 | 3.6± 0.4 | 4.0± 0.4 | 3.8± 0.4 | 3.7± 0.1 | 3.7± 0.6 | 3.5± 0.4 | 3.6± 0.4 |
| Hemoglobin, g/l | 115.6± 21.7 | 112.4± 9.7 | 113.7± 13.6 | 101.9± 14.1 | 103.5± 17.4 | 115.8± 12.2 | 102.5 10.3 | 106.5± 18.5 | 100.4± 13.4 | 108.9± 14.1 |
| Platelets. 10*9/l | | 201.3± 0.2 | | | 246.0± 0.03 | 312.4± 0.05* | 220.0± 0.06 | | 178.8± 31.8 | 210± 0.3 |
| Hematocrit, % | 36.9± 6.7 | 37.3± 3.3 | 39.3± 0.8 | 32.0± 4.2 | 32.2± 4.2 | 39.7± 0.9 | 32.8± 3.4 | 34.5± 5.5 | 32.3± 3.9 | 35.6± 4.0 |
| Leukocytes, 10*9/l | 11.3± 3.5 | 9.2± 1.5 | 10.3± 1.9 | 8.9± 2.4 | 7.9± 1.7 | 9.8± 1.9 | 8.3± 1.3 | 7.6± 1.3 | 9.2± 1.9 | 7.8± 2.1 |
| Metamyelocytes, % | 3.0± 1.0 | 4.0± 0.02 | | | | 5.0± 0.03 | | | 2.3± 1.1 | 1.0± 0.01 |
| Stab, % | 3.1± 1.7 | 6.6± 3.3 | 4.3± 1.8 | 6.3± 1.6 | 2.5± 1.5 | 11.0± 4.8 | 2.0± 0.01 | 5.8± 4.8 | 3.5± 1.7 | 4.0± 1.6 |
| Segmented, % | 72.6± 5.3 | 73.8± 3.4 | 76.3± 1.1 | 74.3± 3.8 | 76.0± 7.5 | 73.0± 11.1 | 70± 0.02 | 72± 6.5 | 75.2± 4.8 | 70± 12.0 |
| Eosinophils, % | 1.7± 0.4 | 1.0± 0.01 | 1.0± 0.02 | 1.0± 0.01 | 2.0± 0.01 | 2.5± 1.5 | 1.0± 0.01 | 2.0± 0.7 | 2.5± 1.8 | 18.6± 26.2 |
| Lymphocytes, % | 18.0± 7.3 | 14.8± 3.8 | 15.3± 3.1 | 15.5± 4.0 | 16.0± 6.0 | 13.1± 4.2 | 26.0± 0.03 | 16.3± 5.3 | 17.5± 6.1 | 15.3± 4.4 |
| Monocytes, % | 4.5± 1.9 | 3.2± 1.8 | 3.7± 1.6 | 3.8± 1.6 | 5.0± 1.0 | 4.6 1.6 | 1.0± 0.01 | 2.0± 0.5 | 3.8± 1.6 | 3.5± 1.4 |

As shown in tab. 1, timely blood transfusion corrective therapy for the identified deviations made it possible to maintain the parameters of erythrocytes, hemoglobin, hematocrit within the standard values. An increase in the number of platelets in the peripheral blood was revealed up to 312 ± 0.05 on the 6th day. The appearance of metamyelocytes on days 1,2,6 indicated the significance of the stress reaction, and on the 9-17 and 18-25 days of the systemic inflammatory response of the injured patients.

Table 2
Changes in blood biochemical parameters

| Days | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9-17. | 18-25. |
|-------------------------|--------------|---------------|--------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Glucose, mmol/l | 8± 2 | 8± 1 | 7± 1 | 11± 5 | 13± 2* | 7± 1 | 8± 0.2 | 7± 1 | 7± 1 | 7± 1 |
| Total protein, g/l | 58± 10 | 57± 2 | 51± 3 | 51± 7 | 56± 4 | 56± 6 | 59± 10 | 48± 6 | 56± 5 | 60± 7 |
| Urea, mmol/l | 8± 2 | 7± 2 | 9± 2 | 12± 6 | 12± 4 | 8± 2 | 9± 3 | 9± 2 | 10± 4 | 8± 3 |
| Creatinine, mmol/l | 0.1± 0.02 | 0.1± 30.02 | 0.1± 0.04 | 0.14± 0.03 | 0.15± 0.02 | 0.09± 0.02 | 0.09± 0.05 | 0.12± 0.02 | 0.13± 0.04 | 0.10± 0.02 |
| Total bilirubin, μmol/l | 16± 3 | 37± 30 | 33± 17 | 23± 8 | 20± 2 | 18± 3 | 18± 0.3 | 20± 0.4 | 18± 3 | 15± 2 |
| Bil.direct, μmol/l | 4± 3 | 27± 23 | 4± 0.2 | 8± 6 | 7± 3 | 3± 2 | 6± 0.2 | 8± 0.1 | 5± 4 | 3± 3 |
| Diastase, mg.ml/hour | 57± 46 | 179± 84 | 28± 0.6 | 178± 18 | 23± 3 | 28± 0.5 | 25± 0.8 | 30± 0.6 | 66± 16 | 82± 28 |
| Ast, u/l | 115± 71 | 92± 28 | 97± 5 | 95± 5 | 69± 7 | 75± 22 | 77± 8 | 70± 10 | 81± 38 | 67± 18 |
| Alt, u/l | 66± 29 | 46± 15 | 75± 12 | 48± 22 | 82± 26 | 69± 13 | 61± 15 | 43± 21 | 78± 49 | 49± 20 |

The tendency to an increase in glucose in the blood was revealed on the 4.5th day in conditions of complete exclusion of parenteral administration of carbohydrates, which corresponds to the acrophase of the circadian rhythm of the inflammatory reaction (tab. 2). After that, on the 5th day, an increase in stabs was noted up to 11 ± 4.8 on the 6th day. Stress hyperglycemia on days 4-5 caused a decrease in immune tolerance and, most likely, caused an exacerbation of the systemic inflammatory response on days 6.

The tendency to an increase in total bilirubin in the blood on day 2 was due to a tendency to an increase in the direct fraction to $27\pm 23 \mu\text{mol/l}$, associated with the cytolytic effect of severe trauma on hepatocytes, also to an increase in ALT to $66\pm 29 \text{ u/l}$ on day 1, a tendency to increase in diastasis to $179\pm 84 \text{ mg ml/hour}$ on day 2. It should be noted that the tendency to an increase in indicators persisted throughout the observation period against the background of corrective infusion and detoxification therapy. Damage to the cellular structure of tissues by trauma caused an increase in AST in 1 day to $115\pm 71 \text{ u/l}$. The average INR and APTT indices were within 1.5 ± 0.2 and 23 ± 6.2 seconds, that is, during the first 25 days after injury, the tendency to hypercoagulability persisted.

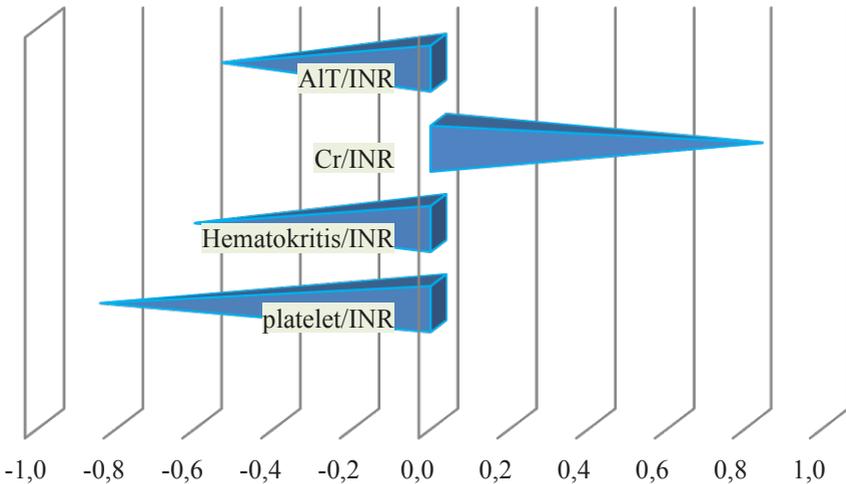


Fig. 1. Correlation links INR

A pronounced tendency to increase INR was facilitated by an increase in the blood creatinine index of age (0.79). A negative correlation between platelets and INR (-0.86), apparently, characterizes the compensatory response of internal coagulation factors to a possible loss of platelets.

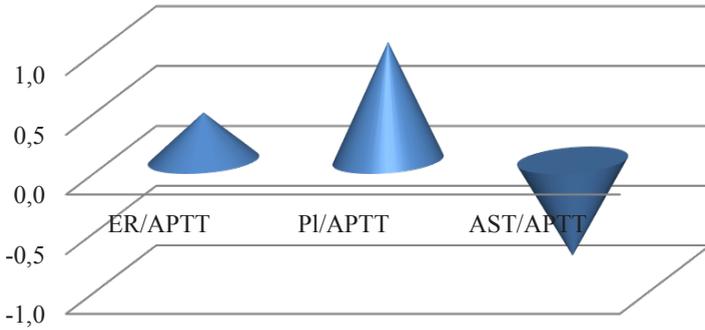


Fig. 2. correlations APTT

An increase in the number of erythrocytes above $3.5 \cdot 10^9/l$ (0.4), platelets above $300 \cdot 10^9/l$ (0.95), causing a tendency to increase APTT can negatively affect the blood coagulation activity, contributing to hypocoagulation (fig. 2). Perhaps, under these conditions, mechanisms are activated that prevent thrombus formation. The trend towards an increase in AST throughout the observation period caused a trend towards hypercoagulability, decreasing APTT (-0.89) (fig. 2).

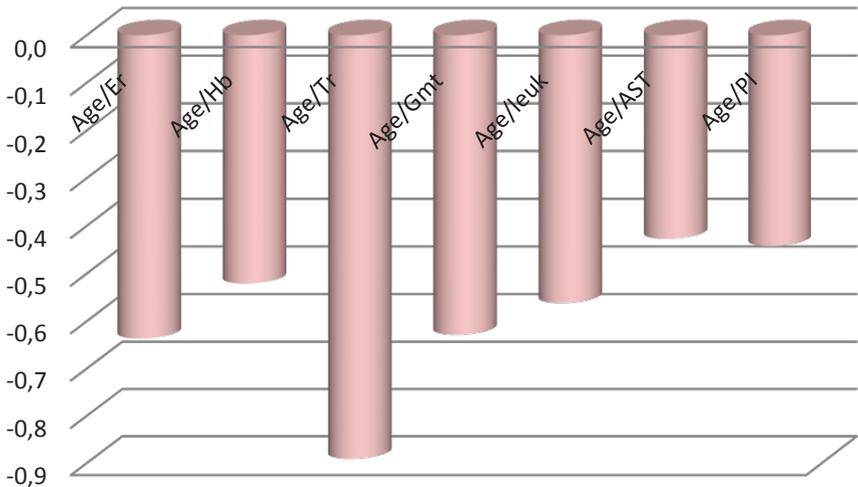


Fig. 3. Effect of age on blood counts

A negative effect of increasing age on the parameters of erythrocytes (-0.63), hemoglobin (-0.52), platelets (-0.89), HMT (-0.63), leukocytes (-0.56), AST (-0.42) and PI (-0.44), with a strong direct correlation with INR (0.79) (fig. 3.1). Thus, in response to the age-related decrease in hematopoiesis under conditions of severe stress - CSTBI, there was a compensatory increase in the factors involved in INR (PI).

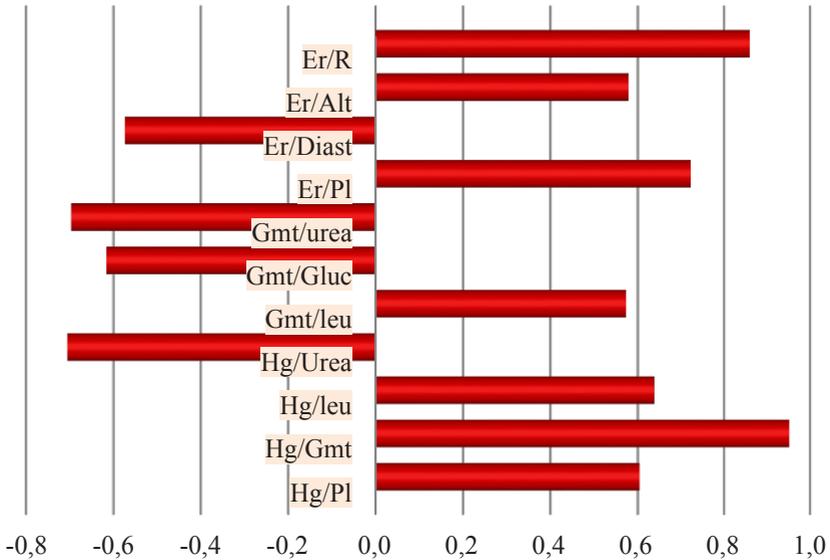


Fig. 4. Correlation links of the red part of blood

A direct strong correlation (fig. 4) was found between the number of erythrocytes and the index of blood clot retraction (0.84) and less pronounced with the ALT index (0.6). As well as the level of hemoglobin and HMT (0.87). A negative correlation was observed between HMT and the concentration of glucose (-0.6) and blood urea (-0.65). Attention is drawn to the direct relationship between HMT and leukocytes (0.6), hemoglobin and the number of leukocytes (0.6), the level of hemoglobin and the number of platelets (0.6). The revealed correlations, apparently, reflect the synergism of the functional activity of the hematopoietic function and the immune response in the acute period of CSTBI.

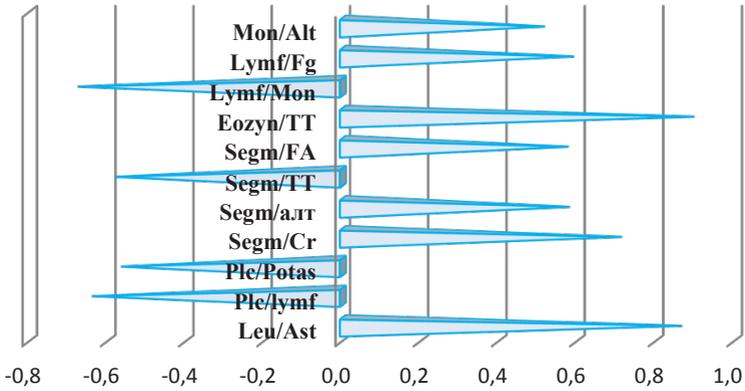


Fig. 5. Correlation connections of the white part of blood

Fig. 5 shows the correlations of the components of the white part of the blood, where a strong direct correlation was found between the number of eosinophils and TT (0.84), leukocytes and AST (0.82). The revealed features characterize a close relationship between the integrity of cellular structures (AST), hemocoagulation and the severity of an acute systemic inflammatory response to severe trauma.

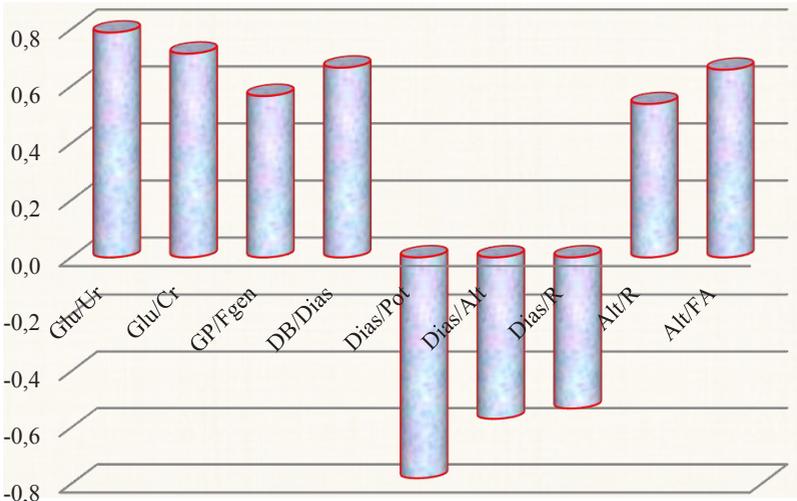


Fig. 6 Correlation links of blood biochemical parameters

Direct correlations were revealed between glucose and blood urea (0.8), glucose with plasma creatinine concentration (0.7), total protein with plasma fibrinogen levels (0.6), direct bilirubin with blood diastase (0.7), ALT and fibrinolytic activity of plasma (0.7) (fig. 6).

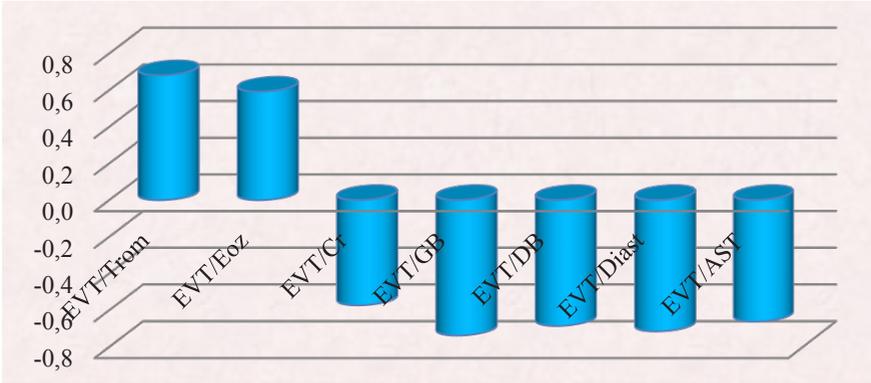


Fig. 7. Correlations between blood parameters and EVT

A moderate direct correlation was found between EVT and the number of platelets (0.7) and the number of eosinophils (0.6). While the effect of the hypersympathotonic response on trauma had an opposite effect on creatinine levels (-0.6), total and bound blood bilirubins (-0.7; 0.7), blood diastase activity (-0.7) and AST level (-0.7) (fig. 7) in the first 8 days after CSTBI.

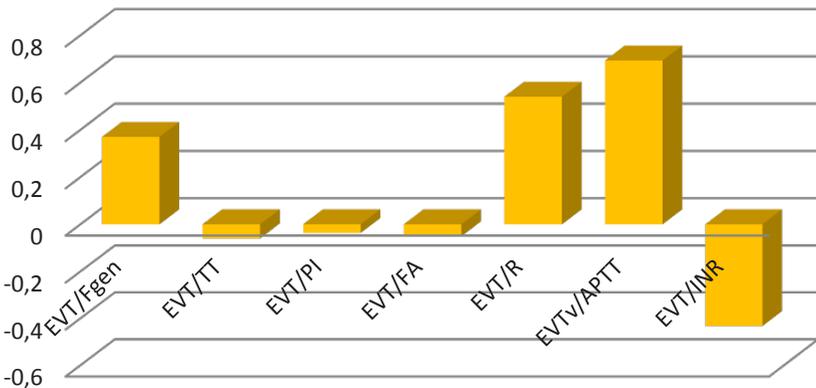


Fig. 8. Correlations between the components of the hemostasiogram and EVT

The relationship between the autonomic response and the hemocoagulation system in the first week after severe trauma is shown in Fig. 8. It reliably reflected the stimulating effect of the hypersympathotonic response to APTT (0.69), to a lesser extent on clot retraction (0.54), and the plasma fibrinogen level (0.4). At the same time, there was a tendency to the formation of feedback between EVT and INR (-0.4). It should be noted that the obtained indicators are the result of intensive therapy with timely correction of deviations from physiological standards with an average value of the mesor of the circadian rhythm EVT of $1.67 \pm 0,07$ units

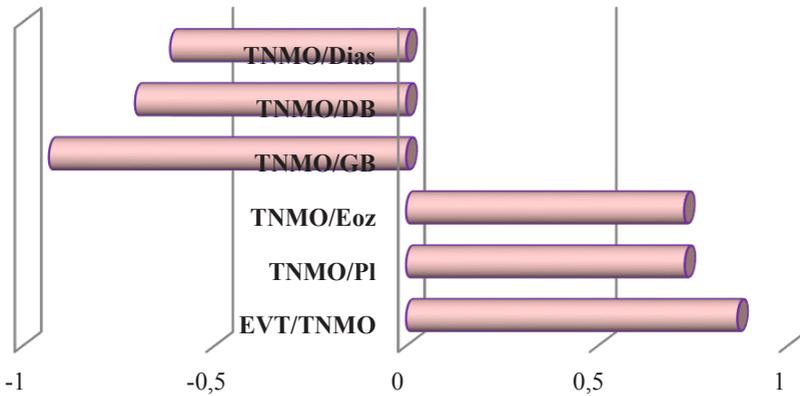


Fig. 9. Relationship of blood parameters with TNMO

The ongoing treatment of the early acute period of traumatic illness also changed the correlation between hemostasis indicators and myocardial oxygen demand, which on average increased during the first week to $108 \pm 0.3\%$. Thus, a direct strong dependence of TNMO on EVT (0.87) was revealed, as well as a direct relationship between myocardial oxygen demand and the number of platelets in the blood (0.72), and eosinophils (0.72) (fig. 9). That is, despite the ongoing anti-inflammatory therapy during the first 8 days, signs of the activity of factors causing prolonged myocardial hypoxia were found, this is the severity of the inflammatory response, activation of hematopoiesis, hypersympathetic response. That is, the ongoing stress-limiting therapy was not effective enough in terms of protecting the myocardium from oxygen starvation, which inevitably leads to a decrease in compensatory activity and adaptive hemodynamic capabilities already in the first week after CSTBI.

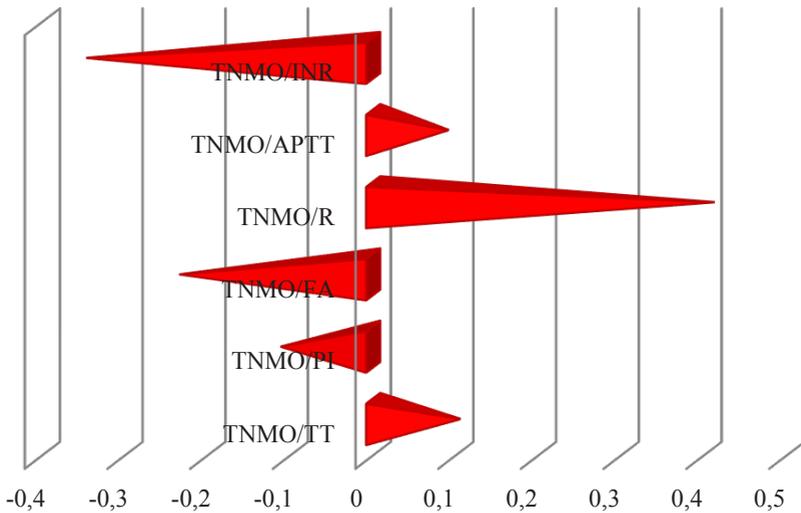


Fig. 10. Correlation of hemostasis parameters with TNMO in the first 8 days after injury

The ongoing intensive therapy somewhat reduced the negative effect of changes in hemostasis parameters on TNMO (fig. 10). Thus, there was a tendency to increase TNMO with an increase in the retraction time of the blood clot (0.41). The conducted stress-limiting therapy proved to be insufficiently effective in protecting the myocardium from oxygen starvation, which inevitably leads to a decrease in compensatory activity and adaptive hemodynamic capabilities already in the first week after CSTBI.

Conclusions. Timely blood transfusion therapy made it possible to maintain the parameters of erythrocytes, hemoglobin, hematocrit within the normative values. The tendency to an increase in glucose in the blood was revealed on day 4.5, which corresponds to the acrophase of the about-week rhythm of the inflammatory reaction. On the 5th day, an increase in stabs was noted up to $11 \pm 4.8\%$ and up to $13 \pm 2\%$ on the 6th day. Hyperglycemia in the acrophase of a weekly biorhythm on days 4-5 caused a decrease in immune tolerance and an exacerbation of the systemic inflammatory response on days 6. The trend towards an increase in AST throughout the observation period caused a trend towards hypercoagulability, decreasing APTT (-0.89). The synergism of the functional activity of the hematopoietic function and the immune response in the acute period of CSTBI was revealed.

References

1. <https://med39.ru/laboratoria/gemostaziogramma.html>
2. <https://diseases.medelement.com/material/>

基于牙科填充材料改性的复发性龋个性化治疗和预防新概念的目标
**OBJECTIVES FOR A NEW CONCEPT OF PERSONALIZED
TREATMENT AND PREVENTION OF RECURRENT CARIES BASED
ON MODIFICATION OF DENTAL FILLING MATERIALS**

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抽象的。目前的牙科在龋齿的高效诊断、预防和治疗方面取得了显著的成功；然而，龋病的发病率仍然很高。

在这方面，需要研究牙科材料的成分和性能，以及改变和改善其物理、机械和化学参数的原理。根据研究的目的和目的，我们研究了聚合物填充材料在电磁场暴露下的物理和机械性能。

作为为确定材料的物理和机械性能而进行的强度测试的结果，获得了材料强度的可靠增加和样品在压缩、径向断裂和弯曲后破坏所需的最大载荷的数据。填充材料上的电磁场暴露。

因此，在填充材料上的电磁场暴露时，注意到所有研究材料的强度参数都增加了，这预示着填充物的使用寿命增加，总体上提高了填充和处理的质量，也将有助于预防通过减少与咀嚼负荷期间填充物碎裂和破裂相关的并发症数量来减少复发性龋齿。

关键词：预防性和个性化牙科；龋齿；高分子填充材料；电磁暴露；强度特性；创新技术；预后；量身定制的治疗。

Abstract. *Current dentistry has achieved pronounced success in highly effective diagnosis, prevention, and treatment of dental caries; however, caries incidence rate remains high.*

In this regard, there is a need in the study of composition and properties of dental materials, as well as the principles of changing and improving their physical, mechanical, and chemical parameters. According to the purpose and objectives of the study, we studied the physical and mechanical properties of the polymer filling materials at electromagnetic field exposure.

As a result of the strength tests carried out to determine the physical and mechanical properties of the materials, the data was obtained for a reliable increase in strength of materials and maximum load required for destruction of the

sample in compression, diametrical fracture, and bending after electromagnetic field exposure on filling materials.

Thus, at electromagnetic field exposure on filling materials, an increase in strength parameters in all the studied materials was noted, which predicts an increase in the service life of fillings and improves the quality of filling and treatment in general, and will also contribute to prevention of recurrent caries by reducing the number of complications associated with chipped and cracked fillings during chewing load.

Keywords: *preventive and personalised dentistry; dental caries; polymer filling materials; electromagnetic exposure; strength properties; innovative technologies; prognosis; tailored treatment.*

Background

Current dentistry has achieved pronounced success in highly effective diagnosis, prevention, and treatment of dental caries; however, caries incidence rate remains high. Therefore it is necessary to search for new approaches to a comprehensive study and solution of the dental caries problem in the field of preclinical diagnosis, tailored prevention and treatment. A large number of filling materials and methods of its application do not provide highly effective prevention and treatment of dental caries because of complications such as secondary and recurrent caries, there is a necessity for their improvement and development of new aspects of their production and use. In this regard, there is a need in the study of composition and properties of dental materials, as well as the principles of changing and improving their physical, mechanical, and chemical parameters [1-3].

Successful outcome of caries treatment depends on many factors, including service life of fillings; therefore, the quality of dental materials is the key problem of predictive, preventive and personalized dentistry. An important characteristic of filling materials is strength - the ability of the filling to withstand mechanical stress, without being destroyed. Strength depends on the structure of the material, molecular and atomic cohesion. Thus, it is necessary to search for options of modification of polymer fillings by physical fields, which will allow to increase resistance and micro hardness of the material, so that it becomes more resistant to mechanical and physical influences, which will contribute to a longer service life of fillings and prevention of secondary caries [1, 3].

The carried out complex studies have indicated strengthening of macromolecular **cohesion** of adhesive compounds during activation of polymer macromolecules by physical fields. The authors have proven that magnetic field exposure applied to polymer resins increases hardness and strength of the samples due to ordering of the long-range structure, which indicates the material mechanical properties improvement. Based on this data, it is possible to predict higher increasing

strength parameters of polymer-based filling materials after physical field exposure. In connection with the mentioned above, it is advisable to study the electromagnetic field for the strength properties of polymer filling materials to increase their resistance parameters and recurrent caries prevention [1-3].

Materials and methods

According to the purpose and objectives of the study, we studied the physical and mechanical properties of the polymer filling materials at electromagnetic field exposure at the Dental clinic base. Hybrid and macro - filled materials were selected for the study. For the in vitro study, we used Dentlite (Vladmiva, RF) and Solitaire (Heraeus Kulzer, Germany) composite filling materials (Table 1).

Table 1. The distribution of polymer filling materials before and after electromagnetic field exposure

| Group | Filling material | The number of samples |
|---------------|------------------|-----------------------|
| A group EMF + | Solitaire | 10 (25%) |
| | Dentlite | 10 (25%) |
| B group EMF - | Solitaire | 10 (25%) |
| | Dentlite | 10 (25%) |
| Total | 40 (100%) | |

In accordance with Table 1, it follows that the samples of the polymer filling materials of two groups were equally distributed. The sample preparation technique: each sample of the study group was preliminarily placed in the system for polymer materials in constant electromagnetic field conditions with strengths of 22×10^4 A/m for 25 minutes. Then the material samples of the both groups were cured by polymerization light [1, 3].

To determine the physical and mechanical properties of the Dentlite and Solitaire filling materials after electromagnetic field exposure, strength tests were carried out in accordance with the National Standard N31574-2012, including determination of the strength parameter at diametric break and bending. For objective assessment of the physical and mechanical properties of the filling materials, we also conducted tests to determine the compressive strength. The prepared samples were kept in a thermostat for a day before testing. Strength tests were carried out on an IR 5040-1 testing machine.

Results

As a result of the strength tests carried out to determine the physical and mechanical properties of the materials, the data was obtained for a reliable increase in strength of materials and maximum load required for destruction of the sample in compression, diametrical fracture, and bending after electromagnetic field exposure on filling materials (Table 2).

Table 2. Strength parameters of polymer filling materials before and after electromagnetic field exposure

| Filling materials | Dentlite | | Solitaire | |
|----------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | Control group | Study group | Control group | Study group |
| Mean (min/max) | | | | |
| Compression | 3913.6 (3814.4/4028.8) | 4110.7 (3910.1/4408.5) | 3304.8 (3298.0/3311.0) | 3346.6 (3321.9/3399.1) |
| Diametrical fracture | 1089.1 (1001.7/1185.6) | 1315.7 (1250.1/1437.8) | 1095.3 (1012.1/1191.4) | 1247.3 (1105.1/1388.1) |
| Bending | 24.1 (19.5/28.7) | 28.7 (21.8/34.0) | 20.6 (18.9/22.1) | 24.3 (22.5/26.2) |

Abbreviations: Mann-Whitney U test p-level $p < 0.5$

Table 2 presents a comparative characteristic of the average values of compressive strength parameters of the Dentlite and Solitaire filling materials with and without electromagnetic field exposure. A statistically significant difference in the results was obtained, confirmed by the received results of the average values. Similar results were obtained in the study of other strength parameters.

According to the statistical analysis of the strength parameters of the Dentlite material under compression, it follows that, in the control group without electromagnetic field exposure, the average value of the load applied to the sample for its destruction was 3913.6 (3814.4 / 4028.8), and in the study group was 4110.7 (3910.1 / 4408.5), which indicates an increase in strength characteristics.

When testing the diametral fracture of the Dentlite material, the same tendency of increase in the strength properties of the material was observed: in the control group without electromagnetic field exposure, the average value of the load applied to the sample was 1089.1 (1001.7 / 1185.6), and in the study group, was 1315.7 (1250.1 / 1437.8).

During the bending test of the Dentlite material, there was also an increase in the strength properties of the material: in the control group without exposure to the electromagnetic field, the average value of the load applied to the sample was 24.1 (19.5 / 28.7), and in the study group, was 28.7 (21.8 / 34.0), which indicates an increase in the strength of the material.

In the Solitaire filling material, the same tendency of increasing compressive strength was observed from 3304.8 (3298.0 / 3311.0) in the control group to 3346.6 (3321.9 / 3399.1) in the study group; in bending from 20.6 (18.9 / 22.1) in the control group to 24.3 (22.5 / 26.2) in the study group. Thus, the differences between the control and the study group are statistically significant.

Conclusion

Considering that in the oral cavity, the chewing load is distributed in various directions, including tangentially, which, for example, predicts bending and diametral rupture tests, these studies made it possible to reliably evaluate the biomechanics of all types of injuries. As a result of the strength tests for compression of Dentlite and Solitaire filling materials after electromagnetic field exposure, an increase in strength of the materials of the research groups was achieved. The analysis of comparative characteristics revealed the most pronounced increase in strength parameters in the Dentlite material, which is due to the better susceptibility of its microstructure to these types of strength tests.

Thus, at electromagnetic field exposure on filling materials, an increase in strength parameters in all the studied materials was noted, which predicts an increase in the service life of fillings and improves the quality of filling and treatment in general, and will also contribute to prevention of recurrent caries by reducing the number of complications associated with chipped and cracked fillings during chewing load, which fits into the concept of preventive and personalised medicine.

References

1. Moiseeva NS, Kunin AA. *Clinical and laboratory evaluation of microstructural changes in the physical, mechanical and chemical properties of dental filling materials under the influence of an electromagnetic field. EPMA Journal (2018) 9: 47. <https://doi.org/10.1007/s13167-018-0126-x>.*
2. Moiseeva NS, Kunin AA, Haytac CM. *Efficiency of dental caries prevention with the use of polymer-based toothpastes modified by the electromagnetic field. EPMA Journal (2018) 9: 319. <https://doi.org/10.1007/s13167-018-0140-z>.*
3. Kunin AA, Moiseeva NS, Mekhantieva LE. *Improving the effectiveness of dental caries prevention using therapeutic toothpastes. EPMA J. 2017;8(Suppl 1):S50.*

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别赫捷列夫和他名字的病

BEKHTEREV AND THE DISEASE OF HIS NAME

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抽象的。流行的百科全书“骨科名人录” (SeydBehroozMOSTOFI 着) 包含了世界上创伤学和骨科发展历史上著名骨科创伤学家的简短传记。这些传记按字母顺序排列, 开头描述了著名骨科医生罗伯特·亚当斯 (1791-1875 年) 的生平, 他是都柏林大学教授, 曾发表过关于类风湿性关节炎的科学出版物。该百科全书出版了 365 名骨科创伤学家的传记和照片。这部百科全书来自俄罗斯科学家, 包括天才尼古拉·伊万诺维奇·皮罗戈夫 (1910-1881)、加布里埃尔·阿布拉莫维奇·伊利扎罗夫 (1921-1992) 和弗拉基米尔·米哈伊洛维奇·别赫捷列夫 (1857-1927) 的传记, 他不是一名骨科创伤学家, 而是一名外伤专家。作为一位杰出的神经学家和心理学家, 他于 1892 年发表了一篇关于强直性脊柱炎 (AS) 的文章。出于某种原因, 这本百科全书没有包括骨科和吸虫学教授 Konstantin Mitrofanovich SIVASH (1924-1989) ——世界上独一无二的全金属全髋关节假体的发明者 (1959)。

关键词: Bekhterev Vladimir Mikhailovich, 心理学, 神经病学, 消除性脊柱关节炎, Bekhterev-Marie-Strumpell 病。

Abstract. *The popular encyclopedia "Who's Who in Orthopedics" (by Seyd Behrooz MOSTOFI) contains short biographies of famous orthopedic traumatologists throughout the history of the development of traumatology and orthopedics in the world. The biographies are arranged in alphabetical order and begin with a description of the life of the well-known orthopedist Robert ADAMS (1791-1875), a professor at the University of Dublin who had scientific publications on rheumatoid arthritis. The encyclopedia has published biographies and photographs of 365 orthopedic traumatologists. From Russian scientists, the encyclopedia includes biographies of the genius Nikolai Ivanovich PIROGOV (1910-1881), Gabriel Abramovich ILIZAROV (1921-1992) and Vladimir Mikhailovich BEKHTEREV (1857-1927), who is not an orthopedic traumatologist, but. being an eminent neurologist and psychologist, he published in 1892 an article on ankylyzing spondylarthritis (AS). For some reason, this encyclopedia did not include the professor of orthopedics and trematology Konstantin Mitrofanovich*

SIVASH (1924-1989) - the inventor (1959) of the world's unique all-metal total hip joint endoprosthesis.

Keywords: *Bekhterev Vladimir Mikhailovich, psychology, neurology, anclilizing spondioarthritis, Bekhterev-Marie-Strumpell disease.*

Introduction. The literature quotes an excerpt from the letter of the genius physicist Isaac NEWTON to his friend, the outstanding inventor and founder of experimental physics, Robert Hooke (1676): "If I saw further than others, it was because I stood on the shoulders of giants." This is true in historical and moral terms, for science is not only a process of constant expansion and deepening of human knowledge about phenomena and objects, but also for understanding those who stood at the origins of a new direction and the latest open. Knowledge over time, of course, undergoes changes and even becomes obsolete, but moral criteria and personal qualities of the first and subsequent researchers remain unchanged in science and life. In this context, the biography, fate, aspirations and research of the outstanding scientist Vladimir Mikhailovich BEKHTEREV is of everlasting value for new researchers, regardless of their age, nationality, specialty and field of activity.

Bekhterev V.M. - neuropathologist and neuropsychiatrist. In the encyclopedia "Who's Who in Orthopedics" it is written that "V.M. Bekhterev owns over 500 works, among them: "Pathways of the spinal cord and brain", "Fundamentals of the doctrine of the functions of the brain", "Nervous diseases in isolated groups", "Objective psychology", "General diagnosis of diseases of the nervous system", "General foundations of human reflexology" and others.

There is no such area of neurology, which V.M. Bekhterev would not be engaged in. His numerous scientific works reflect many of the problems and achievements of neuroscience of that time. Starting from a morphological position, V.M. Bekhterev studied psychoneurology. Having completed a well-written study in human reflexology, the field of neuropsychiatry, he sought a model of the human personality in both normal and pathological manifestations. Shortly before his death, V.M. Bekhterev revised and republished his main anatomical work "Pathways of the spinal cord and brain", which became the main theoretical and clinical manual.

V.M. Bekhterev himself was engaged not only in neurology, psychiatry or reflexology. Firstly, he was a neuropsychiatrist in the broadest sense of the word, and secondly, he painted a clear picture of a multifaceted and at the same time integral human personality, combining the features of a world scientist and an outstanding public figure.

In 1892 he wrote an article about a disease that was later called "ankylosing spondylitis" (AS) or "Marie-Strumpell's disease". This is written in the said encyclopedia.

"Morbus Bechterew-Marie-Strumpell". Description history. Information about this deformation (disease), which constrains the movement, was known millions of years ago, because skeletons were found during archaeological excavations in ancient Egypt, Sudan, Cuba, Rome, Bulgaria, Tatarstan, not only in humans, but even in dinosaurs and other prehistoric animals. Skeletal changes similar to the anatomical changes in AS have been found in crocodile, tiger, bear, dog, monkey, and human remains. This disease was noticed by the brilliant ancient Roman Claudius Galenus (129-200 AD) - the author of the famous book "On the structure of the human body." Even earlier, the "father of medicine" - the ancient Greek physician Hippocrates (460 BC) sagely described this pathology as: "the vertebrae of the back and neck can be affected by pain that extends to the sacrum". And later in the Y century A.D. Caelius Aurelianus described this ailment as "the patient is exhausted from back pain, moves slowly, and can only bend or stand with difficulty."

There are even religious parables for the healing of such patients. Saint Luke seemed to straighten a fully bent 18-year-old woman (Gospel of Luke. New Testament. Bible. Chapter 13. verse 10-13.). In the same chapter there is a mention of the fact that in one of the synagogues Jesus, seeing a crumpled woman, called her over and said to her: "Woman! You are freed from your disease" (Luke 13:13). "He laid his hands on her, and she immediately straightened up and began to praise God." Oh, if only it would be so easy to cure sufferers with AS and other serious ailments! It is difficult to agree with these examples, because it is possible that these bent over have banal sciatica and psychoneurotic status. Or maybe what you want is described as reality, because there is no documentation?

At the same time, we know that the first radiography in the world was recorded only in 1895 by Wilhelm Conrad Rontgen. Yes, and then there were no pharmacological (NSAIDs (non-steroidal anti-inflammatory drugs), analgesics, glucocorticoids, BAIDs (basic AID), GEBD (genetically engineered biological drugs: infliximab, etanercept, adalimumab, golimumab, certolizumab, etc.) and non-pharmacological (balneotherapy, exercise therapy, psychotherapy) methods of treatment. And the history of joint replacement in patients with this pathology dates back only to 1891, when Dr. Themistocles GLUK from Germany made the first ivory implant for hip replacement, but more on that in another article.

Skeletal deformities similar to AS have been found in the pharaohs and the Medici family, although we know that clarification and differentiation of changes in bones, joints and ligaments of the skeleton is really not possible without modern MRI, CT, contrast and panoramic studies, 3D modeling, PET CT or PET MRI (positron emission tomography with CT or MRI), genetic, immunological, biochemical and clinical blood tests.

The most detailed first description of this disease is found in the Italian anatomo-

mist and surgeon of the Renaissance Realdo Colombo (1516-1559) (Realdo Colombo) in his famous treatise "On Anatomy" in 15 volumes. And the Irish doctor Bernard Connor (Bernard Connor, 1666-1698) described the fusion of the vertebrae and ossification of the ligaments, reminiscent of the "bamboo stick" ("arshin swallowed") by the French doctor Pierre Marie (1898), although before them AS was described by English doctors: D.Travers (1824), P.M. Lions (1831), B. Brodie (1850), J. Peget (1877), C. Fagge (1879), E. Bradford (1833), H.H. Glutton (1883), N. Davis-Colley (1885), D. Teker (XIX century), etc.

The report of the Russian neurologist V.M. Bekhterev (1883) by the German neurologist A. Strumpel (1897), the French neurologist P. Marie (1898) and B. Connor in XU11 are considered the first clinical descriptions of AS. Therefore, this ailment was named in Russia, Europe and in a number of other countries as Bekhterev-Marie-Strumpel (Morbus Bechterew-Marie-Strumpel), Maria-Strumpel or as Bekhterev-Marie-Strumpel disease. (Morbus Marie-Strumpel, s.) By the way, Vladimir Mikhailovich Bekhterev has an unconditional priority in the description of fixed kyphosis of the thoracic spine, accompanied by neurological disorders caused by damage to the membranes and roots of the spinal cord. Academician Bekhterev V.M. drew the attention of doctors in different countries to the problem of diseases accompanied by ankylosation of the spine. The name "Bekhterev's disease" with AS is legally used nowadays not only in Russia.

Bekhterev-Marie-Strumpel disease. "I have repeatedly had the opportunity to observe a painful lesion with the characteristic signs indicated by Strumpel and Marie, which, however, I always distinguished from the lesion that I described under the name of 'stiffness with curvature of the spinal column.' (V.M. Bekhterev "On ankylosing inflammation of the spine and large joints of the extremities." Journal "Review of Psychiatry, Neurology and Experimental Psychology". 1899).

This was during the work of V.M. Bekhterev professor of psychiatry at Kazan University. This ailment (AS) is known to us from school years and from the novel by Nikolai Ostrovsky "How the Steel Was Tempered". The writer himself suffered from spondyloarthritis and "rewarded" the protagonist of the work of Pavel Korchagin ("cannot get up in the morning, gradually immobilizes, crumples, goes blind, heart and kidney problems begin"). In this disease, the spine, joints and sacroiliac joints are calcified, growing together and gradually become immobile due to chronic inflammatory processes in the ligaments and joints of the spine and the sacroiliac joints. "I am inclined to think that both curvature of the spine and stiffness in this case are not primary... Curvature of the spine, flattening of the chest and chest failure can be made dependent on the parietic state of the muscles supporting the spine due to degeneration of the spinal roots".

Subsequently, the views of V.M. Bekhterev at AS specified: "One can assume. That we had an independently developed diffuse chronic process in the areas adja-

cent to the hard shell of the spinal cord, in all likelihood, chronic inflammation of the surrounding tissue and outer layers of the hard shell itself, which, on the one hand, caused extensive dense adhesions of the hard shell with the bodies along the bells and ligaments, and on the other hand, squeezing the emerging roots. It is possible, of course, that in the course of time a lesion of the spinal cord itself may join".

And five years later (1887) V.M. Bekhterev came to the conclusion that "this description cannot be considered complete, but in some particulars it does not fully correspond to the symptoms of the lesion that I described under the title "stiffness of the spine... is essentially the same affliction". This is the opinion of a real scientist who does not consider himself not to be gutted. And in 1889 the opinion of V.M. Bekhterev after sectional research returned to the original: "Some of the vertebrae in the upper thoracic part are fused tightly by the anterior parts of their bodies, others are limitedly mobile. An autopsy did not reveal any signs of disease of the articular parts of the spine. At autopsy, no mechanisms were found that lead to the roots being directly compressed due to a decrease in the size of the intervertebral foramen. Changes come to light primarily in the posterior and anterior roots, more sharply in the upper half of the thoracic region and in the lower part of the cervical. The posterior roots are in places reborn almost entirely, there is a degeneration of fibers, corruption of neurology and connective tissue. In the spinal cord, there is also a degeneration in the same areas of the spinal cord at the indicated level, it looks somewhat thickened with a noticeable development of blood vessels. Clear changes in the cells of the intervertebral nodes: the phenomena of degeneration and simple atrophy".

In his dissertation, Golant Z.Ya. back in 1913, he emphasized that with AS, patients develop "excruciating hyperesthesia, reaching the point that patients cannot stand the touch of underwear." The manifestations of a wide variety of symptoms of discomfort are possible, which worsen the quality of life of patients with AS.

Researchers' interest in AS (M 45.0) is growing. And already 22 forms of AS are distinguished, National, European and International scientific forums on AS are convened, the Rome (1961) and New York (1966, 1984) criteria for the study, diagnosis, classification, treatment and monitoring of patients with AS have been created. Seronegative AS has already been identified, the ASAS - Assessment in Ankylosing Spondylitis working group has been created at the European Antirheumatic League (EULAR), which coordinates the development of a new classification, diagnostic methods, monitoring and treatment of patients with spondyloarthritis. In Russia, back in 2013, a group of ESA experts on SA was formed at the Association of Rheumatologists of Russia (the first head of the ESA was Professor Elza Romanovna Agababova).

There are no in-depth studies in the literature on the psychological status of patients with AS, although V.M. Bekhterev was an outstanding psychologist.

About Bekhterev V.M. "To tell about the life of Bekhterev is to tell an epic about a powerful hero who, with the power of titan, created a huge, powerful and beautiful temple of that part of Eastern European science, where for the first time a complete comprehensive study of the human personality in the manifestations of his individual and social life began" (K.I. Platonov).

"V.M. Bekhterev was a creative personality with a huge, almost legendary erudition, broad outlook and diverse interests" (professor of psychology at MSU, L.S. Vytogotsky).

"Only two people know perfectly the anatomy of the brain - this is God and Bekhterev" (professor of anatomy at the University of Berlin Friedrich Kopsha).

Professor M.V. Bekhterev by various scientists in 1912, 1914 and 1925 several times for the Nobel Prize, but, unfortunately, they did not manage to get it.

"We are seeing off to the grave a prominent scientist whose scientific merits are known far beyond the borders of our country. These merits are immeasurable. Even in ancient times, when the area of nervous activity was mysterious and dark. Academician Bekhterev opened the door to this dark area with his scientific key, shedding bright rays of scientific light on it. Even then, Bekhterev laid the foundations of reflexology, that is, the doctrine that is closest to materialism and therefore is the only scientific understanding of mental life. " (N.A.Semashko, Minister of Health of the USSR).

Statements by V.M. Bekhterev. "Good psychologists can only be those who know how to observe themselves well"

"If the patient does not feel better and does not feel better afterwards, then you're no doctor"

"Let's drink to those blissful times when scientists will be able to do the same science"

"Every society in terms of ideas lags behind scientists for several generations"

"Moral ugliness and criminality are the result of a lack of upbringing and depravity from an early age"

"You cannot be the leader of the people without embodying their dreams"

"Aren't our prisons overcrowded with persons who are only guilty of the fact that, wishing well for their homeland, they were heralds of new ideas and other orders in our country?" (September 1905 at the congress of psychiatrists in Kiev)

"At the turning point of history, one cannot stand at a crossroads and wait, one needs the will to act, to build and constructive work; and for us, scientists, who have always devoted their strength to efforts to serve humanity, there should be no hesitation" (1919)

"I was not at all envious of those who preferred abroad to their home, although I must say that together with my family I had to try in times of famine only oats and rusty herring or vobla" (V.M. Bekhterev. "Autobiography")

"When a country of high material culture becomes infected with the Middle Ages, as we see in America (USA-M.A.), which boasts of its technical achievements and freedoms, then this is already a serious danger that can infect other countries, a danger that needs to be looked directly into eyes and which must be warned" (V.M. Bekhterev. "Struggle for Science")

"Empress Alexandra Feodorovna – is but an ordinary pretty hysterical woman"
"Not a single sigh and not a single smile disappears without a trace"

"Drunkenness is an age-old evil, it has taken deep roots in our everyday life and has given rise to a whole system of wild drinking habits. These customs require drinking and treating in any case... alcohol is poison even in small doses...". "The economic damage caused to the country by the consumption of alcohol is so great that with the elimination of it, public finances will only benefit, not to mention the country's annual savings of 1 billion rubles, which is higher than the amount consumed by the population" (V.M. Bekhterev, Director of the Anti-Alcohol Clinical Institute"(1912).

"Suicides increase with the increase in human suffering and decrease with the rise in the material and moral well-being of society." (V.M. Bekhterev. 1908).

The Bekhterev family. Vladimir Mikhailovich Bekhterev is a physiologist, neuropathologist, reflexologist, psychologist, lieutenant general of the medical service of the Russian Imperial Army, academician, founder of a psychophysiological laboratory in Kazan, founder of the Kazan society of neuropathologists and psychiatrists, founder of the neuropathological institute in St. Petersburg, headed the Department of Nervous and Mental Diseases of Mediko - Surgical Academy, founded the journal "Neurological Bulletin", was the chairman of the Russian Society of Normal and Pathological Psychology, a member of the editorial committee of the multivolume manual "International Treatise on Pathological Psychology". In 1926 he married a second marriage to Berta Yakovlevna Gurzhik-Are (Latvian), who was shot on December 15, 1937. He himself died suddenly on December 24, 1927, and Bekhterev's brain was preserved in the "pantheon of the brain of great people."

There is information that the death of Bekhterev, according to the historian R.A. Medvedev, allegedly connected with the fact that after consultation with J.V. Stalin's professor inadvertently said that Stalin suffered from paranoia. And in "Literaturnaya Gazeta" (September 2, 1988) in the article "The Last Diagnosis" O. Moroz writes that the director of the neuropsychiatric institute V.M. Bekhterev (founded in 1908 at the request of V.M. Bekhterev himself) received a telegram to come to the Kremlin's Medical Directorate upon arrival in Moscow. On the same day (December 27, 1927), the Congress of Psychiatrists and Neuropaths of the Soviet Union opened. And when one of the colleagues inquired about the reasons for the academician's lateness for the meeting, "Bekhterev answered irri-

tably: " I watched one withered paranoid. " Someone reported this, and the fate of Bekhterev was a foregone conclusion: he soon died of poisoning.

However, the newspaper "Argumenty i Fakty" (September 1995, No. 39-780) published an interview with Academician Natalya Petrovna Bekhtereva, granddaughter of V.M. Bekhterev . "It was a tendency to declare Stalin crazy, including using the alleged statement of my grandfather, but there was no statement, otherwise we would have known. Grandpa was indeed poisoned, but because of something else. And someone needed this version. They started to put pressure on me, and I had to confirm that it was so. I was told that they would publish what Bekhterev was a brave man and how he died, boldly performing his medical duty. What is the doctor's duty? He was an excellent doctor, how could he come out from any patient and say that he is paranoid? He couldn't do it."

First wife - N.P. Bazilevskaya gave birth to 6 children for V.M. Bekhterev. The second son of Bekhterev V.M., Pyotr Vladimirovich Bekhterve, was arrested on September 22 and shot dead on February 23, 1938, and his wife, a doctor, Zinaida, was sentenced to 68 years in the Gulag as the wife of an "enemy of the people."

Pyotr Vladimirovich Bekhterev was a talented engineer and inventor, had patents, worked as chief designer of Ostekhbyuro. Together with many other employees of the Ostekhbyuro, on February 23, 1938, he was found guilty under the ill-fated article 58 of the Criminal Code of the RSFSR, and on the same day he was shot by the decision of the Military Collegium of the Supreme Court of the USSR. Rehabilitated in 1956. P.V. Bekhterev's wife was also repressed and was serving time in the Mordovian GULAG camp. Their daughter is Natalia.

Bekhtereva Natalya Petrovna, an outstanding neurophysiologist, academician of the Academy of Sciences of the USSR, was brought up with her brother in an orphanage, for she was listed as the daughter of an "enemy of the people." Subsequently, she headed the "Institute of the Human Brain of the Russian Academy of Sciences", was elected vice-president of the International Union of Physiological Sciences, vice-president of the International Organization for Psychophysiology, editor-in-chief of Human Physiology and International Journal of Psychophysiology. Truly, human destinies are inscrutable.

References

1. Agababova E.R. "Seronegative spondyloarthritis". In the book "Guide to Internal Medicine. Rheumatic diseases. M. 1997
2. Bekhterev V.M. "On ankylyzing inflammation of the spine and large joints of the extremities." In the journal "Review of Psychiatry, Neurology and Experimental Psychology", 1899, P. 7-8.
3. Bekhterev V.M. "Pathways of the spinal cord and brain." M-L. 1926.

4. Bunchuk N.V. "V.M. Bekhterev and the history of the description of ankylyzing spondylitis". In the journal "History of Medicine". Moscow. P.94
5. Golant R.Ya. "On the immobility of the spine." Dissertation for the degree of Doctor of Medicine ". St. Petersburg. 1913 M. 1969 P. 1-56.
6. Nikiforov A. "Bekhterev". Moscow. "Young guard", 1986.
7. Munipov V.M. Munipov. "V.M. Bekhterev"
8. Sandor Erdes. "Ankylyzing spondylitis". Moscow. "GEOTAR-Media". 2020
9. S.B. Mostofi. «Who*s Who in Orthopedics». Springer.2004. London-Berlin.

医学教育组织中的远程培训形式：COVID-19 大流行期间的学生体验
**REMOTE FORM OF TRAINING IN A MEDICAL EDUCATIONAL
ORGANIZATION: STUDENT EXPERIENCE DURING A PANDEMIC
COVID-19**

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概括。与 SARS COVID-19 大流行有关的情况对现代学生教育形式进行了调整。本文通过音频和视频材料介绍了医学教育机构学生对向远程学习形式过渡的态度，以及他们对实践技能培训结果的看法。他们确定了学生与远程学习相关的技术和心理问题。提出了关于向远程学习形式过渡对学生实践技能和技能质量的影响的问题。

关键词：远程学习形式，学生向远程学习过渡的态度，远程教育的组织，互动交流。

Summary. *The situation related to the SARS COVID-19 pandemic has made adjustments in the modern form of student education. This article presents the attitude of students of a medical educational institution to the transition to a distance learning form, their opinions on the results of training in practical skills through audio and video materials. They identified problems of students related to distance learning, both technical and psychological. Questions were raised about the impact of the transition to a distance learning form on the quality of practical skills and skills of students.*

Keywords: *distance learning form, attitude of students to transition to remote learning, organization of distance education, interactive communication.*

Due to the transition to a distance learning form (FSD) of students in medical schools, the volume and format of materials taught through various Internet programs has changed by an order of magnitude, and the implementation of various

methods of electronic education has dramatically accelerated. The current situation related to the COVID-19 pandemic has led to a new look at various areas of the educational process. One of the private issues of the general problem of pedagogy is the organization of distance education for students of medical educational institutions.

The purpose of our study was to study the attitude of medical students to the transition to distance education in connection with the pandemic.

The introduction of technologies for distance education of students at the Medical Institute of the North-Eastern Federal University (SVFU) began in 2000. At the first stage, various scientific and practical videoconferences were held from different cities of Russia for doctors and students. A little later, by videoconferencing, teachers of the Medical Institute for doctors and nurses of rural hospitals began to give selected lectures in a number of clinical disciplines [1] [2].

It should be noted here that since 2014, the Department of Higher Nursing Education (WSO) of the SVFU Medical Institute has been actively participating in the international project "Creating a scientific and educational environment on remote presence technology for use in medical education and clinical practice of nurses of the Arctic regions" initiated by the College of Nursing Education of the University of Saskatchewan (Canada.). The University of Saskatchewan donated portable remote presence technology (robotic remote learning technology) to the University of Northeastern Federal University Medical Institute as a result of successful joint international efforts to introduce distance education and medical care to the population of remote villages of the North [3].

In March 2020, in connection with the pandemic, our university completely switched to remote education, the need for interactive forms of training and control of knowledge received increased significantly. Attempts to use some of them revealed technical problems, mainly due to a sharp increase in the number of concurrent users on the site, so the process often failed. This required the search for technical solutions that were found and that hour solved. Currently, sites allow you to fully take advantage of distance learning opportunities, ensure attendance, conduct practical classes that do not have an online format and organize a knowledge test.

After the transition to distance learning in October-November 2020, we conducted a questionnaire of 159 students of the Medical Institute in order to obtain an express assessment of the new model. The survey was actively attended by students of the medical department of 109 students (68.6%), students of secondary vocational education 38 (23.9%) and higher nursing education 11 (6.9%). Students were asked to answer the questions posed in the form of a test and thereby state their attitude to the pros and cons of distance education, as well as formulate their proposals for improving this system. The study reflects student responses to changing learning settings and format.

Taking into account the objectively current situation caused by the pandemic, almost all students praised the introduction of distance education. And they also sympathized with the fact that in the first days there were possible shortcomings in the e-learning system, which needed further improvement. Analysis of the obtained data shows that the obtained results show two trends: positive impact and negative impact of distance learning on the process of educational process.

Among the positive features of distance education, medical students most often noted the comfort of learning in the usual home environment and a decrease in stress levels, saving time and money for moves between buildings and clinical bases, arising in classes in the audience, copying material, availability of more information resources, The possibility of choosing the optimal pace of material development, including recourse to complex issues, possibility of scheduling the daily routine, changing the mode of communication with the teacher in and out of the educational time.

So, many 62.6% of students liked the distance form of study. Although before the pandemic, 64.8% of students were not ready for distance learning, and at the same time in the initial stages of e-education, 71.1% of students repeatedly experienced technical problems and interruptions in the Internet.

Of the respondents, 50.7% of students believe that with this form of training, the given topic is easily assimilated due to the ability to read lecture material several times. Especially liked the remote form of study during the examination session - 64.8% of students rated very positively. At the same time, some - 44.4% of students negatively assessed the distance form and emphasized that e-learning does not encourage learning and is poorly absorbed due to the lack of personal contact with the teacher.

Most interviewed 28.8% students during the day are engaged in distance education from 3 to 5 hours. When detailing the data obtained, it turned out that 11.8% students are engaged in electronic education for 3 hours, two hours - 8.5% and five hours - 8.5% students. And at the same time, 52.9% of students believe that personal responsibility is the motivating factor for independent education in distance learning.

Attention is drawn to the fact that 76.7% of students consider distance learning not acceptable for students of a medical institution. Of the respondents surveyed, 68.4% agree that the period of the educational process, distance learning in future professional activities will affect very negatively. The wish of 83.3% of students is to increase the share of video lectures and expand interactive communication opportunities, but at the same time everyone wants to engage in face-to-face practical skills.

Thus, in the context of the pandemic, the role of remote forms of educational technology in the training of medical students has increased significantly. The results of the survey of students made it possible to tentatively find out their attitude

to distance education technologies and get proposals that can be used to improve the electronic educational environment.

At the same time, most respondents emphasized that the remote form of training in no way makes it possible to fully fill the opportunities for full-time training of future medical workers, especially with regard to the formation of professional clinical skills.

References

1. *Bachelor-nursing training in the context of the implementation of e-learning in Yakutia. N.A. Protasova et al. Electronic scientific and educational Bulletin "Educational bulletin "Consciousness"" / "Educational bulletin "Soznaniye" 2019. Vol. 21. N 11-c.30-34 <https://e-pubmed.otg>*
2. *Northern Nursing Education Network – Continuing Nursing Education during the COVID-19 Pandemic. Don M Leidl co-authored Electronic Scientific and Educational Journal Frontiers in Medicine and Health Research FMHR-2-108 Vol 2(1): 1-4 Published date: August 21, 2020 London. <https://escires.com/articles/FMHR-2-108.pdf>.*
3. *New Perspectives in Nursing Education: The Role of Nurses in Health Promotion for Indigenous Peoples of the Arctic Region—The Case of the Republic of Sakha (Yakutia). A.G. Karpova co-authored The Northern Review Journal , № 43 2016 Pp.135-138.*

医疗团队对某医科大学学生专业活动的影响

**INFLUENCE OF MEDICAL TEAMS ON THE PROFESSIONAL
ACTIVITY OF STUDENTS OF A MEDICAL UNIVERSITY**

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注解。与新型冠状病毒感染 COVID-19 相关,对医务人员的需求有所增加,取而代之的是学生小队的战士。本文考察了动机对学生旅战士职业活动的影响。

关键词:专业活动、医疗团队、动机、青年、学生。

Annotation. *In connection with the new coronavirus infection COVID-19, the need for medical personnel has increased, which were replaced by fighters of student squads. This article examines the influence of motivation on the professional activity of the fighters of student brigades.*

Keywords: *professional activity, medical teams, motivation, youth, students.*

Student medical teams are a form of extracurricular activities for students and a rapidly developing area of modern students in the Russian Federation. Thanks to the joint activities of students and medical organizations, students receive practical skills in their chosen profession, and a medical organization can assess human resources. Since the conditions of the modern labor market significantly increase the requirements for the level of training of graduates of medical universities, practical training is one of the most important stages in the formation of a future specialist. [1] [3]

In 2020, the whole world is faced with the spread of the new coronavirus infection COVID-19, in connection with which there was an acute shortage of medical personnel in almost all types of healthcare institutions. At such a moment, the need for additional specialists becomes urgent, in the role of which are also fighters of

student medical teams, who, during the phase of the active spread of coronavirus infection, worked along with all medical workers.

As you can see, every year the movement is becoming more popular among young people. At the moment, the detachments are spread over most of the regions of the Russian Federation. Speaking of medical teams, currently there are 4 all-Russian and 2 district labor projects in the country, in which 2,000 fighters, 112 teams, 100 medical organizations, 45 educational organizations of higher and secondary vocational education take part.

Based on the foregoing, the purpose of this study is to study the influence of medical teams on the professional activities of students of a medical university.

Based on the purpose of the study, the following task can be distinguished:

- Identify the motivation of young people to work in student medical teams.

To achieve the set task, we used the questionnaire method. The survey was conducted anonymously in an online format using the Google Forms service. Our questionnaire consisted of 11 questions, where the main problems of identifying motivation were indicated. In total, 73 fighters of student medical teams from various higher educational institutions of the Russian Federation took part.

Medical teams contribute to the further professional development of the student, since the acquisition of practical skills motivates students to form an increased interest in professional activity, and is also an important part in the training of future medical workers. [2]

During the survey, we found out that participation in student teams affects such personal qualities and abilities as self-confidence (83.6%), striving for self-development (76.7%), sociability (71.2%) and willingness to come. help (65%). The revealed qualities are qualities that every medical professional must undoubtedly possess.

Further, the majority of respondents believe that, being a fighter of student medical teams, he acquired a rich and active life for himself personally (63%), work experience in his specialty (19%). After all, purposeful work in the specialty requires a lot of endurance and patience. And also, it is the activity of student medical teams, the mass scale and a huge number of like-minded people that affect the motivation and maintenance of interest in their future profession.

With the help of the question “What do you think motivates students to work in medical units?”, We learned that it is the acquisition of practical skills (80.8%) that motivates students to join the ranks of medical units. Thus, by giving young people the opportunity to apply the knowledge acquired in the course of theoretical education in practice, student teams contribute to an increase in interest in future professional activities. Through work in teams, students can learn what awaits them in the future, what situations they may face and how to overcome possible difficulties on their way.

Based on the foregoing, student medical teams acquire great importance in the formation of a future specialist, forming not only professional competencies, but also instilling in him perseverance, hard work, love for the profession, the ability to create, be useful to society and, of course, a socially active citizen of their country.

Student corps are one of the huge youth organizations that have a purposeful job, charter, and regulations. In the modern world, global construction is taking place, in which the fighters of student brigades make their considerable contribution. During the period of foundation of student groups, traditions appeared that have survived to this day. In addition to working days, fighters can go through a special school to familiarize themselves with the activities of this organization.

Student medical teams allow, with the help of mentoring of experienced doctors, to form professional competencies based on the organic unity of fundamental knowledge, possession of practical skills and a clear understanding of future professional tasks, work experience in a professional society, active contact of young people with potential employers and their further employment in the primary link of the system health care of the Russian Federation.

Medical teams are engaged in really important and socially useful things. In addition to summer employment of students, the fighters are engaged in volunteer work, participate in various charity events, provide all possible assistance to the elderly in need: labor and home front veterans, disabled people, single women, large families, orphans. They closely interact with public institutions, so them as a nursing home, correctional schools, orphanages, preschool institutions.

A student, working in the summer, gets the opportunity to put into practice the knowledge gained in an educational institution, get acquainted with the working conditions of an ordinary central district hospital (CRH), and the leadership of the CRH - find replacements for key employees during the summer holidays. Purposeful work in your specialty requires a lot of endurance, patience and motivation for your future profession.

References

1. *Official site of the All-Russian Youth Public Organization "Russian Student Detachments" / URL: https://trudkrut.rf/meditsinskie_otryady*
2. *Borisova O.V., Pavlov N.V. "Theory and practice of the formation of social activity of students in the conditions of club associations of universities" - Cheboksary: Chuvash. State Pedagogical University - t, 2012 p. 176*
3. *Platonov Yu.V. "Student detachments" - Lenizdat, 1977, p. 224*

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确定改进仿制药药物开发过程的关键因素
**IDENTIFICATION OF KEY FACTORS FOR IMPROVING THE
PROCESS OF PHARMACEUTICAL DEVELOPMENT OF GENERIC
DRUGS**

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抽象的。在 EAEU 内协调对复制药物的药物开发 (PD) 过程的监管有助于开发具有特定质量指标且对患者安全有效的药物。为了在药物开发公司开发此类药物，药品质量体系 (PQS) 必须正确运行，包括其结构中的风险管理系统，并且必须在公司中定义清晰的 PD 流程算法。

本研究的目的是确定改善吸入液体形式药物 PD 过程的关键因素，以及将现代方法应用于仿制药的 PD。

该研究确定了对定性 PD 过程等关键改进因素的需求，例如在 PD 的每个阶段使用工具和方法来识别、分析和评估药物质量风险，包括额外的理论评估准备阶段PD。

关键词: 协调, 药物开发, 开发质量, 目标质量概况。

Abstract. *Harmonization of regulation of the process of pharmaceutical development (PD) of reproduced drugs within the EAEU contributes to the development of drugs with specified quality indicators that are safe and effective for the patient. In order to develop such drugs in the development companies of medication, the pharmaceutical quality system (PQS) must function correctly, including a risk management system in its structure, and a clear algorithm of the PD process must be defined in the companies.*

The aim of this study was to identify the key factors for improving the process of PD of drugs in the form of liquid for inhalation, as well as the application of modern approaches to PD of generic drugs.

The study identified the need for such key improvement factors for the qualitative PD process as the use of tools and methods for identifying, analyzing and assessing risks to the quality of drugs at each stage of PD, the inclusion of additional preparatory stages for the theoretical assessment of PD.

Keywords: *harmonization, pharmaceutical development, quality by development, target quality profile.*

Harmonization of requirements in the field of development and circulation of medicines at the stage of transition from national regulation to a single one within the framework of the Eurasian Economic Union has led modern domestic developers to the need to develop drugs with specified and controlled quality indicators.

The regulation of the pharmaceutical development (PD) process of other international integration associations is based on documents describing the need to apply a modern concept based on a risk-based approach to pharmaceutical development of reproduced medication - Quality By Design. Based on the guidelines ICH Q9 and ICH Q10 However, the application of this approach is impossible without an efficiently functioning PQS company developing reproduced medication, supported by a key improvement factor - a risk management system for the quality of the product being developed [1].

The aim of the study is to identify the key factors for improving the PD process of reproduced drugs, the application of modern approaches to PD.

Available sources of literature, the State Pharmacopoeia, regulatory documents and guidelines for pharmaceutical development of medicinal products, documents of the registration dossier, developer reports on pharmaceutical development were used as research materials in this work.

Achievement of the set goals in the work was carried out on the basis of general scientific research methods within the framework of logical analysis, as well as through the analysis and interpretation of the data obtained on the pharmaceutical development of drugs.

In the course of the research, audit management of PQS documents, documents of registration dossiers for drugs, PD reports of the manufacturer of reproduced drugs was carried out - it was revealed that the lack of a risk management system at the PD stage led the drug developer to negative consequences associated with refusals in the state registration of drugs with a regulatory authority at the stage of drug quality examination, the need for additional stages of PD due to this significant time and financial costs and, as a result, possible negative consequences for the company's reputation, reduced competitiveness in the pharmaceutical market [2]. In the course of the study, insufficient elaboration of certain issues prior to the stages of PD was determined, which predetermined the need to identify key factors for improving the PD process, develop an algorithm for conducting PD of

reproduced drugs, include a preparatory PD stage aimed at determining the exact concept of PD of a new reproduced drugs and subsequent use of the obtained data for creating a targeted quality profile of developed drugs within the framework of the concept of improved medication development, applying a risk-based approach at almost all stages of PD.

Based on the above facts, the research team decided to create an algorithm for conducting PD with identifying key factors for improving the process of creating a medication molecule by testing a modern approach to the development of Quality By Design applicable to the activities of this drug developer organization using the example of PD reproduced drugs in a liquid dosage form for inhalation.

At the first stage of the study, the concept of choosing drugs was worked out - as a preparatory and necessary stage of PD. The main criteria of which were: determination of the approximate composition of drugs, determination of the pharmacological group of drugs, nosological classification, pharmacological action, information on studies in the territory of the Russian Federation conducted with original drugs and necessary for carrying out with the developed drugs, planned target sales markets, forecasts for sales volume, pharmacological prospects, analysis of the registration strategy, data on controlled impurities, estimated quality indicators controlled in the finished product, the need to separate into a separate production / site, requirements for the class, type of separate production, dosage form parameters, packaging parameters (taking into account climatic zones), methods of cleaning equipment (standard, specific), storage conditions (taking into account the planned sales markets), peculiarities of working with drugs, the possibility of quality control, financial indicators of the drug development project. This preparatory stage was previously absent in the development company during the development and was subsequently identified as a necessary and key improvement factor for the process of high-quality PD drugs with specified quality indicators.

At the second preparatory stage for the developed drugs, a target quality profile was created based on indicators that are critical for the quality of drugs, the interests of the company, the planned ways to promote the product, in accordance with the requirements of the regulatory documents EMA, ICH Q8 "Pharmaceutical Development", which includes such sections how: purpose of drugs, principle of its action, modes of administration, indicating the dosage form and composition of the original drugs, dosage, method of drug delivery, quality attributes (shelf life, stability, sterility, suspected impurities and contaminants, drug release route, data on primary packaging medication, indicating the main properties and requirements for materials), information on the transfer of the developed technology with an indication of the volume of the proposed experimental-industrial batch, the requirements of the current regulatory documents regarding this medication, etc. [3,4,5].

After that, the PD stage was carried out - the stage of theoretical assessment, which includes the definition and justification of the list of critical attributes of the quality of the finished product, raw materials and materials, excipients, primary packaging materials, production processes using risk assessment and analysis tools. The identification and assessment of risks for reproduced drugs in DF liquid for inhalation was carried out, critical indicators of the finished DF, active ingredient, primary packaging material, production process parameters were identified. In the process of theoretical assessment, a register of risks was obtained for the process of PD drugs in DF - liquid for inhalation (see table 1).

Table 1 Risk register of the PD process by the degree of impact on the quality of the developed drugs

| Risk name | Classification (By applicability to a specific DF) | The need for control in PD (+/-) |
|--|---|----------------------------------|
| Risks associated with the preparatory phase of PD | | |
| Wrong name for drugs | Universal | + |
| Incorrectly selected original drugs | Universal | + |
| Incorrectly selected information on research on the territory of the Russian Federation, the EAEU and other international integration associations | Universal | + |
| Pharmacological viability is incorrectly determined drugs | Universal | + |
| The analysis of the registration strategy was performed incorrectly | Universal | + |
| No data on controlled impurities | Universal | + |
| Assumed quality indicators controlled in the finished product are missing or incorrectly defined | Universal | + |
| The need to separate into a separate production / site was not found, the requirements for the purity class, the type of separate production were not determined | Universal | + |
| The parameters of the dosage form are not formulated | Universal | + |
| Packaging parameters are not determined (taking into account climatic zones) | Universal | + |

| | | |
|---|---|-----------------------|
| No suggested cleaning methods for equipment | Universal | + |
| Peculiarities of working with drugs have not been identified | Universal | + |
| The possibility of quality control has not been determined | Universal | + |
| Risks associated with the properties of the finished DF and deviations from the standard indicators (theoretical PD stage) | | |
| Deviation in terms of authenticity | Universal for any DF being developed | + |
| Quantitation | Universal for any DF being developed | + |
| Related impurities | Universal for any DF being developed | + |
| Water content | Specific for DF - liquid for inhalation | + (for certain DF) |
| Deviation from the volume of the contents of the package | A critical indicator for any DF. Most critical for liquid DF, in particular for liquid for inhalation - it is related to the volume of liquid to be poured into the evaporator. | + |
| Microbiological purity | A critical indicator for any DF. | + |
| Risks associated with the properties of the substance and deviations from standard indicators | | |
| Deviation in terms of authenticity | Universal for any DF under development. | + |
| Quantification of the active substance | Universal for any DF under development. | + |
| Related impurities | Universal for any DF under development. | + |
| Water content | Specific for DF - an inhalation liquid. | + (for certain DFs) |
| Microbiological purity | Critical indicator for any DF. | + |

| Risks associated with the use of excipients and deviations from standard values | | |
|---|---|---|
| Authenticity | Critical indicator for any DF. | + |
| Microbiological purity | Critical indicator for any DF. | + |
| Risks associated with the parameters of the manufacturing process of generic drugs in DF liquid for inhalation | | |
| Pressure drop across filters during filtration | Specific for DF - liquid for inhalation, for drugs for oral administration (solutions, drops, etc.) | + (applicable if it is planned to use equipment similar in parameters in the technological process) |
| Deviations in the CIP parameters of the mixer during the mixing stage | Specific for DF - liquid for inhalation, for drugs for oral administration (solutions, drops, etc.) | + (applicable if it is planned to use equipment similar in parameters in the technological process) |
| The presence of sterilizing filters at the filling stage | Specific for DF - liquid for inhalation, for drugs for oral administration (solutions, drops, etc.) | + (applicable if it is planned to use equipment similar in parameters in the technological process) |
| The presence of aspiration from the working environment of the machine | Specific for DF - liquid for inhalation, for drugs for oral administration (solutions, drops, etc.) | + (applicable if it is planned to use equipment similar in parameters in the technological process) |
| Primary packaging screw position | A universal critical parameter. Most critical for liquid DF. | + |
| Tightening force of the cover | Specific for DF - liquid for inhalation, for drugs for oral administration (solutions, drops, etc.) | + (applicable if it is planned to use equipment similar in parameters in the technological process) |

| Risks associated with the primary packaging material of the generic drugs being developed | | |
|--|--|--|
| Primary packaging material composition | A universal critical parameter for any DF. | + |
| Cover material, adapter | Specific for DF - liquid for inhalation | + (for DF - liquid for inhalation. For other DF - assessed individually) |
| Shape and size of cover, adapter | Specific for DF - liquid for inhalation | + (for DF - liquid for inhalation) |
| Valve travel in adapter | Specific for DF - liquid for inhalation | + (for DF - liquid for inhalation) |
| Primary packaging material | Universal critical parameter for any DF | + |

A preliminary analysis of the processes of modern pharmaceutical development of drugs showed that the most suitable for the purposes of assessing the selected drugs is a modified FMEA (Failure Modes and Effects Analysis) method, adapted for the purpose of ranking quality attributes in terms of their impact on the safety and efficacy of finished drugs for the consumer. The next stage of the research was the development of a list of actions to control the selected critical attributes and reduce or eliminate possible risks associated with them and the compilation of lists of quality requirements for the components being developed by the drugs.

It was determined that the main stages that determine the result of PD are the preliminary, preparatory stage of forming the concept of reproduced drugs new for the developer company and the stage of theoretical assessment of drugs, including the assessment of critical parameters of the production process and quality attributes of both finished drugs and substances, excipients and materials of primary packaging of medication.

Thus, the risk assessment of both the main substance and the finished product in terms of determining critical indicators formed the basis for the creation of drugs with specified quality indicators, emphasizing the criticality of individual properties and determining the need for additional control in the development process and became, in this study, a tool for process optimization PD drugs and has been instrumental in identifying key factors in improving the PD process of reproduced drugs.

Application of this approach at the planning stage made it possible to create a target drug quality profile, which includes detailed data for the development of the design parameters of the study, and also made it possible to assess the risks related

to the critical properties of the active substance that could affect the effectiveness and safety of drugs, contributed to the determination of quality indicators, required for inclusion in the specification for the substance and for the active substance.

The implementation of the modern concept of Quality By Design, regulated by ICH Q 8 "Quality by Development", provides for a systematic approach to processes and products at the stage of pharmaceutical development and predetermines the conduct of voluminous complex experimental research, provided by personnel with the appropriate competencies and level of training.

To date, the experimental studies carried out form the basis of a methodological approach to optimize the PD process of reproduced drugs. Pharmaceutical development based on a risk-based approach to the processes and quality indicators of the product being developed, optimized in terms of adding preparatory stages as key factors for improving the PD process, is a guarantee of the creation of effective and safe drugs, the reproducibility of the technological process in modern conditions in production, the implementation of medication with specified indicators quality.

References

1. *Agreement on Unified Principles and Rules for the Circulation of Medicines within the Eurasian Economic Union and the decision of the Supreme Eurasian Economic Council, Article 5 [Electronic resource] – Access: <http://www.consultant.ru/>;*
2. *Mollah A.Kh., Long M., Baysman G.S. Risk management in pharmaceutical production / per. ed. Alexandrov A.A. – Vialek, 2014 – 438 P;*
3. *ICH guideline Q8 (R2) on pharmaceutical development, 22 June 2017 EMA/CHMP/ICH/167068/2004 Committee for Human Medicinal Products, [Electronic resource] – Access: <https://www.ema.europa.eu/>;*
4. *ICH guideline Q10 on pharmaceutical quality system, September 2015 EMA/CHMP/ICH/214732/2007 Committee for Human Medicinal Products, [Electronic resource] – Access: <https://www.ema.europa.eu/>;*
5. *ICH guideline Q11 on development and manufacture of drug substances (chemical entities and biotechnological/ biological entities), November 2012 EMA/CHMP/ICH/425213/2011, [Electronic resource] – Access: <https://www.ema.europa.eu/>.*

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食品工业用水的特殊要求
**SPECIFIC REQUIREMENTS FOR WATER USED IN THE FOOD
INDUSTRY**

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抽象的。作者考虑了食品和饮料生产中水处理问题的当代状况。本文介绍了饮用水和瓶装水、乳制品行业、啤酒和软饮料生产以及伏特加、出口伏特加和婴儿食品生产的受监管水质参数。文章表明，中央公用设施和饮用水供应的水需要额外处理才能生产食品和饮料。应清除硬盐、铁、锰、矿物盐、有机化合物和微生物污染。此外，许多公司使用地下水源（来自井）。这使得水处理程序更加复杂。作者考虑了离子交换、磁性水处理、催化氧化、矿物原料吸附过滤除铁、曝气、反渗透、电渗析、活性炭吸附等处理方法。作者展示了治疗机制及其优缺点。该文章指出了哪些材料和设备可用于在水处理实践中应用这些方法。它描述了有效水处理的新技术，例如辐射分解、空化和高级氧化处理技术。

关键词：水、硬度盐、铁、锰、矿物盐、有机化合物、特定要求

Abstract. *The authors considered the contemporary state of the issue of water treatment in food and beverages production. The article presents regulated water quality parameters for drinking and bottled water, for dairy industry, beer and soft drinks production, as well as for production of vodka, vodka for export, and baby food. The article shows that water from central utility and drinking water supply needs additional treatment to produce food and beverages. It should be cleaned from hardness salts, iron, manganese, mineral salts, organic compounds and microbial contamination. Besides, many companies use groundwater sources*

(from wells). That makes water treatment procedure even more complicated. The authors considered such treatment methods as ion exchange, magnetic water treatment, catalyzed oxidation, deferrization using sorption-filtering materials from mineral raw materials, aeration, reverse osmosis, electro dialysis, activated carbon adsorption. The authors show the treatment mechanisms, their advantages and disadvantages. The article indicates which materials and equipment can be used to apply these methods in water treatment practice. It describes new techniques for effective water treatment such as radiolysis, cavitation and advanced oxidation treatment techniques.

Keywords: *water, hardness salts, iron, manganese, mineral salts, organic compounds, specific requirements*

Executive summary Water is a major input in food, from primary production through all stages in the food value chain to consumption. Water can contact food directly or indirectly and is used in maintenance of hygiene and sanitation throughout the food chain. Water is a diminishing resource globally and not all food primary producers and processors have access to safe water sources. Water needs to be used conservatively and it is possible to reuse water if it does not present a health risk for consumers [1]. At its 48th session in November 2016, the Codex Committee on Food Hygiene (CCFH) noted the importance of water quality in food production and requested the Food and Agriculture Organization of the United Nations (FAO) and the World Health Organization (WHO) to provide guidance for those scenarios where the use of “clean water” was indicated in Codex texts – in particular, for irrigation water and clean seawater – and on the safe reuse of processing water. In addition, guidance was sought on where it is appropriate to use “clean water” [2-7]. The first meeting of Experts was held in Bilthoven, The Netherlands, in 2017, to address this request. The Experts concluded that future work should focus on the following: • development of a fit-for-purpose concept, taking into consideration the context of water uses along the food chain; • focus on the priority sectors – fresh produce, fishery products and reuse of water in food operations – chosen based on their significance in health protection and global trade; • review of existing guidance materials in food and water safety in consultation with experts with relevant expertise to exploit synergies between these areas and to ensure relevance for the food industry; • practical guidance provided through the use of decision support system (DSS) tools, such as a decision tree (DT), incorporating assessment of risks and use of monitoring to ensure safe quality of the water; • other end products, such as communication tools for end users. A second meeting of Experts was held at FAO in Rome, Italy, in 2018, to address the work recommended. Working groups were formed for the three priorities for water use and safety – i.e. fresh produce sector, fishery sector and water reuse in establishments [8-15].

Water supplied to feed the population belongs to the strategic category. It should be supplied around the clock, in sufficient quantity and quality. This food resource has an important social and sanitary-epidemiological significance. Water is one of the most important factors in protecting the health of citizens, their physical potential, working capacity and life expectancy.

The functionality of water is versatile. On the one hand, water is not actually a nutrient, does not have nutritional and energy value. However, its physiological effect on the body is very significant. Given the fact that a person consists on average of 60% of water, 34% of organic substances, 6% of inorganic (for different ages, the ratios given change), in water takes part in almost all vital metabolic processes: promotes digestion, serves as a solvent for inorganic and organic compounds, removes harmful metabolic products from the body, regulates the salt content in tissues and fluids, participates in many other metabolic reactions [16].

The mineral composition available in the water can serve as a source of food nutrients necessary in the diet. But the excess of individual macro- and micro-nutrients in water, organic and mineral impurities have a toxic effect on the human body. These indicators are regulated by sanitary rules and norms SanPiN 2.1.4.1074-01. Drinking water. (WHO, EU, USEPA).

In Russia, catering and food industries in the production of food products mainly uses water from the system of domestic and drinking water supply. In the production of certain types of food products, general requirements for water are not enough. Water must be of a high degree of purification or enriched with certain minerals. Such water has additional requirements related to the characteristics of technology, quality and purpose of products, storage time, specifics of use [17].

The quality of food products depends on the components of the recipe, the technological process, the qualification of personnel, the industrialization of the technological process, compliance with the principles of HACCP. The most important and fundamental in this chain is water. It must have a qualitative and quantitative composition of chemical components determined for each type of product, which is consistent with the technology used and the ingredient composition specific to the specific technological process of the food industry. In case of imbalance, for example, the possibility of intoxication of consumers of products, if water with an increased concentration of chemical components is used. A synergistic effect is also possible with the combination of chemical interaction of substances in water and the main components of food products. There salting food product will be of reduced quality and safety and. It should be noted another important factor. Excessive mineralization of water will affect organoleptic indicators. Finished products may have unconventional taste data that differ from the requirements for quality, traditional perception and consumer preferences. Changed organoleptic indicators of manufactured products can also affect the course of technological processes,

supplies of raw materials, storage.

The specifics of the food industry sectors have also affected the requirements for water. So, for water used in dairy production, the requirements are set according to SanPiN 2.1.4.1074-01 "Drinking water. Hygienic requirements for the water quality of centralized drinking water supply systems". This water is subject to control indicators with restrictions on the total mineralization, the content of iron, manganese, hardness salts, phenol, and organohalogen compounds. The issue of water hardness is particularly acute.

The concentration of salts in water affects the organoleptic parameters and solubility of dry substances, the pH value determines the rate of chemical reactions, affects the smell, taste and its appearance. An increase in water hardness helps to reduce the rate of dissolution of dry dairy products, and in the restored milk processing product - to reduce the stability of the protein phase with an increased risk of premature coagulation, as well as the heat resistance of the restored products. These processes can be prevented by softening water [18, 19]. Features are also noted in the production of sugar. Only water of a low degree of mineralization is suitable here, since the high salt content makes it difficult to cook and the subsequent process of sugar crystallization. In the production process, the presence of rotting substances is completely excluded due to the fact that the latter are the cause of fermentation of the reaction mass in the diffusers, which is absolutely unacceptable, leads to marriage [20].

In the beverage industry, special requirements are imposed on water. The usual concentration of ions in natural waters has a significant impact on the quality of drinks. The usual concentration of ions in natural waters has a significant impact on the quality of drinks. For example, bicarbonate ions bind acids that provide a regulated taste of beverages. The content of magnesium, iron, and calcium ions can lead to the formation of sediment and opalescence [21].

Certain specific requirements are noted in the distillery production. Here, the water should not contain calcium and magnesium chlorides, which affect the vital activity of yeast. In accordance with the current regulatory document, the presence of calcium sulfate in the water used for brewing is limited, which prevents the fermentation of malt [20].

For the production of alcohol-containing products, the water that is part of the drink should not contain hardness salts and be moderately mineralized [20]. It is shown in [22] that the methods of water treatment introduced at distilleries do not provide softened water with good technological qualities. An analysis of the available publications on this issue shows that in the process of water treatment using existing technologies, the total salt content does not decrease, but only their qualitative composition changes; organic substances that negatively affect the taste and smell of water, and then the vodka produced on it, are not removed.

Due to the fact that the qualitative and quantitative composition of mineral impurities in natural waters varies greatly in the sources, in order to obtain good vodka indicators, it needs to be adjusted, and every time when using water from another system or artesian [22]. In the current economic conditions, it is more expedient to completely demineralize the source water, purify it from organic substances and then give it drinking qualities with salts in a certain proportion. The alcoholic beverage obtained on the water prepared in this way will meet the established quality.

Water treatment in the manufacture of meat products remains an important factor. An increase in water hardness affects the ability of muscle proteins to retain free water during processing (cooking), reduces consumer properties and product yield. Products are severely dehydrated, excessive shrinkage occurs, leading to weight loss, deformation of products and other defects. According to other indicators, the water used in the meat industry must meet the requirements of the SanPiN 2.1.4.1074-01.

The production of bakery products also imposes special requirements on the quality of water. It affects the intensity of fermentation and the organoleptic properties of the dough and finished products. In order to improve the structural and mechanical properties of semi-finished products and finished products, increase the mass of finished bread by increasing the moisture content of the dough and improving the safety of bread, the water used, which is introduced into the technological process of manufacturing products from the domestic drinking water supply system, must be additionally purified from iron, hardness salts, organochlorine compounds and other impurities present in the water, depending on the region of its content [23, 24].

In accordance with the requirements set out in this message, it is necessary to systematize specific additional values and functional features and develop modern methods of water conditioning in relation to the type of manufactured products. The aspect of using unified methods of water treatment is very important.

Currently, ion exchange methods of water purification from undesirable impurities, usually on synthetic high-polymer ionites, are widely used in the food industry due to the high efficiency and simplicity of organization. The existing variety of hardware and technological design allows you to effectively carry out the stages of water purification, both from organic and mineral impurities. There are opportunities to create low-waste technological processes. One of the directions may be ion exchange technologies for water purification, which is its ecological aspect and rational organization of technology. To ensure water quality, various methods of water treatment are used: coagulation, Na-cation, demineralization, distillation, electrodialysis, reverse osmosis, according to approved regulatory and technical documentation. Depending on the composition of the source water, its clarification, de-ironing, softening, demineralization, desilination are carried out

at distilleries. [24]. At the enterprises of the baking industry, its air conditioning is carried out.

References

1. *FAO and WHO. 2019. Safety and Quality of Water Used in Food Production and Processing – Meeting report. Microbiological Risk Assessment Series no. 33. Rome.*
2. *Alcalde-Sanz, L. & Gawlik, B.M. 2017. Minimum quality requirements for water reuse in agricultural irrigation and aquifer recharge: Towards a water reuse regulatory instrument at EU level, EUR 28962 EN, Publications Office of the European Union, Luxembourg.*
3. *Allende, A. & Monaghan, J. 2015. Irrigation water quality for leafy crops: A perspective of risks and potential solutions. Internat. J. Environ. Res. Pub. Hlth. 12: 7457-7477.*
4. *CAC (Codex Alimentarius Commission). 1999. Principles and guidelines for the conduct of microbiological risk assessment. CXG, 30. (available at <http://www.fao.org/docrep/004/y1579e/y1579e05.htm>).*
5. *CAC. 2003. CXC 53. Code of hygienic practice for fresh fruits and vegetables. pp. 1-26. (available at http://www.fao.org/ag/agn/CDfruits_en/others/docs/alinorm03a.pdf).*
6. *Ceuppens, S., Johannessen, G.S., Allende, A., Tondo, E.C., El-Tahan, F., Sampers, I., Jacxsens, L. & Uyttendaele, M. 2015. Risk factors for Salmonella, shiga toxin-producing Escherichia coli and Campylobacter occurrence in primary production of leafy greens and strawberries. Internat. J. Environ. Res. Pub. Hlth. 12: 9809-9831.*
7. *CPS (Center for Produce Safety). 2014. Agricultural Water: Five year research review. Center for Produce Safety, Davis CA, USA. (available at <https://producesafetycentreanz.files.wordpress.com/2014/06/cps-ag-water-research-report-2014.pdf>).*
8. *De Keuckelaere, A., Jacxsens, L., Amoah, P., Medema, G., McClure, P., Jaykus, L.-A. & Uyttendaele M. 2015. Zero risk does not exist: Lessons learned from microbial risk assessment related to use of water and safety of fresh produce. Compr. Rev. Food Sci. Food Safety, 14: 387-410.*
9. *EC (European Commission). 2017. European Commission Notice No. 2017/C 163/01 Guidance document on addressing microbiological risks in fresh fruit and vegetables at primary production through good hygiene. (available at <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52017XC0523%2803%29>).*

10. EC. 2004. *Commission Regulation (EC) No 852/2004 of the European Parliament and of the Council of 29 April 2004 on the hygiene of foodstuffs*. *Off. J. Eur. Union*, L 139: 1-23.
11. EC. 1998. *Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption*. *Off. J. Eur. Communities*, L 330: 32-54.
12. EC. 1991. *Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment*. *Off. J. Eur. Communities*, No. L 135, 30/05/1991, pp. 40-52.
13. EC. 1980. *Council Directive 80/778/EEC of 15 July 1980 relating to the quality of water intended for human consumption*. *Off. J. Eur. Communities*, No. L 229, 30.08.1991, pp. 11-29.
14. EEA (European Environment Agency). 2017. *Use of freshwater resources*. (available at <https://www.eea.europa.eu/downloads/b2b1971a46d14f349f45e25e2417757d/1521619965/assessment-2.pdf>).
15. EFSA (European Food Safety Authority). 2014. *Panel on Biological Hazards (BIOHAZ). Scientific opinion on the risk posed by pathogens in food of non-animal origin. Part 2 (Salmonella and Norovirus in leafy greens eaten raw as salads)*. *EFSA J.*, 11. (available at www.efsa.europa.eu/efsajournal).
16. Tamara Krasnova. *Water treatment in food industry December 2018 Food Processing Techniques and Technology* 48(1):15-30/
17. Borisov B. A., Egorova E. Y., Zainullin R. A. 2014. *Water treatment in the production of food and beverages - St. Petersburg: Profession*. - 398 p.
18. Bredikhin, S. A. Kosmodemyansky Y. V., Yurin V. N. 2003. *Technology and technique of milk processing*. - M.: KolosS. - 400 p.
19. Golubeva, L. V. 2005. *Handbook of dairy technologist*. - SPb.: GIORD. - 272 p.
20. Alitdinova, S.Y. 2005. *Development of a safe method for the use of ion exchange resins in water treatment in the food industry*. Moscow. – 123 p.
21. Ogorodnik A.A., Novikov M.S., Klemeshov D.V. 2019. *Water treatment technologies in the production of non-alcoholic, low-alcohol and alcoholic beverages*. *Sovremennye nyi issednyi i innovatsioni*. No 6 [Elektronnyi resurs]. URL: <https://web.snauka.ru/issues/2019/06/89777>
22. Lavrishcheva, T.N., Egorov, A.S. 1971. *Development of water treatment technology for distillation with the use of ion exchange resins. Ion exchange and chromatography*. Voronezh: Izd-vo Voronezh, un-ta. - Vol.2. - p.93-94.
23. Korchagin, V. I. 1999. *Dependence of properties of semi-finished products and finished products on the chemical composition of water*. *Bakery of Russia*. - № 6. - p. 22-23.
24. Mazur, P. Y. Yansheva I. N. 2002. *Water in the preparation of bread*. *Bakery of Russia*. - № 6. - p. 30-32.

用核磁共振弛豫测量法对油进行在线结构动态分析的装置
**APPARATUS FOR ON-LINE STRUCTURE-DYNAMIC ANALYSIS
OF OILS BY NUCLEAR MAGNETIC RESONANCE RELAXOMETRY
METHOD**

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抽象的。 本文致力于核磁共振弛豫 (NMRR) 方法在原油、油/水乳液和分散体的物理化学特性 (PCC) 研究中的应用, 通过自动化仪器-机电复合体。 , 但尚未公开对燃料、油和乳液进行快速分析的机会[1]。NMRR 的结构动力学分析为解决理论和实践中的几个问题提供了机会。

关键词: 核磁共振弛豫, 色散特性, 排序, 仪器

Abstract. *The paper is devoted to nuclear magnetic resonance relaxometry (NMRR) method applications for the physical-chemical characteristics (PCC) study of crude oils, oil/water emulsions and dispersions by automated instrumental-mechatronic complexes. Method of pulse nuclear magnetic resonance relaxometry has great, yet not disclosed opportunities for the express analysis of fuels, oils and emulsions[1]. Structure-dynamical analysis by NMRR gives an opportunity to solve several problems of theory and practice.*

Keywords: *NMR-relaxation, dispersion characteristics, ordering, apparatus*

Introduction

Wide application of the NMR methods in the industrial operative oil control is restricted by some problems: lack of instrumentation for automatic control of oil-mining and oil preparation processes. Among problems also are: absence of

methods and computer programs; cumbersome and ponderousness of apparatus; danger of fire and explosion; severe climatic conditions of oil-mining. Urgent requirement of the oil-industry - is the possibility for express-analysis in laboratories and on-line flow of physical-chemical parameters (PCP) of the oil disperse systems (ODS - crude and dry oils, oil products) - concentrations of water, sulphur, asphaltenes *Asph*, hydrocarbons, paraffin's, density ρ and viscosity η in oils, water droplets distribution, as well as velocity of the crude oil flow (debit) in the pipeline after chink or bore-hole.

Characterization of oil systems using NMR techniques is a vast and expanding scientific activity Lo [1]. It is one of the key problems of petroleum reservoir engineering and NMR is the most perspective technology, capable to do such estimates Shikhof, Arns [2].

Methods and instruments to overcome marked problems

To overcome this restrictions, we elaborated the construction of mechatronic complex for measurements of PC-parameters of crude oils with incorporated in it system of representative liquid probe sampling with program of automatic operation from microcontroller *ATMEGA8515L*. Complex compare to prototype [5] at $\pm 4\%$ accuracy of sampling gives an opportunity to homogenize the flow, remove the dashes, scan the pipe by nozzle moving. The unique feature of the NMR approach is the diversity of chemical and physical properties at different structural levels that can be accessed using a single NMR instrument. For industry-oriented applications, an important goal is the implementation of nondestructive analysis and control procedures [3].

Results

Were received experimental correlations between PCC and NMRR- parameters, which became the basis for on-line flow express-methods of crude oils and oil-water emulsions characteristics determination.

NMRR-equipment for the on-line express-control is presented. Express-methods for determination in oil/water emulsions using NMR are described. Installation for the oil/water emulsion deemulsation is described.

Wide opportunities of Nuclear Magnetic Resonance Relaxometry (NMRR) for determination of structure-dynamical parameters were demonstrated in the papers Kashaev et al [4-6] and it is found, that NMRR is unique for molecular motions and viscosity studies. Such opportunities possess nuclear (proton) magnetic resonance relaxometry (NMRR) method, which need not sample preparation, non-destructive, can be used in explosive and fire dangerous zone, easy for automation and very fast – measurement time usually is less, then 2-3 minutes. From all methods of water control NMRR is the sole, which embrace the whole range up to 100% of water and gas concentrations. On-line NMR-control of crude oils and oil products components is not used until now, but we have constructed on-line

NMR-control installation [7].

We have also designed new portable, easily transported relaxometers NMR NP-1 with parallel interface and NMR NP-2 (fig.1) with USB interface [Kashaev R.S., Temnikov A.N., Idiyatullin Z.Sh..Portable relaxometer of NMR. Patent of RF on useful model № 67719, 2006] with the weight less, then 15 kg, connected with Notebook by USB-port. It is used for express-analysis of PCP and has no analogues. In our Universities NMR NP-1,2 are used for science research and educational process. They are power supplied from 12 V accumulator or ≈ 220 V. Time of measurement < 2 minutes. Sensibility is $K = \nu^2 D^3$ [MHz²cm³] = 2700-4150 MHz²cm³, that is near to “Minispec pc120” (Bruker,Germany). Magnetic system is build from rare earth elements alloys *NdFeB*. Heterogeneity of H_1 field is $< 2\%$ in 75% of volume. See Table 1.

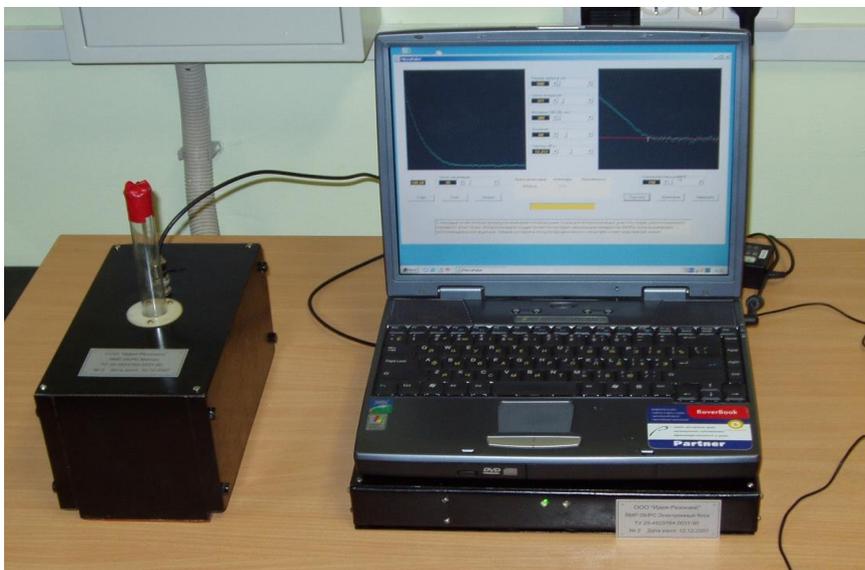


Fig.1. Portable Relaxometer NMR NP-2 with USB interface

Comparative parameters of portable NMR NP-2 with NMR-relaxometers Table 1

| Parameters | Portable NMR NP-2, Kazan, Republic of Tatarstan | Minispec Pc 120 (Bruker, Germany) | MQA 6005 (Oxford, UK) |
|--------------------------|---|---|--------------------------|
| Sensitivity $\nu^2 V$ | 2700 -4150 | 1600-6400 | 880 |
| Resonance frequency, MHz | 10 - 18 | 10 - 40 | 2 |

| | | | |
|--------------------------------------|-----------------------|------------------------|----------------------|
| Diameter of sample, mm | 10-30 | 10- 40 | 50 |
| Power, WA | 15 (from accumulator) | 300 | 300 |
| Dimensions: Electronics, Magnet , cm | 4x25x30 20x15x10 | 106x54x43 106x54x43 | 39x61x31 32x28x27 |
| Mass, kg | <15 | 80 | 30 |

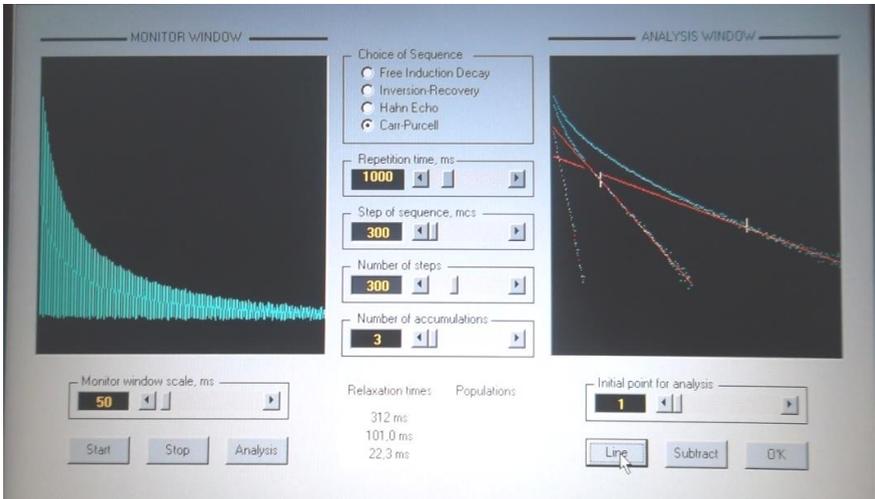


Fig.2. Envelope of spin-echo signals (in the left part of monitor) and its decompositions on components (right part) at measurements of spin-spin T_{2i} relaxation times. Obtained NMR-parameters are set in the central bottom part

Conclusions

Was elaborated the construction of mechatronic complex for measurements of PC-parameters of crude oils with incorporated in it system of representative liquid probe sampling with program of automatic operation from microcontroller ATMEGA8515L. By the nuclear magnetic resonance relaxometry (NMRR) method were studied physical-chemical characteristics (PCC) of crude oils, oil/water emulsions and dispersions by automated instrumental-mechatronic complexes.

References

1. S.-W.Lo, G.J.Hirasaki, R.Kabayashi, (2002) Soc. Petrol. Eng. Journ. 7, 24-34.
2. I.Shikhof, C.H. Arns, (2016) Appl. Magn. Reson 47:1391. Doi: 10.1007/s00723-016-0830-4.

3. S.S.Zalesskiy, E.Danieli, B.Blumich, V.P. Ananikov (2014), *Chem. Reviews*, 114, 5641-5694

4. Kashaev R.S.-H. *Apparature and NMR-method of oil disperse systems analysis*. Lambert Academic publishing (LAP). GmbH&Co.KG, Saarbruken, Germany, 2012. 92 p.

5. Kashaev R.S.-H. *Oil Disperse Systems Study Using Nuclear Magnetic Resonance Relaxometry (NMRR)*. *Advances in Energy Research*. V.16. 2013. Nova Science publishers, Inc. ID 12590, N-Y USA.

6. Kashaev R.S.-H. *Correlations between viscosity and NMR-relaxation in oil disperse systems //Applied Magnetic Resonance*, 2018, №49, p.309-325.[https://doi.org/ 10.1007/s00723-018-0977-2](https://doi.org/10.1007/s00723-018-0977-2)

7. Kashaev R.S.-H., Temnikov A.N., Idiyatullin Z.Sh. *Patent of RF №2544360; 20.03.2015 in Bull. №8, 2 p.*

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基于所选对象的小干扰校正远程图像的对比度
**CORRECTION OF THE CONTRAST OF A REMOTE IMAGE BASED
ON SMALL DISTURBANCES OF THE SELECTED OBJECTS**

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抽象的。通过将图像中的选定对象与参考 - 参考界标进行比较,可以确定和校正距离图像中规则分量的对比度的扰动。图像中分布和随机分量的相应扰动并不总是被明确识别,因为它们也是由它们的分布函数引起的。

该论文提出在远程图像相对于形成的对“参考对象-参考点”或所选对象的对比度扰动的先验已知指数变化的线性范围内实现对远程图像的对比度的校正。在这种情况下,使用关于图像形成算法在整个合成帧上的均匀性和各向同性的假设。

该研究是在俄罗斯基础研究基金会 (RFBR) 的资助下在科学项目 № 19-07-00697 的框架内进行的。

关键词: 空间频谱, 参考地标, 距离图像

Abstract. *Perturbations of the contrast of regular components in the distance image are determined and corrected by comparing the selected objects in the image with reference - reference landmarks. The corresponding disturbances for the distributed and stochastic components in the image are not always explicitly identified, since they are also caused by their distribution functions.*

The paper proposes to implement the correction of the contrast of a remote image in the range of linearity of its change relative to the formed pairs "reference object - reference point" or a priori known indices of the contrast disturbance of the selected objects. In this case, the assumption about the homogeneity and isotropy of the image formation algorithm over the entire synthesized frame is used.

The research was carried out with the financial support of the Russian Foundation for Basic Research (RFBR) in the framework of the scientific project № 19-07-00697.

Keywords: *spatial frequency spectrum, reference landmarks, distance image*

Introduction

Comparison of regular patterns in images and detection of mutual perturbations can be realized by simple pixel-by-pixel subtraction of images from each other (with preliminary necessary transformations of mutual residuals of scale, translation, and rotations), and to solve the problem of identifying perturbations of stochastic components, it may be necessary to additionally apply theorems of statistical analysis of the presented pictures (with modeling of perturbed distribution functions of random variables).

Disturbances of the regular components in the image can be determined even visually, especially by comparing with selected reference or reference objects - reference landmarks. Disturbances, for example, of stochastic components in the image, especially in terms of their distribution functions, are not always represented in the image in an explicit form.

The paper proposes, based on the indices of the perturbation of the contrast of the selected objects relative to the reference objects (or a priori known), to implement the contrast correction on the existing background based on the assumption of the uniformity and isotropy of the image formation algorithm.

Purpose of the study

Implement algorithms for correcting the contrast of objects in the image under consideration based on a computable representation of the Bates and McDonnell model.

Materials and methods

Perturbations of the parameters that determine the transfer characteristics of the analog-digital paths of optical and quasi-optical radio engineering systems (including the signal transmission medium) oriented to work with spatial objects often lead to an increase in the bands (and sections, in the general case) of the intersection of spectral portraits (SP) of the observed objects and noise components in the paths of transit of remote information. This fact, in terms of the impact on the result of the systems operation, is assessed as a deterioration in the resolution, quality factor, clarity, etc.

For classes of radio engineering systems with remote sensing modules, represented in accordance with information processing algorithms by the Bates and McDonnell model [1,2,3], it is possible to define a list of algorithms for the so-called secondary information processing: noise reduction, spectral and correlation analysis, correction and restoration of resolution the ability of the probing paths and the informative properties of the synthesized images (including based on the use of a priori information about the observed objects). The aforementioned perturbations of the parameters of radio engineering systems can be considered in the main part of the Bates and McDonnell model representing them as perturbations of the execution of binary bilinear operations of a computable representation of

the model (provided that it is represented in the algebraization of the problem by bilinear forms (of the form $(ax+b)(cx+d)$), for example, where the x -vector of "useful" data, and the remaining elements of the bilinear form are the numerical values of the parameters characterizing the technique of receiving information).

These operations as part of the algorithms of the model under consideration are objectively based on the performance of the multiplication operation, the use of which makes it difficult to implement the so-called adiabatic representation of the components of the system (a system with the absence of mutual influence of its elements).

Regular disturbances in the equipment and algorithms of its operation, when they do not exceed certain threshold values [4, 5], often make it possible to notice that the regular components (images of objects) in the synthesized images are disturbed in such a way that they can be represented by regular functions describing the results of observing the behavior stochastic components (and their distribution functions). In addition, if the disturbances of the regular components in the image can be determined even visually, especially on reference or reference objects - reference landmarks, then disturbances of the stochastic components, especially in terms of distribution functions, cannot always even be described explicitly.

In this paper, spectral portraits of "disturbed" images are presented and considered, described by the following approximate relationship:

$$F_S^{Vi}(\omega) \approx F_S(\omega)(1 + \beta\omega^\beta), \quad (1)$$

where $\beta = \frac{\|V_{il}\|}{\omega_c}$, $F_S^{Vi}(\omega)$ – the original Fourier representation of the image S for a given perturbation matrix V_p , ω – spatial presentation frequencies, ω_c – weighted average spatial frequency in the spectral portrait of the original image. Relation (1) follows from the additive form of representation of the perturbed quantities: the perturbed parameter receives the perturbing effect in an additive form. At the same time, this approach involves the use of so-called small perturbations, which means the fulfillment of the requirement $\beta\omega^\beta \ll 1$, and with the provision of "broadening" the bands of the spectra of perturbed quantities by hardly one or two harmonics while maintaining the period of their location on the frequency axes. In such formulations of the problem, the band of the investigated spectrum of the perturbed value is often forcibly expanded into the high-frequency region by the assumed value, then for the frequencies placed with the initial period, their amplitudes are approximated under the continuation of the envelope of the rest of the spectrum. The appearance of "parasitic" high frequencies on the spectrum disturbance curve is suppressed by notch filtering.

Results

Fig. 1 and fig. 2 show the initial and difference images, which were obtained by processing the original image using a disturbing matrix with a small norm (0.05) and a matrix with a norm with a value of 0.3.

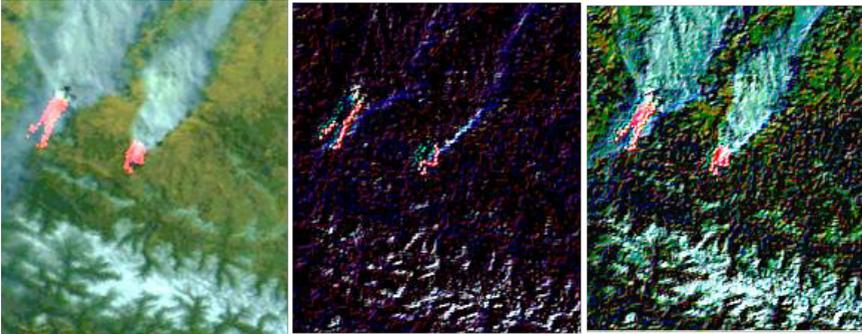


Fig. 1. Original image (left), difference image with perturbation matrix norm 0.05 (center), difference image with perturbation matrix norm 0.3 (right)



Fig. 2. Original image (left), difference image with perturbation matrix norm 0.05 (center), difference image with perturbation matrix norm 0.3 (right)

Fig. 1 (left) shows a space image containing mainly fractal images - fire centers in the taiga, framed by pseudo-regular boundaries. Fig. 2 (left) shows an image of a fragment of a city line containing approximately equivalent in amplitude low, medium and high SP modes. To the right are the difference images: "disturbed" minus the original one.

The difference spectral portrait (fig. 3) shows a low presence of changes in the low frequency region and a nonlinear increase in this change towards the periphery of the frequency axis, i.e. the fact of a steeper fall to zero of the spectral portrait of the verified image (in the region of the cutoff frequency) was recorded, which explains the improved signal-to-noise ratio determined by setting the cutoff frequency itself. In the original image, the corresponding measurement of the

averaged signal-to-noise ratio gives a value of 75.6, which, with an error of about 6%, corresponds to the criterion of its increase by a factor of $\sqrt{2}$.

In fig. 3, the upper right image was obtained by transforming from the left one according to formula (1) with minimization of the perturbation matrix of the original image until an energy prevalence of the pixels of the right image over the left one by 2% -3% was obtained, observing the requirement $\beta\omega^\beta \ll 1$ when assigning its maximum spatial frequency for image values.

At the same time, the upper right quadrant of Figure 3 does not yet contain obvious nonlinear (inherent in images with power amplification) image contrast distortions. With a further increase in the energy prevalence of the right image, the linearity of the transformation began to break.

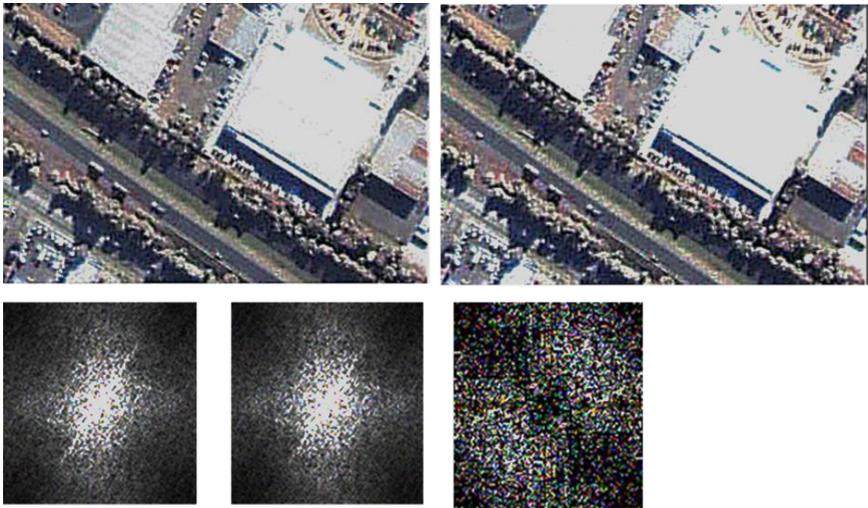


Fig. 3. Original image with resolution correction (top left); corrected image (top right); spatial frequency spectrum of the original image (bottom left); spatial frequency spectrum of the corrected image (bottom center); difference spectrum (bottom right)

Conclusions:

The requirements introduced in the work to fulfill the conditions of the multiplicative form $\beta\omega^\beta \ll 1$ are the starting ones for image correction with an increase in the contrast level of the image counts with the exclusion of almost completely nonlinear transformations.

References

1. *Air reconnaissance radar stations / Ed. Kondratenkova G.S. – M.:Voenizdat, 1983. – 152 P.*
2. *Bates R., McDonnell M. Image Recovery and Reconstruction. – M.:Mir. 1989. – 336P.*
3. *Tikhonov V.I. Statistical radio engineering. – M.:Soviet radio,1966. – 677 P.*
4. *Vintaev V.N., Ushakova N.N. Non-trivial correction of high-resolution space images. – Saarbrücken, Germany: Lambert Academic Publishing, 2018. – 208 P.*
5. *Vintaev V.N., Dubinin V.I., Konstantinov I.S., Ushakova N.N. The problem of synthesizing algorithms for verifying video data // Piloted flights into space: mater. of IV international scientific and practical conf. – M.:Star City, 2000. – P.171-172.*

热电厂热泵最大允许容量变化分析
**ANALYSIS OF CHANGES IN THE MAXIMUM ALLOWABLE
CAPACITY OF HEAT PUMPS AT THERMAL POWER PLANTS**

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抽象的。本文致力于评估热泵机组 (HPU) 的最大允许容量, 该设备可以集成到技术方案中, 条件是一些现有热电厂在电力市场上的盈亏平衡运行 (TPP) 的领土发电公司 1 (TGC-1)。对于所考虑的发电厂, HPU 的最大允许容量值计算了 1 个月的时间。就研究中使用的方法而言, 最有益的联合热电厂 (CHPP) 是 CHPP-22 和 CHPP-5。HPU 的能量转换系数 (ECC) 等于 5 时, CHPP-22 的平均最大允许容量为 689.1 MW, 而 CHPP-5 的平均最大允许容量为 711.6 MW。评价并以 CHPP-5 为例说明站场技术经济指标对热泵容量终值形成的影响。研究表明, 在对实际火电厂热泵容量进行评估和选择时, 需要考虑该站运行的技术经济指标的复杂性, 如: 供电量、电力批发市场 (WEM) 加权平均供电成本和供电参考燃料的特定消耗量。

关键词: 火力发电厂; 供热; 热泵; 电力市场; 能量学

Abstract. *This article is devoted to the assessment of the maximum allowable capacity of a heat pump unit (HPU), which can be integrated in a technological scheme, conditional upon a break-even operation in the electricity market for a number of existing thermal power plants (TPP) of Territorial Generating Company No. 1 (TGC-1). For the considered power plants, values of the maximum allowable capacity of a HPU were calculated for a period of 1 month. The most beneficial combine heat power plants (CHPPs) in terms of the methodology used in the study were the CHPP-22 and the CHPP-5. With a HPU's energy conversion coefficient (ECC) equal to 5, the average maximum allowable capacity for the CHPP-22 was 689.1 MW, and for the CHPP-5 – 711.6 MW. An assessment is given and the influence of the technical and economic indicators of stations on the*

formation of the final value of a heat pump's capacity is illustrated by the example of the CHPP-5. It is shown that when assessing and choosing the capacity of a heat pump for a real thermal power plant, it is necessary to take into account the complex of such technical and economic indicators of the operation of this station as: the amount of electricity supplied, the wholesale electricity market (WEM) weighted average cost of electricity supplied and the specific consumption of the reference fuel for electricity supply.

Keywords: *thermal power plants; heat supply; heat pumps; electricity market; energetics*

Introduction

Working within the tough framework of economic competition forces generating companies to take actions to reduce the consumption of primary energy resources. For thermal power plants, this is expressed in a decrease in the consumption of natural fuel for the production of heat and electric energy. One of the promising directions indicated in the energy strategy of the Russian Federation until 2035 [1] for energy and resources conservation at TPPs is the use of heat pump units in technological schemes of TPPs for additional heat production at stations or optimization of operating modes. In this area, studies are being carried out in which the possibility of heat pumps' integration into schemes of power plants of various types is considered: basic cogeneration steam turbine units [2], condensing steam turbine units of nuclear power plants [3], and the increasingly popular combined cycle gas turbine units [4].

For a heat pump unit, it is important to determine its boundary conditions of operation (the maximum capacity), at which it ceases to be economically efficient in the wholesale electricity market. These boundaries are determined by the condition of a break-even operation in the electricity market: there is a full compensation of fuel costs by revenues from supplies to the electricity market [5]. Thus, for one generating company with several TPPs, the maximum capacity of a HPU can vary widely and depends on many factors that are determined by the characteristics of a particular station's production and marketing activities.

The purpose of this work is to determine the maximum capacity of heat pumps at a CHPP in a break-even operation on the electricity market, using the example of a generating company in the Russian Federation, and analyze factors, that affect on the capacity.

Materials and methods

All calculations were made for the generating company TGC-1 using data on the actual operating modes of its stations and data on the specifics of its' work in the wholesale electricity market. Ten CHPPs of TGC-1 were considered: Central CHPP (C-CHPP), Pravoberezhnaya CHPP-5, Vasileostrovskaya CHPP-7, Pervo-

mayskaya CHPP-14, Avtovskaya CHPP-15, Vyborgskaya CHPP-17, Severnaya CHPP- 21, Yuzhnaya CHPP-22, Petrozavodskaya CHPP (P-CHPP) and Apatitskaya CHPP (A-CHPP). February 2021 was selected as the calculation period.

The method for finding the value of the maximum allowable capacity of a HPU is based on limiting the maximum capacity of a heat pump unit by the condition of a break-even operation in the electricity market (the should be a full compensation of fuel costs associated with electricity production by income from supplies to the electricity market) [5]:

$$Q_{HPU}^{max} = W_{e/e} \times (1 - w_{TPP}^{ON}) \times \left(1 - b_{e/e} \times 10^{-3} \times \frac{P_{nf}^{act}}{C_{e/e}} \times \frac{29300}{Q_a^c} \right) \times \varphi, \quad (1)$$

where $W_{e/e}$ – hourly output of electricity from a TPP, MW;

w_{TPP}^{ON} – share of electricity for own needs;

$b_{e/e}$ – specific consumption of the reference fuel (r.f.) for electricity supply, kg r.f./ $(MW \cdot h)$;

P_{nf}^{act} – natural fuel price, rubles/thousand m^3 (rubles/t);

$C_{e/e}$ – the WEM weighted average cost of released electricity, rubles/ $(MW \cdot h)$;

29300 kJ/kg r.f. – the calorific value of the reference fuel;

Q_a^c – actual heat of natural fuel combustion, kJ/ nm^3 ;

$\varphi=3 \div 5$ – HPU's energy conversion coefficient.

On the wholesale electricity market, power plants sell electricity simultaneously in several sectors. For TGC-1, two sectors are decisive: the day-ahead market (DAM) and the regulated contracts (RC). The WEM weighted average cost of electricity supplied, rubles/ $(MW \cdot h)$:

$$C_{e/e} = \frac{W_{e/e.DAM} \cdot C_{DAM} + W_{e/e.RC} \cdot C_{RC}}{W_{e/e.DAM} + W_{e/e.RC}}, \quad (2)$$

where $W_{e/e.DAM}$ – electricity supply to the day-ahead market, $MW \cdot h$;

C_{DAM} – the day-ahead market electricity cost, rubles/ $(MW \cdot h)$;

$W_{e/e.RC}$ – electricity supply under the regulated contracts, $MW \cdot h$;

C_{RC} – the regulated contracts electricity cost, rubles/ $(MW \cdot h)$;

Results and discussion

For every day of the considered period the values of the maximum allowable capacity of a heat pump were found, using equation (1). Figures 1-3 show the values of the maximum, the minimum, and the average values of the allowable capacity of a heat pump unit for the above-mentioned TTPs with different values of HPUs' energy conversion factor.

The results show that the CHPP-5 and the CHPP-22 have the maximum allowable capacity of a HPU.

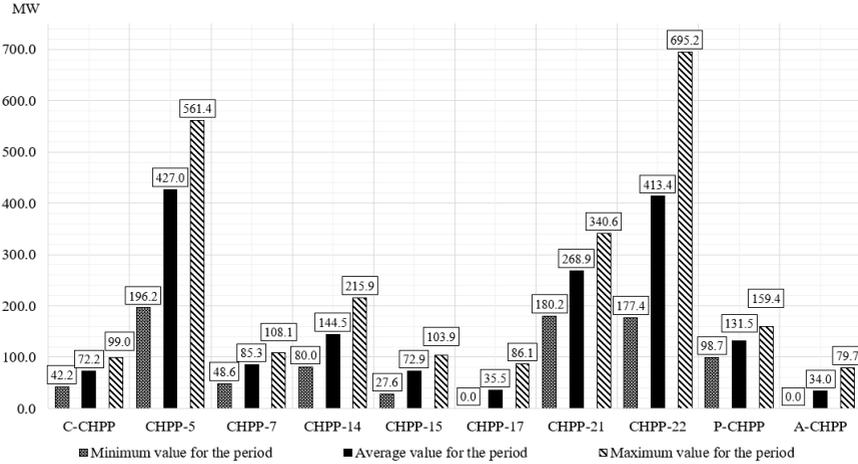


Figure 1. Maximum allowable capacity of a HPU for real CHPPs at $\varphi=3$

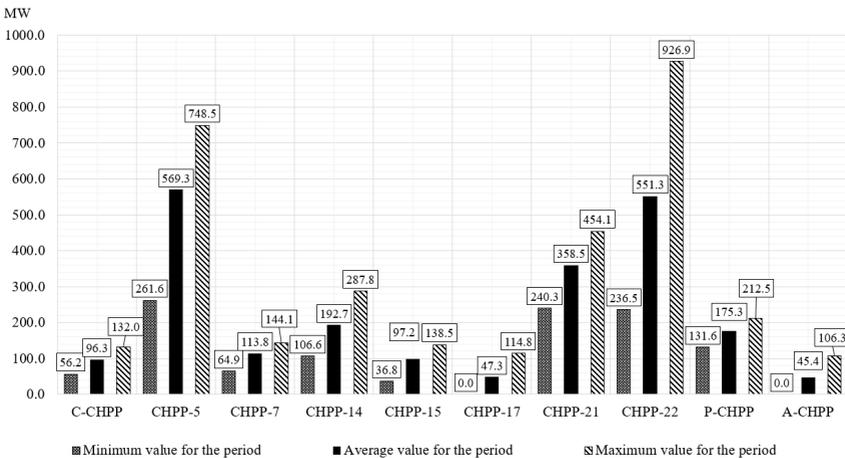


Figure 2. Maximum allowable capacity of a HPU for real CHPPs at $\varphi=4$

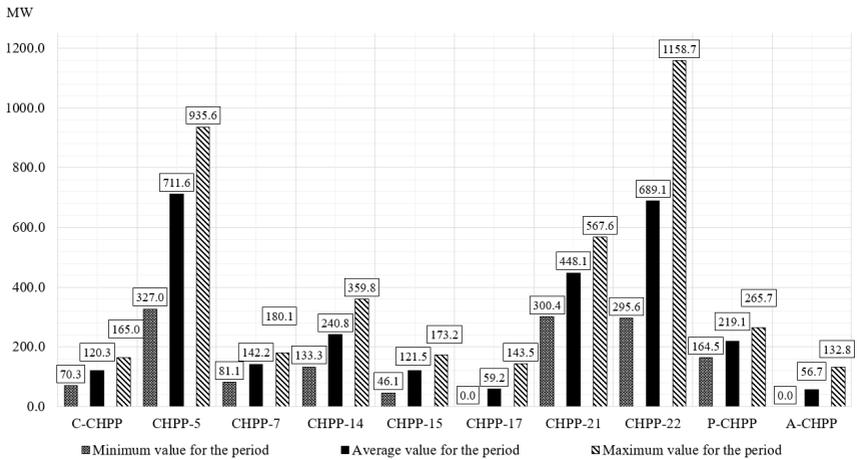


Figure 3. Maximum allowable capacity of a HPU for real CHPPs at $\varphi=5$

For the Pravoberezhnaya CHPP-5, the change in the allowable capacity of a HPU and the effect on its value of the parameters included in formula (1) during the considered calculation period are analyzed below.

Figure 4 shows the dynamics of the maximum allowable capacity changes. Figure 5 illustrates the hourly electricity supply, as well as the daily sales value of the electricity supplied. Figure 6 shows changes in the specific consumption of the reference fuel for electricity supply, as well as fluctuations in the cost of fuel (the cost of natural fuel is recalculated to the cost of the reference fuel).

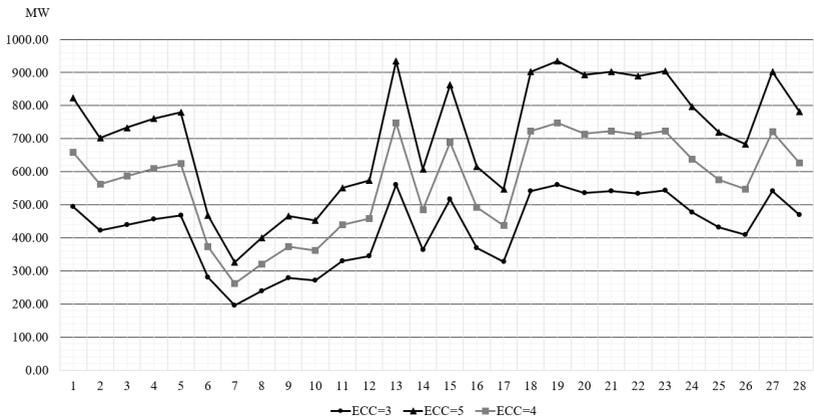


Figure 4. Changes in the maximum allowable capacity of a HPU at the CHPP-5

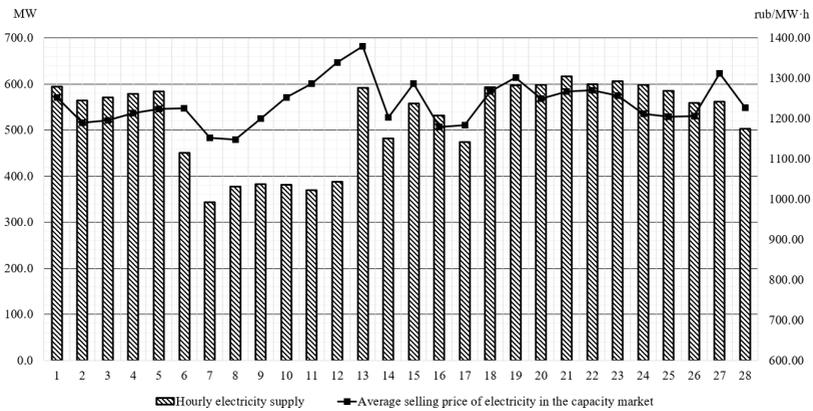


Figure 5. Changes in the hourly electricity supply and the average cost of electricity sales

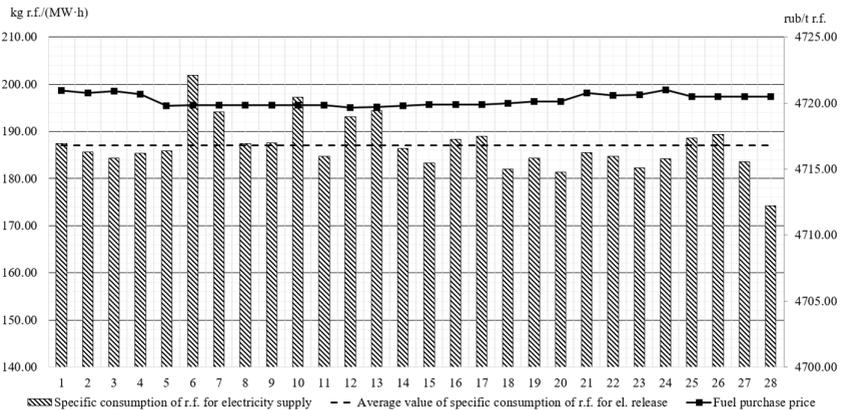


Figure 6. Changes in the specific consumption of the for electricity supply and the cost of fuel

Figure 4 shows that in the period, the cost of purchasing fuel by the station can be considered constant: actually, the changes in the cost values do not exceed 1 rubles/t r.f. and fluctuate around 4720 rubles/t r.f. Thus, the cost of fuel practically does not affect the value of the maximum allowable capacity of a heat pump.

If to consider the periods from February 1 to February 5, as well as from February 13 to February 28 in Figures 4 and 5, it can be seen that the profiles of the graphs of changes in the allowable HPU's capacity and changes in prices for

electricity supply look the same. This is especially noticeable on the days of peak values of a HPU's allowable capacity: February 13, 15, 19 and 27.

In the period from February 5 to 13, a significant decrease in the value of the maximum allowable capacity of a heat pump is observed. Despite the fact that the minimum value of the electricity supply price is on February 8 (1147.73 rubles/(MW·h)), the minimum value of a HPU's allowable capacity is on February 7. This is due to the influence of the hourly supply of electricity from the CHPP-5.

It can be assumed that of the three considered parameters, the change in the specific consumption of the reference fuel for electricity supply has the weakest effect on the value of the maximum allowable capacity of a HPP. This is clearly seen in Figures 4 and 6. For example, with the highest specific consumption of the reference for electricity supply on February 6 (201.91 kg r.f./(MW·h)), the value of the HPU's allowable capacity (467.43 MW at $\varphi = 5$) is far from the lowest in Figure 4 with $\varphi = 5$.

On the example of CHPP-5, it can be seen that when analyzing the maximum allowable capacity of a heat pump according to the method [5], resulting in equation (1), it is important to take into account a combination of factors (the hourly electricity supply, the weighted average price of electricity supply to the wholesale electricity market and the specific consumption of the reference fuel consumption for electricity supply). This goes from the fact that the prevailing factor changes in different periods of operation of the thermal power plant, which is studied.

Conclusions

The maximum allowable capacities of heat pumps at ten CHPPs of TGC-1 in conditions of break-even operation on the electricity market were determined for the calculation period of February 2021. The Pravoberezhnaya CHPP-5 and the Yuzhnaya CHPP-22 have the maximum values of the allowable capacity of a HPU.

For the CHPP-5, changes in HPU's capacity and factors determining it were shown. During analysis, it was revealed that the determining factors are the amount of electricity supplied, the weighted average selling price of electricity on the wholesale electricity market, and the specific consumption of the reference fuel for electricity supply, which affects to a lesser extent. It was clearly shown that when determining the capacity of a heat pump, there is a combination of the listed factors that should be taken into account.

Nomenclature

Abbreviations

| | |
|--------|---------------------------------------|
| A-CHPP | Apatity combined heat and power plant |
| C-CHPP | Central combined heat and power plant |
| CHPP | combined heat and power plant |

| | |
|--------|--|
| DAM | day-ahead market |
| ECC | energy conversion coefficient |
| HPU | heat pump unit |
| P-CHPP | Petrozavodsk combined heat and power plant |
| r.f. | reference fuel |
| RC | regulated contracts |
| TPP | thermal power plant |
| WEM | wholesale electricity market |

Variables and coefficients

| | |
|-------------------|---|
| $b_{e/e}$ | specific consumption of the reference fuel for electricity supply, kg r.f./(MW·h) |
| C_{DAM} | the day-ahead market electricity cost, rubles/(MW·h) |
| $C_{e/e}$ | the WEM weighted average cost of electricity supply, rubles/(MW·h) |
| C_{RC} | regulated contracts electricity cost, rubles/(MW·h) |
| P_{nf}^{act} | natural fuel price, rubles/thousand nm ³ (rubles/t); |
| Q_a^c | actual heat of natural fuel combustion, kcal/nm ³ |
| Q_{HPU}^{max} | maximum allowable power of a heat pump unit, MW |
| $W_{e/e}$ | hourly output of electricity from a TPP, MW |
| $W_{e/e,DAM}$ | electricity supply to the day-ahead market, MW·h |
| $W_{e/e,RC}$ | electricity supply under regulated contracts, MW·h |
| w_{TPP}^{ON} | share of electricity for own needs |
| $\varphi=3\div 5$ | HPU's energy conversion coefficient |
| 29300 | calorific value of the reference fuel, kJ/kg r.f. |

References

1. Ministry of Energy of the Russian Federation. *Energy Strategy of the Russian Federation for the Period Till 2035*. Available online: <https://minenergo.gov.ru/node/1026> (accessed on 30 August 2021)

2. Sergeev, V.V.; Anikina, I.D.; Kalmykov, K.S.; Naletov, I.D. *Efficiency of using heat pumps with various refrigerants in real steam turbine power units with PT-80 and T-250 turbines*. In *Proceedings of the International Scientific Conference on Energy, Environmental and Construction Engineering (EECE-2019)*, Saint-Petersburg, Russia, 19–20 November 2019; Volume 140, p. 10001, <https://doi.org/10.1051/e3sconf/201914010001>

3. S.E. Shcheklein, O.L. Tashlykov, A.M. Dubinin, *Improving the energy efficiency of NPP, Nuclear Energy and Technology, Volume 2, Issue 1, 2016, Pages 30-36, <https://doi.org/10.1016/j.nucet.2016.03.006>*

4. Sergeev, V.; Anikina, I.; Kalmykov, K. *Using Heat Pumps to Improve the Efficiency of Combined-Cycle Gas Turbines. Energies 2021, 14(9), 2685, <https://doi.org/10.3390/en14092685>*

5. Treshcheva, M.; Anikina, I.; Sergeev, V.; Skulkin, S.; Treshchev, D. *Selection of Heat Pump Capacity Used at Thermal Power Plants under Electricity Market Operating Conditions. Energies 2021, 14(1), 226, <https://doi:10.3390/en14010226>*

工具金属陶瓷: 与硬质合金相比, 在钻削灰口铸铁时的优势
**INSTRUMENTAL CERMETS: THEIR ADVANTAGES IN
COMPARISON WITH HARD ALLOYS WHEN DRILLING GRAY CAST
IRON**

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抽象的。用于制造刀具的现代材料,可提高材料加工质量。钻削金属时的工具金属陶瓷(硬质合金)及其特性。

关键词: 金属陶瓷, 耐磨性, 高性能加工, 硬质合金, 钻孔。

Abstract. *A modern material for the manufacture of cutting tools, which improves the quality of material processing. Tool cermets (hard alloys) and their characteristics when drilling metals.*

Keywords: *Cermet, wear resistance, high performance machining, cemented carbide, drilling.*

The most important condition for maintaining and developing competitive production is its continuous improvement. Considering the technological systems in which metalworking is carried out, it should be noted the most important direction in the development of high-speed and high-performance processing. They differ from traditional approaches in increased productivity, accuracy and quality of the surface layer. The implementation of these processing methods is carried out in a complex and imposes certain requirements on equipment and tools.

Processing on CNC machines is perfect for high-quality and precise processing of metals, ensuring the required roughness, high quality parts, obtaining ideal surfaces, maintaining specified dimensions, and increasing labor productivity. Such a machine performs all the necessary technological operations independently, with the control of a given program.

The choice of cutting tool material is an important factor when planning a metal-working operation.

One of the most promising tool materials today is cermet.

Let's compare the cutting conditions when drilling with cermets and hard alloys of Gray cast iron.

Using MatCad, we will create the spatial responses of the carbide and cermets cutting speed model. Next, on the basis of an analytical assessment of the spatial responses of the cutting speed model with the materials under consideration, we will construct a cutting speed monogram on the feed rate and drill diameter to compare cutting conditions.

Creation of a matrix filled with the values of stochastic experimental data, displaying this matrix on the screen, calculating the decay rate with simultaneous randomization of the experimental data.

$$y(x) := x^2 \cdot \sqrt{4 - x^2} \quad x_H := 0 \quad x_K := 2$$

$$N := 10 \quad i := 0..N \quad x_i := x_H + \frac{x_K - x_H}{N} \cdot i \quad Y_i := y(x_i)$$

 $x =$

| | |
|----|-----|
| | 0 |
| 0 | 0 |
| 1 | 0.2 |
| 2 | 0.4 |
| 3 | 0.6 |
| 4 | 0.8 |
| 5 | 1 |
| 6 | 1.2 |
| 7 | 1.4 |
| 8 | 1.6 |
| 9 | 1.8 |
| 10 | 2 |

 $Y =$

| | |
|----|-------|
| | 0 |
| 0 | 0 |
| 1 | 0.08 |
| 2 | 0.314 |
| 3 | 0.687 |
| 4 | 1.173 |
| 5 | 1.732 |
| 6 | 2.304 |
| 7 | 2.799 |
| 8 | 3.072 |
| 9 | 2.825 |
| 10 | 0 |

$X :=$

| |
|--------|
| 3 |
| 2 |
| 1.5 |
| -0.15 |
| 2.9 |
| 0.345 |
| 12 |
| 3.45 |
| -9 |
| -0.123 |

$Y := y(X)$

 $Y =$

| | |
|---|------------------------|
| | 0 |
| 0 | 20.125i |
| 1 | 0 |
| 2 | 2.976 |
| 3 | 0.045 |
| 4 | 17.661i |
| 5 | 0.234 |
| 6 | 1.704i-10 ³ |
| 7 | 33.46i |
| 8 | 710.772i |
| 9 | 0.03 |

Determination of processing modes using the Rastrigin optimization function.

$$f(\mathbf{x}) = An + \sum_{i=1}^n [x_i^2 - A \cos(2\pi x_i)]$$

where: $A = 10$

```

Program MAX;
{ Найти максимальное число }
Uses Crt;
Var
  n,imax,i:integer;
  max:real;
  a:array[1..25] of real;
Begin
  ClrScr;
{ Ввод исходных данных }
  Write('Введите кол-во эл-в массива: '); Read(n);
  WriteLn('Ввод массива');
  for i:=1 to n do begin
    Write('a[' ,i, ']= ');
    Read(a[i])
  end;
{ Вывод исходных данных }
  WriteLn('Кол-во элементов массива = ' ,n);
  WriteLn('Исходный массив');
  for i:=1 to n do
    WriteLn('a[' ,i, ']= ' ,a[i]:4:1);
{ Расчётная часть }
  imax:= 1; max:= a[1];
  for i:= 2 to n do
    if a[i]>max then begin
      max:= a[i];
      imax:= i;
    end;
{ Вывод результатов }
  WriteLn('Максимальный элемент массива a[' ,imax, ']= ' ,max:5:3);
End.

```

Gray cast iron drilling

Initial analytical expression for determining the cutting speed when drilling

$$v := \frac{C_v D^q}{T^m s^y} K_v$$

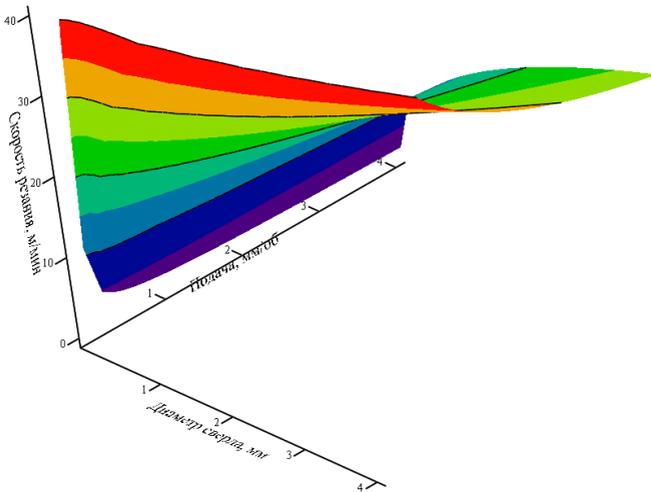


Fig. 1 Spatial response of the cutting speed model (carbide)

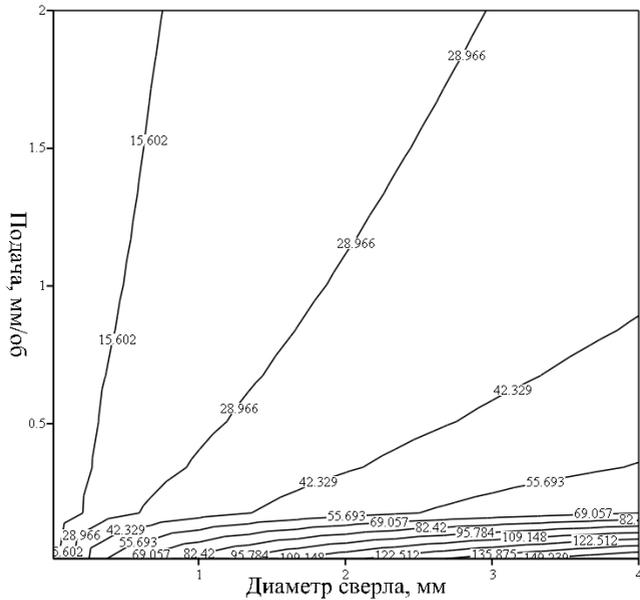


Fig. 2 Nomogram of cutting speed versus feed and drill diameter (hard alloy)
(built on the basis of an analytical assessment of the spatial response of the model, fig. 1)

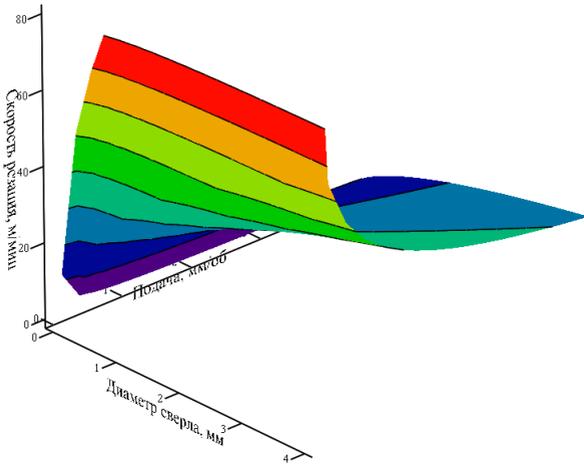


Fig. 3 Spatial response of the cutting speed model (cermet)

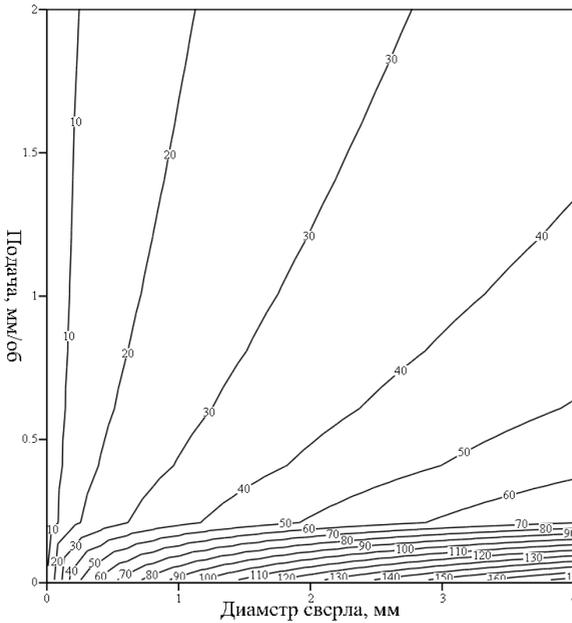


Fig. 4 Nomogram of cutting speed versus feed and drill diameter (cermet) (built on the basis of an analytical assessment of the spatial response of the model, Fig. 3)

In comparison, we see that when drilling Gray cast iron, cermets significantly outperform hard alloys in cutting conditions.

The emergence of a large range of cutting tools raises the problem of optimal choice very sharply. The task of selecting the optimal tool for the given organizational and technical conditions can be quite laborious. As a result, to reduce labor intensity, to warn against possible non-optimal solutions, it is necessary to summarize the main key points that speed up the selection process.

The sequence of the choice of the instrument is important, highlighting the main key issues that arise at various stages.

An important factor is the organizational aspect. It includes information support of technologists and engineers - economists and other interested parties with the necessary data sources. Summarizing the main sources of data required, the most important should be highlighted:

- state standards;
- catalogs of manufacturers of tools;
- electronic databases on the instrument;
- electronic resources on the Internet;
- technical reference books.

Considering the listed data sources, it should be noted that in the conditions of the rapidly developing market of cutting tools, catalogs of tool manufacturers, electronic databases on tools, interactive Internet resources have the most complete and new information. Electronic databases have the greatest ease of use, but they lack additional technical information. This problem can be solved by additional equipping the workplace with technical manuals, as well as a selection of the required information.

The electronic databases of the largest manufacturing companies (Sandvik – www.coroguide.com) are equipped with an automated search system. This greatly speeds up and simplifies the selection process, and it is also possible to quickly form orders for the selected tool. Let's note the Internet resources of the leading manufacturers of tools for high-speed and high-performance processing:

- Sandvik – www.coromant.sandvik.com/ru;
- ISCAR – www.iscar.ru;
- Mitsubishi - www.mitsubishicarbide.ru;
- Mapal - www.mapal.de;
- Kennametal – www.kennametal.com;
- Pokolm - www.pokolm.com;
- Dormer Tools – www.dormertools.ru;
- Seco - www.secotools.com;
- Prototyp - <http://www.prototyp.com>;
- Pramet -www.pramet.com;

- Walter -www.walter.com;
- Korloy- <http://www.korloy.com>;
- Titex - <http://www.titex-prototyp.com>.

Domestic tooling enterprises:

- KZTS Kirovograd hard alloys plant - www.kzts.ru;
- Association of manufacturers of machine tool products "Stankoinstrument"
-<http://www.stankoinstrument.ru>.

The choice of tool firms, first of all, should be subject to the principle of comparative analysis of the tool of different firms for technical and economic efficiency.

For the design of technological processes for the machining of parts, an important stage is the choice of a cutting tool. A very large assortment of cutting tools gives us a great opportunity to choose the optimal tool for the required operations.

Looking at the analysis made, we can conclude that modern cutting tools are superior to conventional cutting parameters in terms of cutting parameters. This can be explained by the following advantages:

- use of new tool geometries;
- efficient use of cutting edges;
- very high durability;
- use of modern alloys for the manufacture of cutting inserts.

Accordingly, looking at the advantages obtained, we conclude that the modern cutting tool material cermet and its new characteristics allow the use of more optimal and high cutting conditions, which has an impact on improving the productivity of the machining process.

References

1. Whittington K., Vlasov V. *High-speed machining // CAD and graphics*, - 2002. – No11.
2. Zayakin S. *Cuts all the same tools // Equipment*. – 2006 - No 109.
3. *Based on site materials: www.mitsubishicarbide.ru*.
4. *Main directory Sandvick Coromant 2007*.
5. *ISCAR main catalog 2007*.
6. *High-performance metal cutting. M.: publishing house "Polygraphy" 2003. – 301 P.*
7. Krasnova M.N., Drobyshev A.A. *Instrumental cermets: properties and advantages. // Topical issues of theory and practice of scientific research development: collection of articles of the International Scientific and Practical Conference (July 14, 2020, Perm).-UFA OMEGA SCIENCE,2020.-33 P.*

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研究高架岩层物理状态的地-地下探测技术的发展与方法
**ON THE DEVELOPMENT AND METHOD OF GROUND-
UNDERGROUND PROBING FOR THE STUDY OF THE PHYSICAL
STATE OF THE OVERHEAD STRATA OF ROCKS**

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抽象的。一种获取环境物理状态信息的方法被认为与开发的地-地下探测方法相关，该方法基于对一组给定频率的准稳态电磁场进行数值分析来实现。线性源，显示了其实际应用的前景。

关键词：电勘探，地-地下探测，异常，准平稳磁场，数值模拟。

Abstract. *A method for obtaining information about the physical state of the environment is considered in relation to the developed method of ground-underground probing, implemented on the basis of a numerical analysis of a quasi-stationary electromagnetic field for a given set of frequencies generated by a linear source, which has shown the promise of its practical application.*

Keywords: *electrical prospecting, ground-underground probing, anomaly, quasi-stationary magnetic field, numerical modeling.*

Monitoring the physical state of the water-bearing layer (WBL) during mining operations, especially in the conditions of salt deposits, is one of the urgent modern tasks.

In order to develop information capabilities for predictive control of the physical state of WBL, we are developing an electrometry method based on the use of electromagnetic ground-underground probing (GUP), which has the potential to significantly increase the information content of the results [3, 4]. One of the problems in its implementation is the creation of a method for solving the inverse problem as applied to this method. Many scientists have dealt with similar issues [1, 2, 5, 6, etc.], but in view of the complexity of the analytical solution of this problem, it has not yet been adequately implemented and requires the search for an

approximate, simplified method for assessing the physical state of the supra-drift water-bearing layer (WBL).

In this paper, one of the variants of such a method is considered, based on the assessment of the degree of anomalousness of the observed field by its comparative analysis with the background component of the magnetic field, which is the closest to the features of the problem being solved.

The implementation of this method is carried out on the example of the underground-ground probing (UGP) method (which is a variant of the GUP method), which provides the possibility of ground-based survey when the AB linear source is located at the depth of the mine opening (fig. 1). Let's consider the process of this implementation.

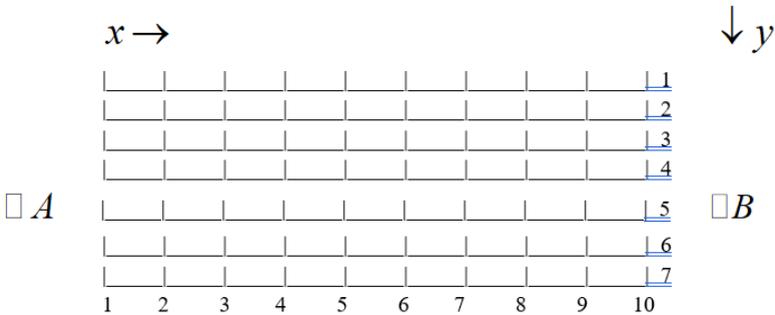


Fig. 1. Scheme of areal observations using the UGP method

To determine the strength of the magnetic field created by a linear source AB in a homogeneous medium (H_0), the Bio-Savart-Laplace law was used, taking into account the possibility of its application not only for a constant field, but also for a quasi-stationary field:

$$dH_0 = \frac{I \sin \alpha}{4\pi r^2} dl \quad (1)$$

According to fig. 1, $\sin \alpha = \frac{r d\alpha}{dl}$; and correspondingly, $dl = \frac{r d\alpha}{\sin \alpha}$; or considering that $r = \frac{r_0}{\sin \alpha}$ value $dl = \frac{r d\alpha}{\sin \alpha} = \frac{r_0 d\alpha}{\sin^2 \alpha}$. In accordance with these relations, formula (1) will be written in the form

$$dH_0 = \frac{I \sin^3 \alpha}{4\pi r_0^2} \cdot \frac{r_0 d\alpha}{\sin^2 \alpha} = \frac{I \sin \alpha}{4\pi r_0} d\alpha \quad (2)$$

By integrating this expression in the range from α_1 to α_2 , we obtain the formula for calculating the magnitude of the magnetic field strength at the observation

point located at a distance r_0 from the supply line AB in the direction orthogonal to it, in the case of a homogeneous model of the medium:

$$H_0 = \frac{I}{4\pi r_0} (\cos \alpha_2 - \cos \alpha_1) = \frac{I}{4\pi r_0} \left(\frac{x}{\sqrt{x^2 + r_0^2}} + \frac{(l-x)}{\sqrt{(l-x)^2 + r_0^2}} \right). \quad (3)$$

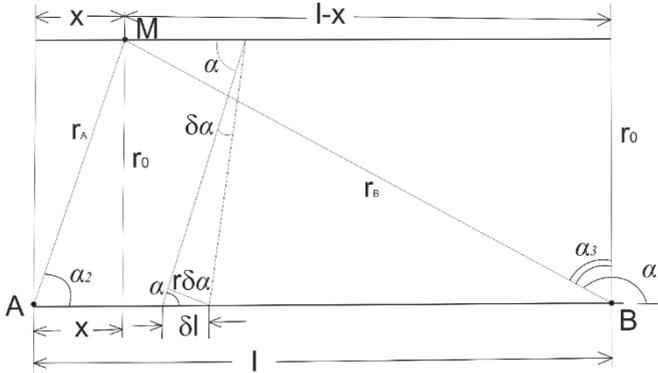


Fig. 2. To the calculation of the magnetic field generated by a linear source of limited length AB

According to fig. 3, which reflects the nature of the location of the source and observation points, we obtain formulas for determining the components of the magnetic field in relation to the UGP method:

$$H_{0,x}(x, r_0) = 0 \quad (4)$$

$$H_{0,y}(x, r_0) = H_0(x, r_0) \cdot \sin \alpha \quad (5)$$

$$H_{0,z}(x, r_0) = H_0(x, r_0) \cdot \cos \alpha, \quad (6)$$

where $H_0(x, r_0)$ - the total field determined by the formula (3);

$r_0 = \sqrt{Z_0^2 + y^2}$, Z_0 - AB line depth;

The value of the angle α is found from the relation

$$\alpha + \alpha_1 = 90^\circ, \quad (7)$$

where $\alpha_1 = \text{artg} \frac{y}{Z_0}$; y - distance from the projection of the AB line on the earth's surface to the observation profile.

Based on this, we obtain

$$\alpha = 90^0 - \alpha_1 = 90^0 - \text{artg} \frac{y}{Z_0} \cdot \tag{8}$$

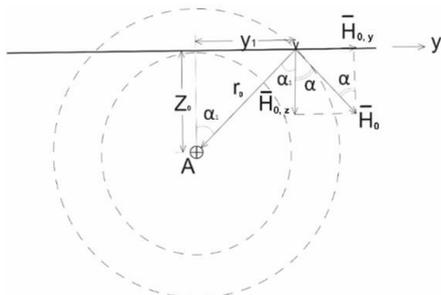


Fig. 3. Determination of the magnetic field components for the UGP method

The plots reflecting the behavior of the magnetic field components ($H_y(y)$, $H_z(y)$) along the profile intersecting the linear source AB for different values of X are shown in fig. 4 (at $AB=1000$ m, $I=1$ A, $I=1$ A, $\rho_0 \geq 1000$ Ом·м).

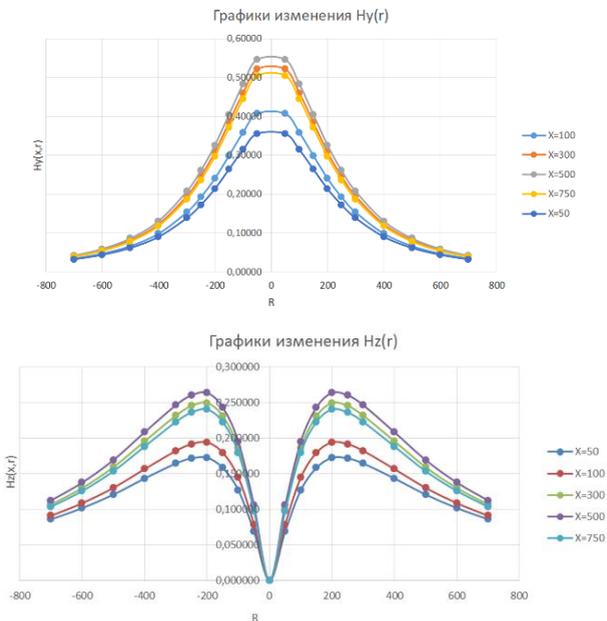


Fig. 4. Graphs of the components of the magnetic field $H_y(y)$ and $H_z(y)$ for different values of X, displaying the influence of the finiteness of the supply line AB on the magnitude of the measured magnetic field

In order to optimize the formation of the background field model, the following operations were used.

1. Determination and accounting of the coefficient associated with the reduction of the magnetic field for a homogeneous medium to its constant value, which removes the influence of the features of the nature of its behavior with distance from the linear source AB and the influence of its limited length:

$$k(x, y) = \frac{H_{0,max}(X=AB/2, y=min)}{H_0(x, y)}, \tag{9}$$

$$H_1(x, y) = k(x, y) \cdot H_0(x, y),$$

where $H_{0,max}(x=AB/2, y=min)$ and $H_0(x, y)$ are calculated by the formula (3).

According to the results of the performed 2D numerical simulation (fig. 5), in the case of a homogeneous medium with a resistance of more than $1000 \text{ } \Omega \cdot \text{m}$ and a field frequency in the range of 39–3125 Hz, the magnitude of the magnetic field does not actually depend on the resistance of the medium and the frequency; therefore, the resulting background field has a constant value for the subject. section ($H_1(x, y) = const$). At the same time, the performed numerical analysis showed a significant increase in the degree of manifestation of a low-resistance medium (with a resistance less than $10^3 \text{ } \Omega \cdot \text{m}$) in a quasi-stationary magnetic field. This information can also be used, if necessary, in shaping the background magnetic field.

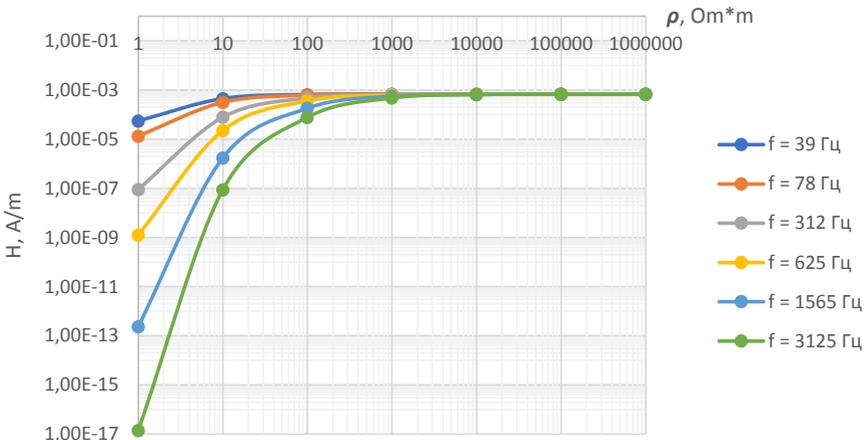


Fig. 5. Dependence of the magnetic field of a linear source on the resistivity of a homogeneous medium for a given frequency range (from 39 to 3125 Hz)

2. Determination of the background field for a heterogeneous medium.

2.1. Reducing the influence of the limb of the supply line and the nature of the change in the magnetic field with distance from the linear source

$$H_{obs}^0(x, y, f) = k(x, y) \cdot H_{obs}(x, y, f). \tag{10}$$

In this case, the frequency f is selected depending on the distance of the observation point from the supply line AB ($f = f(y)$) using the analysis of parametric probings.

2.2. Statistical analysis of the field $H_{obs}^0(x, y, f)$ in order to highlight its most stable values with an accuracy of a given value (10-15%).

2.3. Determination of the background magnetic field in the form of the average value of the set $H_{obs}^0(x, y, f)$, determined from the results of statistical analysis (or taking into account the degree of its background variability over the area (x, y))

$$H_{cp}^0(x, y, f) = \frac{1}{n} \sum_{j=1}^n H_{na6n}^0(x, y, f) \tag{11}$$

3. Determination of anomalous values of the observed magnetic field $H_{anom}^0(x, y, f)$:

$$H_{anom}^0(x, y, f) = \frac{H_{na6n}^0(x, y, f) - H_{cp}^0(x, y, f)}{H_{cp}^0(x, y, f)} \cdot 100\%. \tag{12}$$

4. Repetition of subp. 2-4 to assess the anomalousness of the components of the magnetic field X $\bar{H}_y(x, y)$, $\bar{H}_z(x, y)$.

The results of testing the developed algorithm in order to analyze the nature of the manifestation of low resistance anomalies in the case of GUP and UGP for model data are shown in fig. 6.

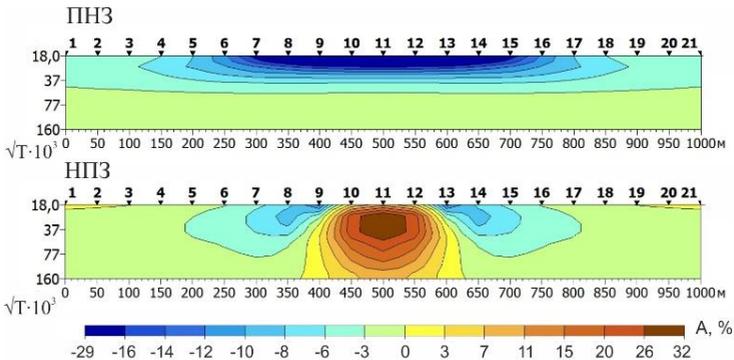


Fig. 6. Anomaly parameter sections

As a result of the conducted studies, an approximate method of interpreting the results of observations by the UGP method was developed, which provides the possibility of obtaining express information about the presence of zones of increased disturbance of the water-protective properties of the rocks of the overhead section of the section.

References

1. *Bursian V.R. The theory of electromagnetic fields used in electrical exploration. L.: Bowels, 1972. 368 P.*
2. *Zaborovskiy A.I. Electrical prospecting. M.: GNTINiGTL, 1963. 423 P.*
3. *Kolesnikov V.P. Electrometry. Fundamentals of the theory of alternating electromagnetic fields: textbook. Perm: PSU Publishing House, 2013. 185 P.*
4. *Kolesnikov V.P., Laskina T.A. Development and implementation of the method of low-frequency ground-underground probing// Bulletin of Perm Geological University. 2018. V.17, № 3. P.284-291.*
5. *Semenov V.S., Dybowski V.G. Nevedomsky A.V. Electromagnetic field of linear alternating current in a plane-layered medium. Siberian institute of physics and technology at Tomsk state un-ty. 2000.*
6. *Svetov B.S. Fundamentals of Geoelectrics. M.: Publishing house of LCI, 2008. 656 P.*

根据纳尔奇克气象站分析 1961–2020 年期间的气候变化
**ANALYSIS OF CLIMATIC CHANGE FOR THE PERIOD 1961-2020
ACCORDING TO THE NALCHIK
WEATHER STATION**

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抽象的。气候一直以来都是我们大气的“参数”之一，最容易受到变化的影响。在过去的十年中，许多气象量的月平均气候特征发生了显著变化。

由于大量科学研究，有足够的证据表明全球和区域范围内的气候变化。当地的气候变化引起了人们极大的兴趣。

本文的目的是根据位于卡巴尔达-巴尔卡尔共和国山麓地带的纳尔奇克气象站的数据，分析1961–2020年期间气温变化、降水变化和积雪厚度的变化。 ，在海拔500 m 的高度。

研究结果发现，在Nalchik m/站研究期间，2020年年均气温增长率增加，创历史新高，各季节降水量减少，除了春天。在全球变暖期间观察到平均 10 天积雪厚度的增长率增加。

关键词：温度，降水情况，积雪厚度，气象站，趋势，异常，变化率。

Abstract. *The climate has always been and is one of the "parameters" of our atmosphere, which is most susceptible to changes. Over the past decade, many of the monthly average climatic characteristics of a number of meteorological quantities have changed significantly.*

Thanks to numerous scientific studies, there is ample evidence of climate change on a global and regional scale. Local climate changes are of great interest.

The purpose of this article is to analyze changes in the temperature regime, precipitation regime and the thickness of the snow cover for the period 1961-2020 according to the data of the Nalchik meteorological station, located in the foothill zone of the Kabardino-Balkarian Republic, at an altitude of 500 m above sea level.

As a result of the study, it was found that during the period under study at the Nalchik m/station there was an increase in the growth rate of average annual temperatures with a record high anomaly in 2020 and a decrease in precipitation

amounts in all seasons, except for spring. An increase in the growth rate of the average 10-day snow cover thickness was observed during the period of global warming.

Keywords: *temperature, precipitation regime, snow cover thickness, meteorological station, trend, anomaly, rate of change.*

In Russia, 2020 was the warmest year on record, and warming is happening here faster than the world average. If earlier scientists had to prove that the climate crisis is real, now the inhabitants of Russia notice with their own eyes climate change: more frequent and destructive hurricanes, ice rains, heat, drought, floods [1].

The fact of a significant increase in the average air temperature near the Earth's surface is beyond doubt. Regular observations of the worldwide network of meteorological stations confirm the change in average temperature [2].

According to research by Rankova E.Ya., in Russia in the twentieth century, in all seasons, an increase in temperature was observed, in magnitude exceeding the estimates for the globe and the Northern Hemisphere as a whole. In the last 50 years, the trend decreased for the warm period, but increased significantly for the cold one. In Russia in the twentieth century the intensity of aridity increased in all seasons, but to a greater extent in the cold period. The intensity of warming over the 100th anniversary (1901-2000) averaged $0.9^{\circ}\text{C}/100$ years for the territory of Russia. The maximum warming was noted in 1995. In the last 50 years, there has been a tendency towards a decrease in annual and seasonal precipitation amounts for Russia as a whole [3].

The purpose of this article is to analyze changes in the temperature regime, precipitation regime and the thickness of the snow cover according to the data of the Nalchik meteorological station, located in the foothill zone of the Kabardino-Balkarian Republic, at an altitude of 500 m above sea level.

To study climate change, the data of hydrometeorological observations over a long period (1961-2020) were used.

The studies were carried out in the following directions: the time series of meteorological parameters were investigated by the methods of mathematical statistics and supplemented by linear trends characterizing the trend of the value under consideration for the full study period from 1961 to 2020 and for the period from 1976 to 2020, since 1976, according to the estimates of the Intergovernmental Panel on Climate Change (IPCC), is considered to be the beginning of global warming [4]. The trends were calculated by the well-known least squares method (LSM) [5]. The slope of the linear trend equation is a characteristic of the average rate of change of the climatic variable over the considered time interval and is expressed when analyzing the temperature regime in degrees per decade ($^{\circ}\text{C}/10$ years), for

the precipitation regime in millimeters/month per decade (mm/10 years) and for the average 10-day snow depth in centimeters per decade (cm/10 years). Average values were obtained for the period 1961-2020 standard deviations, norms and anomalies of mean temperatures, total precipitation and mean ten-day snow cover. The “norm” is understood as the long-term average value of the considered climatic variable for 1961-1990 (base period). Anomalies are defined as deviations of the observed value from the norm. To obtain the average annual series of snow cover, the average ten-day heights were averaged over 7 months of the cold season, from October to April, in the period 1960/61-2019/20.

Temperature regime

Data on annual and seasonal average temperatures, as well as data on changes in the temperature regime at the Nalchik meteorological station are shown in Table 1.

Table 1. Temperature regime and anomalies for 1961-2020, Nalchik

| Temperature, °C | year | winter | spring | summer | autumn |
|--|------|--------|--------|--------|--------|
| Average temperature (1961-2020) | 9,9 | -1,7 | 9,6 | 21,2 | 10,4 |
| Standard deviation (1961-2020) | 1,0 | 1,9 | 1,2 | 1,2 | 1,2 |
| Climatic norm (1961-1990), N | 9,3 | -2,3 | 9,1 | 20,4 | 10,0 |
| Average anomaly (1961-2020) | 0,6 | 0,6 | 0,5 | 0,7 | 0,4 |
| The angular coefficient of the trend (1961-2020), °C /10 yrs | 0,4 | 0,4 | 0,3 | 0,5 | 0,3 |
| The angular coefficient of the trend (1976-2020), °C /10 yrs | 0,6 | 0,6 | 0,5 | 0,7 | 0,5 |

At m/station Nalchik, the average annual temperature for the period 1961-2020 was $t = 9.9^{\circ}\text{C}$ at a rate of $N = 9.3^{\circ}\text{C}$ (1961-1990). Average seasonal temperatures also exceed the norm, especially the summer season, where the excess of the norm was 0.8°C .

There was an increase in the growth rate of average annual temperatures from $0.4^{\circ}\text{C}/10$ years in the period 1961-2020 up to $0.6^{\circ}\text{C}/10$ years in the period 1976-2020. The highest growth rate was observed in the summer period and amounted to $0.7^{\circ}\text{C}/10$ years (table 1).

Figure 1 shows that the number of positive anomalies is greater than negative (42:18), and since 1994 in Nalchik there have been extremely positive anomalies of average annual temperatures with a record high anomaly of $+2.3^{\circ}\text{C}$ in 2010 and $+2.4^{\circ}\text{C}$ in 2020, which exceeds the standard deviation by more than 2 times.

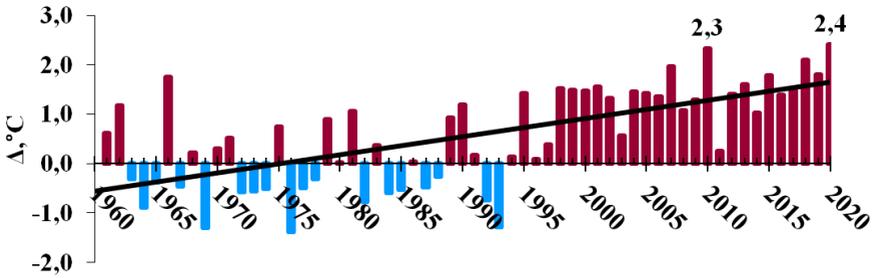


Figure 1. Annual average temperature anomalies, 1961-2020

Figure 2 shows the anomalies of mean annual and mean seasonal temperatures for 2020. In all seasons and throughout the year, positive anomalies of mean temperatures were observed the winter anomaly is in the lead, followed by the autumn and summer anomalies.

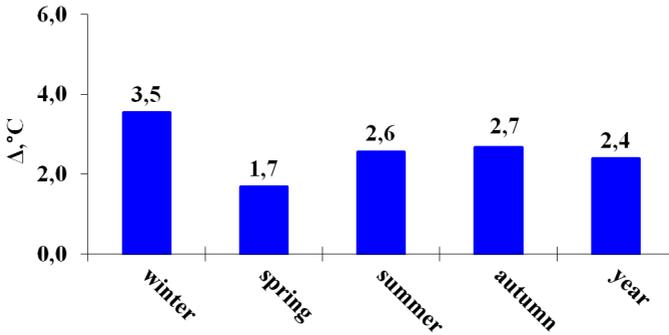


Figure 2. Seasonal mean temperature anomalies, 2020

Table 2 shows the years with the maximum and minimum values of the average monthly and average annual air temperature for the period from 1961 to 2020.

Table 2. Maximum and minimum values of the average monthly air temperature

| Periods | Months | | | | | | | | | | | | Year |
|---------|--------|------|------|------|------|------|------|------|------|------|------|------|------|
| | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | |
| year | 2007 | 2002 | 2008 | 2012 | 2003 | 2019 | 2018 | 2006 | 2015 | 2012 | 2010 | 2010 | 2020 |
| max | 2,3 | 5,2 | 8,6 | 15,1 | 18,6 | 23,5 | 25,2 | 26,2 | 19,9 | 14,4 | 8,7 | 4,5 | 11,7 |
| year | 1972 | 1976 | 1985 | 2019 | 1981 | 1967 | 1967 | 1984 | 1978 | 1976 | 1993 | 2002 | 1976 |

| | | | | | | | | | | | | | |
|-------------------------|-------|------|------|------|------|------|------|------|------|-----|------|------|-----|
| min | -12,5 | -9,9 | -2,8 | 5,9 | 12,7 | 17,1 | 19,5 | 18,5 | 13,4 | 5,4 | -5,5 | -7,2 | 7,9 |
| norm (1961- 1990) | -3,6 | -2,7 | 2,1 | 10,1 | 15,3 | 19,1 | 21,5 | 20,7 | 16,3 | 9,5 | 4,2 | -0,7 | 9,3 |

The table shows that in the average annual air temperature at a rate of 9.3° C, the minimum was +7.9°C in 1976, and the maximum in 2020 +11.7°C.

It can be noted that the maximum values of the average monthly temperature were observed only after 2002 (2002-2020), and the minimum values before 2002 (1967-2002). The greatest deviation of the minimum from the climatic norm was 8.9 ° C and was observed in January 1972 with a value of -12.5°C.

Precipitation mode

In Nalchik, the average value of the average annual precipitation for 1961-2020 is 635.1 mm with a norm of 636.4 mm. The maximum amount of precipitation falls on the summer season – 232.5 mm, followed by the spring (196.6 mm), autumn (134.3 mm) and winter (71.0 mm) seasons. In all seasons (except for autumn) and the year as a whole, the average anomalies in the amount of precipitation are negative (Table 3).

In the period from 1961 to 2020, there was a negative trend in annual precipitation (-2.6 mm/10 years) with a further increase (-6.9 mm/10 years) in the period 1976-2020. The deficit of winter and spring precipitation during the period of global warming has decreased, while the sums of precipitation in summer and autumn have acquired negative trends.

Table 3. Precipitation regime and anomalies for 1961-2020, Nalchik

| Precipitation, mm | year | winter | spring | summer | autumn |
|--|-------|--------|--------|--------|--------|
| The amount of precipitation (1961-2020) | 635,1 | 71,0 | 196,6 | 232,5 | 134,3 |
| Standard deviation (1961-2020) | 108,4 | 20,02 | 55,22 | 68,04 | 52,86 |
| Climatic norm (1961-1990), N | 636,4 | 72,0 | 201,9 | 233,8 | 127,7 |
| Average anomaly (1961-2020) | -1,3 | -1,0 | -7,0 | -2,0 | 5,7 |
| The angular coefficient of the trend (1961-2020), mm / 10 yrs | -2,6 | -1,8 | -2,6 | 1,1 | 1,0 |
| The angular coefficient of the trend (1976-2020), mm/ 10 yrs | -6,9 | -0,8 | 2,3 | -6,6 | -2,1 |

The performed analysis of anomalies of annual precipitation amounts for the period from 1961 to 2020. showed that the number of positive and negative anomalies for the entire study period was distributed approximately equally (31:29). A record high positive anomaly was observed in 1992 (256.8 mm), and negative in 1986 with a value of -234.4 mm (Fig. 3).

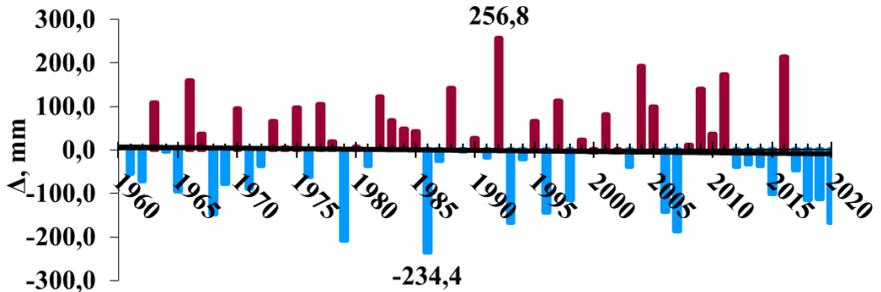


Figure 3. Annual precipitation anomalies, 1961-2020

Figure 4 presents an analysis of the anomalies of seasonal and annual precipitation amounts for 2020, from which it can be seen that this year there was a deficit in the amount of precipitation in the year and in all seasonal, except for spring.

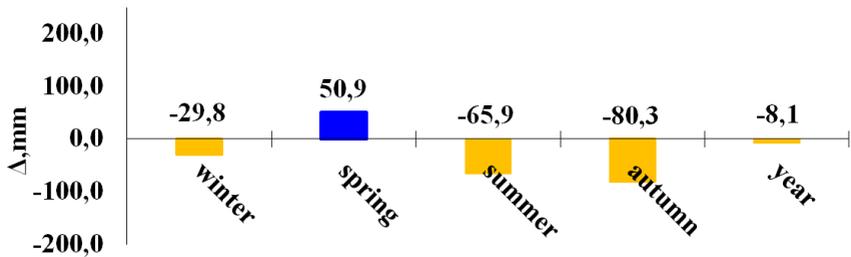


Figure 4. Seasonal precipitation anomalies, 2020

Table 4 shows the years with the maximum and minimum values of precipitation amounts for the period from 1961 to 2020.

Table 4. Maximum and minimum values of precipitation amounts

| Periods | Months | | | | | | | | | | | | Year |
|-------------------------|--------|------|------|------|-------|-------|-------|------|------|------|------|------|-------|
| | I | II | III | IV | V | VI | VII | VIII | IX | X | XI | XII | |
| year | 1966 | 1978 | 2018 | 1963 | 2016 | 2009 | 1997 | 1970 | 2009 | 1975 | 1992 | 2001 | 1992 |
| max | 54,0 | 59,1 | 94,6 | 166 | 177,2 | 211 | 179,5 | 148 | 173 | 162 | 90,2 | 79 | 893,2 |
| year | 1999 | 2017 | 1979 | 2009 | 2007 | 2006 | 2000 | 2006 | 1994 | 1974 | 2010 | 2011 | 1986 |
| min | 4,8 | 4 | 4,9 | 14 | 27 | 26 | 5 | 6 | 2,5 | 0 | 6 | 4 | 402,0 |
| norm (1961- 1990) | 22,6 | 24,3 | 39,3 | 64,1 | 98,5 | 100,3 | 72,3 | 61,2 | 55,1 | 43,5 | 29,1 | 26,2 | 636,4 |

The table shows that in the annual precipitation amounts at a rate of 636.4 mm, the minimum was 402.0 mm in 1986, and the maximum in 1992 was 893.2 mm.

The largest deviation of the maximum from the climatic norm was 118.5 mm and was observed in October 1975 with a value of 162 mm, and the deviation of the minimum precipitation from the norm (-74.3 mm) in June 2006 with a value of 26 mm.

Snow cover

One of the most important characteristics of the regional climate is the state of the snow cover. The analysis of observations of the regime of the thickness of the snow cover for the period 1960/1961 has been carried out to 2019/2020.

Seasons from October to April 1960/1961, 1961/1962, ..., 2019/2020 hereinafter, for brevity, they are written as 1961, 1962, ..., 2020. As in previous works [6, 7], when analyzing the characteristics of the snow cover, for example, 1961, the data of October, November, December 1960 and January, February, March and April 1961 were used. Table 5 presents the statistical characteristics of the thickness of the snow cover.

Table 5. Snow cover regime and anomalies for 1961-2020

| Snow cover, cm | Year |
|--|------|
| Snow cover thickness (1961-2020) | 4,0 |
| Standard deviation (1961-2020) | 2,7 |
| Climatic norm (1961-1990) , N | 3,8 |
| Average anomaly (1961-2020) | 0,2 |
| The angular coefficient of the trend (1961-2020), cm /10 yrs | 0,04 |
| The angular coefficient of the trend (1976-2020), cm /10 yrs | 0,12 |

As can be seen from the calculation results, the average 10-day snow cover thickness was 4.0 cm, which is 0.2 cm higher than the climatic norm. There has been an increase in the growth rate of the average 10-day snow cover thickness from 0.04 cm/10 years to 0.12 cm/10 years since 1976.

Over the studied period, the number of positive anomalies (25) is less than negative (35). A record high anomaly was observed in 2012 with a value of 11.3 cm (Fig. 5).

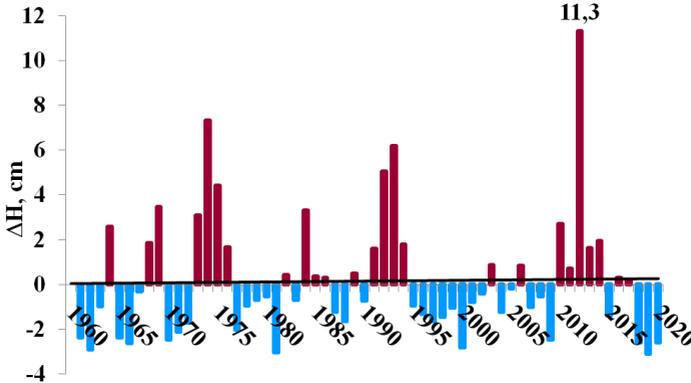


Figure 5. Annual anomalies of snow cover thickness, 1961-2020

Figure 6 shows the anomalies of the mean 10-day thickness of the SP by months of the cold period of 2020, which showed that there are no anomalies in October and November, and only negative anomalies were observed from December to April.

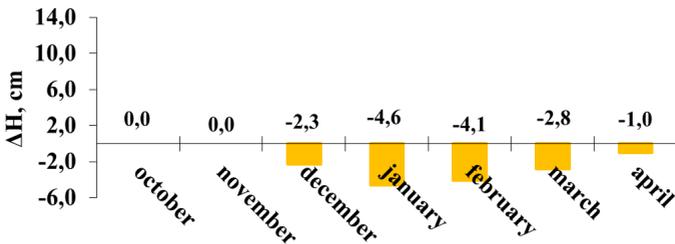


Figure 6. Anomalies in snow cover thickness by months, 2020

Studies on the distribution of the average 10-day SP thickness for the period from 1961 to 2020 showed that the highest averaged SP height at m/station Nalchik was obtained in January 4.4 cm and February – 6.0 cm (Table 6).

Table 6. Average 10-day SC height by months, 1961-2020

| Months | October | November | December | January | February | March | April |
|---------|---------|----------|----------|------------|------------|-------|-------|
| Nalchik | 0,8 | 1,7 | 3,2 | 4,4 | 6,0 | 3,2 | 1,2 |

The variation in the SP thickness over the observation period at the foothill m/station Nalchik ranges from 0.7 cm (2019) to 15.1 cm (2012), with an average long-term value of 4.0 cm.

Conclusions

At m/station Nalchik, an increase in the growth rate of average annual temperatures from 0.4°C/10 years was observed in the period 1961-2020 up to 0.6°C/10 years in the period 1976-2020. The number of positive anomalies exceeds the negative ones by more than 2 times (42:18) and since 1994 in Nalchik there have been extremely positive anomalies of average annual temperatures with a record high anomaly of + 2.3°C in 2010 and +2.4°C in 2020. Average value of the average annual precipitation for 1961-2020 is 635.1 mm with a norm of 936.4 mm. 1961 to 2020 at Nalchik station, a decrease in the amount of precipitation was observed in all seasons, except for the spring one. There has been an increase in the growth rate of the average 10-day snow cover thickness from 0.04 cm/10 years to 0.12 cm/10 years since 1976. A record high anomaly in the thickness of the snow cover was observed in 2012 with a value of 11.3 cm.

References

1. <https://greenpeace.ru/projects/izmenenie-klimata/>
2. Kokorin A.O. *Climate change: an overview of the state of scientific knowledge on anthropogenic climate change.* World Wide Fund for Nature. Moscow. 2005.P. 20.
3. Rankova E.Ya. *Climatic variability and climate change over the period instrumental observations / Institute of global climate and ecology of Roshydromet and RAS. M., 2005.*
4. Gruza G.V., Rankova E.Ya . *About modern climate changes.* <https://climatechange.igce.ru>
5. *Least squares method: method. instructions / comp .: L.V. Kolomiets, N.Yu. Ponikarov. - Samara: Publishing house of Samara University, 2017 - 32 p.*
6. *Russian Hydrometeorological Encyclopedic Dictionary / Ed. A.I. Bedritsky. St. Petersburg: Summer Garden, 2009. Vol. II. P. 34.*
7. Tashilova A.A., Kesheva L.A., Teunova N.V. *Analysis of long-term changes in the height of snow cover according to data from the Nalchik meteorological station. AMAN reports, vol. 19, no. 3, Pp. 70-78.*

天然盐在春小麦栽培中的除草效果
HERBICIDAL EFFICIENCY OF NATURAL SALT IN CULTIVATION
OF SPRING WHEAT

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抽象的。进行这些研究是为了评估 30% 天然盐溶液在春小麦栽培中的除草活性效果。在克拉斯诺亚尔斯克森林草原条件下的田间试验中，使用了克拉斯诺亚尔斯克边疆区 Troitsk 矿床的粗天然盐水，其成分中含有 g/l: 钠 - 77.07; 镁 - 0.49; 铁 - 3.67; 钙 - 2.56; 钾 - 2.36; 氯化物 - 131.00; 硫酸盐 - 1.51。天然盐的浓度是通过稀释原碱盐水得到的。研究表明，氯化钠是 Troitskoye 矿床盐水的主要成分，对杂草成分具有除草活性和作用选择性。天然盐溶液的最大效率在带有 30% 天然盐溶液和卫星 Zh 的变体中被注意到。收获小麦的作物总杂草在杂草数量方面减少了 84%，在生物量方面减少了 89%，表明这种使用天然盐的技术是有效的。发现这种天然除草剂对多年生根部脱落杂草 *Sonchus arvensis* 和 *Cirsium arvense* 以及一年生杂草 *Chinichloa crus-galli* 非常有效。

关键词：天然卤水，Troitskoye 矿床，除草剂，杂草，春小麦，农黑土。

Abstract. *The studies were carried out in order to assess the effect of the herbicidal activity of a 30% solution of natural salt in the cultivation of spring wheat. In a field experiment under the conditions of the Krasnoyarsk forest-steppe, crude natural brines of the Troitsk deposit of the Krasnoyarsk Territory were used, containing in their composition, g/l: sodium - 77.07; magnesium - 0.49; iron - 3.67; calcium - 2.56; potassium - 2.36; chlorides - 131.00; sulfates - 1.51. The concentration of natural salt was obtained by diluting the original base brine. Studies have established that sodium chloride, being the main component of brines from the Troitskoye deposit, has herbicidal activity on the weed component and selectivity of action. The maximum efficiency of the natural salt solution was noted for the variant with a 30% solution of natural salt with the Satellite, Zh. A*

*decrease in the total weediness of crops for harvesting wheat by 84% in terms of the number of weeds and by 89% in terms of biomass indicates the effectiveness of this technology of using natural salt. The natural herbicide was found to be highly effective against perennial root-shedding weeds *Sonchus arvensis* and *Cirsium arvense* and the annual weed *Chinochloa crus-galli*.*

Keywords: *Natural brine, Troitskoye deposit, herbicide, weeds, spring wheat, agrochernozem.*

Introduction

The creation of favorable conditions for the growth and development of agricultural crops during their growing season is determined by a set of agrotechnical measures [Purlaur et al., 2009; Strizhkov et al, 2018; Nikolaichenko, 2019; Kurdyukova, 2021], among which the main role is assigned to the fight against weeds. Weeds, being a constant component of agroecosystems, determine yield losses from 10 to 50%. Therefore, the use of chemical herbicides in the technology of cultivation of agricultural crops is several times higher than the amount of other plant protection products [Aktar et al, 2009; Cantrell et al, 2012]. At the present stage of the development of agriculture, a completely new concept is being formed, the essence of which is not in the complete destruction of the weed component in agrocenoses with the growing threat of environmental pollution by pesticides, but in the regulation of their number [Korneva et al., 2014; Yan et al, 2016; Cressey, 2015, Bruhal et al., 2017]. In this regard, the issue of a fundamental change in approaches to the development of new herbicides is being resolved. They must be safe for the environment and have a different mechanism of action from existing drugs. One of these compounds, which is proposed to be used as a natural herbicide, is the brine from the Troitskaya salt deposit (Krasnoyarsk Territory). The rationale for the possibility of using natural salts of various concentrations for weed control and its effect on soil properties was discussed by us earlier [Kurachenko et al, 2020; Vlasenko et al, 2020].

The purpose of the study – to evaluate the herbicidal efficiency of natural salt in the cultivation of spring wheat in the conditions of the Krasnoyarsk forest-steppe.

Objects and Methods

The studies were carried out in 2021 in the conditions of the Krasnoyarsk forest-steppe, located on the southwestern outskirts of Central Siberia. This territory receives 350-450 mm of precipitation per year. The average annual air temperature in the region varies from 0.5 to 3.0°C, sometimes dropping to -2°C. The duration of the period of biological activity varies within 90-155 days. The sum of active temperatures is 1550-1800°C, soils freeze to a depth of 1.5-3.0 m.

The study of the herbicidal effectiveness of natural salt was carried out in a

field experiment in wheat agrocenosis according to the scheme: 1) control (without treatment); 2) treatment of plants with a 30% solution of natural salt; 3) treatment of plants with a 30% solution of natural salt with an adhesive Satellite, J.

In the experiment, we used crude natural brines from the Troitskoye deposit, geographically located in the Krasnoyarsk Territory and having explored reserves of the mineral halite of about 1 billion tons. Crude natural brines of this deposit in their composition contained in g/l: sodium - 77.07; magnesium - 0.49; iron - 3.67; calcium - 2.56; potassium - 2.36; chlorides - 131.00; sulfates - 1.51. The concentration of natural salt was obtained by diluting the original base brine. The choice of concentration of natural salt as herbicide is based on preliminary field experiments.

The total area of the plot is 15 m², the registration area is 10 m², the location is systematic. Each variant is repeated four times. The crops of spring wheat variety Novosibirskaya 31 were sprayed using a professional battery-operated telescopic sprayer (CAIMANTELESCOPIC 150 EW) during the beginning of tillering with a massive appearance of weeds. The consumption rate of the working fluid was calculated on the basis of a hectare rate of 300 l/ha.

The soil of the experimental plot is clay-illuvial agrochernozem typical of heavy loamy granulometric composition, characterized by a high humus content (6.0-6.5%), a very high amount of exchange bases (53.2-62.0 mmol/100g), and a neutral reaction of the soil solution (pH_{n₂o} 6.8-6.9), a very high content of mobile phosphorus (343-316 mg/kg) and exchangeable potassium (228.6-220.1 mg/kg).

Weed counts were carried out by a quantitative method on 4 accounting plots with a size of 0.25 m² on each plot of the experiment, where the total number of weeds was counted by species. The biological effectiveness of natural salt was determined in comparison with the original contamination. Weed counts were carried out before the treatment of experimental plots, two weeks later, and before harvesting the crop.

Results and discussion. The formation of weeds in the crops of spring wheat took place under optimal conditions for their growth and development. During the period of emergence of spring wheat seedlings, the amount of precipitation exceeded the average annual level by 75%. Sowing of spring wheat on a layer of perennial grasses (forage mixtures) and warm weather conditions determined a strong degree of contamination of the agrocenosis of wheat before the start of its tillering. In the summer period, 17 species of weeds from 10 botanical families were recorded in wheat crops (tab. 1). The weed coenosis is represented by plants from the family Amaranth, Lebed, Cabbage, Madder, Lamb, Bluegrass, Pink, Compositae, Lipoaceae and Bindweed. The biomorphological spectrum of weed species indicates that 10 species are juvenile weeds and 7 species are perennial. Representativeness of biological groups of weeds, according to L.D. Protasova

et al. [2008] is determined by weather conditions. So in the control variant in extreme years, 15-16 species were observed, and in years favorable for plant growth, it reached up to 39 species.

Table 1 – Species composition of weeds in the agroecosystem of spring wheat

| Species | Latin name | Family | Biological group |
|------------------------|--------------------------------|-----------------|----------------------|
| annual | | | |
| Amaranthus retroflexus | <i>Amaranthus retroflexus</i> | Amaranthaceae | spring annual |
| Shepherd's Purse | <i>Capsella bursa pastoris</i> | Mustards | spring annual |
| White goosefoot | <i>Chenopodium album</i> | Chenopodioideae | spring annual |
| Cleavers | <i>Galium aparine</i> | Chenopodioideae | wintering annual |
| Galeopsis tetrahit | <i>Galeopsis tetrahit</i> | Mints | spring annual |
| Annual bluegrass | <i>Poa annua</i> | Pooideae | spring annual |
| Spear saltbush | <i>Atriplex patula</i> | Amaranthaceae | spring annual |
| Common wild oat | <i>Avena fatua</i> | Pooideae | spring annual |
| Setaria pumila | <i>Setaria</i> | Pooideae | spring annual |
| Cockspur grass | <i>Chinochloa crus-galli</i> | Pooideae | spring annual |
| perennial | | | |
| Dandelion | <i>Taraxacum</i> | Compositae | tap-root perennial |
| Silverweed | <i>Potentilla anserina</i> | Rosaceae | perennial |
| Field bindweed | <i>Convolvulus arvensis</i> | Convolvulaceae | root-scion perennial |
| Perennial sow thistle | <i>Sonchus arvensis</i> | Compositae | root-scion perennial |
| Leonurus | <i>Leonurus quinquelobatus</i> | Labiatae | tap-root perennial |
| Creeping thistle | <i>Cirsium arvense</i> | Compositae | root-scion perennial |
| Timothy | <i>Phleum pratense</i> | Pooideae | perennial |

The account of weediness of spring annual wheat crops showed that a strong degree of weediness was manifested in the first half of the growing season of the crop (tab 2). The rapid growth and development of spring annual wheat in the stemming phase resulted in the suppression of the weed component. The average degree of contamination of the culture (22 pcs/m²) in the control variant was noted during the ripening of the culture.

Table 2 – Dynamics of weed infestation of spring annual wheat crops

| Option | 30.06* | | 13.07** | | 17.08*** | |
|--------------------------------|--------------------|------------------|--------------------|------------------|--------------------|------------------|
| | pcs/m ² | g/m ² | pcs/m ² | g/m ² | pcs/m ² | g/m ² |
| Control (without treatment) | 60 | 56.4 | 60 | 58.0 | 22 | 24.4 |
| Natural salt 30% | 92 | 82.4 | 52 | 34.4 | 22 | 27.2 |
| Natural salt 30% +adhesive | 88 | 108.0 | 60 | 32.0 | 14 | 12.0 |

* - before treatment

** - two weeks after treatment

*** - before harvesting

A strong degree of contamination of the wheat agrocenosis was also noted in the variants of the experiment with the use of a 30% solution of natural salt. Before the treatment of crops with a natural herbicide, the number of weeds reached 88-92 pcs/m². A weed phytocenosis has formed here, consisting mainly of perennial weeds (52-61%). The dominant perennial species in these variants of the experiment were dandelion (*Taraxacum*), perennial sow thistle (*Sonchus arvensis*), and field bindweed (*Convolvulus arvensis*). The use of a 30% solution of natural salt and its use in conjunction with an adhesive made it possible to reduce the competition between weeds and the crop for the main factors of growth and development by the beginning of spring annual wheat stemming. Despite the growth of "second wave" weeds, the natural herbicide in all variants of the experiment led to a reduction in their number. The calculation of the biological effectiveness of a natural herbicide, determined two weeks after its application on vegetative plants, showed that the different form of its application affected the weed component at a similar level (44 - 32%) (fig.). The weeds that retained their viability were in a depressed state, as evidenced by their low biomass. The average weight of weeds on the variants of the experiment with the use of natural salt decreased 2.4-3.4 times and did not exceed 34 g/m².

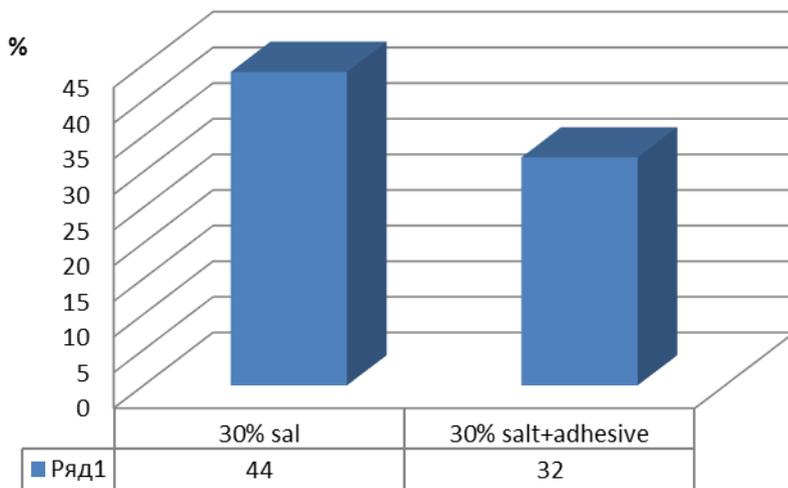


Figure - Biological efficiency of a solution of natural salt on crops of spring annual wheat, % to the initial state

The data of the field experiment showed a decrease in the total weediness of spring annual wheat crops to harvesting on the variant of the experiment using a 30% solution of natural salt with adhesion by 84% in terms of weeds and 89% in terms of biomass.

Evaluation of the effect of a natural salt solution on the main species showed its selectivity in relation to the weed component. In the soil of the control variant, in the July period of counting weeds, their maximum species diversity is noted (tab. 3). In the spring annual sowing of wheat of the control variant, single common wild oat (*Avena fatua*) and silverweed (*Potentilla anserina*) plants disappeared by this period. At the same time, perennial species dominated significantly - field bindweed (*Convolvulus arvensis*), dandelion (*Taraxacum*), creeping thistle (*Cirsium arvense*). Spear saltbush (*Atriplex patula*) prevailed among spring annual crops.

Table 3 – Characteristics of the action of natural salt solution on the main types of weeds (pcs/m²)

| Weed species | Control (without treatment) | | Natural salt 30 % | | Natural salt 30% + adhesive | |
|--------------------------|--------------------------------|-------|-------------------|-------|--------------------------------|-------|
| | 13.07 | 17.08 | 13.07 | 17.08 | 13.07 | 17.08 |
| <i>Perennial</i> | | | | | | |
| Dandelion | 8 | 0 | 20 | 3 | 16 | 0 |
| Field bindweed | 12 | 5 | 8 | 4 | 12 | 4 |
| Perennial sow thistle | 4 | 12 | 0 | 5 | 0 | 6 |
| Leonurus | 4 | 0 | 20 | 3 | 16 | 0 |
| Creeping thistle | 16 | 0 | 0 | 0 | 0 | 0 |
| Timothy | 0 | 0 | 4 | 0 | 0 | 0 |
| <i>Spring</i> | | | | | | |
| Spear saltbush | 8 | 1 | 4 | 8 | 4 | 3 |
| Cockspur grass | 4 | 4 | 0 | 1 | 0 | 1 |
| <i>Winter</i> | | | | | | |
| Cleavers | 4 | 0 | 4 | 1 | 12 | 0 |

The use of a 30% solution of natural salt to control the weed component on spring annual wheat crops showed high efficacy of the natural herbicide against perennial sow thistle (*Sonchus arvensis*) and creeping thistle (*Cirsium arvense*). The inhibition of the aerial part of perennial root-sprouting weeds in the variants of the experiment using a solution of 30% natural salt, as well as in the case of its use with the Satellite adhesive, is this confirmation. High activity of natural salt against the annual weed cockspur grass (*Chinocchio crus-galli*) was noted. The herbicidal activity of the natural salt solution was maintained until the end of the spring annual growing season of wheat.

Conclusion

The results of the field experiment showed herbicidal activity and selectivity of the action of a 30% solution of natural salt. Under the conditions of strong infestation of spring annual wheat crops, the effectiveness of the natural herbicide manifested itself two weeks after treatment and was accompanied by a decrease in the number of weeds by 44-32% and a decrease in their average weight by 2.4-3.4 times. The maximum efficiency of the natural salt solution was observed in the variant with the Satellite adhesive, which reduced the surface tension of the working solution, ensured the creation of a uniform film on the leaf surface and promoted better adhesion of the natural herbicide and its absorption by the plant.

A decrease in the total weediness of crops for harvesting wheat by 84% in terms of the number of weeds and by 89% in terms of biomass indicates the effectiveness of this technology of using natural salt.

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References

1. Brukhal F.Y., Krasnyuk L.M. Harmfulness of weeds in soybean crops in the forest-steppe zone of Ukraine // *Plant Protection*, 2017. - № 41. – P. 9-16.
2. Korneva O.G., Bayrambekov Sh.B., Dauletov B.S. Herbicides for protecting corn crops from weeds in the Volga delta // *Plant Protection and Quarantine*, 2014. - № 4. - P. 17-19.
3. Kurdyukova O.N. The system of chemical methods for controlling weeds in sunflower crops // *Bulletin of KrasGAU*, 2021. - № 1. - P. 37-42.
4. Protasova L.D., Larina G.E., Spiridonov Yu.Ya., Raskin M.S., Abubikerov V.A. Phytosanitary monitoring of fallow fields and adaptation of weeds to Roundup and Liberty // *Agrochemistry*, 2008. - № 4. – P. 59-72.
5. Purlaur V.K., Trubnikov Yu.N., Butkovskaya L.K., Morozov N.D., Kryuchkov A.A., Mazurov I.A., Salagasheva O.O., Alkhimenko R.V., Malinnikov A V.V., Malakhova Z.V., Terekhova V.F., Khizhnyak S.V., Platonova Yu.V., Zlotnikova O.V., Potekhin A.A., Bopp V.L. Chemical protection of grain crops in the Krasnoyarsk Territory: guidelines. - Krasnoyarsk, 2009.- P. 5-12.
6. Aktar W., D. Sengupta, D., Chowdhury A. Impact of pesticides use in agriculture: their benefits and hazards // *Interdisc. Toxicol*, 2009. - Vol. 2, - № 1. - P. 1–12.
7. Cantrell C.L., Dayan F.E., Duke S.O. Natural products as sources for new pesticides // *J. Nat. Prod*, 2012. - Vol. 75. - № 6. - P. 1231–1242.
8. Cressey D. Widely used herbicide linked to cancer // *Nature*, 2015. doi:10.1038/nature.2015.17181.
9. Kurachenko N. L., Ul'yanova O. A., Vlasenko O. A. and E. Yu. Cazanova The effect of natural salt of various concentrations on the chernozem chemical properties // *IOP Conf. Series: Earth and Environmental Science* 548 (2020), 072057.
10. Nikolaichenko N.V. Productivity of nontraditional medicinal and forage crops in the conditions of dry steppe of the Volga region // *Inter. J. Adv. Biotechnol. Res*, 2019. - V. 10. - № 2. - P. 384–391.

11. Strizhkov N.I., Azizov Z.M., Suminova N.B., Eskov I.D., Nikolaichenko N.V., Molchanova A.V. *The effect of the sowing methods and the seeding rate on the yield of nicandra physalodes biomass in single-species and mixed with sugar sorghum phytocenoses in the steppe zone of the Volga region // J. Pharmaceut. Sci. Res. 2018. V. 10. № 4. P. 323–329.*
12. Vlasenko O.A., Ul'yanova O.A., Kurachenko N.L., Kazanova E.Y. *Effect of natural salt solutions on grass- wheatgrass association phytomass //IOP Conference Series: Earth and Environmental Science 677(4) (2020), 04207*
13. Yan D., Zhang Y., Liu L., Yan H. *Pesticide exposure and risk of Alzheimer's disease: a systematic review and meta-analysis // Scientific Reports, 2016. - V. 6. 32222. doi:10.1038/srep32222.*

女贞子果实的形态解剖特征

**MORPHOLOGO-ANATOMICAL FEATURES OF THE FRUITS OF THE
*LIGUSTICUM SINENSE***

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抽象的。中国使用药用植物的经验可以追溯到几千年前,大约有 12000 种植物被用于中药 (TCM), 其中有 300 种药用植物是栽培的。

研究中药药用植物,可以合理选择在俄罗斯引种栽培的品种,增加药用植物及其制剂的储备。

在圣彼得堡国立农业大学与四川省农业科学院 (中华人民共和国成都) 工业作物科学研究所合作的框架内,获得了中国川芎的种子 (菖蒲)。东方的传统医学和西欧的医学中都使用了各种类型的襁褓。它们用于高血压、冠心病,具有镇痛、抗风湿、镇静、防腐作用,改善血液循环。

我们研究的目的是研究中国藜 (*Ligusticum sinense* Oliver, Apiaceae) 果实的形态和解剖特征。使用活体材料和固定在乙醇中的材料研究胎儿的形态和解剖结构。

川芎的果实椭圆形,二种子,分裂成两个分果 (果实的一部分),种子不从果皮中脱出。子果皮颜色为棕色,从背面不压扁,背侧凸出,具三棱和二侧棱。导电束穿过肋条;在成熟的水果中,它们几乎是看不见的。在背肋之间的凹陷处有 1-2 根精油小管,在侧面 - 2-3,在腹侧 - 2-4。成熟果实中的果皮薄壁细胞被压缩和弄皱。种皮的非木质化内果皮保存完好。

研究揭示了女贞子果实的特定形态学和解剖学特征,将它们与女贞子属的其他物种区分开来。对川芎的进一步研究,将有助于判断其在俄罗斯引种、栽培和利用的前景。

关键词: 川芎、药用植物、果实、种子、肋骨、分果、果皮、精油管

Abstract. *The experience of using medicinal plants in China goes back several millennia, about 12000 plant species are used in traditional Chinese medicine (TCM), of which 300 species of medicinal plants are grown in culture.*

The study of medicinal plants from traditional Chinese medicine will make it possible to rationally select species for their introduction and cultivation in Russia, as well as increase the arsenal of medicinal plants and preparations based on them.

Within the framework of cooperation between the St. Petersburg State Agrarian University and the Scientific Research Institute of Industrial Crops of the Sichuan Academy of Agricultural Sciences (Chengdu, People's Republic of China), seeds (mericarpies) of Chinese ligusticum were obtained. Types of ligusticum are used in traditional medicine of the East and in medicine in Western Europe. They are used for hypertension, coronary heart disease, they have analgesic, antirheumatic, sedative, antiseptic effects, improve blood circulation.

The aim of our research was to study the morphological and anatomical features of the fruits of Chinese ligusticum (Ligusticum sinense Oliver, Apiaceae). The morphology and anatomy of fetuses were studied using live material and material fixed in acetoalcohol.

The fruit of the Chinese ligusticum is elliptical, two-seeded, splitting into two mericarps (parts of the fruit), the seed is not released from the pericarp. Mericarps are brown in color, not compressed from the back, the dorsal side is convex with three well-defined ribs and two lateral ones. Conductive bundles pass through the ribs; in ripe fruits, they are almost invisible. In the hollows between the dorsal ribs there are 1-2 essential oil tubules, on the lateral side - 2-3, on the ventral side - 2-4. Pericarp parenchyma cells in mature fruits are compressed and crumpled. The non-lignified endocarp of the seed coat is well preserved.

Studies have revealed specific morphological and anatomical features of the fruits of Ligusticum sinense, distinguishing them from other species of the genus Ligusticum. Further studies of Chinese ligusticum will make it possible to judge the prospects for its introduction, cultivation and use in Russia.

Keywords: *ligusticum, medicinal plants, fruit, seed, rib, mericarp, pericarp, essential oil tubule*

Introduction

From year to year, interest in medicinal plants is growing, both in Russia and around the world. To satisfy the need of medicine for medicinal plant raw materials, some types of plants are collected in nature, others are grown in culture. However, the natural reserves of many types of medicinal plants are under threat of destruction, all this leads to a decrease in the biological diversity of plants. Anthropogenic impact has a detrimental effect on the state of plant resources. Some plant species do not tolerate trampling and suffer from uncontrolled harvesting, especially in suburban forests. Many types of medicinal plants have the status of protected and endangered.

It is quite obvious that the problem of conservation of medicinal plants, the threat of destruction of their natural resources, as well as rapid climate change lead to an understanding of the need to search for new species and forms of medicinal plants and cultivate them in the soil and climatic zones of the Russian Federa-

tion. This problem is relevant not only for Russia, but also for other countries. According to Chinese researchers from the Sichuan TCM Research Center, they organized expeditions to Tibet and identified rare species of medicinal plants used in traditional Chinese medicine. Methods of conservation of rare species are being developed, as well as technologies for their cultivation in culture [1]. The cultivation of medicinal plants has a number of advantages, the main ones being the achievement of high yield, quality and uniformity of raw materials, its environmental safety, the use of mechanization means, simultaneous and fast harvesting, etc. [2]. As you know, the experience of using medicinal plants in China goes back several millennia, about 12000 plant species are used in traditional Chinese medicine (TCM), of which 300 species of medicinal plants are grown in culture. Therefore, the study of medicinal plants from traditional Chinese medicine will allow us to rationally select species for their introduction and cultivation in Russia and will increase the arsenal of medicinal plants, which, ultimately, will contribute to expanding the range of herbal medicines.

Within the framework of cooperation of the St. Petersburg State Agrarian University with the Scientific Research Institute of Industrial Crops of the Sichuan Academy of Agricultural Sciences (Chengdu, People's Republic of China), seeds (mericarpies) of a medicinal plant [3] were obtained, used in traditional Chinese medicine - Chinese ligusticum from family of celery *Apiaceae*.

Types of ligusticum are used in folk medicine and as food plants. So, Scottish ligusticum, which grows in the European part of the Russian Federation, the Far East and Alaska, is eaten as a vegetable plant. Ligustikum arafe - an endemic of the Western Transcaucasia, has a fragrant rhizome, from which a powder is prepared for flavoring tobacco. Ligusticum Wallich, or Wallich, (*Ligusticum wallichii*=*Ligusticum chuanxiong* Hort.), A related species - Chinese ligusticum (*L. sinense*) and zheholensky ligusticum (*L. jeholense*) are used in traditional Chinese medicine (TCM) and in medicine in Western Europe. The medicinal raw materials are the rhizomes and roots of these plants. Wallich ligusticum rhizomes contain essential oil with numerous components, alkaloids and organic acids (ferulic). Preparations from rhizomes are used for hypertension, coronary heart disease, they have an analgesic effect, improve blood circulation. The roots and rhizomes of Chinese ligusticum have antirheumatic, sedative, antiseptic and diaphoretic effects [4, 5].

Chinese Ligusticum - *Ligusticum sinense* Oliver is a perennial herb 80-100 cm high. In the soil it has a short, branched rhizome. Under natural conditions, it is distributed in East Asia (China, Japan), grows in forests at an altitude of 3000 m above sea level, occurs in shrub thickets, in meadows, slopes, along river banks. Loves wet places and shade. This species is cultivated in East Asia and Europe. It is not yet grown in Russia [6].

Purpose of the study - to study the morphological and anatomical features of the fruits of Chinese ligusticum to identify diagnostic signs.

Materials, methods and objects of research

The object of the study were seeds (mericarps) of *Ligusticum sinense* sample from Sichuan province (China). The morphology and anatomy of fetuses were studied using live material and material fixed in acetoalcohol. To soften the fruits, a mixture of ethyl alcohol, glycerin and water (1:1:1) was used. Temporary preparations were prepared according to generally accepted methods. The study of objects was carried out using a binocular and a microscope.

Research results

The Chinese ligusticum has a specialized, non-opening, fractional fruit, which, when ripe, decays into 2 mericarp (half-fruit). It is formed from the lower ovary, in shape - elliptical or ovoid, two-seeded, the seed is not released from the pericarp. Mericarps are light to dark brown in color, their length is 2.4-3.1 mm, width is 1.0-1.3 mm, they are not compressed from the back, the dorsal side is convex with three well-defined ribs and two lateral, no wings. The ribs are primary, almost equal, rounded, the marginal ribs are located at the width of the lateral ones; in some mericarpia, additional ribs appear on the dorsal side. The ventral side has a protruding keel. At the apex there is a noticeable spout 1.0–1.2 mm long (fig. 1).



Fig. 1. Mericarps of the Ligusticum sinense

The mass of 1000 seeds (mericarp) is 1.76 g. Conductive bundles pass through the ribs; in ripe fruits they are almost invisible. In the hollows between the dorsal ribs there are 1-2 essential oil tubules, on the lateral side - 2-3, on the ventral side - 2-4 (fig. 2). Costal essential oil tubules are not visible.

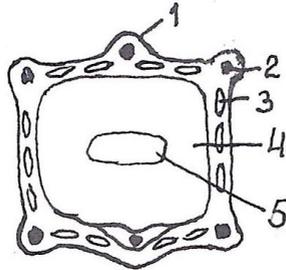


Fig. 2. Cross-section of the mericarp of the *Ligusticum sinense* (diagram): 1-the rib of the dorsal side; 2 – the conducting bundle; 3 – the essential oil channel; 4-the endosperm; 5 – the embryo

The anatomical study of the mericarps showed that in mature fruits the cells of the pericarp parenchyma are crumpled (fig. 3) and filled with tannins. The exocarp is covered with a finely folded cuticle, its cells are almost isodiametric with beaded lateral walls.

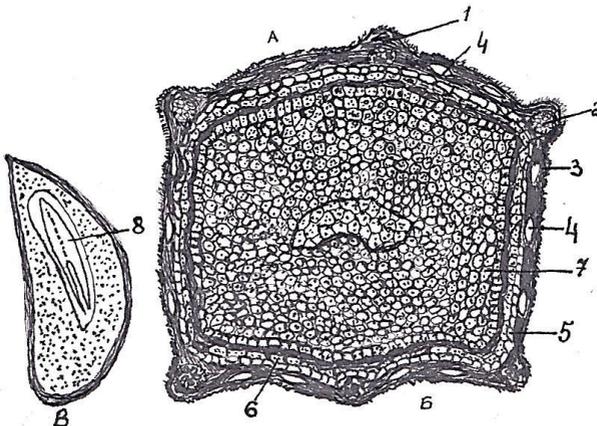


Fig. 3. Cross section of the mericarp of the *Ligusticum sinense*: A – dorsal side of the mericarp; B – abdominal side; C – longitudinal section of the mericarp; 1 – rib; 2 – conducting bundle; 3 – exocarp; 4 – essential oil channel in the mesocarp; 5 – endocarp; 6 – seed peel; 7 – endosperm; 8 – embryo

The mesocarp consists of 4-6 layers of parenchymal cells, there are no crystals in the cells, the essential oil tubules are fusiform (fig. 4). The endocarp is not lignified, remains in mature fruits and is represented by large cells. Like all representatives of the celery family, the seed coat is poorly developed, tightly pressed against the endocarp. Inside the seed lies a powerful endosperm, the cells of which are filled with oil, aleurone grains, and calcium oxalate crystals. On the ventral side, the endosperm is flat or slightly convex.

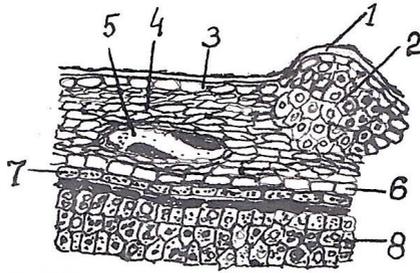


Fig. 4. Cross-section of the mericarp of the *Ligusticum sinense* (fragment): 1 – cuticle; 2 – conducting bundle; 3 – exocarp; 4 – mesocarp; 5 – essential oil channel; 6 – endocarp; 7 – seed peel; 8 – endosperm

A comparative analysis of our data and the material contained in the literature [7, 8] shows both the general similarity and uniformity of the structure of fruits in the species of the genus *Ligusticum*, and differences in morphometric and anatomical details. Distinctive features of the mericarpi of Chinese *ligusticum* are their relatively small size (2.4-3.1 mm), in the cross section of the mericarp they are almost square, not compressed from the back, have small rounded ribs, the number of tubules varies depending on the size of the mericarp, it is preserved in mature fruits endocarp and seed coat, secondary rib formation noted.

Conclusion. The studies carried out have revealed specific morphological and anatomical features of the fruits of *Ligusticum sinense*, distinguishing them from other species of the genus *Ligusticum* and capable of serving as diagnostic signs. Further study of Chinese *ligusticum* will reveal the prospect of its introduction, cultivation and use in Russia.

References

1. Peng Fang. *Breeding and cultivation of Traditional Chinese Medicine (TCM) in Sichuan Province.* – Chengdu, November, 2019. – verbal report.

2. Terekhin A.A., Vandyshv V.V. *Technology of cultivation of medicinal plants / Textbook.* – M.: RUDN, 2008. – 201 P.
3. Naida N.M., Tsyganova N.A. *Study of medicinal plants in China // St. Petersburg State Agrarian University.* – SPb: SPbSAU, № 1 (58). – 2020. – P. 9-14.
4. Kyosev P.A. *Russian herbalist. Description and application of medicinal plants / Kyosev P.A.-M.: Eksmo, 2015.* – 896 P.
5. Batorova S.M. Yakovlev G.P., Aseva T.A. *Directory of medicinal plants of traditional Tibetan medicine.- Novrsibirsk: Science, 2013.* – 292 P.
6. Vinogradova V.M. *Apiaceae Lindl. (Umbelliferae Juss.) — Celery (Umbrella). // Flora of Eastern Europe. M. – SPb, KMK Scientific Publishing Partnership. 2004 V. 11 P. 315-437.*
7. Pimenov M.G., Ostroumova T.A. *Umbelliferae (Umbelliferae) of Russia. M.: KMK Scientific Publishing Association, 2012.* – 477 P.
8. Arenas Posada J.A., Garcia Martin F. *Atlas carpologico y corologico de la subfamilia Apioideae Drude (Umbelliferae) en Espana peninsular y Baleares. // Ruizia, 1993. – V. – 12. – 245 P.*

不同基因型奶牛乳房外观特征
EXTERIOR FEATURES OF THE UDDER OF COWS OF DIFFERENT
GENOTYPES

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抽象的。本文介绍了公牛 - 父亲及其选择对初始种畜的影响对个体性状严重程度的影响的结果,以及对母牛 - 女儿乳房外部的综合评估。在记录的牲畜总数中,公牛父亲对个体特征严重程度的影响份额从 0.3% 到 8.6% 不等。在杂种中,平均而言,它比纯种(从 0.3 到 5.9%)更高,更多样化(从 1.0% 到 8.6%)。

关键词: 奶牛乳房外部, 基因型, 公牛影响比例, 品种

Abstract. *The article presents the results of the influence of bulls - fathers and their selection to the initial breeding stock on the severity of individual traits and a comprehensive assessment of the exterior of the udder of cows - daughters. The share of the influence of bulls-fathers on the severity of individual traits ranged from 0.3 to 8.6% in the total recorded livestock. In hybrids, on average, it was higher and more diverse (from 1.0 to 8.6%) than in purebreds (from 0.3 to 5.9%).*

Keywords: *exterior of the udder of cows, genotype, proportion of the influence of bulls, breed*

In recent years, in the Kaluga Oblast, due to the rational organization of breeding and artificial insemination of livestock, the genetic potential of milk production of ordinary herds has increased to 6,000 kg or more per lactation. The level of realization of the genetic potential of livestock productivity depends on a number of factors: feeding, housing, resistance to diseases, stress, suitability for machine milking.

Suitability for machine milking is determined by a large group of functional and morphological characteristics. There are about three dozen of them, most of them are well inherited, and exterior ones are manifested regardless of the conditions of keeping and feeding.

According to individual authors [1, 2], the losses of farms from the unsuitability of cows for machine milking can reach 15% of the gross milk yield. In recent years, in a number of large farms, a tendency towards an increase in the proportion of animals with udder defects has been revealed [3].

It follows from the foregoing that an effective system is needed to improve the dairy herd for suitability for machine milking. Improving the livestock is impossible without knowledge and a clear understanding of how well and what is good or bad the herd, and what it should become in the future.

Purpose of the study - in a herd of black-and-white breed, the influence of bulls - fathers and their selection to the initial broodstock on the severity of individual traits and a comprehensive assessment of the exterior of the udder of cows-daughters - was studied.

Material and research methods: A total of 200 cows from mothers from the Frans 247 line and four pairs of bulls were counted. In each pair there were purebred black-and-white and Holstein bulls - analogues in terms of the level of milk production of their maternal ancestors. The black-and-white bulls belonged to the Frans 247 line, the Holstein ones to the Vis Aydial 933122 line.

The daughters of bulls of each pair were analogous in terms of time of birth ($\pm 5-10$ days), were raised and kept from birth to the end of lactation in exactly the same conditions: in the same group cages, in the same premises, on the same rations, etc.

As a result, there were 8 groups of cows (according to the number of fathers), four of them are purebred black-and-white breeds (100 heads) and four groups (100 heads) of half-breeds.

The exterior features of the udder were studied according to the methodology of T.A. Polezhaeva. (Kaluga, 1987) [4]. For each cow, 18 individual traits (66 of their characteristics) were assessed and recorded in the scorecard, and an assessment was given for a complex of traits, broken down into categories: Category I - animals without defects, III - category - cows with one or more major defects in the exterior of the udder.

Results of the study. Table 1 shows the characteristics of the studied groups by the presence of animals with a positive characteristic of six traits and the specific gravity of cows in categories I and III. All groups differed sharply from each other in terms of individual characteristics and a comprehensive assessment.

Table 1 - Characteristics of the exterior of the udder of cows of different genotypes ^{x)}

| Positive characteristics of udder conformation traits | Specific weight of cows, % | | | The share of the influence of the fathers | |
|---|----------------------------|-----------------|------------------|---|------------|
| | $M_1 \pm m_1$ | $M_2 \pm m_2$ | $D \pm md$ | η_1^2 | η_2^2 |
| Uniformity of development of lobes | 58.8 \pm 4.75 | 69.7 \pm 4.69 | 10.9 \pm 6.68 | 0.33 | 4.7 |
| Symmetry of development of lobes | 68.4 \pm 4.36 | 80.8 \pm 3.89 | 12.4 \pm 5.84 | 5.9 | 1.8 |
| Tub-bowl shape | 10.9 \pm 2.99 | 11.1 \pm 3.41 | 0.2 \pm 4.54 | 0.82 | 1.0 |
| Horizontal bottom | 18.1 \pm 3.72 | 15.6 \pm 3.05 | -2.5 \pm 4.81 | 3.4 | 8.64 |
| Average nipple diameter | 95.3 \pm 2.15 | 92.2 \pm 2.91 | -3.1 \pm 3.62 | 3.5 | 0.96 |
| Average position of the nipples | 97.4 \pm 1.54 | 81.8 \pm 3.58 | -15.6 \pm 3.89 | 3.4 | 3.5 |
| Category I | 40.1 \pm 4.68 | 50.1 \pm 5.04 | 10.0 \pm 6.88 | 1.9 | 2.3 |
| Category III | 4.9 \pm 2.13 | 14.5 \pm 3.41 | 9.6 \pm 4.02 | 4.8 | 1.3 |

x) genotype 1 (n = 100) - purebred black-and-white breed with moderate inbreeding in the Frans 247 line;

genotype 2 (n = 100) - half-bred hybrids with Holsteins, cross lines of Frans x Vis Aidial 933122.

In each genotype, the offspring of 4 fathers - the same age (5 + 10 days) at birth.

The difference in the average indicators of purebreds and hybrids ranged from 12.4% for the symmetry of the development of lobes to 15.6% for the location of the nipples. The hybrids simultaneously surpassed purebreds in the specific weight of animals of categories I and III by 10 and 9.6%, respectively. However, in almost all cases, the breed differences were not very reliable due to the large differences between the offspring of bulls.

The share of the influence of bulls-fathers on the severity of individual traits ranged from 0.3 to 8.6% in the total recorded livestock. In hybrids, on average, it was higher and more diverse (from 1.0 to 8.6%) than in purebreds (from 0.3 to 5.9%).

Conclusion

Thus, the individual properties of bulls-fathers have a greater impact on the quality of the udders of daughters than the breed characteristics of their genotype.

In this regard, the usual assessment of milk yield, fat content, protein in milk and the development of daughters should be supplemented by an assessment of the conformation of the udder of daughters both in purebred breeding and when crossing the livestock with Holstein bulls.

References

1. Garkavy F.L. *Cow breeding and machine milking*. M., Kolos, 1974 P.146.
2. Ruzsky S.A., Sergeev S.A. *Selection of cows for machine milking* M., Kolos, 1968 P.54-60.
3. Polezhaeva T.A., Glotova Z.S. *Improving the number of dairy cattle by breeding and reducing production losses from unsuitability for machine milking*. Coll. Science – agro-industrial complex of the Kaluga Oblast (Abstracts), Kaluga, 1994.
4. Polezhaeva T.A. *Graphical recording of the assessment of the exterior of the udder of cows (methodological recommendations)*, Kaluga, 1987, P.1-16.

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铅钴离子对大麦幼苗的分离和复合作用
SEPARATE AND COMBINED ACTION OF LEAD AND COBALT IONS
ON BARLEY SEEDLINGS

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抽象的。在试验中，研究了铅和钴离子对春季品种约瑟芬大麦幼苗的植物毒性和致突变作用。已经评估了在用于发芽种子的溶液中与钴离子共同存在的情况下减少铅的负面影响的可能性。在评估重金属离子的联合作用时，浸种液中含有 Pb^{2+} 和 Co^{2+} ，其浓度对应于相同的 MPC 值 (0.1; 1; 10; 100)。植物毒性和细胞毒性表现的标准是以下指标：种子萌发能量、异常细胞频率和有丝分裂指数。结果表明，大麦种子发芽溶液中铅离子的含量导致发芽能量显著 ($p < 0.05$) 降低，有丝分裂指数降低，异常细胞频率增加。饮用水的金属浓度等于 0.1 MPC 时的对照值。种子萌发溶液中钴离子的存在也导致这些参数值的变化，然而，在离子浓度等于 1 MPC 时与对照的显著差异。揭示了铅与钴离子在溶液中共同存在的负面影响的减少。在这种情况下，重金属离子浓度越高， Co^{2+} 的补偿作用越强。发现在铅离子的存在下，与两种金属离子的组合存在相比，每浓度单位的异常细胞的定量产率高 2.14 倍。假设有可能使用含钴的农用化学品（植物生长调节剂、膳食补充剂、复合肥料）作为减少铅毒性作用的药剂。

Abstract. *In the experiments, the phytotoxic and mutagenic effect of lead and cobalt ions on seedlings of barley of the spring variety Josephine was studied. The possibility of reducing the negative effects of lead with the joint presence of cobalt ions in the solution for germinating seeds has been evaluated. When evaluating the combined action of heavy metal ions, the seed soaking solution contained Pb^{2+} and Co^{2+} in concentrations corresponding to the same MPC values (0.1; 1; 10; 100). The criteria for the manifestation of phyto- and cytotoxicity were the following indicators: seed germination energy, frequency of aberrant cells, and mitotic index. It was shown that the content of lead ions in the solution for germinating*

barley seeds led to a significant ($p < 0.05$) decrease in the germination energy, a decrease in the mitotic index and an increase in the frequency of aberrant cells in comparison with the control values already at a metal concentration equal to 0.1 MPC for drinking water. The presence of cobalt ions in the seed germination solution also led to changes in the values of these parameters, however, significant differences with the control were at an ion concentration equal to 1 MPC. A decrease in the negative effects of lead with its joint presence in a solution for germination with cobalt ions was revealed. In this case, the higher the concentration of heavy metal ions, the stronger the compensating effect of Co^{2+} . It was found that in the presence of lead ions, the quantitative yield of aberrant cells per concentration unit is 2.14 times higher compared to the combined presence of two metal ions. An assumption is made about the possibility of using cobalt-containing agrochemicals (plant growth regulators, dietary supplements, complex fertilizers) as agents that reduce the toxic effect of lead.

Keywords: barley, lead, cobalt, phytotoxicity, mutagenicity, combined action

Introduction

Various types of modern production (industrial enterprises, thermal power plants, motor transport, mining, etc.) are powerful sources of pollution of the biosphere with heavy metals [1], which negatively affect living organisms and the degree of this influence must be assessed, especially in cases when it concerns food quality issues, for example, in the production of agricultural products [2]. Heavy metal ions come from soil or nutrient solution, mainly by passive diffusion, and the competition of ions can be largely predicted based on their physicochemical characteristics and parameters of the environment from which ions enter the plant [3].

Lead is widely used in media components. According to the literature, lead binds to sulfhydryl groups of enzymes and inhibits their activity or can replace other metals that are cofactors in important enzymes, which also leads to suppression of their activity [4]. Cobalt is one of the metals with potential mutagenic and carcinogenic properties [5]. At the same time, in the ionic form of Co in living organisms it participates in many nonspecific biochemical reactions (carboxylation and decarboxylation, hydrolysis of peptide bonds, hydrolysis of phosphorus esters, transfer of phosphate groups) activated by Mn, Mg, Zn, Ni, Fe, Ca and can be replaced by ions of these metals. Through its influence on enzyme systems, cobalt participates in the exchange of amides in plants, regulates nucleic acid exchange, activates the photochemical activity of chloroplasts, and also stimulates cellular reproduction of plant leaves [3]. In addition, it participates in hormonal regulation and is able to enhance the effect of auxin, which stimulates the processes of elongation and cell division.

The combined content of two or more metals can have excellent effects on living organisms, both in terms of the strength of the effect and in its directionality. It has been shown experimentally [6-7] that synergism and antagonism are not random events of interaction between stress agents. So, with the combined action of such pairs of metals as Zn and Co, Cr and Co, Co and Cu in low concentrations on the cells of the duckweed (*Lemna minor* L.), antagonistic toxic effects were noted in comparison with their individual effects [8], which is explained by physical-chemical properties of metals (ionic radius, oxidation state) and their competition for binding sites in molecules and routes of entry into the cell.

To reduce the negative consequences of the action of heavy metals, more and more drugs are used that have multifunctional properties and affect not only growth processes, but also the resistance of plants to various stress factors of the external environment [9]. Such substances, as a rule, have physiological activity and, differing in the purpose of action and/or method of application, affect the physiological and metabolic processes in plants, contribute to the realization of the genetic potential and better assimilation of nutrients. One of these substances includes cobalt-containing fertilizers [9] or complex fertilizers containing cobalt in a chelated form.

The purpose of this work was to study the phyto- and cytotoxic effects of lead ions on seedlings of spring barley varieties Josephine and to assess the possibility of reducing negative effects due to cobalt ions.

Research methodology

The object of the study was spring barley (*Hordeum vulgare* L.), variety Josephine (brewing), included in the State Register in 2008, the applicant is the Secobra Recherches seed breeding company, France.

To assess the toxic effect of lead ions, barley seeds (50 pieces each) were placed in Petri dishes and soaked in 30 ml of lead hydroxide solution ($\text{Pb}(\text{OH})_2$) at concentrations corresponding to 0.1 MPC for drinking water (0.0005 mg/l), 1 MPC 0.005 g/l, 10 MPC (0.05 g/l) and 100 MPC (0.5 g/l). Seed germination was carried out in a thermostat at a temperature of 25°C for 2 days. Similarly, seeds were soaked in solutions of cobalt hydroxide ($\text{Co}(\text{OH})_2$) at concentrations of 0.001 g/l - 0.1 MPC, 0.01 g/l - 1 MPC, 0.1 g/l - 10 MPC and 1 g/l - 100 MPC. To assess the combined action of metal ions, a seed soaking solution was prepared with the addition of lead and cobalt hydroxides in concentrations corresponding to the same MPC values. The experiment was repeated four times.

The toxic effect of the studied ions was assessed by the change in morphometric parameters - germination energy - GE - expressed in the percentage of seeds that gave roots equal to half the length of the seed and sprouts on the 2nd day of germination, the frequency of aberrant cells (FAC - the ratio of the sum of ana-

and telophase cells, in of which violations were registered, to the total number of analyzed ana-telophases of the first division of meristematic cells of the root meristem of seedlings) and the mitotic index (MI - the percentage of dividing cells from the total number of analyzed). FAC and MI in the cells of the root meristem of barley seedlings were assessed after 48 h of seed germination, when the seedling length reached 5-10 mm. The samples were fixed in acetic alcohol (3:1). Cytogenetic analysis was performed in ana-telophases on temporary squashed preparations stained with acetocarmine. Compressed preparations were viewed under a microscope at 400 magnification. In each variant, from 900 to 1500 ana-telophases were analyzed. To process the research results, we used standard statistical methods of data analysis [10]. The significance of the differences was determined by the Student's test.

The antagonism coefficient (AC) was calculated using the formula [11]:

$$AC = S_{Me1+Me2} / S_{Me1} + S_{Me2}$$

where $S_{Me1+Me2}$ – the proportion of aberrant cells under the combined action of two metals minus the value of the spontaneous background of aberrations (the proportion of aberrant cells in the control);

S_{Me1} and S_{Me2} – the proportion of aberrant cells under the action of one of the metals minus the value of the spontaneous background of aberrations (the proportion of aberrant cells in the control).

Results

Soaking barley seeds in a solution containing lead ions at the studied concentrations led to a significant decrease in seed germination energy (GE) and mitotic index (MI). GE (ion concentration - 0.1 and 1 MPC) was 80.1 and 60.3%, control values were 88.3%. The mitotic index at the same MPC concentrations was 6.8 and 4.2%, while in the control MI it was 8%. So, under the action of lead ions at a concentration of 0.05 g/l (10 MPC), GE decreased 3.9 times compared to the control values, MI - 3.8 times, FAC increased 9.5 times. At a lead ion concentration of 1 g/l (100 MPC), the seeds did not germinate at all.

The content of cobalt ions in the solution for germinating barley seeds caused multidirectional effects depending on the concentration of ions. Thus, pronounced phyto- and cytotoxic effects were noted at ion concentrations corresponding to 10 and 100 MPC. The germination energy decreased by 1.4 and 4.8 times compared to the control values, MI also decreased by 1.3 and 3.3 times (at $p < 0.05$). Toxic effects were proved by an increase in FAC at the given MPC concentrations - 2.7 and 3.1% compared to the control values - 0.6%. It is known that increased concentrations of cobalt lead to toxic effects, which are associated with the development of oxidative stress, suppression of assimilation processes and the translational apparatus [13]. The cytotoxic effect of metal ions can be represented

as suppression of mitosis and damage to chromosomes, as evidenced by our data. At the same time, when germinating barley seeds in a solution containing cobalt ions at a concentration of 0.01 g/l (1 MPC for drinking water), their germination rate increased by 11.4% and significantly differed from the control values. There was also an increase in MI of 32.5%, while the FAC remained at the control level. It can be assumed that at a given concentration of cobalt ions, the activation of enzymes involved in matrix synthesis and in the synthesis of a biologically active substance, cobalamin, occurs, which leads to stimulating effects [8].

Germination of barley seeds in a solution containing both lead and cobalt ions led to a decrease in the negative effect caused by an increased content of lead ions. It was revealed that the presence of cobalt ions at concentrations of 1 and 10 MPC in solution together with lead ions at the same concentrations according to MPC led to a significant increase in GE (from 60.3% for the Pb²⁺ + variant to 74.3% and from 22, 2% to 48.2%, respectively). If, when germinating barley seeds in a solution containing Pb²⁺ at a concentration corresponding to 100 MPC, a sharp inhibition of seedling development was noted (GE = 0), then the addition of cobalt ions to the solution at a concentration corresponding to the same MPC values, GE, was - 10.1%.

The same tendency to suppress the negative effect caused by lead ions during joint germination in a solution containing cobalt ions can be traced according to the MI and FAC indices. In the concentration of metal ions equal to 0.1 MPC, there is a slight increase in MI from 6.8% in the Pb²⁺ variant to 7.1% in the variant of their joint presence, but with an increase in the concentration of Co²⁺ to 1, 10 and 100 MPC, a decrease in the negative effect lead ions were more pronounced and MI increased by 1.9; 2.5 times; at a concentration of Pb²⁺ 100, the MPC MI is 1.3%. Antagonism coefficients (according to FAC) calculated under the combined action of lead and cobalt ions at concentrations equal to 0.1–10 MPC for drinking water were 0.19, respectively; 0.35 and 0.41.

Conclusion

One of the sources of the entry of heavy metals into the soil are agrotechnical measures aimed at increasing the productivity of agricultural crops (the introduction of fertilizers, pesticides, the use of wastewater for irrigation). Lead enters the soil together with mineral fertilizers and is absorbed mainly by the root system of plants. In the zones of root division and extension, there are no physiological barriers to the movement of heavy metals; therefore, the tissues of the apical site accumulate their ions, which is one of the reasons for the growth-inhibiting effect of these chemical elements [12]. Potentially, preventing the accumulation of an element in the crop, as well as reducing its toxic effect on plant growth, is possible due to the effect on the biological barrier of absorption of the element, which is associated with the properties of plants and soils, and physicochemical, which

directly depends on various chemical and ion-exchange reactions.

In the case of the combined action of various pollutants, the final effect may differ significantly from the effect of the separate presence of metal in the medium. The studies presented by us, carried out on seedlings of barley of the spring variety Josephine, prove the negative effect of high concentrations of lead ions on the germination rate of seeds, cell division and the structure of chromosomes. This is consistent with the information that some heavy metals are capable of causing nuclear damage [14], disrupting RNA synthesis, and inhibiting ribonuclease activity [15]. Disorders of cell division are primarily based on the ability to bind heavy metal ions with sulfhydryl groups of fission spindle proteins and enzymes responsible for the passage of mitosis, as a result of which these proteins lose their activity. The action of cobalt ions, on the contrary, leads to both stimulation and inhibition of processes, depending on the concentration of the element in the solution for germinating seeds.

The study of the frequency of aberrant cells in the root meristem of barley seedlings showed that the joint presence of lead and cobalt ions in the solution leads to a significant decrease in the frequency of chromosomal aberrations. The positive effect of cobalt ions is most likely due to an increase in the expression of genes that control the increased synthesis in the cells of the apical meristem of proteins, like lactoferrin or transferrin, capable of inactivating the action of lead ions. With the content of lead ions, the quantitative yield of aberrant cells per concentration unit, expressed in units of MPC for drinking water, was 2.14 times higher compared to the combined presence of ions of two metals. The coefficient of antagonism, calculated according to the indicator of aberrant cells with separate and joint presence of metal in concentrations equal to 0.1-10 MPC for drinking water, ranged from 0.19 to 0.41 units. Thus, the presence of one metal (cobalt) reduced the phytotoxicity of the other (lead), which can be used for practical purposes, namely, in regulating the supply of lead to plants through the use of cobalt-containing agrochemicals at various stages of plant development. In addition, a decrease in the toxic effect of lead can completely change the direction and strength of plant organisms' responses to the action of stress agents of a different nature.

References

1. Zlobina N.Yu., Konoshina S.N. *Anthropogenic pollution of the biosphere with heavy metals and ways to prevent it // Network scientific journal. OreISAU. 2015. № 1(4). P. 69-72.*
2. Kalojev B.S., Kumsiev E.I. *Accumulation and distribution of heavy metals in plants under natural geochemical background // News of the Gorsk State Agrarian University. 2014. V. 51. № 3. P. 97-102.*

3. Voloshin E.I. *Accumulation of cadmium and lead in soils and plants // Agrochemical Bulletin.* 2000. № 3. P. 23-26.
4. Dart R. C., Hurlbut K. M., Boyer-Hassen L. V. // *Medical Toxicology (3rd ed.)*. Lippincott Williams & Wilkins. 2004. P. 1426.
5. Nelwyn Y., Christie N.T., Costa M. *In vitro assessment of the toxicity of metal compounds. Disposition of metals in cells: Interactions with membranes, glutathione, metallothionein, DNA // Biol. trace element research.* 1984. № 6. P. 139-158.
6. Amosova N.V., Tazina I.A., Synzynys B.I. *Phyto- and genotoxic effects of iron, cobalt and nickel ions on the physiological parameters of plants of various species // Agr. biology.* 2003. № 5. P. 49-54.
7. Amosova N.V., Synzynys B.I. *On the combined effect of aluminum and iron on barley and wheat seedlings // Agr. biology.* 2005. № 1. P. 85-87.
8. Ince N.H., Dirilgen N., Apikyan I.G., Tezcanli G., Usttin B. *Assessment of toxic interactions of heavy metals in binary mixtures: a statistical approach // Archives of Environmental Contamination and Toxicology.* 1999. V. 36. P. 365-372.
9. Yagodin B.A., Zhukov Yu.P., Kobzareno V.I. *Agrochemistry. M.: Kolos,* 2002. 584 P.
10. Gubin V.I., Ostashkov V.N. *Statistical methods for processing experimental data. Tyumen: Publishing house "Tyum SSRU",* 2007. 202 P.
11. Petin V.G., Synzynys B.I. *The combined effect of environmental factors on biological systems. Obinsk.: IATE,* 1998. 71 P.
12. Titov A.F., Laidinen T.F., Kaznina N.M. *Influence of lead ions on the growth and morphological parameters of barley and oat plants // Physiology and biology of cultivated plants.* 2001. V.33. №1. P. 33-37.
13. Sharma V., Naugraiya M.N., Tomer G.S. *Toxic effects of cobalt, chromium, lead and nickel chloride on growth performance of siris (Albizia spp.) // IJCS.* 2018. V. 6. № 2. P. 2407-2410.
14. Liu D., Jiang W., Gao X. *Effects of cadmium on root growth, cell division and nucleoli in root tip cells of garlic // Biol. Plant.* 2003/4. V. 47. № 1. P. 79–83.
15. Shah K., Dubey R.S. *Cadmium elevates level of protein, amino acids and alters activity of proteolytic enzymes in germinating rice seeds // Acta Physiol. Plant.* 1998. V. 20. № 2. P. 189–19

改进排水加湿系统的水调节
**IMPROVEMENT OF WATER REGULATION ON DRAINAGE-
HUMIDIFICATION SYSTEMS**

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抽象的。排水加湿系统运行分析, 配备自动控制系统, 配合水电自动装置调节水量过程, 及时调节耕地作物复垦制度, 保证水资源的合理利用, 进行了。这样的系统允许在整个生长季节将地下水位保持在正常范围内, 从而确保农业产量的增加。经查明, 在排水加湿系统上建设加湿网络和自动化设施的额外费用为每公顷12500卢布, 维护运行费用为每公顷10500卢布。

关键词: 排水加湿系统, 双向调湿, 水力自动装置

Abstract. *The analysis of the operation of the drainage and humidification system, equipped with an automated control system for water regulation processes with the help of hydro-automatic devices, in order to promptly regulate the reclamation regime of cultivated crops, guaranteeing the rational use of water resources, has been carried out. Such a system allows maintaining groundwater levels within normal limits throughout the growing season, which ensures an increase in agricultural production. It was found that additional costs for the construction of a humidification network and automated facilities on a drainage and humidification system amount to 12500 rubles per hectare, and the operating costs for maintenance are 10500 rubles per hectare.*

Keywords: *drainage-humidification systems, two-way humidity control, hydro-automatic devices*

Introduction. Most of the territory of Russia is located in the temperate zone and is characterized by excessive moisture. To obtain stable high yields in such

areas, drainage systems were built. But during the growing season, periods of drought occur, leading to the drying out of the soil profile and the death of the cultivated crops. To solve the problem, it is necessary to build a system of two-way regulation of the moisture content of the root layer of the soil [3], equipped with an automated control system for water regulation processes, providing the required reclamation regime. In such systems, the control of the water content in the soil in periods of different moisture content is automated according to the set values at the characteristic points of data sampling, depending on the heat and moisture supply of the period of the year and the requirements of agricultural crops.

Studies have established that when soil moisture deviates from the optimal value by 10% during the growing season, a decrease in crop productivity from 30% to 50%, a temperature change by 1°C reduces productivity by 5-10% [4]. Thus, the operational and effective management of the reclamation regime is a complex optimization problem, the solution of which is carried out using modern automated systems, which ensures the operational regulation of the energy and material balance of plant growth and development factors with constant monitoring of their condition, which guarantees a decrease in operating costs and an increase in the profitability of grown crops. when obtaining economically justified and environmentally sound crop yields.

Purpose of the work: to evaluate the operation of the drainage and humidification system, equipped with an automated control system for water regulation processes using hydraulic machines.

Materials and research methods.

The efficiency of the reclaimed land use largely depends on the design perfection of the drainage and humidification systems, the level of their technical equipment, the adopted structure for the management of the reclamation regime and the organization of operational services.

In the design and construction of drainage and humidification systems, depending on soil and climatic conditions, double-acting systems with a closed regulating network and subsurface humidification are used by creating a backwater in drainage collectors and subsequent infiltration of water into the ground. Subsoil moistening is most effective on drained massifs with terrain slopes $i \leq 0.005$ and soils with a filtration coefficient of at least 0.5 m/day. The control of the water-air regime in such systems is carried out according to the level of groundwater controlled in the wells of the regime observation network.

Depending on the relief and hydro-geological features of a particular drained massif, as well as the adopted methods of subsurface moistening, the planned location of the control network on the drainage and humidification systems can be represented by four typical schemes: water supply to the mouths of drainage collectors by creating a backwater in the channels of the conducting network (type

I); water supply to the sources of drainage collectors from humidifying channels (type II); water supply to the sources of drains from humidifying collectors (type III); water supply from humidifying canals to the sources of non-sloping or low-slope drains (type IV) [2].

For the technical improvement of drainage and humidification systems, increasing the efficiency of control of the processes of regulating the water-air regime and ensuring the rational use of water supplied for humidification, hydraulic structures have been introduced on a number of systems, ensuring the use of technological schemes for automatic water regulation.

A typical example of a system with automated control of water regulation processes using hydro-automatic devices is a drainage and humidification system with an area of 946 hectares. This system was chosen as the object of automation due to the technical perfection of its conducting network, a reliable source of humidification and technological uniformity of the operating modes of network facilities. A network of collecting drainage canals with a total length of 69.2 km is designed on the system, through which water coming from a closed drainage network (length 638.9 km) is diverted into the main canal and into three humidification tracts with a length of 28.3 km to supply water from the reservoir into a closed regulatory network.

The reservoir is located in the eastern part of the drained massif at command elevations and is filled with water from the Ubert River using a pumping station (flow rate 210 l/s). On the drainage channels of the conductive network and drainage collectors, regulation is applied along the upper pool, on the humidification channels and collectors - along the lower one.

To maintain a given level of groundwater on drainage and humidifying collectors, regulating wells are arranged, which are equipped with manual shut-off devices. The same technology is used to maintain the level regime on polder systems with machine drainage.

To implement the selected automatic control schemes, a complex of automated structures was used, equipped with hydraulic automatic devices designed by different authors, including those from Ukgiprovdokhoz.

Head water outlets from the reservoir to the humidification canals are equipped with diaphragm-type hydro-automatic devices that stabilize the water levels in the downstream of the structures with an accuracy of $\pm 2...3$ cm [1.5] (figure 1).

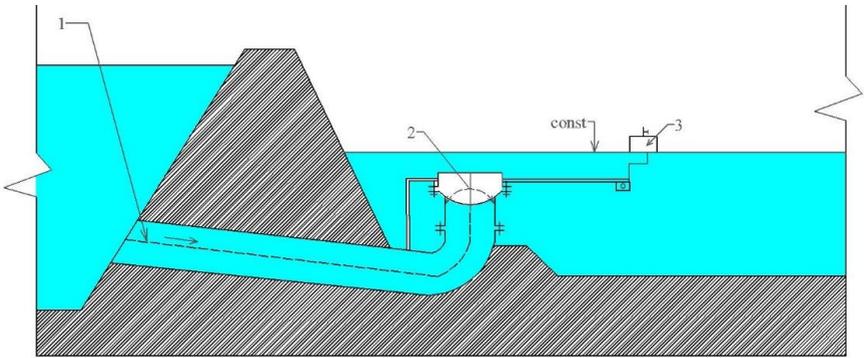


Figure 1. – Water outlet with diaphragm type hydroautomat: 1 - water outlet pipe; 2 - diaphragm hydraulic automatic device; 3 - downstream level sensor

Retaining structures on the humidification canals are equipped with sector-type hydro-automatic devices that stabilize the water levels in the downstream of the structures while protecting the canals from overflow [1,5] (figure 2). At the well-head tubular structures on the drainage network canals, box-shaped gates are provided, which ensure the stabilization of water levels in the upper pool due to the automatic discharge of excess water coming from the drainage network (figure 3).

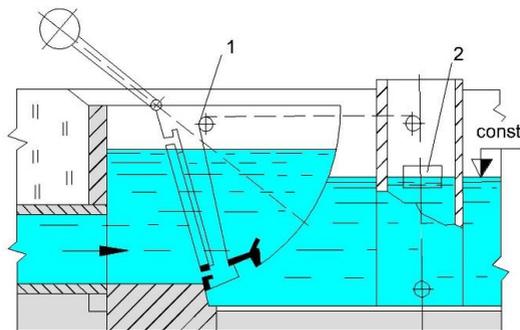


Figure 2. – Retaining structure with a sector-type hydro-automatic: 1 - sector-type hydro-automatic; 2 - level sensor

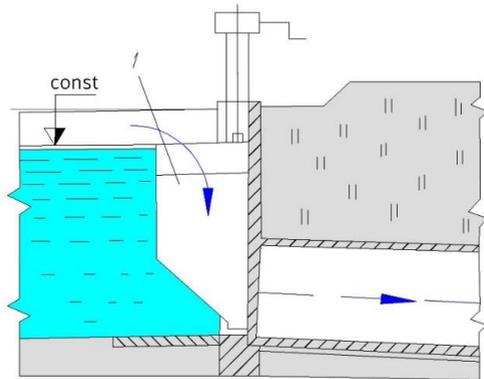


Figure 3. – Wellhead structure with box-type valve: 1- box-type valve

All wellhead wells on drainage and humidifying collectors are equipped with disc-type regulators [5], which allow creating backwater in the collectors and provide automatic discharge of excess water into the well through the top of the flexible hose when the specified groundwater level rises during the period of prolonged intense precipitation (figure 4).

For the equipment of control wells installed at the sources of the collectors [5], diaphragm-type water supply devices were used to maintain a constant water level in the well, regardless of changes in the pressure at its inlet and the collector operating mode (Figure 5).

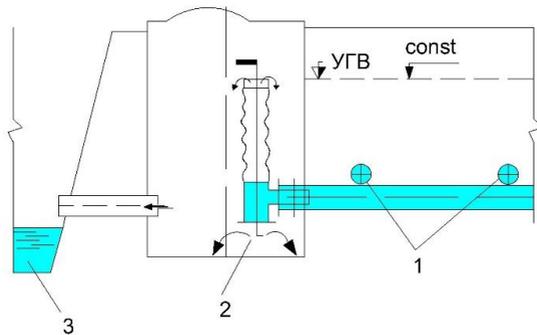


Figure 4. – Scheme of a wellhead well with a back-pressure regulator: 1 - drains, 2 - a poppet-type back-pressure regulator, 3 - collecting channel

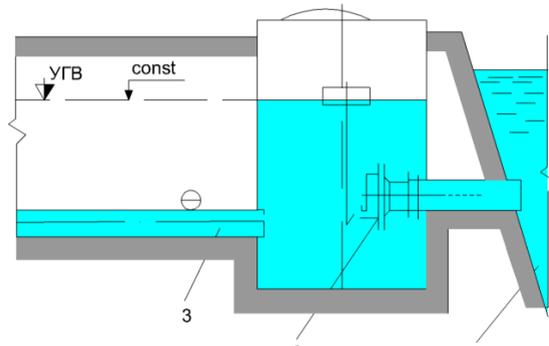


Figure 5. – Diagram of a well with a water supply hydraulic automatic device:
 1 - a humidifying channel, 2 - a diaphragm-type hydraulic automatic device,
 3 - a collector

Subsoil moistening with automation of water regulation allows maintaining groundwater levels within the drainage rate during the entire growing season, which ensures an increase in agricultural production.

During the operation of the drainage and humidification systems and the applied technical means of water regulation, some disadvantages were revealed. These include, first of all, a large number of structures (120-150 per 1000 hectares) on a closed network, which leads to an increase in the material consumption of systems, a decrease in the level of efficiency in managing their work due to the complexity and complexity of maintenance.

Conclusions:

1. Subsoil humidification on a drainage and humidification system with automation of water regulation allows maintaining groundwater levels within the drainage rate throughout the growing season, which ensures an increase in agricultural production.

2. Additional costs for the construction of a humidification network and automated facilities on a drainage and humidification system amount to 12500 rubles per hectare, and the operating costs for maintenance are 10500 rubles per hectare. The annual economic effect from the introduction of humidification measures with the automation of level regulation is about 125000 rubles per hectare.

References

1. Benin D.M. Means of automation of culverts reclamation structures: monograph / D.M. Benin, V.L.Snezhko, Moscow: DPK Press, 2018. – 108 P.

2. *Land reclamation: a textbook for university students / A.I. I.P. Golovanov Aydarov, M.S. Grigorov [et al.]; ed. A.I. Golovanov. – SPb: Doe, 2015.-816 P.*

3. *Semenova K.S. Canal sluice as a way to combat spontaneous combustion in drained peatlands of the Moscow region / K.S. Semenova // In the collection: Theory and practice of modern agricultural science. Collection of the III national (all-Russian) scientific conference with international participation. – 2020. – P. 563-566.*

4. *Shabanov V. V. Avtomatizatsiya kompleksnogo regulirovaniya faktorov zhizni rastenii / Shabanov V. V. // Gidrotekhnika i melioratsiya. – 1982 – № 1. – P. 60-75. – [Elektronnyi resurs]. – Rezhim dostupa: http://www.ieek.timacad.ru/kmirz/Htmls/works/-1982_41.pdf.*

5. *Mazepa V.K. Drainage flow regulators for collectors of drainage and humidification systems / Mazepa V.K., Chaly B.I., Kovalchuk Yu.G. // Melioration and water management – 1984 – 61 – P. 17-21.*

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