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**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

International Conference



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

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Foreword

We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 56 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).

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

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

Fan Fukuan,

Chairman of the organizing committee of the conference

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

*Full Professor, Doctor of Economic Sciences,
member of the Chinese Academy of Sciences*

前言

我们感谢所有参加本次会议的“上海合作组织国家的科学研究：协同作用和整合”，感谢您的演讲和报告。代表所有上海合作组织成员国的广泛参与者都谈到此次活动的必要性和重要性。参与者的报告涵盖了广泛的主题性科学问题，我们的联合互动将有助于不同国家的科学家进一步发展理论和应用的现代科学研究。会议结果是来自7个国家（中国，俄罗斯，乌兹别克斯坦，哈萨克斯坦，阿塞拜疆，塔吉克斯坦，吉尔吉斯斯坦）的83位作者的参与。

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

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

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

关于领土税收潜力的政府间关系的国际惯例
**INTERNATIONAL PRACTICE OF INTERGOVERNMENTAL
RELATIONS IN TERMS OF THE TAX POTENTIAL OF THE
TERRITORIES**

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注解。 本文探讨了以几个国家为例建立政府间关系的经验。 在领土的税收潜力的背景下考虑了政府间关系，并分析了预测收入的方法。

关键词：政府间关系，均等化转移，税收潜力，区域总产品，代议税制。

***Annotation.** The article explores the experience of building intergovernmental relations on the example of several countries. Intergovernmental relations were considered in the context of the tax potential of the territories, and methods for forecasting income were analyzed.*

***Keywords:** intergovernmental relations, equalizing transfers, tax potential, gross regional product, representative tax system.*

In world practice, the process of building intergovernmental relations in the allocation of transfers is considered in terms of the tax potential of the territories. The income potential underlies the methodology of interbudget regulation of most countries regardless of the state, as well as the administrative and territorial structure.

The methodology for assessing the tax potential in each state has its own characteristics and ultimately depends on the following factors:

- directions of use of income potential;
- the mechanism of distribution of intergovernmental transfers;
- the number and significance of local taxes;
- the degree of tax evasion;
- completeness and availability of information on this issue.

Indicators of tax potential are macroeconomic indicators. The basis is the ability of the population to pay taxes, which depends on the level of income, the volume of output, the provision of services, and performance of work. For example, the income of the population shows the ability to pay taxes in force on the territory, but does not reflect the possibility of introducing new types of taxes.

The same disadvantage has the volume of personal disposable income from personal income minus direct taxes. The gross regional product (GRP) represents the total value of goods and services produced in the region, and thus gives a description of the income base, where a significant part of the production factors used to produce GRP may belong to residents of other territories. To assess the potential for a representative tax system, information is needed on the tax bases and revenues for each tax for each territory.

A review of the international practice of assessing tax potential provides an opportunity not only to study the basic techniques used in such an assessment, but also to select those methods that could be implemented in a particular country.

A review of the US experience shows that the country has never had a system of equalizing interbudgetary transfers between the federal budget and state budgets, while the total number of types of financial assistance to state budgets reached 2000. Nevertheless, it was the work of Advisory The Commission on Intergovernmental Relations (ACIR) has had a tremendous impact on fiscal policy in other federated countries. The expert commission elaborated and tested on the American material the concept of a “representative tax system” (RTS), which formed the basis of financial interrelations between the levels of the budget system in various federal states [1].

The main idea of the RTS method is to assess the tax potential by calculating the amount of revenue that would be collected in the state budget, subject to the average tax collection, the same types of tax revenues and the same tax rates.

To apply this method, it is necessary to have data on actually collected taxes and non-tax payments, as well as on tax bases for all considered taxes and for all territories. The available data on all tax bases of the territories, as well as the average level of tax efforts applied by them to collect each tax, allow us to calculate the amount of revenue that each state could collect if it applied the average level of tax effort and if the composition, structure and tax rates for all states were the same. This value will be the assessment of the tax potential of the territory.

The main advantage of RTS is that it allows you to calculate the tax potential of territories with different tax systems. The RTS method consists of five basic steps:

1. Definition of all items of budget revenues for each territory. To improve the accuracy of the assessment, a representative tax system should take into account all taxes and quasi-tax payments received by the state budget. The composition of these taxes and fees may vary from state to state.

2. Building a single classification of income items of different states. To build a representative tax system, the entire set of payments collected by different states must be classified according to a single scheme.

The basis of this classification is the principle of similarity of sources of income. Elements of a representative tax system in the United States are called tax components, with which you can continue to work under the same rules. In the United States, a representative tax system includes 27 tax components.

3. Determination of the composition of the standard (regulatory) tax base. For each tax component, its standard tax base is determined. The definition may be based on the wording of current legislation, but for many taxes the composition of the regulatory tax bases may vary in different states, or data on the regulatory tax bases may be missing. In such cases, it is necessary to select indicators that indirectly characterize the tax bases of such tax components.

Requirements for the selection of indirect indicators reflecting the size of standard tax bases in the States:

- a high degree of correlation with the regulatory tax base;
- a clear definition that does not allow ambiguous interpretations;
- availability of comparable data for all States.

An important feature of this approach is that the data used to measure standard tax bases should be taken from independent sources that are not subject to state authorities. The composition of the sources of information and the data themselves requires careful consideration for each tax component.

4. Determination of representative (average) tax rate. Once a standard tax base indicator is defined for each tax component, it is necessary to determine a representative (average) tax rate that will be applied to that tax base.

Average rates are calculated on the basis of the weighted average actually established rates, taking into account the real tax collection: for each tax component, the incomes received by all states are added, and this number is divided by the total size of the tax bases for this component across all states.

5. Calculation of the tax potential of each state. The tax potential of each state for a particular tax component is calculated by multiplying the average rate for that component by the standard tax base. The summation of indicators for individual tax components provides an indicator that characterizes the total amount of income that could potentially be collected by each state at the average level of tax efforts and average structure, composition and tax rates [2].

In general, the method of determining the tax potential for a representative tax system allows you to accurately and fully assess the tax potential of each territory. The method is based on the use of detailed data and takes into account the differences in tax rates for different components of the tax system. The tax capacity indicator, as determined by a representative tax system, is considered to be a very accurate measure of the true tax potential. The disadvantage of this method is that it requires the use of a large amount of data.

Australia uses one of the most detailed and well-developed methods of inter-budgetary regulation. Assessment of tax potential is completely similar to the method of representative tax system.

The methodology is tasked to assess and compare the tax potential of each state, according to its own income sources, based on the average level of tax effort, i.e. the average level of tax rates and fees and the average level of efficiency of the mobilization of revenues. In this case, the tax potential is calculated in per capita terms.

The first step is to analyze the legislation of the states, set the parameters of taxation - the category of payers, the taxable base (taxable activities or types of assets), the existing tax benefits.

In the second step, the average tax policy parameters are determined. If differences in the parameters of policies between states are small, then the actual income received by each state is taken as an assessment of the tax potential that characterizes the state's ability to mobilize revenues from its own revenue base. In this case, an assessment of the tax base is not required, and differences in actual per capita income are attributed solely to the efficiency of the use of the tax base. However, much more often such differences are associated not only with the level of effort and state policy, but also with factors not directly regulated by the state authorities, i.e. the amount of tax bases.

For this reason, the third step of the methodology determines the best indicator characterizing the tax base with the average parameters of tax policy. Preference is given to indicators that measure the volume and value of performance (by activity), transactions or taxable assets [3].

In fact, the choice of the tax base indicator is made of three options:

- the real tax base in accordance with the law based on the data of state authorities,

- proxy tax base according to the Australian Bureau of Statistics. As a rule, such indicators are close to the real indicators of the tax bases, but they do not always coincide with them;

- global indicator (gross product of the state, disposable household income, population of the state). Such indicators are used in case of impossibility of an objective choice of the characteristics of the tax base or the lack of data.

Obviously, the first of these options is the most preferable in calculations.

After that, if necessary, adjustments are made to the tax bases to ensure uniformity and comparability of indicators. The basis for the adjustment is given by the states in which most of the relevant tax is collected.

After that, the average level of revenue mobilization efforts is calculated, i.e. average effective tax rate (cumulative state income divided by total tax bases). This implies that all applicable tax benefits are automatically taken into account at the average tax rate.

The tax potential is estimated by multiplying the adjusted tax base for each state (for each category of tax) by the average effective tax rate. This is equivalent to multiplying the total actual incomes of all states by the share of that state in the total income base.

In the future, the tax potential indicator is used to calculate the distribution of equalizing interbudgetary transfers between states.

Assessing tax capacity in Canada is an element of the system of equalizing intergovernmental transfers. Their goal is to ensure that the provincial authorities have sufficient income to provide budget services of comparable quality with comparable levels of taxation.

The tax potential is assessed on a per capita basis and measures the ability of the provinces to generate revenues from their own sources. To do this, all revenue sources are grouped into five categories:

- taxes on personal income;
- corporate income taxes;
- sales taxes;
- property taxes;
- income from natural resources.

For all these categories, with the exception of natural resources, it is determined what amount of taxes would go to the budget of each province at an average tax rate and a given amount of tax base. In the case of revenues from natural resources due to the diversity of types of resources and the diversity of payments (which makes it difficult to calculate the average tax rate), actual income indicators are used.

According to the described procedure, the per capita tax potential of each province is based on estimates of their own incomes.

In order to use in the mechanisms of budgetary equalization, 50 percent of revenues from natural resources are deducted from the tax potential of each province, as well as the so-called “national standard” - the average level of income in all 10 provinces. Equalizing transfers are received by provinces that are below average.

Thus, Canada also uses the representative tax system method.

The main problems that arise in the calculation of tax potential are related to the methodology of assessment of tax (non-tax) bases, namely, what indicator to use as a characteristic of the tax base for each source of income. In addition, the emergence of new sources of income periodically leads to changes in the formula for calculating the tax potential. Some payments of taxes on goods and services under provincial jurisdiction are not included in the calculation or are not fully included. This allows to stimulate the development of tax bases for taxes not included in the assessment of tax potential [4].

In France, the assessment of the tax potential is carried out according to a legally approved methodology at the levels of communes and departments in order to distribute part of un-earmarked financial assistance - the subsidy for functioning (La Dotation Globale de Fonctionnement (DGF)).

Although in France there are more than 40 local taxes, the tax potential is estimated from the tax bases of the three main local taxes, which provide about 80% of all tax revenues at local levels: built-up and undeveloped land (foncier bâti, foncier non bâti) and housing tax (taxe d'habitation). To calculate the tax potential, the tax base for each type of tax is multiplied by the average rate for this tax throughout the country. In this case, it is assumed complete tax collection. Assessing the tax potential in France is not a time consuming procedure and requires only data on tax bases for three types of "property" taxes.

In the Republic of Kazakhstan uses a single approach to the assessment of incomes of territories for the purpose of preparing local government budgets in order to determine the volume of transfers of a General character.

In this technique, the following options for determining the income forecast are used:

- «direct account» on the basis of indicators of tax bases, tax rates, indices characterizing the dynamics of the main indicators of socio-economic development,
- forecast based on actual or expected income income using income growth indices,
- use of forecast data provided by the relevant authorities.

When applying the "direct account" method, the income forecast is defined as the product of the tax base forecast by the legislatively approved tax rate. In this case, the forecast indicator of the tax base is either calculated in the framework of this methodology, or is an exogenous parameter [5].

With regard to the use of the indicator of the forecast of the tax base in the «direct account method», here the question arises of the origin of this indicator. In fact, this method does not fully disclose the secrets of forecasting, since it involves the use of indicators that were themselves somehow predicted, which is in many respects equivalent to just using the forecast of the corresponding income without any additional manipulations.

In some cases, when applying the method of «direct account» as an indicator of the tax base, the indicator for the reporting period is used, which is then adjusted to the conditions of the forecast year. Such a technique is used, for example, in the prediction of property tax, where the projected growth rate of fixed assets is applied. Here there is the same problem of using exogenous parameters, but not related to the tax base, but to the coefficients of its growth.

In addition, the prediction of a tax by the direct account method implies a 100% collection of this tax, which in practice is not always observed. This is especially true of indirect taxes, that is, taxes that are not dependent on taxpayers' incomes, and which are traditionally lower in collectability.

Thus, the assessment of income potential based on the forecast of the tax base and current tax rates seems to be overestimated, unless the actual level of collection is already taken into account in the forecast of the tax base.

The forecast, based on actual or expected income, is based on the use of actual income in the reporting financial year or expected income for the current financial year using income growth indices. In connection with the use of this approach, the following questions arise:

1. Calculate expected revenue in the current financial year. There is no indication in the methodology of how the expected income of the relevant income is estimated in the current fiscal year, which, like when using the "direct counting" method, is a problem of using exogenous data.

2. Indexation of revenue growth in the planned year compared with the reporting or current fiscal year. As a rule, the indicator of growth in revenues in the planned year compared to the reporting or current fiscal year is the indicator of inflation. This does not take into account the dynamics of growth of the tax base in real terms. At the same time, in the Republic of Kazakhstan for many years (including the crisis period), an increase in the main indicators of socio-economic development has been observed, which suggests a possible underestimation of the forecast made using this forecasting method.

When forecasting tax and non-tax revenues based on the amount of income received in the base period, neither changes in tax legislation (tax rates, tax base, tax breaks, tax deadlines, etc.) or budget legislation changes (deductions from taxes) are practically taken into account. budgets of one level or another). At the same time, changes in budget and tax legislation directly affect revenues to the budget.

When forecasting income by the direct account method, the discrepancy between the applied statistical indicator reflecting the tax base and the tax base, which is always lower due to the presence of exceptions and privileges, is not always taken into account. It does not use the effective tax rate, and the rate established by tax legislation, which can lead to an overestimation of the income forecast. Therefore, to improve the accuracy of forecasting, you must either clear the economic indicator of the components that are not taxable, or apply an effective tax rate, the procedure for determining which must also be established [6].

When forecasting tax revenues, the level of collection is not taken into account, which determines the extent to which taxpayers fulfill their tax payment obligations. The collection rate significantly affects the actual income. In addition, it has its own dynamics, accounting for which will help to improve the accuracy of forecasting.

Thus, the current method of forecasting revenues of local budgets provides a formalized procedure for calculating a rather limited list of revenues of local budgets. With respect to the remaining incomes, it is indicated that either their forecasting is based on the regulatory legal acts, in accordance with which the respective payments are made, or the use of estimates provided by the administrators of the respective incomes is foreseen. At the same time, the mentioned regulatory legal acts themselves do not always contain clear instructions regarding the procedure for forecasting the respective incomes. This approach does not fully use the possibilities of formalizing the procedure for forecasting revenues of local budgets..

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研究破坏性创业的结果是俄罗斯企业的一个特定现象
**THE RESULTS OF THE STUDY OF DESTRUCTIVE
ENTREPRENEURSHIP AS A SPECIFIC PHENOMENON OF
RUSSIAN BUSINESS**

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注解。 本文将破坏性企业家精神研究的结果作为俄罗斯企业的一个特定现象，在澄清破坏性创业作为现代俄罗斯商业现象的具体情况的基础上，提出了这种现象的形式化模型，这对于在这一科学知识领域开发和改进分析和方法工具。

关键词：商业，破坏性创业，现象，积分因素

Annotation. *The article presents the results of the study of destructive entrepreneurship as a specific phenomenon of Russian business on the basis of clarifying the specifics of destructive entrepreneurship as a phenomenon of modern Russian business, which allowed to propose a formalized model of this phenomenon, necessary for the development and improvement of analytical and methodological tools in this field of scientific knowledge.*

Keywords: *business, destructive entrepreneurship, phenomena, integral factors*

Modern business is very versatile both in Russia and abroad. The diversity of destructive entrepreneurship is represented by a sufficiently large number of individuals and legal entities seeking to «enter» into the business or already working there. The versatility of destructive entrepreneurship is expressed by the variety of forms of its implementation. It is important to note that these forms in Russia and abroad do not have many differences, but the difference as a whole exists, which can be explained by the difference in the mentality of Russian and foreign entrepreneurs..

By the specifics of destructive entrepreneurship, we understand a certain phenomenon that we can observe in Russian business not only at the present time, but also in the foreseeable past. Summarizing the well-known philosophies [1, 4, 5] the phenomenon is evidence of the presence of something else. According to this definition, we must recognize that in modern business, along with legitimate business, which is regulated by law, there is an illegitimate business (destructive entrepreneurship),

which operates outside the legal field. At first glance, it may seem that destructive entrepreneurship is insignificant in its scope and is spontaneous, but the inaccuracy of the collected statistical data, errors in interpretations of economic processes inherent in Russian business, the shortage of professionals indicates the opposite.

Clarify the concept of the phenomenon from the standpoint of existing philosophical views. The most clearly and fully disclose the phenomenon of destructive entrepreneurship, in our opinion, is possible through the ideology of I. Kant [1]. So, I. Kant in his works [1, 2] considers the phenomenon as a correlation of the subjective properties of the object (process) under study. For example, the study of any body as a phenomenon is possible through the correlation of its properties (heat, color, taste, location, etc.).

Considering a business from this point of view, we can distinguish its properties by focusing on the subjects of this business and the conditions in which these entities operate and develop. For business entities we include: entrepreneurs, contractors and the state. Since the state is not interested in the functioning and development of destructive entrepreneurship, we exclude it from our research. The conditions for the functioning and development of business entities are the integral factors of the business environment [3, 4, 5]: the socio-cultural environment, the economic environment, the technological environment, the political situation, the legal environment, the institutional environment, the geographical environment.

Thus, the specific nature of the phenomenon of destructive entrepreneurship of Russian business can be represented through the manifestation of two characteristic phenomena generated by business entities and integral factors of the business environment. Let us consider them in more detail and formalize them for use in further research as follows:

$$\Phi = \{\mathcal{Y}^c, \mathcal{Y}^\phi\}, \quad (1)$$

Where \mathcal{Y}^c – specific phenomenon generated by business entities, \mathcal{Y}^ϕ – specific phenomenon generated by integral factors of the business environment.

So, what properties (qualities) are inherent in an entrepreneur and contractors of Russian business? Most likely, those that are inherent in man, for both the entrepreneur and any counterparty are people. Based on an analysis of the literature on modern entrepreneurship and management [5, 6, 7], as well as a written survey conducted in 2017 among: students of St. Petersburg universities (231 people), entrepreneurs working in the Russian business (256 people). In total, 453 questionnaires were accepted for work, the remaining 6.99% were rejected due to a large number of corrections. In this written survey, respondents were asked to record 20 qualities of a person, which a modern entrepreneur working in the trucking business in the field of freight traffic must possess. The results of a written survey of respondents to establish the most important qualities of a modern entrepreneur are given in table. 1 (fragment of the results).

Table 1. The results of a written survey of respondents in order to establish the most important qualities of a modern entrepreneur (a fragment of the five most important)

The qualities of an entrepreneur	Number of references	Overall rank
Creativity	408	1
Riskiness	792	2
Courage	1275	3
Reliability	1458	4
Genius	1569	5

The data presented in Table 1 illustrate the priorities in the formation of the qualities of modern entrepreneurs in the trucking business.

Analyzing the obtained results, we can state that for each key attribute of destructive entrepreneurship in business a specific phenomenon (\mathcal{Y}) is characteristic, which can be represented as a combination of qualities inherent to carriers and counterparties in the analyzed period of time. Imagine the specifics of the phenomenon in the form of a set:

$$\begin{aligned}
 \mathcal{Y}_1^c &= \{K_p, P_n, \Gamma_e, \Gamma_n\} & \mathcal{Y}_9 &= \{P_n, H_a, K_M\} \\
 \mathcal{Y}_2^c &= \{P_n, P_a, H_a, O_6, P_c\} & \mathcal{Y}_{10} &= \{P_n, P_c, K_M\} \\
 \mathcal{Y}_3 &= \{P_n, P_a, H_a, O_6, P_c\} & \mathcal{Y}_{11} &= \{K_p, P_n, \Gamma_e, H_a, K_M, \Gamma_n\} \\
 \mathcal{Y}_4 &= \{P_n, H_a, P_c\} & \mathcal{Y}_{12} &= \{K_p, P_n, \Gamma_e, H_a, K_M, \Gamma_n\} \\
 \mathcal{Y}_5 &= \{P_n, P_a, O_6, P_c\} & \mathcal{Y}_{13} &= \{P_n, P_c, H_a, K_M\} \\
 \mathcal{Y}_6 &= \{P_n, P_c, H_a, O_6\} & \mathcal{Y}_{14} &= \{P_n, P_c, H_a, K_M\} \\
 \mathcal{Y}_7 &= \{K_p, P_n, \Gamma_e, H_a, P_c, K_M, \Gamma_n\} & \mathcal{Y}_{15} &= \{P_n, O_6\} \\
 \mathcal{Y}_8 &= \{P_n, H_a, K_M\} & \mathcal{Y}_{16} &= \{P_n, K_M\}
 \end{aligned}$$

\mathcal{Y}_1^c – specific phenomenon of evasion from official registration in the relevant bodies of the legal (physical) person, \mathcal{Y}_2^c – specific phenomenon lack of registration of commercial contracts, \mathcal{Y}_3 – specific phenomenon intentional distortion of these commercial contracts, \mathcal{Y}_4 – a specific phenomenon of unfair registration of business entities, \mathcal{Y}_5 – the specific phenomenon of the loss of the legal status of travel and shipping documents, \mathcal{Y}_6 – peculiarity of payroll in envelopes \mathcal{Y}_7 – the specific phenomenon of the distortion of financial statements through the regulation of primary documentation, \mathcal{Y}_8 – specific phenomenon regular re-registration of a legal entity, \mathcal{Y}_9 – the specific phenomenon of the appearance of “dead souls”, \mathcal{Y}_{10} – specific phenomenon unreasonable revaluation of fixed assets, \mathcal{Y}_{11} – specific phenomenon of fraud with the fuel when filling the rolling stock, \mathcal{Y}_{12} – specific phenomenon of car insurance fraud, \mathcal{Y}_{13} – the specific phenomenon of falsification of travel reporting, \mathcal{Y}_{14} – the specific phenomenon of falsification of working overtime, \mathcal{Y}_{15} – specific phenomenon opaque selection of counterparties, \mathcal{Y}_{16} – a specific phenomenon lack of control on the degree of use of rolling stock.

On the basis of the results obtained, it is necessary to state: in general, a specific phenomenon, the influence of a person’s personal qualities on destructive behavior in business can be represented as follows:

$$\mathcal{P}^c = \{P_n, O_6, K_m\}, \quad (2)$$

where P_n – riskiness (willingness to accept risk), O_6 – commitment (the ability to fulfill its obligations), K_m – Competence (ability to perform tasks in a specific work activity).

For the substantiated development of this study, we analyzed the integral factors of the business environment of Russian business in order to highlight the most important in the manifestation of the phenomenon of destructive business behavior. To do this, we conducted a written survey of 296 students and 220 entrepreneurs of St. Petersburg. During the survey, it was proposed to choose 5 of the most important factors attributable to each of their business environments in freight road transport by the criteria of “strong influence”, “slight influence”, “target”, “non-target”. 500 questionnaires were accepted for work, since 16 (or 3.1%) of the questionnaires contained errors, for example, fewer or more factors were chosen. The results of the survey were processed (Table 2, a fragment of the obtained results).

Table 5. Processing the results of the survey

№	Factor	Criteria			
		Strong influence	Slight influence	Targeted	Inappropriate
Economic environment					
1	the type and nature of their client requests	3950		2563	
2	availability of monetary resources	4596		3781	
3	the amount of interest that can be received on invested capital	3598		4560	
Legal environment					
4	possibility of self-organization of business	2687		1125	
5	state support	1884		965	
Technological environment					
6	the complexity of the services, works, products	2530		2369	

Based on the results obtained, the following conclusion can be made: the following environments are the highest priority in the study of destructive business behavior: economic, legal and technological, due to the special significance of the factors that characterize them. As a result of the survey, we found that in the economic environment the following factors are of the highest priority - incomes and expenses of entrepreneurs (individuals and legal entities), wages and unemployment, clients' ability to pay for goods, works, services, tax rates, insurance attractiveness; in the legal environment - state support, the degree of state regulation. It is important to emphasize that there is no need to explore these factors, in terms of their impact on the key attributes of the destructive entrepreneurship of Russian business that we identified earlier, since their influence is closely interrelated and locally directed to the business as a whole during a certain period of time.

As A. Kouchner wrote: "Times are not chosen, they live and die in them". Therefore, we will present a specific phenomenon (\mathcal{R}^Φ) as a set of media affecting it independently of the key attribute of destructive behavior, namely:

$$\mathcal{R}^\Phi = \{\mathcal{E}_c, \Pi_c, T_c\}, \quad (3)$$

where \mathcal{E}_c – economic environment, Π_c – legal environment, T_c – technological environment.

Thus, the specificity of the phenomenon of destructive entrepreneurship of Russian business in a formalized form is:

$$\Phi = \{ \mathcal{R}^c, \mathcal{R}^\Phi \} = \{ P_n, O_o, K_m, \mathcal{E}_c, \Pi_c, T_c \}. \quad (4)$$

The obtained results will allow not only to develop an analytical and methodological toolkit for the study of the destructive entrepreneurship of Russian business, but will also be necessary to substantiate the reasons for the destructive business behavior of entrepreneurs in order to work out local actions to combat it.

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社会经济系统的协同模型
SYNERGISTIC MODELS OF SOCIAL AND ECONOMIC SYSTEMS

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注解。 在市场社会经济系统的许多模型中的过程，已经研究了多部门协同模型的帮助。正在研究经济和社会灾难领域的发展中的自组织系统。考虑了一些特定的市场发展模式：生产，金融，劳动力市场资源和一些社会系统。进化发展和混乱行为以奇怪的吸引子的形式显示，然后是新结构的自组织。研究了竞争和引进创新条件下劳动力市场要素增长和停滞的情景。提出了在存在社会，工业和金融危机现象时有效管理宏观经济系统的数学模型。

关键词：社会经济系统模型，劳动力资源，协同方法，规律和随机发展，灾难，危机管理。

***Annotation.** Processes in a number of models of the market socio-economic system, with the help a multisector synergistic models have been studied. Processes are being studied in developing, self-organizing systems in the fields of economic and social catastrophes. Some particular models of market development are considered: production, financial, labor market resources and some social systems. Evolutionary development and chaotic behavior are shown in the form of strange attractors followed by self-organization of new structures. Scenarios of growth and stagnation of labor market elements in the conditions of competition and introduction of innovations are studied. A mathematical model of effective management of macroeconomic systems in the presence of social, industrial and financial crisis phenomena is proposed.*

***Keywords:** models of socio-economic system, labor resources, synergetic methods, regular and stochastic development, catastrophes, crisis management.*

Introduction. Classic socio-economic analysis of complex economic multiparameter systems and processes in them, as a rule, does not lead to an adequate description in the form of mathematical models optimization methods; theories of operations research. However, economic and social systems are unpredictable

in their development, suggesting the possibility of implementing several different options. The principle of optimality, widely used in most economics and mathematics, does not describe the self-oscillation of system parameters, their rapid changes and jumps, and other approaches are needed to study them [1, 2].

In a market economy, socio-economic systems (SES) are open and non-equilibrium and participate in the exchange of resources, information and entropy with the environment. The entropy exchange can lead to its local decrease in SES, which leads to structural changes and the formation of new forms of organization and functioning. In the behavior of complex systems, as a rule, chaos arises with the subsequent self-organization of new optimal structures. To describe an open non equilibrium SES, it is necessary to jointly solve a model of several dynamic coupled nonlinear differential equations describing the behavior of the markets for the production of goods, labor, finance, services, etc. The general regular and stochastic behavior of an open multi-sector models of an economic system as a system of differential equations was previously considered as examples of synergistic systems [3, 4].

Purpose of the study. The objective of the article is to study the scenarios of dynamic changes in socio-economic systems, taking into account various economic and social factors, external influences and the possibility of managing them. In the structure and behavior of open synergistic systems, a series of dynamic chaotic states often occurs, described by strange attractors characterized by a fractal or multi-fractal structure and changing it over time. Chaotic behavior of phase trajectories in the state space of systems, i.e. in phase space, can turn with time into cyclical fluctuations of economic and social parameters or show the transformation of the behavior of SES phase trajectories into behavior like a stable or unstable mode, focus or a strange attractor. Therefore, the goal of managing the development of SES is to provide transients that lead to the desired attractor and finding the asymptotic motion further in the evolutionary mode [4, 5].

Synergistic models of processes in socio-economic systems. Experience suggests that the behavior, evolution of social systems is often unpredictable. Therefore, it is necessary to use systems of dynamic, coupled, nonlinear; differential equations with parameters, since bifurcation, catastrophes are possible for them, leading to the description of such system behavior [4].

A feature of social economic systems that distinguishes them from the technical natural science systems is the existence of a large number of hidden control parameters. That is often specially organized, with the aim of not disclosing mechanisms for managing society. Hidden parameters can be identified in the course of studies of open sociological and economic data using factor and correlation analysis. The identification of these parameters and their changes is part of the task of verifying the models used and allows us to predict the consequences of changes

in these parameters for the SES.

We assume that the SES state is characterized by the vector variable \vec{x} and some controlling n -dimensional parameter \vec{c} , the change of which affects the behavior of \vec{x} . The space of change of \vec{x} and \vec{c} is called the phase space. The change of the vector of variables \vec{x} , in the presence of the field of control parameters \vec{c} , is characterized by the speed $\vec{f}(\vec{x}, \vec{c})$ whose value in the gradient approximation can be expressed through the synergetic potential of the SES $U(\vec{x}, \vec{c})$ as [2, 6]

$$\frac{d\vec{x}}{dt} = \vec{f}(\vec{x}, \vec{c}) = -\frac{\partial U(\vec{x}, \vec{c})}{\partial \vec{x}}. \quad (1)$$

Consider the equilibrium or quasistationary state of the SES, which in the one-dimensional case is given by the equation $f(x(c), c) = 0$. With the parameter with a unique resolution, the stationarity equation gives the curve of equilibrium states of the systems $x = x(c)$. However, if the solubility conditions for the stationarity equation are violated at the point (x_0, c_0) , a new stationary branch of solution (1) may appear in the phase space, i.e. a bifurcation (splitting) of equilibrium curves occurs [1, 2, 6].

When changing the model parameters $-C_i$, triple, quadruple, etc. may appear critical points, i.e. the emergence of other branches of the solution model (1). In this regard, in the theory of bifurcation it is necessary to decide the question of possible changes in the models of functioning and changes in the structures of the SES. Thus, the transition of systems through the critical points c_0 with a change in the parameters C_i is accompanied by the ambiguity of the choice of further behavior of the systems. The situation is complicated by the appearance of *structural instability* in some branches. The *structural stability* of SES is understood as the invariance of the bifurcation pattern of the system with small changes in the model parameters.

Since near the critical points of the system, the parameters are in the region of strong fluctuations of parameters, this means that when switching to a structurally unstable phase trajectory, a series of instabilities may appear and, consequently, difficulties in controlling systems in the region of critical points. However, computer simulation shows that emerging avalanches of chaotic bifurcations usually alternate with periods of quiet evolutionary development [1, 6].

The consequence of the general statements made is the bifurcation behavior of nonlinear synergetic models of SES: *first*, it is necessary to conduct a bifurcation analysis, which consists in identifying critical points on phase trajectories; identifying the presence of stable and unstable branches during the passage of critical points; and *secondly*, the analysis of the stability of the trajectories of SES models after the passage of critical points.

Synergetic model of the labor market. The labor market, subordinating mainly to the laws of supply and demand, according to the mechanisms and principles of its operation, is a special kind of market that has significant differences from other markets. The economic factors, for example, the demand for labor, wages, as well as social and social-psychological factors are the regulators on it. From the demand side, the main factor in the dynamics of the labor market and employment in the socio-economic system is the phase of economic cycles and market conditions. Scientific and technological progress and the emergence of new production and information technologies have a great influence on the demand for labor.

We will assume that the labor market relaxes more slowly than production and financial markets and therefore is a parameter of the order of our task. The characteristics of production, financial market, and governing social and socio-psychological parameters will be included in the nonlinear equations for the order parameter as quasi-equilibrium constants. Since the labor market is segmented, we will consider the concentration of workers x_i employed in i -th segment. Given the nonlinear terms not exceeding the quadratic in the order parameter, for the nonlinear model from (1) we get

$$\partial x_i / \partial t = a(\vec{c})x_i + b(\vec{c})x_i^2 + k(\vec{c})x_i, \quad (2)$$

here $a(c)$ is the coefficient of self-reproduction of a resource, $b(c)$ is a coefficient taking into account competition in the labor market, $k(c)$ is a coefficient of the influence of social and psychological factors on the market, such as the level of life-saving technologies that allow to protect, treat, feed people i.e. increase the average lifespan. These factors, for example, include: the level of development of information digital technologies in the economy. Cultural factors include, for example, gender relations, the level of female emancipation and literacy, etc.

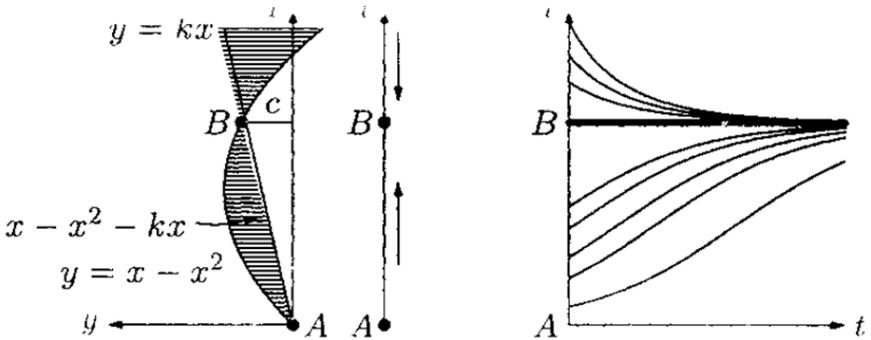


Fig.1. Phase trajectories and the domain of existence of solutions of equation (2). [7].

Turning to the dimensionless variables in (2), one can proceed to the kind of “soft model” of the study of populations in nature proposed [7]. Such a model is called a feedback system, in the sense that the last member in the right part (2) responsible for social and psychological external factors correlates with the first member, which takes into account the very reproduction of the factor under study. The areas of possible solutions (2) and possible phase trajectories are given by the curves in Fig.1. As can be seen, the density of resources tends, for any non-zero initial states, with time to a steady state B , determined by a combination of economic and social factors. The most stable point B is the intersection of the parabola of the non-linear limiting growth rate y due to competition in the market and direct kx – describing the influence of social factors. At large coefficients k , which determines the coefficient of slope of the line, the situation may be the absence of intersection of lines and loss of stability of the concentration of the labor force sector. Such is the sad fate of many professions driven by modern technology or environmental bans.

In the theory of catastrophes, the synergistic potential of the SES $U(\vec{x}, \vec{c})$ of equation (1) is reduced to one of the canonical types and gives a classification of the potentials of the dynamic SES in terms of their stable behavior near equilibrium points. Near stationary points, the potential is represented as power series for small deviations of parameters from values at stationary points $(x_i - x_{i0})$. The main result of the theory of catastrophes is the proof of the assertion that with the degrees of parameters in the potentials $r \leq 4$, the family of singularities is structurally stable and belongs to one of the families according to the classification of the theory of catastrophes. The main applications of the theory of catastrophes in science and technology belong to “assembly” and “fold” disasters [1, 6]. The above task of human resource management and applies to disasters such as «fold».

Model of social disasters. A catastrophe that describes social excesses with the help of a synergistic potential (1) may have the form

$$V(x, v, u) = x^4/4 - ux^2 + vx, \quad (3)$$

where x is the specific number of riots and offenses, u is the parameter of disappointment and hopelessness, v is the parameter of social tension in labor sector. The potential has critical, doubly degenerate and threefold degenerate critical points of the catastrophe, defining the lines of bifurcations and catastrophes. We obtain the bifurcation diagram of the catastrophe “assembly” in the form of a semi cubic parabola.

Riots (strike, riot) occur when the phase paths intersect the bifurcation line with increasing frustration u and hopelessness v in the form of a jump in the disorder concentration order parameter. Riot prevention is reduced to developing measures to determine the degree of tension and measures to improve the social situation of workers. This will allow choosing a trajectory in the phase space bypassing the lines of catastrophes, expressed in the abrupt amplification of protests, strikes and riots.

Model of dynamic chaos. Models of complex economic and social systems under certain conditions demonstrate the behavior of a type of dynamic chaos. Consider a model of change in the behavior of students, their psychology in everyday life and life. Let x be a characteristic of relationships in everyday life (family, dormitory), y is the state of relations at school (school, university), z is a general characteristic of the mental state of students. We assume that the sign (-) of the parameters of the problem means the ability to deal with negative phenomena and the sign (+) means the absence of a fight against them. The model of student behavior and their mental state can be represented as a system of three equations for the SP (4). We introduce the correlation coefficients of the factors between the parameters σ , r , b . These factors determine the personality and their relationship to the processes in everyday life, society and communication with the environment. The proposed model has the form

$$\begin{aligned} dx/dt &= \sigma(y - x), \\ dy/dt &= rx - y - xz, \\ dz/dt &= xy - bz, \end{aligned} \quad (4)$$

The first equation describes the state of family relationships, largely dependent on success in school. The second equation reflects both the relationships in the family and the team at school. The third equation of the system (4) reflects the ability of a person to manage his psyche in connection with family and the team. The system of equations (4) is a standard Lorentz model, demonstrating chaotic behavior [2, 6].

In Fig. 2, it can be seen that the system of equations (4) has instabilities of phase trajectories. At $r = 28$, $\sigma = 10$ and $b = 8/3$, computer simulation shows that the system begins to describe trajectories around one of the (unstable) focus of the coils with an amplitude increasing with time, describing a spiral that is unwinding.

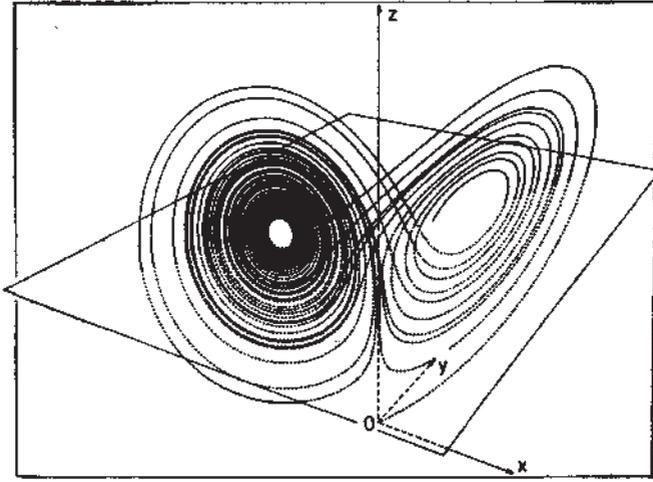


Fig.2. The Lorenz attractor pattern for phase trajectories at computer simulation

After several orbits, the system suddenly leaves this mode and rushes monotonously to the second focus, starting to describe the orbits around it in a spinning spiral. In this case, the time spent at each focus is distributed randomly, despite the dynamic nature of the initial equations. This was the first strange attractor in meteorology, which later became a popular mathematical model of the dynamic chaotic behavior of open nonlinear complex systems.

Conclusion. In economics and sociology dealing with the description and modeling of complex open nonlinear systems, the study of synergistic models of dynamic chaos, fractal structures and dissipative synergistic models becomes habitual. Synergetic in this century has already taken up the process of modeling the socio-economy systems. But the most impressive, apparently, will be the results of synergistic modeling of economic and social phenomena, claiming the role of strategic historiography and computer forecasting in the social sciences.

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金融全球化背景下公司资本结构优化标准选择的有条理方法的发展
**THE DEVELOPMENT OF METHODOLOGICAL APPROACHES TO
THE CHOICE OF CRITERION FOR A CORPORATION CAPITAL
STRUCTURE OPTIMIZATION IN THE CONTEXT OF FINANCIAL
GLOBALIZATION**

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抽象。 本文介绍了选择优化公司资本结构标准的主要方法的分析结果。 描述的标准是：最大化财务盈利能力，最小化加权平均资本成本，最小化金融风险水平。 特别注意证实有关使用作为资本结构优化的标准指标的可能性的假设，该假设考虑了股息政策的有效性。 该标准旨在最大化公司的市场价值，提高股息政策的效率，同时考虑到代理人与股东之间的冲突。 研究结果可用于证明管理层对资金来源选择和公司目标资本结构的决策是合理的。

关键词：最优资本结构；财务杠杆效应；财务盈利能力；资本成本加权平均；最小化结构风险；代理冲突；股息支付模式。

Abstract. *The article presents the results of the analysis of the main approaches to the selection of criteria for optimizing the capital structure in corporations. The criteria are described: maximization of financial profitability, minimization of weighted average cost of capital, minimization of the level of financial risks. Particular attention is paid to the substantiation of the hypothesis about the possibility of using as a criterion indicator of capital structure optimization the criterion that takes into account the effectiveness of dividend policy. This criterion is aimed at maximizing the market value of the corporation, improving the efficiency of dividend policy, takes into account the Agency conflict between shareholders and managers. The results of the study can be used to justify management decisions*

on the choice of funding sources and the target capital structure of a corporation.

Keywords: *optimal capital structure; effect of financial leverage; financial profitability; weighted average cost of capital; minimization of structural risk; agency conflict; dividend payment models.*

The theoretical concept of capital structure determines the choice of strategic directions of financing of a corporation, ensuring the increase of its market value. The modern theories of capital structure have received wide lighting in the economic literature and form quite extensive methodical tools for assessing and optimization of this indicator [1; 2; 3; 4; 5; 6; 7]. However, the current scientific provisions need to be improved taking into account the high variability of market conditions, caused by the deepening of financial globalization. From this point of view, scientific interest are the works devoted to the study of the formation of transnational capital and globalization of financial risks, the methodology of their accounting in the formation of the capital structure [8; 9; 10; 11; 12; 13].

At the same time, the available scientific developments, which address theoretical, methodological and methodical issues of optimization of the corporate capital structure, not only do not exhaust the possibilities of studying this problem, but also determine the need to intensify further scientific research in this direction.

The optimization criterion of a corporation's capital structure can be the maximization of the level of financial profitability, the minimization of the weighted average cost of capital, the minimization of financial risks, as well as another criterion determined by a corporation itself [14, p.1110].

To perform optimization calculations on the criteria of maximizing the level of financial profitability (return on equity) the mechanism of financial leverage is used, which is based on the measurement of economic effects achieved with different combinations of equity and debt capital in the balance sheet (liabilities) of the corporation. Financial leverage is an objective factor that arises from the appearance of borrowed funds in the amount of capital used by a corporation, allowing it to receive additional profit on equity.

In order to define the capital structure in the process of optimization modeling, it is important to quantify the benefits and risks associated with the financial leverage. The increase in financial profitability occurs if the borrowed funds raised at a certain loan interest rate are used to finance activity that involve a higher yield compared to the level of interest on borrowed capital. If the economic profitability of assets falls below the level of interest on borrowed capital, due to which the assets of a corporation are formed, the financial profitability will be decreased and the attraction of borrowed capital can lead to a deterioration of financial position of a company and increase financial risk, associated with the need to pay regular interest payments, and in case of lack of operating profit – to sell part of the assets

of the corporation.

In international practice, there are different approaches to assessing the effect of financial leverage.

The American concept is based on the priority role of the stock market in decision-making in the context of financial globalization. «This method involves the construction of a linear dependence EBIT-EPS and the choice of EBIT for the projected value of such capital structure, in which the value of EPS would reach a maximum» [15, p.51]:

$$EPS = \frac{(1 - T)(EBIT - Interests) - D_{preferred}}{N_{shares}}$$

where: T – income tax rate; EBIT – profit before interest on loans and taxes; Interests – interest payments on loans; $D_{preferred}$ – dividends on preferred shares; N_{shares} – number of shares outstanding.

This formula is necessary to calculate the cumulative effect of financial and operating leverage (DOFL) in order to determine the overall business risk associated with a corporation:

$$DOFL = \frac{\Delta EPS}{EPS_0} / \frac{\Delta EBIT}{EBIT_0}$$

where: EPS_0 – net profit (loss) per ordinary share of the base period; $EBIT_0$ – profit before interest and tax for the base period.

If the DOFL value changes by 1%, the EBIT value changes by more than 1%. The higher the interest rate on credit and lower profit, the greater cumulative effect of financial and operating leverage (DOFL) and higher financial risk. At the same time, the risk of loan default with interest increases for the creditor, and for the investor – the risk of a fall in the dividend and the share price. If the borrowed funds are not attracted, the force of the impact of the financial leverage is equal to one. Thus, it is concluded that it is impossible to combine high production risk with high financial risk.

The European approach, actively used by Russian companies, focuses on the growth of return on equity compared to the return on assets when raising debt capital. In the European approach the effect of financial leverage is defined as the difference between the return on equity and the return on assets, that is, the additional yield from the owner of equity arising from the attraction of borrowed capital with a fixed percentage.

With a positive value of the financial leverage differential ($ROA - K_d$) any increase in the proportionality coefficient will cause an even greater increase in financial profitability, and if the differential value is negative, the increase in the coefficient will lead to an even greater decrease in financial profitability. Financing of corporation's activities mainly through equity or debt capital will have a direct impact on financial profitability. Financial profitability is characterized as a value

that depends on the return on assets and financial leverage:

$$ROE = (1 - t) \times \left[ROA + \frac{D}{E} \times (ROA - K_d) \right],$$

or

$$ROE = (1 - t) \times ROA + DFL,$$

where: ROE – financial profitability (return on equity); t – the rate of income tax, in relative terms; ROA – return on assets; D – borrowed capital; E – equity; K_d – the average interest rate on loans; DFL – the effect of financial leverage.

It follows from the formula that financial profitability is higher, the higher the return on assets and the greater the effect of financial leverage.

The increase in the share of borrowed capital leads to a decrease in the level of financial stability of a corporation, which forces creditors to raise the level of the credit rate, considering the inclusion of an increasing premium for additional financial risk. As a result, the average estimated interest rate increases, which (at this level of economic profitability of assets) leads to a reduction in the differential. A high level of proportionality coefficient may nullify the differential value, where the use of borrowed capital does not increase financial profitability. If the differential value is negative, the financial return will be reduced, as part of the profit generated by equity will be spent on servicing the borrowed capital at high interest rates for the loan. Therefore, attraction of additional borrowed capital is expedient only on condition that the level of economic profitability of the corporation exceeds the cost of borrowed funds.

Thus, the optimal capital structure of the corporation by the criterion of maximizing the level of financial profitability should be understood as «such a ratio of equity and borrowed capital, which, taking into account the peculiarities of the functioning of the enterprise allows it to maximize the profitability of its own funds, i.e. to obtain the maximum amount of net profit on equity advanced in operational activity» [6, p.267].

In the context of financial globalization «the European model of the effect of financial leverage should be adapted to the Russian economic conditions, to take into account the peculiarities of profit taxation in terms of the allocation of interest on borrowed capital, the lack of many domestic companies representative market quotes to assess the market capital structure and a number of other features that modify the original formula» [16, p.583].

The process of capital structure optimization by the criterion of its cost minimization is based on preliminary estimation of the cost of equity and debt capital under different conditions of its attraction and implementation of multivariate calculations of the weighted average cost of capital (WACC). Optimization of the capital structure is achieved by minimizing the WACC indicator that takes the character of capital raising costs, which should be covered by the corporation's profitability. In forming the optimal ratio of the corporation's own and borrowed funds in the total amount of funding sources, both ini-

tial and target weighting is used, which should be maintained for a long period of time.

Analyzing the capital structure of international corporations, some country differences can be identified, that affect the formation of the optimal capital structure. Differences in capital structures have several reasons: the specifics of accounting systems in different countries, differences in tax savings on different sources of financing, the costs of bankruptcy with increased use of debt financing. The capital structure of the corporation, in turn, influences its credit rating, which affects the cost of financing. International companies receive a credit risk rating from one of the global agencies to gain access to international financial markets. Higher values of the rating correspond to: greater profitability, better debt service.

As a result of increasing the dynamism and uncertainty of the external economic environment in the context of financial globalization, a risk-oriented approach to the optimization of the capital structure in corporations is becoming increasingly important. Risk factor accounting in capital structure optimization modeling allows to identify and assess risks inherent in the processes of forming the ratio of financial resources in corporation. Based on the results of the evaluation, only those alternative management decisions are made, which, under other equal conditions, minimize the level of risks. Depending on the results of monitoring and control of risks, adjustments may be made to previous management decisions aimed at achieving the necessary level of financial security of a corporation.

The possibilities of using methodological tools for risk factor accounting in the process of capital structure optimization are quite extensive, as they differentiate different methodological approaches to risk assessment, within which separate methods (economic-statistical, expert, analog) and indicators are distinguished.

The methodological tools for the formation of the required level of profitability of financial transactions taking into consideration the level of risk allow to ensure a clear quantitative proportionality of these two indicators in the process of optimizing the capital structure of a corporation:

1. The required level of risk premium is determined by the following formula:

$$RP_n = (\bar{R}_n - A_n) \times \beta,$$

where: RP_n – the level of risk premium for a particular financial (stock) instrument; \bar{R}_n – the average rate of return in the financial market; A_n – risk-free rate of return in the financial market; β – beta-coefficient characterizing the level of systematic risk for a particular financial (stock) instrument.

2. The required risk premium amount is determined by the following formula:

$$RP_s = SI \times RP_n,$$

where: RP_s – the amount of risk premium for a particular financial (stock) instrument in the present value; SI – the cost (quoted price) of a particular financial (stock) instrument; RP_n – the level of risk premium for a particular financial (stock) instrument, expressed in decimal.

3. The overall level of profitability of financial transactions taking into ac-

count the risk factor is determined by the formula:

$$RD_n = A_n + RP_n,$$

where: RD_n – the total level of return on a particular financial (stock) instrument, taking into account the risk factor; A_n – risk-free rate of return in the financial market; RP_n – the level of risk premium for a particular financial (stock) instrument [1, c.651-653].

The theory and methodology of risk management also uses a set of models for the analysis and evaluation of various risk indicators and their gradations: basic indicators of financial risk assessment, defined in the framework of the modern portfolio theory of G. Markowitz and J. Tobin; model of market risk measurement Value-at-risk (VAR); model of pricing for financial assets from the position of market risk (CAPM) W. Sharpe; model of inflation risk assessment; model of risk assessment of capital structure risk F. Modigliani and M. Miller; a set of indicators for assessing the risks of financial and economic activities of corporations, in particular liquidity risks and financial stability reduction; point models for assessing the creditworthiness of organizations-borrowers used in banking practice; a set of domestic and foreign models for diagnosing bankruptcy risks.

All the above methods and models are applicable in risk assessment of the corporate capital structure formation. It should be noted the importance of integrated models, which allow to simultaneously take into account the many risk factors affecting the choice of financing schemes of a corporation.

The analysis of scientific works devoted to the study of the relationship between the concepts of «capital structure» and «dividend policy» and their interaction [2; 7; 17], allowed us to formulate a hypothesis about the possible use as a criterion of optimization of capital structure, defined by a corporation itself, a criterion for the effectiveness of dividend policy defined by a system of indicators (Dividends per Share, DPS; Earnings per Share, EPS; Price / Earnings Ratio, P/E; Dividend Yield, DY; Total Expected Rate of Return, TERR; Dividend Payout Ratio, DPR; Reinvestment Rate, RR).

The separation of ownership and control functions gives rise to a multilateral Agency conflict when the interests of corporate owners, rights holders, stakeholders and management do not coincide [18, c.78]. Therefore, the management of the capital structure should be aimed at weakening this conflict and aligning the interests of management and owners using the mechanism of dividend policy.

Optimization of capital structure according to the criterion taking into account the efficiency of dividend policy can be achieved as a result of dividend payment modeling, using the most well-known models: dividend growth model of Myron J. Gordon (1962) [19], based on the cost of equity; model of James T.S. Porterfield (1965) [20], according to which a corporation «must pay dividends only if it is fully confident that after the payment of dividends the share price will not fall below the

value that was before the payment of dividends, i.e. the inequality must be fulfilled:

$$V_1 + D_0 \geq V_0,$$

where: V_1 – the forecast of the market value of the share, less the expected dividend, but after the dividend announcement; V_0 – the market price of the share before the dividend announcement; D_0 – the expected dividend» [21, c.289].

It can be concluded that there is no universal model for determining the level of dividend payments. This is due to the large number of variables affecting dividend policy, and the inability to accurately predict the market reaction to dividend payments. However, these models can help a corporation's management to determine the amount of dividend payments, which allows to optimize the capital structure, which maximizes the market value of a corporation.

In conclusion, it should be noted that the formed capital structure of a corporation should be periodically analyzed in terms of compliance with the criteria of optimality and validity of the choice of one or another optimization criterion. If the capital structure is optimal, it must be maintained, if not-it is necessary to optimize the capital structure according to the selected criterion. In the second case, technical work should also be carried out to minimize the negative consequences of the violation of the optimal capital structure of a corporation.

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在经济实体中建立信息和分析会计过程的模型
**MODEL OF BUILDING AN INFORMATION AND ANALYTICAL
ACCOUNTING PROCESS IN AN ECONOMIC ENTITY**

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注解。 本文的材料反映了构建经济活动事实的过程，反映在商业经济实体的会计中。

关键词：经济活动事实，分析信息，会计，过程。

***Annotation.** The material of the article reflects the process of building the facts of economic activity, reflected in the accounting of commercial economic entities.*

The article is executed following the causal logic of building accounting and generating accounting (financial) reporting data in economic entities.

***Keywords:** facts of economic activity, analyzed information, accounting, process.*

An economic entity is a system whose activity is characterized by a set of constantly changing facts of economic activity. The facts of economic activity form the analyzed information and are under its influence. The generated information is the result of internal and external contacts of an economic entity. The constant change of the facts of economic activities occurring in the economic subject is due to the analysis of the events taking place, filled with information on the results of contacts. A series of changeable facts forms accounting information data through various forms of primary documents. Thus, an economic subject is a systematically organized construction of constantly analyzed information parameters, data and forms of documents containing them.

Causal subordination and structural construction of the analyzed information of accounting documents forms the information and analytical process of accounting. The information analyzed covers:

- primary data of the analyzed accounting process and documents containing them;

- formed, formed (real) and reflected monetary contacts with the internal and external composition of counterparties (Fig. 1).

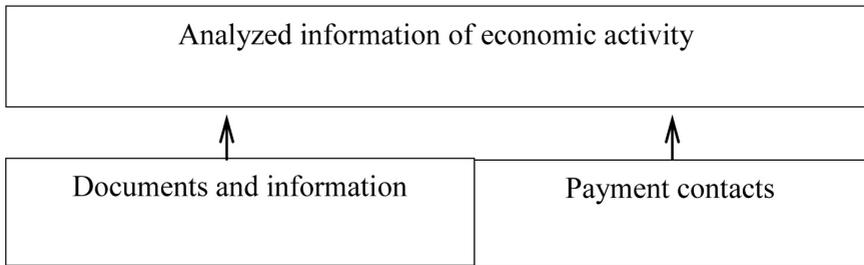


Fig. 1 - The composition of the analytical information

The analyzed information of the primary documents used by the economic entity, according to the results of interaction with contractors, is distinguishable in time and space by:

- name and content;
- the composition of the calculations made;
- the composition of the contacting participants (internal (dependent) and external (independent)), distinguished by individual data;
- types, activities;
- territories;
- coverage of commodity markets and attraction of sources of financing;
- affects the different composition of the used goods and their units of measurement;
- the presence of the reasons for their origin, the consequences of their application and reflection in the accounts of the balance sheet.

Informational data covers calculations. The calculation of information involves the analysis of events, emerging situations and includes the calculation of data (parameters and indicators) about the product in the natural-material (conditional), cost units of measurement on which the preparation of various documents is based (calculation, estimate, invoice, table with specified parameters strict reporting form). According to the calculations, an aggregate value of the value of the goods in terms of money is formed according to the actions fixed in the contract. Analyzed calculations-substantiate the analytical information subsequently recorded in the contract, including concerning the schedule for making payments, the timing, the cash account number of the economic entity, etc. Such data should be uniformly reflected in the data of the parties to the contract management and accounting.

Thus, the calculations justify the preparation and implementation of the obligations reflected in the contract, build up a counting algorithm - calculation-payments and calculation-calculation of information on certain parameters, composition of the goods and units of its measurement. The reason for the formation of the

calculations is the preparation and execution of the contractual contacts, including transfer of advances and the formation of debt obligations. Calculations are the rationale for the formation of the current financial and operational needs, allowing to attract the demand products, which are closely dependent on the composition, size of current liabilities and sources of its financing, generate revenue.

The information and analytical process as a change in the facts of economic activity covers all accounting carried out by an economic entity - management, accounting and tax (Fig. 2).

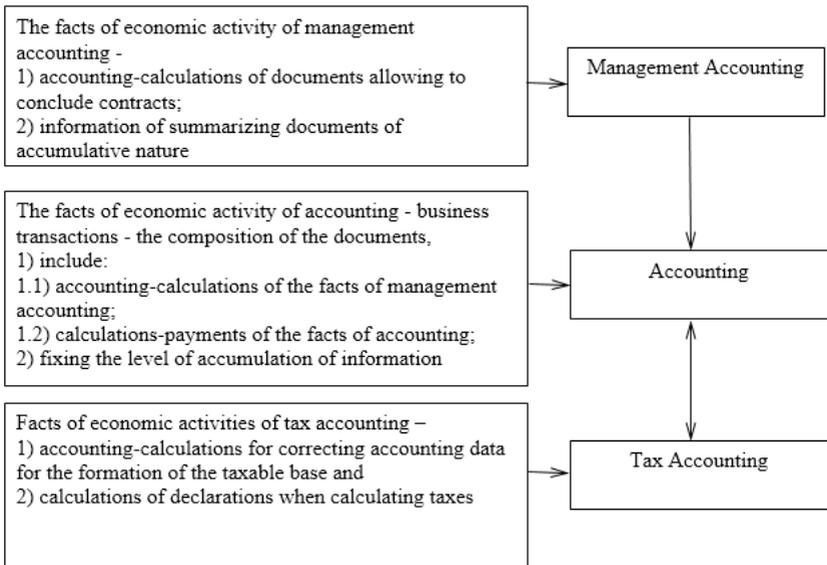


Fig. 2 - Information and analytical process of building accounting information

The information-analytical process combines the facts of economic activity of management accounting, the content of which is formalized through calculations as part of various documents and is summarized in documents of a cumulative nature. Prepared information data on calculations are the basis for the supply, sale, receipt of goods and the obligations formed simultaneously.

The composition of the fixed (concluded, executed) analyzed information of contracts for the movement of goods is concentrated in business transactions (elements of business accounting), the result of which is to make payments with counterparties. All analyzed information is accumulatively recorded in the information data of the facts of business accounting and generates the balance sheet information of the financial report on any date.

According to the accounting information analyzed, the adjustment is made of information data to form the taxable base. According to the determined taxable base, calculations of taxes are made. Formed tax calculations are reflected in the accounts of accounting and are the basis for the payments of tax deductions.

Calculations-accounting and calculations-payments are calculations carried out by an economic entity with counterparties (internal and external) and the source is generated, constantly analyzed by the economic entity data. Calculations form the analyzed and accumulated information of accounting documents containing information about the product and counterparties on the composition and the corresponding units of measurement.

Information and analytical process of accounting, formed as a relationship of information of the facts of economic activity contained in the documents, is formed through the causal logic of preparing different types of paper and electronic media in the account of contacting economic entities and creates conditions for the formation of the final reporting, which is subject to analysis not only internal, but also by external users. The parameters and data of the accounting (financial) statements allow the diagnosis of the financial condition of the economic entity, both at the stage of the generated information and the results of its formation. The achievement of financial equilibrium depends on the construction of an information analytical accounting process in an economic entity.

农业经济增长管理认知图的编制在俄国
**DEVELOPMENT OF COGNITIVE MAP OF MANAGEMENT OF
ECONOMIC GROWTH OF THE AGRICULTURE IN RUSSIA**

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摘要：文章分析了俄罗斯农业经济增长的过程。已经表明了发展趋势和抑制工业进一步发展的原因。在认知模型的基础上确定了农业经济增长管理系统的参数内容。已经开发出一种用于管理工业园区经济增长的模糊认知图，其静态和动态分析允许在各种管理影响下获得农业动态的预测。

关键词：农业，俄罗斯，经济增长，认知建模，模糊认知图，静态和动态分析，战略选择。

Abstract. *The article analyzes the processes of economic growth in the agriculture in Russia. Tendencies of development and the reasons restraining the further growth of industry have been shown. The parametric content of management system of economic growth of agriculture has been determined on the basis of cognitive modeling. A fuzzy cognitive map for management of economic growth of the industrial complex has been developed, the static and dynamic analysis of which allowed obtaining forecasts of the dynamics of agriculture under various management influences.*

Keywords: *agriculture, Russia, economic growth, cognitive modeling, fuzzy cognitive maps, static and dynamic analysis, strategic alternatives.*

Agriculture of Russia, which has shown growth in recent years, can not be unambiguously assessed, claiming that this dynamic is for the ages. On the one hand, it is encouraging that large capital has been drawn into the agricultural business, investing hundreds of billions of rubles in its development. Long-term projects, especially those supported by the state, will pay off for a long time in the form of increasing volumes of food production. But, on the other hand, there is a concern about the dynamic change in the structure of agricultural production, when the main growth is provided by large farms and holdings. The agricultural sphere is a special branch not only of the national economy, but of the whole state system. Number of problems that occur in the agricultural sector of Russia shows that the

economic dynamics of agricultural production is still far from the necessary level of stability and intensity. Therefore, it is important to adequately assess the state of agriculture and develop an effective strategy for management of the economic growth of the industry complex in accordance with the agricultural potential of the country.

In general, the competitiveness of Russian agriculture is insufficient. At present, it arises from the closure of the Russian market for the import of food and agricultural goods, a weak ruble and low-cost labor. Technological inferiority from developed countries results in low crop yields and animal productivity. In addition, the country does not have a sufficiently developed processing of agricultural products and bringing it to the end consumer. The share of storage, processing and production of food in GDP is only 2-3%, while in the developed countries it is 10-20%. At the same time, the share of agriculture in the Russian GDP ranges from 4 to 5%, which corresponds to OECD countries.¹

Despite the positive and stable dynamics of agricultural production, all the more so, against the backdrop of the Russian economy's growth rate, there are plenty of reserves for the growth of the agriculture. However, as well as problems. A key condition, slowing down the agriculture dynamics, is the low profitability of the industry. In many respects this is a consequence of lack of regulation in the inter-industry relations in which agriculture is clearly at disadvantage. Initially, acting in conditions of perfect competition, farmers are unable to resist the monopoly abuse of producers of power, fuel, fertilizers and other means, as well as the oligopoly of distributive networks.

Another powerful obstacle to the development of the agricultural economy is the technological backwardness of the Russian agriculture. Russian fields receive a massively smaller amount of mineral fertilizers than in developed countries. According to the World Bank, Russia is behind in terms of input of mineral fertilizers per hectare of plowed field 12 times by Germany, 8 times by the United States, 30 times by China². In 2017, only 1.5 t/ha of organic fertilizers were added, which is 2.3 times less than at the beginning of the Perestroika (1990 - 3.5 t/ha). Energy capacity decreased in the calculation for 100 hectares of crop acres from 364 hp in 1990 to 198 hp in 2017. There is not enough seeding, not enough progressive technologies are applied. These circumstances result in low crop yields (for example, grain-crops: 3 tons/ha in the Russian Federation, 8 tons/ha in Germany), corresponding labor productivity and cash revenues.

The situation is even more difficult in animal agriculture. For example, the two times decreased cow population (from 20.5 million in 1990 to 8.3 million in 2017)

¹ The World Bank. URL: <http://www.worldbank.org/en/country/russia/publication/policies-for-agri-food-sector-competitiveness-and-investment>

² World Bank. URL: <http://data.worldbank.org/indicator/AG.CON.FERT.ZS/countries>

caused a shortage of domestic milk and an adequate increase in its imports. In comparison with Canada, located approximately in the same natural and climatic conditions, the yield of milk per 100 hectares of farmland in Russia is three times lower (46.5 t and 14.3 t, respectively). In the agriculture of Russia, the gross added value in 2017 per 1 employee amounted to 13667.77 USD in prices of 2010, in Canada – 72147.48, in Norway – 130127.78.

The interaction of science and production still remains problematic. The «Golden Triangle» of the great agricultural power - the Netherlands is: state – science and education – business, so far remains a long-awaited dream for Russia.

Thus, it can be stated that the activation of the economic growth of agriculture becomes one of the most priorities of state regulation of the economy.

The studies of the economic growth of the agriculture conducted on the basis of formalized methods have made it possible to identify the main strategic initiatives in ensuring sustainable dynamics of agriculture (Anokhina M., 2017). However, the complicated and turbulent nature of changes in agricultural production, presence of a very large number of growth factors, need to take into account the relationships between the parameters of economic dynamics in its condition determine the possibility of combining traditional approaches, based on formalized research methods, with subjective models developed using expert judgment, the logic of “common sense”, intuition and heuristics as one of the requirements for the methodology of management of economic growth. The methodology of cognitive modeling satisfies these requirements to the greatest degree. Theoretical bases of the cognitive approach and its applied aspects in solving problems in the management of weakly structured systems were formed in the works of Casti J. (1982), Axelrod R. (1976), Atkin R. and Casti J. (1977), Roberts F. (1978), Kosko B. (1986), V.B. Silov (1995), V.I. Maksimov (2001) and others.

Cognitive modeling is a research of the functioning and development of weakly structured systems (WSS) and situations by building a model of the WSS (situation) on the basis of a cognitive map (Avdeeva Z. et al., 2007). Within the framework of the conducted research, the cognitive map is a weighted directed graph, the vertices of which are compared concepts, in terms of which the author’s concept of management of the economic growth of agriculture is described, and the edges - relations and the degree of influence, reflecting the cause-effect relationships between these concepts. The fuzzy cognitive maps (FCM) of Silov (Silov V.B., 2005) were chosen as the basis for constructing a cognitive model for management of the economic growth of agriculture. This choice is conditioned by the desire to provide higher accuracy of modeling, to use in combination the quantitative and qualitative characteristics of the state of the agricultural sector, to carry out not only an individual but collective estimation of model parameters, to model the generating and dynamically strategic alternatives for provision of a

given sustainable economic dynamics of the industrial complex.

The methodology of cognitive modeling of the process of management of the economic growth of agriculture includes 11 stages. In its development, the algorithm of cognitive analysis for a complex situation, formulated in the papers of Silova V.B., was used. (2005), Gorelov V.I. et al. (2012), Erokhin D.V. et al. (2010), Krioni, N.K. et al. (2016), Kruglov V.V. (2002), Kulinich A.A. (2010), Ponsesovskii A.G. et al. (2009), Kolodenkova A.E. (2017).

For static analysis of the fuzzy cognitive map, an operation of transitive closure of the corresponding cognitive matrix has been performed and the main system indicators have been calculated, according to which, mutual consonance, dissonance and other integral indicators characterizing the properties of the system are determined (Borisov et al., 2007; Erokhin D.V. et al., 2010; Kopeliovich D.I. et al., 2018):

Dynamic analysis of the behavior of the cognitive map of management of economic growth of agriculture was carried out on the basis of the mathematical apparatus of impulse processes (Ponsvesovskii A.G. et al., 2009; Isaev R.A. and Podvesovskii A.G., 2017).

The dynamic analysis of cognitive map involves the development of a variety of alternatives, which allow to bring the state of the system to a given target value (level).

To construct a fuzzy cognitive map (FCM) for management of the economic growth of agriculture, seventeen concepts were divided into four groups. Given the cause-effect relationship between quantitative, qualitative and generating dynamics, and the content of the latter as a source of sustainable growth, the parameters of the generating dynamics are defined as controllable concepts. Based on the results of this stage, a cognitive matrix was constructed, containing estimates of the intensity of the influences, a visual representation of which was a fuzzy cognitive map for management of the economic growth of agriculture (Fig. 1).

The system indicators of the fuzzy cognitive management map for the economic growth of agriculture are presented in Table 1. The computational experiment of the fuzzy cognitive model of management of the economic growth of agriculture on the basis of statistical analysis made it possible to verify it as adequate to the real situation.

Taking into account the interconnection of quantitative, qualitative and generating changes, it is possible to move the system in positive direction and to strengthen the processes of economic dynamics in agriculture by means of the concepts “Concentration of value added in science-intensive sectors of agriculture” and “Differentiation of rural and urban population”.

When developing alternatives for management of the economic growth of agriculture, in accordance with the rules of FCM dynamic analysis from the whole

set of controllable concepts, the concept “Differentiation of rural and urban population” was considered as impeding, therefore in all generated alternatives, given its content in modern conditions, it was desirable to weaken this concept. All other controllable concepts are assigned to the group of contributing and, accordingly, in the strategies for management of the economic growth of agriculture, their strengthening is necessary.

With the help of the SSDS “IGLA”³, 242 strategic alternatives for management of the economic growth of agriculture were generated, 16 of them turned out to be undominated. Visual analysis of these alternatives on the criteria of the level and sustainability of achievement of target concepts, the magnitude of the power of management actions made it possible to unambiguously identify the Alternative 99 as the best one. This Alternative allows to increase the concepts «Agricultural Production Index» and «Gross added value per employee in agriculture» from the 6th step by 5 levels and ensure that their value is above the given target one.

³ The "IGLA" software system of decision support (SSDS) (Intelligent Generator of the Best Alternatives). Developed in Bryansk State Technical University under the supervision of Podvesovskii A.G. Available at: <http://iipo.tu-bryansk.ru/quill/download.html>

Table 1. System indicators of the FCM for management of the economic growth of agriculture

No	Concepts	\bar{C}_i	\bar{C}_j	\bar{D}_i	\bar{D}_j	\bar{P}_i	\bar{P}_j	I_i^C	I_i^P	I_i^{SC}	I_i^{SC}
1	Agricultural production index	0.8972	0.9591	0.1028	0.0409	0.181	0.3638	-0.0619	-0.1827	0.9591	0.1028
2	Gross added value per employee in agriculture	0.891	0.9653	0.109	0.0347	0.2056	0.2918	-0.0742	-0.0862	0.9653	0.109
3	Profitability of agricultural organizations	0.9813	0.7882	0.0187	0.2118	0.2029	0.2808	0.1932	-0.0779	0.9813	0.2118
4	Milk production	0.9095	0.8683	0.0905	0.1317	0.1682	0.1414	0.0412	0.0268	0.9095	0.1317
5	Meat production	0.9095	0.8683	0.0905	0.1317	0.1802	0.1414	0.0412	0.0388	0.9095	0.1317
6	Gross harvest of main crops	0.9095	0.8689	0.0905	0.1311	0.1922	0.1237	0.0405	0.0608	0.9095	0.1311
7	Production of gross agricultural output in comparable prices	0.9033	0.9345	0.0967	0.0655	0.1873	0.2947	-0.0312	-0.1075	0.9345	0.0967
8	Yield of the main crops	0.9224	0.8623	0.0776	0.1377	0.2322	0.092	0.0601	0.1402	0.9224	0.1377
9	Productivity of livestock and poultry	0.9291	0.8617	0.0709	0.1383	0.2682	0.1125	0.0675	0.1557	0.9291	0.1383
10	Index of labor productivity in agriculture	0.9095	0.8915	0.0905	0.1085	0.1562	0.1481	0.0179	0.0081	0.9095	0.1085
11	Competitiveness of domestic agricultural production	0.9033	0.9182	0.0967	0.0818	0.1756	0.1627	-0.0149	0.0128	0.9182	0.0967
12	Differentiation of rural and urban population	0.6526	0.9776	0.3474	0.0224	-0.2191	-0.1145	-0.325	-0.1046	0.9776	0.3474
13	Quality of living of rural population	0.6921	0.9714	0.3079	0.0286	0.1446	0.1552	-0.2794	-0.0105	0.9714	0.3079
14	Greening of agricultural production and products	0.91	0.8558	0.09	0.1442	0.1265	0.0832	0.0543	0.0433	0.91	0.1442
15	Concentration of value added in science-intensive segments of agriculture	0.9748	0.8492	0.0252	0.1508	0.3975	0.1315	0.1256	0.266	0.9748	0.1508
16	Ratio of processing of agricultural products	0.91	0.8558	0.09	0.1442	0.138	0.1294	0.0543	0.0086	0.91	0.1442
17	Natural and climatic conditions of agricultural production	0.9467	0.8558	0.0533	0.1442	-0.2456	-0.0462	0.091	-0.1994	0.9467	0.1442

When using this alternative, the concept “Profitability of agricultural organizations” has a stable dynamics in the target value zone from the 7th step. Of course, such results require significant efforts in achieving, above all, the controllable parameters of the generating dynamics. It is necessary to weaken the concept “Differentiation of the rural and urban population” by 6 levels from the 7th step, to raise the concept “Quality of living of rural population” by 6 levels, to provide “very high” value of the concept “Greening of agricultural production and products” from 3rd step (raise by 5 levels), to achieve the “high” value of the concept “Concentration of value added in the science-intensive segments of agriculture” from the 8th step (increase by 5 levels), to bring up to “very high” value the concept “Ratio of processing of agricultural products” from the 8th step (increase by 6 levels). With the achieved values of the quantitative, qualitative and generating dynamics of the agriculture in modern management practices, it is very difficult to provide such a significant change in its condition. Therefore, using an impulse modeling, a variant of strategy based on Alternative 99 was developed, taking into account the real possibilities and assuming a stage-by-stage change of certain controllable concepts. As such concepts, the concepts “Differentiation of rural and urban population” and “Concentration of value added in science-intensive segments of agriculture” were chosen, taking into account the power of their influence on the system. The process of management of the economic growth of agriculture can be divided into three stages with the following targets: the first is to form growth potential; the second is to ensure the sustainability of economic dynamics; the third is to upgrade the quality growth of agricultural production.

At the stage of formation of the growth potential (stage I), as a result of the power of influence of the management concepts, determined in the course of cognitive modeling, “Agricultural Production Index” as the main indicator of the economic growth of the agriculture will be increased by 15.3%, “Gross value added per employee in agriculture” - by 23.6%, “Profitability of agricultural organizations” will increase after a slight decrease by 14.6% in the first steps. The main efforts put to build the growth potential should be oriented towards improving the quality of living of rural population. A significant increase in the corresponding parameter by - 19.5% (5 levels) combined with a complex moderate growth (by 1-2 levels) of other parameters of the generating dynamics will significantly increase the concepts of the “Index of labor productivity in agriculture” by 14% (3 levels), “Competitiveness of domestic agricultural production” - 7.5% (2 levels), which in turn will lead to an increase in the concept “Production of gross agricultural output in comparable prices” by 14% (3 levels). It should be noted that in the complex format of the implementation of management impacts on controlled concepts, the negative impact of the natural and climatic conditions of agricultural production will be reduced by at least 2.5%.

Cognitive modeling of the power of influence of management concepts at the stage of ensuring the sustainability of growth (stage II) allowed to determine the next level of target concepts - "The index of agricultural production" and "Gross value added per employee in agriculture" will increase by 10%, "Profitability of agricultural organizations" - by 6.6%. At this stage, the main management impact should be associated with an increase by 7.5% in the concept "Ratio of processing of agricultural products", the concept "Quality of living of rural population" by 8.2%. The remaining concepts of the generating dynamics group need to be changed moderately (by 1 level) in the corresponding desired direction: increase the concept "Greening of agricultural production and products" by 4.8%, in accordance with a given impulse increase the concept "Concentration of value added in science-intensive segments of agriculture" by 5% and reduce the concept "Differentiation of rural and urban population" by 5%. At the same time, for all the parameters of qualitative dynamics it is possible to achieve a moderate increase by 1 level: the concepts "Productivity of livestock and poultry" and "Index of labor productivity in agriculture" will increase by 4.5%; "Yield of the main crops" by 5%; "Competitiveness of domestic agricultural production" by 5.5%. The influence of the generating and qualitative dynamics will make it possible to ensure comparatively higher values (an increase by 2 levels) of all parameters of quantitative dynamics: increase by 7.5% in the concepts "Milk production" and "Meat production"; "Gross harvest of main crops" by 9%; "Production of gross agricultural output in comparable prices" by 11.5%. As in the previous stage, during the modeling process, a weakening of the negative impact of the natural and climatic conditions of agricultural production by at least 2.5% (0.5 level) is detected.

At the III stage, in which it is necessary to ensure a new growth quality, all the target concepts will demonstrate the fixation of the dynamics at the achieved level: the overall growth of the concept "Agricultural production index" will amount to 25.3%, "Gross added value per employee in agriculture" - 23.6%, "Profitability of agricultural organizations" will be stabilized after a small decline (1.25%) with a growth value of 20%. Management actions from the concepts of the group "Generating Dynamics" should increase by 1 level. At the same time, it is necessary to keep the achieved 27.7% growth of the concept "Quality of living of rural population", increase the value of growth of the concept "Ratio of processing of agricultural products" by 7.5% and the concept "Greening of production and agricultural products" by 4.8%. The concept "Concentration of value added in the science-intensive sectors of agriculture" by the force of impact in accordance with the set values of impulse impact increases by 5%. At the same time, "Differentiation of rural and urban population" should be reduced by 5% at this stage. This level and nature of the generating dynamics of agriculture will make it possible to raise all the concepts of the "Qualitative Dynamics" group by 1 level and, in

particular, to increase the growth of the concepts “Index of labor productivity in agriculture” and “Productivity of livestock and poultry” by 4.5 %; “Yield of the main crops” - 5%; “Competitiveness of domestic agricultural production” - 5.5%. The quantitative dynamics on the third stage will be enough stable and will basically have the character of fixation. We should expect an increase in the concepts “Milk production” and “Meat production” by 7.5%, keeping the “very high” level of concepts “Gross harvest of main crops” (by 4%) and “Gross production in agriculture in comparable prices” (an increase by 2%). Based on the results of the modeling at the stage of “Ensuring a new quality of growth”, the negative impact of the natural and climatic conditions of agricultural production will continue to weaken, and as a whole, the implementation of the strategy will achieve at least a 7.5% reduction in this concept.

The strategy of management of the economic growth of agriculture, developed using cognitive modeling and presented by the authors, makes it possible to clearly set priorities in agricultural policy, unambiguously determine the directions and nature of management impacts within the framework of the agriculture management mechanism, and ensure sustainable and balanced development of agricultural production as the basic branch of the national economy.

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工业园区的形成是该地区可持续经济增长的基础
**FORMATION OF INDUSTRIAL PARKS AS A BASIS FOR
SUSTAINABLE ECONOMIC GROWTH IN THE REGION**

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注解。国家和区域国民经济的区域化是优化区域经济管理的必要条件，也是最大限度地发挥区域社会经济发展不平衡的一个因素。

经济领域分配的主要目的是形成适当的区域政策。从经济角度来看，区域政策在合理利用区域竞争优势在分工体系中的应用，优化区域经济中自然资源潜力的利用和建立的有效性方面尤为重要。区域间经济关系。

罗斯托夫地区区域政策在世界和国家经济危机后发展中的核心任务是重新构建经济发展模式。罗斯托夫地区经济在不久的将来的增长前景将取决于这种区域经济发展模式的形成，该模式将能够充分应对全球经济发展和国际市场变化的全球趋势。

关键词：区域经济；工业园区；再工业化；创新和技术集群，地域生产综合体。

***Annotation.** The regionalization of the national and regional national economy is an essential condition for optimizing the management of the regional economy, as well as a factor in maximizing the existing uneven social and economic development of the regions.*

The main purpose of the allocation of economic areas is the formation of an adequate regional policy. From an economic point of view, regional policy is of particular importance in the context of rationalizing the use of competitive advantages of regions in the system of division of labor, optimizing the use of natural-resource potential in the regional economy and the effectiveness of establishing economic relations at the interregional level.

The central task of the regional economic policy of the Rostov region in the post-crisis development of the world and national economies is the reformatting of the economic model of development. The growth prospects of the Rostov region's economy in the near future will be determined by the formation of such a regional model of economic development that will be able to adequately respond to global trends in the development of the global economy and market changes in international markets.

***Keywords:** region economy; industrial parks; re-industrialization; innovation and technology clusters, territorial production complexes.*

In the conditions of the Soviet planned economy, economic regionalization acquired state significance. At the stage of market transformations characteristic of countries with transitional economies, economic zoning actually ceased to exist, which led to a serious disorganization of the territorial system of rational distribution of production, development and distribution of productive forces.

The principles of economic specialization inherent in the system of territorial division of labor are also reflected in the formation of the highest stage of this process - the international division of labor. It is obvious that the presence of general principles of economic specialization at all levels of the spatial and territorial hierarchy of the economy demonstrates the crucial role of economic regionalization as a key element in the formation of a harmonious system of functioning of regional and national economic complexes.

Economic regionalization forms the basis of the system of territorial management of the national and regional national economy, is an essential condition for optimizing the management of the regional economy, as well as a factor in maximizing the existing uneven socio-economic development of the regions.

The most important aspects of economic regionalization are:

- effective distribution of powers between federal, regional and local authorities in the framework of modern approaches of innovation management;
- optimization of the system of prerequisites for improving the investment potential;
- improvement of the internal market system and the infrastructure component of the regional economic potential.

The main properties of the economic region are: complexity, integrity, specialization and controllability.

In regional studies and economics there is a system of relative indicators that determine the degree of complexity of the national economy of the region:

- percentage of products of intraregional production consumed in the region itself;
- the share of products for interdisciplinary use;
- degree of use of regional resources.

As for integrity, its most important aspect is the presence of stable production-technological, as well as intra-and inter-regional relations.

These categories (complexity and integrity) are peculiar criteria that necessitate the creation of a system of zoning and the actual allocation of regions, which is largely due to the formation of relative intraregional autonomy within the framework of a subjective economic activity.

Thus, the following group of indicators has become most representative in this methodological key:

- the index of the level of specialization of the region by industry (the ratio of

the share of the economic region in the region for the production of this industry to the proportion of the region in the country across the entire industry and agriculture);

- the efficiency index of specialization (the ratio of production per unit of costs in the region to the same indicator for the Rostov region as a whole);
- cumulative index of specialization (product of the previous partial indices).

Regional specialization determines the formation of an integrated system of regional division of labor, which is the basic category in assessing the place of an economic region in the system of reproduction processes. The specialization of economic activity is the most important characteristic in determining the boundaries of economic regions: this process inevitably correlates with the need to improve conditions within the framework of production specialization and the formation of a full-fledged domestic market. Ultimately, a rational system of territorial division of labor is one of the determining factors in the mechanisms for increasing labor productivity within specific economic zoning units.

In modern conditions there is a certain categorical apparatus, reflecting the most important reference points within the framework of economic regionalization.

- industrial zone - a combination of industrial enterprises, united by a common territory, production and production-technological relations, a single production infrastructure, a common transport and geographical position within one or several closely located settlements (cities, urban-type settlements);

- the zone of advanced development is the territory that has prerequisites for the formation of high rates of socio-economic development, as well as its economic specialization, based on the degree of competitiveness, natural resource potential, internal and external economic factors and developed markets;

- agglomeration is a territorial-economic combination that occurs on the basis of a large city or several cities and creates a significant zone of urbanization; characterized by a high degree of territorial concentration of industry, infrastructure and population density; It has a decisive influence on the economy and social life of the surrounding territory; shows a high degree of complexity of the economy and the territorial integration of the population;

- industrial (agro-industrial) park is a production (part of production) territory, the boundaries of which are determined, provided or to be provided with engineering and transport infrastructure, designed to accommodate and operate business entities (investors);

- points of growth - the center of economic activity, able to achieve independent growth to the level at which growth begins to spread to adjacent territories.

Economic zoning of the Rostov region will allow the following tasks:

- transformation of the production structure of economic regions, large urban

districts, modernization of infrastructure, improvement of the environmental situation;

- formation of a regional policy aimed at creating a system of industrial parks and industry clusters;
- identification of priority development zones, aimed at increasing the share of high value-added industries;
- overcoming the socio-economic backlog of agro-industrial territories;
- development of mechanisms for the development of agricultural municipalities, small cities and single-industry towns, the development of social infrastructure in the countryside;
- overcoming the economic mono-profile of lagging areas;

Increasing the role of fundamental and applied science, as well as increasing the share of innovative products in the total output within economic regions, including by optimizing the allocation of means of production in the system of territorial division of labor;

Improvement of transport, financial, social and other types of infrastructure;

- reduction of differentiation in the level and quality of life of the population of individual economic regions of the Rostov region, reducing their backlog.

The totality of these tasks requires certain views and assessments necessary for the formation of proposals for their solution:

- assessment of the resource potential of the region and its socio-economic and demographic features necessary for the development of the methodology, instrumental apparatus and criteria for managing the overall geo-economic potential of a taxonomic unit;
- analysis of the economic condition of various regions of the region and the specifics of the development of the system of municipal formations of the region.

In the broadest terms, economic zoning makes it possible to improve the system of territorial production concentration and the effective use of production factors in the framework of economic activity. Economic regionalization also serves as an essential basis for forecasting research, budget and financial planning.

The consistent use of a number of leading factors necessary for building an effective system of economic regionalization allows us to form a clear and harmonious system of regional reproduction within the increasingly complex territorial division of labor. It is important to note that an effectively constructed system of economic regionalization induces a deepening territorial division of labor.

The tasks of economic zoning of the Rostov region closely correlate with the prospects and opportunities for the region to reach a qualitatively new level in the framework of technological progress processes. It is the assessment of the potential potential of the productive forces of the region contributes to the optimal approach to the placement of new industries, effective models of interregional

cooperation, the formation of prerequisites for increasing the significance of the region in the global arena.

The economic regionalization of the Rostov region is a serious basis for the possibilities of enhancing the innovative potential of production, in the light of the objectives of strengthening the role of the 5th and 6th technological structures in the Russian and regional economies.

Thus, based on the agricultural and industrial specialization of municipalities of the Rostov region, transport links, natural resource identity and experience of previous attempts at zoning, the following economic regions of the Rostov region are proposed:

- Rostov agglomeration;
- Border area;
- Central District;
- Northeast district;
- Volgodonsk district;
- South-Eastern region;
- Southern region.

The strategic territorial structure of the economy is based on the need to support a fundamental balance of development levels of competitive production that meets the highest standards of quality of life, from a territorial perspective. To solve this problem, it is necessary to maximally promote the implementation of specific competence for each territory. The balance in the development of all these territories can be achieved by:

1. Creation of a network of agro-and industrial parks according to the cluster principle: i.e. placing within the engineering-prepared production areas of several enterprises of related industries, lengthening the value chain, which will allow to obtain maximum efficiency for each resident.

2. Concentrations in large nodal production centers of the national level (Rostov-on-Don - financial, educational and management center of the South of the country, Taganrog and Novocherkassk - centers of high-tech industries and research bases; Volgodonsk bipolar - energy generating and industrial center ; bipolar Gukovo-Zverevo - a center for deep processing of hydrocarbon raw materials; Shakhty and Novoshakhtinsk - industrial-developed centers with diversified production: light industry, food industry, construction industry, metal and evoo-brabotka; g.Salsk, g.Millerovo, g.Konstantinovsk - major agricultural commodity processing centers).

3. In order to optimize the industrial infrastructure of the area, ensuring the highest possible level of economic development throughout the entire Rostov region, it is proposed to create a five-level hierarchical system of centers:

- a) the federal level - Rostov-on-Don;

- b) interdistrict level - the reference centers of economic regions;
- c) district level (district center);
- d) cluster level (center of a group of rural settlements);
- e) local level (center of rural settlement);

Despite significant indicators in the field of agriculture and agribusiness, the potential for further development can be used more effectively. This can be achieved through the formation of systems of agro-industrial parks. To achieve maximum efficiency, this system should include all stages of production: the collection of raw materials, processing and sales of products on the terms of the manufacturer.

For the stage of collecting raw materials and products for processing, it is advisable to organize a network of receiving points on the principle of marketing cooperation. This solution allows to solve a number of tasks for the development of agriculture in the region.

在俄罗斯联邦实施银行账户协议的组织和法律方面
**ORGANIZATIONAL AND LEGAL ASPECT OF THE APPLICATION
OF A BANK ACCOUNT AGREEMENT IN THE RUSSIAN
FEDERATION**

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注解。 本文讨论了俄罗斯联邦银行账户协议的法律和实际应用，以及此类协议对该国银行系统发展的影响。

关键词：俄罗斯联邦民法典，结算账户运作，银行转账，银行账户协议，银行，非现金支付。

Annotation. The article discusses the legal and practical application of a bank account agreement in the Russian Federation, the impact of this type of agreement on the development of the country's banking system.

Keywords: Civil Code of the Russian Federation, operations on a settlement account, bank transfer, bank account agreement, banks, non-cash payments.

In modern conditions, a bank account contract, taking into account the growth of the banking market in the country as a whole, is increasingly being used by credit institutions.

In accordance with Art. 845 of the Civil Code of the Russian Federation Bank, under a bank account agreement, undertakes to accept and credit funds received to the account opened for the client (account holder), to carry out client orders for the transfer and issue of the relevant amounts from the account and for other account transactions. After the account is opened, the client can conduct operations on it: withdraw or charge funds. In accordance with Art. 848 of the Civil Code of the Russian Federation, the bank is obliged to perform for the client transactions provided for accounts of this type by a law, banking rules established in accordance with it and customs of business turnover applied in banking practice, unless otherwise provided by the bank account agreement.

Thus, a credit institution is authorized to perform operations in the interests of the client and on its behalf, at the same time the list of such operations is limited. Operations on the current account are regulated mainly by chapter 46 of the Civil

Code of the Russian Federation, which regulates settlements, and are carried out within the framework of a bank account agreement. In accordance with paragraph 3 of Article 861 of the Civil Code of the Russian Federation, non-cash payments are made through banks in which relevant accounts are opened. The operations carried out within the framework of a bank account agreement include actions related to the settlement of payment orders, settlements under a letter of credit, and settlements under collection.

L. G. Efimova defines a bank transfer as an independent agreement between a bank and a client, which is based on a bank account agreement and provides the following mechanism for concluding such an agreement. The payment order submitted by the client to the bank is an offer addressed to the bank, and contains the client's proposal to conclude this contract. The bank does not have the right to refuse, since its obligation to transfer the funds belonging to the client arises from the bank account agreement. Acceptance by the bank of the client's offer is expressed in implicit actions: the bank is obliged not only to write off the corresponding amount from the client's account, but also to transfer the settlement documents to the intermediary bank or the recipient's bank [1].

L.A. Lunts adheres to a slightly different opinion, believing that a bank transfer should be recognized either by the cession or by the delegation [2], however, taking into account the fact that when the cession occurs, the creditor is replaced by the main obligation due to the contract, according to V.A. Belova, "... this is the conclusion of unilateral transactions" [3], it seems that this position is not entirely justified. With such a position, it is not clear in what capacity a bank should be perceived by third parties who must accept from it the proper execution of an agreement with their counterparties? In this regard, Sarbash S.V. [4] finds the solution in the disposition of Art. 313 of the Civil Code of the Russian Federation: the fulfillment of the obligation may be imposed by the debtor on a third party, if the law, other legal acts, the terms of the obligation or its substance do not imply the obligation of the debtor to fulfill the obligation personally. In this case, the creditor is obliged to accept the performance proposed for the debtor by a third party.

It should be noted that in order to apply to the bank, properly executed payment orders the consequences of the invalidity of transactions, you should decide on the possibility of referring them to the transactions of execution of payment documents. Quite often there are cases of issuing cash or transferring money to another account for payment orders and powers of attorney presented by unauthorized persons. At the same time, banks in bank account agreements seek to free themselves from possible liability, guided by paragraph 2 of the Resolution of the Plenum of the Supreme Arbitration Court of the Russian Federation No. 5 of April 19, 1999: unless otherwise provided by law or contract, the bank is responsible for the consequences of executing instructions issued by unauthorized persons and

those cases when using the procedures stipulated by banking rules and the agreement of the bank could not establish the fact of issuing the order by unauthorized persons. For example, the Resolution of the Presidium of the Supreme Arbitration Court of the Russian Federation No. 3468/02 of September 10, 2002 states: a verdict of a court of general jurisdiction that has entered into legal force establishes the fact that funds are written off on a counterfeit payment document, that is, illegal withdrawals of funds in the absence of an appropriate order from the account holder. The Plenum of the Supreme Arbitration Court of the Russian Federation in Decree No. 5 of April 19, 1999 “On some issues of the practice of settling disputes related to entering into, executing and terminating bank account agreements” clarified that the authority of persons entitled to manage the account is checked by bank rules and contract with the client. In cases of transfer of payment documents to the bank in writing, the bank must verify, using external signs, the signatures of authorized persons and the seal on the document submitted to the bank to samples of signatures and a seal imprint contained in the card transferred to the bank. By virtue of paragraph 3 of Article 401 of the Civil Code of the Russian Federation, the basis of the responsibility of a person engaging in entrepreneurial activity is a violation of an obligation if it did not occur as a result of force majeure or other grounds are not provided for by law or contract. The contract regulating the relations of the parties does not establish a limitation of bank liability in such cases¹.

According to Art. 845 of the Civil Code of the Russian Federation, the bank undertakes, under a bank account agreement, to accept and credit the funds received to the account opened for the client, to comply with the client’s instructions for transferring the corresponding amounts from the account, and the client, by virtue of art. 851 of the Civil Code, is obliged to pay for bank services. Since actions to credit funds and their cancellation by themselves do not create for the parties to the above settlement and cash service agreement to establish, amend and terminate civil rights and obligations relative to each other, such actions should not be recognized as transactions.

According to Art. 854 of the Civil Code of the Russian Federation, the bank withdraws funds from the account on the basis of the client’s order. If there are funds on the account, the amount of which is sufficient to meet all the requirements for the account, these funds are debited from the account in the order of receipt of customer orders and other documents for write-off, unless otherwise provided by law, i.e. in calendar order (Article 855 of the Civil Code of the Russian Federation). In the case when the funds on the account are not enough to meet all the demands made on it, the funds are debited in the order of priority established by law [5].

¹ Resolution of the Presidium of the Supreme Arbitration Court of the Russian Federation of 10.09.2002 No. 3468/02 // Bulletin of the Supreme Arbitration Court of the Russian Federation. - 2002. - № 12.

If it is an intrabank payment, then the obligation will be considered fulfilled only after the entire amount has been received on the account specified in the payment document. If the money needs to be transferred to an account in another bank, then the obligation of the paying bank will be considered fulfilled after the funds are debited from its correspondent account to the correspondent account of the receiving bank, unless otherwise provided in the bank account agreement (clause 3 of the Resolution of the SAC Of the Russian Federation No. 5 of April 19, 1999).

The economy in its present form cannot exist separately without the banking system, and the development of the banking system directly depends on the possibility of using non-cash payments. Thus, all payments for civil liabilities between business entities, as well as payments for taxes must be made through a bank account. Also, it is necessary to recognize that these legal relations are highly influenced by scientific and technological progress, modern technologies. In the conditions of the development of these aspects, increasingly complex relationships in this area of business life, and in all others will lead to the emergence of an increasing number of questions, the need for more detailed, well-thought-out regulatory framework. Detailed legislative development of this issue would help solve many problems in the sphere of relations between banks and their customers, as well as the state.

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全球化背景下的文化安全

CULTURAL SECURITY IN THE CONTEXT OF GLOBALIZATION

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注释：现代世界的文化受到内部和外部的影响。 内部转型的结果可以被认为是传统价值观（对于每个民族文化而言都是个体）与消费价值（没有任何文化认同）的背离。外部转型的结果可以被视为全球化文化。 全球化文化是在文化对话，文化互动和跨文化共存的背景下形成的。 她力求和谐，相互理解，相互尊重。 它适应了人类的进步。 但是，在全球化的背景下，她提出了文化安全问题。 一方面，它旨在保护文化价值，另一方面，旨在建立系统的统一

关键词：全球化，文化，全球化文化，文化互动，文化合作与对话，文化空间，文化安全，世界文化论坛[中国太湖]

Annotation. *culture in the modern world is subject to both internal and external influences. The result of internal transformations can be considered a departure from traditional values (which are individual for each ethnic culture) to values of consumption (which are not identified with any culture). The result of external transformations can be considered a globalizing culture. A globalizing culture is shaped in the context of a dialogue of cultures, cultural interaction and intercultural coexistence. She strives for harmony, for mutual understanding, mutual respect. It is tuned to the progress of humanity. But it was she who poses the question of cultural security in the context of globalization. On the one hand, it is aimed at preserving cultural values, and on the other, at creating systemic unity*

Keywords: *globalization, culture, globalizing culture, cultural interaction, cooperation and dialogue of cultures, cultural space, cultural security, World Cultural Forum [Taihu, China]*

The globalizing world determines its own rules and conditions of existence for the world community, as it covers all levels of its livelihood and establishes the interdependence of its subjects between them. The relationship is expressed not only in the formation of international forms of activity, but also in the dialogue of

cultures and civilizations.

Today, the dialogue of cultures has gone beyond the boundaries of local associations to the world stage. This is vividly illustrated by the International Cultural Forum of Lake Taihu, which originated in 2011 in China as a global association. He united not only the peoples of different cultures and civilizations, but also identified global problems in the development of world culture. This is indicated by the topics of the forums. In 2011 - “Dialogue and interaction in the interests of world harmony and common development”, in 2014 - “Strengthening contacts with the use of “soft power” in culture, promoting peace and development”, in 2018 - “Intercivilizational dialogue: creating a common future for humanity.” The dynamics of problem statement is obvious. The world community should pay attention to cultures.

If the essence of globalization can be determined through the analysis of transformational, modernizing processes, then its phenomena are revealed not only in economic, political, but also in cultural images. One of these is cultural security. Analyzing the 3rd World Cultural Forum 2014, A.N. Chumakov noted that cultural interaction between countries unites humanity into a global community. The basis for this is: recognition of the principles of the coexistence of cultures, the role of culture in the preservation of the world, the role of culture in the progress of humanity [3]. It is worth noting that A.N. Chumakov between the World Cultural Forum [Taihu, China] and the Davos World Economic Forum sees a deep connection. They are united by cooperation and dialogue, which ensure world harmony. But the desire for harmony has its own barriers. One of them is mentality.

If Claude Levi-Strauss wrote back in the 20th century that cultural interaction produces not only positive, but also negative phenomena, then J. Tardif, referring to S. Huntington, notes that today the interaction between peoples belonging to different civilizations is not only growing, it also gives rise to confrontation between value systems and visions of the world.

The modern world, characterized by a globalizing culture, has brought out of the limits of not only social institutions, but also state, geographical borders human (interpersonal, intergroup, etc.) relations. And if in local geopolitical systems, human relations were formed within the framework of the historically established matrix (traditions, customs, value regulators, mentality, religion, etc.), then outside of them a particular person (group) becomes its carrier (expression), reflecting on cultural attitudes (when “common” is expressed in “private”) into a new cultural space. At the same time, the cultural space, becoming a new living environment, promoting cultural adaptation, acts as a mechanism (instrument) of cultural dialogue.

Jean Tardif in the article “Intercultural Dialogues and Cultural Security” [4] asks about this rhetorical question: “This situation raises one of the most important

questions of our time: how are we ready to understand other cultures?" And as if continuing his thought, he asks a new question: "Can we talk about a dialogue between cultures, if mutual knowledge is not enough?". The formulation of these questions leads the author to the need to talk about the openness of cultures to each other, but here a new problem arises - cultural security.

According to Jean Tardif, cultural security can be defined as "the ability of society to maintain its specific character, despite changing conditions and real or virtual threats: more precisely, this is due to the persistence of traditional patterns of language, culture, association, identity and national or religious that are considered acceptable ". From this we can conclude that the problems of identity and security are not only interrelated, but also constitute one whole. Identity (its safety / non-safety) characterizes the level of security implementation. And security problems are raised when a degree of threat arises (including identity).

This suggests that the problems of cultural security are polyspherical. Culture in the security space is no longer a specific (material or spiritual) product, but a sphere and result of human activity. This is what the fact of the destruction of the giant statue of Buddha in 2001 by the Taliban indicates. What is it? Destruction of another culture or self-assertion of their culture ??? Therefore, speaking of the emerging globalization culture, it is necessary to think harmony, to think about cultural security.

According to V. Mezhuhev, "the nature of philosophical reflection is such that any of its objects is revealed as a cultural phenomenon" [5]. Is it possible from these positions to talk about cultural security as a phenomenon of culture?

On the one hand, cultural security is protection, on the other hand, it is system balance (system balance). V. M. Mezhuhev, introducing the concept of the "idea of culture", thinks under it the possibility of "systematic unity" and "typological differences". If under the first one there is a multitude of cultural forms, then under the second one there is a historical multitude of cultures of nations. If we reflect on the idea of cultural security in the context of the idea of culture, we will reach a systemic balance of cultural identity and cultural identity. And here it is worth noting the following.

As noted earlier [1], security problems arise at the moment of crisis, at the junction of contradictions, therefore, cultural security should prevent a crisis of civilizations. This is explained by the fact that culture is the basis of cultural interaction and dialogue. And the dialogue of cultures, as already noted, has become the platform that is the main global strategic task [2]. Therefore, the idea sounds quite purposefully at all convocations of the World Cultural Forum [Taihu, China] that today the world is subject to a crisis of culture and spirituality. And to return to its harmony can be based on mutual understanding and dialogue of cultures.

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倡导“一带一路”作为全球化进程的反思
**INITIATIVE «ONE BELT - ONE WAY» AS A REFLECTION
GLOBALIZATION PROCESSES¹**

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注解。 本文致力于从全球化发展的角度分析“一带一路”倡议，其目的是以牺牲“权力制衡”制度来形成新的世界秩序。 这是俄中合作的风险和机遇。

关键词：全球化，全球化进程，区域化，新世界秩序，“权力平衡”，“一带一路”，中国，俄罗斯。

Annotation. *The article is devoted to the analysis of the “One Belt - One Way” Initiative from the standpoint of globalization development, the purpose of which is to form a new world order at the expense of the “system of balance of power”, the elements of which are the risks and opportunities for Russian-Chinese cooperation.*

Keywords: *globalization, globalization processes, regionalization, new world order, “balance of power”, “One belt - one way”, China, Russia.*

Both globalization in general and globalization processes in particular, are each cause-effect relationship with the emerging new world order, the outlines of which can be revealed on specific local phenomena, which, being local, are an expression of global trends.

One of such phenomena is the Initiative (in the Chinese version) / Strategy (in the western and domestic variant of the interpretation of the concept) “One belt - one way”. Why is the Initiative a global trend? Forming itself in a specific country, “One Belt - One Way” is aimed at a global reorganization of the world order. Why is the Initiative a local phenomenon? Realizing as the embodiment of China’s idea of a harmonious society, “One Belt - One Way” is aimed at regionalization.

The tendencies of the formation of the new world order, which is replacing the American idea, emerging in China, are already clearly beginning to declare themselves today. As noted by L.E. Grinin, already in the 90s of the 20th century,

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“the number of predictions regarding the inevitable weakening of American hegemony and at the same time the coming of Asia to the leading position” increased [1].

Becoming a source of globalization, the United States formed such a mechanism that allowed developing countries, including China, to make a massive leap forward in a short time, thereby justifying their dominant role in transforming the world order. So, as the world order, so L.E. Grinin, held «on any system of balance of power,» then changing, the balance of power entails a change and the world order [2]. Therefore, the “One Belt - One Way” Initiative can be considered as an integral part of the “power balance system”.

In the context of Russian-Chinese relations, the “One Belt - One Way” Initiative has historical and cultural grounds. The geopolitical advantage, the powerful potential for economic development, the length of the border line can contribute to the development and cooperation of Russia and China in the field of bilateral trade, in achieving and promoting economic policy. The reaction to the Crimean incident by European and American countries, the introduction of political sanctions against Russia, objectively provided and accelerated the emergence of new opportunities for the development of the economies of China and Russia. Against this background, the “One Belt - One Way” Initiative creates favorable objective conditions for the economic development of countries along the belt. On the one hand, as noted by Vanveem, the implementation and promotion of the “One Belt - One Way” Initiative should contribute to the deepening and development of trade cooperation between China and Russia, and on the other, to promote the process of regional integration in Northeast Asia [4].

At the same time, Chinese experts, for example, Zhao Huirong, in 2015, in the article “How Russia Considers the Silk Road Economic Belt?” Noted that among Russian scientists there are different, sometimes opposing opinions about the Initiative, which, as it were, are divided into two groups. Scientists who are engaged in Russian-Chinese trade and economic relations operate with objective factors. And scientists, officials who are not professionals in this matter have a one-sided position, caused by a lack of understanding of the situation.

Therefore, as Zhao Huirong writes at the end of the article, China and Russia should make more efforts to expand humanitarian exchanges, as this will contribute to the destruction of the main obstacles to which it relates: cultural differences, lack of trust and mutual understanding, problems of information exchange [5].

The Chinese economy is developing rapidly today, so the importance of the Russian market is recognized in the process of deepening the policy of openness and strengthening national trade cooperation. As part of the “go out” policy, China not only sees Russia as a long-term trading partner, as noted earlier, but also actively promotes trade and economic cooperation with its various regions [3].

At the same time, China also attaches great importance to investment cooperation with Russia. For example, according to Jiliaishanli, according to the data of the Foreign Direct Investment Statistics Budget in 2016, Chinese-Russian investment special funds have sharply increased, including the investment flow of China to Russia totaled \$ 634 million [6].

Thus, as noted by Russian and Chinese experts, the “One Belt - One Way” Initiative has favorable conditions for investment cooperation and the expansion of trade between China and Russia. It will make it possible to find a common language while preserving the differences between the two cultures, strengthening the international status without violating the national interests of the two states.

The “One Belt - One Way” Initiative is a globalization development strategy. On the one hand, it relies on the powerful innovative potential of China (investment flow, technical capabilities, etc.), on the other hand, on the search and application of forms of its introduction into social, cultural, economic, financial life as Russian regions, in particular, and Russia as a whole. Therefore, considering it as part of the “system of balance of power”, it is necessary for both sides, determining the risks and opportunities for cooperation, to reach the level of equal dialogue, which is one of the conditions for globalization development. It is not by chance that in May 2017, at the regular Forum on the discussion of the “One Belt - One Way” Initiative a new level of its development was defined, which should move from “connecting hearts of people” (humanitarian exchanges) to “the path of civilization”.

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通过数学和自然科学学科的数学建模进行整合
**INTEGRATION BY MEANS OF MATHEMATICAL MODELLING
OF MATHEMATICS AND NATURAL-SCIENCE DISCIPLINES**

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注解。 本文论述了目前最紧迫的问题之一 – 数学与自然科学的整合, 揭示了整合水平 (完整性水平, 教学综合水平, 跨学科联系水平), 描述了数学与自然科学整合的本质。 跨学科联系层面的科学: 在一级知识 (科学语言, 理论, 应用部分) 和活动层面实施跨学科联系。

关键词: 整合, 数学, 自然科学, 跨学科交流。

Annotation. *The article deals with one of the most urgent problems at present - the integration of mathematics and natural sciences, reveals the levels of integration (integrity level, level of didactic synthesis, level of interdisciplinary connections), describes the essence of integration of mathematics and natural sciences at the level of interdisciplinary connections: implementation of interdisciplinary connections at the level knowledge (language of science, theory, applied part) and at the level of activities.*

Keywords: *integration, mathematics, natural sciences, interdisciplinary communication.*

The concept of “integration” in the education system comes out in two ways: first, it is the creation of a holistic view of the world around the student (here integration is seen as the goal of learning, that is, to the level of knowledge); secondly, it is the finding of a common platform for the convergence of subject knowledge (here integration is a means of learning, that is, integration at the level of activities).

In the structure of integration, an important place is occupied by the levels of its implementation. M.N. Berulava [3] suggests such levels of integration.

The first and highest level of integration of the content of education is the level of integrity, culminating in the formation of a new academic discipline of an integrative nature and having its own subject of study.

The second level of integration of the content of education is the level of di-

dactic synthesis. Integration of subjects at this level is carried out constantly.

Didactic synthesis characterizes not only the content integration of school subjects, but also its procedural synthesis determined by it. The main integrating factor at this level is the general object of study.

The third level of integration is the level of interdisciplinary connections. Integration is carried out both at the level of knowledge and at the level of activities.

An important role in integration is the choice of integration frameworks that will play a system-forming role.

V.S. Bezrukova notes: “The determination of the system-forming integration factor is the finding of a basis for association. The system-forming factor is an idea, a phenomenon, a concept, or an object capable of: combining the components of a system into a whole unity; target them; stimulate a holistic activity manifestation; while maintaining a certain and necessary degree of freedom of the components; to provide self-regulation of the new system, its self-development” [2, p. 60].

The system-forming role of mathematics is substantiated by the ongoing integrative process of the mathematization of various sciences, both natural sciences and humanities.

Mathematization of scientific knowledge combines all sorts of ways and forms of applying the methods and tools of mathematics to study the objects of other sciences.

The system-forming role of mathematics is manifested through the implementation of interdisciplinary connections, which is accomplished through the solution of interdisciplinary problems.

An interdisciplinary task is “a task, the condition and requirements of which contain the components of the main and adjacent (adjacent) objects, and the solution and analysis contribute to a deeper and more complete disclosure of the volume and content of the concepts determining the relationship between these objects” [11, p. eleven].

Let us give an example of an interdisciplinary task.

Task. Cheese makers believe that with an equal volume, ball-shaped cheeses better retain their taste, than cylinder-shaped, parallelepiped-shaped cheeses. Why?

Taste changes as a result of evaporation, and possibly oxidation. From the courses of physics and chemistry it is known that the processes of evaporation and oxidation depend on the surface area of the body.

By the necessary calculations, we come to the conclusion that the taste qualities of spherical cheese are better preserved than those of other forms, since with equal volumes the surface area of the ball is the smallest.

According to the new Federal State Educational Standards, the integration

of mathematics and natural sciences involves the formation of interdisciplinary concepts. The reader will find a detailed discussion of this in our papers [4, 5, 7] and in [12].

In [12], it is noted that interdisciplinary concepts will be understood as concepts that: 1) are denoted by the same term in different subjects; 2) have the same meaning and meaning.

We refer to interdisciplinary concepts that: form the scientific worldview; much more often than other concepts serve as a means of studying various issues in various academic disciplines; work actively over a long period of time; contribute to the most complete implementation of interdisciplinary relations; have applied and practical orientation.

We now turn to the question of interdisciplinary connections between mathematics and natural sciences (physics, chemistry, biology).

There are three kinds of connections between mathematics and physics:

a) physics sets problems, the solution of which leads to the emergence in mathematics of new ideas and methods, and they in turn become the basis for the development of mathematical theory;

b) the application of a mathematical theory with its ideas and apparatus for the study and analysis of physical phenomena leads to the creation of a new physical theory;

c) the physical theory is based on the existing mathematical apparatus, but the latter is developed as it is used in physics; there is a parallel development of physics and mathematics.

The mathematical apparatus is necessary for physics, first of all, as a language for the description of physical phenomena, as one of the methods of physical research.

M.V. Lomonosov noted: "... a physicist without mathematics is blind."

A. Einstein wrote: "One of the most important characteristic features of modern physics is that the conclusions drawn from the initial ideas are not only qualitative, but also quantitative. To draw quantitative conclusions we must use the mathematical language And if we want to draw conclusions that can be compared with the result of an experiment, we need mathematics as an instrument of research" [15, p. 376 - 377].

For example, the language of differential and integral calculus opens up great opportunities for a more rigorous definition of a number of physical quantities, the recording of physical laws; accurate record of Newton's second law and the law of electromagnetic induction; EMF induction arising in a frame rotating in a magnetic field; consideration of the types of equilibrium of bodies not only from the standpoint of the action of forces, but also from the energy point of view.

M.N. Skatkin and G.I. Baturina [14] proposed a classification of interdiscipli-

nary connections at the level of knowledge and at the level of activities, naming the elements of science language, theory and applied part. They substantiated their point of view by the fact that in the process of learning the objects of learning are not only knowledge, but also techniques and methods of activity, since the structure of the learning and cognitive activity as its main elements include not only the content, but also the operational side aimed at solving certain problems).

Let us give examples of interdisciplinary connections of mathematics and physics at the level of knowledge realized through the language.

Example 1. The language of geometric transformations, in particular, vector calculus, is used in a physics course to illustrate Newton's third law with respect to, for example, such pairs of things: a book and a table on which it rests; the atomic nucleus and the electron circulating around it.

Let us give examples of interdisciplinary connections of mathematics and physics, implemented through theory.

Example 2. When studying the concept of angular velocity in physics, a mathematical concept is used — a rotation around a point.

Let us give examples of interdisciplinary connections of mathematics and physics, realized through the applied part.

Example 3. In a physics course, it is possible to solve a number of problems based on the coordinate method studied by students in a geometry course. Consider the following problem for illustration: "A load of mass m falls from a certain height onto a stand resting on a spring, which is fixed in a recess so that the stand is flush with the ground. The fall of the load causes the oscillatory movement of the spring: it is first compressed and then straightened, throwing the load in such a way that it rises above the stand. Determine at what height from the ground level this will occur if the weight of the stand is m_1 , the spring stiffness is k , its deformation is absolutely elastic, and air resistance is not taken into account."

Let us give an example of the interdisciplinary connection between mathematics and physics, implemented at the level of the type of activity.

Example 1. In the course of mathematics, students are taught the ability to create tasks according to a given equation. A similar type of activity - drawing up tasks, can also be organized in a physics course, thus interdisciplinary communication at the level of activities will be realized between mathematics and physics. So, for example, students in the 8th grade in the subject "Thermal phenomena" may be offered the following task: "Make a task to determine the amount of heat according to the graph shown in the figure and solve it."

Unlike physics, chemistry did not contribute to the development of new areas of mathematics, but unilaterally borrowed ready-made, previously developed sections of mathematics. Therefore, it can be argued that mathematics "acts" on chemistry, and this is the mathematization of chemical science.

Researchers have shown that it is impossible to solve all the problems of chemistry in a purely deductive mathematical way, while some branches of physics are amenable to deductive organization.

Since chemical processes take place in time, an independent variable, time, can be introduced for their mathematical description, and thus it is possible to describe chemical phenomena in the form of differential equations. Such branches of mathematics as the methods of linear algebra, the theory of differential equations, calculus of variations, etc. are used to solve the problems of thermodynamics of nonequilibrium processes. The theory of finite sets, graph theory entered into the basis of the method of calculations of the thermodynamic parameters of organic reactions.

Analysis and calculation of equilibria in complex multicomponent systems were previously unavailable due to large computational difficulties; this problem has now become solvable due to high-speed computers. Analog and digital computers are widely used to simulate the kinetics of chemical processes.

Group theory has become a tool for attempting to give an interpretation of the periodic table of elements, in terms of the symmetry of chemical elements in the table. Group theory allows us to solve such a chemistry problem as the establishment of selection rules that determine whether a given transition between two states is allowed or prohibited.

The emergence of a new concept - "mathematical chemistry" - is associated with the extensive use of mathematical modeling of chemistry, and especially in chemical technology, in which mainly work methods for solving a system of linear and nonlinear differential equations in partial derivatives for describing the temperature distribution, heat transfer, diffusion, crystallization and etc.

The section of mathematics, probability theory, is used to quantify the probability of a spontaneous formation, for example, of a protein molecule or nucleic acid molecule in the corresponding period of geological development.

Let us proceed to consider examples of the implementation of interdisciplinary relations of mathematics and biology.

Example 1. The exponential function $y = a^x$ ($a > 0$, $a \neq 1$) allows us to describe fast-growing processes: the reproduction of bacteria, the fermentation of yeast, the growth of population, etc.

Example 2. The reason for the successful use of probabilistic methods in practice is one surprising feature of the reality surrounding us - the statistical stability of various quantities. The concept of probabilities arose as a reflection of this stability, and, of course, that it should be used in cases where this stability is manifested.

For example, the law of Mendel on heredity. The teachings of C. Darwin on the origin of species had one drawback - there is no clarity in the Darwinian theory as to how these or other changes are accumulated in the progeny.

The basis of the resolution of the contradiction is the probabilistic law, which was established by G. Mendel. In fact, having constructed a probabilistic mathematical model, Mendel theoretically uncovered the fundamental laws of hereditary transmission of characters.

The model that Mendel used is well known in mathematics — these are Markov chains that have many other practical uses. [1].

Example 3. In 1931, Alexander Brown published a study “A comparative study of the arrangement of spruce cone scales as an introduction to the general study of the arrangement of leaves.”

The arrangement of the leaves is phyllotaxis.

The stem of a plant grows straight up (the principle of verticality), while the leaves (usually) form an ascending spiral.

A. Brown showed that the “rotation” of leaves occurs in different plant species at different speeds. Tulip and gladiolus leaves grow to the left, then to the right. Thus, from leaf to leaf, a “turn” occurs by $1/2$ turn. It is said that phyllotaxis is equal to $1/2$. In grasses with a triangular stem, a full turn falls on 3 leaves, that is, the leaves turn at an angle equal to $1/3 \cdot 360^\circ = 120^\circ$; phyllotaxis is $1/3$. In the leaves of plants of the Rosaceae family (rose, raspberry, plum) - 5 successive leaves turn around the stem 2 turns. Rotation is $2/5 \cdot 360^\circ$. In many species of cabbage (cruciferous family), snapdragon, plantain 8 leaves per every 3 turns (phyllotaxis is $3/8$). In dandelion, potato phyllotaxis is $5/17$. In spruce, pine, larch, phyllotaxis is $8/21$.

We see that phyllotaxis takes values $\frac{1}{2}, \frac{1}{3}, \frac{2}{5}, \frac{3}{8}, \frac{5}{13}, \frac{8}{21}, \dots$ – sequence of numbers of numerators and sequence of numbers of denominators are a sequence of Fibonacci numbers.

Example 4. The unit of volume is “white.” The quiet rustling of leaves is estimated at 1 white, loud spoken language - at 6.5 white, the growl of a lion - 8.7 white. From this it follows that in terms of the strength of sound, conversational speech exceeds the rustling of leaves by $10^{6,5-1} = 10^{5,5} \approx 316000$ times. The lion’s growl is about 158 times stronger than a loud conversation. Noise, the volume of which is more than 8 bel, is considered harmful to the human body.

A possible form of integration in the learning process are integrated lessons and integrated elective courses. Integrated lessons and elective courses are designed to deepen students’ knowledge, broaden their horizons, instill interest in the subjects being studied, deepen interdisciplinary communication, and eliminate the fragmentation of a person’s ideas about the world around them.

There is no unambiguous approach to the definition of an integrated lesson. Some scientists consider an integrated lesson - a lesson in studying the interrelated material of two or several subjects that two teachers conduct, while others believe that an integrated lesson is determined by the range of tasks that can be done only through integration.

From the very name of this type of lesson “integrated” it follows that the peculiarity of such a lesson comes from the integration process.

An integrated lesson carries a methodological function, ensures integrity and unity when studying the diversity of the surrounding world.

In conclusion, we give the words of the great scientists.

I. Kant: “Mathematics is the pride of the human mind.”

A. N. Krylov: “Sooner or later, any correct mathematical idea finds application in a particular case.”

D. Santayana: “Just as all the arts are in harmony with music, all sciences strive for mathematics.”

G.D. Steinhilber: “Mathematics is the mediator between spirit and matter.”

In our works [4,5,6,7,8,9,10] the reader will find a thorough conversation about the problems of the integration of mathematics and natural sciences.

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青少年健康的自适应能力

THE ADAPTIVE CAPACITY OF ADOLESCENT HEALTH

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注解。 本文介绍了一项关于青少年健康状况的研究数据。 已经建立了受试者健康状况与其适应能力的联系。 发现了五年级学生的适应水平较低，并且确定了患有心身不适应的儿童，导致了一种具有固定负面经历的“不健康”生活方式。 据推测，预计患有心身疾病适应能力较低且未来健康水平下降的儿童。

关键词：适应，健康，紧张。

Annotation. *The article presents data from a study of the health status of adolescents. The connection of the health of the subjects with their adaptive capabilities has been established. A low level of adaptation of fifth-graders was revealed, and children with psychosomatic disadaptation, leading an “unhealthy” lifestyle with fixed negative experiences, were identified. It is assumed that children with a low level of adaptability of psychosomatic diseases and a decrease in the level of health in the future are expected.*

Keywords: *adaptation, health, strain.*

According to the definition of the World Health Organization, health is a state of complete physical, mental and social well-being, and not just the absence of disease and physical defects. Approximately the same definition of the concept of “health” is given in the Great Medical Encyclopedia.

The habitat is a combination of natural and social factors affecting the growth, development, and general condition of organs and systems, the organism as a whole. Habitat components (water, air, food, soil, climate, etc.) can have a direct or indirect effect on human health at any age period of its development. They in

one degree or another cause the response of the body, can provoke a disease. Thus, health is a reflection of the relationship of the organism and the environment. If these relationships are balanced, then the person is practically healthy [7].

Health testifies to the adaptation and resistance of the organism to changing conditions of existence.

Adaptation is the adaptation of an organism as a biological system to environmental conditions. There are three types of adaptation: physical, physiological, psychological. **Physical adaptation** is the adaptation of the organism to the climatic and geographic conditions, acclimatization in various geographic zones. **Physiological adaptation** - physiological changes in the body, providing adaptation to changing environmental conditions (high and low temperatures, lack of oxygen, etc.). **Psychic (social) adaptation** - behavioral adaptation, or human activity in adapting to production and social conditions. The physiological meaning of adaptation is to maintain a biological system of homeostasis. At the same time, physiological mechanisms of organism resistance to environmental changes appear [7].

The state of human health is ultimately determined by the power of its adaptation reserves. The higher the functional reserve, the lower the “price of adaptation”. Adaptation of an organism to new conditions of vital activity is provided not by separate organs, but coordinated in time and space and specialized functional systems co-ordinated among themselves [2]. The main role in maintaining the mechanisms of active adaptation and stability is played by the nervous and endocrine systems, i.e., rapid response systems. Failures in the work of these systems reduce the stability of the body and are the cause of many diseases.

Adaptability is the innate and acquired ability to adapt to the whole diversity of life under any conditions. There are high, medium and low degree of human adaptability [1]. The level of adaptability increases or decreases under the influence of upbringing, training, conditions and lifestyle. Formed or formed personal characteristics, orientations, choices, hierarchy of value systems, goals and needs, aspirations, level of verbal (formed by upbringing, training and life) intelligence and culture, including the culture of emotional expression and interpersonal relations, facilitate or complicate the adaptation of a person in real life, also being factors of adaptability.

High or normal adaptability is favorable psychophysical data, high performance, endurance, stress tolerance, high or normal learning ability and ability to gain experience, unconditional self-confidence, the adequacy of aspirations and life goals choices [1]. It is obvious that facilitating the acquisition of the qualities of a normal adaptability and, as a result, sufficient adaptation is one of the main concerns of a teacher of a healthy lifestyle (HLS) when working with low-adaptive and maladjusted children.

The study involved 132 students of the fifth grade of Lyceum No. 44 of Lipetsk (63 girls and 69 boys). It is known that by the age of 9–10 not only the functional, but also the adaptive capabilities of the pupil's organism are improved.

To identify the level of adaptability we used the test method.

The proposed questionnaire grouped the main complaints that arise in the presence of deviations from the nervous, cardiovascular systems, gastrointestinal tract, kidneys, nasopharyngeal diseases and allergic conditions. Purposeful research is of particular importance, since quite often these pathologies are not fully revealed, which in turn leads to the delayed implementation of preventive measures and reduces their effectiveness.

If the sum of positive answers (“yes”) is not more than 3, the adaptivity is high, if 3-10 - medium, over 10 - low, 20-25 - very low [8].

Although most children safely survive the difficult period of adaptation to school at the middle level (another school building, changing offices, new teachers), moreover, during this period puberty processes are intensively taking place for some, for some, the tension associated with this is excessively large. Such schoolchildren can experience a variety of functional impairments, including a decrease in mental and physical performance, a decrease in immunobiological, protective properties, and an increased incidence. In this regard, the role and importance of the regulatory function of the autonomic nervous system in providing psycho-physiological adaptation has increased.

126 students were surveyed (of which 59 were girls (46, 8%) and 67 were boys 53, 2%, respectively) and it was determined that 69 students or 54, 8% (of them 33 were boys, 49, 3% and 36 - girls - 61%) responded positively to 3 or more questions that were aimed at identifying a possible pathology of the nervous system (neurotic and autonomic disorders).

Positively to the questions that concerned, possible diseases of the cardiovascular system were answered by 42 students or 33, 3% of them 18 boys (26, 9%) and 24 girls (40, 7%). 74 adolescents answered positively to one or several questions to questions aimed at identifying suspected nasopharyngeal diseases, which accounted for 58, 7% of them 36 boys (53, 7%) and 38 girls (64, 4%), respectively. The answers “Yes” to two or more questions aimed at identifying possible pathology on the part of the gastrointestinal tract were given by 49 students (38.9%), 20 of them boys (29.9%) and 29 girls (49.2%). Positively to the questions that concerned, possible diseases of the urinary system 20 people, which amounted to 15, 9% of them 8 boys (11, 9%) and 12 girls (20, 3%). Allergic manifestations were noted in 46 fifth-graders (36, 5%), of which 22 were boys (32, 8%) and 24 girls, or 40, 7%, respectively. Moreover, out of 126 students surveyed, only four or 3, 2% did not report any manifestations in themselves (3 boys - 4, 5% and 1 girl - 1, 7%).

The systems studied in order of the frequency of complaints arising from the children surveyed are arranged as follows.

Group	Place					
	1	2	3	4	5	6
Boys	ENT	Nervous system	Allerg.	GIT	CVS	Urine
Girls	ENT	Nervous system	GIT	CVS and Allerg.		Urine
Overall	ENT	Nervous system	GIT	Allerg.	CVS	Urine

We have conducted a study of the level of adaptability of students in the parallel of the 5th grades of the MOU of Lyceum No. 44 in the city of Lipetsk. 132 students were surveyed (of which 63 girls and 69 boys) and it was found that 98 students (74, 2%), 42 girls (66.7%) and 56 boys (81, 2%) have high and normal adaptability, and 34 (25, 75%) students out of them 21 girls (33, 3%) and 13 boys (18, 8%) turned out to be low adaptive, respectively.

It was revealed that out of the whole contingent of the examined group, 29 students belong to group III (22%); 84 fifth-graders (63.6%) have group II health; and only 19 belong to health group I (11.4%), which confirms the low level of schoolchildren's health, marked by a huge number of authors. At the same time, among children belonging to health group I, four have a low adaptability (21%); of all adolescents with group II health, 21 students are poorly adapted (25%); and of all children belonging to group III of health, have a low level of adaptability 9 (31%). On the basis of the results obtained, it was established that, on the one hand, a decrease in adaptability correlates with the level of health, and on the other, group I does not guarantee high adaptive abilities of the organism. At the same time, it can be concluded that the adaptability is significantly reduced in general in 25.7% of the examined, i.e., more than in a quarter of adolescents, the harmony of the "body and soul" is disturbed, since disadaptation is always psychosomatic (body and soul).

The results of the study allow us to trace the relationship between the level and absenteeism of students due to illness. We found that more than 70% (20 days or more) of sick leave have students with low adaptability - 12 students (35.3%), 7 girls (33.3%) and 5 boys or 38.5%, respectively.

Psychosomatic diseases are an integral part of human psychosomatic maladjustment. Accordingly, violations of the harmony of mental and vegetative-somatic functions are eliminated by rest, by changing the environment (for example, during weekends and holidays), by streamlining the mode of life, physical education and sports, switching to a new activity (hobby), etc. .

Conclusion. The results of the study not only demonstrated a low level of adaptation of fifth-graders, but also revealed children with psychosomatic maladjustment, leading an "unhealthy" lifestyle and having fixed negative experiences. In this regard, we can assume in the future the occurrence in children with a low level of adaptability of psychosomatic diseases and a decrease in the level of health.

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教育合作是形成交际普遍教育行动的一种手段

**EDUCATIONAL COOPERATION AS A MEANS OF FORMING
COMMUNICATIVE UNIVERSAL EDUCATIONAL ACTIONS**

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注解。 本文探讨了教育合作的概念及其对交际普遍学习活动形成的影响。

关键词：教育合作，交际普及教育活动

Annotation. *The article discusses the concept of educational cooperation, its influence on the formation of communicative universal learning activities.*

Keywords: *educational cooperation, communicative universal educational activities*

Modern society is a vast information field. Fast information and qualitative analysis allow the teacher to plan and organize effective actions even before there will be material consequences associated with updating the information. In addition, the pace of development of scientific knowledge and information technology in the near future will transform society from industrial to informational.

In such a society, it is necessary to develop basic skills that allow young generations to receive, perceive, transmit and analyze new information in order to effectively interact with each other. Many children cannot communicate when they enter primary school. They can not get acquainted, do not know how to politely address another child, how to politely refuse, they hardly manage to listen carefully to others. This creates many problems, both for the children themselves and for the teachers.

How to organize the interaction of teachers and students with each other? How to teach them to cooperate? Learning cooperation helps to make this idea a reality, in order to give the child confidence in success. Thanks to this technology, children learn to interact in a collective work with their peers and teacher, actively cooperate, and independently acquire knowledge. Cooperation, educational interaction, partnership, educational dialogue, educational activities, communicative pedagogy - all synonymous with educational cooperation [1].

Full educational cooperation is possible when using various forms of its organization. It should be aimed at developing a student's personal and communicative universal educational activities, on educating a student who is able to teach, change himself, on the ability to communicate, the ability to cooperate, the ability to solve problems, the ability to exercise self-government. An important condition for choosing a form of educational cooperation is the degree of effectiveness in achieving the goals.

In pedagogy, there are several forms of educational cooperation.

1. Cooperation with the teacher.
2. Peer cooperation.
3. Cooperation with yourself.

The dynamics of educational cooperation are viewed as a consistent movement of a student: from cooperation with peers, to cooperation with a teacher and further to cooperation with oneself.

The joint educational work of students implies their direct appeal to each other for advice and help. In cooperation with their peers, children learn to help a friend, to seek help from each other, formulate their points of view, find out the points of view of their partners, find out the difference of points of view, try to resolve differences with the help of arguments. Cooperation with peers is necessary for the formation of the ability to build one's action taking into account the actions of a partner, to understand and accept each other's opinions, to be able to take into account the individual emotional state of the partners; have initiative, the ability to obtain the missing information; have a willingness to draw up a plan for joint activities; to be able to resolve the conflict, showing self-criticism and friendliness in evaluating the participant of the joint action; When teaching in collaboration with peers, the teacher's direct help is harmful, as he takes on the reflective part of the work [2].

Cooperation with a peer involves the ability to cooperate with the teacher. Situations of educational cooperation with the teacher arise when a group of students in solving the teacher's practical problem notice the reasons for their incompetence and indicates them to the teacher. Educational cooperation is characterized by the activity of the student, who, solving a practical problem, realizes that to solve it he lacks certain knowledge or methods of action. The child formulates

the question of the specific help that he needs to solve the task and addresses to the teacher. A student who is able to separate the known from the still unknown and who is able to formulate his question on the topic of training becomes a subject of educational activity, able to teach himself with the help of a teacher. The teacher enters into cooperation with the student only on his initiative, upon request for specific assistance. The teacher does everything possible so that the child can formulate his question in the language of the content of the subject. It is necessary to organize educational cooperation in such a way that it includes all forms of interaction of learning – and the child’s cooperation with the teacher and with other students, and with himself. The ability of the student to enter into a relationship of cooperation becomes a condition for the formation of the child as a subject of learning activities, capable of self-education and self-education [3].

Learning collaboration fundamentally changes the role of the teacher in the classroom. Direct training and instruction is reduced. Most of the time the teacher in the classroom should be devoted to facilitating the learning process. This is a way to implement the training, in which the mentor takes the position of assistant, helps the student to independently master new knowledge and skills. Facilitation of learning imposes many requirements on the teacher, such as the ability to observe, listen and speak, clearly instruct, ask questions, observe and control the process, support, encourage, inspire, timely and correctly intervene in what is happening. The main task of the teacher-facilitator or coordinator is to stimulate and direct the process of independent information retrieval by students. The teacher, who is in the position of the training coordinator, creates cognitive problem situations, directs the students’ efforts to a certain direction, confronts different opinions, creates conditions that encourage them to make independent decisions, conclusions.

The cooperation of the student with himself implies the ability to record, analyze and evaluate changes in one’s own point of view as a result of the acquisition of new knowledge. In order to teach a child to define the boundaries of the known and the unknown, it is necessary to develop his ability to define the limits of his or her own capabilities, what he knows and knows and does not know or does not know.

Full educational cooperation is possible with the use of various forms of its organization, aimed at developing a student’s personal and communicative universal educational activities, at educating a student who is able to teach, change himself, the ability to communicate, the ability to cooperate, the ability to solve problems, the ability to self-manage. An important condition for the choice of forms of educational cooperation is their degree of effectiveness in achieving the objectives of the lesson.

The main forms of organization of educational cooperation are known - work in pairs, groups of permanent and shift composition, collective interaction.

Group work is one of the most productive forms of organizing children's educational cooperation, since it allows you to:

- provide the children with emotional and informative support;
- give each child the opportunity to establish themselves, to try their hand at discussions;
- give each child the experience of the implementation of universal educational actions, which form the basis of the ability to learn (functions of monitoring and evaluation, goal setting and planning);
- provide the teacher with additional motivational tools to involve children in the learning content[4].

There are different types of group work organizations:

- group-collective - characterized by the fact that the problem will be solved even when not all students actively interact;
- jointly interdependent (collective-cooperative) - the overall result is achieved by the actions of all students; if someone stops their work, then the rest will have difficulties;
- collectively-creative - in the learning process there is an educational creative work of the team; the number of students varies from two to a whole class.

Educational cooperation from grade 1 should be built as an agreement on cooperation and mutual assistance, in the preparation of which both parties are involved: the teacher and the children [5].

Each time, proposing a new standard of learning relationships, the teacher offers the children an open choice situation between the «right» (school) and «wrong» (preschool) behavior and gives everyone the opportunity to try, try on themselves both, not in words, but in practice from preschool to school.

The technological process of group work consists of the following elements:

1. Preparation for the group task:

- formulation of the cognitive task (problem situation);
- briefing on the sequence of work;
- distribution of didactic material in groups.

2. Group work:

Familiarity with the material, planning work in a group;

- distribution of tasks within the group;
- individual assignment;
- discussion of individual group work results;
- discussion of the general task of the group (comments, additions, clarifications, generalizations);
- summing up the group task.

3. The final part.

- report on the results of work in groups;

- analysis of the cognitive task, reflection;
- general conclusion about group work and the achievement of the task [6].

Thus, the forms of organization of educational cooperation is the organization of such studies, in which students have a single cognitive task. The best is a group of 2-6 people, because in larger groups it is impossible to ensure the active work of all its members. It is better to start using the technology of educational cooperation in the pre-school preparation group..

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专业创新发展的特点

FEATURES OF PROFESSIONAL CREATIVE DEVELOPMENT

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注释本文侧重于理论和方法论证明，模型的职业培训有助于学生的创造力发展。

关键词创造力，个性创造性发展，专业任务和知识

Annotation. *The article focuses on theoretical and methodical justification, the vocational training of model contributing to the development of creativity of students.*

Keywords: creativity, creative development of the personality, professional tasks and knowledge

Vocational training of students of higher educational institutions with formation of professional qualities and practical skills assumes the participant of association in creativity.

The significant contribution to a creativity problem were made by domestic researchers D.B. Rubenstein, Ya. A. Ponomarev, Bogoyavlenskaya, A.V. Morozov.), and foreign researchers such as (J. Gilford, E.P. Torrance, R. Mai, A. Maslou, K. Rogers) [1-3].

In modern science psychology and pedagogical creativity is considered by personal category in aspects:

- 1) manifestations of divergent thinking (J.Gilford, O. Tikhomir);
- 2) updatings of intellectual activity (Bogoyavlensky D,B . Ermolayeva -Tomina L.B);
- 3) the integrated quality of the personality (Ponomareva Ya, Khutorskii A).

The principle of methodological base of scientific pedagogics of art creativity, creative development of the personality, research of therapy humanistic to Maslou, R. Mai of L.S. Vygotsky of A.V. Bakushinsky, became basic by D.B. Bogoyavlenska, Ya.A. Ponomareva, and J. Gilforda, E. P. Representations of art education training are S.A. Gerasimov, G.M. Tsypin of B.M. Nemensky, of geshtaltteorie

by F.Perlz, J.Enright and the system of integrated pedagogics and psychology to science by Torrance and K. Wilbur. Given higher education and creative achievement of the modern researches connected with problems are put in analysis (F.T. Mikhaylova of V.P. Zinchenko V.V. Kravetsky A. Zapesotsky of V.I. Andreyev, etc., A.A. Rean), the principle of development of humane pedagogics (V.I. Vernadsky N.K. Roerich, Sh.A. Amonashvili), provisions of system of the developing training (V.V. Davydov, Must be the conception of culture education (V.T. Kudryavtsev, B.I. Slobodchikov, L.V. Shkolyar), Elkonin, B. Zinchenko [4-7].

Creativity (Latin the unusual ideas, original decisions to deviate traditional schemes of thinking, is ability of the person to creation - fire. Creativity is one of components depends on the creative person and or erudition fire. The people having high creativity levels are called by creatives.

In research of the directions of the phenomenon of creativity: Representatives of one of them connect with informative processes with level the author world famous and consider levels, allocate to creativity, reveal creativity - cognitive - a research of communication and type of creative process of a stage.

Other direction in studying creativity - personally focused aspects which are connected with process of that personal creativity on a research. Characterologic motivational qualities of the identity of people come to light, is considered by representatives of this direction, emotional, shown socially role creatively of creativity, with self-updating counted persons.

Ability to constructive independent way of thinking and behavior intension some overcoming causing deep creativity of developed persons, shown in various forms of external installation new and active fire independently and stereotypes,

The meaning "creativity" _intertwines with meaning "creation". So, the internal resource of the person having certain specifics and leading to creation is considered to the process, creativity, its ability to refuse ways of thinking or ability to find new potential, new stops, fire stereotypic version of the solution of problems is understood. Ability of the person to constructive independent way of thinking, understanding and development of the behavior, creativity, also to define.

There are certain distinctions of creativity and intelligence. The first who is turned hardly on this problem (distinctions and convergent to divergent intelligence), was J Gilford. Universal informative ability Gilford offered the concept creative to creativity. J. Gilford refused of classical thinking and deductive divisions into inductive The participant of association of ten considered kinds of convergent (unidirectional) thinking. Convergent according to J. Gilford that case when to the person on the basis of set to find only true, decisive desicion. The direction of researches begun by J. J. Gilford consistently creativity of thinking in the terms continued describes by E.P. Torrensom. The item Torrance understands as creativity as ability to the perception aggravated shortcomings, gaps of knowledge, disharmony [8].

The theory of sets of the researches conducted in the field of communication which were various also the world famous authors revealed the number of creativity. So, practically the world famous experts in this area G. Eisenk , Д. Vexler , L. Termen , R. Wisberg and others are also considered that the high level of development assumes the high level of development [9]. The representatives of this points of view based on empirical researches which are guided classical results among representatives by biographies of 282 European celebrities on the basis of achievements of IQ and tried to assess the achievement of participants of association in 1926 aged between 17 to 26. In researches they leaned on a scale Stanford to Bina. Creative achievements, naturally, that the connection between IQ and creative were investigated by IQ not to assessment intellectual, indicators were high.

Proceeding from the analysis on development of youth of the following conclusions of theoretical literature, creativity:

1. On the basis of the analysis and scientific and methodical literature, the bases theoretical researches on a problem, psychology and pedagogical are defined the creative development done culturological.

The participant of association of students in the course of vocational training. To skills practical creative approach of professional tasks and knowledge, these bases, became theoretical integration.

2. The main criteria, taking into account readiness for acceptance and development of future profession - the participant of association of creative development of students «are revealed. Such criteria, became: extraordinary, the openness to experience of creative potential, uneasiness interested in the involvement of creative tasks, empathy educational process stamped and sense of humour.

3. The studied subject, the independent model of development of creativity directed to formation of skills and to introduction of professional skills of students of drawing up a practical work on occupations in pedagogical studied of future teacher.

Creative development it is relevant and the problem of psychological features demands fixed In the conditions of development of credit system of training when it is hardly given to independent work of students is significant. The participant of association of students in the course of vocational training. On these bases the skills of practical creative became integration of professional tasks and knowledge.

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教学设计在培养学生的个人潜能

**PEDAGOGICAL DESIGN IN THE DEVELOPMENT OF THE
STUDENT'S PERSONAL POTENTIAL**

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注解。更新的教育基于内容功能设计作为跨学科人道主义类别。设计是设定和解决人类生活各个方面问题的通用方法。在设计中,动作不是通过真实的现象和过程来执行的,而是通过它们的模型来执行。它们反映了特征,特别是人格的形成。个人选择与内部价值构建的个人重要任务相关。设计作为更新现有教学实践的一种方式有助于公开对话,直接和教师和学生的反馈。

单词:教育设计,建模,项目范式,教育环境。

Annotation. *The updated education is based on the content functional design as an interdisciplinary humanitarian category. Design is a universal way of setting and solving problems in all spheres of human life. In design, the actions are performed not with real phenomena and processes, but with their models. They reflect the characteristic features, especially the formation of personality. Individual choice of a person is correlated with the personally significant task of internal value construction. Designing as a way of updating the existing teaching practice contributes to an open dialogue, direct and feedback of the teacher and the student.*

Key words: *design in education, modeling, project paradigm, educational environment.*

Innovative (transformative) essence of design is the most radical way of updating the existing practice in education. The renewed education is based on the content-semantic functional of the phenomenon of design as an interdisciplinary humanitarian category, reflecting the characteristic features of the formation of a

personality.

Education is an ongoing formation, and “not at all, not in a favorable distant or near future, but literally here and now” [1].

The ontology of each individual choice of a person is correlated with the personally significant task of internal value construction, marks K.Kh. Zampeisova. [2].

In the updated education, the model priorities of the project product are understood as thinking activities that determine the future process and the result of the transformation of reality, having an ideal character, since the project actions are carried out not with real phenomena and processes, but with their mental models.

That is why the design is a targeted rational human activity, the purpose of which is to simulate ideas about the future end result and the forthcoming possible consequences of the operation of the project construct.

Modeling is a means of representing and transforming an object that is not yet present in reality, it allows you to operate with objects for which we do not have complete knowledge, where the pedagogically accent category of design actualizes humanistic design vectors in education.

The project paradigm by E.F. Maslikova [3, p. 18], on the one hand, creates a “unique space” of pedagogical “freedom and creativity”, and on the other hand, it significantly “increases the level of responsibility” of educational subjects for “made independent decisions”. This is due to the ability to make a meaningful choice of development directions, i.e. “Accumulate resources at growth points”.

Design by Lazarev V.S. [4], as an interdisciplinary scientific concept, is a “universal way of posing and solving problems” in all spheres of human life.

Majuga A.G., Sinitsina I.A. [5] note that they contribute to the disclosure of the “non-linear situation of open dialogue, direct and feedback teacher and student,” a direct connection with the qualitative aspects of educational interaction.

Thus, the design reflects a specific human activity that has its own meaning, acts as an initial link of expedient, transformative activity, characteristic only for a person in a way related to the transfer of subjective reality into an objective one and the combination of personally significant ideas for him.

Asakaeva D.S., Mavrina I.A. [6] note the “ambiguous” nature of the definition of the term “design”, which is one of the “reasons for the possible transformations of meanings” of the concept under consideration, including in the pedagogical plane.

Thus, the category of quality of education is the main and decisive in the evaluation of educational and pedagogical projects, what to speak about the summarizing and final position of educational design.

Environmental design attributions of education quality according to D.A. Da-

nilov [7] is a qualitative self-transformation of participants in the process, i.e. realization by each educational subject of its “individual potential”. The realization of the individual and his personal developmental vectors and resources, interests and opportunities will allow creating a projected educational environment that encourages the individual to creativity, activity, and independence.

The process of formation, enrichment and distribution of allocated resources Kulambaeva K.K., Dosanova S.S., Kulambaev A.K. correlate with the managerial task of implementing the predictive prospects for the individualization of the educational process, the development of students’ subjective experience [8].

Consequently, in organizational and methodological terms, it reaches the level of the main task of educational management: ensuring the effective use and transformation of the organization’s resource potential for achieving the goals set.

E.F. Maslikova [3] recommends in the “total-resource”, regarding the project (project-pedagogical) realization of the potentials and opportunities of educational quality, in the personal development of students (a person), to refer to the content-semantic functionality of the species diversity of projects.

In her opinion [3], the project goal is an ideal model of the teacher’s personality as in this case it goes to the level of the “pragmatic model” as the “means of organizing practical actions” of the teacher and the “way” of presenting “the results of pedagogical activity implementing the basic human ability to “Anticipated future design”.

Further, she [3] argues that the project-state: reflects the effective readiness of the subjects for targeted self-change and qualitative development. Personality designs whenever it develops ways to turn one situation into another, more acceptable.

Project Plan: realizes the achievement of the project goals of progressive development (self-change) in the prognostic unity of vector dimensions.

The plan can be considered as a private type of project. The difference, according to Rozin V.M. [3, p. 40], is that the project is a complete object, with the structure and operation. The plan, in turn, sets the state of the planned object in time.

Project effect: subjective (functional) objects of design and functional (consumer) quality of educational services.

In the pedagogical perspective, we draw attention to two features of the above definition, which are directly interrelated:

- target category of “effect”;
- the resulting characteristic in the current market realities directly related to the category of “consumer qualities of educational services”.

The cultural and educational effect of the design of universal educational activities, according to Novikova G.P., Afanasyeva T.P., Eliseeva I.A., is addressed to the development of such key competencies as “learning skills”. The resulting functional effect of the formative pedagogical interaction of the teacher-student is

an effective condition for positive transformations of the quality of education. [9].

The result of the design of universal educational actions that help solve the problem of “fast and high-quality learning” and ensuring the student’s generalized ability for self-development and self-improvement are the active actions of the learner himself as the real subject of the pedagogically controlled process.

Having considered the characteristics of the personal-developmental potential of design in education, understood as the basic (subject, subjective) basis for effective transformations of educational quality, let us summarize:

- some aspects and vectors of the studied pedagogical issues, based on the basic meaning of the term problem, a complex issue, i.e. we are faced with a task requiring resolution, further research;

- we believe that finding the ways, forms and methods of educational ascent from the existing educational possibility of quality to the real (personal) reality of the existence of quality education is the substantive essence of the pedagogical perspective of the study.

In his own life, a person designs himself in the future - as an ideal, a dream, a model, defining the semantic vectors of educational prognosis as a reflection of the future into the present, productive feedback between them, promoting awareness of the new in continuous communication, states Sadykova A.K. in her article “Modern pedagogical effects of self-realization of the personality of the school teacher” [10].

Thus, the realization of the personal-developmental potential of design in education is the basis of the renewed education.

It is design that can and should act as the dominant condition in the orientation towards the principle of creativity, as a fundamental qualitative resource, where the educational component generates personal vectors of progressive movement in the development of the learner’s personal potential..

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在大都市的现代条件下创造休闲产业的事件技术的发展
**DEVELOPMENT OF EVENT TECHNOLOGIES IN THE CREATIVE
LEISURE INDUSTRY IN THE MODERN CONDITIONS OF THE
METROPOLIS**

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注解。 本文分析了大都市创意休闲产业中事件技术的发展，以培养文化和教育机构的人才，以及在新的社会经济条件下发展这一过程。

关键词：事件技术，创意休闲产业，组织，组成部分。

Annotation. *The article presents an analysis of the development of event technologies in the creative leisure industry in the metropolis in order to train personnel for cultural and educational institutions, and the development of this process in the new socio-economic conditions.*

Keywords: *event technology, creative leisure industry, organization, components.*

At the present stage, it is very important to rethink cultural and spiritual values in Russia, especially in such a large metropolis as Moscow, as there is an acute question about the spiritual, social and civic position of each citizen in relation to the historical and cultural heritage of Russia and the artistic and national traditions of the people. Of particular importance for young people, who are responsible for the development of Russia in the future, is the assimilation of the entire wealth of world artistic culture [5].

The national culture that emerged at the earliest social development of our state is inextricably linked with the historical and cultural development of the whole country, its richest spiritual values that must be preserved for future generations. This is extremely important for the formation of the cultural policy of Rus-

sia, for the education and development of the citizens of our fatherland [6].

Unfortunately, at present, a holistic state youth cultural policy is not supported by financial support for children's and youth cultural programs. This led to the destruction of the system of educational work in the education system, which also affected the organization of mass cultural and leisure work in the urban environment and led to changes in the spiritual and artistic values of landmarks and dominants.

This study shows that the decline in aesthetic spiritual and moral values in the organization of leisure for all age groups in cultural institutions is significant. The reason for this is the global changes of recent years in the state and in society. As a result, there is a total expansion from abroad of mass culture, especially affecting the younger generation.

In the urban environment, the socio-cultural sphere is very large and diverse. At present, institutions of the leisure industry of various types and profiles are widely represented in Moscow. They are different by departmental affiliation and ownership. They are also diverse in different categories of participants and age groups. In modern institutions of the creative leisure industry, thousands of specialists in organizing leisure activities have been involved in organizing events, studios, clubs. The monitoring conducted in many leisure establishments shows that the specialists working in them do not all have special professional education in the field of culture, which undoubtedly affects the organization of the quality of creative leisure.

In modern studies in the field of creative leisure, it is said that the system of spiritual and aesthetic education of the younger generation in recent decades has undergone a number of changes, and not always of a positive nature. Many forms of cultural and leisure activities in the system of additional education of children and young people from budget funding have been transferred to paid forms of education, which undoubtedly affected the socio-economic aspect of the entire leisure of the population. The large-scale entertainment industry without spiritual foundations, without an understanding of the psychological and pedagogical age characteristics of children and young people, is very expensive and not always available for various age groups of the population.

Despite the fairly extensive scientific research and the availability of analytical monitoring devoted to the creative industries, the term "creative industries" itself does not have clear definitions. Many researchers imply a variety of content in this term. So, the main part of these studies is devoted to this title, and they are mostly written in English. And this work is further complicated by the fact that the term "creative industries" translates into Russian as "творческие индустрии" and "креативные индустрии". In our study, we do not separate these two terms, as in the English-language literature they are understood as synonyms.

One of the first documents in the history of the development of creative lei-

sure was a document of the Department of Culture, Media and Sport of the British Government in 1998. This report included the following criteria for defining creative industries - “an activity that originates from individual creative activity, skills or talent, and which has the potential to extract financial profits, create jobs through the production and use of intellectual property” [2]. Based on these criteria, the leisure industries were identified in the report as creative: advertising, architecture, visual arts and antiques market, crafts, design, designer fashion, films and cinema, software for interactive leisure, music, performing arts, publishing, software and computer services, television and radio. [5] This definition of creative industries had a significant effect and was later mentioned in various government reports. Scottish Enterprise, the main economic development agency in Scotland, lists creative industries without mentioning any criteria: games, radio and television, new media, films, music industry, design, publishing, architecture, advertising, visual arts, cultural industry. [3] In Australia, the Queensland Government includes among the creative industries 5 interrelated segments of the creative industries: music, musical composition and musical production; movies, television and entertainment software; theater performances; writing, publishing and print media; advertising, graphic design and marketing; architecture, visual art and design [4].

In the definition given in the report of the Scottish Enterprise agency, it is clear that the sphere of “cultural industries” is included in the sphere of “creative industries”, is part of them. This is important, since a sufficiently large number of statistical studies will measure the presence of “cultural industries”. In the donated study, they were also automatically included in the “creative industries” [7].

It should be noted that cultural institutions in Moscow, which can also be attributed to the creative leisure industry, currently exist in a highly competitive environment in the market of free time along with organizations whose budget opportunities, and hence marketing practices, are much wider. At the same time cultural institutions are full participants in this market and provide services in the field of creative leisure. The free time market includes the socio-cultural leisure of all age categories of the population. The increase in the requirements for socio-cultural leisure, which has arisen in the modernization sphere of culture, also occurs in the conditions of the industry of creative leisure. It is important for employees of cultural institutions to own modern technologies for organizing leisure activities of various categories of the population and to attract attention, focusing exclusively on high-quality and relevant leisure forms [8].

Therefore, the issue of professionally-oriented training of specialists capable of competently joining the modern development of the entertainment industry in the domestic market of creative leisure based on innovative technologies of cultural and leisure activities becomes relevant.

Training programs for such specialists at the undergraduate and graduate levels should be aimed at expanding knowledge in the art industry, at acquiring professional competencies by future specialists aimed at implementing urban creative variable programs and projects that may be of interest to different age groups, especially families with children. Such a strategy in the development of the leisure industry is undoubtedly socially significant in the modern cultural space of the urban environment, especially influencing the upbringing and development of children and young people [6].

Inclusion in the training of specialists of innovative technologies used in the industry of modern creative leisure, undoubtedly, should be based on the use of national traditions of the domestic experience of cultural and leisure activities.

This statement corresponds to the modern development of the leisure industry in our country, which corresponds to the targets set forth in the State program of the Russian Federation “Development of culture and tourism” for 2013-2020 [9].

Analyzing the situation in the cultural space of Moscow, it can be concluded that many programs and projects developed by various agencies of the creative leisure industry in one way or another form the public consciousness, world outlook, certain behavioral norms, develop feelings of patriotism, national identity, broad involvement in artistic and creative activities by means of socio-cultural, recreational and leisure technologies. This is confirmed by numerous surveys among students and children in the work practice bases that are included in the training programs for bachelors and masters of social and cultural activities [3].

The issue of training specialists in the direction of socio-cultural activities: both bachelors and masters has been successfully solved over the past decade at the Department of Socio-Cultural Activities of the Institute of Culture and Arts of the Moscow City Pedagogical University. For the future training of specialists in the field of creative leisure industry, the faculty of the department developed a master program “Event-technology in the industry of creative leisure” [2].

The practice-oriented orientation of the preparation of masters in the field of event-technologies of the creative leisure industry consists in their mastering the specific features of this industry, which include mastering modern innovative cultural practices and technologies of social and cultural activities, as well as organizational and managerial skills.

Thus, the content of the educational program of training specialists for work in the industry of creative leisure should be a simulation of the cultural and leisure space of the urban environment, as a multi-stage process of project technologies of cultural and leisure activities. A large role in this process belongs to the professional and personal qualities of a specialist in the industry of creative leisure, who owns practical modern competencies in this field of culture. [4,5].

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后现代主义文学美学
在瑞恩岭的起源美国家园

**POST-POSTMODERNISM LITERARY AESTHETICS
IN RYAN RIDGE'S PROSETRY AMERICAN HOMES**

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摘要。本文探讨了理解和诠释后现代主义当代文学作品的问题，反映了现代中介实践影响下的艺术意识的变化。艺术家根据他对如何应用作者的艺术和美学工具集的认识，创造了一种新的审美程序，需要读者的互动。文学作品的概念构成了生成语境的过程，其中词语是概念的原型。这种概念的重新语境化发生在符号学的互之间性和作者的形态之间，这反过来又需要激活读者的话语能力。当关注焦点转移到情境的相关细节时，通过参考交际实践和刻板知识的集体记忆来构建旧概念的新含义，从而在意识的虚拟时间表和无限的语义空间中产生新的语境和意义。为了说明后现代意识，文章的作者分析了当代美国作家瑞安里奇的散文。

关键词：后现代主义美学，散文，语境，话语，反讽，身份，瑞恩岭，艺术意识。

Summary. *The paper investigates issues of understanding and interpreting contemporary literary works of post-postmodernism which reflects changes of artistic consciousness under the influence of modern intermedial practices. The artist creates a new aesthetic programme which demands interaction on the reader's part, based on his awareness of how to apply the author's artistic and aesthetic toolset. The conception of the literary work frames the process of generating contexts, in which words are prototypes of notions. Recontextualization of the notions happens within interdiscursivity of semiosis and the author's modality, which in their turn require activation of the reader's discursive competences. New meanings of the old notions are constructed by referencing to collective memory of communicative practices and stereotyped knowledge when the focus of attention is switched to the relevant details of the situation, thus producing new contexts and meanings in virtual chronotope of the consciousness and unlimited semantic space. To illustrate post-postmodern consciousness the author of the article analyses a contemporary American writer Ryan Ridge's prosetry.*

Keywords: *post-postmodernist aesthetics, prosetry, context, discourse, irony,*

identity, Ryan Ridge, artistic consciousness.

The study of consciousness in sciences is of paramount importance since understanding one's own identity becomes a starting point for every person's existence. Paul Ricœur's ideas on Time and Narrative, subject's verbal activity are essential for defining consciousness as a form of human existence in his conception of signification as *use through language game*. He called it *the grasp of language on experience* [1].

XXI century scientists are trying to understand the latest cultural phenomena which cannot but influence a person's life. S. S. Khoruzhy [2], V.A. Shkuratov [3], O. Zhukova [4] and others point that virtual practices and technologies, gender revolutions and transformed consciousness change our life. Kenneth J. Gergen, an American psychologist who develops ideas of social constructionism spoke of a social chameleon and introduced a notion of multiphrenia as the splitting of the individual into a multiplicity of self-investments [5]. Self-identity constructing as well as being aware of its liability to deconstructing are the two opposites of one and the same phenomenon of self-actualization. The consciousness of a "pastiche personality" [5, p.150], or a "file individual" in O. Zhukova's interpretation, is a new identity constructed according to socium expectancy [4, p. 11]. D. Dennett spoke about discursive characteristics of a personality in the relevant context when he described it as a sum of communications with the self as a center of narrative gravity [6, p.89].

The user operates intermedial language where notions are associated with accessible discourses (mass media, architecture, musical images, paintings) and contexts. It opens a multimode perspective for artistic imagination with reference to the real world. But differs from the real world since it is unlimited and guided by the artist's choice. Generating contexts is framed by the artistic concept where words are prototypes of the notions and are used as navigators within the semantical continuum. Information users possess the four basic components of consciousness – its secondary and nonmaterial nature, subjectivity and activity. These four components are logically consistent to base the quantum-informational epiphenomenalism conception (after I.V. Cherepanov) [7, p. 192].

Art as reality comprehension, reflexion and recreation integrates two systems – the system of semiotic signs and the system of the subject who operates the reality system. Contemporary theories of text consider the text as a unit of communication which is different from those of a word and a sentence. In poetical text and poetical semantics "endless semiosis" is more intensive and demonstrative, as V.Y. Chernyavskaya points out, referring to S.T. Zolyan's works, whom she considers to be one of the fundamental and consistent researchers of poetical semantics. According to V.E. Chernyavskaya, literary text is interdiscourse, in which there are no ready-made meanings, but which itself generates meanings, and the reader is involved into a *process* of free interpretation not necessarily coinciding with the

author's encoded meanings [8, p. 86].

Interdiscursivity of art meets the demands of a new aesthetic post-postmodernism programme with its new aesthetic and artistic canons, where one can find its specific features, such as technimages. The principal difference from traditional text images is that interpretation is changed into interactivity knowing how to apply the author's artistic and aesthetic toolset [9]. New types of texts appear, or reappear and become popular: microliterature, twitterature, flash fiction, prosestry.

A wide range of terminology describing similar notions and researches investigating different aspects of contemporary art in its diverse manifestations (meta-modernism, hypermodernism, digimodernim) indicate that post-postmodern aesthetics is still being elaborated and defined. The most interesting ideas which are relevant in the context of the presented paper can be found in works of Moscow's visual artist Anatoly Osmolovsky who develops an *auratism* and *reflexive modernism* conception (Contemporary Art: Here and Now. Rejection of museums) [10] and Nicolas Bourriaud's (*Postproduction: Culture as Screenplay: How Art Reprograms the World* [11]).

American author Ryan Ridge's prosestry reflects the features of XXI century digital communication era. The brevity of his style reminds of the style of today's communication, laconic and interdiscursive. The book *American Homes* is written in the hybrid genre of prosestry in 2014 and is published in the *21st Century Prose* collection. This work of fiction breaks traditional canons and demands a new approach to its understanding. Jacob Heustis illustrated the book to add and interplay on another level of its many codes together with other graphical means used by R. Ridge to render his "architectural" conception:

Twelve steps

TWELVE STEPS

step

One man's Stairway to Heaven is another man's Staircase to Hell [12 p.49]. This complex image activates the reader's mind and involves him in all the expe-

riences of going up and down in the so-called virtual chronotope. Citations from Confucius and Stephen Malkmus are used as epigraphs to the book as keys to “unlock” the meanings of the whole book.

The strength of a nation derives from the integrity of the home. Confucius.

The metaphor of the house for the whole nation generates meaningful contexts:

Everybody needs a home
Takes centuries to build
And seconds to fall

Stephen Malkmus

Antithesis becomes a text generating pattern and is used by the author to reveal the contradictory sides of American society with facts of reality confronting American dream ideals. The author is a chronicler. His chronograph is a compilation of slogans, aphorisms, schematic pictures. Reading aloud in a monotonous voice which R. Ridge deliberately chooses when presenting his works of fiction creates an additional meaning of a documented registry witnessed by the narrator. The conceptuality of the work, the carcass of which can be presented in the house metaphor, to allow to build upon by adding numerous details of its architecture – porches, doors, kitchens, bedrooms, – manifests itself as the major aim of the author, which is to transmit the conceptual idea.

In one of his articles R. Ridge mentions a contemporary British visual artist David Shrigley (1968), whose creativity influenced that of R. Ridge’s (*Everything is Good: the Art of David Shrigley*) [13]. To compare the artistic consciousness of the two of them I recommend to get acquainted with D. Shrigley’s animated short film *the Door* [14] and then read R. Ridge’s *American Homes*. The text of the book is emotionless though written in flat ironic tone which can be correlated with the animated black and white paradigm sketching in D. Shrigley’s film. The analysis of the two artistic visions creates an effective context to search for parallels and influences while at the same time it gives us insights into the artistic consciousness and better understanding of their artwork. In fact, successful interpretation and understanding of the author’s concept are dependent on the recipient’s (reader’s) discursive competences.

Remex-culture of Lawrence Lessig [15] and Nicolas Bourriaud’s *postproduction* [16] have become modern reality in which it is difficult to find an original image which is not metarepresented, devoid of interdiscursive and intertextual connections.

DOOROGRAPHICAL DIVISIONS

FRONT DOOR—BACK DOOR—SIDE DOOR—GARAGE DOOR—PATIO DOORS—FRENCH DOOR—STORM DOORS—SCREEN DOORS—CELLAR DOOR—PET DOORS—VARIOUS INTERIOR DOORS—ATTIC DOOR—BASEMENT DOOR—BATHROOM DOORS—BEDROOM DOORS—CABINET DOORS—CLOSET DOORS—FALLOUT SHELTER DOOR—TRAPDOOR—

DOORS ON FILM—DOORBELL

To get a better handle on Doors, let us begin by approaching them in their various forms.

Things to consider:

Open Doors are invitations.

Locked Doors often dabble in the occult.

Keys are the keys to proper operation.

Sometimes opportunity knocks. Other times it rings the Doorbell.

A Door is not a Door when Ajar [12, p. 9].

Like alliteration and assonance in English poetry juggling with ideas and contexts through punning in *American Homes* is a peculiar feature of Ridge's style. A few quotations to illustrate the point:

American Homes is saving coupons and the world [Ibid. p.3]

But the future is a multiple orgasm. It just keeps coming. [Ibid.p.66]

(play on words: save, come)

One man's Stairway to Heaven is another man's Staircase to Hell [Ibid.p.49]
(transformation of well-known contexts: One man's breath is another's death).

Complex linguistic signs in such works of fiction should not be reduced to separate linguistic units and devices interpretation though, because they function in layered codes of meanings and the signification process is revealed between the layered structures. The information weight of complex signs in such works increases and though the language itself seems not difficult to read, it demands high intellectual potential and abstraction from the linguistic surface to penetrate the implied meanings the author encodes.

DRIVEWAY DESIGNS

THE STRAIGHT & NARROW—THE AMERICAN EVOLUTION—THE TEEPEE—THE FIGURE 8—THE HIDDEN DRIVE

Private roads that deliver us to and from our American Homes, Driveways serve as access from American Homes to the rest of the country. Over time, many Driveways—like many Americans—fall apart and break down. Some seek repair. Others remain cracked. Below is an aerial representation of the five most common American Driveway designs, followed by brief expositions.

[Aerial Representation]

- *Design 1: —*
- *Design 2: -O*
- *Design 3: ^*
- *Design 4: ∞*
- *Design 5:*

The author guides the reader and presents a narrated variant to interpret “the

Aerial Representation” if you read further in his book:

Design 1 – Illustrates a classic and careful American Driveway style known as “The Straight & Narrow.” This simple design incorporates a remarkably straight-forward construction and appeals to American Homeowners who uphold the principles of our national Constitution and abide by at least eight of the Ten Commandments – folks who believe that the quickest and most moral way between two points is a straight line.

Once the author defined his tools and techniques to signify, he gets a boundless imaginative combination of meanings to generate within his conceptual domain. For which R. Ridge states:

American Homes is never running out of ideas.

And American Homes Ideas are about R. Ridge’s ideals [Ibid. p. 90]

Idea for American Dream House

One in which you wake up happy. Every day you wake up happy. You wake up and you’re happy every day [Ibid.p.107].

Remake of the above context is based on the revision of ideas through inversion and repetition: *you wake up happy*. Formal-structural analysis is not enough for the surface layer decoding, because the implicit context is larger, and its volume depends on the reader’s intention to cooperate and play with the suggested concept. In this sense the work can set contexts but is not limited within these contexts. The artist’s task is to translate the algorithm and gradually navigate the reception of his ideas. The degree of aesthetic pleasure can vary from stage to stage when reading and focusing on elements of the artist’s code and depends on the depth of immersion into artistic mind, the recipient’s competences and evaluation of the conceptual idea, which can be intellectual, aesthetic, ethic, emotional, and so on).

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英语、俄语中的疾病名称名

DISEASE NOMINATION IN ENGLISH AND RUSSIAN

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本文主要研究英语与俄语中疾病名的称名学特征。

关键词: 疾病, 派生, 形态学, 称名学, 术语学, 俄语, 英语

Abstract. *Current article studies main peculiarities in disease nomination in English and Russian. The results of study reveals common and specific features in term-formation in the above-mentioned languages.*

Key words. *disease, derivation, morphology, nomination, terminology, Russian, English.*

Medicine is one of the oldest scientific areas of human activity; medical terminology is also a long-established lexical system. The medical term is one of the main tools necessary for the work of various specialists and researchers, moreover, terms often carry the whole volume of information about certain object and act as a regulator in the process of scientific and practical communication.

In Modern English medical terminology, there are a lot of loanwords. Firstly, because Latinized Greek constructs account for roughly half of the terms in the glossary, it makes sense to set out their common features as a separate but complementary discussion in this introduction rather than repeat the analysis in the individual entries. Where there are other commonalities, the same treatment applies and these have been titled according to outstanding morphological features and set out in groups below.

1. Morphology of Latinized Greek

The word ending ‘*itis*’ denotes ‘inflammation’ as the main characteristic of each medical condition and can be classed as a semantic constant regardless of the morphology of the other part/s. The other typical Greek endings ‘*asis*’, ‘*osis*’ can be similarly understood as constants. The morphology for the nouns ending in ‘*ia*’ & ‘*opathy*’ can also be treated this way.

2. The Morphology in Eponymous – Terms derived from family names

In this selection from the glossary we can usefully group all eponymous words

together to discuss their common structural tendencies rather than repeat them in each entry. The current morphological considerations that apply to future change in these medical use words are rooted in the historical treatment of compound words in Modern English in which the possessive ‘s’ has typically been dropped or been assimilated into a following word that begins with the letter ‘s’. Thus we commonly find this in Surnames that have the second part with ‘son’ as in Johnson, Parkinson Wilson Peterson Richardson & so on. See also ‘*Karposi’s sarcoma*’. The ease of phonological change can be understood by substituting the word ‘syndrome’ for ‘disease’ in all the words in this sample. Of course the same would apply if we choose ‘sickness’ instead of ‘syndrome’. The increase in the usage of syndrome in the 20th century has likely had a strong crossover influence on all eponymous forms in other combinations such as with ‘*disease*’, ‘*fever*’, ‘*infection*’, & ‘*complain*’, and therefore notwithstanding the orthographic arguments for or against compounding, the phonological factor can be understood as a natural driving force for change. See ‘*Crohn’s disease*’ as an example for which the current Webster gives ‘*Crohn disease*’ classing it as a *less commonly used variant*. This example shows the historical model slow changeover from one variant to the other often completed within one generation. The orthographic change denotes the sense evolution and the stress shift is the phonological complement.

Classification of medical conditions		Eponymous – Terms derived from Family names in combination with ‘disease’				Table 1
Name	Title	Background	Time	Field	First use	Other name
Thomas Addison	physician	English	19 th	skin disease	1856	bronze skin disease
Alois Alzheimer	neurologist	German	19 th	dementia	1912	AD /Alzheimer’s
Bernhard L. F. Bang	veterinarian	Danish	20 th	veterinary medicine	1920	brucellosis
Peter Emil Becker	geneticist	German	20 th	neurology	1972	Becker’s muscular dystrophy
Richard Bright	physician	English	19 th	nephrology/ kidney disease	1831	
Carlos Chagas	physician	Brazilian	20 th	tropical medicine	1912	American trypanosomiasis
Creutzfeldt-Jakob						
Hans G. Creutzfeldt	neuropathologist	German	20 th	dementia	1963	CJD Human BSE [Mad cows]
Alfons M. Jakob	neurologist	German	20 th			
B.B. Crohn	pathologist	American	20 th	bowel disease	1932	regional enteritis, regional ileitis
Harvey Cushing	neurosurgeon	American	20 th	brain surgery		Cushing’s syndrome

Philippe Gaucher	doctor	French	19 th	skin disease	1882	Gaucher /Gaucher's disease
Robert James Graves	physician	Irish	19 th		1835	Graves' disease
Gerhard H. Hansen	physician	Norwegian	19 th	leprosy	1871	Hansen's disease HD
Thomas Hodgkin	Dr./pathologist	English	19 th	anaemia	1832.	Hodgkin's lymphoma or Hodgkin's
George Huntington	neurologist	American	19 th	dementia	1872	Huntington disease or Huntington's chorea
Heinrich A. Johne	bacteriologist	German		tuberculosis	1907	paratuberculosis
Moritz Kaposi*	dermatologist	Hungarian		skin disease	1916	Kaposi's sarcoma
Tomisaku Kawasaki	pediatrician	Japanese	20 th	pediatrics	1975	Kawasaki/ Kawasaki's syndrome also Kawasaki's disease
József Marek	veterinarian	Hungarian		cancer	1907	
Prosper Ménière*	physician	French	19 th		1871	Ménière's syndrome
Lou Gehrig*	baseball player	American	20 th	sclerosis/paralysis	1939	
Sir James Paget	surgeon	English	19 th	cancer	1880	
James Parkinson	physician	English	18 th /19 th	neurology	1817	shaking palsy paralysis agitans, Parkinson's , Parkinson's syndrome
Percivall Pott	surgeon	English		tuberculosis	1835	
Tay-Sachs						Tay-Sachs
Warren Tay	physician	British	19 th	ophthalmology, dermatology, and pediatrics		
Bernard P. Sachs	neurologist	American	19 th / 20 th	neurology	1907	
Samuel A. K. Wilson	neurologist	English		neurology	1915	

3. General classification – The collocation of terms, from ‘Malady’ to ‘Syndrome’

Here the words have been grouped by the general terms used in the naming of medical conditions in compounds namely: ‘disease’ as in ‘Heart Disease’, ‘fever’ as in ‘Scarlet Fever’, ‘sickness’ as in ‘Decompression Sickness’, ‘syndrome’ as in ‘Organic Brain Syndrome’ & ‘pox’ as in ‘Smallpox’. The different morphological structures in these terms reflects the earlier historical reality of an underlying parallel use of French alongside native constructs onto which Latin and Latinized Greek forms were added in the transition to Modern English. We can note the dominant use of ‘disease’ and discuss its semantic and morphological evolution as a constant in the compound term and thus give one detailed analysis rather than repeating it in each of the relevant terms in the glossary. Although there are far

fewer terms in the glossary that have ‘fever’, ‘sickness’ or ‘pox’, they have also been included. Other words that can theoretically collocate as the second element of the compound term have been included for reference even though they do not appear in the glossary, for example ‘malady, illness, consumption, complication & indisposition’. Thus, although we most commonly find ‘heart’ together with ‘disease’ as in ‘heart disease’.

4. The Treatment of loanwords from French – The Politics of Morphology

In order to understand the complexity of morphological changes in the words of French origin, some background is given here by way of this introduction which is in two parts. The first part introduces the overall historical background from 1066 leading up to the transition to Modern English in the 16th century. The second part looks at the later problematic classification of earlier unchanged and also new French loanwords, and their acceptability as English in the context of how they were historically treated at any one period by the mainstream.

The adoption of French loanwords into native speech dates from the 1066 establishment of Norman French rule over England. The use of French as the official language of government created a line of French speaking kings of England who at the same time saw and styled themselves as the rulers of France as well. Thus from the outset for at least 300 years, their French identity was dominant in shaping the daily life of the native people and their language. Thus throughout this early period, common use French loanwords that were assimilated into the native speech patterns so as to be no longer transparently French over time, were thus naturalized¹ and Latin or Greek origin also obscured in the spellings. Perhaps the best examples of this type of change can be seen in the medical use words ‘quinsy’[swelling] ‘palsy’[numbness] and ‘megrin’[headache]. Since this early period spans 300 years [12th -14th Century] a study to compare the changes in these loanwords with the changes going on in the equivalent French forms could be useful as a model to gauge the change in identity of the State in the transition to Modern English. Thus if at the point at which the word was adopted it remains fixed in the spoken language and does not follow the subsequent changes in the French, then this would be indicative. For example consider the example of ‘quinsy’ as set out in the table below:

The Sound Patterns of Modern English	The Transition to Modern English - French to English Conversion Model Type I				Table 1		
	12 th to 16 th century French morphology				16 th century French	16 th century English	17 th century French
Latin	1176	1256	1300-1350				
cynanche	quinancie	eschinance	esquinancy	esquinancy	squinancie squinanche	quinsy swinsy	esquinancie

In this case we can see the diverging spellings as the definitive factor and thus the emerging Modern English and Modern French words both look and sound different.

In terms of Russian medical terminology, borrowing also has been a very habitual way of replenishing vocabulary for several centuries.

Borrowed medical terms of Greek and Latin origin, as a rule, came into Russian not from Greek or Latin directly, but from the international fund of medical terminology. Moreover, today, when people construct new terms, the reference to ancient Greek and Latin words and elements (roots and affixes) provides an international commonality and therefore a clarity of such terms for medical professionals from different countries. The obligation to learn Latin in medical educational institutions ensures the constant maintenance of this situation in medical communication.

Among the terms of Greek and Latin origin, it can be noted that, there are an amount of terms which have certain prefixes and suffixes, which can be dated back to their original languages, as well as compounds. The predominance of loan words in morphemes among terms in general and in particular in disease names is undoubted. It can be said that, non-derivative loan terms which fully correspond to a certain Greek or Latin root are rare. For example just like, Rus. *ангина* (Lat. *angina* ‘suffocation’) ‘acute infectious disease manifested in inflammation of the pharyngeal mucosa, tonsils’; Rus. *зепнеc* (Greek. *herpes*) ‘a disease of human and animals caused by viruses and characterized by skin lesions (vesicular rash; deprive) on the lips, pharyngeal mucosa, eyes, etc.’.

It should be noted that, there is another small group of loan words in Russian – terms which derived from semantic translation, for example: Rus. *ВИЧ* - вирус иммунодефицита человека ‘human immunodeficiency virus’ (the acronym for *ВИЧ* can be traced back to the internationalism HIV - human immunodeficiency virus); Rus. *СПИД* - синдром приобретенного иммунодефицита ‘Acquired Immune Deficiency Syndrome’ (СПИД <internationalism AIDS - Acquired Immune Deficiency Syndrome); Rus. *стидофобия* - болезненное состояние вследствие боязни заразиться СПИДом. ‘painful condition due to fear of getting AIDS’ (СПИД+фобия <AIDS+phobia).

Russian medical terminology also retains a considerable number of native Russian elements, despite the enormous influence of the international terminological system and globalization, which began in the terminological systems much earlier than in the language as a whole. For Russian, ethnic specific, motivated terminological units are very important, despite the fact that it may make it less convenient from the point of view of internationalization, and less convenient for the communications between medical professionals from different countries.

Original Russian disease names, primarily formed by morphemic derivation,

are characterized by motivation and colloquial coloration.

English disease names are more consistent with the international terminological system; they are characterized by professional specification, abstraction, and to a lesser extent bear the imprint of English history and thus less nationally labeled than the Russians. This situation is explained by the gradual ousting of nationally specific words from the sphere of English medical terminology and the replacing of them with internationalisms.

Medical terminology is a subsystem that develops within the framework of the common linguistic system, and it is reflected in the most concentrated form, by the existing trends of the language development. In medical terminology, there are common linguistic phenomena such as the predominance of suffixing in the process of word-formation, and the desire for a metaphorical transferring of concepts, etc. The directional nature of medical terminology distinguishes it from common vocabulary of a language, but at the same time reveals the hidden possibilities of the linguistic nomination system. At the same time, in the functioning of the medical terminology, there are also some special laws related to the specifics of this field of vocabulary. One of these patterns is the activation of the processes of derivation and borrowing, due to the quantitative growth of medical concepts.

The studies of modern medical terminology in English and Russian, allows us to visually trace and analyze the development path, in order to find out the basic laws in linguistic nomination.

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冷却介质对Wistar大鼠肝细胞倍性的影响(实验研究)

**INFLUENCE OF THE COOLING MEDIUM ON THE PLOIDY OF
WISTAR RAT HEPATOCYTES (EXPERIMENTAL STUDY)**

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注解。研究了单次浸泡(水)和单次低温下Wistar大鼠冷却环境对肝脏的影响。结果发现,在暴露于深水低温(快速冷却速率)后,肝细胞明显改变,细胞核中遗传物质急剧减少(高达3.2c),进一步表现出适应性补偿适应性。过程和高倍体细胞池数量的增加(高达13c)。到第7天,并且在第14天,恢复了2c-4c的池数。当暴露于中等空气低温(缓慢冷却速率)时,改变过程进行的强度较低(比水低温低4-5倍),并且适应过程提前进行,肝细胞的多倍化(池9c-13c的出现)立即记录。h-termia和未来的影响逐渐增加细胞2c-4c的数量。因此,实验性低温的冷却环境对肝细胞的倍性具有显著影响。

关键词:低温,冷却环境,肝细胞,倍性

Annotation. *The influence of the cooling environment on the liver of Wistar rats with single immersion (water) and single air hypothermia was studied. It was found that immediately after exposure to deep water hypothermia (rapid cooling rate), there was a pronounced alteration of hepatocytes and a sharp decrease in genetic material in the cell nuclei (up to 3.2c), with further manifestation of adaptive-compensatory adaptive processes and an increase in the number of high-ploid cell pools (up to 13c). by 7 days), and on the 14th day, the number of pools of 2c-4c was restored. When exposed to moderate air hypothermia (slow cooling rate), alteration processes proceeded less intensively (4-5 times lower than in water hypothermia), and adaptation processes proceeded earlier; polyploidization of hepatocytes (appearance of pools 9c-13c) was recorded immediately after the effects of h-termia and in the future gradually increased the number of cells 2c-4c. Thus, the cooling environment in experimental hypothermia had a pronounced effect on the ploidy of hepatocytes.*

Keywords: *hypothermia, cooling environment, hepatocytes, ploidy*

The ambient temperature is one of the main abiotic factors affecting the homeostasis of humans and animals and a change in the thermal regime entails disturbances in all body systems [11]. At the same time, a significant amount of the population of our country inhabits territories with low ambient temperatures. From 40% to 70% of the territory of Russia is represented by the permafrost zone [6], where the air temperature can drop significantly and reach minus 40-50 ° C and lower, and therefore the cold is our national problem [12,13].

Air cooling (air hypothermia) is characterized by the contact of limited areas of the body surface with the environment, which leads to a longer period of temperature decrease and the formation of local damage. When cooled in the aquatic environment (immersion hypothermia), full contact with the cooling factor is observed, which is accompanied by a more intense effect of the damaging factor on the body, and this leads to more intense heat transfer and the cooling period takes minimal time [8].

The general principle of adaptation of mammalian organs after damage is the restoration of the total cell genome. This is achieved either by dividing cells, or by increasing the total genome in the cell, i.e. polyploidy. In the liver, polyploidy has been shown to directly reflect the intensity of regenerative processes after injury and correlates with the strength of the damaging factor [10].

In the literature there is a small number of works devoted to tissue and intracellular reorganization of the liver during hypothermia [2,4,5,7,9]. However, there have been very few studies where the ploidometric characteristics of hepatocyte nuclei when exposed to the cold factor have been studied in the literature, and we have not found studies on the effect of hypothermia on the liver cells depending on the cooling environment.

The purpose of the study is to study the ploidometric characteristics of the nuclei of hepatocytes of Wistar rats when exposed to hypothermia depending on the cooling environment.

Material and research methods

The study was performed on 50 white Wistar rats. The effect of the cold factor on the liver of animals, depending on the cooling environment, was studied on two hypothermia models: single deep water (immersion) and single moderate air. Animals were divided into 3 groups: 1 group - a control group, intact animals on a free diet (n = 10); Group 2 - animals that underwent deep immersion hypothermia (n = 20); Group 3 - animals that underwent moderate air hypothermia (n = 20).

Single deep immersion hypothermia was modeled by placing animals in individual cages in water at a temperature of 5° C, at an ambient temperature of 7° C. The criterion for the termination of the experiment was a decrease in the rectal

temperature of 20–25° C, the exposure time was 40 ± 5 min.

A single moderate air hypothermia was simulated by placing the animals in individual cells in a cooling chamber at air temperature of -25°C until the rectal temperature reached 30° C. The exposure time was individual and was 6 ± 3 hours.

Animals of groups 2 and 3 were removed from the experiment by decapitation immediately after cooling was stopped, then after 2, 7, and 14 days (5 animals each) in accordance with the “Rules for conducting work using experimental animals”. Liver samples were fixed in 10% neutral formalin for 24-48 hours, then wired on a TISSUE-TEK VIPTM6 machine (Sakkura, Japan), embedded in Histomix paraffin (TISSUE-TEK TEC 5 paraffin filling station, Sakkura, Japan). Sections were made on a Accu-Cut SRM rotary microtome (Sakkura, Japan), stained with hematoxylin and eosin in a TISSUE-TEK Prisma machine (Sakkura, Japan) and placed under the film in a TISSUE-TEK Film machine (Sakkura, Japan). On hematoxylin and eosin stained preparations, the average number of hepatocytes in 5 fields of view with an increase of x400 and the alteration index (the ratio of the number of necrotic hepatocytes to the total number of hepatocytes in 5 fields of view) was considered.

To determine the ploidy of the nuclei of rat liver cells, sections were stained by Feulgen method using cold hydrolysis in 1N HCl solution for 1.5 hours. The DNA content was determined in 25-30 nuclei, as well as in 25 small lymphocyte nuclei in the same series of sections. The average DNA content in the nucleus of a small lymphocyte was taken as a diploid value (2c). Ploidometry was performed using the VidioTest-Morphology program 5.2. («VideoTest», St. Petersburg, Russia) using the modules «Standard» and «Ploidy». The DNA accumulation index (AIDNA) was calculated - the weighted average arithmetic index of DNA content in hepatocyte nuclei according to Avtandilov G. G. (2000) [1]. Histograms of cell distribution were plotted using AIDNA. Micrographs were taken using a Nikon Eclipse E200 microscope (Japan) with a 100 x 1.25 lens, a 570 nm light filter and a VIDICAM digital video camera (Russia). The conditions of illumination of the objects under study were the same for all measurements.

Statistical processing of the material was performed using the Statistica 6.0 package. In the normal distribution, methods of parametric statistics were used (Student's t-test), if the criteria of normal distribution were not met (the Shapiro-Wilk criterion $W = 0.89$, $p < 0.01$), non-parametric statistics were used: the Kolmogorov-Smirnov test or the U-test Mann Whitney. Data was considered reliable at $p < 0.05$.

Research results

A ploidy analysis showed that in the liver cells of the control group of rats AIDNA was characterized by a low value ($3.5 \text{ sec} \pm 0.1$), tetraploid cells prevailed, which is consistent with the literature data [3].

Immediately after a single water hypothermia in animals of the second group, the number of hepatocytes in 5 fields of view increased by 17.8%, the alteration index increased 81.25 times, AIDNA in the nuclei of hepatocytes was reduced by 8.6% compared with the control group (see table). In animals of group 3, immediately after a one-time moderate air hypothermia, the number of hepatocytes in 5 fields of view decreased by 30.3%, the alteration index increased 19.25 times, AIDNA in the nuclei of hepatocytes was increased 2, 3 times compared with the control group (see table). At the same time, compared with the 2nd group at this time of observation, the number of hepatocytes and the alteration index were reduced (by 40.8 and 76.3%, respectively), and AIDNA increased 2.5 times.

2 days after exposure to hypothermia in group 2, the number of hepatocytes compared to control was reduced by 3.4%, the alteration index of hepatocytes increased 97 times, AIDNA in cell nuclei increased 1.6 times, the limits of AIDNA fluctuations were from 2c to 13c (see tab.). In group 3 of the study, after 2 days, the dynamics of changes was similar to group 2: compared with the control, the number of hepatocytes decreased by 14.3%, the alteration index increased 18 times, AIDNA increased 1.6 times (see table). A comparative analysis of 2 and 3 groups after 2 days of the experiment showed that with air hypothermia, the number of hepatocytes decreased by 11.3%, the alteration index - by 81.5%, AIDNA - by 3.5% compared with aquatic hypothermia.

Table. Morphological and ploidy parameters of hepatocytes with different types of hypothermia

Hepatocyte parameters	The duration of the experiment				
	Control	Immediately after hypothermia	2 days after hypothermia	7 days after hypothermia	14 days after hypothermia
Aquatic hypothermia					
The number of hepatocytes in 5 fields of view	180,5±5,5	212,6±12,9*	174,4±9,3*	132,8±3,3*	148,7±7,6*
Alteration Index (%)	0,4±0,1	32,5±3,1*	38,85±2,2*	21,9±1,3*	6,6±0,7*
AIDNA (c)	3,5c±0,1	3,2±0,2*	5,7±0,2*	9,3±0,2*	6,6±0,7*
Air hypothermia					
The number of hepatocytes in 5 fields of view	180,5±5,5	125,8±4,0*	154,6±5,9*	174,2±3,3*	200,4±5,9*
Alteration Index (%)	0,4±0,1	7,7±1,6	7,2±1,2	4,3±0,4*	1,2±0,2*
AIDNA (c)	3,5c±0,1	8,05±0,2*	5,5±0,1*	4,4±0,1*	3,4±0,1*

Note. * $p < 0.05$ compared to control.

7 days after exposure to deep hypothermia in group 2 compared with the control, the number of hepatocytes in 5 fields of view was reduced by 26.4%, the alteration index was increased 54.75 times, AIDNA in nuclei increased 2.7 times (see tab.). In group 3 of the study, after 7 days, the dynamics of changes was similar to group 2: compared with the control, the number of hepatocytes decreased by 3.5%, the alterations index increased 10.75 times, AIDNA increased by 25.7% (see tab.). A comparative analysis of 2 and 3 groups after 7 days of the experiment showed that with air hypothermia, an increase in the number of hepatocytes was observed by 31.2%, the alteration index was reduced by 80.4%, and AIDNA decreased by 52.7% compared to water hypothermia.

14 days after exposure to hypothermia in group 2 compared with the control, the number of hepatocytes in 5 fields of view was reduced by 17.6%, the alteration index was increased by 16.5 times, AIDNA in the nuclei increased by 88.6% (see tab.). In group 3, 14 days after exposure to hypothermia compared with control, the number of hepatocytes was increased by 11.0%, the alteration index was increased by 3 times, AIDNA in the nuclei decreased by 2.9% (see tab.). A comparative analysis of groups 2 and 3 after 14 days of the experiment showed that with air hypothermia, an increase in the number of hepatocytes was observed by 34.7%, the alteration index was reduced by 81.8%, and AIDNA decreased by 48.5% compared to water hypothermia.

An analysis of the ploidy histograms of hepatocyte nuclei showed that the hepatocytes of the control group were diploid, 2c (20%), triploid, 3c (30%), tetraploid, 4c (46%) and octaploid cells, 8c (4%).

Immediately after conducting hypothermia in animals of the second group of the study, the distribution of hepatocytes according to AIDNA was as follows: 1c - 3.4%, 2c - 43.8%, 3c - 16.85%, 4c - 21.35%, 5c - 4.5%, 6c - 2.25%, 7c - 6.7% and 8c - 1.15%. The AIDNA distribution histogram had a shift to the left and a single peak in the region of hepatocytes with a ploidy of the 2c nucleus. Immediately after exposure to hepatocytes with ploidy from 1c to 4c, animals of the third group were not observed, the number of clones increased from 5c to 8c (5c - 3.8%, 6c - 14.4%, 7c - 24.4%, 8c - 16, 7%) and clones appeared with AIDNA from 9c to 13c (9c - 19.2%, 10c - 14.1%, 11c - 2.6%, 12c - 2.6%, 12c - 2.2). The histogram of cell distribution by AIDNA had a shift to the right and a single peak in the 7c region.

2 days after exposure to hypothermia in group 2 of hepatocytes, the distribution was as follows: 1c - 0%, 2c - 5%, 3c - 12.5%, 4c - 11.25%, 5c - 23.75%, 6c - 15%, 7c - 13.75%, 8c - 7.5%, 9c - 6.25%, 10c - 1.5%, 11c - 2.25%, 12c - 0% and 13c - 1.25%. The histogram of the distribution of AIDNA showed a wide heterogeneity of values, there was a single peak in the 5c region and a shift to the right. In group 3 of the study, 2 days after hypothermia of hepatocytes with ploidy of the 3c core was 4.1%, 4c - 24.5%, 5c - 24.5%, 6c - 22.4%, 7c - 15.3%, 8c -

6.1%, 9c - 3.1%. When analyzing the histogram of AIDNA distribution, it should be noted that hepatocytes with ploidy of 3c and 4c appeared and hepatocytes of 10c - 13c disappeared. The histogram had a shift to the right and peaks in the 4c and 5c regions.

After 7 days after exposure, in group 2 of hepatocytes with a ploidy of the nucleus 1c - 4c was not, 5c - 1.4%, 6c - 1.4%, 7c - 6.8%, 8c - 16.4%, 9c - 32.9%, 10c - 27.4%, 11c - 5.5%, 12c - 2.7% and 13c - 5.5%. The AIDNA distribution histogram was characterized by a shift to the right and had a single peak in the 9c region. 7 days after exposure, in group 3 of hepatocytes with ploidy of the 3c nucleus was 16.25%, 4c - 52.5%, 5c - 13.75%, 6c - 10%, 7c - 6.25%, 8c - 0% and 9c - 1.25%. Histogram analysis showed an increase in hepatocyte clones in the 3c and 4c regions and a decrease from 5c to 9c. The AIDNA distribution histogram was characterized by a shift to the left and had a high peak in the 4c region.

After 14 days, in group 2 of hepatocytes with ploidy of the 1c core was not observed, 2c - 6.7%, 3c - 8.3%, 4c - 26.7%, 5c - 23.3%, 6c - 18.3%, 7c - 16.7%, 8c - 0%, 9c - 0%, 10c - 13c - 0%. The AIDNA distribution histogram was characterized by a shift to the right and had a single peak in the 4c region. In group 3, after 14 days, the hepatocytes were distributed as follows: 2c - 17.5%, 3c - 30%, 4c - 51.25% and 7c - 1.25%. The histogram of cell distribution had a shift to the left and a single peak in the area of cells 4c.

Thus, deep aquatic hypothermia had a pronounced damaging effect on the liver of experimental animals, which was expressed primarily by an increase in the alteration index of hepatocytes immediately after exposure (81 times) and maintaining high index values up to 14 days; an increase in the number of diploid hepatocytes by 2.2 times and a shift in the histogram of the distribution of AIDNA to the left. In the posthypothermic period, ploidy analysis revealed a decrease in the number of 2c hepatocytes (4 times) on the 2nd day, the disappearance of this pool of cells for 7 days and the appearance of a pool of 2c hepatocytes on the 14th day (3 times lower than the control level). AIDNA significantly increased on the 7th day (by 2.7 times), during this period the 9c and 10c cells prevailed (the histograms had a sharp shift to the right), which may indicate adaptive compensatory-adaptive processes in the liver tissue. By day 14 of the experiment, AIDNA remained above control by 1.9 times.

After exposure to air hypothermia, the hepatocyte alteration index also increased, but less significantly than in the water regime (19 times versus 81 times relative to the control), gradually decreasing towards the end of observation, but remaining more than the control values 3 times. AIDNA increased immediately after exposure (2.3 times), normalizing to 14 days. Immediately after exposure, hepatocytes 9c and 10c prevailed in the liver (the histogram had a sharp shift to the right), which may indicate early adaptation processes. In the posthypothermic

period - immediately after exposure - a ploidy analysis revealed the disappearance of the pool of 2c-4c hepatocytes and the appearance of clones 9c-13c (40% of all hepatocytes); on the 2nd day - the appearance of 4 hepatocytes (47% less control) and the disappearance of clones 10c-13c; on the 7th day - the growth of hepatocyte clone 4c (14% above the control) and the disappearance of clones 8c and 10c-13c; on the 14th day - the appearance of 2c hepatocytes (12.5% less than the control) and an increase in the number of 4c hepatocytes (11% higher than the control).

Thus, the results of the study showed that the cooling environment had a significant impact on the ploidy profile of the hepatocytes of experimental animals, and the nature of these changes was interconnected with the rate of cooling. At a rapid rate of cooling (deep water hypothermia) immediately after exposure to hypothermia, there was a sharp decrease in the content of genetic material in the nuclei of hepatocytes, and its increase was noted only after 7 days. At a slow rate of cooling (exposure to moderate air hypothermia), the adaptation of hepatocytes and a significant increase in AIDNA in the nuclei occurred immediately after exposure to hypothermia.

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深度低温白大鼠肝脏肥大细胞的形态功能特征
**MORPHOFUNCTIONAL CHARACTERISTICS OF MAST CELLS
IN THE LIVERS OF WHITE RATS WITH DEEP IMMERSION
HYPOTHERMIA**

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注解。这项工作的目的是评估低温期间大鼠肝脏肥大细胞(MC)的形态功能活动。该研究在20只Wistar大鼠上进行。通过将动物置于温度为5°C,环境温度7°C的水中的单独笼中来模拟低温。终止暴露的标准是动物的直肠温度为20-25的成就。 °C,相当于深度低温。在实验过程中,将动物分成4组:在冷却结束后立即从实验中取出第1组的大鼠;第2组大鼠 - 2天后;7天内有3组大鼠,14天内有4组大鼠。研究表明,冷应激对大鼠肝脏有明显影响。在实验的第2天,观察到肝脏的形态功能活性MC的增加,这与肝细胞再生的开始一致。在第7天(在自适应过程的最大活动期间),MC的定量和形态测量参数最高。MC的活动在第14天减少。因此,低温是组织MC的形态功能活性的强有力的激活剂。间质MC可能是响应于冷因子的破坏作用而在肝脏中激活再生和适应过程的重要因素。

关键词:体温过低,肝脏,肥大细胞,适应。

Annotation. *The aim of the work was to evaluate the morphofunctional activity of the mast cells (MC) of rat liver during hypothermia. The study was performed on 20 Wistar rats. The hypothermia was modeled by placing the animals in individual cages in water at a temperature of 5 ° C at an ambient temperature of 7 ° C. The criterion for the termination of exposure was the achievement by the animals of a rectal temperature of 20-25 ° C, which corresponded to a deep degree of hypothermia. During the experiment, the animals were divided into 4 groups: rats of group 1 were removed from the experiment immediately after the termination of*

cooling; rats of group 2 - after 2 days; 3 groups of rats in 7 days and 4 groups of rats in 14 days. The results of the study showed that cold stress had a pronounced effect on the liver of rats. On the 2nd day of the experiment, an increase in the morphofunctional activity MC of liver was observed, which coincided with the beginning of the regeneration of liver cells. On the 7th day (during the period of the greatest activity of adaptive processes) the quantitative and morphometric parameters of the MC were the highest. The activity of the MC decreased on the 14th day. Thus, hypothermia is a powerful activator of the morphofunctional activity of tissue MC. Interstitial MC may be important factors in the activation of regenerative and adaptive processes in the liver in response to the damaging effect of the cold factor.

Key words: hypothermia, liver, mast cells, adaptation.

Despite numerous studies on the death of people from the cold, the diagnosis of cold death and fatal hypothermia continues to be relevant. At present, many aspects of the effects of cold on the human body have been thoroughly studied, and diagnostic and differential diagnostic criteria for death from hypothermia have been developed, but a holistic view on the compensatory-adaptive processes and adaptation of the organism to the cold factor in pathological anatomy and forensic science currently missing.

According to modern concepts, mast cells (MC) are a key element of influence on metabolic processes and they have an important biological significance in tumor growth, regeneration, adaptation to stress and hypoxia [1,2,3,4,5,6,7,8,9,ten].

The population of mast cells in the tissues of the body is an independent regulatory system. This statement is confirmed by the fact that MCs of various tissues of experimental animals are systemically included in adaptive processes under the influence of extreme factors on it. At the same time, only a few works are devoted to the study of the MC value in hypothermia. Thus, it has been shown that exposure to cold factor causes an increase in the number of MCs and their degranulating forms in the skin, skeletal muscles, and intestinal mesentery of experimental animals. [11,12,13].

The aim of research was to study the effect of deep immersion hypothermia on the morphofunctional activity of the rat liver mast cell population in the experiment.

Materials and methods

The research was performed on 25 Wistar rats. The hypothermia was modeled by placing the animals in individual cages in water at a temperature of 5 ° C at an ambient temperature of 7 ° C. The criterion for the termination of exposure was the achievement by the animals of a rectal temperature of 20-25 ° C, which corresponded to a deep degree of hypothermia. The exposure time was individual and averaged 40 ± 5 min. During the experiment, rats were divided into 4 groups.

Animals of group 1 (n = 5) were removed from the experiment by decapitation immediately after cooling was stopped, animals of group 2 (n = 5) after 2 days, animals of group 3 (n = 5) after 7 days and animals of group 4 (n = 5) - after 14 days. A morphological study of the liver of intact animals (n = 5), which served as a control group, was also conducted.

For histological examination, liver samples were fixed in 10% neutral formalin, then the material was wired on a TISSUE-TEK VIPTM6 machine (Sakkura, Japan), embedded in Histomix paraffin (TISSUE-TEK TEC 5 paraffin filling station, Sakkura, Japan). Sections 5-7 μm thick were made on a Accu-Cut SRM rotary microtome (Sakkura, Japan), stained with hematoxylin and eosin in a TISSUE-TEK Prisma automat (Sakkura, Japan) and placed under the film in a TISSUE-TEK Film automat (Sakkura, Japan). MC revealed toluidine blue (Bio-Vitrum, Russia). MC micrographs in the liver were obtained using a Nikon Eclipse E200 microscope (Japan) with a VIDI CAM digital video camera (Russia) at x 400 magnification. The MC distribution density was calculated in 5 fields of view with a microscope magnification x 400 using the Image Tool. 3. Calculate the MC degranulation index (DIMC) (the percentage of cells in the degranulation state of the total MC number). MC morphometry was performed using the licensed morphometric program "VideoTest - Morphology 5.2.". Statistical processing of the data was performed using the statistical package Statistica 6.0.

Results and discussion

The results of the study showed that in the liver of rats of the control group MC were located in the connective tissue of the portal tracts and along sinusoids. They were small and round in shape. The number of cells varied from 1 to 2, their average number was 1.2 ± 0.2 in 5 fields of view with x 400 magnification. The MC area was $34.0 \pm 0.7 \mu\text{m}^2$. The granules were mainly located compactly in the cytoplasm MC. The number of compact forms of MC was $83.2 \pm 0.3\%$. The phenomenon of degranulation was noted in a small number of cells. DIMC was equal to - $16.8 \pm 0.5\%$ (table).

Immediately after exposure to a single deep immersion hypothermia, the MCs in the liver tissue looked small, rounded or elongated, placed one by one in the portal tracts, localized near the vessels and bile ducts. The MC distribution density was 4.0 ± 0.5 in 5 fields of view, the cell area was equal to $40.2 \pm 3.2 \mu\text{m}^2$. Compact forms of MC revealed $84.5\% \pm 5.1$. DIMC amounted to - $15.5\% \pm 5.1$ (table).

On the second day after a single immersion hypothermia, MC in the liver were arranged in groups and individually in the portal tracts, in the stroma of the liver, near the vessels and bile ducts. MCs looked polymorphic, with elongated cells predominating. The density of the MC distribution at this time of the experiment was 10.2 ± 1.4 , the area of the MC - $51.5 \pm 1.9 \mu\text{m}^2$. The compact form of MC was $75.8\% \pm 0.9$. DIMC was equal to - $24.2\% \pm 0.9$ (table).

On day 7 after hypothermia, MCs were located in groups and individually in the portal tracts, near the vessels, the bile ducts and the connective stroma. At this period of the experiment, MCs differed significantly in their morphological characteristics from the cells of the previous study dates: they had large sizes, the cells of elongated and irregular shape prevailed. The MC distribution density at this time of the experiment was 10.8 ± 0.9 , their area increased to $73.3 \pm 3.2 \mu\text{m}^2$. Compact forms of MC were $67.2\% \pm 1.9$. DIMC was equal to $- 32.8\% \pm 0.9$ (table).

On the 14th day of the experiment, the MCs were located in the portal tracts, predominantly one by one, near the vessels and the bile ducts. Compared with the previous period of the experiment, the size of the MC decreased. The round cells prevailed. The MC distribution density at this time of the experiment was 9.0 ± 1.4 , the cell area was $57.9 \pm 2.3 \mu\text{m}^2$. The compact form of the MC was $84.9\% \pm 3.1$. DIMC amounted to $- 15.1\% \pm 3.1$ (table).

Table. Quantitative and morphometric characteristics of mast cells, depending on the duration of the experimental single deep immersion hypothermia

The duration of the experiment	Mast Cell Parameters			
	MC number	Compact MC number (%)	DIMC	MC area (μm^2)
Control	$1,2 \pm 0,2^*$	$83,2 \pm 0,3$	$16,8 \pm 0,5$	$34,0 \pm 0,7^*$
Immediately after hypothermia	$4,0 \pm 0,5^*$	$84,5 \pm 5,1^*$	$15,5 \pm 5,1^*$	$40,2 \pm 3,2^*$
2 days after hypothermia	$10,2 \pm 1,4^*$	$75,8 \pm 0,9^*$	$24,2 \pm 0,9^*$	$51,5 \pm 1,9^*$
7 days after hypothermia	$10,8 \pm 0,9$	$67,2 \pm 1,9^*$	$32,8 \pm 0,9^*$	$73,3 \pm 3,2^*$
14 days after hypothermia	$9,0 \pm 1,4$	$84,9 \pm 3,1^*$	$15,1 \pm 3,1^*$	$57,9 \pm 2,3^*$

Note: * - data are reliable at $p < 0.05$.

Conclusion

Thus, the results of the study showed that a single deep immersion hypothermia had a significant impact on the morphofunctional activity of liver MC in experimental animals. The number and size of MCs began to increase immediately after exposure to hypothermia, and after 7 days, during the period of active regeneration and adaptation of hepatocytes, the number of MCs and their morphometric parameters were highest, and the number of degranulating forms of these cells was maximum. By the 14th day of the experiment, the MC content in the liver remained at the same level, but the area of MC and DIMC was significantly reduced. The increase in the number of MCs in the liver tissue of animals on the 7th day of the experiment may be due to their migration from other organs. An increase

in the morphofunctional activity of MC in the posthypothermic period leads to an acceleration of regenerative processes in the liver tissue after damage caused by exposure to cold factor.

Thus, hypothermia is a powerful activator of the activity of interstitial liver MC. Interstitial MCs are important stimulators of hepatocyte regeneration in the process of adaptation of the liver to hypothermia.

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基质金属蛋白酶9在肾细胞癌中的预后价值
**PROGNOSTIC VALUE OF MATRIX METALLOPROTEINASE 9 IN
RENAL CELL CARCINOMA**

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研究目的 - 根据临床和形态学参数以及术后患者生存情况, 研究基质金属蛋白酶-9在肾细胞癌和肿瘤内炎症浸润细胞中的表达。

材料与amp;方法。研究了108种肾癌药物。免疫组化法检测基质金属蛋白酶-9 (MMP-9) 的表达, 通过计算细胞胞质中的积分光密度评估其严重程度。

结果。结果表明, MMP-9在肿瘤细胞和肿瘤内炎症浸润细胞中的整合光密度与肾癌的重要预后因素相互关联: 癌症的组织学变异, 根据TNM的疾病分期, 肿瘤部位的大小, Fuhrman分级, 存在转移和5年患者术后生存率。

对MMP-9的整合光密度的研究可以作为肾细胞癌的另外的预后因素。

关键词: 肾癌, 基质金属蛋白酶-9, 预后。

The aim of the research – to study the expression of matrix metalloproteinase-9 in cells of renal cell carcinoma and intratumoral inflammatory infiltrate cells depending on the clinical and morphological parameters and postoperative patient survival..

Material and methods. 108 kidney cancer drugs were investigated. The expression of matrix metalloproteinase-9 (MMP-9) was detected by the immunohistochemical method, its severity was assessed by calculating the integral optical density in the cytoplasm of cells.

Results. It was shown that the integrated optical density of MMP-9 in tumor cells and intratumoral inflammatory infiltrate cells was interconnected with important prognostic factors of kidney cancer: a histological variant of cancer, stages of the disease according to TNM, size of the tumor site, Fuhrman gradation, the presence of metastases and 5-year postoperative survival rate of patients.

The study of the integrated optical density of MMP-9 may serve as an additional prognostic factor in renal cell carcinoma.

Keywords: kidney cancer; matrix metalloproteinase-9, prognosis.

Despite numerous studies, at present there is no reliable predictor of prediction in renal cell carcinoma (RCC), therefore, the search for new significant prognostic markers for RCC is an important task.

Currently, researchers are paying close attention to the participation of matrix metalloproteinases in tumor growth, considered as an important factor in the progression of malignant tumors. Thus, according to the literature, matrix metalloproteinases are involved in stromal remodeling, stimulation of angiogenesis, and tumor invasion and metastasis. [1,2,3].

Matrix metalloproteinase-9 (MPP-9) is a member of the gelatinase family, an important feature of which is the ability to cleave the components of the basement membranes and a number of proteins of the connective tissue matrix, which facilitates the migration of endothelial and tumor cells [1,2]. The expression of MPP-9 is fixed both in the tumor cells and in the intratumoral inflammatory infiltrate (CII) cells [4]. Also a number of authors consider MPP-9 as a critical causal factor (trigger) for tumor-induced angiogenesis. [4].

A high level of expression of MMP-9 was detected in neoplasms of various localizations. The adverse prognostic value of high MMP-9 expression in tumor cells has been shown in lung cancer, bladder cancer, cervical cancer, rectal cancer, and endometrial carcinoma [5,6]. However, for a number of localizations, such a dependence was not revealed [7].

With respect to the RCC, the data is inconsistent. According to a number of researchers, the expression of MMP-9 in tumor cells was significantly higher than in unchanged kidney tissue and was interconnected with the TNM stage. [8,9]. However, opposite data were obtained, indicating that MPP-9 was not dependent on the size of the tumor site. In addition, there is evidence that the expression of MPP-9 was interrelated with Fuhrman gradation — with an increase in the degree of nuclear atypia, the expression of MPP-9 increased [10].

In some studies, when conducting Cox multivariate regression analysis with RCC, expression of MMP-9 was an independent predictor factor [11].

Thus, according to the literature, the expression of MMP-9 by tumor cells is important for the progression of a malignant tumor, but the studies on this marker with RCC are limited and they are contradictory, therefore, the study of the prognostic value of MMP-9 expression in RCC needs further study.

The aim of the work is to investigate the activity of MPP-9 in tumor cells and intratumoral inflammatory infiltrate cells depending on the clinical and morphological parameters and postoperative survival of patients with RCC.

MATERIALS AND RESEARCH METHODS

A study of 108 tumors of patients with renal cell carcinoma (RCC), who were treated at the Altai Territory Oncology Center of the City of Barnaul from 2011 to 2013, was conducted.

Men were 56 (51.85%), women - 52 (48.15%). The average age of patients was 57.9 ± 1.2 years. Patients aged 30 to 39 years old were 8 (7.4%), from 40 to 49 years old - 10 (9.3%), from 50 to 59 years old - 40 (37%), from 60 to 69 years old - 30 (27.8%), from 70 to 79 years old - 20 (18.5%).

According to the histological type of tumors, the clear cell variant of kidney cancer prevailed, to which 95 (88%) were classified. The papillary variant of the RCC was met in 8 (7.4%) cases. Unclassifiable (sarcomatoid) RCC was noted in 5 (4.6%) cases.

When grouping tumors according to the clinical stages of the pathological process (I-IV), the tumors were distributed as follows: I the stage (T1N0M0) corresponded to the 67 (62%) observation; II stage (T2N0M0) 10 (9.3%) of observations; III stages (T1N1M0, T2N1M0, T3N0M0, T3N1M0) - 20 (18.5%) observation and IV stages (T4N0M0, T4N1M0, Tlyuby N2M0, Tlyubyublyuby M1) - 11 (10.2%) observations.

In the distribution of tumors according to the degree of nuclear atypia, Fuhrman S.A. gradation was used. (1982): G1 nuclear atypia was noted in 36 (33.3%) tumors; degree of nuclear atypia G2 - 27 (25%); the degree of nuclear atypia G3 is 28 (25.9%) and the degree of nuclear atypia G4 is 17 (15.8%).

The average largest size of the tumor site was 6.6 ± 0.4 cm (median 7 cm).

Distant and regional metastases were noted in 24 (22.2%) cases, localized tumors were 84 (77.8%).

The morphological characteristics of the material were carried out at both macro and microscopic levels. A macroscopic examination determined the size of the tumor (the largest tumor size in the longitudinal axis), the presence of regional metastases, the condition of the veins and the germination of the tumor in the pelvis and perirenal fiber. For histological examination, material was taken from a tumor (at least 3 pieces) and from conditionally unchanged kidney tissue taken from areas as far from the tumor as possible. The surgical material was marked, fixed in 10% neutral formalin solution from 12 to 24 hours. The material was wired through isopropyl alcohol using a carousel posting machine type TISSUE-TEK VIPTM6 (Sakkura, Japan), embedded in paraffin using a TISSUE-TEK TEC 5 paraffin filling station (Sakkura, Japan). Histological sections 5–7 μm thick were obtained using an Accu-Cut SRM semi-automatic rotary microtome (Sakkura, Japan). Samples were stained with hematoxylin and eosin in a machine for automatic coloring of micro-preparations TISSUE-TEK Prisma (Sakkura, Japan). Tissue-TEK Film (Sakkura, Japan).

The expression of MMP-9 was detected by immunohistochemistry using the manufacturer's recommended protocol using mouse monoclonal antibodies (clone 15W2, dilution 1:40) (Nowocasta, UK) and the NovoLink detection system (Nowocasta, UK). The staining was performed in an automatic Ventana XT. The expression intensity of MMP-9 was estimated by calculating the integral optical density (IOP) of the substrate using a special hardware and software complex consisting of a VIDIO CAM digital camera (Russia) adapted for a Nikon Eclipse E200 light microscope (Japan), a personal computer and morphometric software VidioTest-Morphology analysis 5.2. The lighting conditions and brightness thresholds were the same in all cases. In each case, 25-30 cells were examined.

Statistical processing of the material was performed using the statistical package Statistica 10.0. When testing statistical hypotheses, the distribution of data was normal, so the Student's t-test was used for independent variables. Data was considered reliable at $p < 0.05$.

RESULTS OF RESEARCH

An immunohistochemical study of MMP-9 was detected in tumor cells and intratumoral inflammatory infiltrate (CII) cells (leukocytes, mast cells, macrophages). The expression of MMP-9 had the appearance of a diffuse or focal reaction with a homogeneous or granular yellowish-brown staining of the cytoplasm of cells. Excluding clinical and morphological parameters, the average IOP of MMP-9 in tumor cells was 2544.4 ± 218.1 rel. units, and in CII - 2192.3 ± 143.3 rel. units

We carried out a comparative quantitative analysis of IEP MMP-9 in positively stained tumor cells and CII, depending on the clinical and morphological parameters of carcinomas.

The average IOP of MMP-9 in male tumor cells was 2540.8 ± 135.6 rel. units, and in women - 2146.8 ± 88.2 rel. units ($p = 0.02$) (Table 1), in CII for men - 2644.2 ± 127.7 rel. units, and in women - 2035.5 ± 63.2 rel. units ($p = 0.00003$) (Table 2). Thus, in males in tumor cells and CII IOP MMP-9 was significantly higher than in females.

When analyzing the expression of IEP MMP-9 depending on the age of the patients, it was found that the highest rates of IEP MMP-9 in tumor cells were in the age group from 60 to 69 years old, and the lowest in patients aged 30 to 39 years (Table 1). In CII, in the age group of patients from 30 to 39 years old, the lowest indices of IOP MMP-9 were noted, and in the age group from 50 to 59 years old, the highest rates were observed (Table 2).

Depending on the histological variant of the RCC, it was shown that in the sarcomatoid cancer cells, the IEP MMP-9 significantly increased compared to papillary cancer 2.25 times and compared to clear cell cancer 1.9 times (Table 1). In CII, with sarcomatous cancer, the IEP MMP-9 significantly increased by 1.6 times

compared with clear cell carcinoma. When compared with papillary cancer, in the sarcomatoid variant of MMP-9, the IIP tended to increase, but no significant differences were found (Table 2). Thus, the highest values of IEP MMP-9 were noted in the sarcomatoid variant of RCC.

The IOP analysis of MMP-9 depending on the clinical stage of the tumor process in tumor cells and CII allowed us to detect the following data. There are significant differences in the IEP of MMP-9 in tumor cells between stages and II and between stages III and IV, but there are no significant differences between II and III stages (Table 1). Similar data were obtained for CII (Table 2). Thus, depending on the clinical stage of the disease, an increase in the IEP MMP-9 was observed in the tumor cells and CII.

Depending on the degree of nuclear atypia by Fuhrman, the study of IEP MMP-9 in tumor cells showed that there are significant differences with respect to IEP MMP-9 between the degrees of nuclear atypia $G_1 - G_2$ and $G_2 - G_3$ and there is a tendency for IEP MMP-9 to increase with atypia G_4 (Table 1). In CII, depending on the degree of nuclear atypia of the IEP, MMP-9 increased significantly (Table 2). Thus, with degrees of nuclear atypia of G_3 and G_4 carcinomas, higher values of IEP MMP-9 were noted in tumor cells and CII compared with degrees of nuclear atypia G_1 and G_2 , which can be used in the differential diagnosis of low and high renal carcinomas.

Tumor size influenced IOP MMP-9. With a tumor size of ≥ 7.0 cm (it was this size that we chose as a reference point, since this value was the median) in IOP MMP-9 tumor cells was 1.6 times higher than with a size of < 7.0 cm. The differences in the data were significant (Table 1). In CII in tumors ≥ 7.0 cm, IOP MMP-9 increased 1.8 times. The differences are significant (Table 2). Thus, with an increase in the tumor nodule, IOP MMP-9 increased in the tumor and in CII.

The metastatic potential of the tumor also influenced the expression of MMP-9. With locally advanced cancer, IOP MMP-9 increased 2.1 times compared with localized carcinomas (Table 1). In CII, metastatic carcinomas IOP MMP-9 was 1.65 times higher than in tumors without metastasis. Data for tumor and CII are reliable (Table 2). Thus, with metastasis, IOP MMP-9 increased, both in tumor cells and in CII.

Table 1. IOP MMP-9 in tumor cells depending on the clinical and morphological parameters of RCC

Clinical - morphological parameter	IOP MMP-9 (rel. units)	Credibility (p)
Gender: men women	2540,8±136,6 2146,8±88,2	p = 0,02
Age: 30 – 39 years old (1) 40 – 49 years old (2) 50 – 59 years old (3) 60 – 69 years old (4) 70 – 79 years old (5)	1077,8±105,1 2382,6±134,4 2377,9±158,8 2770,3±178,5 1942,8±159,1	p4-1 = 0,01 p4-2 = 0,005 p4-5 = 0,003
Histological variant of the tumor: Papillary cancer (1) Clear cell cancer (2) Sarcomatoid cancer (3)	1916,8±252,2 2324,7±88,3 4317,8±928,7	p3-1 = 0,0007 p3-2 = 0,0009
Stage TNM: I stage II stage III stage IV stage	1929,4±81,7 2798,2±191,4 3152,9±265,4 4631,8± 507,3	p = 0,00003 - p = 0,006
The degree of nuclear atypia by Fuhrman: G ₁ G ₂ G ₃ G ₄	1529,4±45,9 1925,8±97,4 4148,7±227,1 4298,5±449,5	p = 0,000035 p = 0,0000001 -
Tumor node size: < 7,0 cm ≥ 7,0 cm	2074±86,8 3299,8±182,9	p = 0,0000001
Metastases: N0 N+	2049,4±74,8 4221,3±280,35	p = 0,0000001

Table 2. IOP MMP-9 in CII, depending on the clinical and morphological parameters of RCC

Clinical - morphological parameter	IOP MMP-9 (rel. units)	Credibility (p)
Gender: men women	2644,2±170,9 2035,5±63,2	p = 0,00003
Age: 30 – 39 years old (1) 40 – 49 years old (2) 50 – 59 years old (3) 60 – 69 years old (4) 70 – 79 years old (5)	1653,5±170,9 2292,±132,4 2715,9±237,8 2330,1±104,4 2047,1±129,4	- - - -
Histological variant of the tumor: Papillary cancer (1) Clear cell cancer (2) Sarcomatoid cancer (3)	3366,3±233,3 2205,2±80,2 3549,4±433,7	p3-2 = 0,0003
Stage TNM: I stage II stage III stage IV stage	1850,2±46,1 2088,5±136,2 2769,7±224,5 4364,9± 234,5	p = 0,05 - p = 0,00001
The degree of nuclear atypia by Fuhrman: G ₁ G ₂ G ₃ G ₄	1727,5±51,9 2182±86,6 2947,8±147,7 4045,4±502,9	p = 0,000004 p = 0,00006 p = 0,005
Tumor node size: < 7,0 cm ≥ 7,0 cm	1874,1±43,6 3401,7±183,5	p = 0,0000001
Metastases: N0 N+	2042±57,3 3376,4±228,75	p = 0,0000001

We compared 5-year postoperative survival versus MMP-9 IOP in tumor cells and CII. When analyzing survival according to the Kaplan-Meier method as a function of IOP MMP-9 in tumor cells, a graphical reflection of the analysis showed that when IOP MMP-9 in tumor cells was <2500 rel. units, then by 1800 days after surgery, the cumulative survival rate was 0.95 (95%), and when IOP MMP-9 in the tumor cells was > 2500 rel. units, then the cumulative proportion of survivors was 0.49 (49%). A comparative analysis using the log-rank test revealed that the differences between the survival graphs in the study groups were significant (log-rank; p = 0.0006).

In a study of survival versus IOP MMP-9 in CII, a graphical reflection of the result of the study showed that when IOP MMP-9 in CII was <2190 rel. units, then by 1800 days after surgery, the cumulative survival rate was 0.95 (95%),

and when IOP MMP-9 was > 2190 rel. units, then the cumulative survival rate was 0.49 (49%). A comparative analysis using the log-rank test revealed that the differences between the survival curves in the study groups were significant (log-rank; $p = 0.00008$). Thus, IOP MMP-9 in tumor cells and in CII were significant prognostic criteria for 5-year postoperative survival of patients.

CONCLUSION

Despite the significant advances in antiangiogenic therapy of kidney cancer, many issues of diagnosis, prognosis and prediction of the effectiveness of targeted therapy have not yet been resolved. The use of molecular targeted (targeted) drugs involves an awareness of the molecular mechanisms of tumor invasion and metastasis, as well as the ability to determine the pathological level of molecular markers involved in these processes. Therefore, the study and search for new molecular markers of RCC associated with angiogenic and invasive carcinoma activity is relevant. And one of these markers is MMP-9.

In scientific and practical work, it is very difficult to assess the activity of MMP-9 in a tumor, since this proteinase is expressed both by almost all cells of the stromal component and by tumor cells. Therefore, semi-quantitative methods for evaluating this marker, in our opinion, are of little use and therefore in this work we used the method of estimating the integrated optical density of MMP-9 using computer image analysis. Determination of IOP MMP-9 directly in the cytoplasm of cells gave us the opportunity to obtain objective data for each element of a malignant neoplasm.

The results of clinical and morphological comparisons showed that IOP MMP-9 in the cytoplasm of tumor cells was interconnected with a number of important clinical and morphological characteristics of neoplasias and postoperative survival of patients. The highest IOP MMP-9 values were identified: in the case of sarcomatoid cancer, in stage III – IV tumors, large neoplasms, in the degree of nuclear atypia G_{3-4} and in carcinomas with metastases.

MMP-9 is synthesized and secreted by a variety of cells, including activated macrophages, neutrophils, mast cells, endothelium, fibroblasts. This proteinase plays an important role both in the processes of normal physiological development of the matrix (repair, wound healing) and in various pathological conditions, including oncological transformation. In our study, the expression of MMP-9 in CII showed similar trends as in tumor cells and the increase in the expression of MMP-9 in CII was associated with a poor prognosis. On this basis, it can be concluded that CII with RCC is also involved in the processes of invasion, metastasis and progression of neoplasms, and possibly even more than tumor cells.

Thus, the study showed that the determination of IOP MMP-9 in tumor cells and CII can be a useful method in diagnosis and differential diagnosis, and the expression of MMP-9 can serve as an additional predictor of postoperative survival in patients with renal cell carcinoma.

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核仁装置和蛋白质核磷蛋白/ B23对局限性和转移性肾细胞癌的形态功能活性
**MORPHOFUNCTIONAL ACTIVITY OF NUCLEOLAR APPARATUS
AND PROTEIN NUCLEOPHOSMIN/B23 FOR LOCALIZED AND
METASTATIC RENAL CELL CARCINOMA**

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注解。在本文中，作者分析了局部和转移性肾细胞癌中肿瘤细胞核仁装置参数的特征和核磷蛋白/ B23蛋白的表达。检查103例癌症切除的肾脏，检出16例转移灶。根据Dascal Y.等人(1980)的方法使用银染，他们研究了核仁的参数：每个核心的平均核仁数；每个核心的纤维中心(FCs)的平均数量；每个核心的环形，过渡性，核仁核仁的平均数量，以及每个核仁的平均FC数。通过免疫组织化学检测核磷蛋白的表达。结果显示，与局部癌相比，转移性癌细胞中核仁装置的所有参数和核磷蛋白/ B23蛋白的表达均显着升高。原发性癌肿瘤细胞中核仁蛋白的核仁活性和蛋白表达的研究可用于评估术前阶段发生转移至区域淋巴结的风险，计划手术治疗量和预测肾癌病程。

关键词：核仁，nucleophosmin / B23，肾癌。

Annotation. *In this paper, the authors analyzed the characteristics of the parameters of the nucleolar apparatus and the expression of the protein of nucleophosmin / B23 in tumor cells in localized and metastatic renal cell carcinoma. 103 kidneys resected for cancer were examined, metastases were detected in 16 cases. Using silvering according to the method of Dascal Y. et al (1980), they studied the parameters of the nucleoli: the average number of nucleoli per core; the average number of fibrillar centers (FCs) per core; the average number of ring-shaped, transitional, nucleolonemal nucleoli per core, and the average number of FCs per nucleolus. Expression of nucleophosmin protein was detected by immunohistochemistry. It was shown that all the parameters of the nucleolar apparatus and the expression of the protein of nucleophosmin / B23 were significantly higher in the*

cells of metastatic cancer compared with the localized one. The study of nucleolar activity and protein expression of nucleophosmin in tumor cells in primary carcinoma can be used in assessing the risk of developing metastases to regional lymph nodes at the preoperative stage, planning the volume of surgical treatment and predicting the course of kidney cancer.

Keywords: nucleolus, nucleophosmin / B23, kidney cancer.

The nucleolus is the most dynamic structure of the cell and each morphological variant reflects the levels of three main processes associated with the biogenesis of ribosomes: the synthesis of preribosomal RNA, the processing and migration of ribonucleoprotein particles into the nucleoplasm [1]. The differentiated interphase cells are most characteristic nucleolus of the ring-shaped type, and for actively proliferating and synthesizing nucleolonemal nucleols. An intermediate position between ring-shaped and nucleolonem types is occupied by transition-type nucleols [2]. The ability to associate nucleolar organizers, along with amplification of ribosomal genes, leads to the formation of functionally active types of nucleoli from the less active, through their fusion [3]. One of the main signs of the level of morphofunctional activity of the nucleolus is the number of fibrillar centers (FC). So, for the annular nucleolus, one large FC is characteristic, for a nucleolonemal 5 or more FC, and for the transitional type, an intermediate number FC (from 2 to 4).

The nucleophosmin protein (B23) is a multifunctional protein and according to modern data it is the main argentophilic nucleolus protein. The morphofunctional activity of protein B23 is closely interrelated with the regulation of the cell cycle. This protein is weakly expressed by resting cells (in the G₀ phase), but its amount begins to increase immediately after stimulation of cells to divide and progressively increases up to the G₂ period [4].

The morphofunctional activity of the nucleolar apparatus of cells during metastasis has been studied in tumors of certain localizations [5,6,7,8]. Thus, data from Toshikazu Matsuo (1993) showed that in gastric cancer, the number of nucleolar organizers increased in tumors that had metastasis to regional lymph nodes. Overexpression of nucleophosmin was associated with the presence of metastases in colon cancer and squamous cell carcinoma of the oral cavity [9,10]. At the same time, with gastric cancer in the presence of metastases in the primary tumor, a decrease in the expression of nucleophosmin was observed [11].

Studies of the activity of the nucleolar apparatus of the cells of the primary tumor of kidney cancer during metastasis have not been found in the literature.

The purpose of this study was to study the morphofunctional activity of the nucleolar apparatus and the activity of the protein of nucleophosmin / B23 in tumor cells of localized and metastatic renal cell kidney cancer (RCC).

MATERIALS AND RESEARCH METHODS

103 kidneys resected for cancer in the Altai branch of the Russian Cancer Research Center named after N.N. Blokhin Roszdrav Russia. Regional and distant metastases were found in 16 cases. The average age of the patients was 59.1 ± 0.9 years. There were 49 men (47.6%) and 54 women (52.4%). Histochemical and immunohistochemical staining of nucleolar organizers was performed. Histochemical staining of the nucleoli was performed according to the method of Daskal Y., et al., 1980 [12], in our modification [13]. Core dyeing was performed with 1% methyl green solution. The following parameters of the nucleolar apparatus were calculated: the average number of nucleoli per core; the average number of FCs per core; the average number of ring-shaped (R-core), transitional (T-core), and nucleolonemous (N-core) morphofunctional types of nucleoli per core; and the average number of FCs per nucleoli.

An immunohistochemical study of nucleophosmin / B23 was performed using monoclonal antibodies - nucleophosmin n / B23, mouse mAb23 clone (Labvision). The integrated optical density of nucleophosmin in the nucleolus was evaluated using a computer image analysis system consisting of a Leica DME microscope, a Leica EC3 digital camera (Leica Microsystems AG, Germany), a personal computer, and Video Test Morphology software 5.2. The amount of protein B23 was expressed in arbitrary units (cu).

Statistical analysis was performed using Statistica 6.0 software. When comparing the average values used the criterion of significance of student. Differences were considered statistically significant at $p < 0.05$. Correlative relationships were evaluated using the Pearson criterion.

RESULTS AND DISCUSSION

When stained with silver nitrate, the nucleoli of the tumor cells had a brownish color, against which FC were clearly visible as rounded or oblong black granules.

The counting results showed that in the cells of localized cancer, the number of nucleoli was 1.5 ± 0.02 , and in tumors with metastases, the number of nucleoli significantly increased to 1.9 ± 0.05 per core ($p = 0.0000001$) (Table .).

When considering the distribution of morphofunctional types of nucleoli, it was shown that the number of R-core in cells of localized tumors was $26.5\% \pm 2.5$, and in metastatic it significantly decreased to $5.0\% \pm 1.4$ ($p = 0.0001$). The decrease in the number of R-core correlated with the presence of metastases ($r = -0.40$; $p = 0.0001$).

The number of T-core in localized tumors was $48.8\% \pm 2.6$, and in metastatic it was $22.9\% \pm 3.6$ ($p = 0.00002$). The number of T-core was associated with the presence of metastases ($r = -0.44$; $p = 0.0001$). The number of FCs in T-core localized tumors was 2.8 ± 0.02 , in metastatic tumors it significantly increased to 3.0 ± 0.05 ($p = 0.02$).

The content of N-core in localized tumors was $24.7\% \pm 3.4$, and in metastatic it increased to $72.1\% \pm 4.05$ ($p = 0.0000001$). An increase in the content of N-core in the nuclei of tumor cells correlated with the presence of metastases ($r = 0.57$; $p = 0.0001$). The FC content in N-core localized tumors was 7.0 ± 0.1 , and in metastatic tumors it increased to 12.3 ± 0.3 ($p = 0.001$).

In tumors without metastases, the average number of FC was 5.0 ± 0.1 , and in metastatic tumors it significantly increased to 17.5 ± 0.4 ($p = 0.001$) (see table). The number of silver granules per core was interrelated with the presence of metastases ($r = 0.68$; $p = 0.0001$).

Table. Activity parameters of the nucleolar apparatus of the RCC tumor cells, depending on the presence or absence of metastases

Parameters of nucleolar activity	The presence of metastases	
	M(0)	M(+)
The average number of nucleoli per core	$1,5 \pm 0,02^*$	$1,9 \pm 0,05^*$
The average number of R-core per core (%)	$26,5\% \pm 2,5^*$	$5,0\% \pm 1,4^*$
The average number of T-core per core (%)	$48,8\% \pm 2,6^*$	$22,9\% \pm 3,6^*$
The average number of N-core per core (%)	$24,7\% \pm 3,4^*$	$72,1\% \pm 4,05^*$
FC average per 1 T-core	$2,8 \pm 0,02^*$	$3,0 \pm 0,05^*$
FC average per 1 N-core	$7,0 \pm 0,1^*$	$12,3 \pm 0,3^*$
FC average per core	$5,0 \pm 0,1^*$	$12,3 \pm 0,3^*$

Note: $*p < 0,05$.

For a more detailed assessment of the morphofunctional activity of the cells according to the silvering of nucleolar organizers, we divided the tumor cells into groups depending on the number of FCs. A comparative comparison of the distribution of cellular elements of localized tumors with metastatic depending on the number of FC revealed a fundamentally different nature of their grouping. In localized tumors, most cells (72%) had from 1 to 5 FC and 28% of the cells contained from 6 to 30 FC. The histogram characterizing the distribution of cells was distinguished by a shift to the left, single-point and high peak. The carcino histogram with metastases had a different appearance. The majority of cells (99.3%) belonged to classes of cells containing from 6 to 51 more than FC. The histogram, was stretched to the right due to cellular elements with a high FC content per core. Other features of the histogram were the multi-finality and the absence of high peaks, which is a reflection of the wide variability of cellular elements of metastatic tumors in the number of FCs.

During immunohistochemical staining of the nucleoli for nucleophosmin / B23 protein, the tumor nucleoli with localized RCC were stained light brown or

dark brown. The integrated optical density of the protein per 1 nucleolus at the same time was 1339.45 ± 198.1 cu. In the cells of metastatic kidney cancer, the nucleoli looked dark brown or black, and the optical density of the protein increased significantly compared with localized kidney cancer to 2674.45 ± 45.6 cu. on 1 nucleolus. The expression of nucleophosmin / B23 was interconnected: with the presence of regional and distant metastases ($r = 0.36$; $p = 0.01$), with the number of FC in the nucleoli ($r = 0.79$; $p = 0.0001$) and the number of N-core in tumor cells ($r = 0.59$; $p = 0.002$). In the most active N-core with a large number of FC, the optical density of the protein of nucleophosmin / B23 reached 15779.1 cu..

CONCLUSION

Thus, the results of the study showed that the values of the studied nucleolar markers significantly increased in primary tumors with metastases compared with localized tumors. Recognizing this fact, we consider it possible to join the opinion of those authors [14,15] who consider that metastasis of malignant tumors in general and RCC in particular is carried out due to certain clones of tumor cells that have a greater potency for malignant growth. The more a tumor cell contains nucleolonemal nucleoli, FC per nucleus, and the higher the content of nucleophosmin / B23 in the nucleoli, the higher the malignancy of kidney cancer. The wide variability of tumor cell populations in the activity of the nucleolar apparatus is the result of the pathological evolution of tumor cells during RCC and constitutes a link in the pathogenesis of cell selection with a high metastatic potential. In metastases, such pools of tumor cells acquire even more pronounced malignant properties. Therefore, finding subpopulations of tumor cells with high rates of nucleolar activity and overexpression of nucleophosmin / B23 protein in the primary tumor may indicate a risk of metastasis and an unfavorable prognosis of the disease. The study of the morphofunctional activity of the nucleol and the expression of the nucleofosmin / B23 nucleolar protein in tumor cells can be used in assessing the risk of developing metastases at the preoperative stage, planning the extent of surgical treatment and predicting the course of renal cell cancer.

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评估息肉切除术后使用激素和非激素药物进行抗复发治疗的有效性
**EVALUATION OF THE EFFECTIVENESS OF ANTI-RELAPSE
THERAPY USING HORMONAL AND NON-HORMONAL DRUGS
AFTER POLYPECTOMY**

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注解。为了评估不同临床组的抗复发治疗的有效性，在去除子宫内膜息肉后检查了110名患者。在进行抗复发治疗的基础上，将患者分为3组。在第1组中，纳入32例(29.1%)患者，在息肉切除术后未接受抗复发治疗，2~36例(32.7%)患者在息肉切除术后接受“Duphaston”治疗；第3组--42例(38%，2%)术后接受复杂治疗的患者：“Indinol forto”与抗氧化剂联合使用。研究结果显示，1组根据临床资料显示该病复发，21.9%的患者进行超声扫描，2组16.7%，3组在随访12个月内未出现复发。吡咯-3-甲醇(indinol forto)与抗氧化剂组合使用在抗复发药物治疗中是有效和安全的，因为它们影响该疾病发展的主要致病机制。

关键词：子宫内膜息肉，多普勒测量，双重效应，indinol forto，抗氧化剂。

Annotation. *In order to assess the effectiveness of anti-relapse therapy in different clinical groups, 110 patients were examined after removal of endometrial polyps. Based on the conducted anti-relapse therapy, the patients were divided into 3 groups. In group 1, 32 (29.1%) patients were included who did not receive anti-relapse therapy after a polypectomy, group 2 — 36 (32.7%) patients who received «Duphaston» after a polypectomy; group 3 — 42 (38, 2%) patients who received complex therapy after the operation: «Indinol forto» in combination with antioxidants. The results of the study showed that 1 group showed a relapse of the disease according to clinical data and an ultrasound scan of 21.9% of patients, 2 groups of 16.7%, and 3 groups did not experience a relapse within 12 months of*

follow-up. The use of indole-3-carbinol (indinol forto) in combination with antioxidants are effective and safe in anti-relapse drug therapy, since they affect the main pathogenetic mechanisms of the development of this disease.

Key words: *endometrial polyp, dopplerometry, duphaston, indinol forto, antioxidants.*

Timely diagnosis and treatment of endometrial polyps is one of the urgent problems of modern gynecology. The high frequency of recurrences of endometrial polyps (5-35%), the possibility of their malignancy require the improvement of methods of diagnosis and treatment [1,4,6,8]. For many decades, the treatment and diagnostic curettage of the uterine mucous membrane under hysteroscopic control with subsequent hormone therapy has been considered a traditional method of treatment, and if it is ineffective, surgical treatment is performed in the amount of hysterectomy [3,4,6,7].

The question of the need and feasibility of hormone therapy after polypectomy still remains controversial. A number of researchers believe that after the removal of polyps no further treatment is required [3,4]. At the same time, other researchers point to the insufficient effectiveness of only removing the endometrial polyp, paying attention to the expediency of carrying out hormone therapy after removing the pathological focus in order to prevent recurrence of the process [6,7].

At present, the role of other, previously unknown factors in the development of endometrial polyps has been proved, namely: impaired apoptosis, proliferation, neoangiogenesis [5]. The literature describes drugs that have antiproliferative, antiangiogenic and proapoptotic effects, in particular, indole-3-carbinol («Indinol forto») [5,9,10]. In this regard, it seems appropriate to use it in the treatment of endometrial polyps.

PURPOSE OF RESEARCH: To evaluate the effectiveness of anti-relapse therapy in different clinical groups after the removal of endometrial polyps.

MATERIALS AND METHODS: After the removal of endometrial polyps, 110 patients received anti-relapse therapy. Based on the conducted anti-relapse therapy, the patients were divided into 3 groups. Group 1 included 32 (29.1%) patients who did not receive anti-relapse therapy after a polypectomy, Group 2 — 36 (32.7%) patients who received Duphaston 1 tablet (10mg) 2 times a day after a polypectomy. from the 16th to the 25th day of the menstrual cycle for 6 months, in group 3 - 42 (38.2%) patients who after the operation received complex therapy: “Indinol forto” in 2 capsules (600 mg) 2 times daily, daily dose of 1200 mg for 6 months in combination with antioxidants (ascorbic acid, 2 tablets (50 mg), 3 times a day, daily dose 300 mg, α -tocopherol in 1 capsule (100 mg) 3 times a day, daily dose 300 mg, α -lipoic acid in 1 capsule (100 mg) 3 times a day, daily dose 300 mg from the 16th to 25– day of the menstrual cycle for 6 months). The control group

consisted of 15 relatively healthy women of reproductive age with a regular ovulatory menstrual cycle, who did not have gynecological diseases in the anamnesis. The effectiveness of the treatment was evaluated by clinical manifestations and by the method of ultrasound, Dopplerometry with CDM. The following clinical symptoms were assessed: heavy and prolonged menstruation and perimenstrual bleeding. Ultrasonography with Doppler blood flow assessment was performed using an ultrasonic device Sonoline G40 (Siemens). Conducted color Doppler mapping with subsequent evaluation of the curves of the velocity of blood flow in the radial and basal arteries. The determination of the parameters characterizing the blood flow was assessed before the start of treatment on the 5–7th day of the menstrual cycle, then 3, 6, and 12 months after treatment. Statistical processing of the results was performed using commonly used methods of parametric and non-parametric statistics. Methods descriptive (descriptive) statistics included an estimate of the arithmetic mean (M), the average error of the mean (m) - for signs that have a continuous distribution; as well as the frequency of occurrence of characters with discrete values. To assess the intergroup differences in the values of characters with a continuous distribution, Student's t-test was used. The critical confidence level of the null statistical hypothesis (the absence of significant differences or factorial effects) was taken to be 0.05.

RESULTS AND DISCUSSION:

Data on the state of hemodynamics in the radial and basal arteries in women of the control group and in patients of group 1 before the operation and in the dynamics of the postoperative period are presented in table 1.

Table 1 - Comparison of resistance index (IR) in the radial and basal arteries of women in the control group and in patients of group 1 before the operation and in the dynamics of the postoperative period

Hemodynamic index in different vessels	Control group n=15	1 group			
		Before surgery n=32	In 3 months n=32	In 6 months n=32	In 12 months n=32
IR in the radial arteries	0,66±0,01	0,61±0,02 *	0,63±0,01 *	0,66±0,01	0,66±0,01
IR in the basal arteries	0,57±0,01	0,53±0,01 *	0,54±0,01 *	0,57±0,01	0,57±0,01

Note: p is given compared with the control group, where: p<0.05*

When analyzing the Doppler blood flow characteristics in the radial and basal arteries in patients of group 1 before the operation and in the dynamics of the post-

operative period compared to women in the control group, the following features were identified (table 1):

- in the preoperative period, there was a low resistance to blood flow, which was manifested by significantly lower values of the resistance index;
- 3 months after polypectomy, there was a tendency to increase the numerical values of IR in the radial and basal arteries, but their values were comparable to those in women of the control group only 6 months after the operation, and over the next 12 months, the observations remained stable.

In this group of women who did not receive anti-relapse therapy after polypectomy, over the next 12 months of follow-up, a relapse of the disease was observed according to clinical data and by ultrasound in 7 (21.9%) patients. In these patients, the values of IR in the radial and basal arteries did not change during the treatment.

Information about the state of hemodynamics in the radial and basal arteries in women of the control group and in patients of group 2 before the operation and in the dynamics of the postoperative period are presented in table 2.

Table 2— Comparison of resistance index (IR) in the radial and basal arteries of women in the control group and in patients of group 2 before the operation and in the dynamics of the postoperative period

Hemodynamic index in different vessels	Control group n=15	2 group			
		Before surgery n=36	In 3 months n=36	In 6 months n=36	In 12 months n=36
IR in the radial arteries	0,66±0,01	0,56±0,02 *	0,61±0,01 *	0,66±0,02	0,66±0,01
IR in the basal arteries	0,57±0,01	0,48±0,02 *	0,53±0,01 *	0,57±0,01	0,57±0,01

Note: p is given compared with the control group, where: $p < 0,05^*$

When analyzing the Doppler blood flow characteristics in the radial and basal arteries in patients of group 2 before the operation and in the dynamics of the postoperative period compared to women in the control group, the following features were identified (table 2):

- in the preoperative period, there was a low resistance to blood flow, which was manifested by significantly lower values of the resistance index;
- 3 months after polypectomy, there was a tendency to increase the numerical values of IR in the radial and basal arteries, but their values were comparable to those in women of the control group only 6 months after the operation, and over the next 12 months, the observations remained stable.

In this group of women, over the next 12 months of follow-up, the disease recurred according to clinical data (perimenstrual bleeding resumed after 9 months)

and by ultrasound in 6 (16.7%) patients. In these patients, the values of IR in the radial and basal arteries did not change during the treatment.

Thus, in patients in 2 groups who after polypectomy received «Duphaston» 1 tablet 2 times a day from the 16th to the 25th day of the menstrual cycle for 6 months, the effectiveness of anti-relapse therapy according to clinical data and blood flow was 83.3 %

Information on the state of hemodynamics in the radial and basal arteries in women of the control group and in patients of group 3 before the operation and in the dynamics of the postoperative period are presented in table 3.

Table 3— Comparison of resistance index (IR) in the radial and basal arteries of women in the control group and in patients of group 3 before the operation and in the dynamics of the postoperative period

Hemodynamic index in different vessels	Control group n=15	3 group			
		Before surgery n=42	In 3 months n=42	In 6 months n=42	In 12 months n=42
IR in the radial arteries	0,66±0,01	0,55±0,02 *	0,60±0,01 *	0,66±0,02	0,66±0,01
IR in the basal arteries	0,57±0,01	0,47±0,02 *	0,52±0,01 *	0,57±0,01	0,57±0,01

Note: p is given compared with the control group, where: p< 0,05**

When analyzing the Doppler blood flow characteristics in the radial and basal arteries in patients of group 3 before the operation and in the dynamics of the postoperative period compared to women in the control group, the following features were identified (table 3):

- in the preoperative period, there was a low resistance to blood flow, which was manifested by significantly lower values of the resistance index;
- 3 months after polypectomy, there was a tendency to increase the numerical values of IR in the radial and basal arteries, but their values were comparable to those in women of the control group only 6 months after the operation, and over the next 12 months, the observations remained stable.

In this group of women, over the next 12 months of follow-up, no recurrence of the disease was noted.

Thus, in patients in 3 groups, who after polypectomy received Indinol forto 2 capsules 2 times a day and antioxidants for 6 months, the effectiveness of anti-relapse therapy according to clinical data and blood flow was 100%.

The frequency of recurrences of the endometrial polyp in groups after anti-relapse therapy is presented in Figure 1.

From figure 1 it can be seen that the recurrence of the endometrial polyp in group 1 was 21.9%, group 2 - 16.7%, in group 3 - 0%.

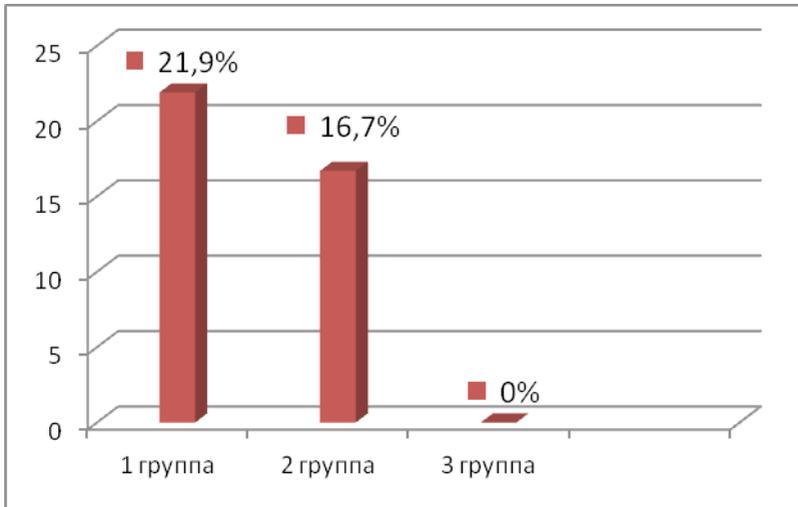


Figure 1— Frequency of recurrence of endometrial polyp in groups after anti-relapse therapy.

A positive effect when using the drug «Indinol forto» is explained by the fact that this drug has an antiangiogenic effect. «Indinol forto», created on the basis of the chemical compound indole-3-carbinol (I3C) contained in cruciferous vegetables, has a high selective antitumor activity, affecting the processes of neoangiogenesis and apoptosis [5,9].

Currently, the participation of estrogens in the development of hyper- and neoplastic processes in the tissues of the female reproductive system (breast epithelium, endometrium, myometrium and cervix) is generally recognized and is considered as one of the leading etiological factors of their occurrence. As indicated in the publications, the key inducer that stimulates the pathological proliferation of cells in hyper and neoplastic diseases of the reproductive organs is the female sex hormone estrogen [2].

The positive effect of indole-3-carbinol («Indinol forto») is due to a wide range of its effects. First, its ability to correct estrogen metabolism: the ratio of estradiol metabolites to 2-hydroxyestrone and 16 α -hydroxyestrone (2 α -ONE1 / 16 α -ONE1) is shifted towards an increase in 2 α -OHE1, which has antiproliferative (antiestrogenic) activity. Its excess, at least two times over the content of 16HE-ONE1, which has a pronounced cell growth-promoting property and is an estrogen agonist, is currently considered as a factor preventing pathological proliferation in hormone-sensitive tissues, including endometrium [10]. Secondly, indole-3-carbinol («Indinol forto»), penetrating into the cell, blocks many signaling pathways stimulated by growth factors (epidermal growth

factor, fibroblast growth factor, insulin-like growth factor of type 1), preventing the phosphorylation of tyrosine kinase residues, what prevents the cascade transmission of proliferative signals from the surface to the cell nucleus, thereby neutralizing the effect of growth factors causing the development of the tumor process [9].

The results of the research showed that after the removal of endometrial polyps a recurrence of the disease was not detected in group 3, patients who received a complex therapy consisting of «Indinol forto» in combination with antioxidants. In our observations, the effectiveness of anti-relapse therapy is associated with an impact on the pathogenetic mechanisms of the development of this disease, which leads to its positive effect.

Thus, the use of indole-3-carbinol («Indinol forto») in combination with antioxidants are effective and safe methods of anti-relapse therapy, since they affect the main pathogenetic mechanisms of the development of this disease.

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生物化学活性点的比较测温

**COMPARATIVE CHARACTERISTICS OF THE EFFECTIVENESS
OF THE USE OF DRUGS OF DIFFERENT PHARMACOLOGICAL
GROUPS IN THE EARLY RECOVERY PERIOD OF ISCHEMIC
STROKE USING THE METHOD OF DIFFERENTIAL
THERMOMETRY OF BIOLOGICALLY ACTIVE POINTS**

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注释。 本文介绍了早期康复期患者的治疗结果。 使用热聚合和生物化学方法。 事实证明,使用nootropic药物时可以观察到。 结果表明,它可用于纠正脑梗塞的治疗。

关键词: 脑梗塞, 治疗矫正, 差示测温

Annotation. *The paper presents the results of treatment of patients in the early recovery period of ischemic stroke. Using the method of differential thermometry of biologically active points (BAP), a comparative characteristic of the effectiveness of the use of aktovegin and cerebrolysin was carried out. It is proved that the best results of recovery are observed when using the nootropic drug Cerebrolysin, which is confirmed by neurological scales, as well as scales determining the psycho-emotional state of patients, and the level and quality of their life. It is shown that the method of differential thermometry BAP can be used to correct the treatment of cerebral infarction.*

Keywords: *cerebral infarction, treatment correction, differential thermometry*

The basic strategy for the development of medical science in the Russian Federation for the period up to 2025 is personalized medicine, supplemented by predictive, preventive and partner components [1]. One of the main areas requiring further development and improvement, presented at the IV International Congress “Regenerative Medicine and Rehabilitation 2009”, is rehabilitation treatment and medical rehabilitation of patients after acute ischemic cerebrovascular accident. Interest in this disease is not accidental: according to the National Association for

the Control of Stroke, 31% of patients who have had a stroke become disabled in the first group, of which 20% cannot walk on their own. Thus, a stroke puts a heavy social and economic burden on society as a whole [2; 3; four]. Since the end of the last century, a clear tendency has been revealed towards the “rejuvenation” of a contingent of patients with vascular diseases of the brain [5]. At the same time, the incidence and prevalence of stroke increase with age: age is one of the non-modifiable risk factors regardless of the type of stroke [6]. In the coming decades, a surge in the incidence of stroke worldwide is expected due to a significant increase in the proportion of the population over the age of 60, and the increase in disability and death from stroke becomes the demographic problem of modern times. In this regard, modern treatment of ischemic stroke includes both the development of new strategic directions for the treatment of acute cerebral circulatory disorders, and the personification of treatment of cerebral infarction with the possibility of its correction based on taking into account all patient characteristics and risk factors for the disease. The development of this direction was promoted by the use of an original device for measuring the temperature difference between the biologically active point (BAP) and the intact skin zone - a differential thermometer.

Purpose of the research: to evaluate the effectiveness of the use of the method of differential thermometry BAP as a basis for the comparative characteristics of the use of drugs of different pharmacological groups and the correction of treatment of patients in the early recovery period of cerebral infarction.

Materials and methods: A device for measuring the temperature difference between the biologically active point and the intact skin area consists of a signal conditioning unit connected to a recording and analysis unit, made on the basis of an analog-digital converter, a single-chip micro-computer and an indicator, characterized in that a memory unit is inserted into it and a serial interface for communication with a personal computer. A patent was received for utility model No. 134028 “A device for recording biopotentials and the temperature of biologically active points”. To quantify the changes in thermograms, a computer program was developed that received a certificate of state registration of computer programs No. 2011611929 and allows calculating 14 digital indicators reflecting the regulatory characteristics of BAP thermograms. It included the following indicators:

- 1 - the total number of positive and negative changes;
- 2 - the number of positive and negative changes in 1 minute;
- 3 - the number of positive changes in 1 minute (frequency);
- 4 - the number of negative changes in 1 minute (frequency);
- 5 - the ratio of positive and negative changes in 1 minute in frequency (difference of indicators);
- 6 - the duration of the positive changes in 1 minute;
- 7 - duration of negative changes in 1 minute;

- 8 - the ratio of positive and negative changes in 1 minute by duration (difference of indicators);
- 9 - frequency regulation index (the ratio of positive and negative changes in ΔT BAP - 3: 4);
- 10 - regulation index by duration (partial positive and negative changes ΔT BAP - 6: 7).
- 11 - the average value of positive transitions in amplitude for 2 min.
- 12 - the average magnitude of negative transitions in amplitude for 2 min.
- 13 - the frequency of horizontal segments for 1 min.
- 14 - the duration of horizontal segments for 1 min.

To assess the effects of drugs in real time studies were conducted using the method of differential thermometry BAP. In patients of all groups on 1 (before the start of treatment), on the 7th and 14th day of hospital stay, changes in the temperature difference ΔT BAP at point C7 were recorded [7]. Registration of ΔT BAP was carried out every second for 2 minutes and immediately reflected on the computer screen in the form of graphs. Then, using the computer program, 14 thermogram indicators were calculated.

The study involved 51 patients. Informed consent was obtained from all subjects. All obtained data were registered in a special individual registration card, executed in accordance with the recommendations of Leonova M.V. and Asetskaya I.L. [8]. The criteria for the inclusion of patients in the study were: the presence of confirmed ischemic stroke, the absence of the hemorrhagic syndrome of any location and etiology, injuries, operations in the last 3 months before the stroke. Exclusion criteria were: pregnancy, severe pathology of the liver and kidneys, mental illness, arterial hypertension resistant to treatment with blood pressure higher than 180/110 mm. Hg Art., as well as the reluctance of patients to participate in the study.

Mathematical data processing was carried out in accordance with the recommendations of Sidorenko E.V. [9]; the paired test and the non-parametric criterion — the T Wilcoxon test [10; eleven]. Statistical analysis of research results was carried out using the program Statistica 6.1.

Research results:

During the entire observation period, patients received standard pharmacotherapy, used for treatment in the early recovery period of ischemic stroke, but during the course of treatment she was subjected to drug correction depending on the dynamics of ΔT changes recorded in BAP on days 1 and 7 research. On the 7th day of observation, the patients were divided into 2 subgroups. Each of these subgroups was treated with a specific treatment (Actovegin or Cerebrosin), which the patient received over the next week until the end of the course of

rehabilitation treatment. According to the data (tab. 2) at point C7 on day 7 of the study, the results indicate an increase in the severity of fluctuations with the + (p5) sign and an increase in the stability of fluctuations with the - (p8) sign in the functioning of the heart meridian, which indicates moderate stimulation of regulatory processes.

Table 2 –Dynamics of changes in $\Delta T BAP$ C7 (r.i., $M \pm m$) in patients with ischemic stroke in the early recovery period with treatment correction (n = 51)

Indicators	1 day n=51	7 day n=51	14 day Actovegin n=26	14 day Cerebrolysin n=25
1	36,2±1,41	39,1±1,48*	36,5±1,50	36,5±1,42
2	18,0±0,75	19,6±0,79*	18,4±0,69	18,4±0,70
3	9,38±0,42	10,5±0,51*	9,66±0,44	9,68±0,45
4	8,62±0,38	9,57±0,47*	8,52±0,51	8,71±0,39
5	0,76±0,04	0,93±0,04*	1,14±0,06*	0,97±0,04*
6	10,8±0,59	11,9±0,61	10,9±0,56	12,7±0,55
7	11,6±0,62	12,9±0,65*	11,9±0,58	11,7±0,60
8	0,80±0,03	1,00±0,04*	1,06±0,02*	1,05±0,05*
9	1,08±0,04	1,09±0,04	1,13±0,06	1,09±0,04
10	0,93±0,05	0,92±0,04	1,06±0,06*	0,94±0,06
11	1,25±0,06	1,35±0,02*	1,24±0,03	1,26±0,03
12	-1,26±0,05	-1,35±0,03*	-1,27±0,03	-1,29±0,03
13	12,2±0,42	13,3±0,45*	12,2±0,38	12,3±0,39
14	37,1±1,43	35,6±1,34	38,2±1,30	37,8±1,35

* p < 0,05 1-14 – see decoding above

In addition, according to the patent for invention RU 2467680 C1 “A method for predicting the effectiveness of treatment of patients with ischemic stroke” dated November 27, 2012. Since indicators 3 and 6 increased by the middle of the course of rehabilitation treatment by less than 20% of the data at the time of initiation of therapy, we can assume a slight improvement in the condition of patients by the 14th day. Therefore, the patients were treated with treatment with one of two drugs: Actovegin, or Cerebrolysin. On day 14 of observations, the $\Delta T BAP$ values significantly changed in terms of indicators 5 and 8 in the two subgroups, but the degree of change was different. Thus, in patients treated with Actovegin, the indicator (5) increased by 50% (p < 0.05); indicator (8) increased by 32.5% (p < 0.05), which indicates an increase in the severity of fluctuations with the + sign in the functioning of the heart meridian and an increase in the stability of fluctuations with the - sign, indicating moderate stimulation of regulatory processes.

In the subgroup of patients who were treated with Cerebrolysin for the 7th day, the indicator (5) significantly increased by 28% ($p < 0.05$) and the indicator (8) significantly increased by 31% ($p < 0.05$), which indicates about increasing the severity of fluctuations with the + sign in the functioning of the heart meridian and increasing the stability of this process, and corresponds to a significant stimulation of regulatory processes.

Comparative characteristics of ΔT BAP (%) in patients with ischemic stroke in the early recovery period at point C7 with the introduction of various allopathic drugs indicates moderate stimulation of regulatory processes on the 7th day of the study; on the 14th day of observation in the subgroup of patients taking actovegin, it is also possible to note moderate stimulation of the regulatory processes, and in patients treated with Cerebrolysin, these processes are more pronounced.

To confirm the results of the study, obtained using the method of differential thermometry BAP, the patients were assessed for the dynamics of the neurological status using the neurological scales (NiHSS and Original [12,13]), the dynamics of the psycho-emotional state using the SAN technique [14], dynamics of the level of quality of life - using the Bartel scale [15] and the dynamics of the functional state of the vascular system - using the method of R. Voll [16].

As can be seen from table 3, significant changes in the dynamics of the neurological status are observed on the 14th day of the study in patients who received Actovegin from the 7th day of the study, on the NiHSS scale (rates decreased by 40%; $p < 0.05$) and on the scale Original (figures increased by 11.8%; $p < 0.05$). When assessing the psycho-emotional state in the same subgroup of patients, there are significant changes in activity indicators (increased by 12.8%; $p < 0.05$), well-being (increased by 21.9%; $p < 0.05$) and mood (increased by 15.2%; $p < 0.05$). Indicators of the level of quality of life also significantly increased by 18.4% compared with the start of treatment ($p < 0.05$); indicators by the method of R. Voll significantly increased by 47.6%.

Table 3 - Dynamics of neurological deficit, psycho - emotional status and level of quality of life (points, $M \pm m$) in patients with ischemic stroke in the early recovery period with correction of treatment (n = 51)

Scales	1st day n=51	14th day Actoveginn=26	14th day Cerebrolysin n=25
NiHSS	14,0±2,42	8,44±1,68*	7,98±1,19*
Original	34,0±1,62	38,0±1,28 *	38,2±1,38*
Wellbeing	2,92±0,21	3,56±0,22*	3,59±0,24*
Activity	3,12±0,18	3,52±0,24*	3,59±0,27*
Mood	3,22±0,25	3,71±0,20*	4,04±0,25*
BARTEL	75,1±3,77	88,9±4,47*	89,4±4,52*
Indicators by the method of R. Voll	43,3±4,93	63,9±3,89**	62,9±3,68**

* p< 0,05 ** p< 0,001

In the subgroup of patients treated with Cerebrolysin from the 7th day of treatment, significant changes in the dynamics of the neurological status are observed on the NiHSS scale (indicators decreased by 43%; $p < 0.05$) and on the Original scale (indicators increased by 12.3%; $p < 0.05$). When assessing the psycho-emotional state, these patients showed significant changes in activity indicators (increased by 15.2%; $p < 0.05$), well-being (increased by 23%; $p < 0.05$) and mood (increased by 25.5 %; $p < 0.05$). Indicators of the level of quality of life also significantly increased by 19% compared with the start of treatment ($p < 0.05$); indicators by the method of R. Voll significantly increased by 45.3%.

Thus, in patients with correction of restorative treatment, parallelism between ΔT BAP indices and data of neurological status, psycho-emotional state and level of quality of life can be noted. The best recovery of neurological deficit, mental state and social adaptation of patients is observed when cerebrolysin is used from the 7th day, which is accompanied by significant stimulation of the regulatory processes at the C7 channel of the heart and is confirmed by maximum positive dynamics according to two neurological scales, the SAN and Bartel scale. Changes in indicators by R.Voll's method on day 14 of observations significantly exceed the percentage of the results of other research methods and, therefore, cannot objectively reflect the depth and intensity of recovery processes in the patient's body.

Conclusion:

1. As a result of the study, it was established that the best results of treatment are observed with an increase in the severity of fluctuations with the + sign, their stability and intensity, and a decrease in the severity of the fluctuations with the sign - , their stability and intensity.

2. A parallelism was established between the changes in ΔT BAP and the dynamics of the restoration of the neurological deficit, psycho-emotional state and the level of quality of life in patients in the early recovery periods of ischemic stroke. It is noted that the dynamics of changes in the functional state of the cardiovascular system, determined using the method of R. Voll, does not always correspond to the dynamics of data from other research methods and, therefore, cannot fully reflect the processes of regulation and recovery that occur in the body.

3. The method of differential thermometry BAP allows you to compare the effectiveness of the use of drugs from different pharmacological groups in the early recovery period of ischemic stroke and can be recommended for the correction of treatment of patients.

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青春期慢性牙龈炎的药理学矫正
**PHARMACOLOGICAL CORRECTION OF IMMUNE DISORDERS IN
CHRONIC GINGIVITIS AT PUBERTY**

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注释。已经表明,已经表明已经表明,已经表明它已经在美国被发现。治疗前TNF α , IL-1 α , IL-2, IL-6, IL-8, IL-18, IF α , IL-4水平 慢性卡他性牙龈炎 IL-10, IL-1Ra, C₃, C₃ α , C₄, C₅, C_{5a}-补体成分, 因子H, C₁-抑制剂和sIgA。已经证明它也是比较治疗的最有效方法。

关键词:慢性卡他性牙龈炎,青少年,免疫力,药理学矫正。

Annotation. *The aim of the work is to evaluate the effectiveness of topical use of drugs with antiseptic properties in chronic catarrhal gingivitis in adolescents. Before treatment and after each treatment regimen, the level of TNF α , IL-1 α , IL-2, IL-6, IL-8, IL-18, IF α , IL-4 was determined in the washout from the gingival pocket of adolescents with chronic catarrhal gingivitis IL-10, IL-1Ra, C₃, C₃ α , C₄, C₅, C_{5a}-components of the complement, factor H, C₁-inhibitor and sIgA. Based on the dynamics of the level of cytokines and components of the complement system in adolescents with chronic catarrhal gingivitis, it can be concluded that the use of basic therapy and solution of parodontocid has been more effective compared to basic treatment.*

Keywords: *chronic catarrhal gingivitis, adolescents, immunity, pharmacological correction.*

Introduction

The results of epidemiological studies conducted in different countries of the

world indicate a high incidence of periodontal tissues and their early occurrence. According to the WHO summary report, chronic gingivitis in Europe was found in almost 80% of children aged 10-12 years and almost 100% at the age of 14-15 years [1, 3, 4].

Most often, children are diagnosed with chronic catarrhal gingivitis (80-85%) and chronic hypertrophic gingivitis (10-15%). Various forms of chronic gingivitis are widespread among adolescents, making up from 70 to 75% of the dental pathology of this age. At this age, gingivitis is caused by the acquisition of pathogenic properties by the resident microflora as a result of a decrease in local immunity. This feature is associated with morphological, vegetative, functional and mental instability of the body of the adolescents causing its certain vulnerability [2, 3]. Особую актуальность приобретает разработка клинически и иммунологически обоснованных методов лечения больных с воспалительными заболеваниями пародонта [2, 4].

The aim of the work is to evaluate the effectiveness of topical use of drugs with antiseptic properties in chronic catarrhal gingivitis in adolescents.

Materials and methods.

The study included 46 adolescents aged from 14 to 18 years (mean age 15.6 ± 1.3 years) who underwent a comprehensive clinical and X-ray examination of the condition of periodontal tissues and were diagnosed with chronic generalized catarrhal gingivitis. The control group consisted of 20 clinically healthy patients.

The criteria for inclusion in the study were: age from 14 to 17 years, the absence or presence of concomitant pathology in remission, the absence of oncopathology, the tolerability of pharmacological drugs used in the study, written consent to participate in the research.

All patients according to the treatment were divided into 2 groups:

Group 1 (20 patients) received basic treatment that included professional oral hygiene, anti-inflammatory, antibacterial therapy (metrogyl gel), physical therapy;

Group 2 (26 people) - additionally, as part of the basic treatment, she received the solution of parodontocid (rinsing daily 2-3 times a day with an exposure of 10-15 minutes).

Wash out of the gum pocket was obtained using a dental excavator by immersing the tool in the gum pocket. Previously prepared by rinsing the mouth with saline for 1.5-2 minutes.

Before starting treatment and after each treatment regimen, the levels of TNF α , IL-1 α , IL-2, IL-6, IL-8, IL-18, IF α , IL-4, IL-10, IL-Ra were determined in the washout from the gingival pocket. IL-1 Ra, C₃, C_{3a}, C₄, C₅, C_{5a} -components of the complement, factor H, C₁-inhibitor and sIgA with the help of the set of reagents of «Vector-Best» and «Citokin» by the method of enzyme-linked immunosorbent

assay.

Statistical processing of research results was performed using non-parametric methods: the Wilcoxon-Mann and Whitney criteria. Differences with $p < 0.05$ were considered statistically significant.

The results and discussion.

In the oral fluid, there was an increased concentration of $\text{TNF}\alpha$, IL-6, a receptor antagonist for IL-1, but a reduced level of IL-10, with normal levels of IL-1 α , IL-2, IL-8, IL-18, IL-4. Baseline treatment normalized the concentration of IL-6 and corrected, but not to the norm, the level of $\text{TNF}\alpha$.

Attention was drawn to the fact that at the local level, the maximum activation of the complement system was observed both in the classical and the alternative ways, while the concentration of the studied regulators of the complement system (C_1 -inhibitor and factor H) increased in the oral fluid. Compared with healthy donors, sIgA levels decreased. The basic treatment corrected only individual indicators of the complement system (concentration of C_3 , C_4 , C_{5a} -components of the complement) and the level of sIgA.

The use of combinations of metrogyl gel and solution of parodontocid, in contrast to the basic treatment at the local level, normalized the concentration of $\text{TNF}\alpha$ and increased the IL-10 level above control values. The normalizing effect on the level of IL-6 did not differ from the basic treatment, while the content of IL-1Ra remained high.

From the indicators of the complement system, the inclusion of a combination of gel metrogil denta and solution of parodontocid additionally normalized the concentration in the washout from the gingival pocket of the C_3 , C_4 , C_{5a} components of the complement system and corrected the level of the C_5 -complement component. The content of sIgA in the washout from the gingival pocket of a combination of metrogyl gel and solution of parodontocid was corrected.

Taking into account the etiopathogenetic features of the disease, it can be argued that in patients with chronic generalized catarrhal gingivitis, there are immune disorders at the local level, which primarily concern innate immunity factors and are not effectively corrected by basic treatment according to existing protocols. The use of an additional periodontal solution allowed more effectively to correct the disturbed indicators of the cytokine and complement system at the local level in this category of patients.

When assessing the condition of periodontal tissues, preference was given to indices that allow evaluating the effectiveness of therapeutic measures taken in dynamics at the time of the beginning and end of the study. For this purpose, the hygiene index for PMA, the need index for the treatment of periodontal diseases (CPITN), the Mulleman's SBI bleeding index, the simplified Green-Vermillion oral hygiene index were used.

After the basic treatment with combinations of metrogel dentum and solution of parodontocid in adolescents with chronic generalized catarrhal gingivitis, mild and moderately severe inflammation was observed in the gum area.

After the basic treatment and the use of a combination of metrogel gel and solution of parodontocid, some positive dynamics were observed, since compared to the results before treatment there was not a single patient whose CPITN index was 4.

Before treatment, in patients with chronic generalized catarrhal gingivitis, the SBI index values corresponding to predominantly severe gingivitis were observed. On the background of the basic treatment and the use of a combination of metrogyl gel and solution of parodontocid, the number of patients with mild to moderate severity and severe inflammation became approximately the same.

After the basic treatment and the use of combination of metrogyl and solution of parodontocid only good and satisfactory oral hygiene was observed when evaluating the oral hygiene index according to Green-Vermillion.

These results support the concept that the major trigger of the inflammatory response in chronic gingivitis is microbial infection and dysmetabolic damage epithelial cells by factors formed due to secondary alteration, inflammatory mediators, activation of free radical oxidation, oxidative modification, enzymatic aggression lysosomal proteases inclusion immune mechanisms [2, 5, 6].

Based on the clinical symptoms and dynamics of periodontal indices, it can be

concluded that the combination of drugs with antiseptic effects studied was more effective than the basic treatment and can be recommended for use in the treatment of chronic catarrhal gingivitis at puberty.

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肿瘤病理学患者和生物体的各种类型的非特异性适应反应的parodont炎症疾病的特点

**FEATURES OF A COURSE OF INFLAMMATORY DISEASES
OF THE PARODONT AT PATIENTS WITH ONCOLOGICAL
PATHOLOGY AND VARIOUS TYPES OF NONSPECIFIC
ADAPTATION REACTIONS OF AN ORGANISM**

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注解。本文介绍了63例急性和慢性牙龈炎和牙周炎患者的非特异性适应反应和身体反应性水平研究结果的数据,这些患者在历史,背景病理学和躯体健康患者的肿瘤疾病背景下。肿瘤病理学患者的炎性牙周病理学在绝大多数病例中发展,其背景是应激和再激活的反应以及低和非常低水平的反应性。对于有良好类型的非特异性身体适应性反应的患者,牙周炎症疾病的标准治疗最有效:训练反应,在中等和高水平反应性的背景下平静和增加激活,同时在应激和再激活的背景下。在放射和化疗过程中患有肿瘤疾病的患者以及具有某些类型的躯体病理学的患者中发现具有低水平反应性的组合。治疗炎性牙周病以获得稳定结果的有效性显着更高。

研究表明,需要扩大背景癌症患者炎症性牙周病的医疗康复措施的复杂性,纳入对非特异性适应反应有积极影响的资金以及生物体的反应性水平。

关键词:炎性牙周病,肿瘤病理学,生物体的非特异性适应反应,生物体的反应性水平。

Annotation. *The article presents data on the results of the study of non-specific adaptation reactions and levels of body reactivity in 63 patients with acute and chronic gingivitis and periodontitis on the background of oncological diseases in history, background pathology and in somatically healthy patients. The inflamma-*

tory periodontal pathology in patients with oncological pathology develops in the overwhelming majority of cases against the background of the reaction of stress and reactivation in combination with low and very low levels of reactivity. The standard treatment for periodontal inflammatory disease is most effective in patients with favorable types of nonspecific adaptive reactions of the body: training reactions, calm and increased activation against the background of medium and high levels of reactivity, while against the background of stress and reactivation in combination with low levels of reactivity revealed in patients with oncological diseases after courses of radiation and chemotherapy, as well as in patients with certain types of somatic pathology. The effectiveness of the treatment of inflammatory periodontal disease to achieve a stable result is significantly higher.

The findings suggest the need to expand the complex of medical - rehabilitation measures for inflammatory periodontal diseases in patients with background cancer; the inclusion of funds that have a positive effect on nonspecific adaptation reactions and the level of reactivity of the organism.

Keywords: *inflammatory periodontal diseases, oncological pathology, nonspecific adaptation reactions of the organism, the level of reactivity of the organism.*

In the structure of morbidity in Russia, oncological pathology is in second place after cardiovascular diseases, although in general, over the past ten years, there has been a decrease in mortality from malignant neoplasms by 0.7–1.2% [9]. Modern treatment of patients with malignant tumors is software and is carried out in accordance with the protocols developed on the basis of knowledge of the features of the biological behavior of tumors, pharmacodynamics and pharmacokinetics of various drugs, the principles of combination of various methods, their sequence and consequences. The main methods of treatment of malignant tumors are surgical treatment, radiation and chemotherapy. However, the combined anticancer treatment does not have a targeted effect and causes negative reactions and damage, both local and systemic. Radiation therapy can lead to impaired function of the salivary glands, the development of radioepitheliitis of the oral mucosa [5,6,10,13]. Foci of osteoradionecrosis may appear in the bone tissue [5,14]. The described complications can occur in different terms [3]. Common reactions to chemotherapy include nausea, vomiting, diarrhea, anemia, thrombocytopenia, neuropathy, suppression of the immune system, myelodepression [8,12]. Early local reactions include mucositis, enamel demineralization, and osteoporosis [9]. Late local complications can manifest as xerostomia, dysgeusia, hyperesthesia, ulceration of the oral mucosa, gingival bleeding, dilution and weakening of bone structures, hypersensitivity to various infections [7]. The frequency of pathology of the oral mucosa and periodontal in cancer patients is very high and reaches 90% [4].

In the works devoted to radiation and chemotherapy of neoplasms of different localization, as a rule, attention is paid to the response of the tumor to treatment and there is practically no assessment of the patient's general condition, as well as the condition of the oral mucosa and periodontal disease. However, the level of health of the body, as well as the nature of the course of the pathological process are determined by the development of one or another nonspecific adaptive response.

The nonspecific adaptive reactions of the body (NARB) of five types are described: stress, reactivation, calm and increased activation, and the reaction of training. [Garkavi L.Kh., Ukolova MA, Kvakina E. B., 1968, 1969, 1975, 1998, 2006].

In the literature, there is no information about the types of adaptation reactions and levels of reactivity in patients with inflammatory periodontal pathology, which developed on the background of combined antitumor treatment.

Purpose of research. To determine the peculiarities of the inflammatory process in the periodontium in patients with oncological pathology on the background of combined antitumor treatment, taking into account the types of nonspecific adaptive reactions and levels of body reactivity.

Materials and research methods. To achieve this goal on the basis of Stomatology Department of Faculty of Professional Development and Re training of Kuban State Medical University of the Ministry of Healthcare of the Russian Federation, and in the conditions of the State budgetary institution of public health of the Dental Clinic No. 1 in Krasnodar, clinical and laboratory studies were undertaken in a group of 63 patients aged 35–52 years in the dynamics of the treatment of inflammatory periodontal diseases.

The patients were divided into 3 groups: the main group - 21 patients with inflammatory periodontal diseases and oncological pathology in the anamnesis; comparison group 1 - 23 patients with inflammatory periodontal diseases with background pathology; comparison group 2 - 19 patients with inflammatory periodontal pathology and no history of somatic diseases.

Evaluation of the condition of the oral cavity and periodontal tissues was carried out before and after treatment, taking into account the data of a comprehensive dental examination and calculation of indices Koetzshke, PI, API.

For determination of NARB types and reactivity levels, the method used by L.Kh.Garkavi, E.B. Kvakina, M.A. Ukolova (1968) with the calculation of the percentage of lymphocytes and other formed elements of white blood [11].

All patients underwent the procedure of oral cavity sanitation, professional hygiene, elimination of local factors irritating periodontal tissues, were taught the skills of individual hygiene. Therapeutic measures were carried out within 14 days according to the approved scheme "Model of medical services of the Krasnodar Territory. Dentistry [2].

Research results. The main group included (21 patients) 11 women and 10 men who applied for specialized dental care after radiotherapy and chemotherapy for cancer tumors. 10 patients were diagnosed with acute localized catarrhal gingivitis (2 people), and chronic generalized catarrhal gingivitis (8 people). From the anamnesis, it was established that all of the patients underwent the last course of radiation and chemotherapy 3–5 months ago. 11 patients had more severe inflammatory periodontal pathology: exacerbation of chronic generalized periodontitis with abscess treatment (4 people), exacerbation of chronic localized periodontitis (7 people).

When collecting anamnesis, it was established that 6 patients received a combined course treatment using radiotherapy and chemotherapy 8 to 12 months before treatment, and 5 patients 3 to 4 months before contacting a dental clinic. The overwhelming majority of patients complained of a general nature: weakness, disturbed sleep and appetite, low performance, and psycho - emotional stress.

Before treatment in the main group, the index value was Koetzshke was 4.8; PI index - 22.7. The rather high level of API index attracts attention - 40.5.

When determining the type of nonspecific adaptive reactions of the body in this group, the number of stress reactions in patients was significantly higher - 11 than in the other groups. Also, 11 stress reactions, 5 training reactions, 5 reactivation reactions were revealed. Reactivity levels varied depending on the type of adaptation reactions. Thus, out of 11 patients with stress reactions, 8 showed a low level of reactivity, and 3 had a very low level. Against the background of the training reaction, a high level was found in 3 patients and an average level of reactivity in 2 patients.

The initial low level of reactivity was determined in 5 patients with reactivation reaction. Reactions of stress, reactivation, combined with low levels of reactivity, developed in patients against the background of the courses of radiation and chemotherapy. The type and duration of the reactions, the level of reactivity also depended on the duration of the treatment of cancer pathology and on the time elapsed after the end of therapy before the initial visit to the dentist.

7 days after the start of therapy, 5 patients with a workout reaction against the background of an average level of reactivity showed a significant reduction in clinical symptoms: disappearance of bleeding gums and pain, improvement of the marginal gum condition (Koetzshke index - 2.1; PI index - 2.9; index API - 4.3). In 16 patients with adverse non-specific adaptation reactions of the body after 7 days, positive dynamics was observed during the inflammatory process, improved oral hygiene (Koetzshke - 2.8; PI index - 3.1; API index - 3.6).

After 2 weeks, there was a significant improvement in the marginal gum, a decrease and no bleeding of the gums. Oral hygiene has significantly improved and plaque has decreased in 10 patients with acute and chronic gingivitis. A simi-

lar clinical picture was observed in patients with periodontitis: in 7 patients with chronic periodontitis, the mobility of certain groups of teeth decreased; in patients with exacerbation of chronic periodontitis (4 people), the swelling of the gingival margin disappeared and the discharge from the periodontal pockets significantly decreased.

The comparison group 1 (23 people) included 13 men and 10 women with background pathology: disorders of the autonomic nervous system, diseases of the gastrointestinal tract, vasomotor sinusitis, hepatitis C, type 1 diabetes, hypertension and chronic tonsillitis. 2 patients were diagnosed with chronic localized catarrhal gingivitis in the acute stage, in 5 patients with chronic generalized catarrhal gingivitis; in 5 patients exacerbation of chronic localized periodontitis with abscess formation was detected, and in 11 patients chronic generalized periodontitis was found.

Before treatment, the Koetzshke index value is 5.1; PI index - 31.4; API - 26.8. However, the index of plaque API compared with the main group below. This may be due to the violation of trophic processes in the periodontium and changes in the microbiocenosis. Koetzshke index data is almost identical with the main group. The index of dental plaque API is higher than in the main group.

When determining the types of nonspecific adaptive reactions in 6 patients, a training reaction was detected, in 4 - quiet activation, in 10 - an increased activation reaction, in combination with medium and high reactivity levels. Only in 3 patients with diabetes mellitus and a disorder of the autonomic nervous system, an adverse type of non-specific adaptation reactions was detected — a reactivation reaction, in combination with a low level of reactivity.

After 7 days after treatment, all patients in this group had no pain, significantly improved oral hygiene, a significant decrease in bleeding was observed, tooth mobility decreased, there was no discharge from the pockets (Koetzshke - 2.3; PI index - 3.3; API index - 2.9).

The comparison group 2 included 19 somatically healthy people (13 men and 6 women). The main cause of inflammation in the periodontal disease was poor oral hygiene. Acute catarrhal gingivitis was detected in 2 people, chronic gingivitis in 17.

The Koetzshke index is low - 2.8, due to the absence of destructive processes in the periodontium. Indexes PI - 19.9 and API - 24.2 lower than in the main and comparison group 1.

In this group, 5 reactions of calm activation, 11 reactions of increased activation and 3 reactions of reactivation were revealed. In 16 patients with the reaction of calm and increased activation, medium and high levels of reactivity were detected, in 3 patients with a reactivation reaction - a low level. Reactivation reaction in combination with a low reactivity level was detected against the background of ARVI.

Already on the 4th day of therapy, patients noted the absence of bleeding and bad breath, the teeth surface is smooth and shiny (Koetzshke index - 2.1, PI index - 2.9; API index - 2.9). 14 days after the treatment, there were no complaints. Patients with a reactivation reaction in combination with a low level of reactivity (3 people) after 7 days showed an improvement in the condition of periodontal tissues (Koetzshke index - 2.3; PI index - 3; API index - 2.2), and after 14 days bleeding occurred rarely (Koetzshke index - 2.5; PI index - 2.6; API index - 2.4).

Conclusion. The inflammatory periodontal pathology in patients with oncological pathology develops in the overwhelming majority of cases against the background of the reaction of stress and reactivation in combination with low and very low levels of reactivity. It is noteworthy that a significant and significant increase in the API index in this group of patients appears to be related to changes in the oral microbiocenosis and the immune response against the background of the therapy of the underlying disease.

The standard regimen for the treatment of inflammatory periodontal pathology is most effective in patients with favorable types of nonspecific adaptive reactions of the body: training reactions, calm and increased activation against the background of medium and high levels of reactivity. While, against the background of the reaction, stress and reactivation in combination with low levels of reactivity that were detected in patients with cancer after radiation and chemotherapy courses, as well as in patients with certain types of somatic pathology, the duration of the treatment of inflammatory periodontal diseases to achieve a stable result significantly higher.

The findings suggest the need to expand the complex of medical - rehabilitation measures for inflammatory periodontal diseases in patients with background cancer, the inclusion of funds that have a positive effect on nonspecific adaptation reactions and the level of reactivity of the organism.

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动脉高血压患者的治疗

**THE EFFECTIVENESS OF ANTIHYPERTENSIVE
PHARMACOTHERAPY IN THE CORRECTION OF IMMUNE
DISORDERS IN PATIENTS WITH ARTERIAL HYPERTENSION**

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摘要。 这是一个导致血压系统发展的过程。32名高血压患者，左侧动脉高压，风险3（高），左心室肥厚者均在不断观察。TNF，IL-1 α ，IL-6，IL-8，IL-10，IL-2，C_{3a}，C_{5a}和C_{5a}在血浆中检测到C₃组分。事实上，它可以用作护理机构的途径。IL-1 α ，H₄的相容性。

关键词：动脉高血压，免疫，抗高血压药物治疗，细胞因子。

Annotation. *The aim of the study was to assess the level of cytokines and components of the complement system in patients with arterial hypertension stage II stage 2 and to establish a relationship with the level of blood pressure. 32 patients with a diagnosis of stage II hypertension, grade 2 arterial hypertension, risk 3 (high), left ventricular myocardial hypertrophy were under constant observation. In patients with arterial hypertension, an increased level of TNF, IL-1 α , IL-6, IL-8, IL-10, IL-2, C_{3a}, C₅ and C_{5a}-component of the complement system, but a decrease in the level of C₃-component was detected in the blood plasma. The use of anti-hypertensive pharmacotherapy in patients with arterial hypertension was accompanied by a decrease in blood plasma, but not to the level of a group of healthy donors, the concentration of TNF, IL-10, IL-2, C₃-component of the complement system and the concentration of IL-1 α , C₄-component of normal complement and factor H.*

Keywords: *arterial hypertension, immunity, antihypertensive pharmacotherapy, cytokines.*

Introduction

Clinical studies of recent years have shown that remodeling of the left heart, which develops in a number of pathological conditions, including arterial hypertension, is a factor that can worsen the prognosis of the underlying disease and increase the risk of cardiovascular complications [1, 3].

However, despite the fact that some progress has been made in studying this process, questions concerning the influence of various factors, including immune, on the remodeling components attract the attention of practitioners and are among the urgent problems of cardiology [2, 4, 6].

Currently, more and more nosologies and not only infectious etiology are caused by changes in the immune status, both at the systemic and local level, and the prognosis and outcome of the disease sometimes depends on the compensatory mechanisms of immunity maintenance [1, 5]. A large number of studies devoted to the study of the etiology and pathogenesis of arterial hypertension do not fully answer the questions of the pathogenesis of arterial hypertension and methods for its prevention [2, 4, 7].

The aim of the study was to assess the level of cytokines and components of the complement system in patients with arterial hypertension stage II stage 2 and to establish a relationship with the level of blood pressure.

Materials and methods.

32 patients with verified, according to the clinical recommendations «Arterial hypertension in adults» (2016) and the recommendations of the European Society of Hypertension and the European Society of Cardiology (2013), were under constant observation, with a diagnosis of stage II hypertension, left ventricular myocardial hypertrophy, grade 3 arterial hypertension based on data from a complex clinical and instrumental examination methods. Criteria for inclusion of patients in the study:

- age 30-50 years;
- a hypertensive illness of the II stage, the 2nd degree with a hypertrophy of a myocardium of a left ventricle, subject to electrocardiographic signs and / or echocardiographic signs
- history of the disease 5 years or more;
- the presence in the history of non-systemic antihypertensive drugs.

The exclusion criteria were symptomatic arterial hypertension, the presence of acute inflammatory and chronic diseases in the acute phase, diabetes mellitus, malignant neoplasms and blood diseases, the presence of chronic diseases of the broncho-pulmonary system with impaired function of the respiratory system.

All patients were prescribed starting antihypertensive therapy, including perindopril (5-10 mg / day) + amlodipine (5-10 mg / day), and after 4 weeks from the start of the study, a two-fold “office” blood pressure measurement was performed.

The plasma levels of cytokines TNF, IL-1 α , IL-6, IL-2, IL-8, IL-10, receptor

antagonist IL-1 (RAIL) and components of the complement system C_3 , C_4 , C_{3a} , C_5 , C_{5a} , factor H and C_1 -inhibitor on the first day of admission and 4 weeks after the start of antihypertensive therapy.

Statistical processing of the research results was carried out in accordance with generally accepted principles of statistical analysis. Values of normally distributed quantitative parameters are presented as arithmetic mean (M) with arithmetic mean error (m), and abnormally distributed values - median (Me) with interquartile interval (P25; P75). Differences were considered statistically significant at $p < 0.05$.

The results and discussion.

When determining the initial level in patients with arterial hypertension in the blood plasma, an increase in the levels of TNF, IL-1 α , IL-6, IL-8, IL-10, IL-2, C3a, C5 and C5a-components of the complement system, but a decrease in C_3 -component.

The use of antihypertensive pharmacotherapy in patients with arterial hypertension was accompanied by a decrease in blood plasma, but not to the level of the group of healthy donors, the concentration of TNF, IL-10 and IL-2, the concentration of IL-1 α is normalized.

On the background of antihypertensive therapy in patients with arterial hypertension, the concentration of the C_3 -component of the complement system decreases and the level of the C_5 -component of the complement system increases and the concentration of the C_4 -component of complement and factor H is normalized.

Analyzing the Spearman multiple correlation matrix between the dynamics of blood pressure indices and the studied cytokines and components of the complement system in patients with arterial hypertension were obtained reliable links between diastolic and systolic blood pressure and TNF (0.93 and 0.89, respectively), IL-8 (0.92 and 0.91, respectively) and the C_5 -component of the complement system (0.90 and 0.92, respectively).

The results confirm the literature data on the interdependence of target organ damage in arterial hypertension and impaired immune homeostasis, manifested by activation of the complement system and changes in pro- and anti-inflammatory cytokines [4, 6, 8].

Data on the state of the cytokine link of the immune system and the activity of the complement system dictate the need for a more detailed study of the immune mechanisms of target organ damage in arterial hypertension.

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当实验中的再生塑性心力衰竭时, TELMISARTAN作为心脏保护剂的可能性
**THE POSSIBILITY OF TELMISARTAN AS CARDIOPROTECTOR
WHEN THE REGENERATIVE-PLASTIC HEART FAILURE IN THE
EXPERIMENT**

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摘要。我们研究了替米沙坦对实验性再生 - 塑性慢性心力衰竭 (CHF) 心肌组织的影响。实验在40只白色杂种雄性大鼠上进行, 其体重为150-200gr。我们使用了4组动物: 对照; 大鼠腹腔注射阿霉素15mg / kg, 分6次注射2周; 用替米沙坦口服治疗的动物, 每天15mg / kg, 持续8周; 根据相同方案接受阿霉素和替米沙坦的大鼠。使用光学和超微结构水平研究在实验3和8周后第3天获得的材料。我们发现替米沙坦在再生塑料CHF中具有以下作用: 减少心肌细胞的异形, 间质和细胞内水肿。具有扩大的核周空间的心肌细胞不太常见。核仁的主要特征是纤维成分占优势; 没有观察到它们的碎裂和分离。在大多数情况下, 收缩装置的特征在于相对保留的结构; 线粒体更密集地堆积着嵴。这些数据表明替米沙坦的心脏保护作用。免疫组织化学研究揭示了替米沙坦对阿霉素诱导的细胞凋亡和增殖过程的抑制作用。

关键词: 替米沙坦, 心肌, 心肌保护, 萘环类心力衰竭, 阿霉素。

Summary. *We investigated the effects of telmisartan on the cardio-muscle tissue in experimental regenerative-plastic chronic heart failure (CHF). The experiment was conducted on 40 white mongrel male rats, whose weight was 150-200 gr. We used 4 groups of animals: control; rats, intraperitoneally treated with doxorubicin at a dose of 15 mg/kg, which was divided into 6 injections for 2 weeks; animals treated with telmisartan per os, 15 mg / kg daily for 8 weeks; rats that received doxorubicin and alongside telmisartan according to the same schemes.*

The material obtained on the 3-rd day, after 3 and 8 weeks of experiment was studied using light-optical and ultrastructural levels. We found the following effects of telmisartan in regenerative plastic CHF: reduction of heteromorphosis of cardiomyocytes, interstitial and intracellular edema. Cardiac myocytes with an expanded perinuclear space were less frequently met. Nucleoli were mainly characterized by a predominance of fibrous component; their fragmentation and segregation were not observed. The contractile apparatus, in most cases, was characterized by a relatively preserved structure; mitochondria were more densely packed with cristae. These data indicate the cardioprotective properties of telmisartan. Immunohistochemical study revealed the inhibitory effect of telmisartan on apoptotic and proliferative processes induced by the introduction of doxorubicin.

Keywords: *telmisartan, myocardium, cardioprotection, anthracycline heart failure, doxorubicin.*

Currently, anthracycline antibiotics, in particular doxorubicin, remain the drug of choice in the treatment of many cancer diseases. Doxorubicin is used both independently and as part of various combinations of anticancer drugs, many of which are standards for the treatment of solid tumors. Despite all the advantages of drugs from this group, they are not without side effects. It is known that the main “target” of cytostatics are actively proliferating cells that quickly recover after the completion of anti-tumor therapy. The cells of the definitive myocardium are also susceptible to the effects of chemotherapeutic agents, especially anthracycline antibiotics. Unlike rapidly proliferating cell populations, cardiomyocytes (CMC) are characterized by the ability to repair them at the intracellular level. Therefore, anthracycline cardiotoxicity can significantly impair the quality of life of patients and be potentially fatal [1].

Objective: to study the effect of angiotensin II telmisartan receptor antagonist on the histological structure of cardiac muscle tissue in doxorubicin-induced CHF.

Materials and methods. This work was carried out on the basis of the Department of Histology, Cytology and Embryology of Rostov State Medical University and laboratory of electron microscopy research Institute of Neurocybernetics SFU. The experiment was carried out on 40 male Wistar rats with a body weight of 0.15 – 0.20 kg, divided into 4 groups of 10 rats each. Animals were kept in the conditions of standard vivarium: room temperature 18-20°C, relative humidity 40-60%, 12-hour cycle day / night. It is known that estrogen has some cardioprotective effect, so only males rats were used in the experiment.

All procedures and protocols used in the experiment were consistent with the basic principles of humane treatment of laboratory animals, provided for “International recommendations for biomedical research using animals” [3]. Animals under compulsory anesthesia in / b thiopental Na at a dose of 30 mg / kg were de-

capitated and the material was taken for morphological studies. Experimental animals were divided into the following groups: the first group – control rats, which received a saline solution in the appropriate body weight volume. The 2nd group included animals that were administered doxorubicin (LANCE-Pharm, Moscow) in a course dose of 15 mg/kg intraperitoneal (I/b), this dose was divided into 6 injections for 2 weeks [4]. Rats from the third group received per os, telmisartan (“Berlinger Ingelheim Pharma GmbH and Co.KG”, Germany) 5 mg/kg daily for 8 weeks. Animals from the fourth group, starting from the first day of the experiment, were administered in parallel doxorubicin and telmisartan on the same schemes of administration. Since the rate of biochemical processes is species-specific, the amount of the studied drug was calculated taking into account the conversion factor of 5.9 relative to the therapeutic dose for humans [5]. Apoptotic and proliferative activity was investigated by immunohistochemical detection of proteins P53, Bcl-2 and Ki-67. Light-optical and ultrastructural study was carried out on the material obtained 3, 21 and 56 days after the beginning of the experiment. In the first and third groups, myocardium for research was taken only on the 56 day of the experiment. To study the myocardium at the ultrastructural level a transmission electron microscope TecnaiG2 SpiritBioTWIN with an accelerating voltage of 120 kV was used [6]. Light microscopy was performed using a microscope ZEISS PrimoStar [6].

Results. The comparative light-optical and electron - microscopic study of the structure of the atrial and ventricular myocardium of intact animals showed that the results do not contradict the data of such studies reflected in the literature [4]. However, insufficient attention is paid to histophysiological features of the cardiomyocytes of the right atrium. Comparative morphological study of atrial and ventricular myocardium of rats from the third group receiving telmisartan did not reveal significant changes relative to the norm. Such results indicate the absence of any effect of telmisartan on myocardial morphology.

The study of the effect of doxorubicin on the myocardium of both parts of the heart indicates its pronounced cardiotoxic effect. In the myocardium of animals in this group, after 3 days and further on 21 and 56 days, the heteromorphism of cardiomyocytes in both parts of the heart is obvious. Often there were apoptotic changes in cardiac myocytes. Late in the experiment, necrosis and fibrosis foci were visualized. In most cardiomyocytes was observed dystrophic changes accompanied by karyopyknosis, karyorhexis and karyolysis cores that only grow in remote periods of the experiment. The karyolemma of most nuclei had a pronounced tortuosity of the course, local extensions of the perinuclear space were observed. Most cardiomyocytes have nuclei with dispersed euchromatin, the presence of usually one nucleolus with a predominance of fibrillar component; however, nucleoli with manifestations of fragmentation were often encountered.

In the contractile apparatus of cardiomyocytes was expressed the lysis of the myofibrils microfilaments, they observed a loosening. Myofibrils in the central zone of sarcoplasm of cardiomyocytes were thinned. Mitochondria are mostly irregular in shape, more often with dense matrix and randomly Packed crystals. However, in most mitochondria, the matrix is light, the cristae are disoriented. The cisterns of sarcoplasmic network near the nucleus and in the subsarcolemmal areas often were dilatated. Dictyosomes of the Golgi complex with signs of reduction of its cisterns and vesicles were located in atrial cardiomyocytes in the nuclear zone. The number of atrial granules is significantly reduced (Fig. 1). The manifestations of interstitial myocardial edema as well as the activation of fibroblasts which actively synthesize the components of the extracellular matrix are evident in both parts of the heart.

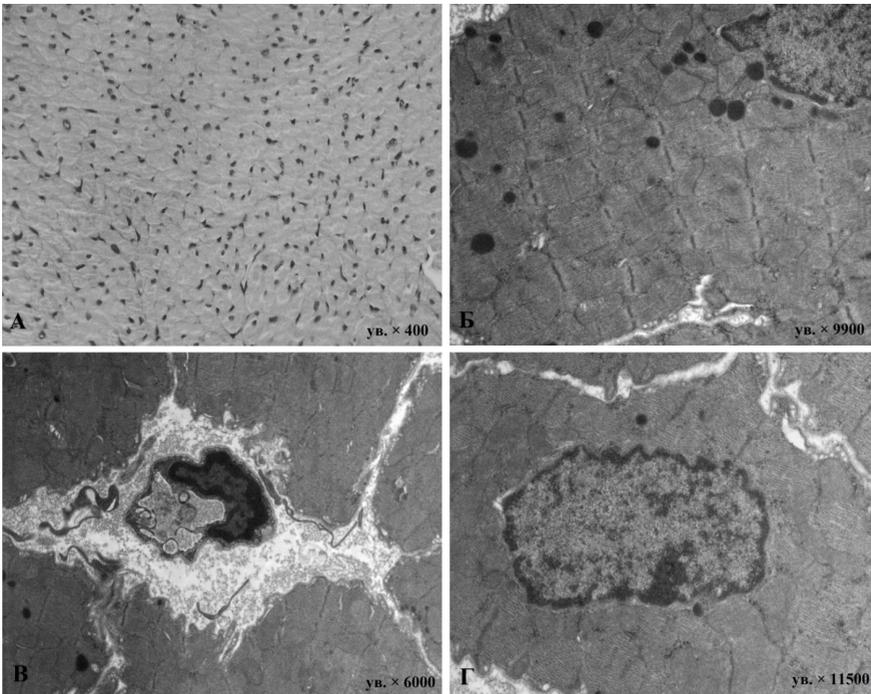


Fig.1. Light and electronic microphotographs of atrial (A, B) and ventricular (B, D) myocardium of rats that were treated with doxorubicin during 8 weeks of the experiment. A) stained with hematoxylin-eosin, UV. $\times 400$; (B, C, D) electronic micrographs. B) UV. $\times 9900$; (V) UV. $\times 6000$; (G) SW. $\times 11500$.

In the myocardium of animals of the fourth group treated with doxorubicin and

telmisartan, compared with the myocardium of animals of the second group treated exclusively with doxorubicin, heteromorphism of cardiomyocytes and dystrophic changes in them were demonstratively less pronounced. In the early periods of observation in the nuclei of many cardiomyocytes in karyoplasm prevails euchromatin, in the nucleoli prevails fibrillar component. The state of the contractile apparatus of the cardiomyocytes in the experimental group is comparable to changes in the 2nd group at the same time of the experiment, while the damaging effect of doxorubicin was more pronounced in the ventricular myocardium. In the long term of the experiment, pathological changes in the contractile apparatus are less pronounced, however, within the sarcomere of myofibrils, areas of myofilament lysis are noticeable.

Mitochondria have a different shape with a predominance of round or oval. The vast majority of these organelles had an enlightened matrix and loosely packed crystals. Mitochondria of small size, often irregularly shaped, with dark matrix densely packed with crystals were much less common. As in the 2 group, extended and shortened cisterns sarcoplasmic networks are most often located near nuclear subsarcolemmal areas. For atrial cells were characterized of a single dictyosome of the Golgi complex with a small number of atrial granules. Interstitial edema is less pronounced. We saw a significant activity of fibroblasts which synthesized the components of the interstitium, mainly collagen fibers. In all terms of the experiment, the heteromorphism of the vascular endothelium of the microcirculatory bed is obvious. There were endothelial cells with dark hyperchromic nuclei, with small organelles and a large number of vesicles. In the early stages of the experiment, edematous endotheliocytes with a small number of vesicles were occasionally encountered (Fig. 2).

After studying the content of Ki-67 protein in intact myocardium by immunohistochemistry, we revealed extremely low proliferative activity of cardiomyocytes. The presence of p53 and Bcl-2 proteins in a very small number in cardiac cells indicates weak pro- and antiapoptotic processes, respectively. In animals which administered only telmisartan, the expression levels of proteins P53, Bcl-2, Ki-67 were comparable to intact myocardium. High rates of apoptotic and proliferative activity were found in both parts of the rat heart after administration only doxorubicin, especially in the long-term experimental period. The immunohistochemical analysis showed a significant increase in the expression of p53 and Bcl-2 proteins. Ki-67 protein expression was also significantly higher than in the control group. By 8 weeks of the experiment in this group of animals the number of cells with positive immunohistochemical reaction increased significantly.

The immunohistochemical analysis of CMC of rats, which were administered telmisartan in parallel with doxorubicin, showed a significant increase in the number of cells with a high content of Bcl-2 protein relative to the control.

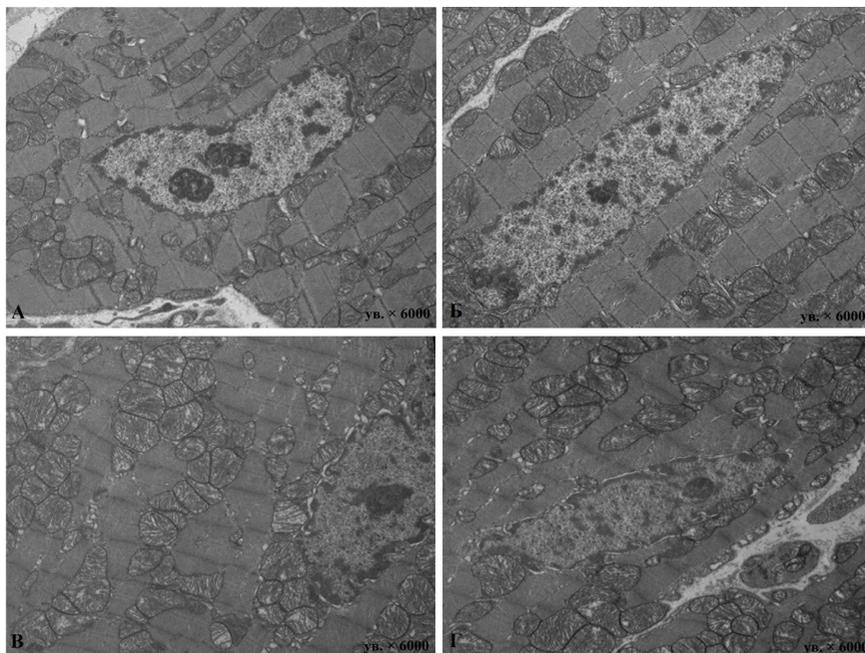


Fig. 2. Electron micrographs of atrial (A, B) and ventricular (C, D) cardiomyocytes of the rat myocardium after administration of doxorubicin and telmisartan. Eight weeks of experiment. Electronic micrographs: (A) MAG \times 6000, (B) MAG \times 6000, (C) MAG \times 6000, (D) MAG \times 6000.

The number of cells with high protein P53 in the early stages of the experiment is only slightly higher than those in the myocardium of intact animals. The level of Ki-67 protein expression was also higher than that in the control group, which indicates an increase in both the proliferative activity of CMC and antiapoptotic processes in comparison with the first term. Proapoptotic processes were expressed rather weakly. It should be noted a gradual increase in the number of positive cells by the 8th week of the experiment.

Discussion of results. The information we present on research results of rat myocardial ultrastructure in experimental modeling of regenerative-plastic CHF is mainly correlated with the already published data [4]. However, more purposeful and extensive application of the method of electron microscopy in our experiment allows us to assert about the undoubted increase in the heteromorphism of myocardial cells under the influence of doxorubicin as the main altering factor contributing to the emergence of reactive changes in the nuclear compartment,

organelles of energy, synthetic, contractile apparatus and other intracellular structures that are most in need of repair processes. It is also clear that this method in the comparative ultrastructural study of myocardium of experimental laboratory animals with the combined administration of doxorubicin and telmisartan evidently and convincingly demonstrates the morphological diversity of detected myocardial cells, as well as a clearly different comparative ratio of the volume of cellular heteromorphism in the dynamics of the experiment, especially in the most different range of its terms. The observed manifestations of the apparent destruction of the contractile apparatus, mitochondria, sarcoplasmic network in combination with changes in the ultrastructure of the nuclear compartment of cardiac myocytes in the experimental group of animals certainly confirm the blocking of reparative nuclear biosynthesis in the corresponding absence of free ribosomes in the sarcoplasm of cardiomyocytes and in the nucleoli – the granular component. Manifestations of intracellular regeneration manifest most often in the near membrane areas of adjacent cardiac myocytes. Ultrastructural signs of blocking intracellular regeneration are associated with the observed processes of myocytolysis and autophagy, destruction of cardiac cells extending to the border of the intercellular membranes of intercalated discs.

It should be carefully considered proliferative potential and apoptotic death of cardiomyocytes of the atria and ventricles and the reactivity of their nuclear compartment. Immunohistochemical analysis of apoptotic and proliferative activity in cardiomyocytes of rats, which received only telmisartan, showed that the number of cells with the expression of the proapoptotic protein P53 and antiapoptotic protein Bcl-2 and the proliferation factor Ki-67 was not significantly different from similar parameters of cardiomyocytes of an intact myocardium. In animals that were administered with only doxorubicin, a significant increase in the number of cells with the expression of pro - and antiapoptotic protein and proliferation factor Ki-67 was revealed. With the parallel administration of doxorubicin and telmisartan, these immunohistochemical parameters were significantly lower than those after administration of doxorubicin alone. This indicates the activation of intracellular regeneration processes in this group. The volume of the interstitial component of the cardiovascular tissue under the influence of only doxorubicin was significantly greater than in the intact myocardium. The use of telmisartan against the background of the introduction of doxorubicin led to a less pronounced development of the interstitial component.

Findings. A comparative morphological study of the ultrastructure of the myocardium in experimental doxorubicinol regenerative plastic with CHF allows us to conclude that angiotensin II receptor antagonist telmisartan used in its treatment has an obvious cardioprotective effect. The cardioprotective effect of telmisartan is characterized by less pronounced heteromorphism of cardiomyocytes reduction

of interstitial and intracellular edema, as well as the preservation of the structures of the contractile apparatus and mitochondria. All this once again convinces us that telmisartan has got cardioprotective properties. In addition, there was a stabilization of the nuclear compartment and less pronounced damage to the synthetic apparatus, which suggests an improvement in the synthetic processes in the cardiomyocytes as a result of the cardioprotective effect of telmisartan. The immunohistochemical study revealed no significant changes in apoptotic and proliferative activity in the application of telmisartan relatively intact myocardium. Doxorubicin has an undoubted activating effect on apoptotic and proliferative processes. The use of telmisartan together with the administration of doxorubicin reduces the doxorubicin-related increased apoptotic and proliferative activity.

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UDC 615.322

来自香蕉皮 (Musa) 的水溶性多糖和化学品的物理性质
**PHYSICO-CHEMICAL CHARACTERISTICS OF WATER-SOLUBLE
POLYSACCHARIDES AND PECTIN SUBSTANCES, EXTRACTED
FROM THE PEEL OF BANANA (MUSA)**

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注释。它是有机营养质量的91%：蛋白质，脂类，纤维，碳水化合物 [1,2,3,4,5,6,7,8]。由于丰富的矿物质，酶和油，香蕉皮可以去除。该组分组分证实了香蕉皮的相关性

Annotation. *Waste of industrial use of bananas is its peel, 91% of the mass of the peel is water and organic nutrients: proteins, lipids, fiber, carbohydrates [1, 2, 3, 4, 5, 6, 7, 8]. Due to the rich content of minerals, enzymes and oils, banana peel can alleviate suffering from burns, scratches and bruises. This component confirms the relevance of the topic, which allows to find practical application of banana peel*

The aim of research is to quantify the polysaccharide composition of banana peel and to establish the rheological characteristics, the distribution coefficient, the degree of association for the fraction of water-soluble polysaccharides and pectic substances.

Conclusion. Based on the studies of water-soluble polysaccharides and pectin substances of banana peel, the following conclusions were made:

1. The average molecular weight of WSPS was determined, which amounted to 1652.3 g / mol., And for pectic substances it was 16109.9 g / mol, which makes it possible to attribute them to the group of high-molecular compounds.

2. It is shown that water-soluble polysaccharides and pectin substances from banana peel do not have surface-active properties.

3. It has been established that the transfer of pectic substances and water-soluble polysaccharides from the hydrophilic to the hydrophobic phase is possible with a recovery rate of 42% and 56% from WSPS and PV, respectively

4. Studies have shown that the distribution of WSPS and PS between the two phases of ethyl acetate-water is determined by a distribution coefficient of 1.38 and 1.07, respectively.

Recommendations:

It has been suggested that the inedible part, the peel, remaining after the processing of the fruit of a banana, requires finding ways to utilize it. The study of the physicochemical properties of the substances isolated from it confirms the possibility of their use as biologically active substances.

关键词：香蕉，水溶性多糖，物质，溶液粘度，流变特性，分配系数，缔合度。

Keywords: banana, water-soluble polysaccharides, pectin substances, viscosity of solutions, rheological characteristics, distribution coefficient, degree of association.

Materials and methods.

The method of obtaining water-soluble polysaccharides [9].

Air-dried raw banana peel in the amount of 50g., Poured 250 ml. water (ratio - raw material: extractant = 1: 5) and kept at room temperature for 5 hours. The extract was filtered, WSPS from the filtrate was besieged with double volume of 96% ethanol. At the same time a grayish precipitate fell out. The precipitate was dried in a desiccator over concentrated sulfuric acid.

After WSPS was extracted, the meal was poured twice with an oxalate buffer of 500 cm³ (250 cm³ of a 0.5% solution of ammonium oxalate and 250 cm³ of a 0.5% solution of oxalic acid) with infusion over the course of a day. To precipitate pectic substances (PS), acetone was added to the obtained extract in a 1: 1 ratio. The precipitate of pectic substances (PS) was centrifuged and dried in a desiccator over concentrated sulfuric acid.

After extracting PS, the meal was extracted twice with a 7% solution of sodium hydroxide with a volume of 200 cm³ with infusion overnight. The obtained extract was neutralized with glacial acetic acid to neutrality on a universal indicator paper and placed in a dialyzer for 24 hours. The precipitated hemicellulose A was centrifuged and dried in a desiccator over concentrated sulfuric acid. Then acetone was added to the supernatant in a 1: 1 ratio. Hemicellulose B precipitate was not observed.

Rheological studies of water-soluble polysaccharides [10]

1) To determine the average molecular weight of water-soluble polysaccharides (WSPS), the viscometric method was used. A dilution method was used to prepare a series of solutions and determine the time of their expiration using an Ostwald viscometer. Further, the following were determined: relative, specific, reduced and characteristic viscosities of solutions, on the basis of which the average molecular weight of polysaccharides was calculated.

The relative viscosity was calculated taking into account the time of expiration of water (t_0) and solutions according to the formula:

$$\eta = t_x / t_0;$$

where $[\eta]$ - characteristic viscosity,

(t_0) – flow time of the water,

(t_x) – expiration time of the test solution.

To calculate the average molecular weight (M), the Mark-Houwink-Kuhn equation was used. [9]

$$[\eta] = K M^\alpha;$$

where $[\eta]$ - characteristic viscosity,

K and α – constants,

M - molecular weight of the test substance.

2) Determination of the surface activity of PS and WSPS was established using a stalagmometer, by counting droplets of solutions of different concentrations arising from the same volume.

Surface tension was calculated by the equation [10]:

$$\sigma_x = \sigma_0 \frac{n_0}{n_x};$$

where σ_0 and σ_x - surface tension of water and solution,

n_x and n_0 - the number of drops of solution and water.

3) The distribution coefficient in the system diethyl ether - water was established using electrochemical method-conductometry. Conductometric studies were carried out on the device - conductometer brand “Expert -002”. As a result of the research, a calibration graph of the electrical conductivity was built ($1/R_0 \text{ } \Omega\text{m}^{-1} \text{ cm}^{-1}$) from concentration (C, %), which allowed us to determine the equilibrium concentration of polysaccharides transferred to the extractant.

The distribution coefficient was calculated by the equation [11]

$$K = \frac{C_1}{C_2^n}$$

where C_1 and C_2 – the concentration of PS and WSPS in water and extractant, n - degree of association.

Introduction.

Banana (*Musa*) is an edible fruit of cultivated species (*Musa acuminata*, *Musa paradisiaca*, *Musa balbisiana*) of a herbaceous annual plant that grows in a tropical climate. Banana is the fourth most popular after rice, wheat and corn. But

the most interesting thing is that a banana (all its parts) is used for medical and cosmetic purposes. Waste of industrial use of bananas is its peel, 91% of the mass of the peel is water and organic nutrients: proteins, lipids, fiber, carbohydrates [1, 2, 3, 4, 5, 6, 7, 8]. Due to the rich content of minerals, enzymes and oils, banana peel can alleviate suffering from burns, scratches and bruises. This component confirms the relevance of the topic, which allows to find practical application of banana peel.

The aim of research is to quantify the polysaccharide composition of banana peel and to establish the rheological characteristics, the distribution coefficient, the degree of association for the fraction of water-soluble polysaccharides and pectic substances.

Research results and discussion.

Polysaccharides from crushed air-dried raw materials of banana peel (*Musa*) are extracted by direct extraction with various extractants, followed by precipitation of individual fractions with ethanol or acetone. 4 fractions were obtained from the banana peel: water-soluble polysaccharides (WSPS), pectin substances (PS), hemicellulose A, hemicellulose B. The most interesting are the fractions of water-soluble polysaccharides (yield is 4.6%) and pectin substances (yield is 2.7 %).

For the obtained PS and WSPS, the surface-active properties were studied, the average molecular weight of polysaccharides was determined, the features of their distribution between the two phases of immiscible liquids.

Aqueous solutions of the studied substances were prepared (0.15-0.6%), the number of drops and the viscosity of water and solutions were measured using a Traube stalagmometer and Ostwald viscometer. The results are presented in table 1.

Table 1. The dependence of the expiration time of aqueous solutions of WSPS and PS, obtained from the peel of a banana.

WSPS				
C%	t, sec	η_{OTH}	η_{yn}	η_{np}
H ₂ O	28,43	-	-	-
0,15	29,26	1,029	0,029	0,19
0,25	29,5	1,093	0,092	0,368
0,5	35,1	1,288	0,296	0,592
0,6	35,27	1,408	0,241	0,41
PS				
H ₂ O	28,63	-	-	-
0,15	34,42	1,202	0,202	1,347
0,3	41,18	1,438	0,439	1,463
0,6	57,7	2,015	1,015	1,692

To establish the dependence of viscosity on concentration, relative, specific and reduced viscosity were calculated. The specific viscosity characterizes the increase in viscosity of the solution η , compared with the viscosity of the solvent η_0 . The reduced viscosity η_{np} is the ratio of the specific viscosity to the concentration [9].

To calculate the average molecular weight, it is necessary to determine the characteristic viscosity $[\eta]$ as $C \rightarrow 0$.

This value for PS was found by plotting the dependence η_{np} from C. The section cut off by a straight line from the ordinate axis $[\eta] = 1.23$ [Figure 1]. To calculate the molecular weight, we used the literature data k and α , characteristic of natural polysaccharides. [12] The average molecular weight for PS was 16,109.9 g/mol. Similarly found the value of the characteristic viscosity for WSPS, equal to 0.08 and the molecular weight of 1625.3 g/mol.

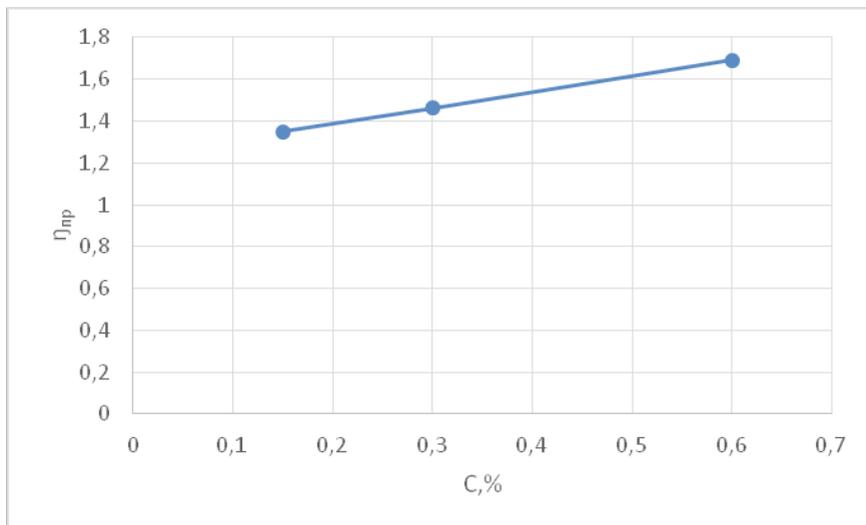


Figure 1. *The dependence of the reduced viscosity on the concentration of solutions of pectic substances.*

To establish the presence of surface activity in the studied polysaccharides, a stalagmometric method was used. The measurement results showed that the number of drops of solutions of different concentrations of water-soluble polysaccharides, passed through a stalagmometer, did not differ from the number of drops of solvent. This allowed us to assign water-soluble polysaccharides obtained from the peel of bananas to the group of surface-inactive substances.

To predict the prediction of the distribution of the studied substances in the body systems, a study was made of the distribution coefficient. From organic solvents, we chose ethyl acetate as it has a low solubility in water, and a density that differs with solutions. For the study, aqueous solutions of polysaccharides were mixed with an extractant in equal volumes. The solution was shaken vigorously. To determine the concentration used electrochemical method-conductometry. The electrical conductivity of WSPS solutions was measured before and after extraction using an Expert-002 conductometer. The results are presented in table 2.

Table 2. The results of changes in the resistance of water-soluble solutions polysaccharides and pectic substances.

WSPS									
C%	R_0, OM	$1/R_0 * 10^4$ $\text{OM}^{-1}\text{CM}^{-1}$	R_1, OM	$1/R_1 * 10^4$ $\text{OM}^{-1}\text{CM}^{-1}$	$C_1, \%$	$C_2, \%$	$\lg C_1$	$\lg C_2$	K
0,15	1968,29	5,08	2448,01	4,08	0,11	0,04	-0,96	-1,40	0,92
0,30	1045,32	9,56	1339,76	7,46	0,23	0,07	-0,64	-1,15	1,34
0,60	539,96	18,50	692,64	14,43	0,47	0,13	-0,33	-0,48	1,88
								K_{cp}	1,38
PS									
0,15	1186,73	8,4	1457,88	6,9	0,11	0,04	-0,96	-1,40	0,61
0,30	639,42	15,6	794,19	12,6	0,24	0,06	-0,62	-1,22	1,14
0,60	345,39	28,9	443,32	22,6	0,47	0,13	-0,33	-0,48	1,46
								K_{cp}	1,07

The linear dependence of the electrical conductivity ($1/R_0$) on the concentration of the initial PS solutions is shown in Figure 2

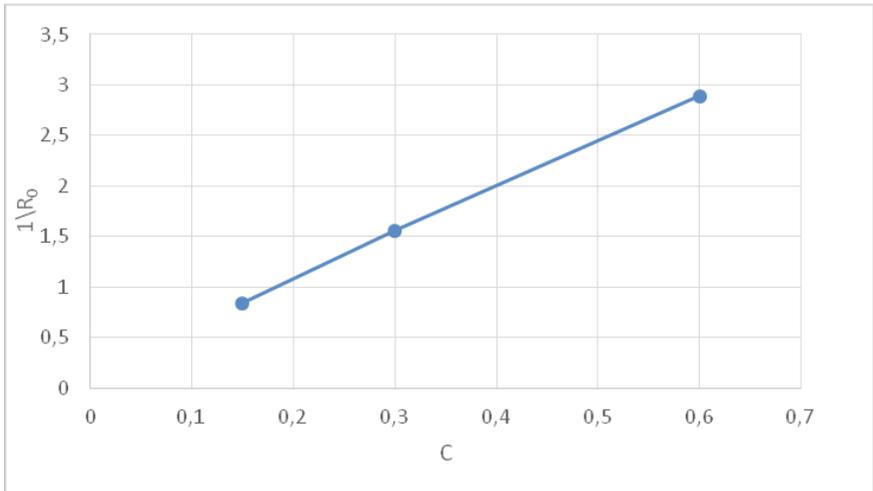


Figure 2. The dependence of the electrical conductivity of solutions of pectic substances on the concentration.

Extraction was carried out for 60 minutes. Using a separating funnel, separating the aqueous portion, the resistance of the solutions ($1/R_1$) was measured. When studying the absorption of substances and their penetration through the cell membrane, the distribution coefficient of the substance (K) between water and the organic extractant is an important value. It is calculated as the ratio of the concentration of the substance in the raffinate (C_1) to the concentration in ethyl acetate

(C_2), in degrees (n), corresponding to the degree of association:

$$\frac{C_1}{C_2^n} = K \quad [2]$$

Using a calibration graph, the concentration of PS and WSPS in the raffinate was determined. From the difference between the initial and equilibrium concentrations of polymers in water, their concentration in the extractant was found.

Depending on the nature of the extractant, the third component may be in it in the form of individual molecules or in the form of associates. Their presence affects the properties of the solution and the magnitude of the distribution coefficient.

The degree of association (n) characterizes the location of the substance molecules in the extractant. The logarithm of the equation allowed us to determine it by the dependence of $\lg C_1$ on $\lg C_2$ (Figure 3). The segment cut off by the straight line from the ordinate axis is equal to $\lg K$, and the slope of the straight line to the abscissa axis is the degree of association (n).

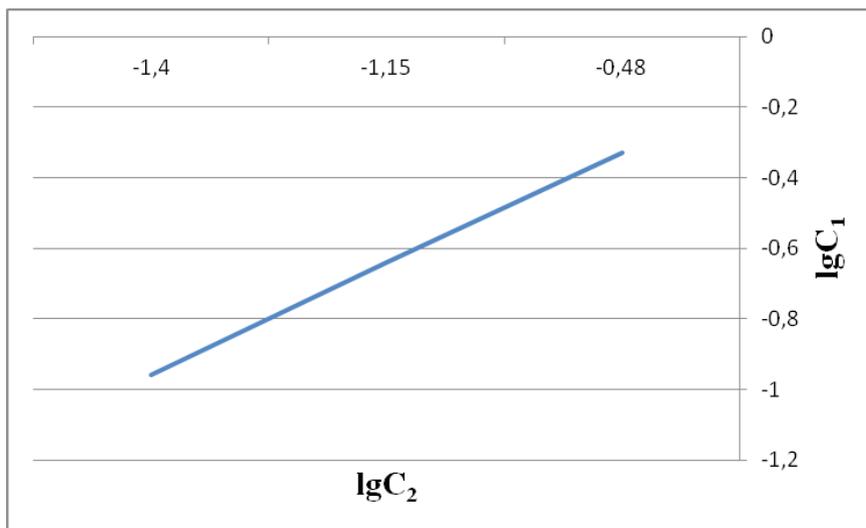


Figure 3. The dependence of $\lg C_1$ from $\lg C_2$ for aqueous solutions of WSPS.

Для WSPS $n=0.67$, для PS $n=0.56$, что свидетельствует о возможности ассоциации молекул в экстрагенте.

The found mean values of the distribution constants were 1.38 for WSPS and 1.07 for PS.

The smaller the value of K, the more efficient the extractant and the greater the degree of extraction of the substance.

The mass of the extracted component was calculated using the equation:

$$m_3 = m_0 \left[1 - \left(\frac{KV_2}{KV_1 + V_2} \right)^n \right],$$

where m_3 , m_0 – the mass of the extracted and source substances;
 K – distribution coefficient;
 V_1 и V_2 – volumes of solution and extractant;
 n – extraction number.

The degree of extraction was determined as the ratio of the mass of the extracted substance in the extractant and contained in the initial solution. The results of the calculations showed that the recovery rate from WSPS was 42%, from PS 56%.

The data obtained indicate that the receipt of water-soluble polysaccharides from aqueous solutions in the hydrophobic phase is not a difficult process, since K is close to unity. This allows the experiment to be brought closer to the living conditions of a bioorganism and to further study the effect on the distribution coefficient of temperature and pH of the medium, corresponding to the acidity of the stomach and intestines, which can characterize the bioavailability in vitro.

Conclusion. Based on the studies of water-soluble polysaccharides and pectin substances of banana peel, the following conclusions were made:

1. The average molecular weight of WSPS was determined, which amounted to 1652.3 g / mol., And for pectic substances it was 16109.9 g / mol, which makes it possible to attribute them to the group of high-molecular compounds.
2. It is shown that water-soluble polysaccharides and pectin substances from banana peel do not have surface-active properties.
3. It has been established that the transition of pectic substances and water-soluble polysaccharides from the hydrophilic to the hydrophobic phase is possible with a recovery rate of 42% and 56% from WSPS and PS, respectively.
4. Studies have shown that the distribution of WSPS and PS between the two phases of ethyl acetate-water is determined by a distribution coefficient of 1.38 and 1.07, respectively.

Recommendations:

It has been suggested that the inedible part, the peel, remaining after the processing of the fruit of a banana, requires finding ways to utilize it. The study of the physicochemical properties of the substances isolated from it confirms the possibility of their use as biologically active substances.

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俄罗斯联邦使用的抗逆转录病毒药物范围分析结果
**RESULTS OF THE ANALYSIS OF THE RANGE
OF ANTIRETROVIRAL DRUGS USED
IN THE RUSSIAN FEDERATION**

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注解。世界卫生组织的数据表明，需要采取综合方法为艾滋病感染者提供医疗服务。只有在结合使用HAART和诊断研究时，才能推广目前艾滋病流行。我们研究的目的是分析在联邦一级购买的抗逆转录病毒药物的范围，以便为感染艾滋病毒的患者提供药物援助。该研究是根据俄罗斯联邦卫生部2018年缔结的国家合同数据进行的，该数据在俄罗斯联邦统一采购信息系统官方网站上公布。分析了2018年和2019年下半年向接受HAART的人提供药物援助的各种抗逆转录病毒药物。据透露，2018年购买药物的预算支出用于向人类免疫缺陷病毒感染，包括与乙型和丙型肝炎病毒一起，用于医疗用抗病毒药物，花费超过200亿卢布，其中包括直接用于抗逆转录病毒药物的金额为94.59%。据确定，2018年俄罗斯联邦卫生部购买了21种HAART所需药物的国际非专有名称，未考虑释放的剂量和形式。其中，17种单一制剂（81%），4种两种或更多种药物的组合（19%）。与此同时，主要的现金成本（25%）落在了洛帕那韦+利托那韦的INN上。抗逆转录病毒药物的主要供应商是R-PHARM。

关键词：药物，艾滋病毒感染，抗逆转录病毒疗法，供应商，政府合同，金钱。

Annotation. WHO data suggest the need for an integrated approach in the provision of medical care for HIV-infected. Generalization of the HIV epidemic at the present time is possible only when using a combination of HAART and diagnostic studies. The purpose of our study was to analyze the range of antiretroviral drugs purchased at the federal level to provide drug assistance to HIV-infected patients. The study was conducted on the basis of data on state contracts concluded by the Ministry of Health of the Russian Federation for 2018, presented on the official website of the Unified Procurement Information System of the Russian Federation. An assortment of antiretroviral drugs for the provision of drug assistance to people receiving HAART during the second half of 2018 and 2019 was analyzed. It was revealed that in 2018 the budget expenditures on the purchase of drugs to provide persons infected with the human immunodeficiency virus, including in combination with hepatitis B and C viruses, with antiviral drugs for medical use, spent more than 20 billion rubles, including The amount spent directly on ARV drugs was 94.59%. It was determined that in 2018 the Ministry of Health of the Russian Federation purchased 21 international non-proprietary names of the drugs required for HAART, without taking into account the dosages and forms of release. Of these, 17 monopreparations (81%), 4 combinations of two or more drugs (19%). At the same time, the main cash costs (25%) fall on the INN of lopinavir + ritonavir. The main supplier of ARV drugs was R-PHARM.

Keywords: drugs, HIV infection, antiretroviral therapy, suppliers, Government contracts, money.

Introduction

According to the World Health Organization, a comprehensive approach to treating people with HIV is an objective need for medical care. The introduction of highly active antiretroviral therapy (HAART) into the medical practice of treating HIV-infected people is an effective achievement in the field of healthcare. Reducing the contagiousness of patients due to a reduction in viral load, improving the quality of life of those infected and increasing their life expectancy makes it possible to call HAART a tool capable of managing the disease and retraining it from fatal to chronic. Antiretroviral drugs are used to perform HAART.

The purpose of our study was to analyze the range of antiretroviral drugs purchased at the federal level to provide drug assistance to HIV-infected patients.

Materials and research methods

The materials of the study were information about the State contracts for the supply of medicines for medical use concluded by the Ministry of Health of Russia, published on the official website of the Unified Information System in the field of procurement. In the process, a systematic approach, content analysis, methods of documentary, comparative and one-time analysis, synthesis and grouping of indicators using information technologies were used.

Results and discussion

The study revealed that the use of HAART at the State level in the Russian Federation began in 2006. Currently, the provision of drug treatment regions for medical use, necessary for HAART for HIV-infected patients, is provided by the Russian Ministry of Health as part of Government Decree No. 1512 of December 28, 2016 “On Approval of the Provision on the Organization of Ensuring Persons infected with Human Immunodeficiency Virus, including combination with hepatitis B and C viruses, antiviral drugs for medical use, and the provision on the organization of provision of persons with multidrug tuberculosis venous pathogen resistance, antibacterial and anti-tuberculosis drugs for medical use” [1]. It has been established that from January 1, 2017, a federal register of HIV-infected people [2] operates in the Russian Federation [2], which allows optimizing the distribution of diagnostic test systems and predicting the required number of HAART drugs in each region.

Based on the information provided in the Unified Procurement Information System [3] (as of 02.10.2018), it was determined that the Ministry of Health of Russia concluded Government contracts for the supply of medicines for medical use in the amount of more than 77 billion rubles in 2018. It was established that the main way to conduct procurement procedures was an electronic auction - 89%, the proportion of purchases from a single supplier (performer, contractor) was 11%. More than 20 billion rubles were spent on the purchase of drugs for the provision of persons infected with the human immunodeficiency virus, including in combination with the hepatitis B and C viruses, antiviral drugs for medical use, more than 19 billion rubles, which is about 94.59% of the money spent.

Data on medicinal preparations for medical use purchased in 2018 by the Ministry of Public Health of the Russian Federation for HAART are presented in Table 1.

Table 1. Data on the number of government contracts concluded in 2018 for international non-proprietary names of drugs for antiretroviral therapy.

№	International Nonproprietary Name of the Drug	Number of concluded Government contracts, units
1	Abacavir	4
2	Abacavir + Lamivudine	2
3	Atazanavir	5
4	Darunavir	3
5	Didanosine	3
6	Dolutegravir	1
7	Zidovudine	4
8	Lamivudine	4
9	Lamivudine + Zidovudine	2
10	Lopinavir + Ritonavir	4
11	Maraviroc	1
12	Nevirapine	2
13	Raltegravir	4
14	Rilpivirin + Tenofovir + Emtricitabine	2
15	Ritonavir	2
16	Saquinavir	1
17	Tenofovir	2
18	Fosamprenavir	1
19	Phosphazide	2
20	Etravirin	2
21	Efavirenz	5

As follows from the data in Table 1, in 2018, the Ministry of Health of Russia concluded 56 State contracts for the supply of 21 INN drugs required for HAART, without regard to dosages and forms of release. Of these, 17 monopreparations (81%), 4 combinations of two or more drugs (19%).

It should be noted that a different number of Government contracts has been concluded for various INN drugs. Thus, atazanavir and efavirenz drugs account for 9% each; abacavir, zidovudine, lamivudine, lopinavir + ritonavir, raltegravir, 7% each; darunavir, didanosine at 5%; etravirine, abacavir + lamivudine, lamivu-

dine + zidovudine, nevirapine, rilpivirine + tenofovir + emtricitabine, ritonavir, tenofovir, phosphazide at 4%; dolutegravir, maraviroc, saquinavir, fosamprenavir 2% of the total number of concluded Government contracts, which is due to the different number of dosages and forms of release in different drugs and the implementation of procurement procedures for one INN drugs.

In the course of the study, we found that the greatest financial costs are accounted for drugs: lopinavir + ritonavir - 25%; raltegravir - 11%; etravirine and atazanavir 10% each; rilpivirin + tenofovir + emtricitabine 8%; efavirenz 7%; darunavir and dolutegravir 5% each; tenofovir, ritonavir and abacavir + lamivudine at 3%; fosamprenavir, lamivudine, abacavir and phosphazide at 2%; saquinavir, lamivudine + zidovudine, zidovudine, 1% each; nevirapine, maraviroc, didanosine less than 1% of the total cost of purchasing HAART drugs in 2018.

An analysis of the concluded Government contracts showed that there are 9 main suppliers of ARV drugs in Russia (Table 2).

Table 2. Data on suppliers of antiretroviral drugs, according to the Government contracts concluded in 2018.

Provider	Number of contracts, units	Amount under contracts, mln. Rub.
Joint-stock company "R-PHARM"	26	11444,89
Limited Liability Company "PROFARM"	9	1441,03
Limited Liability Company "COSMOFARM"	5	522,73
Limited Liability Company "Biotek"	3	1023,29
Joint Stock Company "PHARMSTANDART"	4	3463,93
Closed Joint-Stock Company GLACKSMITKLEIN TRADING	5	1562,02
Limited Liability Company "IRWIN 2"	1	283,88
Limited Liability Company "FARMAKTIVY CAPITAL"	2	59,65
Limited Liability Company "Trading House BF"	1	49,46

As follows from the data presented in Table 2, more than 46% of the contracts from their total number and more than 57% of the money spent in 2018 are accounted for by «R-PHARM» JSC.

Conclusion

To provide drugs for HAART of HIV-infected people in the Russian Federation, on the basis of information about electronic auctions held in 2018, more than 56 Government contracts were concluded, totaling more than 19 billion rubles. The main winner of the auctions for the supply of HAART drugs was «R-PHARM» JSC (11.4 billion rubles). The highest cash costs fall on the drug lopinavir + ritonavir 25%.

Purchasing drugs in the required quantity in order to perform HAART helps to reduce the number of opportunistic diseases and, as a result, increase the life expectancy of HIV-infected people, which is currently the most effective method to combat the consequences of this disease.

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URL: <http://base.garant.ru/71296222/#ixzz5WTKPvBZe>

在聚-D, L-丙交酯 - 共 - 乙交酯制剂上的基于桂利嗪的微粒
**PREPARATION OF MICROPARTICLES OF CINNARIZINE
BASED ON POLY-D,L-LACTIDE-CO-GLYCOLIDE FOR THE
DEVELOPMENT OF A NEW INNOVATIVE DOSAGE FORM**

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注释。确定实验是在可生物降解的聚合物聚-D, L-丙交酯 - 共 - 乙交酯上进行的。研究并提出了影响聚合物基质包含度的因素。

关键词：桂利嗪，聚-D, L-丙交酯 - 共 - 乙交酯，可生物降解的聚合物，微粒生产。

Annotation. *The article reflects the experimentally obtained results of the selection of the best conditions for obtaining a new prolonged dosage form of cinnarizine based on the biodegradable polymer poly-D,L-lactide-co-glycolide. Factors influencing the degree of inclusion of cinnarizine in the polymer matrix were studied and presented.*

Keywords: *Cinnarizine, poly-D,L-lactide-co-glycolide, biodegradable polymers, microparticle production.*

Cerebrovascular diseases are one of the main causes of death or disability in humans. Most often, patients have ischemic brain lesions, which can have various pathogenetic causes. For the treatment of these conditions, drugs are used to improve the blood supply and microcirculation of the brain [1,2].

The most reasonable, from the pathogenetic point of view, is the use of drugs that belong to the group of calcium channel blockers. One of the most studied and frequently used drugs is cinnarizine. Despite the wide range of indications for use of the drug and its affordability, cinnarizine has side effects [3,4]. The best known

is the ability of cinnarizine to increase the manifestations of parkinsonism, which diminish or disappear when the drug is canceled [5,6].

The development of nanotechnology in modern pharmaceutical science makes it possible to create drugs of a new generation. The basis for their creation are polymeric carriers, which are capable of forming stable micro and nano particles. The side effects of new drugs are significantly reduced by reducing the dose and frequency of taking the drug [7,8,9]. At the moment, the copolymer of lactic and glycolic acids – poly-D, L-lactide-co-glycolide has become widely studied, on its basis new long-acting drugs have been developed [10].

The physicochemical properties of cinnarizine make it possible to obtain its microparticles based on poly-D, L-lactide-co-glycolide. In order for the drug to be maximally included in the polymer matrix, it was necessary to find out how the active substances and the polymer will be introduced, the ratio of cinnarizine and poly-D, L-lactide-co-glycolide, the rate of homogenization of the solution, the concentration and the type of surfactant active substance [11].

In a series of experiments, we managed to find out that the coprecipitation method is optimal. To obtain microparticles, precise weights of cinnarizine and poly-D, L-lactide-co-glycolide were dissolved in a small volume of chloroform. After this, with constant stirring, the resulting solution of cinnarizine and poly-D, L-lactide-co-glycolide in chloroform was introduced dropwise into the aqueous solution of the surfactant with the help of a homogenizer. For complete removal of chloroform, the resulting emulsion was shaken for 10 to 24 hours. The obtained microparticles were centrifuged for ten minutes. Then repeated successive washing with purified water and centrifuging after each washing four times were repeated. The degree of inclusion of cinnarizine was determined by the method of spectrophotometry.

The degree of inclusion (CB) of cinnarizine in the microparticles was calculated by the formula:

$$CB\% = \frac{C_{\text{общ}} - C_{\text{свобод}}}{C_{\text{общ}}} \times 100\%,$$

where $C_{\text{общ}}$ – the content of cinnarizine in the finished sample of microparticles;
 $C_{\text{свобод}}$ – concentration of free (not associated with microparticles) cinnarizine [10,12].

The degree of inclusion of cinnarizine in microparticles was determined by spectrophotometry [13]. First determined the content of free cinnarizine, and then included in the microparticles.

According to the results of the experiment, the following result was obtained: the degree of inclusion of cinnarizine in microcapsules on 3% polyvinyl alcohol is more and amounts to 63.5%, in contrast to Tween – 80 - 57.48%. Consequently, in further work, polyvinyl alcohol will be used as surfactants (Fig. 1).

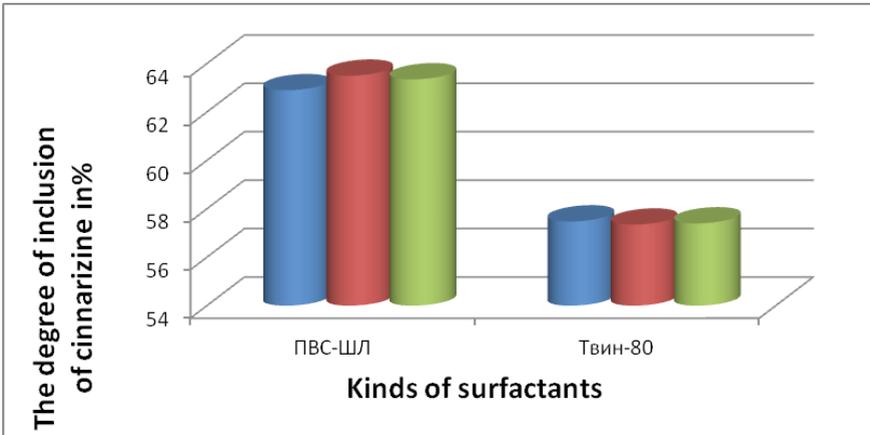


Figure 1. Dependence of the degree of inclusion of cinnarizine on the type of surfactants

It is known that when the concentration of surfactants increases, a dense hydrophilic shell forms on the surface of the microparticles, which leads to a decrease in the degree of incorporation of the drug substance into the polymer matrix. With a further increase in the concentration of the surfactants solution, the obtained microparticles acquire an asymmetric form and the inclusion of the drug in it is impossible. Therefore, it is necessary to choose the optimal concentration of surfactants for maximum inclusion of cinnarizine into the polymer matrix [10,12].

To select the optimal concentration of surfactants, cinnarizine microparticles were obtained using PVA of 1, 2, 3, 4, 5, 6% solutions. The obtained microparticles of cinnarizine were evaluated by the degree of inclusion of cinnarizine into the polymer matrix (Fig. 2).

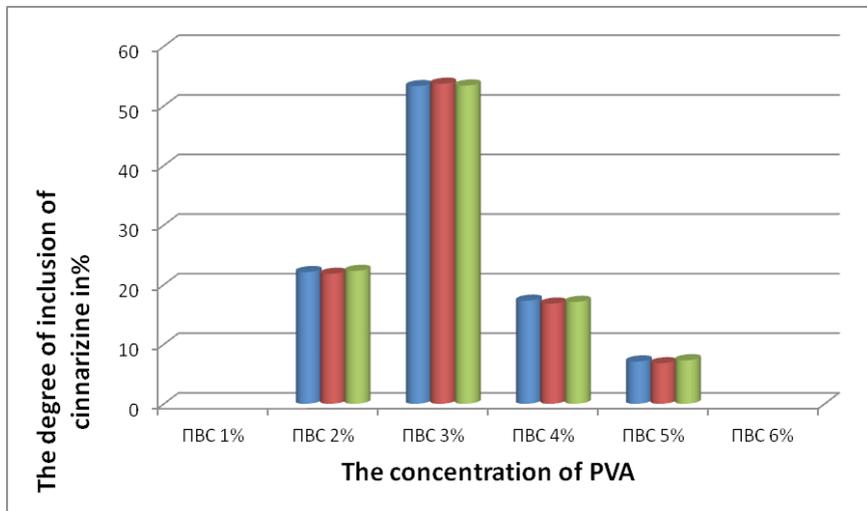


Figure 2. The dependence of the degree of inclusion of cinnarizine on the concentration of PVA

As can be seen from the obtained data, the highest degree of inclusion of cinnarizine in the microparticles is achieved at a PVA concentration of 3%.

At the next stage of research, the dependence of the degree of inclusion of cinnarizine into microparticles on the rate of homogenization was studied. Upon receipt of microparticles of prolonged action based on biodegradable polymers, the rate of homogenization has a significant impact on the degree of incorporation of the drug substance. Thus, the low rate of homogenization leads to slow evaporation of the organic solvent and an increase in the time of formation of the active surface of the polymer. This significantly increases the size of the microparticles and reduces the degree of drug incorporation. An increase in the intensity of homogenization leads to foaming [10, 14].

Cinnarizine microparticles of prolonged action based on poly-D,L-lactide-co-glycolide were obtained using an Ultra-Turrax T-18 homogenizer with a speed interval from 3600 to 24000 rpm. The obtained microparticles of cinnarizine were evaluated by the degree of inclusion of cinnarizine into the polymer matrix (Fig. 3).

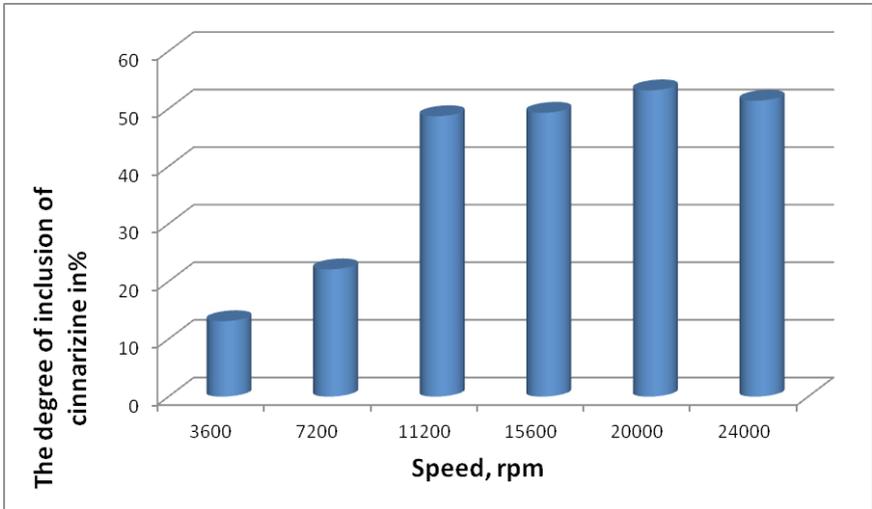


Figure 3. The dependence of the degree of inclusion of cinnarizine on the rate of homogenization

The obtained experimental data allowed us to conclude that the optimal performance of long-acting cinnarizine microparticles was observed at a homogenization rate of 20,000 rpm. A decrease in the rate of homogenization leads to an increase in the size of the microparticles and a decrease in the degree of inclusion of cinnarizine into the microparticles obtained.

One of the conditions affecting the degree of drug substance incorporation into the polymer matrix is the dependence of the ratio of the drug substance and the polymer [10,14,15].

According to the literature, an increase in the amount of polymer leads to an increase in the viscosity of the solution and an increase in particle size, which leads to a decrease in the aggregative stability of the colloidal system. This reduces the degree of incorporation of the drug into the microparticles, thus, it is inappropriate to produce microparticles in this way [10].

A series of experiments was conducted to study the effect of cinnarizine to poly-D, L-lactide-co-glycolide on the degree of inclusion of cinnarizine in the polymer matrix and selection of the optimal ratio of cinnarizine: poly-D,L-lactide-co-glycolide (Fig. 4).

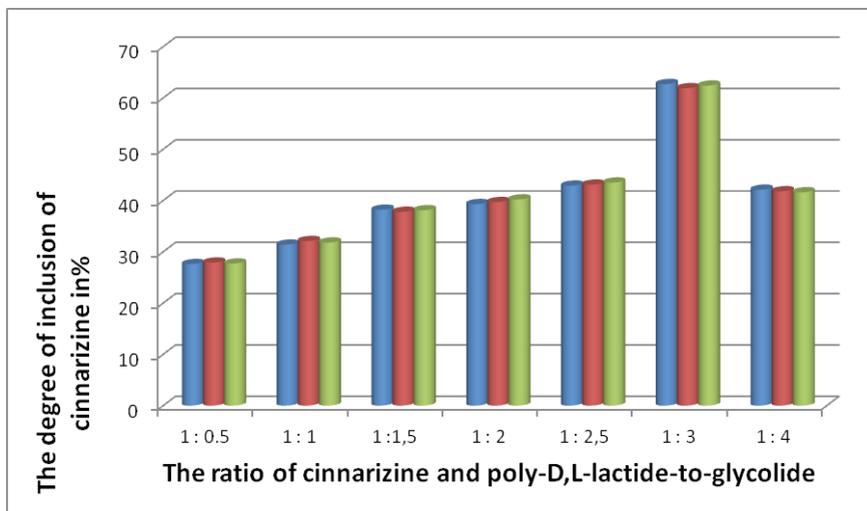


Figure 4. The effect of the ratio of cinnarizine and poly-D, L-lactide-co-glycolide on the degree of inclusion in the polymer matrix

The degree of inclusion of cinnarizine in microparticles was determined by spectrophotometry (1-1: 0.5; 2-1: 1; 3-1: 1.5; 4-1: 2; 5-1: 2.5; 6-1: 3 ; 7-1: 4).

From the data it follows that the maximum degree of inclusion of cinnarizine is observed at a ratio of cinnarizine: poly-D,L-lactide-co-glycolide - 1: 3.

One of the important conditions for the maximum inclusion of cinnarizine in microparticles of prolonged action is the sequence of introduction of the main components. Therefore, two methods were used to introduce cinnarizine and poly-D,L-lactide-co-glycolide into the resulting solution [14]. The joint dissolution of cinnarizine and poly-D,L-lactide-co-glycolide in chloroform, followed by the introduction of surfactants into the solution and the separate dissolution of cinnarizine and poly-D, L-lactide-co-glycolide in chloroform and their sequential introduction into surfactants (Fig. 5).

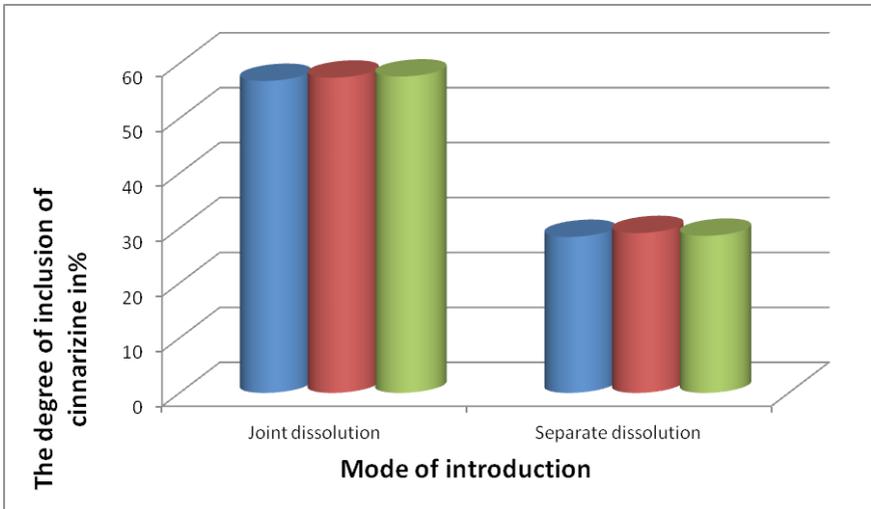


Figure 5. The effect of the order of introduction of cinnarizine and poly-D, L-lactide-co-glycolide in the solution of surfactants.

As follows from the obtained data, the order of addition of cinnarizine and poly-D, L-lactide-co-glycolide into the surfactants solution has a significant effect on the degree of inclusion. Therefore, to obtain microparticles, the first method of co-dissolution of cinnarizine and poly-D, L-lactide-co-glycolide in chloroform was chosen, followed by the introduction of surfactants into the solution.

Conclusion

Thus, optimal conditions were selected for obtaining a prolonged dosage form of cinnarizine based on poly-DL-lactide-co-glycolide, namely, as surfactants, it is most efficient to use PVA at a concentration of 3%, at a homogenization rate of 20,000 rpm, with a ratio of cinnarizine: poly -D, L-lactide-co-glycolide - 1: 3, the method of joint dissolution of cinnarizine and poly-D, L-lactide-co-glycolide in chloroform, followed by the introduction of surfactants into the solution, under these conditions the maximum inclusion of cinnarizine in the polymer matrix occurs micro particles.

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真菌多样性调查和保护
在南部的乌拉尔 (俄罗斯)

**FUNGAL DIVERSITY INVESTIGATION AND CONSERVATION
AT THE SOUTHERN URALS (RUSSIA)**

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注解。 文章讨论了研究和保护生物多样性对生物圈存在的重要性。 值得注意的是,南乌拉尔(俄罗斯)的领土以自然条件的高度独特性为特征,这影响了区域生物群的多样性。 长期研究已经允许完全确定大分子生物群的物种组成,目前包括405种。 在这些物种中,有14种被列为罕见和受威胁物种。 为了优化保护生物多样性的多样性系统,有必要监测已知种群并寻找新的地方,出于稀有的原因使用更准确的物种分级,制定保护种群的措施,同时考虑到物种的生态特性。

关键词:真菌,大酵母,多样性保护,珍稀物种,乌拉尔南部,俄罗斯

Annotation. *The article discusses the importance of the study and conservation of biodiversity for the existence of the biosphere. It is noted that the territory of the Southern Urals (Russia) is characterized by a high originality of natural conditions, which affects the diversity of regional biota. Long-term studies have allowed to fully identify the species composition of the biota of macromycetes, which currently includes 405 species. Of these species, 14 are classified as rare and threatened. To optimize the system of preservation of mykobiota diversity, it is necessary to monitor known populations and search for new localities, to use more accurate gradation of species for reasons of rarity, development of measures to preserve populations taking into account the ecological specificity of species.*

Keywords: *fungi, macromycetes, diversity conservation, rare species, Southern Urals, Russia*

The study and conservation of biodiversity is a global environmental problem whose solution is an integral part of sustainable development. The value of biodiversity lies in the fact that the disappearance from the biosphere of any species is the loss of its identified or potential properties; the species carries on non-renewable genetic resources that could be used in genetic engineering. Also, these species are like a “margin of safety” of the biosphere, because higher diversity in the systems determines their resistance to external influences [3].

Implementation of programs for the conservation and restoration of biodiversity of different levels invariably confronted with three groups of problems:

- anthropogenic load in direct or indirect form, leading to the depletion of the biotic complexes of separate regions;
- the problem of investigation of biotic complexes, which includes problem of completeness of the detection of the species composition of the biota, studying of ecological characteristics of individual species, increasing the data of rare and endangered species and definition their adequate status of rarity;
- development and implementation of forms of preservation of rare species populations which can make effective influence on preservation and/or increase their population.

The continuing incoming of data on the species composition of the biota of separate regions constantly change the overall picture of local and global biodiversity. Inventory of species composition of biota of regions previously not covered by investigations, a closer examination of a particular group of organisms previously surveyed areas bring a lot of new information about the ecology of individual species and communities, patterns of their distribution. As a result, the species considered to be the cornerstone in any region are species represented by small populations within the entire areal; species represented by single finds are random, drift; some threatened species due to climatic conditions are able to significantly increase their number. Such data make it necessary to adjust the conservation status of rare species and to adapt the forms and methods of their conservation. When dealing with such a dynamic system as biological diversity, adequate measures taken by the person for its preservation must also be dynamic. That is why lists of rare species of plants, animals, fungi are subject to periodic review.

Unfortunately, trying to preserve as many species as possible, some researchers subjectively expand the species lists, including species that are not only rare, but also “interesting”. This trend is particularly visible in some regional Lists of rare species. However, the desire to expand lists of rare and subject to protection of species complicates the conservation of biodiversity: too voluminous lists of rare species lead to a devaluation of these lists; they become primarily documents of environmental education and propaganda.

The Southern Urals region is located in the South-East of the European part of Russia and is characterized by a wide variety of natural conditions, being a place of mixing of biotic complexes of Europe, the Ural mountains, Siberia, Central Asia. The peculiarity of nature attracted many researchers who noted in the flora and fauna of the region many rare species that are included in the regional red book, the Red book of the Russian Federation, are considered rare for Europe and Eurasia.

Macromycetes are the least studied part of the region’s biota. Purposeful long-term studies of the macromycetes of the Southern Urals have led to significant

results: the number of detected species has changed from 38 (1930) to 143 (2002) [1], 157 (2006) [2], 307 (2015)[4], 405 (2018) [7]. Estimated regional fungal diversity - 850 species [6].

The issues of biodiversity conservation are an integral part of biodiversity investigations of a particular group of living organisms, therefore, the allocation of rare species of fungi of the region, the researchers addressed repeatedly. A significant amount of data collected suggests that 34.5% of the species found are single or small finds [8]. These species can be grouped into several groups for reasons of small numbers:

- relict species;
- species with low abundance within the entire areal;
- skid species;
- species with low registration capacity and difficult identification.

It is these species that should be considered rare and endangered. Currently, the official list of rare species of fungi in the region includes 14 species of fungi-macromycetes [5]. The main criterion of inclusion of that species in the list was the recognition of their rarity across the country or continent.

For example the regional Red book does not include many representatives of the genera *Antrodia*, *Postia*, *Phaeolus schweinitzii* (Fr.) Pat., *Porodaedalea pini* (Brot.: Fr.) Murrill. These species are found in pine forests and small area of these forests in the region determine their regional rarity, but for other regions of the Russian Federation, where the area occupied by pine plantations is much higher, these species are common. However, when adding fungi to the lists of threatened or endangered species in other countries was not seen as a priority. An important argument in the choice of 14 species included in the Red book is the ability to identify them in the field particularly by environmental services.

At the present level of knowledge of the regional mycobiota the optimization of system of protection of rare and endangered fungal species requires solving of some problems:

1. The need to continue work on the inventory of mycobiota species composition, discovery of new locations of rare and potentially rare species and also monitoring of previously identified populations of species with the official status of rarity.

2. In the future, when reviewing the list of rare species, it is necessary to strictly adhere to the methodological approach, according to which it is necessary to distinguish between actually rare species (few, represented by single finds, species, data on the distribution and abundance of which are incomplete or incorrect) and species for the conservation of populations of which it is necessary to take special measures. Species of the second group are candidates for inclusion in the Red book; the first group is a reserve of species that need further study to establish objective status.

3. When allocating rare species of fungi, it is necessary to provide specific measures for the conservation of their populations, since the main purpose of the red book is to preserve and restore the number of threatened species. The main reasons for the rarity of fungi are the reduction in the area of specific types of forests, indirect or, less often, direct anthropogenic impact. In some cases, the rarity of species is due to their biological and ecological characteristics, which is why they are represented by small populations throughout the area. Accordingly, the main measures for the conservation of rare species of fungi are the protection of their typical habitats and monitoring of populations.

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土壤样品中芽孢杆菌的诱导表现
**PHAGE INDICATION OF BACILLUS ANTHRACIS IN SAMPLES
OF SOIL**

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摘要。炭疽杆菌在非无菌土壤样品中的应用。B.A.噬菌体处理方法。这是浓度为 $\times 10^3$ BFU / g的配方。它由B.a.建立。炭疽杆菌 - 舒雅-15对于 (36 ± 1) °C是4小时。

关键词：炭疽芽孢杆菌，土壤，反应，噬菌体，细菌，炭疽，测定。

Annotation. *In this article the method research results of setting the reaction of phage titer growth aimed to determine Bacillus anthracis in nonsterile samples of soil. The treatment of research soil suspension with trichloromethane at the ration of 1:10, allowed us to increase sensitivity of indication method by phage B.a. Rot UGSHA of anthrax agent till the determination of concentration equal to $n \times 10^3$ BFU/g. It was established that the ideal time of exposition allowing more full cooperation of research bacteriophage B.a. Rot UGSHA with indicator crop Bacillus anthracis – Шля-15 is 4 hours of cultivation with pre growing of research material during 2 hours at (36 ± 1) °C.*

Keywords: *Bacillus anthracis, soil, reaction, bacteriophages, bacteria, anthrax, determination.*

Introduction

It is well-known that for anthrax establishing diagnosis the complex of research methods is applied. Due to methodology guidelines in laboratory diagnosis of anthrax up to the present days the main method is bacteriological diagnosis, including microscopic examination of base material, obtaining and studying the pure growth properties of disease agent, biological test for laboratory animals,

immune-serological and allergological research methods and also molecular diagnostic research, including real-time polymerase chain reaction setting [1-2].

In professional literature some methods of *Bacillus anthracis* indication in samples of soil, based on appliance of specific bacteriophages are described. They are based on specific phage property to be absorbed and reproduced in cells of homological microbe species followed by the record of this process on the basis of reaction traits. For bacillus anthracis determination the following phage indicator methods are used: reaction if phage titer growth, reaction of phage adsorption, phage titer method. At this rate in adsorption reaction of phage the specific process of irreversible adsorption phase of phage particles on bacterial cells is determined by agar-layer technique after neutralization of non-absorbed corpuscles by anti-phage serum [1, 3, 5].

However we refused *Bacillus anthracis* indication in soil using this method as Rusaleev V.S. (1988) showed the possibility of adsorption of some anthrax bacteriophages on cells of closely related species of aerobiotic bacillus. During the indication of anthrax bacillus using phage titer method cooperation in phage system cell is viewed indirectly by color change of indicator methylthiazoliltetrazolyl (rather subjective method) [4].

In spite of the fact that anthrax bacteriophage became widely used in identification of agent of disease, the question about using phage for strain typing and phage indication remains open. Phage tetrazol method and reaction of phage titer growth are recommended during diagnostic of anthrax, they didn't become widely used in diagnostic laboratories [5]. In this regard the study of specificity of setting reaction of phage titer growth and determination of application in phage indication of anthrax bacillus in soil-one of the transfer factor of infectious agent is the relevant objective.

The research goal is the determination of the effectiveness of reaction of phage titer growth for fast determination of anthrax agent in soil and optimization of method of this reaction setting.

Materials and methods

Strains of bacteria *Bacillus anthracis*-СТИ, *Bacillus anthracis* 55-ВНИИВВ и М, *Bacillus anthracis* – Шюя-15, *Bacillus anthracis* 34 F₂, 12 strains of bacteria *Bacillus mycoides*, 52 strains of bacteria *Bacillus cereus* and *Bacillus thuringiensis*, *Bacillus subtilis* – 6 strains, *Bacillus mesentericus (pumilus)* – 8 strains, *Bacillus coagulans* – 3 strains, *Bacillus megaterium* – 3 strains, received from the museum of microbiology, virology, epizootology and veterinary and sanitary expertise department of FSBEI of Higher education Ulyanovsk State Agricultural University. For bacteria cultivation beef-extract broth was used. The solid and semisolid nutrient mediums were 1,5 and 0,7% beef extract agar- agar. As the assay liquid beef extract broth was used. Nutrient medium, used in our work, had pH 7,2-7,4. Concen-

tration of sporous and vegetative culture bacteria and also bacteriophage titer were determined by agar-layer technique.

Anthrax bacteriophage B.a. Rot UGSHA was detached and selected by the group of authors in 2015 [3; 6].

The setting of reaction of ohage titer growth was conducted using instructional techniques, certified by the members of microbiology, virology, epizootology and veterinary and sanitary expertise department of FSBEI of Higher education Ulyanovsk State Agricultural University [7-10].

The research results

Taking into account that in Russian and world literature, devoted to study of specificity and diagnostic interest of phage diagnostic *Bacillus anthracis* method, there is no data pointing to any fundamental difference in phage sensitivity of attenuate and field anthrax strain, we thought fit to conduct the experiment only on the models of vaccinating and avirulent strain of *Bacillus anthracis*.

Our research on determination of fluctuating data of anthrax B.a. Rot UGSHA phage titer while storing (Table 1) has allowed to establish that in culture on strains *Bacillus anthracis* – Шуя-15 and *Bacillus anthracis* 34 F₂ it had lytic activity $n \times 10^8$ BFU/ml, which slightly has changed while storing at 2-4 °C without adding preserving agent during 12 months (lowered to $n \times 10^6$ plague-forming units (BFU)/ml; the repairer to $n \times 10^8$ BFU/ml was at three-stage passaging on indicator crop.

Table 1 - Lytic activity change of anthrax YTCXA phage while storing, number of BFU/ml

Time duration	Name of indicator crop			
	<i>B. anthracis</i> Шуя-15	<i>B. anthracis</i> 55-ВНИИВВнМ	<i>B. anthracis</i> - СТИ	<i>B. anthracis</i> Sterne 34 F ₂
Capping moment	1,0±0,1x10 ⁸	1,9±0,1x10 ⁶	1,4±0,1x10 ⁷	3,0±0,1x10 ⁸
3 months	0,7±0,2x10 ⁸	1,7±0,1x10 ⁶	1,0±0,4x10 ⁷	1,9±0,6x10 ⁸
6 months	0,1±0,4x10 ⁸	1,9±0,2x10 ⁵	0,7±0,3x10 ⁷	0,8±0,4x10 ⁸
9 months	0,7±0,3x10 ⁷	0,8±0,4x10 ⁵	0,5±0,2x10 ⁶	1,6±0,5x10 ⁷
12 months	0,4±0,2x10 ⁷	0,5±0,1x10 ⁵	1,1±0,4x10 ⁵	0,9±0,3x10 ⁷
15 months	0,6±0,3x10 ⁶	0,8±0,2x10 ⁴	0,7±0,2x10 ⁵	0,2±0,1x10 ⁷
18 months	0,3±0,1x10 ⁶	0,5±0,1x10 ⁴	2,6±0,5x10 ⁴	1,3±0,4x10 ⁶
21 months	0,8±0,2x10 ⁵	0,2±0,1x10 ⁴	1,1±0,3x10 ⁴	0,6±0,3x10 ⁵

Initially we conducted the research using artificially contaminated *Bacillus anthracis* – ШЮЯ-15 as the test sheet of the sterile sample of soil. Experimentally we established that the pre-growing of the material during 5-24 hours at 3 hour intervals and cultivation of inoculations within thermostat at $(36 \pm 1) ^\circ\text{C}$ between 5 and 24 hours (interval was also 3 hours) allows us to conduct the bacteria *Bacillus anthracis* – ШЮЯ-15 indication in sterile soil samples during the reaction of phage titer growth in concentration $n \times 10^3$ micron/ml. The analogue concentration of *Bacillus anthracis* – ШЮЯ-15 can be discovered in this reaction without using the stadium of pre growing of the research material during temporary cultivation exposition (phage + indicator crop) equal to 5 hours. It was established that the time for the reaction of phage titer growth is about 24 hours.

The second stage of our research was elaboration of reaction of phage titer growth on nonsterile samples of soil, artificially contaminated *Bacillus anthracis*. The research results showed that the reaction of phage titer growth within phage indication of anthrax agent in soil is $n \times 10^3$ CFU/g of sterile soil against $n \times 10^4$ - 10^7 CFU/g for nonsterile samples. It is explained by the competitive growth of closely related species of aerobiotic saprophytic bacillus. It should be noted that sensitivity of reaction of phage titer growth during the research of artificially infected samples of nonsterile soil fluctuated.

The next set of experiments was devoted to detailed analysis of method of phage titer growth and identification of possible reasons of its low sensitivity. It should be noticed that during the experiments the liberation of research test from contamination by aerobiotic sporogenous saprophytes by heat at different temperatures and getting the set goal. Besides the physiological salt, recommended for cell dilution during the determination of phage titer in reaction of phage titer growth is isotonic only towards mammal cells, but its usage for bacteria dilution lowers their germinating power for 50 % or more, changing the reaction results.

With the purpose of full escape of microbial contamination of research samples of nonsterile soil we tested the following procedure. It was that in flasks under research, after incubation, we added trichloromethane (chloroform) at the rate of 1 ml/10 ml of research fluid. The content was carefully mixed and left at room temperature for 30-40 minutes. After seeding of chloroform to the bottom the top of the fluid was tested for phage presence. This procedure can be changed to 3-stage filtration: 2 stages of bioburden reduction microfiltration through Vladipor membrane of МФАС-ОС-3 with the pore size of 0,8 micron, then МФАС-ОС-2 with the pore size of 0,45 micron and sterile filtration with the help of filter conductor «Millipore Millex-GP» with polyester-sulfone filler and pore diameter of 0,22 micron. But this procedure increases the reaction cost.

Carrying in methodology of the setting of phage titer growth aiming to indication of anthrax microbe, such additional technique as processing suspension with

chloroform allowed to raise the sensitivity reaction during the research of non-sterile samples of soil till the determination of concentration equal to 10^3 CFU/g. At such modification of reaction of phage titer against the soft lawn of indicator crop, clearly distinguished negative colonies are observed, which number in test sample was 5-10 times larger than in blank sample.

After elaboration of release technique of research material from subtend microflora we optimized the whole map of setting of reaction of phage titer growth in nonsterile samples of soil. During the optimization procedure of setting of reaction of phage titer growth we used two variants of areas-growth of research material and further growth of composition (phage+culture) at (36 ± 1) °C and elaborated in sterile samples of soil areas-growth of composition (phage+ culture), during 5 hours at (36 ± 1) °C. In both cases the experiments were conducted using infesting dose of *Bacillus anthracis* – Шля-1510²-10⁴CFU/g of soil. Experimentally it was established that the growth during 2 hours guarantees emergence of seedlings more 60% spores of *Bacillus anthracis*, transferred into research sample.

During further infestation of early vegetative culture by indicator phage it was necessary to set the accurate optimal time, providing the fullest interlocking phage with cells and its further reproduction, that is to decide an issue about conditions, necessary for determination of *Bacillus anthracis* in research substrate by the growth of plague-forming unit number.

The Research Results

At this rate the experiments in optimization of setting of reaction of phage titer growth showed that for the discovery of anthrax bacillus in nonsterile soil in laboratory setting the most optimal is pre growing of research material during 2 hours at (36 ± 1) °C with further phage infestation and mixture incubation during 4 hours at (36 ± 1) °C.

For the determination of setting of reaction of phage titer growth using B.a. Rot YTCXA the research of samples of soil was conducted, they were infested by *Bacillus mycoides*, *Bacillus cereus*, *Bacillus thuringiensis*, *Bacillus subtilis*, *Bacillus mesentericus (pumilus)*, *Bacillus coagulans*, *Bacillus megaterium* in single crop. The results were negative.

On the ground of available data during the experiment we think that the most effective for setting of reaction of phage titer growth aimed to *Bacillus anthracis* indication in nonsterile samples of soil are the following procedures and parameters:

- flasks with samples of soil, entitled to research, after adding indicator phage and relevant period of incubation we added trichloromethane (chloroform) at the rate of 1 ml/10 ml of research liquid. The content was carefully mixed and left at room temperature for 30-40 minutes. After seeding of chloroform to the bottom the top part of the liquid was tested for phage presence, it is possible to use 3-stage filtration: 2 stages are clarifying and 1 stage is sterilizing through membrane filter

of Millipore (filter type: 0,22 μm GV);

- optimal time of exposition allowing the fullest cooperation of research bacteriophage with indicator crop, this is 4 hour cultivation with pre growing of research material during 2 hours at $(36 \pm 1) ^\circ\text{C}$;

- working dilution procedure – 10^2 BFU/ml.

At above mentioned parameters the number of reaction of phage titer growth using anthrax bacteriophage B.a. RotYTCXA, obtained and selected by the authors in 2005 is 10^3 m.k./ml.

It was determined that anthrax bacteriophage B.a. RotYTCXA is able to intracellular development cycle in nonsterile samples of soil with pH 3,4-8,2.

The complex time interval, expended to setting of reaction of phage titer growth is about 26 hours = 30 minutes (trial establishment) + (2+4) hours (time of cultivation seeding) + 40 minutes (trichloromethane treatment) + 30 minutes (seeding by *Gratia*) + 18 hours (time of cultivation seeding).

We consider that the reaction of phage titer growth is simple, but the advanced quantitative method of infectious agent discovery without detachment of pure growth which can be applied along with research methods for indication and identification of pathogene.

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大学单身汉的心理生理学培训
**PSYCHOPHYSIOLOGY TRAINING OF BACHELORS
IN UNIVERSITY**

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注解。文章证实了未来经济学家对心理生理学培训的必要性，以提高专业发展的有效性，保护身心健康。已经开发出一种放松心理物理调节的过程。该课程包括关于功能状态自我调节的心理训练。与对照组的学生进行比较，显示了引入有机体心理状态的课程结果。课后，放松的学生表现出中枢神经系统的活动能力增加和疲劳减少；揭示了心血管系统的功能张力降低和中枢神经系统功能水平的提高。分析了松弛对身体心理生理功能的有益作用机制。建议在经济学学士学位的编制中使用放松心理物理调节课程。

关键词：学士，心理生理学，自我调节，心理卫生

Annotation. *The article substantiates the need for the psycho-physiological training of future economists to increase the effectiveness of professional development and preserve psychosomatic health. A course of relaxation psychophysical regulation has been developed. The course included psycho-training on self-regulation of the functional state. The results of the introduction of the course on the psychophysical state of the organism are shown in comparison with the control group of students. After class, relaxation of students showed an increase in mobility and a decrease in fatigue in the central nervous system; revealed a decrease in the functional tension of the cardiovascular system and an increase in the functional level of the central nervous system. The mechanisms of the beneficial effects of relaxation on the psycho-physiological functions of the body are analyzed. It is recommended to use the course of relaxation psychophysical regulation in the preparation of bachelors in economics.*

Keywords: *bachelor, psychophysiology, self-regulation, mental hygiene*

The system of professional training needs to be improved. High professionalism does not eliminate the problem of the “human factor”. In colleges and universities, the emphasis is mainly on professional problem-solving methods. The

specialist is able to solve the professional side of the tasks set, but is not prepared for how to solve problems in a tense situation, in conflict and limited resources.

The ability to psychophysical regulation (PPR) - the leading quality of the body, is used to mobilize and develop the reserve capacity of the body [1]. It is characteristic that with the help of special psychophysical exercises, a person can change his mood, well-being, functional state, and regulate behavior at will.

Nowadays, the attention of scientists is increasingly attracted by ways of psychological security of a person. So, in order to improve occupational safety, methods of vibroimaging and profiling are being developed [2,3]. Unfortunately, neither in secondary school nor in higher education do not pay enough attention to psychophysical training, methods of stress prevention, psychological protection, self-knowledge and the development of psychophysical qualities.

The aim of research is to develop and implement a course of psychophysiological bachelor's economic direction.

Research methods. The program of relaxation psychophysical regulation (Popova [4]), developed and patented by us, is based on psychophysical exercises aimed at training those involved in the rapid achievement of deep relaxation of the body. At the same time, relaxation develops due to concentration of attention on imaginary or real objects, for example, on the spine, or other parts of the body. The program also contains a theoretical section on the basics of the psychophysiology of learning, memory, emotions, adaptation of the body to stress, and special training to develop the skills of optimal behavior in unpredictable or extreme situations, training in protecting individuals from manipulation, methods of psychological protection

24 students (12 boys and 12 girls), engaged in the system of relaxation psychophysical regulation, and 22 students of the control group (11 boys and 11 girls), not engaged in relaxation, were investigated. Electroencephalography techniques, measurements of heart rate and blood pressure, as well as recording of electrocardiogram for 5 min (cardiointervalography) were used, with the calculation of statistical indicators of heart rate variability (according to Baevsky) [5], which allows to characterize the activity of the central nervous mechanisms of regulation. To assess the properties of the central nervous system, a modified computer tapping test was used. [6].

All subjects gave voluntary informed consent in accordance with the protocol approved by the ethics committee of the Russian Academy of Sciences.

Results.

Our studies revealed uneven changes in brain bioelectrical activity during relaxation. In the final period of the relaxation state formation, a pronounced generalization of alpha and theta activity was observed in the low-frequency region (8 Hz) with a slight predominance of power in the right hemisphere. It should be

noted that the subjects described this state as a state of euphoria.

After 6 months of relaxation on the electroencephalograms of the subjects, changes were revealed indicating the harmonization of interhemispheric and cortical-subcortical relationships, for example, an increase in the severity of alpha-rhythm index power in all leads, including in the right hemisphere. After leaving the state of relaxation, the subjects felt an increase in mood and well-being, a surge of strength.

Most of the subjects after the PPR course revealed a decrease in the heart rate (HR) from 78 ± 1.5 to 72.3 ± 2.4 beats / min ($P < 0.05$), systolic blood pressure from 115 ± 3.7 to 107 ± 2.8 mm Hg. st. ($P < 0.05$), as well as a slight decrease in diastolic pressure. After completing the course with relaxation exercises, there was a decrease in the activity of the central mechanisms of heart regulation, for example, the amplitudes of the mode — by 8–15%, and the stress index — by 20–30 sr. units (tab. 1). In the control group, there were no significant changes in the functional parameters of the heart after passive wakefulness, only a tendency to a decrease in heart rate and blood pressure was noted.

Table 1. Changes in heart rate variability after a course of psychoregulation.

Indicators	Mo, ms	Mo1	Δx , ms	$\Delta x1$	AMo, %	AMo1	IN, cond. units	IN 1
Boys	0,7±0,1	0,8±0,05	0,3±0,1	0,4±0,05	47±2,6	39±2,0*	94±1,1	65±3,5*
Girls	0,6±0,05	0,65±0,05	0,2±0,05	0,3±0,04	49±2,8	42±4,9	96±4,2	75±5,1*

* - significant differences with baseline ($P < 0.05$); indicators with figure 1 - after the course.

Thus, after a course of classes on the program of relaxation psychophysical self-regulation in the test-students, a decrease in the functional stress of the cardiovascular system was noted.

It is characteristic that, according to the tapping test, an increase in mobility, especially in men, and a decrease in “central” fatigue were revealed, which seems to be an important factor in the prevention of adjustment disorders (Table 2). In the control group, the indicators of the tapping test practically did not change during the study period, with the exception of the increase in the indicator of fatigue in girls (from 3.5 ± 1.8 to 7.5 ± 1.7 ; $P < 0.05$).

Table 2. Indicators of mobility of nerve processes and fatigue in subjects (by tapping test)

sex	10 second intervals				F
	1	2	3	4	
M	48,0±3,1	45,7±2,5	48,0±3,2	43,1±3,0	4,1±0,5
M1	53,0±3,2	55,7±2,7*	54,0±2,6*	50,1±3,3*	2,2±0,6*
w	41,0±2,4	43,0±3,1	42,5±2,9	39,8±2,2	2,1±1,7
w1	43,8±2,4	44,5±3,0	47,0±3,7	42,5±2,8	1,6±0,6

M1 and W1 - indicators after a course of relaxation; * - significant differences with baseline (P <0.05); F - fatigue.

The results of the survey showed that students engaged in the program of relaxation psychophysical regulation showed an increase in interest in basic subjects, increased self-confidence, if necessary, to solve professional tasks. As a result of the survey, it turned out that the incidence in the group where subjects were regularly engaged in relaxation self-regulation was lower than in the control group.

All these data indicate that the exercise psychophysical exercises cause changes in the functional state, which are characterized by the normalization of both vegetative functions, cortical-subcortical relationships, and psycho-emotional state.

Discussion

The course of knowledge in psychophysiology and self-regulation is necessary for any modern person who claims to be a high professional. The task of education is to teach a person how to meet the needs acceptable by the society in which he lives. It is necessary to develop a stereotype of an adequate mental reaction in a person, at least at the level of immunity to simple speech aggression.

The positive impact on the function of the nervous system of classes in the program of psycho-physiological preparation of students is largely due to the effects of relaxation, as a special functional state of the body. Regular relaxation exercises lead to the restoration of a balance between the processes of excitation and inhibition. A person who regularly engages in relaxation techniques is characterized by balance and preservation of self-control in extreme situations. Functional stress is an important success factor in work and cannot be harmful to a person if alternated with relaxation, which accelerates energy recovery. Currently, there is a large selection of relaxation techniques, having mastered which a person can change his state at will and control the regenerative processes in the body.

It has long been known antistress value classes relaxation exercises [7]. Relaxation helps to optimize the psychophysiological state of a person, including in stressful situations, thanks to the systematic exercise of sympatho-parasympathet-

ic (tensor-relaxing) functional systems provides the adaptive effect of the limbic and hypothalamic regions directly in the process of stress influence.

Culture is manifested in the ability to live in harmony with others, lead a conversation and organize meetings, write personal and business letters, listen and hear people, organize their personal lives and leisure. This cannot be learned even in the most prestigious vocational school [8].

Conclusion

Economic professions are at risk of developing professional burnout and psychosomatic disorders [9]. It is impossible the successful functioning of the risk management system without adequate personnel readiness to work in a dynamic external environment and high uncertainty. The ideology of risk management, in our opinion, should be based on the principle that risk management begins, is based and ends with training. Therefore, we pay great attention to the psychophysical training of future professionals studying in the economic field.

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甲状腺适应自然和极端环境条件的形态功能方面
**MORPHOFUNCTIONAL ASPECTS OF THYROID ADAPTATION TO
NATURAL AND EXTREME ENVIRONMENTAL CONDITIONS**

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注释。这是一个健康的环境因素的概念。本文介绍了环境和城市环境的结果。这是伊尔库茨克市和河三角洲的河流。

关键词：麝鼠，试验对象，生物指示剂，甲状腺，甲状腺细胞，伊尔库茨克，Novo-Lenino，马术岛，Solnechny microdistrict，Selenga delta

Annotation. *The article is devoted to the problem of morphofunctional reorganization of the thyroid gland as an adaptive response that protects the body from the effects of harmful environmental factors. The paper presents the results of a comparative study of the ability to adapt in mammals living in natural conditions and the urban environment. The object of the study was the muskrat (*Ondatra zibetica*) captured in various districts of the city of Irkutsk and in the region of the Selenga river delta.*

Keywords: *muskrat, test object, bioindicator, thyroid gland, thyrocytes, Irkutsk, Novo-Lenino, Equestrian Island, Solnechny microdistrict, Selenga delta*

Introduction.

Identifying patterns of morphofunctional state of the endocrine glands is one of the fundamental problems not only for morphology and endocrinology, but also for ecological and physiological studies of various natural and geographical territories.

In this regard, of particular interest is the study of the morphofunctional status of the thyroid gland as the leading link in the humoral regulation of physiological processes occurring in the body [2].

As you know, the thyroid gland plays a primary role in the regulation of cell metabolism, growth and development of the organism, as well as in its protective and adaptive reactions, due to the influence of external environmental factors.

Muskrat is one of the most important commercial species, giving valuable skin in large quantities. The economic feasibility of acclimatization of this animal in the Baikal region is not in any doubt [7].

Due to changes in the natural habitat, the muskrat is forced to move to the territory of human settlements, in a particular case existing under the extreme conditions of the urban environment in different parts of the city of Irkutsk, being under anthropogenic impact, successfully adapted and due to its abundance, breadth and ease of study, we use it in ecology histological studies as a bioindicator [11].

Conditions and methods of research. The material was collected during field expeditions from conditionally healthy mature individuals in different areas of the city of Irkutsk, where muskrat populations (*Ondatra zibetica*) were noted, as well as in natural environment in the Selenga delta region. Age was determined using special techniques [4]. We considered it necessary to provide some information about the areas of collection of experimental material.

The Angara is the only river flowing out of Lake Baikal on the banks of which the city of Irkutsk is located. Selenga is a major waterway that flows into Lake Baikal and provides up to half of the annual water flow into the lake, when flowing into Lake Baikal forms a vast delta of 680 km².

Information about the areas of production, the number and sexual status of animals are given in Table 1.

Table 1 - Information about the research material

Areas of collecting experimental material		Number of animals (n=)	
		Males	Females
Districts of the city of Irkutsk	Novo-Lenino	9	6
	Ostrov Konnyj	6	5
	Micro-District Solnechnyj	10	7
Kabansky district Republic of Buryatia	Selenga river delta	27	33

For histological studies, the muskrat thyroid glands were fixed in 10% neutral formalin, a neutral fixing Shabadash mixture and in Carnoy fluid, paraffin sections 5-7 μm thick were stained with hematoxylin-eosin and by the method of van Gison [10]. Histological preparations were studied using a Levenhuk microscope. Micro morphometric measurements were made using the software “Levenhuk C 510 NG 5 M pixels” taking into account the work of classical authors [9].

To assess the morphological criteria for functional activity of the thyroid gland, the following indicators were investigated:

The shape and average diameter of the follicles, their number in sight.

The volume of follicles (based on the concepts of follicles as ellipsoids) according to the formula:

$$V = \pi \frac{L \times B^2}{6}$$

where L and B are the larger and smaller diameter of the follicle.

The average area of thyrocytes (based on the shape of the trapezium) according to the formula [5, 6]:

$$S_k = \frac{n_1 + n_2}{2} \times h$$

where S_k is the cell area, h is the height of the cell, n_1 and n_2 are the larger and smaller base of the cell (trapezium).

The functional activity of the thyroid gland was assessed by calculating the follicular-colloid index (Brown index), which indicates the ratio of the relative volumes of the follicular epithelium and colloid (functional activity is directly proportional to the relative volume of the epithelium and inversely proportional to the relative volume of colloid).

In the study of the thyroid gland, we were guided by the relevant works [3, 8].

The obtained numerical data of micrometric indicators were subjected to statistical processing using the computer programs Microsoft Excel and Biostatica.

The purpose of these environmental and histological studies is as follows: using muskrat as a bioindicator that lives in the urban environment of Irkutsk and in natural conditions in the Selenga river delta, to assess the ecological situation of the studied areas, analyzing the morphofunctional indicators of the thyroid gland.

Research results and discussion.

Morphofunctional characteristics of the thyroid gland of the muskrat living in the conditions of the Novo-Lenino district (north-western outskirts of the city). The thyroid gland of animals of this group has a typical follicular structure. The main structural components of an organ are follicles of various shapes and sizes. The tendency to the numerical predominance of follicles of round and oval forms is clearly seen. On the periphery of the lobes, as a rule, larger ones are located, and in the center - smaller follicles. In animals of this group, the greatest functional activity of the thyroid gland is noted, which is expressed in the destruction of some follicles; thyroid epithelium is in a state of degeneration and desquamation. In the follicles the colloid is liquefied and has vacuoles, in some follicles the colloid is practically absent, which indicates the active influx of the hormone from the latter into the bloodstream. In the same group, the highest morphometric indicators of the structural elements of the organ were noted, such as the average diameter and volume of the follicle, the height and area of thyrocytes, as well as

the minimum value of the Brown index (Table 2). It attracts the fact that all the studied parameters are somewhat higher in females compared with males.

Morphofunctional characteristics of the thyroid gland of a muskrat living in the conditions of the Ostrov Konnyj (city center). Significant histological differences in the organization of the thyroid gland in animals of this experimental group were not observed compared with the previous one, but there is a decrease in the morphometric parameters under study (Table 2).

Morphofunctional characteristics of the thyroid gland of the muskrat living in the Micro-District Solnechnyj (south-western suburb of the city). In the thyroid gland of animals of this group, the arrangement of follicles is characteristic of that in the previous groups. Along the periphery there are larger follicles in which flattened thyrocytes are found, the central portions of the shares of which are represented by smaller follicles with cubic or low prismatic thyrocytes. It should be noted that relatively small follicles appear among the follicles of the peripheral zone. The morphometric parameters of the thyroid gland in animals in this group are lower compared with the previous groups (Table 2).

Morphofunctional characteristics of the thyroid gland of the muskrat living in the conditions of the Selenga river delta (Kabansky district, Republic of Buryatia). In this experimental group, a slight decrease in the size of the follicles of the peripheral zone is observed in the thyroid gland of the muskrat. Some of them acquire an irregular shape. In general, small-sized follicles predominate in the organ. Some of them contain dense homogeneous colloid with a uniform edge, others - a colloid of lower density with a scalloped edge. Most thyrocytes have a cubic or low prismatic form. In the studied animals of this group, the smallest morphometric indicators of the functional elements of the thyroid gland are noted (Table 2) in comparison with the previous groups, sexual dimorphism is also observed (in females, the indicators are higher).

Table 2 - Morphometric parameters of the thyroid gland of the muskrat depending on sexual activity

Indicators		Areas of collecting experimental material			
		Novo-Lenino	Ostrov Konnyj	Micro-District Solnechnyj	Selenga river delta
Capsule thickness (µm)	♂	7,18 ± 0,17	7,54 ± 0,09	8,15 ± 0,17	8,02 ± 0,04
	♀	6,14 ± 0,16	7,60 ± 0,09	7,15 ± 0,09	7,02 ± 0,05
The number of follicles in sight	♂	126,80 ± 3,53	123,20 ± 2,79	112,20 ± 2,79	114,00 ± 2,80
	♀	136,20 ± 2,83	130,00 ± 3,82	116,80 ± 3,53	116,76 ± 2,83

The average diameter of the follicles (μm)	♂	50,36 ± 0,52	48,32 ± 0,29	45,36 ± 0,52	43,72 ± 0,31
	♀	52,40 ± 0,37	52,37 ± 0,36	50,46 ± 0,48	47,35 ± 0,29
The average volume of follicles (μm^3)	♂	853,87±14,26	821,59±12,43	653,87±13,26	518,04±10,22
	♀	865,67±14,28	846,60±14,26	670,67±12,46	521,59±9,43
Thyocyte height (μm)	♂	14,71±0,12	14,20±0,02	12,21±0,06	11,01±0,06
	♀	16,86±1,83	16,21±1,60	14,21±0,10	12,55±0,08
The average area of thyrocytes (μm^2)	♂	223,04±0,70	220,04±0,72	212,54±0,70	210,62±1,52
	♀	234,05±0,63	230,12±1,54	214,43±1,55	212,32±0,66
Brown's index (unit)	♂	3,4	3,4	3,7	4,0
	♀	3,2	3,2	3,5	3,7

Note: ♂- males; ♀- females.

Conclusion.

As a result of our research and analysis of morphofunctional parameters of the thyroid gland of the muskrat depending on the habitat (under the conditions of anthropogenic impact and in natural conditions), an increase in the average diameter and volume of follicles, height and area of thyrocytes in the studied animals living in the Novo-Lenino and the Ostrov Konnyj by 10.8%, $p \leq 0.05$ compared with the individuals living in the Micro-District Solnechnyj, and by 15.4%, $p \leq 0.05$ compared with the area of the Selenga delta.

Such an important indicator of the functional activity of the thyroid gland is the Brown index, and it should be noted that the lower its quantitative value, the higher the functional activity of the gland. According to the results of our research, the indicator of the Brown index in the experimental groups of the Novo-Lenino and Ostrov Konnyj is lower by 10.2%, $p \leq 0.05$ compared to those in the Micro-District Solnechnyj and by 15.0%, $p \leq 0.05$.

The increase in the average diameter and volume of follicles, the height and area of thyrocytes in the thyroid gland is due to the presence of a large number of large follicles on the background of the overall microfollicular structure of the parenchyma, indicating a hyperfunction of the thyroid gland in the muskrat existing in the Novo-Lenino and Ostrov Konnyj, which due to increased secretion activity

of thyroid parenchyma and may contribute to the formation of long-term adaptation in extreme conditions of the urban environment.

In contrast, the bulk of the follicles of the thyroid gland in a muskrat living in the Micro-District Solnechnyj and the Selenga river delta are of medium and small size, which indicates the normal functional state of the organ.

Reported sexual dimorphism in the increase in morphofunctional parameters of the muskrat thyroid is quite consistent with the literature data [1].

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鉴定农业鸟类

**IDENTIFICATION OF ESCHERICHIA CULTURES ISOLATED
FROM SICK AND FALLEN AGRICULTURAL BIRDS**

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注释。给出了沉默的农业动物。

关键词：培养，形态，文化，抗原性，致病性

Annotation. *The data on the identification of Escherichia cultures isolated from sick and dead agricultural birds are given.*

Keywords: *culture, morphological, cultural, antigenic properties, pathogenicity*

Introduction. Escherichiosis of young birds is widespread in various countries and in Kazakhstan. Damage from the disease is composed of the case, reducing weight gain.

The development of the disease depends on the specific taxonomic position of the pathogen, as well as on the conditions of detention and feeding of animals. Escherichiosis from other infectious diseases has some peculiarities: it manifests itself mainly at an early age, the causative agent is conditionally pathogenic enterotoxigenic *Escherichia coli*, which has adhesiveness, the formation of thermolabile enterotoxin and invasiveness [1, 2].

The disease can occur at any time of the year, but more often in winter, spring and summer. The reasons are the accumulation of the pathogen in the premises,

reducing the body's resistance, increasing the percentage of chickens, the lack of isolation of patients, violations of veterinary and sanitary requirements.

The main factors that reduce the resistance of the body and contribute to the emergence of the disease are:

- poor feeding, insufficient control over feed quality (toxicity, presence of conditionally pathogenic microflora, etc.);
- high content in the premises of harmful gases that adversely affect the body of animals;
- Anatomical and physiological features of the body of newborns;
- bacteriocarrier of breeding stock;
- low veterinary and sanitary culture in poultry houses.

A certain role in the spread of colibacillosis as carriers is played by people, rodents, insects. An identical release of the same serovars of pathogenic *Escherichia* from diseased animals, people, and the environment was observed, which indicates the possibilities for a wide exchange of pathogens.

The active use of antibiotics and other chemotherapeutic drugs in medicine and veterinary medicine has led to environmental shifts, to a change in the biological properties of *Escherichia*. Analysis of these changes makes it possible to evaluate the epidemiological features of modern escherichiosis, which occupy a significant place in intestinal pathology.

Materials and methods. Modern certified and standardized biochemical, microbiological, molecular biological studies were used in the work.

Cultures studied morphological, cultural, biochemical properties according to generally accepted schemes [3].

Identification of the isolated cultures was carried out according to the Berge determinant [4].

In experiments on laboratory animals and chickens studied the pathogenicity of cultures isolated from dead, sick and healthy birds.

For mathematical processing of the results, standard methods for finding the mean values and their mean errors will be used.

Research results. As a result of bacteriological studies, we isolated from poultry - 210 cultures of *Escherichia*, from them - from sick animals - 104 cultures, from fallen - 84 and from feces - 22.

The isolated cultures of *Escherichia* possessed typical cultural and biochemical properties. On the Endo medium, growth was observed in the form of juicy round, smooth colonies of red and crimson color, were mobile, formed indole and did not liquefy gelatin.

According to our data, out of 210 cultures, hemotoxin was produced - 88.1%, of which beta-hemotoxin - 78.3%, alpha-hemotoxin - 11.1%, delta-hemotoxin - 1.6%, mixed type of hemotoxin (beta and alpha-hemotoxin) - (9%).

It should be noted that out of 210 cultures of *Escherichia* producing hemotoxins were isolated from dead birds - 122 (58.2%), patients - 53 (25.4)

We have studied the presence of adhesive antigens in 210 cultures of *Escherichia*. The adhesins of *Escherichia* perform the role of a trigger mechanism in the infectious process, providing the microorganisms with the ability to attach themselves to the epithelial surface of the intestine and colonize it, and then act on the organism with enterotoxins. Colonization of the intestine by pathogenic *Escherichia* is an essential step in the pathogenesis of *Escherichiosis*.

As a result of studies, it was found that out of 210 cultures of *Escherichia* - 39.9% gave a positive agglutination test with serum K99; 10.5% - with serum F41; 14.1% - with serum K88; 1.0% with serum 987P; 1.0% - with A20 serum, as well as in associations F41 + K99 - 4.7%, K99 + K88 - 6.8%. Revealed adhesion negative cultures - 25 strains.

When typing 185 adhesion-positive cultures of *Escherichia*, using O-type specific agglutinating serum, were assigned to the following serovars: 08 (1.5%), 09 (1.9%), 020 (8.4%), 0101 (62, 2%), 0138 (11.2%), 0141 (25.7%), 0142 (20.2%) (0149 (1.9%). It was established that the 08, 09, 0141 serovars have adhesive F41 antigen; 020, 0101 - K99; 0138 - A20; 0142 - K88; 0149 - 987P.

We have conducted studies to determine the relationship between pathogenicity and the presence of adhesive antigens in adhesion positive strains of *Escherichia* isolated from patmaterials. In total, 25 strains with the presence of adhesive antigens K99, K88, F41, A20 and 987P were tested in the experiment.

The virulence properties of *Escherichia* cultures were determined by running a biological sample on white mice, weighing 14-16g. Laboratory animals were infected with a washout of daily agar culture of *Escherichia* with saline. Infection was performed intraperitoneally at a dose of 109 CFU.

Of the experimental mice infected with adhesion-positive cultures of *E.coli* died within the first 3 days - 48.2%, after 4-7 days - 17.3%), 34.5% of the experimental mice survived 7 days after infection. From the internal organs of all the dead and surviving from infection of mice, infective cultures were sown abundantly.

The results of the conducted studies showed that there is a definite connection between virulence and detection of adhesive antigens. At the same time, the combination of virulence of cultures and the presence of adhesive antigens in *Escherichia* isolated from birds varies at the level of 70.6%, i.e. of 185 *Escherichia* cultures in which adhesive antigens were found, 154 were pathogenic for white mice.

We found that the most pathogenic for white mice are serotypes 020 (K99), 0101 (K99), 0141 (F41), 0142 - K88 and serotypes 0101 and 0141, which have combinations of K99 + F41 adhesins.

In order to confirm the results of experimental studies on laboratory animals

on the pathogenicity of adhesin-positive strains of *Escherichia*, experiments were conducted to study the pathogenicity of adhesin-positive strains of *Escherichia* on chickens.

To infect experimental animals, we used an adhesin-positive strain of *Escherichia* isolated from *E. coli* 55 chickens (0101-K99). As a control, we took the reference *E. coli* 81 strain, taken from VGNKI (Moscow). The chicks were infected in doses of 10⁸, 10⁹, 2x 10⁹, 3x 10⁹, 5x10⁹ CFU. Experimental animals mostly died 8-12 days after infection with obvious signs of colibacillosis. Bacteriological examination of materials from dead experimental animals was carried out. Infectious cultures were constantly identified.

Thus, it was established that 210 cultures isolated from birds by morphological, tinctorial, cultural, antigenic properties corresponded to the *Escherichia* genus, produced hemotoxins, had adhesive antigens and were highly virulent.

In the studied *E. coli* cultures, adhesins were detected both individually and in combinations. It has been established that there is a definite correlation between the virulence of *Escherichia* and the ability to produce adhesive antigens. The combination of virulence and the presence of adhesins was detected in 75.2% of the studied *E. coli* cultures. The data show that *E. coli* isolated from sick and dead birds with signs of diarrhea, produce fimbrial adhesins, which indicates their enormous role in the pathogenesis of the disease. Therefore, when developing more advanced methods for the prevention of enteroinfection of animals, it is necessary to take into account this pathogenicity factor, which will make it possible to develop effective means of prevention.

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水肿的病因

**ETIOLOGY OF EDEMA DISEASE OF PIGLETS AND
IDENTIFICATION OF ISOLATED CULTURES**

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注释。有许多患者已经患有这种疾病。

关键词：仔猪，水肿，生物学特性，致病性

Annotation. *The data on the study of the etiology and identification of the isolated cultures from fallen, patients with edematous disease and from healthy piglets are presented.*

Keywords: *piglets, edema, biological properties, pathogenicity*

Introduction.

The problem of colibacillosis of animals is becoming increasingly important. This is due to the wide circulation of numerous serovars of *Escherichia* in nature, the polydeterminantity of virulence factors of pathogens, etiology, a variety of ways of introduction into the organism of animals and humans. The damage caused by these diseases is not only in the case of animals, but also in the fact that the animals that have been ill for a long period of time are carriers and become a constant source of contamination of the environment. Products of animal origin (meat, milk, eggs) obtained from carrier animals with insufficient heat treatment can cause food toxicoinfection in humans.

All this causes the study of the epizootic and epidemiological situation of this

infection, the opening of the main driving forces of the infectious process, as well as the improvement of therapeutic and specific prevention and the development of veterinary and sanitary measures. [1,2].

Materials and methods. The study of the etiology of edema disease of piglets, registered in the farms of the Republic of Kazakhstan was carried out in the laboratory of antibacterial biotechnology at the Kazakh National Agrarian University.

The material for isolation of cultures served as patmaterials (liver, lungs, lymph nodes, bone marrow, spleen, affected part of the intestine, heart) from diseased animals that were dead and killed for the diagnostic purpose. During the outbreak of the disease among the piglets, we studied material from 150 animals from farms in three regions of the Republic of Kazakhstan. To obtain primary cultures, the following nutrient media were used: BCH, MPA, Kitt-Tarozzi medium, Endo, Minka. The primary selection of cultures was carried out on the basis of the characteristics of growth on media and microscopic preparations from individual colonies. In selected cultures, morphological, cultural, biochemical, serological, hemolytic properties and pathogenicity were studied according to generally accepted patterns. The pathogenicity of the isolated cultures was determined by placing a bioassay on laboratory animals and in experiments on experimental reproduction of the disease on piglets.

Research results. Despite the progress achieved in the prevention of intestinal diseases in young farm animals, the etiological structure of the edematous disease of piglets in our country has not been completely deciphered.

A total of 500 samples of material from 100 pigs, including 80 dead piglets from spontaneous edema and from 20 pigs killed with clinical signs, were subjected to bacteriological examination.

For in vivo bacteriological diagnostics, 100 samples of feces from clinical healthy animals were examined (20 were suckling piglets, 60 were weaned piglets and 20 were sows).

As a result of bacteriological, 645 cultures were isolated, of which from dead piglets from spontaneous edema disease - 356 (55.2%), from piglets killed with clinical signs - 181 (28.1%) and from healthy - 108 (16.7%).

The purpose of further research was the identification of isolated strains by cultural, biochemical, antigenic and pathogenic properties. In identifying the isolated cultures, the Bergi germ classification scheme was used [3].

All 645 strains of *Escherichia* possessed typical morphological and tinctorial properties. Of the 645 strains, 622 formed indole, 628 were mobile, all strains decomposed glucose, lactose, sucrose, maltose, mannitol to form acid and gas, did not form hydrogen sulfide, and did not liquefy gelatin.

One of the criteria for pathogenicity of microbes is the ability to hemolyze erythrocytes of various animals. According to our data, out of 645 strains of *Es-*

cherichia, hemotoxin 625 (96.9%) was produced, of which beta hemotoxin — 97.6%, alpha hematoxin — 2%, delta hemotoxin — three strains of *E. coli*. All cultures of *Escherichia* isolated from dead and clinical sick pigs with edematous disease produced beta-hemotoxin and stably preserved them during reseeding and storage for 5 years (observation period).

The pathogenicity of *Escherichia* is associated not so much with the production of toxin, but also with the adhesive properties of these bacteria - the latter cause the attachment of bacteria to intestinal epithelial cells and their intensive reproduction, colonization of the intestine, production of enterotoxins with subsequent penetration of bacteria into the regional lymph nodes and bloodstream. The ability to adhere to the epithelial cells of the intestinal mucosa is ensured by the presence of a fimbria or flagella (cilia) of a protein nature. Identification of adhesive antigens was carried out in accordance with the Methodological Guidelines for the bacteriological diagnosis of colibacillosis (escherichiosis) of animals and "Interim guidance on the use of agglutinating serums to the adhesive antigens of *Escherichia* K88, K99, 987P, F41, A20.

The detection of the presence of adhesive antigens was subjected to 537 strains of *Escherichia* isolated from dead and sick piglets with edematous disease, which produced beta-hemotoxin. As a result of the research, it was established that 86% of the studied *Escherichia* strains gave a positive agglutination reaction with K88 serum and 14% with K99 serum.

When typing the same 537 strains of *Escherichia* using O-type-specific agglutinating coli serum, we managed to attribute them to the following serovars - 0141 (74.1%), 0139 (18.2%), 0138 (4.1%), 0142 (2, 7%), 026 (1.2%) and 08 (0.2%).

In order to prove the etiological role of these microbes in pigs, in experiments on laboratory animals, we studied the pathogenicity and virulence of 10 strains of the serovar *Escherichia*, 0141, and 10 strains, 0139, producing beta hemotoxin. A total of 400 white mice were used in the experiments.

The results of the experiment showed that 90% of laboratory animals died within 3-8 days after infection, and only 10% of experimental animals remained alive for a month. Most strains had approximately the same virulence with the exception of strain 16-041, which caused the death of experimental white mice for three days. In all experiments, bacteriological examination of fallen laboratory animals (white mice) was carried out. An infecting culture was constantly distinguished.

The pathogenicity of the isolated strains of *Escherichia* was also tested on piglets of one month of age. For infection, *Escherichia* strains with various adhesive antigens and possessing the most pathogenic properties were used. Animals were infected with intraperitoneal daily agar culture in doses of 5-109 CFU, 1010 CFU, and 15x109 CFU. At 4-5 days after the introduction of the studied cultures, signs

of the disease were observed: refusal of feed, depression, blue skin of the abdomen and ears, temperature was between 40-41 ° C, diarrhea. In piglets infected with culture No. 16-0141 (K-88), before the animals died, incoordination of movements, convulsions, and paralysis of the limbs were observed. At necropsy, dead piglets noted an increase in the mesenteric lymph nodes, hemorrhagic gastroenteritis, liver dystrophy, pulmonary edema, venous congestion of the internal organs, and in two - focal thickening of the stomach wall. These changes correspond to the pathoanatomical picture of the corpses of animals that have died from spontaneous edematous disease.

Thus, it was established that 645 cultures isolated from dead, sick piglets, as well as healthy animals were identified as *Escherichia coli* strains, of which 97.6% were attributed to beta-hemolytic cultures of *Escherichia coli*. All cultures of *Escherichia coli* isolated from piglets fallen from clinically edematous diseases had adhesive antigens K-88 (86%) and K-99 (14%).

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乳酸杆菌属的动态。在鹅消化道念珠菌病的背景下
**DYNAMICS OF LACTOBACILLUS SPP. AGAINST THE
BACKDROP OF CANDIDIASIS IN THE DIGESTIVE TRACT OF
GEESE**

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注释。念珠菌病对农业造成重大经济损失。年轻股票的死亡率可高达80-100%。然而，到目前为止，还没有治疗鹅的念珠菌病的有效方法。本文介绍了酶疗法，益生菌病因学和前列腺疗法以及前列腺疗法的研究。这是一位正在接受抗生素治疗的女性。微生物群落，尤其是鹅的乳酸杆菌，微生物群落，特别是乳酸杆菌，微生物群落，微生物群落；胃，小肠和大肠，每日7至90日龄的鸟类。在复杂的酶益生菌预防疗法的情况下已经建立了高效率。

关键词：念珠菌病，鹅，甲状腺肿，肌肉和腺胃，小肠，制霉菌素，酶，liticase，益生菌，蜂胶，乳酸杆菌。

Annotation. *Candidiasis causes significant economic damage to agriculture. Mortality in young stock can reach up to 80-100%. However, until now, there are no effective methods for treating candidiasis in geese. This article presents studies on the effect of enzyme therapy, probiotic etiology and propolis therapy, as well as complex enzyme probiotic propolis therapy for geese candida mycosis compared with traditional antibiotic therapy on the microbiocenosis, in particular, the dynamics of Lactobacillus spp in the pattern, as well as the i-als, as well as in a sample of the body tissue, as well as in a sample of the body tissue, as with the treatment of the microbes, the rats of the geoses, as with the antibiotic therapy on the microbiocenosis, in particular the lactobacilli of the geese, treat the microbiocenosis, in particular, the lactobacillus goprosis, in the luminous area of the geocenosis, on the microbiocenosis; stomach, small and large intestine from 7 daily to 90 daily age of birds. High efficiency has been established in case of complex enzyme probiotic propolysotherapy.*

Key words: *candidiasis, geese, goiter, muscular and glandular stomach, small and large intestines, nystatin, enzymes, liticase, probiotic, propolis, lactobacilli.*

Candidarycosis is caused by fungi from the genus *Candida*, which are widespread in nature, the environment, and are characterized by lesions of the mucous membranes of the digestive tract and other organs and tissues. *Candida* are conditionally pathogenic microorganisms. The development of avian candidiasis is promoted by factors causing weakening of the immune and adaptive mechanisms, long-term antibiotic therapy, and beriberi [2, 4, 5]. The disease is severe in young animals, adult birds are carriers of infection. Clinically, candidiasis manifests itself in the form of depression, refusal of food, difficulty swallowing, thickening of the goiter, cheesy-yellowish bloom on the beak, esophagus, goiter, and later on throughout the digestive tract, as well as diarrhea, exhaustion, loss of feathers. Mortality of young stock can reach up to 100%. Treatment is effective only in the initial stage of the development of candidiomycosis. The literature gives preference to the use of fungostatic and fungicidal preparations (including antibiotics) in combination with aqueous solutions of iodine, vitamins, thorough disinfection, improvement of zoohygienic conditions of maintenance and feeding [1,3]. Despite the fairly widespread distribution of candidiasis in geese, so far there is not enough attention to this pathology. Candidomycosis continues to cause significant economic damage, and prevention and treatment measures are not perfect. In this regard, the purpose of our research was to study the effect on the dynamics of lactobacilli in the digestive tract with geckery candidiasis, and against the background of enzyme therapy in combination with probiotic and propolysotherapy. For the study, material from goiter, muscle and glandular stomach, small and large intestine of geese was selected.

Materials and research methods. The work was carried out in the conditions of «Atabayevskoye» LLC of the Laishevsky district, «Ak Kanat» LLC of the Almetyevsk district of the Republic of Tatarstan, «Ptichy Mir» LLC of the Tuimazy district, «Altyn Kosh» LLC of the Iglinsky district of the Republic of Bashkortostan. In the experiments used geese breed Linda, from 7 daily to 90 daily age. Laboratory studies were carried out in the conditions of bacteriological departments of district and republican laboratories, microbiology laboratories of the Department of Microbiology and Immunology of the Russian State Agrarian University. The selection of lactobacilli was performed on agar medium MRS prepared according to GOST 10444.11) in an anaerostat, creating a vacuum of 86.6-93.3 kPa using a vacuum pump. Material for research was taken before the start of the experiment - background (7 daily), and then for 14, 30, 60 and 90 days. from the beginning of giving drugs. The experiments had three repetitions, 350 heads each. The birds, according to the principle of analogues, were divided into 7 groups, 70 animals each. The first group was the control group - healthy birds, 2 - 7 patients with candidomycosis. With birds of group 2, no medical manipulations were carried out. 3 groups of geese were subjected to traditional antibiotic therapy with nystatin, 4

groups - enzyme therapy with liticase, 5 groups - enzyme therapy against probiotic therapy with lactobifida, 6 groups - enzyme therapy against propolis therapy, 7 groups - complex enzymotherapy against probiotic therapy and propolisotherapy.

Research results and discussion. *Lactobacillus* spp. in the goiter of healthy geese 1 of the control group, as well as its background level in birds of 2–7 experimental groups, ranged from 4.12 to 4.88 lg CFU / g. For 14 days. from the beginning of the experiments, the indicator of birds in the control group 1 increased, compared with the background value, by 1.53 times. The content of lactobacilli in the goiter of birds of the 2 groups by this period of experience was 1.8 times lower than in the control. At the same time, data on 3-7 groups that were subjected to different methods of therapy exceeded the level of *Lactobacillus* spp. in the craw of geese of group 2: group 3 1.18 times, 4, 5, 6 and 7 groups - 1.57; 1.92; 1.82; 1.75 and 2.01 times. At 30, 60 and 90 days. from the beginning of the experiments, the content of *Lactobacillus* sp. in the goiter of geese 2 groups, which were not subjected to therapeutic manipulations, decreased, compared with the birds of the control group, by 6.63; 7.26 and 4.24 times. The numbers of birds from 3 to 7 experimental groups, on the contrary, tended to increase. This process had a different degree of manifestation and manifestation, depending on the adaptogens used for therapy. By 30 days. experiment level of *Lactobacillus* sp. in the goiter of geese of 3, 4, 5, 6 and 7 groups was higher compared with its value in birds of the 2 groups, in 4.23; 7.03; 7.04; 6.47 and 8.3 times. The maximum number of *Lactobacillus* sp. excreted in the goiter of geese 3–7 experimental groups for 60 days. experience. By this time of research, the value of this indicator for geese of 3, 4, 5, 6 and 7 groups was higher, compared with the data of birds of group 2, by 4.72; 7.94; 8.29; 7.66 and 9.45 times. By 90 days. experiment level of *Lactobacillus* sp. in the goiter of surviving birds of group 2 increased compared with the previous study period (60 days) by 1.59 times. But data of birds of 3, 4, 5, 6 and 7 groups, by the end of the experiment (90 days), were higher than the indicator of birds of the 2 groups, in 2.81; 5.0; 5.03; 4.84 and 5.25 times.

In the muscular section of the stomach of geese, the background level of lactobacilli stood out at a level from 2.94 to 3.56 lg CFU / g. In sick and non-treated birds of group 2, the content of *Lactobacillus* spp. dynamically decreased and was inferior to the indicators of birds 1 of the control group at 14, 30, 60, 90 days. an experiment of 2.77; 6.25; 11.56 and 20.5 times. Level *Lactobacillus* sp. in the muscular stomach of geese of 3, 4, 5, 6 and 7 groups increased dynamically in the course of the experiment. It was higher, compared with the data of geese 2 groups for 14 days. experience in 1.69; 2.39; 2.8; 2.46 and 3.32 times, for 30 days. - 4.13; 6.4; 7.45; 6.37 and 8.55 times; for 60 days - 7.78; 13.2; 14.4; 12.9 and 16.7 times; for 90 days - 13.6; 27.0; 29.8; 26.9 and 30.7 times.

The background value of *Lactobacillus* sp. in the glandular stomach, geese

from the control and experimental groups ranged from 4.0 to 4.6 lg CFU / g. The content of *Lactobacillus* sp. in the glandular stomach of patients with geese of 2, 3, 4, 6 groups, by the 14th day of the experiment was lower than in the control, 5 groups corresponded to the control level, and 7 groups were 1.17 times higher than the birds of the 1 control group. The content of *Lactobacillus* sp. in the glandular stomach of geese of 3, 4, 5, 6 and 7 experimental groups exceeded the data on birds of group 2 by 14 days. experiment, in 1.47; 1.94; 2.17; 1.93 and 2.54 times. This trend continued through the experiment. For 30 days. from the beginning of the experiments, the level of *Lactobacillus* sp. in the glandular stomach of geese of 3, 4, 5, 6 and 7 groups was higher than in birds of group 2, by 2.76; 3.06; 3.26; 2.94 and 5.11 times, for 60 days. - at 7.75; 10.65; 11.06; 10.5 and 13.0 times, for 90 days. - 13.0; 19.8; 19.13; 19.4 and 21.5 times.

Violation of the microbiocenosis against the background of candidiasis of geese was also noted on the part of the thin and thick sections of the intestine. By the beginning of the experiment, the level of *Lactobacillus* sp. in the small intestine of geese of 2-7 groups was lower than in the control by 1.05 -1.15 times. In the subsequent periods of the experiment, the content of lactobacilli in the small intestine of geese of group 2 was intensively reduced and was inferior to that of geese 1 of the control group for 14 days. experience of 1.65; for 30 days - 2.89; on 60 days. - 3.64 and on 90 days. - 3.79 times. Level *Lactobacillus* sp. in the intestines of birds 3, 4, 5, 6 and 7 of the experimental groups tended to recover and increase. By 14 days. research this indicator for 3 -7 groups exceeded its value in the intestines of geese 2 groups of 1.24; 1.49; 1.6; 1.46 and 1.8 times. Activation of lactobacilli in the small intestine of geese of 3-7 groups increased in terms of experience and by 30 days. their level was higher compared to the data of birds of group 2, in 2.08; 2.47; 2.76; 2.32 and 3.42 times. The maximum content of *Lactobacillus* sp. in the small intestine of geese of 3 -7 groups were recorded for 60 days. experience. It exceeded the data of geese 2 groups, not subjected to medical measures in 2.67; 3.29; 3.59; 2.9 and 4.25 times. By 90 days. Experience in all groups showed a slight decrease in the content of lactobacilli in the small intestine of geese. However, these birds 3 -7 experimental groups continued to exceed the level of *Lactobacillus* sp. in the intestines of birds of group 2 in 2.32; 3.77; 4.3; 3.63 and 4.82 times.

Like the dynamics of *Lactobacillus* sp. in the small intestine, their content was changed in the large intestine of geese. The level of *Lactobacillus* sp. in the large intestine, geese were generally lower than in the thin section. The indicator of geese of the 2nd group decreased in terms of studies and by 14, 30, 60 and 90 days. the experience was below its values in birds of the 1st control group of 2.28; 3.54; 9.53; 11.6 times. In the large intestine of geese 3 - 7 experimental groups from 14 days. Experience recorded a significant increase in the level of *Lactobacillus* sp.

By 14 days. their level exceeded the data of birds of group 2 in groups of 3-7 in 1.86; 2.44; 2.79; 2.41 and 3.1 times; to 30 days. - 2.87; 3.78; 4.35; 3.69 and 5.52 times, to 60 days. - 5.74; 9.9; 11.16; 9.04 and 13.34 times, to 90 days. - in 5.43; 12.0; 14.0; 12.0 and 17.2 times.

Conclusion. Candidiasis with damage to the digestive tract of geese leads to a pronounced retardation of reproduction in the goiter, muscle and glandular stomach, thin and thick intestine *Lactobacillus* sp. Treatment with traditional antibiotic therapy using nystatin inhibits the process of reducing *Lactobacillus* levels, but does not restore *Lactobacillus* sp. to control value. Positive effect on the recovery and increase in the level of *Lactobacillus* sp. in the digestive tract of geese provides enzyme therapy with the use of litycase, as well as litycase with probiotic and litycase with propolis. Significant activation of *Lactobacillus* sp. In the gastrointestinal tract of geese provides complex enzyme therapy with litycase on the background of probiotic and propolisotherapy.

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肝脏中的水溶性维生素与鹅念珠菌病
**WATER-SOLUBLE VITAMINS IN THE LIVER WITH GEESE
CANDIDIASIS**

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注释。 本文介绍了消化道。 已经确定它可以发育鹅的肝脏。 它没有帮助。 酶疗法是一个导致水位显著增加的过程。 可以通过益生菌和蜂胶疗法的组合完成新酶制剂的制备。

关键词：念珠菌病，鹅，肝脏，酶疗法，liticase，蜂胶，益生菌，硫胺素，核黄素，吡哆醇，氰钴胺，抗坏血酸。

Annotation. *The article presents the data on the study of the effects of candidiasis of the digestive tract of geese on the level of water-soluble vitamins in the liver: It has been established that, against the background of candidiasis, the state of avitaminosis develops in the liver of geese. Traditional antibiotic therapy does not help restore the balance of vitamins in the liver: Enzymotherapy as well as enzyme therapy on the background of probiotic therapy and propolis therapy contribute to a significant increase in the level of water-soluble vitamins in the liver of birds. The complete replenishment of vitamins in the liver against the background of candidiasis of the digestive tract is possible with the therapy of a new enzyme preparation liticase in combination with probiotic and propolisotherapy.*

Key words: *candidiasis, geese, liver, enzyme therapy, liticase, propolis, probiotic, thiamine, riboflavin, pyridoxine, cyanocobalamin, ascorbic acid.*

Liver - plays an important role in digestion. It regulates the course of all types of metabolism in the body, is involved in cleaning the body from metabolic products, from some microorganisms. It is a depot for trace elements and a pantry for vitamins (especially water-soluble), which are part of enzymes and are involved in redox reactions and are catalysts for many biochemical processes, are involved in the metabolism of proteins, fats and carbohydrates. In this regard, the purpose of these studies was to study the effect of candidiasis of the digestive tract on the dynamics of water-soluble vitamins in the liver.

Material and research methods

The work was carried out in conditions of poultry farms for breeding geese, republican and district veterinary laboratories of the Republics of Tatarstan and Bashkortostan, laboratories of the Department of Microbiology and Immunology of the Russian State Agrarian University - Moscow Timiryazev Agricultural Academy. The studies were conducted on geese of the Linda breed from 7 days. up to 90 days. age Material for research was taken before the start of the experiment - background (7 daily), and then for 14, 30, 60 and 90 days. from the beginning of giving drugs. The experiments had three repetitions, 350 heads each. The birds, according to the principle of analogues, were divided into 7 groups, 70 animals each. The first group was the control group - healthy birds, 2 - 7 patients with candidomycosis. With birds of group 2, no medical manipulations were carried out. 3 groups of geese were subjected to traditional antibiotic therapy with nystatin, 4 groups - enzyme therapy with liticase, 5 groups - enzyme therapy against probiotic therapy with lactobifida, 6 groups - enzyme therapy against propolis therapy, 7 groups - complex enzymotherapy against probiotic therapy and propolisotherapy. Vitamins in the liver were determined by classical and spectrographic methods.

Research results and discussion. In the liver of birds of the 2 groups, which were not subjected to medical manipulations, after 7 days from the beginning of the experiments, the level of thiamine was 1.85 times lower than the control indicator. This process has progressed in terms of research. By 14 days. the difference in reducing the level of vitamins in the liver of birds of group 2, compared with the control, was 2.42 times, by 30, 60 and 90 days. - 3.77; 4.8 and 5.21 times, which indicates a profound change in the metabolism in the body of geese against the background of candidiasis, a violation of the absorption of vitamin in the intestine, putting it off in the liver as a reserve material.

The content of thiamine in the intestines of geese 3 - 7 experimental groups was changed in the direction of a significant increase, under the influence of used adaptogens in the treatment of birds. This process was less pronounced in the liver of geese of the 3rd group, where the classical treatment with the use of the antibiotic nystatin was used. On the 7th, 14th, 30th, 60th and 90th day. from the beginning of the experiment, the level of thiamine in the liver of birds in this group exceeded the data of geese 2 groups in 1.21; 1.58; 2.44; 3.33; 3.94 times. More active accumulation of vitamin B1 was recorded in the liver of birds of the 4, 5 and 6 groups. The maximum content of vitamin B1

was observed, in all periods of experience, in the liver of geese of the 7th group. So, the level of thiamine in the liver of birds of 4, 5, 6 and 7 groups for 7 days. from the beginning of the experiment was higher than its value in the liver of geese 2 groups in 2.07; 2.0; 2.07 and 2.43 times; for 14 days. - 2.75; 2.8; 2.83 and 3.25 times; for 30 days - 4.22; 4.11; 4.33 and 4.89 times. To 60 days. the content

of thiamine in the liver of geese of 4, 5, 6 and 7 groups exceeded its level in sick birds of the 2nd group in 5.33; 5.2; 5.6 and 6.67 times, for 90 days. - at 6.19; 5.91; 6.48 and 7.46 times.

Like the dynamics of thiamine in the liver of geese, the dynamics of vitamin B2 changed. Its content in birds of group 2, dynamically decreasing in the course of the experiment, was lower than the control figures of birds of group 1, by 14, 30, 60 and 90 days. experience, 1.78; 2.3; 2.64 and 3.24 times. The used adaptogens contributed to an increase in the functional activity of the liver and the content of riboflavin in it. For 14 days. the experiment, the level of vitamin B2 in the liver of geese 3, 4, 5, 6 and 7 groups was higher than in birds of group 2 in 1.58; 1.77; 1.73; 1.8 and 1.88 times. By 30 days. the experiment was recorded further increase in riboflavin in the liver of birds, compared with its level in the previous period of experience. This trend continued for 60 days. By the end of the experiment (90 days) the level of riboflavin in the liver of geese of 3, 4, 5, 6 and 7 groups was higher than its content in the liver of geese of the 2 group in 2.97; 3.31; 1.19; 3.5 and 3.54 times.

Considerable negative changes on the background of candidiasis of the digestive tract also affected the content of vitamin B12 in the liver, which is a growth factor necessary for energy metabolism, assimilation of proteins, carbohydrates, fats, blood formation, muscles, normalization of reproductive functions involved in the synthesis of DNA and RNA, methionine production. However, in connection with a violation of the absorbing activity of the intestine, against the background of candidiasis, in geese of group 2, a dynamic decrease in cyanocobalamin in the liver, so necessary for the maintenance of all body systems of birds, is observed. Its content in the liver of geese 2 groups for 14, 30, 60 and 90 days. the experience was lower than in birds 1 in the control group, 2.2; 3.25; 5.0 and 5.33 times. The treatment of geese with the classical antibiotic therapy method increased the content of vitamin B12 in the liver of birds, but this process had a moderate degree of severity. So for 14, 30, 60 and 90 days. from the beginning of the experiments, the content of cyanocobalamin in the liver of birds of group 3 was higher compared to its level in birds of group 2, 2.4; 3.5; 5.0 and 4.66 times. A higher increase in the level of vitamin B12 in the liver was observed in birds of the 4, 5, 6 groups. The maximum increase in the activity of absorption of vitamin B12 from the intestine was noted in birds of the 7th group, where the content of cyanocobalamin in the liver of geese is 14, 30, 60 and 90 days. the experiment exceeded the data of sick birds of group 2 in 4.0; 6.5; 9.33 and 9.0 times.

In connection with the violation of metabolic processes in the liver, against the background of candidiasis, there was a decrease in the content of vitamin C, which is synthesized in the liver itself. This explains many of the changes we have previously obtained in the study on the background of candidiasis: anemia, reduc-

tion of natural resistance factors, immunomorphological disorders in the central and peripheral organs of immunogenesis, dysbacteriosis and others. This fact also indicates a decrease in antitoxic reactions in geese, including toxins secreted by fungi from the genus *Candida*. The level of vitamin C in the liver of geese 2 groups after 7 days. was 1.1 times lower than in control. At 14, 30, 60 and 90 days. from the beginning of the experiments, the content of ascorbic acid in group 2 was inferior to their parameters in the liver of birds of group 1 to 1.38; 1.75; 2.0 and 2.23 times. The level of vitamin C in the liver of geese 3 -7 experimental groups, in varying degrees of activity, was changed upwards. This process was especially vividly manifested from day 14. from the start of the experience. By this period, the indicators of birds of 3 -7 groups exceeded the level of vitamin C in the liver of geese 2 groups of 1.2; 1.55; 1.48; 1.5 and 1.74 times. By 30 days. experience difference, in the direction of exceedance with the index of birds of group 2, was 1.49; 2.26; 1.98; 2.03 and 2.7 times, to 60 days. - 1.76; 2.77; 2.55; 2.64 and 3.51 times, by 90 days. - 1.97; 3.27; 3.02; 3.12 and 4.24 times.

Conclusion.

1. Candidosis of the digestive tract of geese contribute to the development in the body of birds avitaminosis.
2. Traditional antibiotic therapy with nystatin is not sufficient and does not contribute to the restoration of the level and balance of water-soluble vitamins in geese liver.
3. An effective and environmentally friendly method of treating and restoring the level of water-soluble vitamins in the liver of geese, against the background of candidiasis, is the use of the enzyme preparation liticase in combination with the probiotic lactobiphid and propolisotherapy.

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植物种子生物系统对刺激激光机械旋转角膜辐射的响应
**RESPONSE OF PLANT SEEDS BIOSYSTEMS
TO STIMULATION MECHANICAL-ROTATING TURRICULAR
RADIATION OF A LASER**

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注解。世界上生物物质的结构在很大程度上取决于宇宙学因素。这些因素包括生活世界的手征不对称。存在手性的一个原因可以被认为是自然电磁场。本文讨论了激光辐射萝卜和芥菜籽对具有不同定量含量脂肪的刺激对具有L-和D-对称形式的碳水化合物在左右旋转和激光辐射下的响应。

关键词：低强度激光辐射扫描 (NISLI)，左右分子对称形式 (L-, D-)，手性 (手性) (Eng. 手性, 源自古希腊语. $\chi\epsilon\iota\rho$ - «手») - 缺乏关于右侧和左侧的对称性。

Annotation. *The structuring of living matter in the world is largely determined by cosmological factors. These factors include chiral asymmetry of the living world. One reason for the existence of chirality can be considered the natural electromagnetic fields. The article discusses the response to stimulation with laser radiation radish and mustard seeds with different quantitative content of fats with carbohydrates with L- and D-form of symmetry in the device with the right-left rotating and laser radiation.*

Keywords: *low-intensity laser radiation scanning (NISLI), left and right form of molecular symmetry (L-, D-), chirality (chirality) (Eng. Chirality, from the ancient Greek. $\chi\epsilon\iota\rho$ - «Hand») — the lack of symmetry with respect to right and left side.*

Relevance.

Life in the world is asymmetric. Most α -amino acids of natural origin, which are part of proteins, have the S-configuration or, as is often said, belong to the L-series, sugars (carbohydrates), on the contrary, are dextrorotatory, i.e. belong to the D-series [1] (in biological processes only the left molecules of amino acids and only the right molecules of sugars are used). Chiral specificity is an inalienable property of living nature, and the reproduction and maintenance of such specificity is one of the most characteristic vital functions of biosystems, i.e. it can be said that life is chiral [2]. Therefore, studying the response of biosystems to the stimulation of L- and D-forms of symmetry of molecules involved in biological processes, we can hope for more information shedding light on this problem.

Materials and methods

The subject of consideration is the nature of the interaction of the chiral properties of NISLI with right- and left-rotating laser radiation with the chiral properties of the molecules of a biological object. As objects of research, dry radish seeds (*Raphanus sativus L. var. Radicula D.C.*) of the variety “Pink-red with white tip” and Sarepta mustard (*Brassica juncea L.*) are used as an annual herb. The choice was due to the different content of fat molecules with L- and carbohydrates with D-symmetry in mustard and radish seeds. The main composition of the seeds is given in table 1.

Table 1. The composition of the seeds of radish and mustard, g per 100g

	Proteins	Carbohydrates	Fat
Radish	1,2	4,6	0,1
Mustard	37,1	5,9	11,1

Figure 1 shows a diagram of the stimulation of radish and mustard seeds in a device with a circular scan of NISLI with a linear plane of polarization and a right / left direction of rotation of a laser beam sweep [3].

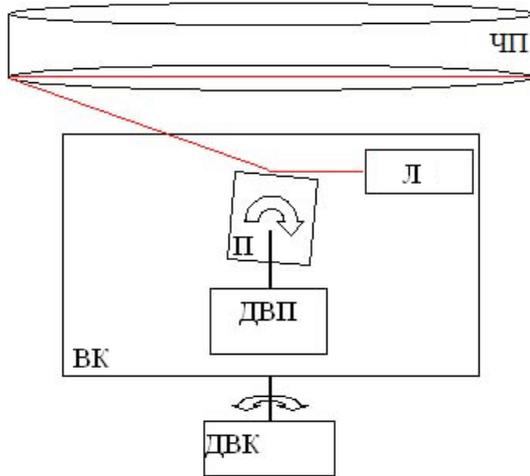


Fig. 1. Scheme of stimulation of seeds of radish and mustard

ЧП — Petri dish with seeds, Л — laser, П — tetrahedral mirror prism, ДВП — prism rotating motor, ДБК — carriage rotation motor, BK — rotating carriage

The impact of the NISLI of the red range was carried out by a semiconductor laser of the type (HLDH-660-A-50-01) with a constant power density $W = 3.5 \text{ mW} / \text{cm}^2$, and an irradiation dose of $D = 0.26 \text{ mJ} / \text{cm}^2$ with the following parameters: - wavelength $\lambda = 658 \text{ nm}$, coherence length $L_{\text{kor}} = 217 \text{ }\mu\text{m}$, pulse duration $\tau_i = 62.5 \text{ }\mu\text{s}$, pulse frequency $f = 1000 \text{ Hz}$, laser radiation power $P_{\text{max}} = 50 \text{ mW}$, radiation exposure 30s.

Dry seeds were formed on 08.18.13 in two separate groups for each object of research (50 seeds in each of the experiments), each formed group consisted of one control and three experimental ones. Then the seeds were soaked in water at room temperature in distilled from under the tap and left for a day (in accordance with GOST 12038-84 [4]).

On the second day, the swollen seeds of 50 pieces were once exposed to NISLI under illumination of 10–15 lx, and a time exposure of 30 s. In the third experiment, when exposed to NISLI of the right + left rotation of the laser beam sweep, the time exposure was 15 seconds right + 15 seconds left rotation. The irradiation parameters: the distance from the emitter to the object, the choice of the pulse repetition rate of laser radiation at 1000 Hz and a time exposure of 30 seconds were experimentally detected by previous experiments. This mode of irradiation stimulates the growth process and contributes to the realization of genetic potential.

Results and conclusions

After irradiation, seeds without sprouting were germinated in Petri dishes on filter paper, at a constant temperature and light conditions. As a response to stimulation, the parameter “dynamics of growth of apexes” of a generally recognized complex indicator was chosen. On the third day of germination with the appearance of the apex was measured. The measurement results are displayed in table 2.

Table 2. Growth dynamics of mustard seed apaxes

Day germination	20/08/13	21/08/13	22/08/13	23/08/13
Control	6,20	11,40	13,00	17,00
Laser right	10,80	15,40	22,20	28,60
Laser left	11,40	18,40	29,80	39,50
Laser right + left	8,80	12,20	13,60	14,60

In the first experiment with mustard seeds, Figure 2, the dynamics of growth of apaxes, had a different meaning. Seed apaxes, which were stimulated by a left-spin laser, were ahead of the growth of all other experimental groups. By the end of the experiment, the advance in relation to the control was 232.4%, in relation to the apaxes of seeds that were stimulated with a laser with right rotation of 138.1%, and in relation to the apaxes of seeds that were stimulated with a laser with right + left rotation of 270.5%.

Mustard

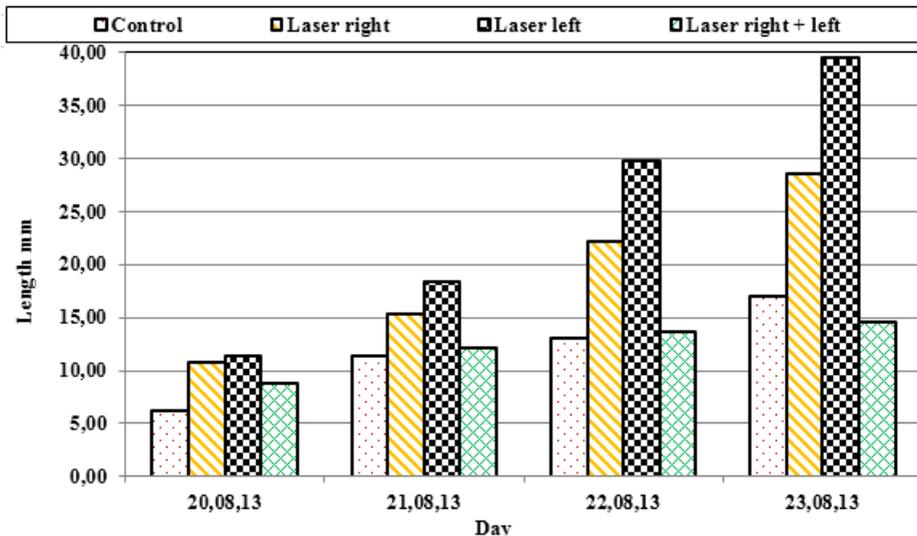


Fig. 2. Dynamics of mustard seed growth

The results of the first experiment show that the stimulation of mustard seeds by the left rotation of a laser beam led to a more active growth of seed apices. Such a growth dynamics can be explained by a high content of fat molecules, with mustard seeds having left symmetry.

In the second experiment with radish seeds, pattern 3 of the growth of apices also had a different meaning. The measurement results are displayed in table 3.

Table 3. Growth dynamics of radish seed apices

Day germination	20,08,13	21,08,13	22,08,13	23,08,13
Control	5,00	8,60	9,80	15,60
Laser right	3,90	13,20	16,80	24,10
Laser left	3,20	10,20	14,20	20,40
Laser right + left	5,00	8,00	13,00	17,80

On the third day, the growth dynamics of radish seeds, subjected to stimulation by the right and left rotation of the laser, lagged behind the growth of the seeds of the control group and seeds stimulated by the right + left rotation. But from the fourth day onward, experienced groups began to outpace control. Seed apices, which were stimulated with a right-spin laser, were ahead of the growth of all other experimental groups. By the end of the experiment, the advance with respect to the control was 154.5%, with respect to the apices of seeds that were stimulated with a laser with left rotation 118.1%, with respect to the apices of seeds that were stimulated with a laser with right + left rotation 135.4%.

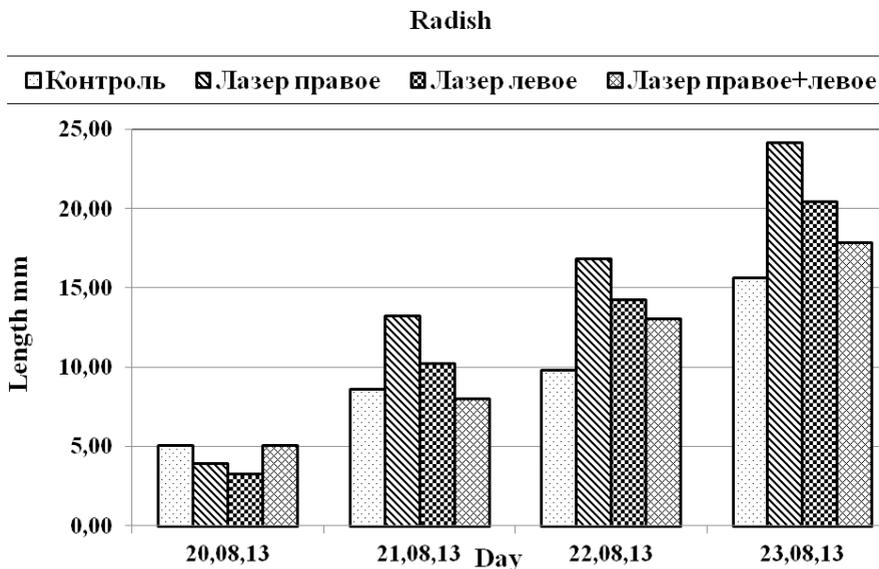


Fig. 3. Dynamics of growth of radish seeds

According to the results of the second experiment, it can be seen that stimulation of radish seeds by the right rotation of the laser beam led to more active growth of seed apices. Explain such growth dynamics can be a high content of carbohydrate molecules in the mustard seeds with the right symmetry.

Conclusion

Thus, the results of the experiments show that the effect of the right- and left-handed radiation of a laser beam sweep on a biological object with a pronounced chirality of molecules is highly effective and significantly increases the germination rate of the seed.

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管理伏尔加河下游地区灌溉农业景观中的昆虫复合体的形成
**MANAGEMENT THE FORMATION OF ENTOMOCOMPLEXES
IN IRRIGATED AGRICULTURAL LANDSCAPES
OF THE LOWER VOLGA AREA**

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注解。 本文考虑了灌溉的作用，灌溉在干旱地区允许扩大农业生态系统中昆虫群落更广谱种的最佳生活条件范围，从而大大增加其生物多样性。 显示了由于嗜温和部分亲水性而在灌溉影响下昆虫的物种多样性及其数量的增加。 这增加了生态系统的稳定性。

关键词：昆虫复合体，灌溉，生物多样性，农业景观。

Annotation. *The article considers the role of irrigation, which in arid regions allows to expand the range of optimal living conditions for the wider species spectrum of the entomofauna in agroecosystems and, accordingly, significantly increase their biodiversity. An increase in the species diversity of insects and their numbers under the influence of irrigation due to mesophilic and, partly, hygrophilic is shown. This increases the stability of the ecosystem.*

Keywords: *entomocomplexes, irrigation, biodiversity, agrolandscape.*

Irrigation is one of the main factors in increasing the stability of agricultural production. At the same time, under conditions of irrigation, along with an increase in the yield of agricultural crops, the harmfulness of phytophages also increases. Only in the group of grain crops, potential losses from pests are estimated at 29.54%, industrial crops - 13.61%, potatoes and vegetables - 17.4% [2, 3].

Expansion of irrigated areas in the south of Russia according to the subprogram "Development of agricultural land reclamation" suggests the need for in-depth as-

assessment of the impact of irrigation on the formation of entomocomplexes, their species composition and dynamics of the number of harmful and useful species.

Long-term studies (1985-2017), conducted by us in the Volga-Don interfluvial area (FSUE “Oroshaemoe”), show that irrigation is one of the most important factors, under the influence of which the ecological conditions in agricultural landscapes change significantly [1]. First of all, irrigation changes the microclimate parameters in the stem and ground tier of the field. Thus, according to our research, the temperature difference in irrigated and non-irrigated alfalfa agrocenoses within 3-4 days after irrigation with sprinkling reaches 7-8°C, and the average for the growing season is 4-5°C. With sprinkling irrigation, the relative humidity of the air inside and above the grass at a height of up to 2 m increases significantly (by 20%), as well as the decrease in the daily amplitude of temperatures. Similar results were obtained by us in the agrocenoses of other cultures. These consequences of irrigation, along with an increase in soil moisture, lead to a significantly greater mesophyticity of the microclimate in the agrocenosis.

In the stalk irrigated field crops a milder microclimate is formed, corresponding to more northerly and more humid regions than the southeast of Russia. In accordance with their ecological standard, insects form specific entomocenosis on irrigated arrays, in which mesophilic species prevail, and the xerophilic population density decreases.

An illustrative example of the occurrence of a species to certain environmental conditions are nodule weevils. Thus, the striped nodule weevil (*Sitona lineatus* L.) significantly increased its abundance in irrigated alfalfa herbage, and in the non-irrigated areas (dominating up to 100%), a more dry-looking species prevailed - a gray bristly weevil (*S. crinitus* Hbst).

Irrigation also has a significant effect on the species diversity and on the number of land entomophages. The results of counting the number of ground beetles dominating in the structure of herpetobia entomocomplexes are presented in Figure 1. The analysis shows that the abundance of this group of entomophages increases 2.5–12.4 times in non-irrigated crops on irrigated fields.

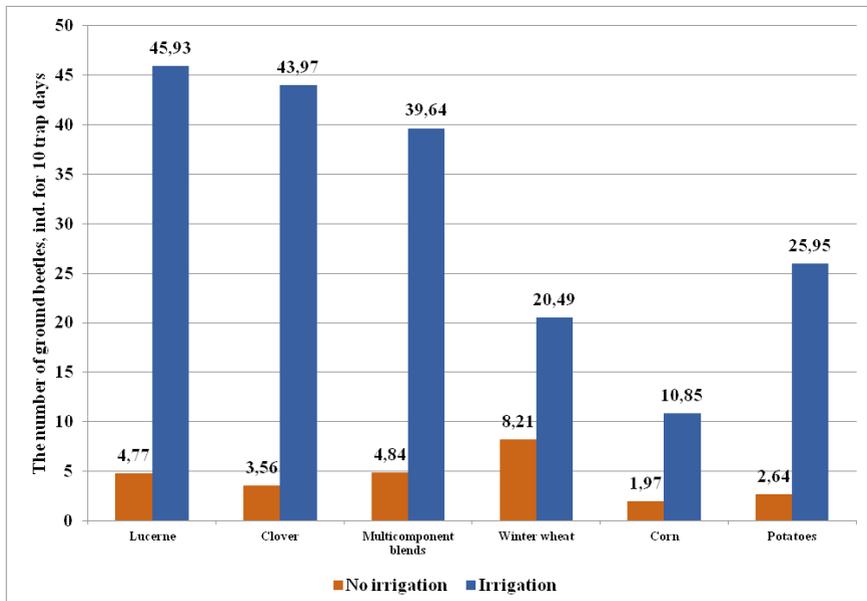


Figure 1. Comparative number of ground beetles (*Carabidae*) in irrigated and non-irrigated agroecosystems of field crops

The increase in the total number of ground beetles on irrigated crops in comparison with non-irrigated is noted primarily due to an increase in the abundance in agroecosystems of such species as *Poecilus cupreus* L., *Pseudoophonus rufipes* Deg., *Bembidion properans* Steph., *Clivina fossor* L., *Poecilus nitens* Chaud. *Harpalus distinguendus* L. Since these species of ground beetles are listed in the literature as active predators of dangerous pests of main forage crops [4, 5, 6, 7], it can be said that an increase in the number of representatives of the ground beetle family is one of the most significant results of irrigation effects on carabidofauna

Considering the herpetofauna complex in the alfalfa agroecosystems, it should be noted that the average number of ground-floor insects on irrigated crops during the growing season is 1.5 to 29.0 times higher than on non-irrigated (Table 1).

Table 1 - Comparative number of herpetobionts on crops of irrigated and non-irrigated alfalfa of the 3rd year of life (FSUE "Oroschaemoe", 1985-2017)

Kinds	Irrigation		No irrigation	
	number of individuals, spc. per 10 trap-days. average seasonally	% prevalence	number of individuals, spc. per 10 trap-days. average seasonally	% prevalence
Carabidae	41,93	82,10	4,77	84,72
Histeridae	1,66	3,25	0,09	1,6
Silphidae	4,11	8,11	0,55	9,47
Staphylinidae	0,03	0,06	0,01	0,18
Trogidae	0,03	0,06	0,03	0,36
Dermestidae	2,27	4,44	0,17	3,02
Cantaridae	0,72	1,41	0,01	0,18
Malachidae	0,29	0,57	0,01	0,18
Total	51,04	100,0	5,61	100,0

Of the representatives of the family of ground beetles, dominant in alfalfa crops (the percentage of prevalence from 82.1 in irrigation to 84.72 in non-irrigated areas), typical predators of the genera *Poecilus* and *Calosoma* are of considerable importance in regulating the number of main pests. *Pseudoophonus rufipes* Deg. is also effective with a mixed-type diet. In the general herpetofauna complex, both in irrigation and in irrigation waters, the number of representatives of the family of dead-eaters (Silphidae) is significant, respectively, 8.11 and 9.47%. In small quantities in the collections were present species from the families Histeridae, Dermestidae, Cantaridae, Trogidae, Staphilinidae, Malachidae.

These data allow us to conclude that under irrigation conditions in the surface layer of soil, the number of useful insect species is an order of magnitude higher than without irrigation. That is, under the influence of irrigation, there is a significant increase in both the general abundance of the animal population of agrocenosis, and directly zoophages, in particular, ground beetles. The main reasons for the increased abundance of herpetobionts under the influence of irrigation can be considered a significant change in the microclimate in the soil tier of the agrocenosis, i.e. in the habitat zone of the overwhelming majority of species of ground beetles, most of which, as already noted, are inhabitants of mesophytic and hygrophytic biotopes [7]. At the same time, additional ecological niches appear on irrigation, in particular, the shoulders of open irrigation canals. All this leads to both the growth of species diversity and the number of herpetobiont entomophages.

It should also be noted that under irrigated conditions, both the total biological diversity and the number of insects that are food objects for ground beetles

are growing. N.S. Kalyuzhnaya et al. [4], E.V. Komarov, and T.L. Karpova [6] as a food base of predatory ground beetles is noted for cereal aphids and wheat thrips, the number of which on irrigated crops is significantly higher than on non-irrigated crops. Thus, the overall increase in the abundance of ground beetles in irrigated conditions, in addition to the optimal microclimate, is also due to the improvement of the food supply.

The bulk of ground beetles of both rain-fed and irrigated agrocenoses are represented by species with a mixed type of food, most of which play an important role in regulating the number of such dangerous pests as a harmful turtle, wheat thrips, cereal aphids, click larvae and others [6]. An increase in the abundance of crops of such species as *Poecilus cupreus* L., *Bembidion properans* Steph., *Pseudophonus rufipes* Deg., *Clivina fossor* L., due to which the total number of the complex mainly increases, is a significant factor in restraining the growth of populations of a number of harmful species of entomofauna agrocenoses. During observations, no damage was recorded by ground beetles of plants and wheat grains.

Thus, it is possible to say that in the conditions of irrigation, more stable communities of insects are formed by increasing their diversity, on the one hand, and by optimizing their structure, on the other.

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冬小麦栽培技术的改进
**IMPROVEMENT OF TECHNOLOGY OF CULTIVATION OF
WINTER WHEAT**

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注解。冬粮作物栽培技术广泛应用于各种肥料,合成和天然的生长调节剂,以及新适应的冬小麦品种的引进。在本文中,作为提高产量的标准被认为是在巴什科尔托斯坦共和国乌法地区的条件下使用新品种。

关键词:冬小麦,品种,产量,品质,作物结构

Annotation. *Technologies of cultivation of winter grain crops provide wide application of various fertilizers, synthetic and natural regulators of growth, and also introduction of new adapted grades of winter wheat. In this article, as a criterion for increasing the yield is considered the use of new varieties in the conditions of the Ufa region of the Republic of Bashkortostan.*

Keywords: *winter wheat, variety, yield, grain quality, crop structure*

Winter wheat is one of the most important, most valuable and high-yielding crops. In world agriculture wheat takes the first place among other crops [10]. Wheat is the main product of global importance, which faces constant needs to improve grain yield. Wheat (*Triticum aestivum* spp. *Aestivum*) is one of the three most important major cultures in the world. In order to meet the future demand of the growing world population on limited arable land, the yield of wheat should increase significantly [12,16].

Wheat is the third largest crop in the world; it grows on more than 200 million hectares of arable land worldwide and produces more than 800 million tons annually [11]. It is no accident that winter wheat is the main food product in 43 countries with a population of over 1 billion people [3]. In Russia, winter wheat is the main food crop. Annually it is sown on the area of 8-11 million hectares [2]. Winter wheat is one of the leading food crops of the Republic. The area of winter wheat in the Republic of Bashkortostan annually increases and today is 26% of the total cultivated area (815 thousand hectares) [8].

Wheat grain contains a large number of substances that are essential for human life. The main ones that determine the nutritional value of grain are proteins and carbohydrates, as well as fats, vitamins, enzymes, fiber and minerals. The protein content in wheat grain can vary from 7 to 25 %, nitrogen-free substances-from 49 to 73 %, fat - from 1.5 to 3 %, fiber – from 1.8 to 2.5 %, ash – from 1.3 to 2.8% of grain weight. The protein content determines the nature of the use of wheat: for baking grain with a protein content of 14-15 %, for pasta– 17 – 18 % [7, 13].

The right choice of varieties allows to increase crop yield, effectively use the soil and climatic potential and increase the cost recovery [1].

The object of the study are 12 new leading varieties and promising lines of winter wheat cultivated in Russia. Observations, records and analyses were carried out in accordance with generally accepted methods.

Field experiments (2016-2017) to study the yield of winter wheat varieties in the conditions of the Ufa region of the Republic of Bashkortostan were carried out in the experimental field of the Department of plant growing and agriculture of the Bashkir SAU. One-factor field experiment, factor a – varieties and lines. The scheme of experience provides for the study of varieties and promising lines of winter wheat: varieties Volzhskaya K (control), Kalach 60, Moskovskaya 39, Aelita, Bezenchukskaya 380, Novoershovskaya, Bashkir 10, Anastasia, lines - Agidel, Ufimka, Lana, Agidel 2. A precursor to experience - pure steam. The repetition of the experience is fourfold. Square plots (3,0 x 5,0) – 15 m², accounting area of plots - 1 m², the area of expertise – 720 m².

Improving the quality and yield of grain crops is the main goal of breeders, given the growing world population [15].

Our studies have shown that the yield of winter wheat grain in the years of research was determined by hydrothermal conditions, which had an impact on the elements of the structure of the crop, they can identify the main factors and judge the nature of their impact on the formation of the crop. The structure of the crop of winter wheat consists of the following elements: the number of productive stems (density of productive stems) per unit area and the average weight of the grain of the ear (productivity of the ear).

Table 1. The structure of the winter wheat harvest depending on the growing conditions (Bashkir state agrarian university, experimental field, 2016-2017)

Grades and lines	Number of plants before harvesting, pieces per, m ²	Productive tilling capacity, pieces per m ²	Number of grains in one ear, pieces	Weight of grain in one ear, gramme	Humidity, %	Thousand grain weight, gramme	Grain yield, t / ha
Volzhskaya K (control)	195,0	193,0	37,0	2,0	17,5	49,1	6,3
Moskovskaya 39	259,0	226,0	62,0	3,4	17,4	45,7	6,3
Bezenchukskaya 380	228,0	215,0	40,0	2,0	16,8	47,6	4,0
Novoershovskaya	177,0	174,0	31,0	1,3	14,9	49,9	4,1
Bashkir 10	246,0	241,0	36,0	1,4	15,7	46,9	5,6
Kalach 60	229,0	227,0	31,0	1,2	16,3	43,6	6,5
Aelita	238,0	238,0	33,0	2,0	16,1	42,5	6,5
Anastasia	207,0	204,0	43,0	1,3	18,8	45,4	5,0
Agidel	259,0	208,0	28,0	1,3	18,8	41,1	3,8
Ufimka	188,0	186,0	38,0	1,9	16,5	51,2	6,7
Lana	216,0	179,0	34,0	1,9	17,9	44,3	4,2
Agidel 2	231,0	206,0	28,4	1,3	18,0	42,5	4,0

Productivity – the most important feature of the variety, which is given priority in breeding. It is caused by various combination of quantitative features (ear length, ear illumination, grain mass from plant and ear, thousand grain weight), which, in turn, are the result of complex interaction of genotype and environment [5].

Studies conducted on the experimental plots showed that the number of plants before harvesting was in the range from 177 to 259 pieces of plants per m². The highest rates were observed in the cultivars Moskovskaya 39 - 259 pieces per m² and in the variety of Agidel - 259 pieces per m². The lowest rates - in varieties Novoershovskaya - 177 pieces per m², lower than the Volzhskaya K (control) on 18 pieces per m², and varieties Ufimka – 188 per m², which is lower than the control option on 7 pieces per m².

Analysis of productive tilling capacity shows that the average for 2 years, this figure was in the range of 174.0 – 241.0 pieces per m². For productive tilling capacity the best indicator was the grade of the Bashkir 10 - 241 pieces per m² higher by 48 pieces per m² in comparison with the variety Volzhskaya K (control). The lowest level was grade Novoershovskaya – 174 pieces per m².

Grain yield is determined by the characteristics of the yield component, which in addition to the number of ears per unit area are characteristics of ears and kernels. Previous studies have shown that the number of grains is much more flexible

than the morphology of the seeds, and the yield of wheat is therefore more related to the amount of grain than to the weight of the grain [17]. According to our research, the number of grains in one ear ranged from 62 to 28 pieces. The largest indicator of the number of grains in one ear, according to the results of research, was 62 pieces in the variety Moskovskaya 39. The lowest level was observed in such varieties of winter wheat, as Agidel and Agidel 2 – 28.0 pieces and 28.4 units respectively.

In terms of weight of grains in one ear the highest rates were observed in the variety Moskovskaya 39 and 3.4 g, the least – at variety Kalach 60 – 1.2 g, control (Volzhskaya K) – 2.0 g.

One of the leading structural elements determining the productivity of the variety is the thousand grain weight. This indicator characterizes the grain size and density – the larger and more densely it is made, the greater the mass [4], and the more protein [6]. Index the thousand grain weight ranged from 41.1 g to 51.2 g. the Highest rates were observed in grade Ufimka – 51.2 g., the smallest – in the variety of Agidel – 41.1 g, a supervisory option this indicator was at the level of 49.1 g.

Grain yield of winter wheat during the study years ranged from 4.0 to 6.7 t / ha. The highest yield was observed in variety Ufimka – 6.7 t /ha that exceeded the control variant (Volzhskaya K) for 0.4 t/ha. large indicators have grade A elite is 6.5 t /ha, and a sort of Kalach 60 – 6.5 t /ha. the Lowest grain yield was observed in cultivar bezenchukskaya 380 – 4.0 t/ha, which is less compared to the variety Volzhskaya K (control) to 2.3 t /ha.

In the production of wheat is important not only productivity, but also special attention is paid to the production of wheat with high quality bread. The concentration and composition of grain protein are the two main components that determine the nutritional and final properties of the dough. The concentration of grain proteins 12 - 14% in the dry weight of the kernel is considered necessary for the production of good and constant volumes of bread. In addition, the composition of gluten proteins, consisting of gliadins and glutenins, determines the quality of baking, since gliadins contribute to the viscosity and extensibility of the dough, while glutenins are necessary for the elasticity of the dough [14].

According to GOST 9353-90 in the quality indicators of winter wheat grain, which determine the class and the purchase price includes the mass fraction of gluten, vitreousness, grain unit, etc. indicators.

Table 2. *Quality of winter wheat grain (Bashkir state agrarian university, 2016-2017)*

№	Grades and lines	Mass fraction of gluten, %	Gluten quality group	Grain unit, g/l	Glassiness, %	Commodity class
1	Volzhskaya K (control)	27,8	2	783,0	70,0	3
2	Moskovskaya 39	29,2	2	802,0	70,1	3
3	Bezenchukskaya 380	26,7	2	775,0	72,6	3
4	Novoershovskaya	24,4	2	781,0	71,5	3
5	Bashkir 10	26,8	2	772,0	73,5	3
6	Kalach 60	23,1	2	801,0	72,5	3
7	Aelita	26,7	2	802,0	76,1	3
8	Ufimka	26,1	1	795,0	76,0	3
9	Anastasia	23,1	1	750,0	77,5	3
10	Agidel	29,9	2	825,0	73,6	3
11	Agidel 2	26,6	2	783,0	77,0	3
12	Lana	26,8	2	798,0	81,2	3

Analysis of table 2 shows that according to the estimate of the mass fraction of crude gluten most varieties had indicators characteristic of commercial grain class 2. According to the content of the mass fraction of gluten in the grain, the highest rate is the Agidel variety-29.9%, exceeding the control version, the variety of soft winter wheat, Volzhskaya K by 2.1%.

Grain vitreousness determines the consistency of the endosperm and depends on the amount, composition, properties, size, and shape of the location of starch grains in it and the form of the location of starch grains and protein substances in it. Vitreousness indicates proteinaceous or starchy character of the grain. Wheat with a predominance of vitreous grains usually has a relatively high content of protein, gluten and good baking qualities. Wheat, consisting mainly of starch grains, is poor in protein, and it is better to use it for baking in sorting to other wheat, which

is more protein-rich [9]. Grain vitreousness 60% or more is an indicator according to GOST 52554-2006 for the highest, 1st and 2nd class. In the experience of the vitreousness of grain was 70.0 (Volzhskaya K) to 81.2 (Lana)%.

Grain unit - one of the most common indicators of technological properties of grain, grain nature is called the weight of 1 liter of grain in grams, which serves as a buyer of flour and cereal evaluation. According to GOST 52554-2006 for higher, grade 1.2 grain unit should not be below 750 g/l. In the experience of the performance grain unit had a value of from to 825 – 750.0 g/l. Best indicator for the formation of the grain unit had sort of Agidel.

Thus, according to the results of our research, it can be concluded that in order to improve the technology of cultivation and obtain the maximum yield of winter wheat in the conditions of the Ufa region of the Republic of Bashkortostan, a promising line of Ufimka is recommended for cultivation.

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在萨马拉地区组织旅游活动的经验

**EXPERIENCE IN ORGANIZING TOURIST ACTIVITIES IN
SPECIALLY PROTECTED NATURAL AREAS OF THE SAMARA
REGION**

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注释。 该区域涉及特别保护的天然区域的旅游组织。 萨马拉地区已被留出来进行保护。 这主要是具有联邦和地区意义的国家古迹。 众多的旅游观光路线。 有人指出应该照顾游客人数。

关键词：保护区，国家公园，天然纪念物，萨马拉地区，旅游，出行。

Annotation. *This article deals with the organization of tourism in specially protected natural areas. On the territory of the Samara Region allocated land with a special regime of nature conservation. This is mainly - national parks and reserve, as well as natural monuments of federal and regional significance. Numerous tourist and sightseeing routes pass through these territories, which are used both in amateur and organized tourism. But due to the fact that national parks and nature reserves have a special status of nature conservation, the number of tourists visiting national parks, and especially the nature reserve should be limited.*

Keywords: *reserve, national park, natural monument, Samara Region, tourism, excursions.*

Russia has a rich history of nature conservation on specially designated territories. The specialists of our country began to develop this problem a hundred years ago, following the pioneers of this topic - the United States of America and some Western European countries. One of the first Russian scientific publications on this topic article is considered to be by I.P. Borodin [1] and other scientists on the need to create and protect nature monuments [2]. As a result, a network of natural reserves appeared in Russia. In the 1980s [3], there was a discussion of specialists and scientists about national parks, which led to the emergence of a system of national parks.

Rest and recuperation of people in the natural environment within the country is now a very popular social task. In this regard, the task of studying the recreation and tourist potential of the territory, identifying and reserving new territories

for recreation, evaluating the existing tourist environmental management and developing recommendations for its optimization is of particular relevance. In the Russian Federation, the Specially Protected Natural Areas (SPNA) include: state nature reserves; natural parks; National parks; state natural reserves; monuments of nature, including those of national significance; dendrology parks and botanical gardens; territories with unique natural resources [4]. Each category of SPNA has specific features in the organization of tourist and recreational activities on its territory..

According to the Register of specially protected natural areas of regional importance of the Samara Region [5] and the State Cadastre of specially protected natural areas of regional and local Importance [6], in the Samara Region, 214 objects have been declared as specially protected natural areas of regional and local significance.

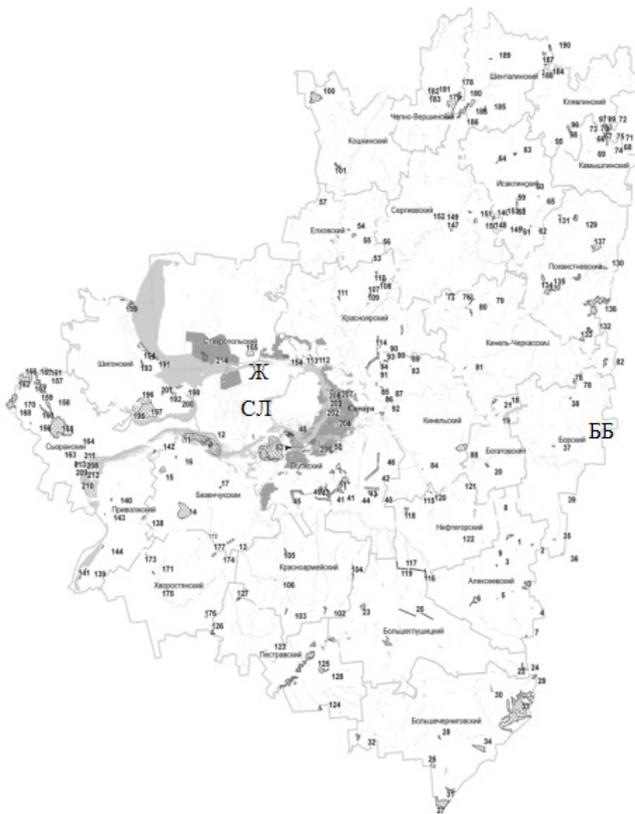


Fig. 1. Map-scheme of specially protected natural areas of the Samara region. Legend: numerals denote natural monuments, “Ж” - “Zhigulevsky State Biosphere Nature Reserve”; «СЛ» - «National Park «Samara Luka»; «ББ» - «National Park «Buzuluksky Bor».

On the territory of the nature monuments of the Samara region pass numerous tourist and excursion routes that are used in amateur, domestic and entrance organized types of tourism, including sightseeing, ecological, sports, hiking, water, bicycle, ski, speleological, automobile and other types of tourism.

In the territories of the national parks “Samara Luka”, “Buzuluksky Bor”, as well as in the Zhiguli State Nature Reserve, it is conducted alongside scientific, educational, environmental protection and tourist activities. These institutions themselves develop tourist, excursion routes and carry out relevant activities. Such work is done in view of the preservation of the natural and cultural wealth of these territories.

Zhigulevsky State Biosphere Nature Reserve named after I.I. Sprygin developed and offers two excursions for tourists and sightseers: “Strel'naya Gora” and “Kamennaya Chasha”. The first route is intended for tourists coming only by buses and cars. The cost of services depends on the types of vehicles. The second route is a pedestrian route and it passes through the ravines and ridges of the Zhigulev Mountains. [7] The “Samarskaya Luka” National Park organizes excursions to such objects as Molodetsky Kurgan and the Dev'ya mountain, p. Shiryaevo and Verblyud Mountain, the cave of Stepan Razin, Ved'mino Lake, Mordvinskaya floodplain, the tract Kamennaya Chasha. The last route, in contrast to the excursion organized by the reserve, passes in the border strip between the reserve and the national park along the Shiryaevsky ravine [8].

National Park “Buzuluksky Bor” is a relatively young national park. In this park, there is mainly unorganized recreation in order to collect forest mushrooms and fruits, and also amateur hiking, skiing and cycling is developed here.

According to estimates, the park workers only in the district directly in the central borovoy, approximately on an area of 60 thousand hectares, in the most interesting recreational and natural areas and well accessible to motor transport, the stream of recreationists can reach 80 thousand people over the summer. In the national park “Buzuluksky Bor”, located in the Samara and Orenburg regions, amateur types of recreation prevail, among which the most popular is the collective, that is, rest aimed at picking mushrooms, berries, nuts and makes up 75% (of the total number of); hiking and walking - 15%; sports competitions - 4%; water trips and recreation on the water - 3% (in the summer, this type of recreation can reach 23%); picnic rest - 1%; other types of recreation - 2%. (Fig. 2).

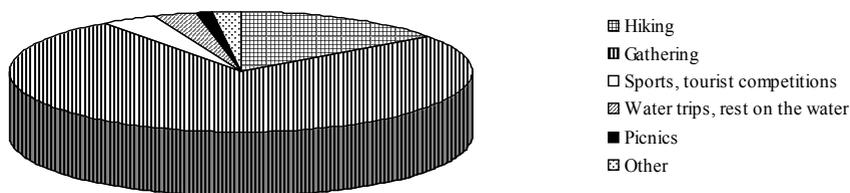


Fig. 2. Purposes of visits by recreants to NP “Buzuluksky Bor”.

The park administration has developed two tourist routes (ecological paths) for the NP “Buzuluksky Bor” covering the main attractions of the park. But at the moment, the popularity of these routes is just beginning to grow.

Amateur tourism on the territory of the national parks of the Samara region since the mid-50s of the last century is one of the most popular types of tourism in protected areas. In the second half of the twentieth century, the following routes

were most visited: 1) Following the tracks of the Volga freemen [9]; 2) The birth of a second Baku; 3) Glory does not fall silent of these days; 4) I.E. Repin on the Volga; 5) Zhiguli Around the World; 6) along the Samara River. These routes pass through national parks, but in recent years, these routes have been re-born, but already under new names and special requirements and rules for visiting SPNA are imposed on tourists.

Despite the fact that these territories are declared as protected areas, these sites are widely used in tourist activities. Travel companies that have entered into agreements with the “Samaruskaya Luka” National park on the use of tourist routes of the National park: “Zhiguli Tour” - travel company, Center for tourist programs “Pilgrim”, Travel Company “U-ra”.

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计算Me-Fe-S-O-SiO₂ (Me-Cu, Pb) 体系中氧化铅活性的方法
**METHOD OF CALCULATING LEAD OXIDE ACTIVITY IN THE
SYSTEM ME-FE-S-O-SIO2 (ME-CU, PB)**

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注解。 本文提出了一种计算复杂多组分体系Me-Fe-S-O-SiO₂ (Me-Cu, Pb) 中氧化铅活性的方法。 结果表明, 该系统氧化铅活性的测定使我们能够逐步确定硫化铅的活性。

计算出的氧化铅和硫化物的活性以及炉渣和铋的元素组成的结果可用于建立热力学模型, 该模型根据铋和炉渣的组成预测铅在炉渣中的氧化物溶解度。

为了更全面地评估和计算系统铜铅铋 - 渣 - 气相中铅成分的活性, 有必要考虑矿磁收缩冶炼中磁铁矿的行为及其对氧化铅量的影响。 活动。

关键词: 热力学, 平衡, 活性, 氧化铅, 硫化物, 铜铅铋, 炉渣, 气相。

Annotation. *The paper presents a method for calculating the activity of lead oxide in a complex multicomponent system Me-Fe-S-O- SiO₂ (Me-Cu, Pb). It is shown that the determination of the activity of lead oxide in this system allows us to stepwise determine the activity of lead sulfide.*

The calculated activity of lead oxide and sulfide, together with the results of the elemental composition of slag and matte, can be used to build a thermodynamic model that predicts the oxide solubility of lead in slags, depending on the composition of matte and slag.

For a more complete assessment and calculation of the activities of lead components in the system copper-lead matte - slag - gas phase, it is necessary to take into account the behavior of magnetite in mine contractile smelting and its influence on the amount of lead oxide activity.

Keywords: *thermodynamics, equilibrium, activity, lead oxide, sulphide oxide, copper-lead matte, slag, gas phase.*

Introduction

The development of a quantitative theory of autogenous heats should be based on a wide range of research in the field of various sciences: thermodynamics, kinetics of chemical reactions, hydrodynamics of multiphase media, heat and mass transfer, etc. At present, there is no exact quantitative theory to simulate the technological process. At the same time, a number of problems can be solved on the basis of fairly simple models. This applies both to the issues of thermodynamics of melting and to the conditions of phase separation.

The main defining feature of chemical systems, allowing them to be distinguished into a separate class from the total set of thermodynamic systems, is a change in the composition of the system as a result of chemical reactions. For a complete system characterization, in addition to setting any two pair variables (pressure and temperature, volume and temperature, entropy and temperature, entropy and pressure), it is also necessary to know the composition of the system, i.e. the concentrations of all substances that make up the system. It is advisable to set the minimum set of substances, which, under the conditions of the known chemistry of chemical transformations, determines the entire composition of the chemical system.

When creating quantitative models, equilibrium calculations have to be carried out for complex multicomponent systems. For example, for smelting copper concentrates per matte, the minimum number of components considered is five (Cu, Fe, S, O, SiO₂). If you do not take into account such components of slag as CaO, Al₂O₃, but consider the behavior of accompanying elements (Pb, Zn, As, Sb, etc.), the number of components increases to seven or ten.

Recently, to predict the behavior of non-ferrous and related metals under equilibrium conditions of known copper matte - slag - gas phase, equilibrium yield phase models have been effectively used for specific processes [1-10].

Despite the well-developed technique of applied thermodynamic calculations, one of the important issues is the determination of the equilibrium solubility of copper and lead in the slag, which is of great practical importance in the processing of copper and lead containing intermediates and recycled materials of complex composition. Moreover, if the solubility of copper in slags has been studied sufficiently thoroughly, then a similar question for lead requires a quantitative determination of the concentrations of all its components present in the slag.

The purpose of this work is to develop a method for calculating the oxide component of lead depending on the thermodynamic characteristics of the complex multicomponent system Me – Fe – S – O – SiO₂ (Me – Cu, Pb) as applied to the processing of intermediate products and circulating materials of lead production.

Thermodynamics system Me-Fe-S-O-SiO₂

The thermodynamics of the copper-lead matte-slag system is a gas phase characteristic of the processing of intermediate products and circulating materials of lead production by recovering in a shaft furnace by contractile melting is quite complex. If we consider this system taking into account all the slag and matte components involved in the physicochemical processes, then it cannot be described because of the many components. Nevertheless, neglecting a small amount of accompanying metals present in the smelting products, this system in a simplified form can be represented as Me-Fe-S-O- SiO₂ (Me - Cu, Pb).

According to the rule of Gibbs phases for the Cu - Pb - Fe - S - O - SiO₂ system at equilibrium, the number of degrees of freedom is: $C = 6 - 3 + 2 = 5$. For the full thermodynamic description of the system, you can choose the following independent variables: copper and lead content in the matte, the pressure of SO₂ in the gas phase, the temperature and activity of FeO in the slag. This choice of variables is natural for analyzing the process of lead smelting of copper-containing lead raw materials to matte. For this system, the magnitude of the fluctuation of FeO activity with SiO₂ > 25% is in insignificant limits, provided that all the oxygen in the slag is converted to 1 mole of Fe₂ +.

Method of calculating the activity of lead oxide

Earlier, in [11], during the initial analysis of industrial data on the composition of the products of smelting mine contractile smelting - mattes and slags, a close dependence was established between the lead content in the slag and its content in matte, which is described by the equation:

$$(\text{Pb}) = -1,01 + 0,082[\text{Pb}], \quad r = 0,79; \quad (1)$$

However, equation (1) is applicable to predict the dependence of the total lead content in the slag on its total content in matte. Nevertheless, as the results of work [12] show, where the forms of lead in the slag are studied, one should take into account the complex mechanism of the transition of lead to slag - in the form of oxide (PbO), sulfide (PbS) and in the form of dissolved metal. It is quite obvious that when organizing measures to reduce the loss of lead with slag, it is necessary to clarify the quantitative ratios of these forms of lead in order to choose the optimal way of slag depletion for lead.

In industrial slags of mine contractile smelting, the proportion of dissolved lead is mainly represented in the oxide and silicate form. The proportion of lead in these compounds reaches 60% of its total content in the slag. The remaining part of lead (40%) in slags is represented by metal and sulfide forms, and their shares in this part are about the same [11].

Under the conditions of mine contractile melting of copper and lead containing intermediates and circulating materials on matte, the thermodynamic probability of lead sulfide oxidation can be described by the following reactions:



The reaction (2) is preferable ($\Delta G = - 290552.2 \text{ J / mol}$) than the reaction (3), as evidenced by the low Gibbs energy $\Delta G = - 85372 \text{ J / mol}$.

Assuming the thermodynamic equilibrium of the matte-slag system and assuming the identity of the constants of the reactions K (2) and K (3) can be written:

$$a_{(\text{PbO})} * P_{\text{SO}_2} / a_{[\text{PbS}]} * P_{\text{O}_2}^{3/2} = a_{(\text{PbO})} * a_{[\text{FeS}]} / a_{[\text{PbS}]} * a_{(\text{FeO})}. \quad (4)$$

Under melting conditions, the values of P_{O_2} and P_{SO_2} are fixed. Then, solving the left side of expression (4) with respect to a (PbO), we obtain:

$$N_{(\text{PbO})} = K1 * N_{[\text{PbS}]}, \quad (5)$$

where: the activity of the components is replaced by the product of the mole fraction and the activity coefficient of the components of lead, $N * \gamma$;

$$K1 \text{ is a constant value } K1 = K_{(2)} * P_{\text{O}_2}^{3/2} * \gamma_{[\text{PbS}]} / P_{\text{SO}_2} * \gamma_{(\text{PbO})}.$$

On the other hand, solving the right-hand side of expression (4) with respect to a (PbO) allows us to write the following equation for the oxide solubility of lead in slags:

$$N_{(\text{PbO})} = K2 * N_{[\text{PbS}]} / N_{[\text{FeS}]}, \quad (6)$$

where: the activity as well as in the previous case is replaced by the product of the mole fraction and the activity coefficient of lead components, $N * \gamma$;

$$K2 = K_{(3)} * \gamma_{[\text{PbS}]} * N_{(\text{FeO})} * \gamma_{(\text{FeO})} / \gamma_{[\text{FeS}]} * \gamma_{(\text{PbO})}.$$

The solution of equations (5) and (6) involves the determination of the activity coefficients of sulfides and oxides of lead and iron.

To calculate the values of a_{FeS} and a_{FeO} activities depending on the copper content in the matte, you can use the cubic spline approximation presented in the paper [2]:

$$a_{\text{FeS}} = y_i + b_i (\text{Cu}_{\text{mat}}/10) + c_i (\text{Cu}_{\text{mat}}/10)^2 + d_i (\text{Cu}_{\text{mat}}/10)^3, \quad (7)$$

where is the index i - the integer part of the fraction ($\text{Cu} / 10$).

Formulas for calculating a_{FeO} are similar (7). The coefficients of the splines are given in [3]. Given the copper content in the matte according to equations (7), it is easy to calculate a_{FeS} and a_{FeO} .

To calculate the lead sulphide aPbS activity, you can use reactions (2) and (3). Based on the reaction (2) can be written:

$$a_{\text{PbS}} = (a_{\text{PbO}} P_{\text{SO}_2}) / (K_3 P_{\text{O}_2}^{3/2}) \quad (8)$$

$$\Delta G = - 496\,011 + 141,6 \text{ T J} / \text{mol}$$

From reaction (3) we have:

$$a_{\text{PbO}} = (a_{\text{PbS}} a_{\text{FeO}}) / (K_4 a_{\text{FeS}}) \quad (9)$$

$$\Delta G = 37\,725 - 67,44 \text{ T J} / \text{mol}.$$

For fixed values of temperature and partial pressure of oxygen and sulfur, substituting the value of a_{PbO} from equation (9) to equation (8) it is easy to calculate the activity of lead sulfide.

Determining the elemental composition of the matte and the activity of the desired matte components easily makes it possible to calculate their activity coefficients. The determination of the dependence of the activity of lead oxide on the composition of the slag can be used to build a thermodynamic model of mine contractile melting of intermediate products and circulating materials of lead production.

Conclusion:

A method for calculating the oxide component of lead depending on the thermodynamic characteristics of a complex multicomponent system has been developed Me-Fe-S-O-SiO₂ (Me-Cu, Pb).

The obtained results of thermodynamic quantities on the activities of lead oxide and sulfide make it possible to fully describe the complex thermodynamic system Me-Fe-S-O-SiO₂ (Me-Cu, Pb), characteristic of the processing of intermediate products and circulating materials of lead production.

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额尔齐斯河春季洪水预报的水文数学模型
**HYDROLOGICAL-MATHEMATICAL MODEL OF THE FORECAST
OF THE SPRING FLOOD OF THE IRTYSH RIVER**

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注解。预测额尔齐斯河春季洪水的水位对于预防自然灾害，水工结构的紧急情况，合理利用水资源是必要的。本文致力于建立和预测额尔齐斯河日常水位的概念模型。该模型使用所有可用的运行信息：气温，降水，流速和关闭点以及河流系统的水位。该模型由子模型组成，其中每个区域的高海拔区域的雪积累，融雪，解冻和雨水失水，斜坡流入和河道流量的计算。在该模型的基础上，开发了软件，使我们能够通过以下几点模拟夏秋季节的日常开支和水位值：鄂木斯克，塔拉，特维里兹，乌斯季伊希姆。观测材料的验证预测质量被称为“令人满意”和“良好”。

关键词 额尔齐斯河，水文和数学模型，春季洪水，融雪，解冻和雨水失水，坡面流入，河道流量预测。

***Annotation.** Forecasting the water levels of the spring flood of the Irtysh River is necessary for the prevention of natural disasters, emergency situations on hydraulic structures, for the rational use of water resources. The article is devoted to the conceptual model of the formation and forecast of daily water levels of the Irtysh River. The model uses all available operational information: air temperature, precipitation, flow rates and water levels in the closing point and on the river system. The model consists of submodels, in blocks of which for the high-altitude zones of each region calculations of snow accumulation, snowmelt, water loss of thawed and rainwater, slope inflow and channel flow are carried out. On the basis of the model, software has been developed that allows us to simulate the values of daily expenses and water levels in the summer-autumn period by the following points: Omsk, Tara, Tevriz, Ust-Ishim. The quality of verification forecasts for observational materials is characterized as “satisfactory” and “good”.*

Keywords. *Irtysch river, hydrological and mathematical model, forecast of spring flood, snowmelt, water loss of thawed and rainwater, slope inflow, channel flow.*

Introduction

The object of the research is the Irtysch River within the Omsk region. On the Irtysch, the amplitude of water levels in the spring-summer period reaches 10 m - from the peak of the flood to the minimum in the summer-autumn low-flow period. Figure 1 shows the course of daily water levels in the river. Irtysch from March 1 to August 30, 2016 in the area from the upper range, within the Russian part, near the village of Cherlak, to the lower section near the village of Ust-Ishim. In 2016, the level rise was from 2.5 m in the return section, to 7.5 m in the lower section.

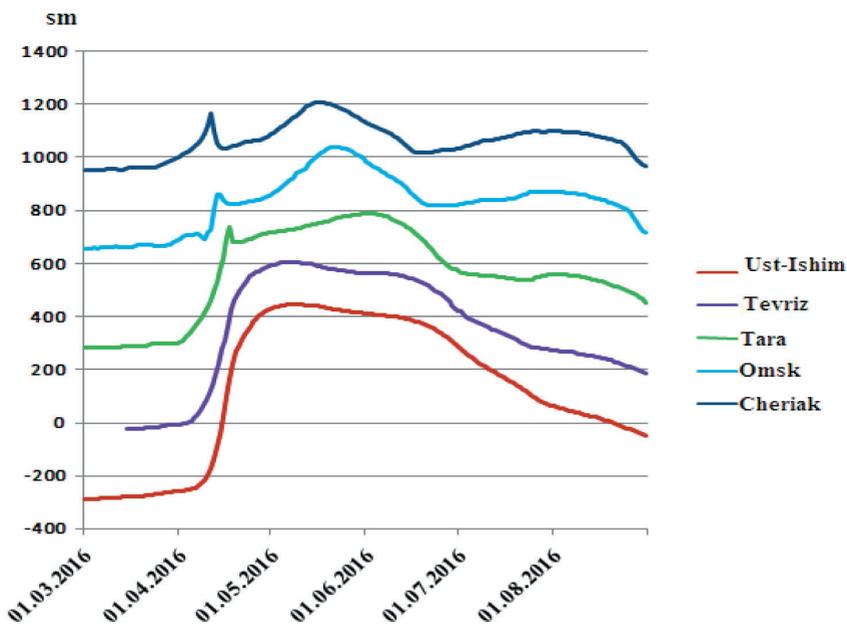


Figure 1. *The progress of daily water levels in the Irtysch River.*

The conceptual model of the forecast of the spring flood was created for the section of the Irtysch River on selected items: Omsk, Tara, Tevriz, Ust-Ishim. The Irtysch basin to Ust-Ishim covers 45% of the Irtysch basin - 738 of 1,643 thousand square km.

The climate of the study area is moderately continental with long cold winters and relatively warm and humid summers. Transition periods - spring and autumn, are short-lived and flow rapidly, especially spring. Natural zones change from steppes in the south to taiga in the north. In the Irtysh basin there is a significant uneven moistening over the territory and over time. The average annual precipitation increases from 280 mm in the south to 600 mm in the north. Before the start of snow melting, 13 to 210 mm of water accumulates in the snow cover.

Due to the flat nature of the territory and its openness from the north and south, in any season of the year, abrupt weather changes, transition from heat to cold, significant fluctuations in air temperature from month to month, from day to day, and during the day are possible.

Against the background of the absence of significant increases and decreases in the earth's surface, such relief forms as manes, river valleys, ridges, ancient hollows of runoff, small ravines, depressions, drainless depressions, lake depressions are widespread.

Before the city of Omsk, the Irtysh River does not accept tributaries. The largest tributaries within the forest (marshy) zone: Om, Tara, Ishim. In the interfluvium of the Irtysh and Ishim is a vast drainless area.

In the territory of the Republic of Kazakhstan, the Upper Irtysh cascade of reservoirs was created. The level regime and the volume of the spring flood of the Irtysh is regulated by the Shulbinsk hydroelectric station, located 70 km above the city of Semey. Its influence on the maximum level of reservoirs extends to the city of Tara, Omsk Region.

The prognostic model consists of submodels, in blocks of which, for the height zones of each region, snow accumulation, snowmelt, melt and rainwater return, slope and riverine drainage are calculated. The model uses both meteorological information and data from observations of water levels in the river system. Water reserves in the channels are calculated from observations of daily levels for 8 hours. The impact of channel stocks on the projected discharge (level) increases downstream.

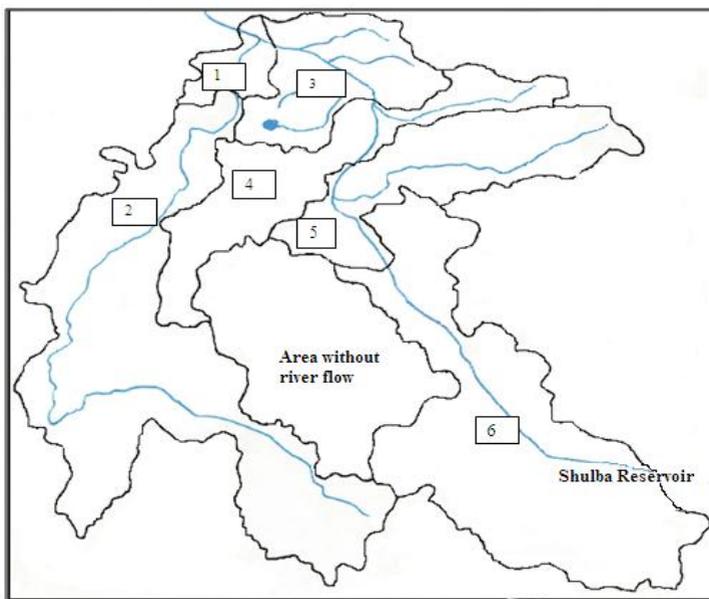


Figure 2. Scheme of the Irtysh basin to the village Ust-Ishim (districts: 1. Ust-Ishim 2. Vikulovo 3. Tevriz 4. Tara 5. Omsk 6. Tatarka).

The time intervals during which the daily intake of water to the surface of the pool exceeds the daily evaporation and infiltration form successive flow-forming periods.

Figure 2 shows a diagram of the areas of the Irtysh basin to the closing section at s. Ust-Ishim.

In the model, the calculation of the variable during snow melting of the area of snow cover and the water-holding capacity of snow is made according to the method of A.G. Kovzel, calculation of water loss of the basin is made according to the method of E.G. Popov [1].

The calculation is performed for each area of the basin consistently every day. The integral water layer filling the water retaining capacity is determined taking into account the water return by the snow cover, precipitation, evaporation and supply of groundwater, as well as the layer of initial filling of the water retaining capacity (according to its connection with the characteristics of the autumn moistening of the pool). The water supply to the slopes during the rain period is determined by arithmetic averaging of the daily precipitation layer at the observation points, which are attached to this region (altitude zone).

The submodel of the slope inflow of water into the channel network is based

on the concept of a dynamic (gravitational) water supply on the slopes. The movement of water in the channel network is calculated by the method, based on the use of the dragging curve [2].

In a generalized form, the structure of the model [2, 3] is shown in Figure 3.

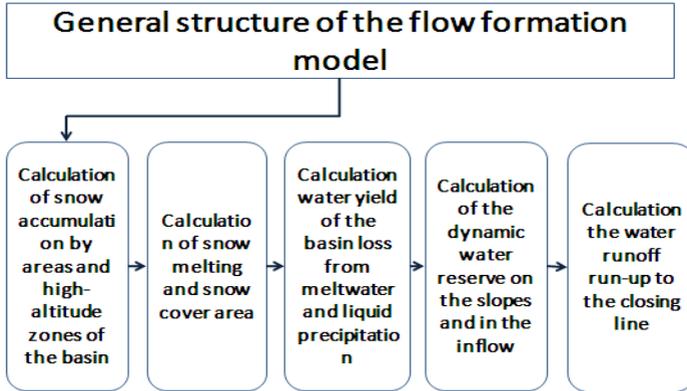


Figure 3. General structure of the flow formation model.

The basis for the calculation of the integral water loss layer of the $Y(t)$ river basin, which is formed during the period of rainfall or snowmelt in each region of the basin, is based on the E.G. Popov’s model:

$$Y(t) = (1 - \omega) [H(t) - P_o th(H(t)/ P_o)] \tag{1}$$

where: t - time; $H(t)$ is the total water layer that came to fill the water retaining capacity of the region from the beginning of snowmelt to the moment t (formulas are given below); ω - the share of permanently drainless area; P_o is a loss parameter characterizing the dimensions of the area’s water-holding capacity for the driest preceding conditions; th is the function of the hyperbolic tangent.

The submodel of the slope inflow of water into the channel network $q(t)$ of the region is based on the concept of a dynamic (gravitational) water supply $W(t)$ on the slopes associated with $q(t)$ in the general case is not linear:

$$W(t+\Delta t) = W(t) + u(t+\Delta t) - q(t+\Delta t), \tag{2}$$

$$u(t+\Delta t) = Y(t+\Delta t) - Y(t), \tag{3}$$

$$q(t+\Delta t) = \alpha \{0.5[W(t) + W(t+\Delta t)]\}^n, \tag{4}$$

where a a variable coefficient taking into account the changing hydraulic conditions of water runoff from slopes and other factors [2, 3]; n is an exponent.

An important place in the forecast model is given to the description of the

movement of water in the channel network. The model uses a calculation method based on the use of the $f(\tau)$ curve. The lagging curve, also called the influence function or response function, is usually understood as a transformational function by which the inflow hydrograph into the channel network of the river basin area under consideration $q(t)$ is converted into a drain hydrograph relative to the closing section of the basin $Q(t)$ based on the integral convolutions

$$Q(t) = \int_0^t q(t - \tau) f(\tau) d\tau \quad (5)$$

In the probabilistic model, the $f(\tau)$ curves are considered as the density of the distribution of the time of reaching the elementary volumes of water in the hydrological system of each region relative to the closing section, for which the forecast is calculated. For its approximation, two or three-parameter probability density functions are used (gamma distribution and others). For the task of these functions, the moments of the distribution of the travel time are estimated.

To this end, each basin area (Figure 2) is divided by an equidistant system on the Fi sites (Figure 4). Equidistants are the lines connecting points that are at the same distance along the channels to the closing alignment.

For each region in the Irtysh basin (Figure 2), the moments of the channel quagmire curve were determined using the formulas given in [2, 3, 4]. In addition, for the considered areas, high-altitude zones are distinguished, their average heights and area shares are determined in relation to the area of the corresponding area.

Water flow calculations using the convolution integral (5) are performed for small pools that are homogeneous with respect to the landscape. In the general case, when a river basin is subdivided into separate areas, the forecast of water discharge is carried out taking into account the principle of superposition: the hydrographs of the flow of each area are summed up in the forecast section according to the expression

$$Q(t + \Delta t) = \left[\sum_{i=1}^n \int_0^{\Delta t} q_i(t + \Delta t - \tau) f_{q_i}(\tau) d\tau \right] + Q_w(t + \Delta t) + Q_{min}, \quad (6)$$

where $Q(t + \Delta t)$ is the water consumption in the closing point; t is the date of issue of the forecast; Δt - forecast advance; n is the number of landscape-hydrological areas where the river basin is distributed; $q_i(t)$ is the total inflow into the channel network from the i -th region (altitude zone); $f_{q_i}(\tau)$ is the curve of lagging of the lateral inflow from the i -th region; $Q_w(t + \Delta t)$ is a component of the water flow due to the depletion of the initial (at the moment t) water supply in the channel network; Q_{min} - sustainable underground (“basic”) power of the river.

Figure 4 Schematic diagram of the construction of equidistant

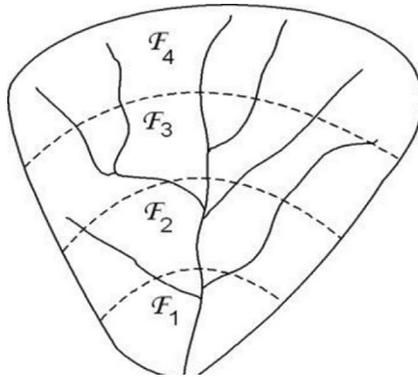


Figure 4 Schematic diagram of the construction of equidistant

Expressing the supply of water in the channel network, depending on the height of the water levels $H_i(t)$ in the observation points of the river system, we obtain the following equation [2, 3]:

$$\begin{aligned}
 H(t + \Delta t) = & [c_0 \sum \int_0^{\Delta t} q_i(t + \Delta t - \tau) f_{q_i}(\tau) d\tau + \sum c_i (H_i(t) - H_{i \min})^{y1} + \\
 & + \sum c_{i+n} (H_i(t) - H_i(t-1))]^{1/y2} + H_{min},
 \end{aligned} \tag{7}$$

where: H - the predicted water level in the closing point; $c_i, y1, y2$ - coefficients; $H_{i \min}$ - the minimum water level in the i -th point of the river system, taken as the conventional zero of reference; H_{min} - the same in the closing line.

The unknown parameters included in the formulas of the individual blocks of the model are determined by a combination of optimization methods and linear regression.

The software allows us to simulate the values of the flow rates (levels) of water by means of numerical experiments. The daily precipitation, the maximum water supply in the snow cover, the characteristics of the preceding wetting of the basin, daily air temperatures known by the time of the forecast, are determined by the actual observations, and by the forecast period by the weather forecast. Taking into account the current composition of the current operational information network, the following observational data are used in the forecast models: snow surveys, daily precipitation and air temperature, water levels and expenditures by 17 points. On the basis of the model, software has been developed that allows us to simulate the values of daily expenses and water levels in the summer-autumn period by the following points: Omsk, Tara, Tevri, Ust-Ishim. The daily operational information is received automatically from the UGMS data collection center.

Table 1 shows the indicators of the quality of verification forecasts for observational materials, which is characterized as “satisfactory” and “good”.

Table 1. Characteristics of the accuracy of forecasts of daily water levels (S is the mean square error of the forecast; G is the mean square deviation of the water level during the forecast lead time; S / G is the quality criterion of the forecast me

Заблаговременность прогноза, сутки	1			2			3			4			5			6			7		
	S/G	S	G	S/G	S	G	S/G	S	G	S/G	S	G	S/G	S	G	S/G	S	G	S/G	S	G
р. Иртыш - Омск	0,65	39	59	0,53	54	103	0,46	65	142	0,51	91	179	0,48	102	179	0,53	132	246	0,53	147	276
р. Иртыш – Тара	0,55	5	9	0,44	8	17	0,40	10	20	0,36	11	41	0,34	13	38	0,33	15	44	0,33	16	50
Р. Иртыш-Тевриз	0,83	16	20	0,65	17	27	0,54	19	25	0,47	20	42	0,43	22	50	0,40	23	57	0,39	25	64
р. Иртыш-Усть-Ишим	0,71	11	15	0,52	13	24	0,41	13	34	0,35	15	43	0,31	16	52	0,29	18	60	0,28	19	68

Figure 5 shows a graph illustrating the degree of coincidence of calculated and actual water levels over the production test period.

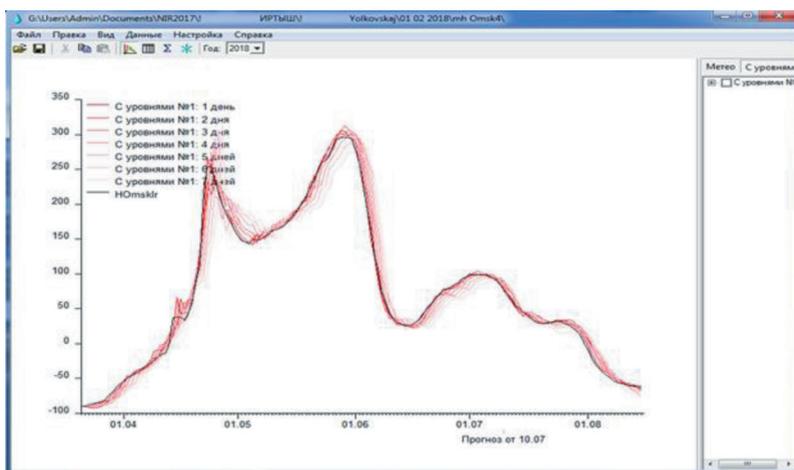


Figure 5. The data output window of the actual and projected water levels in the Irtysh River near the city of Omsk as a graph.

Conclusion.

The developed model is intended for issuing forecasts of daily water levels both during the spring flood period and in the summer-autumn period. Hydrological and mathematical model of the forecast takes into account almost all available information.

The quality of verification forecasts for observation materials is characterized as “satisfactory” and “good”, depending on the availability of hydrometeorological information on the territory. A significant contribution to improving the accuracy of the forecast is given by taking into account the water levels in the channel network. Thus, the model takes into account the channel water reserves at the date of release of the forecast.

The model is represented by a technological forecast line, which provides for the possibility of automated data transfer to forecasting program files.

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银和金的制备和吸附活性二氧化锆XEROGELS
**PREPARATION AND ADSORPTION ACTIVITY OF ZIRCONIUM
DIOXIDE XEROGELS WITH SILVER AND GOLD**

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注解。基于二氧化锆的材料的生产具有广泛的功能特性是基于各种添加剂的引入。在这项工作中,水合 ZrO_2 是在硝酸氧锆(IV)的控制溶胶-凝胶合成中,加入 $AgNO_3$ 和 $AuCl_3$ 盐得到的。已经确定,在银和金的帮助下,无定形 ZrO_2 干凝胶颗粒的多分散性增加。研究了 $ZrO_2 + Ag, Au$ 干凝胶的燃烧和紫外线照射对4-硝基苯酚和亚甲基蓝染料(MB)吸附的影响:在 $500^\circ C$ 下热处理 ZrO_2 不会改变4-硝基苯酚的吸附动力学,而在含 Ag 和 Au 的样品中,吸附减少。 Au 的存在激活了硝基苯酚在样品上的快速吸附。在 $500^\circ C$ 下煅烧的 $ZrO_2 < Ag-ZrO_2 < Au-ZrO_2$ 干凝胶系列中MB的平衡吸附增加,并且样品的UV照射增加了染料的吸附。

关键词:二氧化锆,干凝胶,紫外线照射,吸附,4-硝基苯酚,亚甲基蓝染料。

Annotation. *The production of materials based on zirconium dioxide with a wide range of functional properties is based on the introduction of various additives. In this work, hydrated ZrO_2 was obtained in controlled sol-gel synthesis from zirconyl (IV) nitrate with the addition of salts $AgNO_3$ and $AuCl_3$. It was found that the polydispersity of particles of amorphous ZrO_2 xerogels increases in the presence of silver and gold. The effects of calcinations and UV irradiation of $ZrO_2 + Ag, Au$ xerogels on the adsorption of 4-nitrophenol and methylene blue dye (MB) were determined: heat treatment of ZrO_2 at $500^\circ C$ does not change the adsorption dynamics of 4-nitrophenol, whereas in samples with Ag and Au , adsorption is reduced. The presence of Au activates the rapid adsorption of nitrophenol on a sample with UV light. The equilibrium adsorption of MB increases in the series of $ZrO_2 < Ag-ZrO_2 < Au-ZrO_2$ xerogels calcined at $500^\circ C$, and the UV irradiation of the samples multiplies the adsorption of the dye.*

Keywords: *Zirconium dioxide, xerogel, UV irradiation, adsorption, 4-nitrophenol, methylene blue dye.*

Introduction. Zirconium dioxide has a unique biocompatibility, high resistance to biological agents, good plasticity and low density, so that it is used to create bone, joint and dental prostheses [1-3]. Silver and gold are bioactive elements, exhibiting antimicrobial and antibacterial properties. Interest in materials based on zirconium dioxide doped with silver and gold is not limited to the development of implants [4]. The use of zirconium dioxide with biocidal additives of silver and gold as a sorbent for the removal of pollutants seems to be very relevant. Sol-gel synthesis used in our work is the simplest and most environmentally friendly method for producing highly dispersed oxides, including ZrO_2 nanopowders, which can be used as precursors of zirconia ceramics, as well as sorbents and catalysts. [5-8].

The aim of the work is synthesis of xerogels of zirconium dioxide with additives of silver and gold and analysis of their influence on the dispersion of gels and adsorption characteristics of 4 - nitrophenol and methylene blue. An important task of the study was to clarify the role of pre-treatment of xerogel – orbeint-calcination and UV irradiation. Note that information on the photoactivity of the amorphous form of zirconium dioxide in adsorption is very limited.

Experiment. The scheme for obtaining the xerogel consists of several stages: *preparation of solutions* → *gel formation* → *washing* → *drying* → *heat treatment*.

In our work, a hydrogel was obtained by a hydrolysis-condensation reaction for a reverse sol-gel synthesis from $ZrO(NO_3)_2 \times 2H_2O$ (Across) in the presence of ammonium hydroxide (25% NH_4OH of “high purity” qualification, HimMed, GOST 24147-80). The duration of the sol-gel synthesis was 2 hours at room temperature and constant stirring of the gel, during which the pH was controlled and the degree of dispersion of the gel was analyzed. The obtained gel-like hydroxide precipitate $ZrO_2 \times H_2O$ was washed off from ammonium ions with distilled water on a water-jet pump with a Schott filter, then dried by washing with ethanol. The precipitate was divided into 3 equal parts, placed in porcelain cups, two of which were filled with $AgNO_3$ solutions (“chemically pure”, Germany) or $AuCl_3$ (Across), and the same volume of distilled water was added to the control. Then there was a heat treatment of hydrogels at $180^\circ C$, 2 hours.

Synthesis procedures were consistent with the previously used method [9]. The recommended pH value should be in the range from 9 to 10, which was carried out (Fig. 1). Analysis of the dispersion of the gels was developed in our laboratory [9]. It is based on a sedimentation method with the determination of light scattering of gel sample suspensions. The dependences of the turbidity of suspensions on time during the sedimentation of particles (Fig. 2) had two linear sections from which the sedimentation rates of large W_1 (fraction 1) and small W_2 (fraction 2) of agglomerates were determined. The degree of polydispersity P was estimated as the ratio of the radii of the particle fractions $P = r_1 / r_2 = (W_1 / W_2)^{1/2}$.

The adsorption of 4-nitrophenol (4-NP) and methylene blue (MB) was determined under dynamic and static conditions at room temperature using the photometric method. The Gibbs adsorption (GA) was calculated from the change in the optical absorption of a solution of the substance ΔA using the obtained from the calibrations of the extinction E values of aqueous solutions of 4-nitrophenol (740) and dye (66940 $\text{L}\cdot\text{mol}^{-1}\cdot\text{cm}^{-1}$) for analytical absorption bands of 403 nm (4-NP) and 665 nm (MB). The solution volume (V) and the weight of the xerogel powder (m) were $V=5$ ml and $m=0.1$ g.

$$\Gamma = \frac{(c_0 - c) \cdot V}{m} = \frac{(A_0 - A) \cdot V}{E \cdot m} = \Delta A \cdot k$$

UV irradiation of powders with broadband radiation from an ИМП-350 mercury lamp was carried out in air with an exposure time of 10 minutes.

The discussion of the results. The complex type of pH dependence on the duration of sol-gel synthesis with two maxima (Fig. 1) can be explained by a change in the size of the particles of hydrated zirconium oxide, the degree of their aggregation and the composition of the hydroxyl coating of the particles during the synthesis. The sedimentation curves shown in Fig. 2 indicate the presence of two fractions of large hydrogel particles. The third fraction of suspended particles (their diameter is less than 20 nm) is not determined by the method used. The sedimentation data is confirmed by the results of granulometric analysis.

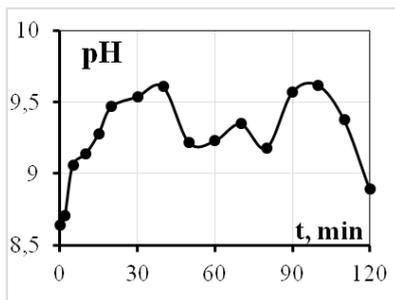


Fig.1. pH change during zirconium oxide hydrogel synthesis

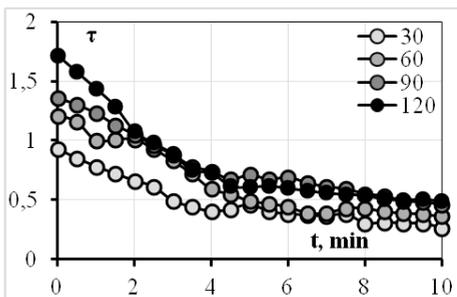


Fig.2. Change in turbidity (cm-1) during sedimentation of particles of hydrogel samples taken during the sol-gel synthesis

Based on the dependences τ -time, the sedimentation rates W of the agglomerated particles of two fractions were calculated. The histogram in Fig. 3 compares the relative rates values of velocity and polydispersity P . The absolute values of

the sedimentation rates of hydrogel particles with a synthesis time of 30 minutes were $W_1 = 0.123$ and $W_2 = 0.031 \text{ min}^{-1} \cdot \text{cm}^{-1}$ ($W_1/W_2 \sim 4$). The values of the velocity W_1 , the ratios W_1 / W_2 , and P increase along the sol-gel synthesis (Fig. 3).

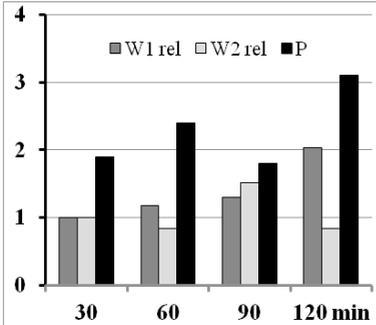


Fig.3. Change in sedimentation rate and polydispersity P of particles 1 and 2 of hydrogel fractions during synthesis

Table 1. Analysis of the dispersion of xerogels on the sedimentation rate of particles W ($\text{cm}^{-1} \cdot \text{min}^{-1}$)

Sample	ZrO ₂	Ag-ZrO ₂	Au-ZrO ₂
W_1	0,083	0,092	0,052
W_2	0,083	0,021	0,021
W_1 / W_2	1	4,4	2,5
$\Pi = r_1/r_2$	1	2,1	1,6

Table 2. Henry's relative constants for the adsorption of 4-NP on ZrO₂ xerogels

Sample	ZrO ₂	Ag-ZrO ₂	Au-ZrO ₂
Without UV	1	0,8	1,8
With UV	1	1,1	1,8

The introduction of silver and gold into the hydrogel increases the polydispersity of the xerogel particles obtained after drying the hydrogel at a temperature of 180°C (Table 1). The xerogel particles are X-ray amorphous, as indicated by the absence in the diffractograms of reflections of the crystalline phase of zirconium dioxide.

Calcination of the oxide at 500°C does not affect the kinetics of the adsorption of 4-nitrophenol in the case of ZrO₂, and in samples with Ag and Au the adsorption is substantially less. Figure 4 shows the kinetic dependences of the adsorption of 4-NP on amorphous samples without and with UV treatment (UVT). The latter reduces the activity of ZrO₂ and Ag-ZrO₂ and activates adsorption on Au-ZrO₂ with a change in the shape of the kinetic dependence.

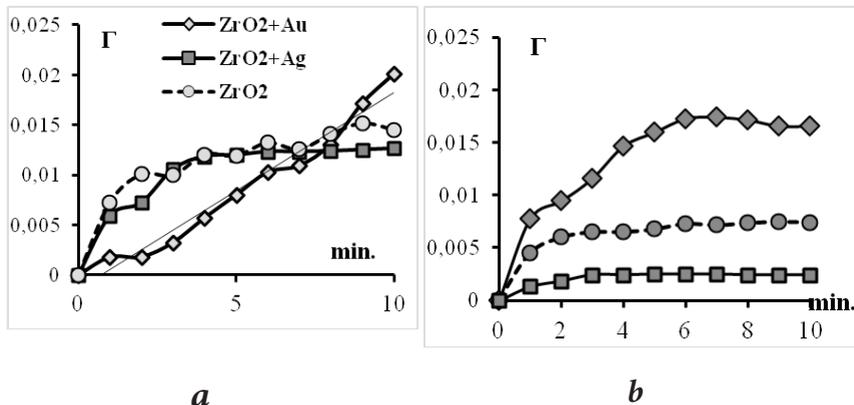


Fig.4. Kinetics of 4-nitrophenol Adsorption (G , mmol / g) on uncalcined samples of ZrO_2 xerogels without (a) and with preliminary UV irradiation (b).

It was interesting to determine the effect of UV irradiation on the equilibrium adsorption characteristics. 4-NP adsorption isotherms had a linear form, the tangent of an angle of which is equal to the Henry constant k_H (Fig. 5). Its value did not change after UV irradiation of ZrO_2 and Au- ZrO_2 ; k_H (ZrO_2) is 0.77 and 0.75 l/g and k_H (Au) 1.35 and 1.34 l/g before and after UV treatment, respectively. The relative values of k_H are given in table 2.

We see the greatest photostimulation of MB dye adsorption in the case of a sample with gold: adsorption increases after the UV by a factor of 8 for $C_{MC} = 6 \mu\text{mol/L}$ and 4 times for the initial concentrations of MB 12 and 19 $\mu\text{mol/l}$ (Fig. 6). The photoactivation effect was also found in the Ag- ZrO_2 sample, but it appears only at high C_{MC} , as well as in ZrO_2 with the lowest equilibrium adsorption before UV treatment. A series of adsorption capacity of $ZrO_2 < Ag-ZrO_2 < Au-ZrO_2$ is

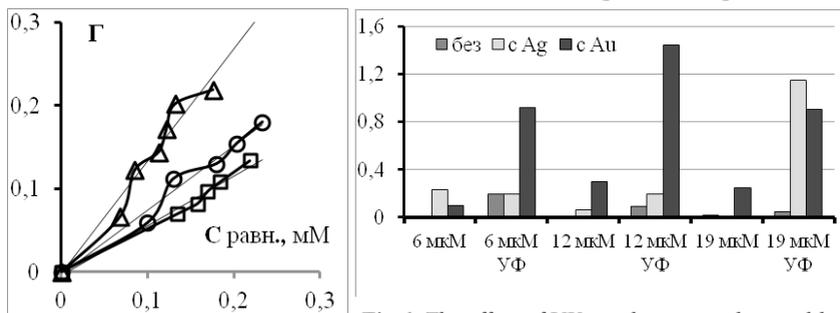


Fig.5. 4-NP adsorption isotherms (G in mM/g) on non-calcined ZrO_2 (o), Ag- ZrO_2 (□), Au- ZrO_2 (Δ)

Fig.6. The effect of UV irradiation on the equilibrium adsorption (G in $\mu\text{M/g}$) of methylene blue on the calcined samples for three concentrations C_{MB} μM .

preserved even after UV treatment.

The photoactivation of ZrO_2 can be explained by the formation of Zr^{3+} paramagnetic centers, which are recorded by the EPR method, as well as hole centers O[10]. The photo-process on the surface of ZrO_2 (cubic) is attributed by the authors to the annihilation of the Zr^{3+} -O⁻ complex.

Thus, it has been established that the degree of polydispersity of zirconia xerogels can be varied by changing the duration of the sol-gel synthesis and the introduction of silver and gold. The adsorption of pollutants from an aqueous medium using 4-nitrophenol and dye MB as an example depends on thermal treatment (calcination), and the use of UV irradiation of sorbents increases the adsorption, and to a greater extent it is expressed in a case of Au- ZrO_2 .

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基于阿克苏特富集高岭土矿床的硅砖理化性质研究
**THE STUDY OF PHYSICS-CHEMICAL PROPERTIES OF SILICA
BRICK BASED ON ENRICHED KAOLIN DEPOSITS OF AKSUAT**

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抽象。在本文中,开发了根据GOST 379-2015的硅酸盐砖的技术指标。在使用液压机PGM-100MГ4-AND制造的二氧化硅砖的制造中,然后进行高压釜处理,此外,读数列出了4个样品的限制耐久性,耐水性,副产物,APCS的比效率,导热系数,抗冻性和耐火性。

关键词:液压机,高压釜加工,极限强度,弯曲。

Annotation. *In this article technical indicators of a silicate brick according to GOST 379-2015 were developed. In the manufacture of silica brick manufactured using hydraulic press PGM-100MГ4-AND then subjected to autoclave processing, and further, the readings are set out restrictive durability in 4 samples, water resistance, paraprodukt, the specific efficiency of the APCS, the thermal conductivity, frost resistance and fire resistance.*

Keywords: *hydraulic press, autoclave processing, ultimate strength, bending.*

In the manufacture of silicate bricks with a hydraulic press made of small hydraulic press of pressed bricks in the form of drugs. Silicate brick is carefully prepared with homogeneous admixtures of pure quartz sand (92-95%), slaked lime (5-8%) and water (7-8%), formed on a special press. After pressing the brick in the autoclave medium is welded with steam, saturated pressure 175°C and 0.8 MPa. Brick is made one-dimensional 250x120x65mm size and modular size 250x120x88mm; continuous and end-to-end, surface and inline. Brick grade: 75, 100, 125, 150, 200, 250[1].

Local materials were widely used for the production of hard products in the autoclave: kaolin enriched and non-enriched, limestone and quartz sand.

Strong and water-resistant autoclave materials and products are obtained as a result of chemical interaction of fine crushed lime and silicon components during their hydrothermal treatment in a steam environment inside the autoclave 175°C at a pressure of 0.8-1.4 MPa[2].. As a result of chemical reaction the strong and water-resistant substance (calcium silicate), the cemented, artificial stone of details of sand is formed. Autoclave materials and products have a dense cell structure[1,3].

Table 1 presents raw materials from the enriched kaolin of the settlement of Aksuat for the manufacture of silicate bricks. These samples for the manufacture of silicate bricks became effective after autoclaving. A control sample for the manufacture of bricks was obtained, then different interest rates were obtained for the samples 1,2,3[4,5,6].

Table 1- raw materials from the enriched kaolin of the settlement of Aksuat for production of a silicate brick

№	Content of silicate brick	Quantity,% Enriched kaolin; Quartz sand; Lime, slaked
1	Control sample – K	0;8;92
2	1 sample	2;8;90
3	2 sample	5;8;87
4	3 sample	10;8;82



After getting samples of sand-lime brick and autoclaved treatment, technical indicators are constructed according to GOST 379-2015.

In table 2 technical indicators of silicate brick from the enriched kaolin of the settlement of Aksuat according to GOST 379-2015 were developed. In the manufacture of silica brick manufactured using hydraulic press PGM-100MF4-AND then subjected to autoclave processing, and further, as indicators of restrictive strength at

the 4-m samples, water resistance, water vapor permeability, the specific efficiency of the APCS, the thermal conductivity, frost resistance and fire retardancy[7].

Table 2-technical indicators of silicate bricks from the enriched kaolin of the settlement of Aksuat

Technical characteristics, 24 hours each	1 sample	2 sample	3 sample	Control sample - K
Ultimate compressive strength, MPa	7,24±0,2%	6,516±0,1%	8,072±0,3%	7,34±0,2%
Ultimate bending strength, MPa	2,16±0,1%	1,98±0,2%	3,04±0,1%	2,19±0,3%
Amount of water absorption after 24 days, %	7,2±0,2%	9,2±0,2%	8,9±0,1%	5,2±0,1%
Specific efficiency of APC	340±0,3%	356±0,3%	348±0,3%	328±0,3%
Thermal conductivity, W/(m*S)	0,70±0,1%	0,68±0,1%	0,72±0,1%	0,69±0,1%
Vapour permeability, Mg/(m * h*PA)	0,11±0,1%	0,09±0,1%	0,05±0,1%	0,07±0,1%
Fire resistance 3000S, hour	2,5±0,2%	2,5±0,2%	2,5±0,2%	2,5±0,2%
Frost resistance.	50C ⁰ ±0,2%	50C ⁰ ±0,2%	50C ⁰ ±0,2%	50C ⁰ ±0,2%

After autoclave treatment, water resistance of silicate brick according to GOST 379-2015, ultimate compressive strength and ultimate bending strength were established. Restrictive compressive strength according to GOST corresponds to the silicate brick brand products 10 and 75, and the allowable Flexural strength corresponds to the silicate brick products of this brand. It is necessary that the water absorption does not exceed 6% according to GOST 379-215. Specific efficiency of active natural radionuclides of silicate brick should be not less than 370 Bq / kg according to GOST 379-2015. The indicator of silicate brick is not more than 370bk / kg is intended for all types of silicate brick. The density of silicate brick 1800 kg / m3 corresponds to GOST 25898-2012 for thermal conductivity and steam conductivity. Also fire and frost resistance correspond to GOST 379-2015.[8]

All technical indicators of this silicate brick are made in days. In the future, these figures remained unchanged when re-registration in 3 months. This means that the kaolin of the settlement Aksuat, enriched with silicate brick, is very convenient, in a comfortable environment, dense, high-quality product that meets the requirements of GOST.

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